NI43-101 Technical Report on the Millennium Gold Property Mojave County, Arizona, U.S.A.

Prepared for:

Stevens Gold Nevada Inc.

350- 1650 West 2nd Ave.

Vancouver, British Columbia

Canada V6J 1H4

Project Location

Mohave County, Arizona, U.S.A.

T 14 N, R 19 W, Sections 17, 18 and 20

UTM Coordinates: 749458mE, 3826097mN

Prepared by:

Mark Fedikow, Ph.D. P.Geo. C.P.G.

Mount Morgan Resources Ltd.

Exploration Geochemistry and Mineral Deposits Geology

1207 Sunset Drive

Saltspring Island, B.C., Canada

V8K1E3

Effective Date: November 9, 2020

Signature Date: November 18, 2020

SIGNATURE PAGE-MOUNT MORGAN RESOURCES LTD.

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T 14 N, R 19 W, Sections 17, 18 and 20

UTM coordinates: 3,826,098 m N, 749,459 m E

[redacted] ***/s/ Mark Fedikow***

Mark Fedikow, Ph.D. P.Geo. C.P.G.

CERTIFICATE OF AUTHOR-MARK FEDIKOW

I, **Mark A.F. Fedikow**, B.Sc. (Honours) M.Sc. Ph.D. P.Eng. P.Geo. C.P.G., do hereby certify that:

I am currently a self-employed Consulting Geologist/Geochemist with a field office at: 1207 Sunset Drive, British Columbia, Canada V8K 1E3.

I am the author of the 43-101 Technical Report "**NI 43-101 Technical Report on the Millennium Gold Property, Mojave County, Arizona, U.S.A.**" with an effective date of November 9, 2020. I am responsible for the contents of this Technical Report and I have reviewed and edited all sections of it.

1. I graduated with a degree in Honours Geology (B.Sc.) from the University of Windsor (Windsor, Ontario) in 1975. In addition, I earned a M.Sc. in geophysics and geochemistry from the University of Windsor and a Doctor of Philosophy (Ph.D.) in exploration geochemistry from the School of Applied Geology; University of New South Wales (Sydney, Australia) in 1982. My Ph.D. thesis concerned the development of exploration geochemical techniques to aid mineral exploration in covered terrain.
2. I am a member in good standing of the Engineers and Geoscientists of Manitoba as a Professional Geoscientist (P. Geo.) and a Professional Engineer (P. Eng.) being registered since 1983. I am also registered as a professional geoscientist (P.Geo.) for the Northwest Territories and Nunavut (2017). I am a Fellow of the Association of Applied Geochemists (A.A.G.), a Member of the Prospectors and Developers Association of Canada and a Certified Professional Geologist (C.P.G.) registered with the American Institute of Professional Geologists (Westminster, Colorado, U.S.A.).
3. I have practiced my profession as a geologist for a total of forty-five years since my graduation from university; as a graduate student, as an employee of major and junior mining companies, the Manitoba Geological Survey and as an independent consultant.
4. As an exploration geologist I have been involved with all aspects of geoscientific investigation and exploration of base and precious metal mineral deposits, diamonds and industrial minerals. I have worked globally including North and South America, China, Africa, Mexico, Portugal and Israel. Specifically, I have prepared geological maps at a wide range in scale, designed geochemical exploration programs, undertook bulk sampling programs for kimberlite and diamonds, logged, sampled and analyzed drill core and prepared a wide variety of reports including mineral property valuation reports. I have also managed exploration teams and Government geological survey crews for more than 30 years.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for the preparation of all sections of the technical report titled **"NI 43-101 Technical Report on the Millennium Gold Property, Mojave County, Arizona, U.S.A."** All sections of the report have been prepared according to NI43-101. The date and

duration of the most recent inspection of the property was November 7, 2020 for a period of 3 days.

7. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.
8. I have read National Instrument 43-101 and 43-101 F1. This report has been prepared in compliance with these documents to the best of my understanding.
9. I consent to the filing of the technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their web sites accessible by the public, of the Technical Report. I also consent to the use of extracts from, or a summary of, this Technical Report.
10. I am President of Mount Morgan Resources Ltd., an independent consultant acting as Qualified Person and independent of both the issuer as described in Section 1.5 and of the Vendor of the property.

CONSENT OF QUALIFIED PERSON

British Columbia Securities Commission
Ontario Securities Commission

Re: Technical Report titled "NI43-101 Technical Report on the Millenium Gold Property Mojave County, Arizona, U.S.A."

I, Mark Fedikow, Ph.D. P.Geo. C.P.G, consent to the public filing of the technical report titled "NI43-101 Technical Report on the Millenium Gold Property Mojave County, Arizona, U.S.A." (the "**Technical Report**") for **Stevens Gold Nevada Inc.** ("**Stevens Gold**").

I also consent to any extracts from or a summary of the Technical Report in the document titled "Annual Information Form" dated January 13, 2021 (the "**AIF**") of Stevens Gold, which the Technical Report supports.

I certify that I have read the AIF filed by Stevens Gold and that it fairly and accurately represents the information in the Technical Report for which I am responsible.

Dated this 13th day of January, 2021.

/s/ Mark Fedikow

[redacted]

Mark Fedikow, Ph.D. P.Geo. C.P.G

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1: SUMMARY

At the request of Stevens Gold Nevada Inc. (Stevens Gold) Mark Fedikow of Mount Morgan Resources Ltd. was retained to prepare a NI43-101 Technical Report to present historic and recent results and to make recommendations for further work on the Millennium Gold Property. The Property is located 3 miles northeast of Lake Havasu City in western Arizona consisting of 3 sections of Arizona state lands with an area of 3 square miles (7.68 km^2). It is wholly owned by Steve Van Ert and Noel Cousins. The Project is under an option agreement between Stevens Gold and the Van Ert-Cousins partnership. The Technical Report is addressed to Stevens Gold. The approximate centre of the project has UTM coordinates 749,459m East and 3,826,098m North.

Stevens Gold and Van Ert-Cousins entered into an option agreement whereby Stevens Gold can earn a 100% interest in the property free and clear of all liens, charges, royalties (save and except for the NSR contemplated herein and bonuses) by satisfying the following financial obligations:

> Subject to the rights of termination the Optionee shall (i) incur the following Expenditures on the Property; (ii) make to Owner the cash payments set forth below (each, an "Option Payment" and, collectively, the "Option Payments") pursuant to the payment procedures set forth below and (iii) deliver to Owner the Shares set forth in the allocation below:
>
> (i) Optionee shall incur Expenditures in the aggregate amount of $1,750,000 on or before the deadlines indicated below (the "Option Deadlines"):
>
> a. $250,000 prior to the first anniversary of this Agreement;
>
> b. $500,000 prior to the second anniversary of this Agreement;
>
> c. $500,000 prior to the third anniversary of this Agreement; and
>
> d. $500,000 prior to the fourth anniversary of this Agreement.
>
> If Optionee fails to incur any of the requisite Expenditures by the relevant Option Deadline and wishes to maintain or exercise the Option, Optionee may pay Owner, within 30 days following the applicable Option Deadline, the amount of the shortfall in Expenditures, and the amount so paid to satisfy the shortfall in Expenditures (a "Shortfall Payment") shall thereupon be deemed to have been Expenditures duly and timely incurred. Any and all Shortfall Payments shall be paid 80% to Van Ert and 20% to Cousins and shall be non-refundable. If any of the requisite Expenditures are not timely incurred by the relevant Option Deadline (or, as the case may be), if any corresponding Shortfall Payment is not

made by the relevant 30-day deadline), then the Option shall automatically terminate upon such failure.

(ii) Optionee shall make cash Option Payments of an aggregate of $1,005,000 to Owner to be paid as follows:

a. $25,000 concurrently upon Owner's signing of this Agreement (all of which shall be paid to Van Ert);

b. $130,000 within 45 days of the Effective Date of this Agreement (of which $104,000 shall be paid to Van Ert and $26,000 shall be paid to Cousins);

c. $150,000 prior to the first anniversary of this Agreement (of which $120,000 shall be paid to Van Ert and $30,000 shall be paid to Cousins);

d. $225,000 prior to second anniversary of this Agreement (of which $180,000 shall be paid to Van Ert and $45,000 shall be paid to Cousins); and

e. $475,000 prior to the third anniversary of this Agreement (of which $380,000 shall be paid to Van Ert and $95,000 shall be paid to Cousins).

All option payments, once made, are non-refundable. If Optionee fails to timely make any Option Payment by the relevant Option Deadline, the Option shall automatically terminate.

(iii) Subject to the receipt of all requisite stock exchange approvals by Optionee, Optionee shall deliver to Owner unencumbered, unrestricted, validly issued, and freely tradable common shares in the capital of Optionee ("Shares") as follows:

a. 1,000,000 Shares within 45 days of the Effective Date of this Agreement (of which 800,000 shall be issued to Van Ert and 200,000 shall be issued to Cousins);

b. 500,000 Shares by the first anniversary of this Agreement (of which 400,000 shall be issued to Van Ert and 100,000 shall be issued to Cousins); and

c. 500,000 Shares by the second anniversary of this Agreement, (of which 400,000 shall be issued to Van Ert and 100,000 shall be issued to Cousins).

Each such delivery, once made, is irrevocable. The Shares shall not be subject to any restriction on resale, except as provided in Section 3.4(vi). If

Optionee is unable to timely deliver any of the Shares because of Optionee's failure to obtain requisite stock exchange approvals (or for any other reason), then the Option shall automatically terminate upon such failure unless, in each such case, Optionee pays to Owner the sum of $100,000 (payable 80% to Van Ert and 20% to Cousins) prior to the Share delivery deadline and thereafter issues the Shares not later than 60 days after the original Share delivery deadline.

1.1 Geological Setting and Mineralization

The principal area of interest lies in the general area of the Mohave Mountains within a suite of Miocene-age volcanic rocks comprising interbedded mafic and felsic flows and intrusions and lesser clastic units which lie unconformably on Precambrian-age gneissic rocks. Both rock units are intruded by dikes, sills and laccolithic-like bodies of rhyolitic composition. The region is structurally complex with detachment faulting occurring to the northwest (Tumarion and Boulder Mine faults), to the southeast (Crossman Peak fault), and to the west (Whipple Mts. fault). Associated listric faulting resulted in a southwesterly tilt to the various rock units. Northeast-striking faults compound the situation. A northwest trending set of steeply dipping faults adds a further complexity and in the case of the Mohave Mountains, a range-front fault separates a mountain block from a pediment block.

Gold mineralization is exposed at surface and in drill core and is associated with pyrite in the form of a low sulphidation epithermal deposit and attendant alteration within subaerially deposited volcanic rocks. Gold-bearing volcanic rocks have a superimposed proximal alteration assemblage represented by hydrothermally bleached felsic volcanic and intrusive rocks that have been silicified, variably sulphidized, carbonatized, argillized and sericitized and mafic volcanic rocks that have been hematized. Outbound from the proximal alteration is a domain of propylitization, chloritization and epidotization.

Exploration to date has focused on windows of alteration and mineralization visible through a dissected fan of alluvial gravels. Exploration of one such window by a junior company in 1997 reported assays for continuous panel samples in an east-west direction totaling 158.5 meters in length and averaging 0.97 g/t gold and 5.71 g/t silver. An intersecting north-south panel reported an interval totaling 140.2 meters in length averaging 1.12 g/t gold and 5.65 g/t silver. A higher grade 97.5 m section was defined within the north-south panel which graded 1.51 g/t gold and 8.13 g/t silver. Five of eight drill holes within this window report gold mineralization, including 33 meters averaging 0.6 g/t gold. The Project is at an early exploration stage with significant historic drilling results and several known gold occurrences and one copper occurrence.

1.2 Database Acquisition

The exploration database for the Millennium project has been acquired between its discovery in 1996 and 2019. It consists of numerous property visits and reports and primarily rock chip geochemical surveys, some soil geochemical orientation surveys and limited ground geophysical surveys. These results were generated by interested parties following up on ongoing prospecting results by the property owners. There has been insufficient work completed to arrive at a mineral resource estimate.

1.3 Conclusions and Recommendations

The Millennium property is an early stage, underexplored low sulphidation volcanic-hosted epithermal gold deposit with geological similarities in style of mineralization and alteration to other epithermal deposits including the Castle Mountain Mine and the Moss Mine. The presence of these and numerous other epithermal gold deposits in the general area of the Millennium property indicates the district is fertile exploration terrain and has good potential for additional deposits.

In Phase 1 of new exploration it is recommended that the Westley Hill area be surveyed with induced polarisation (I.P.) surveys to define drill targets and to provide a framework for drill testing of historic gold mineralization intersected there.

Phase 2 exploration on the property should be initiated with a program of diamond drilling to test historic gold mineralization intersected in 1998. It is recommended that coring versus percussion drilling is utilized for this phase of exploration. Drill core will provide valuable information on alteration and structure in the third dimension as well as provide adequate material for gold assays. The interpretation of the Westley Hill area as the shallow portion of a low sulphidation gold mineralizing system will require deeper drilling to test the lower portions of the epithermal system.

The estimated cost for Phase 1 is $25,000.00 USD and $205,970.00 USD for Phase 2 (incl. 15% for contingencies). Table 1 summarizes Phase 2 costs.

Table 1. Summary of cost estimates for a Phase 2 diamond drill program at the Millennium Gold Property.

Estimate of costs for Phase 2 exploration, Millennium Gold Property.			
Costs in USD.			
Phase 2 Diamond Drilling			
Personnel Costs	**Unit**	**Unit Cost**	**Sub-Total**
Project Geologist	30 days	$600.00/day	$18,000.00
Core Technician	24 days	$300.00/day	$7,200.00
Costs	**Unit**	**Unit Cost**	
Supplies	30 days		$2,500.00
Assays	200 samples	$30.00/sample	$6,000.00
Truck Rental/Fuel	30	$150.00/day	$4,500.00
	Unit	**Unit Cost**	
Exploration Report			
Preparation	10 days	$500.00/day	$5,000.00
	Unit	**Unit Cost**	
Diamond Drilling	3x300 meter holes	$40,000.00/hole	$120,000.00

Related Costs	**Unit**	**Unit Cost**	
Supplies	30 days		$5,000.00
Core Saw Rental	30 days	$600.00/month	$600.00
Assays			
Drill Core	200 samples	$30.00/sample	$6,000.00
	Unit	**Unit Cost**	
Drill Report	10 days	$500.00/day	$5,000.00
		Sub-total:	**$179,000.00**
		Contingency (15%):	**$26,970.00**
		Total:	**$205,970.00**

2: INTRODUCTION

2.1 Terms of Reference

The Millennium Gold Project is in western Arizona and is primarily a gold exploration project. The Project includes mining land in sections 17, 18 and 20 in Township 14 North, Range 19 West and covers a total area of 1916.8 acres. The Report has been prepared to summarize historic work on the Project and to make recommendations for further work.

2.2 Report Responsibility and Qualified Person

The author of this NI43-101 Technical Report was prepared by Mark Fedikow Ph.D. P.Geo. C.P.G., President and Founder of Mount Morgan Resources Ltd. and independent qualified person (QP) as defined by NI 43-101. Dr. Fedikow is a professional geologist in good standing with the Engineers and Geoscientists of Manitoba (Certificate 46580) and the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG No. L3852).

2.3 Site visit

Mark Fedikow of Mount Morgan Resources Ltd. visited the Project on November 7 through November 9, 2020. The visit included geologic examinations in sections 17, 18 and 20 including the Westley Hill area, 7-gram Hill, Echo Bay Hill and the Cordex occurrence area.

2.4 Effective Date

The effective date of this report is November 9, 2020.

2.5 Information Sources

All sources of information for this report were supplied by the property owners and include numerous technical reports and associated databases produced from property visits. These documents formed the primary basis for the opinions, conclusions and recommendations of the QP expressed in this report and the belief that these sources of information are valid and appropriate for the Millennium project and the purpose for which this Technical Report is prepared. Additional sources of information included Arizona State Geological Survey and United States Geological Survey documents and maps and private sector press releases. The author has fully researched and documented the conclusions and recommendations made in this NI43-101 Technical Report.

2.6 Currency and Units of Measure

Currency amounts in this technical report are stated in Canadian (CAD) or US dollars (USD). Quantities are stated in both the Imperial and Metric Systems (System International or "SI") as systems of measure and length. Metric units, as per standard Canadian and international practice, include metric tons (tonnes, t) and kilograms (kg) for weight, kilometres (km) or metres (m) for distance, hectares (ha) for area, and gram per metric ton (g/t) for precious metal grades. Exceptions occur in the report when historic documents are quoted or utilized as it is common for the Imperial System to be used in these reports.

3: RELIANCE ON OTHER EXPERTS

This Technical Report has been prepared by Mark Fedikow QP of Mount Morgan Resources Ltd. at the request of the Stevens Gold Nevada Inc. and is addressed to Stevens Gold Nevada Inc. The author has no reason to believe that data upon which this report is based was not collected in a professional manner and no information has been withheld that would affect the conclusions of this report. The information, conclusions, opinions, and estimates contained herein are based on information available to the Qualified Person as of the effective date of this report.

4: PROPERTY DESCRIPTION AND LOCATION

The Millennium Gold Project area is situated on the southwestern pediment of the Mohave Mountains, approximately 3 miles northeast of the northern limits of Lake Havasu City on the east side of Lake Havasu and the Colorado River in Mohave County and within the west central part of the state of Arizona (Figure 1). It is 210 km (130 miles) south-southeast of Las Vegas, Nevada, and 240 km (150 miles) northwest of Phoenix, Arizona. The elevation at the project is 1800 feet compared to 450 feet at the Colorado River 6 miles to the west. The project area is part of the Basin and Range physiographic province.

The Millennium property consists of three sections including Sections 17, 18 and 20 (TWP 14 N, R 19 W), and has an area of 3 square miles (7.68 km^2). A section is defined as one mile by one mile, which is 1,609 meters square. The claims are 100% owned by Steven Van Ert and Noel Cousins (Table 2). The project has been optioned to Stevens Gold Nevada Inc. The author is not aware of environmental liabilities to which the property is subject or any other significant factors and risks that may affect access, title, or the right or ability to perform work on the property. No permits are required for the initial work that is recommended to be carried out on the property in 2020. A permit will be required for recommended diamond drilling anticipated to be carried out in 2021. It is not expected that there will be any difficulty in obtaining this permit. Topographic coverage is the Lake Havasu City North 7.5' quadrangle.

Table 2. Sections, acreage and ownership, Millennium project.

Section	Lease Number	Acreage (approx)	Lease Holder
Section 17	# 008-120247-00	640	Steve Van Ert
Section 18	# 008-119396-00	636.84	Steve Van Ert
Section 20	# 008-119518-00	640	Steve Van Ert

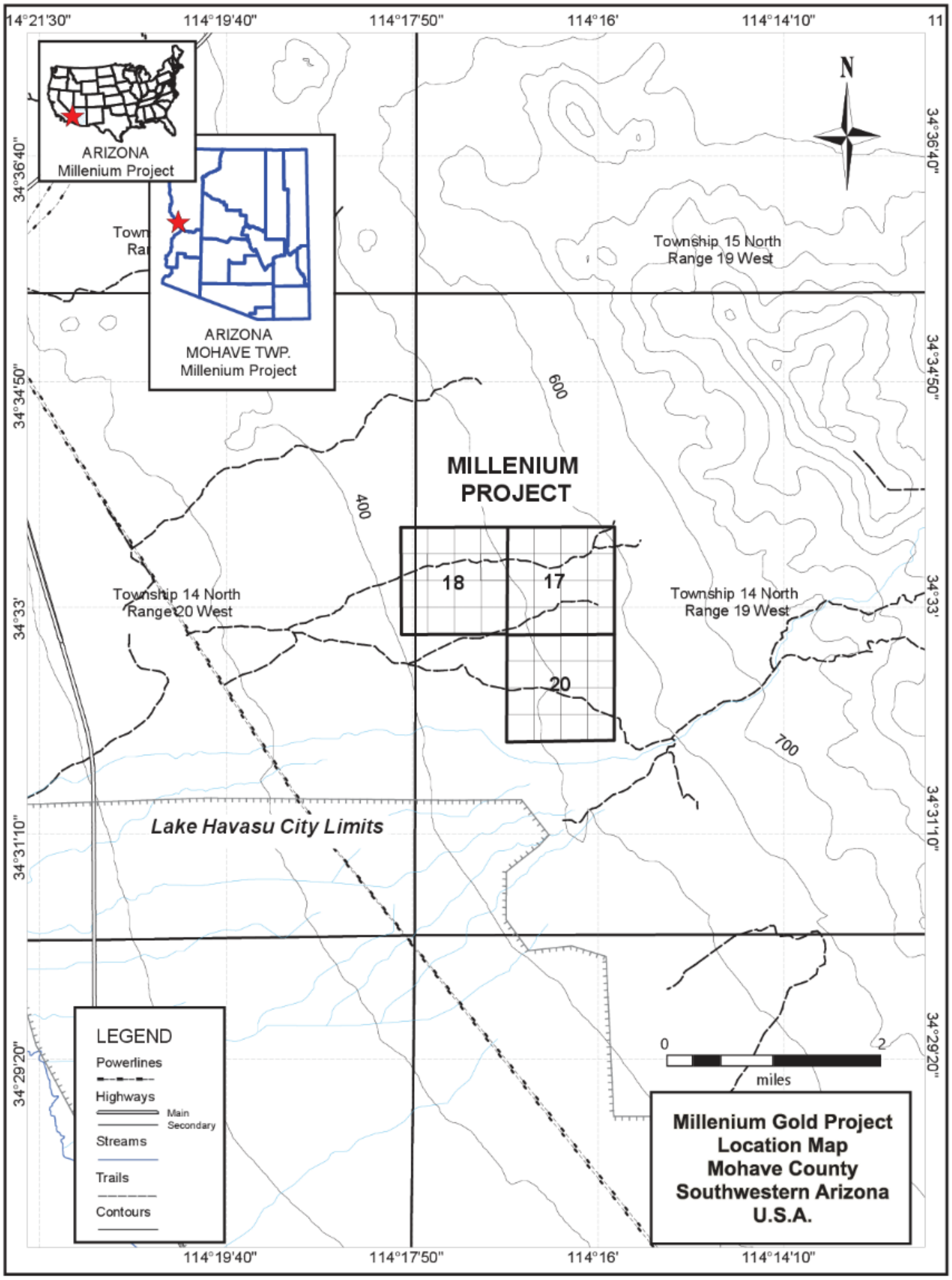


Figure 1. Location map for sections 17, 18 and 20, Millennium Gold Project, Arizona, U.S.A.

5: ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Access

Access to the Millennium property is achieved by travelling north from the center of Lake Havasu City at London Bridge on Highway 95 for 8.5 km (5.3 miles), then east onto a paved road immediately past Lowe's Home Improvement Center for 270 meters (900 feet), then turn north onto another paved road for 370 meters (1200 feet), and then turn east onto a paved road, which, after about 1.6 km (1 mile) becomes a gravel road. Section 17 is about 7 km (4.4 miles) up this road. Numerous dirt roads crisscross the project area. Easy access to most parts of the property can be achieved with a 2-wheel drive vehicle although for general purposes a 4-wheel drive vehicle is recommended.

5.2 Climate

Meteorological data in this section are from the U.S. Climate website for Lake Havasu City, Arizona (usclimatedata.com), Weather Spark weather for the Lake Havasu City area (weatherspark.com) and Wikipedia. Lake Havasu City has a hot desert climate. In the winter months, daytime highs usually range from 60 F (16°C) to 70 F (21 C). Lows in winter average between 40 F to 50°F (4 C -10 C); temperatures do occasionally dip below 40 F (4 C). The city has extremely hot summers, with highs normally remaining between 100 F and 115 F (38 C - 46 C). Highs are known to exceed 120°F (49 C) during the summer months. Overnight low temperatures stay between 80 F to 90 F (27 C - 32°C) for the months of July and August (Table 3).

The highest overnight low temperature (record high minimum) ever recorded in Lake Havasu City was 98°F (37°C) on July 22, 2003. Lake Havasu City also recorded the hottest temperature in Arizona at 128°F (53°C) on June 29, 1994.

Mean annual precipitation is 3.84 inches. The annual mean temperature is 74.6 °F (23.7 °C)

Table 3. Climate Lake Havasu City, Arizona.

	Jan	Feb	Mar	Apr	May	Jun
Average high in ºF	64	70	77	85	96	105
Average low in ºF	44	47	52	59	69	77
Average precipitation in inches	0.76	0.45	0.62	0.06	0.03	0.01
	Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Average high in ºF	109	108	101	88	74	63
Average low in ºF	85	84	75	62	51	43
Average precipitation in inches	0.15	0.33	0.36	0.30	0.33	0.44

5.3 Local Resources and Infrastructure

Local resources are readily available from Lake Havasu City which has a population of 52,527 according to the 2010 census. Qualified personnel for mining and exploration activities are available throughout the region. Mobile connections, electricity, railroads and other services are found within 5 km of the project. The Lake Havasu City airport is located 6 km north of the main business district in Lake Havasu City.

5.4 Physiography

The topography of the project area is characteristic of the Mojave desert and is characterized by extensive gently undulating sandy desert plains penetrated by isolated rock outcrops, low mountains and buttes. These characteristics are typical of the Basin and Range physiographic province in Arizona.

The Basin and Range is a semidesert/arid physiographic province occupying much of the western and southwestern part of the United States. The region comprises almost all of Nevada, the western half of Utah, southeastern California, and the southern part of Arizona and extends into northwestern Mexico. Its complex geologic history is reflected by the presence of numerous small, roughly parallel north-south-trending mountain ranges separated by nearly flat desert plains, or basins. Its 100 or so mountain ranges are the remains of crustal rocks that were upraised or uplifted by faulting along north-south lines, after which the resulting blocks were tumbled, eroded, and partly buried by alluvial debris that had accumulated in the desert basins at their feet. Most of the basins have no outlets for their drainage, and thus rainwater accumulates in the form of salt lakes In the southern part of the Basin and Range the intermontane basins are connected by through drainage that contributes to the flow of the lower Colorado River.

The Millennium property is dominated by pediment adjacent to the Mohave Mountains which are an 18-mile-long mountain range in southwest Arizona. The range is northwest- trending in southwest Mohave County and parallels a southeast stretch of the Colorado River and the Arizona-California border. The range also forms the southwest border of a flatland region to its east and north, namely, 'Dutch Flat' which lies east, at the south end of Sacramento Valley. Lake Havasu City on the Colorado River, is adjacent to the southwest flank of the range. The northwest terminus of the range merges into hills and a rocky region on the east shore of the Colorado River called The Needles. The Topock Gorge of the Colorado and The Needles lay at the east border of the Chemehuevi Mountains of California; both the Chemehuevi and Sacramento Mountains channel the Colorado River to the southeast.

6: HISTORY

The earliest evidence of exploration on the Millennium property was described by Huskinson (1997) and then summarized by Eliopolis (2008). Early exploration included shallow prospects, adits, shafts, and trenches within and near the Millennium property and these evidence the earliest exploration efforts; the date of the work is unknown. Exploration targets were assessed by digging or trenching on narrow quartz-calcite veins or on silicification, argillic or iron oxide alteration zones in outcrop. Shallow bulldozer trenches in gravel on section 20 suggest placer gold exploration. Property owner Steven Van Ert stated that his observations of gold recovery by weekend dry placer operators in 1995 led to his acquisition of the three State leases (pers. comm.). Production records or indications of gold recovery from this work are unavailable. Positive rock geochemical assay results by Van Ert were used to raise interest from numerous mining and exploration groups. Huskinson (1997) reported the Van Ert and subsequent activity as follows:

> "*The gold anomaly was discovered in the mid-1990's through geochemical sampling by the current owner (Van Ert, 1996) and was later verified and expanded through additional sampling by several companies. In 1998, Westley Mines International completed 2500 feet of relatively close spaced drilling to test anomalous surface values, largely in intrusive rhyolite (and andesitic volcanic rocks) in the west central part of the property. Although significant near-surface intervals of gold mineralization were encountered in several holes, the program failed to discover a gold deposit. Significantly, the highest-grade intercept is from a narrow, N-S trending zone of silicified fault breccias. Shortly after termination of the Westley program, sampling by Echo Bay geologists found significant gold in breccias bordering what appears to be a very broad, concealed, east-trending fault zone about 1000 feet south of the drilled area. This feature remains untested.*"

Prior to the property assessment by Huskinson (1997) a significant number of exploration companies assessed the property and were able to confirm the gold assay results of Van Ert (1996) in (i) the area over the Westley Mines drill program and rock chip panel sampling, (ii) approximately 1000 feet south of the Westley “Main Zone” at the Echo Bay Knob where assays of 6 g/t gold were documented, (iii) the 7-Gram Hill area 2000 feet northwest of the Main Zone and (iv) 2000 feet southeast of the Main Zone at the “Cordex Anomaly”. The companies undertaking the exploration included Kinross Gold Corporation, Hunter Dickenson Inc., Orvana Resources, The Northair Group, MK Gold, Cambior, Cordex, Echo Bay Exploration Inc. and Radvak Engineering Inc.

Ongoing work since this exploration included ground magnetic geophysical surveys by Zonge

Engineering, property visits and summary reports by the Sirius Corporation, L.D.S. Winter, and the property owners Van Ert and Cousins. The Sirius Corporation also undertook soil geochemical surveys based on Mobil Metal Ion Technology, “MMI”). In 2015 the property owners undertook a remotely sensed Aster survey and in 2017 Arcan Minerals Corp. undertook ground geophysical magnetic and VLF-EM surveys. Geological mapping of sections 17 and 18 at a scale of 1:6000 was completed by Loring (1999) for Resource Ventures Consulting and by Saunders (2019) on section 20. Property visits were made by many of companies who submitted reports summarizing observations. Table 6 summarizes efforts undertaken on the Millennium property since its discovery in 1996 and up to 2019. Where additional expanded information is available on the activities in Table 4 it is presented in the items below.

Table 4. Summary of work on the Millennium property between 1996 and 2019.

Year	Company	Work	Results
1996	S. Van Ert	rock sampling and	Multiple assays up to 7000 ppb gold and 21 ppm silver;
		prospecting	FA-AAS and multielement geochemistry by ICP-OES
			Chemex Labs (Reno, NV)
1997	Westley Mines	rock sampling,	drill indicated 100' of 0.019 opt gold; continuous rock
	International	drilling, report	chips over 460' grading 1.12 g/t gold and 5.65 g/t silver
			Actlabs-Skyline Labs (Tuscon, AZ)
1997	Kinross Gold	property visit, rock	multiple gold assays up to 2250 ppb gold; FA-AAS
	Corporation	sampling, report	Chemex Labs (Sparks, NV)
1997	Hunter	property visit, rock	multiple assays up to 14,470 ppb gold
	Dickenson Inc.	sampling	
1997	Orvana	property visit, rock	multiple assays to 3640 ppb gold and 11.4 ppm silver;
	Resources	and stream	120 ppb gold in stream sediments; FA-AAS and ICP-OES multielement geochemistry
		sediment sampling	Chemex Labs (Sparks, NV)
1997	Northair Group	property visit, rock	assays up to 4850 ppb gold; ICP-OES multielement geochemistry
		sampling, report	
1997	Cambior	property visit, rock	gold assays up to 4960 ppb and 2.4 ppm silver;
	Exploration USA	sampling	FA-AAS and ICP-OES multielement geochemistry
			IPL International Labs (Vancouver, B.C.)
1998	MK Gold	property visit, rock	gold assays up to 11700 ppb and 11.6 ppm silver
	Company	sampling	FA-AAS; American Assay labs, (Reno, NV)
1999	Cordex	property visit, rock	gold assays up to 2440 ppb, 10.9 opt silver and

	Exploration/	sampling	6.12%, 6.40% and 4.00% copper
	Glamis		Chemex Labs (Sparks, NV)
	Exploration/		
1999	Resource	geological	1:6000 scale mapping on sections 17 and 18
	Ventures	mapping	
	Consulting		
2000	Echo Bay	property visit, rock	multiple gold assays up to 7050 ppb and 33.1 ppm
	Exploration	and stream	silver in rock; 54 ppb in stream sediments; FA-AAS
		sediment samples	and ICP-OES multielement
			Bondar-Clegg Intertek Testing (Vancouver, B.C.)
2003	Radvak	property visit, rock	gold assays up to 6.37 ppm and 14 ppm silver
	Engineering	sampling, report	
2008	Zonge	ground magnetic	detailed coherent magnetic trends attributed to
	Engineering	survey	structure and related mineralization
2008	Sirius	report; soil	summary document and focused gold-in-soil
	Corporation	geochemistry	anomalies; SGS Mineral Services (Vancouver, B.C.)
2010	Van Ert-	report	summary report
	Cousins		
2011	L.D.S. Winter	property visit	summary report
	Consultant		
2015	Van Ert-	Aster survey	clay, iron oxide and silicified outcrop defined; Image 2 Mapping (Colorado)
	Cousins		
2017	Arcan Minerals	VLF-EM and	magnetic and electromagnetic anomalies; maximum
	Corporation	magnetic surveys;	3.83 g/t gold; focused gold anomalies in soil
		rock sampling	SGS Mineral Services (Vancouver, B.C.)
2017	A.R. Miller	property visit	summary report
	Consultant		
2019	F. Saunders	detailed geological	1":50 meters scale, sections 17 and 20
	Consultant	mapping	

6.1 Westley Mines International Inc. 1997

Westley Mines reported exploration including rock chip sampling and the geological setting and style of mineralization at what is referred to as the Main Prospect on the Millennium property. The Main Prospect is described as a zone of west-dipping gold-bearing brecciated Tertiary-aged andesitic volcanic rocks. The gold and silver mineralization occur in a variety of settings including zones of silicification, in quartz-calcite-healed breccias, siliceous stockworks and in fault zones. A 15' deep shaft with a 30' long drift is developed in weakly silicified rhyolite adjacent to the mineralized andesite.

Westley Mines undertook rock chip sampling after the success of initial prospecting and rock chip sampling by Van Ert (1996). The Westley sampling was undertaken along two continuous panels over the Main Prospect (Figure 2). The sampling panels were oriented in a north-south and an east-west orientation and reported persistent gold and silver assays (Table 5) with a higher-grade zone within the north-south panel.

Table 5. Summary of rock chip panel sampling in the vicinity of the Main Prospect, Millennium property.

Sample	Length	Gold	Silver
Location	**(meters)**	**(grams per tonne)**	**(grams per tonne)**
East-West Panel	158.5	0.97	5.71
North-South Panel	140.2	1.12	5.65
North-South Panel			
Includes	97.5	1.51	8.13

Additional sampling, assays and prospecting in the Main Prospect area documented a 600 square foot area with gold mineralization averaging >1 g/t gold. Numerous samples with 2-7 g/t gold and one sample with 20 g/t gold were identified. Silver assays were about 1-3 times the gold content. Sporadic mercury is also present and base metal contents were low.

In 1998 Westley Mines drilled a total of 2500 feet in 6 rotary reverse circulation holes designed to test the results of surface outcrop chip sampling. The holes were drilled approximately 200 feet apart over an area 600 feet by 400 feet and most had inclinations of -60^{o} east. Near surface intervals of gold mineralization were intersected. A plan diagram illustrating the location of the drill holes in relation to the shaft identified on the property is given in Figure 2. Table 6 summarizes significant widths and grades of the gold mineralized intercepts. All drill holes intersected variably altered, fractured massive and amygdaloidal andesite with quartz and calcite veinlets and generally <5% pyrite as disseminations and micro-veinlets. Alteration types included silicification, limonitic, hematitic and argillic. Rhyolite intersected in drilling was described as pink to white massive to flow banded. Figure 3 provides a three-dimensional view of the Westley drill holes, lithologies intersected and assay results.

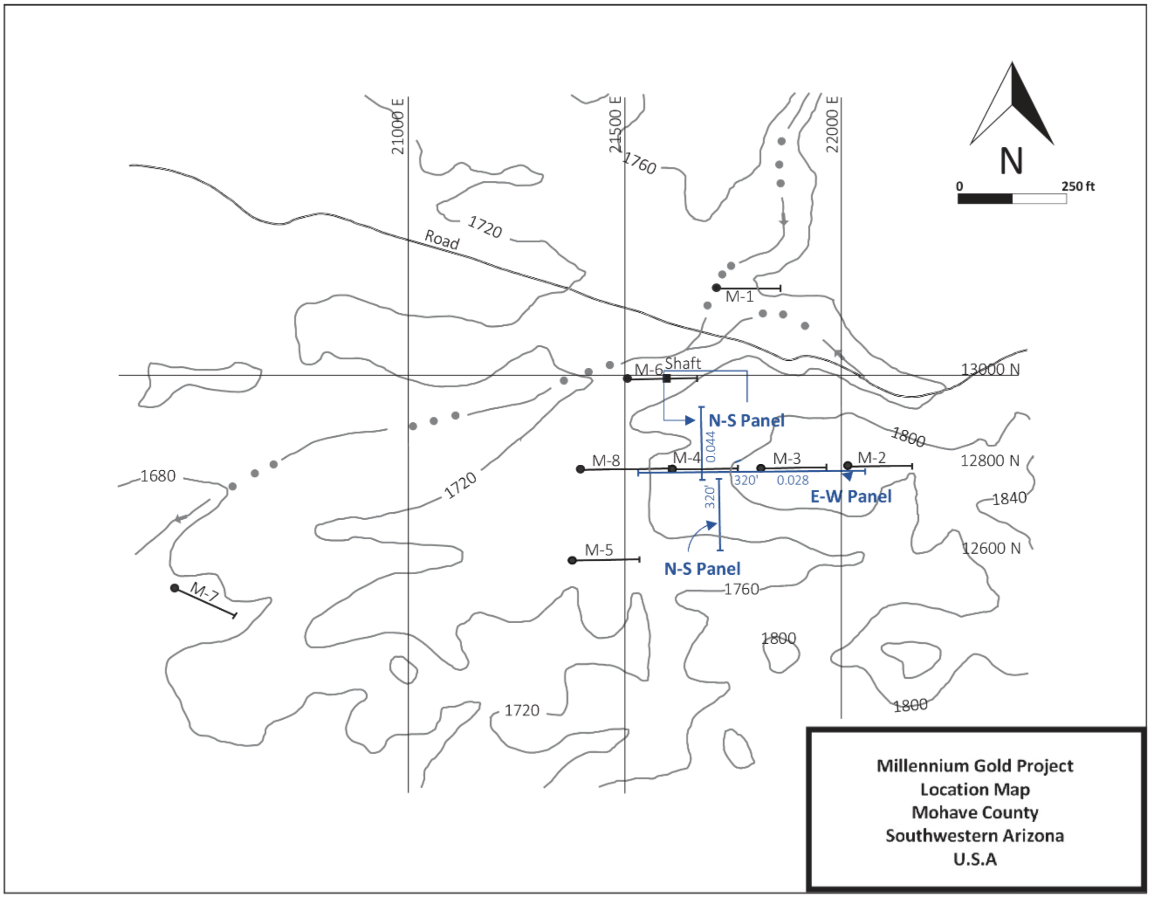
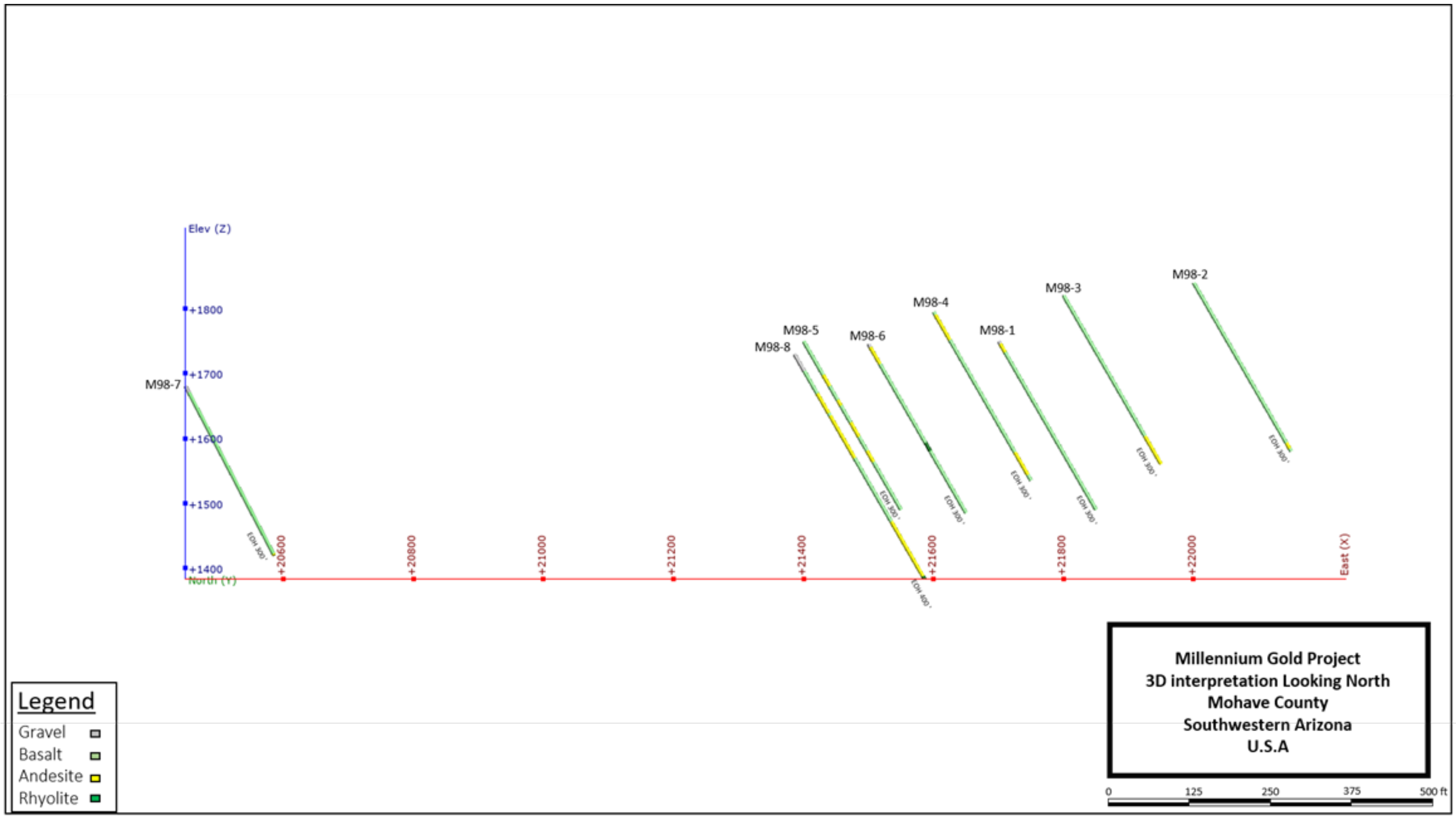


Figure 2. Location of Westley Hill percussion drill holes and chip sample transects, section 17, Millennium Gold Property.

Table 6. Summary of significant gold assay results from percussion drill indicated mineralized intervals, Millennium Gold Project.

Westley Mines International Inc. 1998 Drilling Millennium Project					
DDH#	Depth (feet)	Inclination	Declination	Intersection	Gold Assay Results
				Depth (feet)	
M-1	300	-60	90	20-30	10' of 0.013 opt/0.44 g/t
M-2	300	-60	90	5-15	10' of 0.034 opt/1.16 g/t
				290-300	10' of 0.011opt/0.37 g/t
M-3	300	-60	90	5-30	25' of 0.026 opt/0.89 g/t
M-4	300	-60	90	5-110	105' of 0.019 opt/ 0.65 g/t
M-5	300	-60	90	15-30	15' of 0.017 opt/0.58 g/t
				140-145	5' of 0.016 opt/0.54 g/t
				240-260	20' of 0.0135 opt/0.46 g/t
				280-285	5' of 0.010 opt/0.34 g/t
M-6	300	-60	90	25-125	100' of 0.0149 opt/0.51 g/t
M-7	300	-60	S65E		25’ of 0.006 opt/0.20 g/t
M-8	400	-60	90	105-165	60' of 0.021 opt/0.72 g/t
NOTE: opt=ounces per ton					
g/t=grams per tonne					
Note: All 8 holes were percussion drilled with assays based on 5-foot samples of drill cuttings					



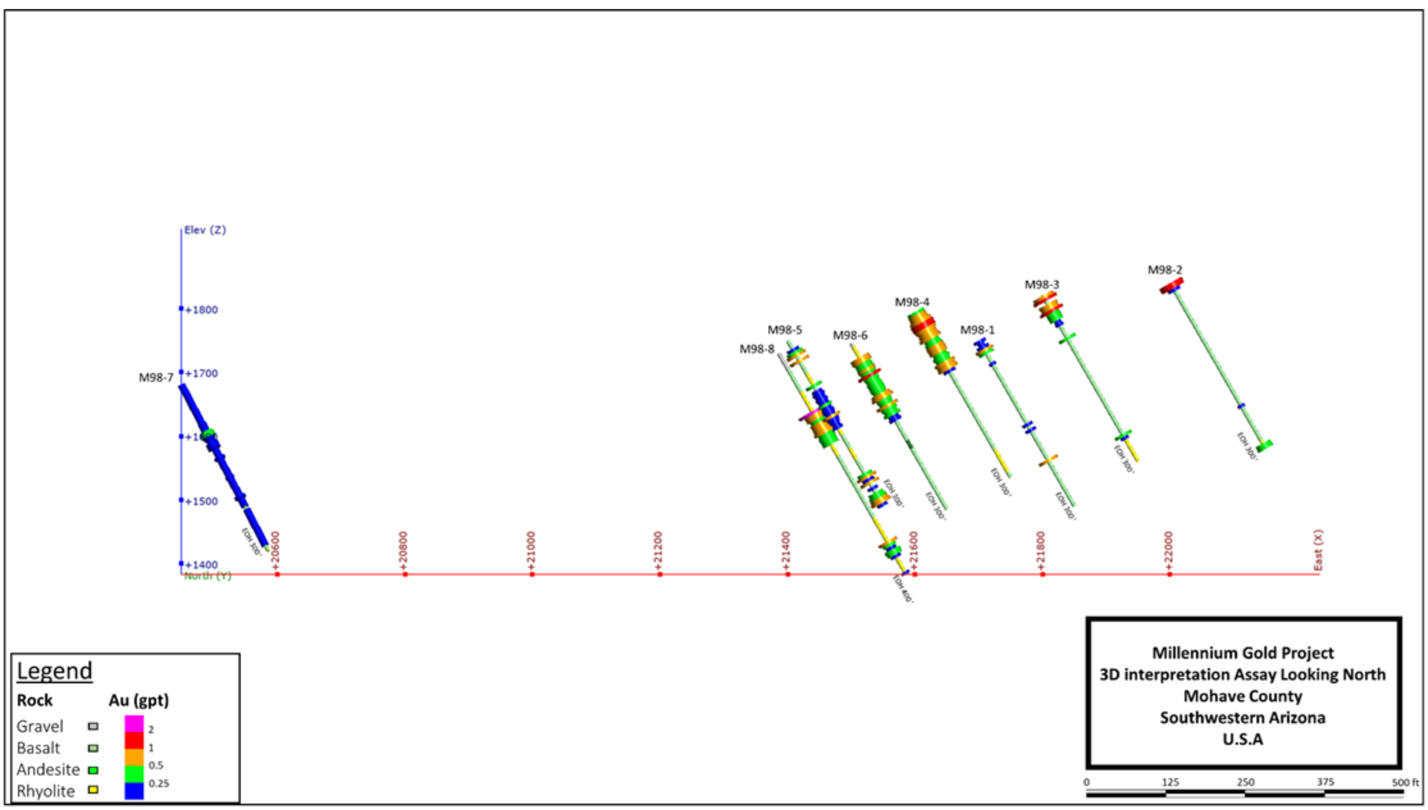


Figure 3. Westley Hill drill holes with lithology and assay data, Millennium Gold Property.

6.2 Sirius Corporation Mobile Metal Ion Technology (MMI) Soil Geochemical Surveys

Several phases of MMI soil geochemical surveys were undertaken on the Millennium Gold Property including those in 2006, 2008, 2012 and in 2015. Sample collection was undertaken by a 2-man crew from sample lines and stations of varying spacings. Sample locations were monitored according to their location on an established grid and with a hip chain. Later surveys utilized hand-held GPS units to determine sample locations. The results for the 2008 surveys are described.

6.2.1 Sample Collection

The initial step in the MMI sampling procedure was to remove the organic material from the sample site and discarded. A pit approximately 40 cm deep was then dug with a shovel and the sides of the pit scraped down with a vinyl trawl to remove loose material. Approximately 250 grams of soil is scraped from the sides of the pit as a continuous plug of sediment at an interval 10-25 cm (4-10 inches) below the contact between organic and inorganic soil. The sample is placed into a pre-labelled plastic snap seal plastic bag. The samples were freighted to SGS Mineral Services in Burnaby, British Columbia, Canada for analysis.

Samples were collected from staggered 400” centers on each of sections 17, 18 and 20. This sample spacing was reduced in areas where suspected mineralization was present. The wide sample spacing was utilized to reduce the individual 1-mile square sections to smaller areas for focused exploration.

6.2.2 Analytical Methods

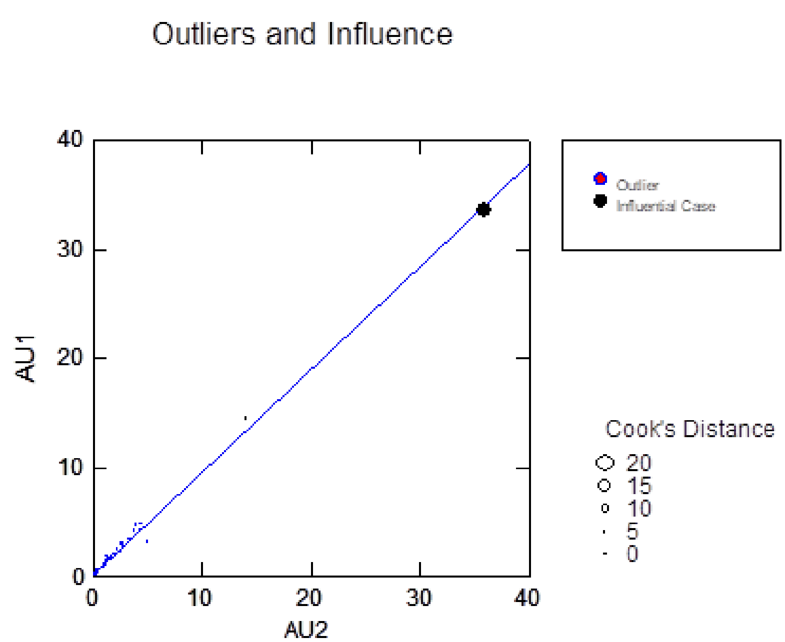
The SGS Mineral Service soil geochemical analytical procedure by Mobile Metal Ions is a partial extraction based on a neutral mixture of reagents that detach loosely bound ions from the surface of individual soil particles. A total of 53 elements are analysed by ICP-MS in the soil sample. Ligands are used to keep metal ions in solution once liberated from the sample. No sample preparation is undertaken once the sample arrives in the laboratory. A 50-gram sample is taken from the sample bag and weighed into a plastic vial fitted with a screw cap. Fifty ml of the MMI solution is added to the sample, which is then shaken for 20 minutes. Samples rest overnight and are then centrifuged for 10 minutes. The solution is diluted 20 times for a total dilution factor of 200 times and transferred into plastic test tubes. The supernatant liquid is then aspirated into an ICP-MS instrument. Results are processed and loaded into the computer-based laboratory information management system. Quality control parameters are reviewed before final reporting of acceptable analyses.

6.2.3 Data Treatment and Presentation

Analytical data was examined visually for analyses less than the lower limit of detection (<LLD). Data <LLD are replaced with a value ½ of the LLD for statistical calculations and graphical representation. MMI data is plotted as response ratios. For the calculation of response ratios the 25th percentile is determined and the arithmetic mean of the lower quartile used to normalize all analyses. The normalized data represent "response ratios" which are then utilized in subsequent plots. Zeros resulting from this calculation are replaced with “1”. Response ratios are a simple way to compare MMI data collected from different grids, areas and environments from year to year. This normalized approach also significantly removes analytical variability due to inconsistent dissolution or instrument instability. Response ratioed data is presented as bubble plots.

6.2.4 Data Reproducibility-Analytical and Field Duplicates, Standard Reference Materials and Analytical Blanks

Analytical duplicate analyses indicate duplicate pairs exhibit a high degree of reproducibility across a wide range in concentration for most MMI-M elements including the base and precious metal commodity elements and in particular gold and silver. Any variability that exists between duplicates is within +/- 25% and as such is interpreted not to be a hindrance to interpretation and the recognition of bona fide trends in the dataset. Most variability occurs at or near the lower limit of determination. Analytical reproducibility is illustrated in Figure 4 for gold and silver based on Cooks Distances which is a commonly used estimate of the influence of a data point when performing a least-squares regression analysis.



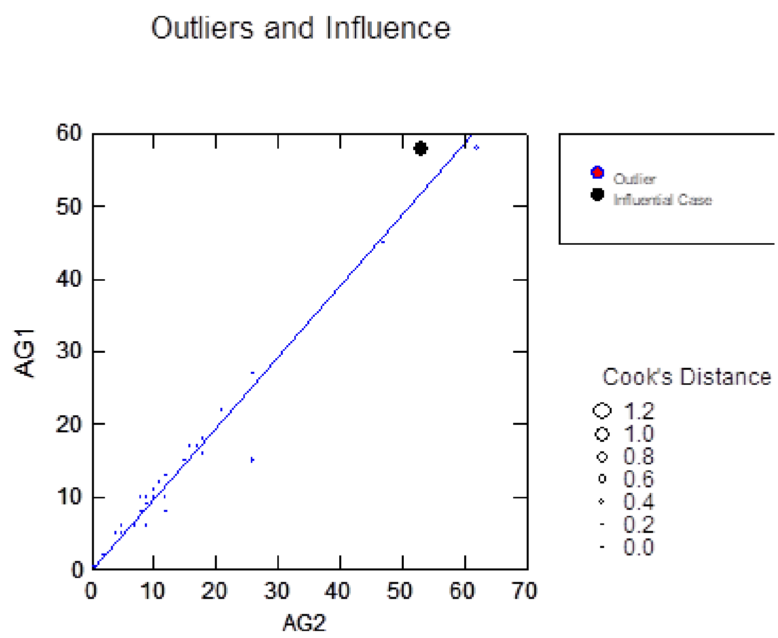


Figure 4. A least squares analysis of MMI analytical duplicates using Cooks Distances to determine outliers in the data, Millennium Gold Project.

Replicate analyses from three field duplicate pairs are presented in Table 7 and indicates good reproducibility for field duplicate pairs for MMI data from base and precious metal analyses.

Table 7. Results for three field duplicate pair MMI analyses. Results displayed as parts per billion (Au1, Au2) and as response ratioed data (AuRR1, AuRR2) for both gold and copper.

ELEMENT	Au1	Au2	AuRR1	AuRR2	Cu1	Cu2	CuRR1	CuRR2
Duplicate Pair 1	0.6	0.6	1	1	140	140	1	1
Duplicate Pair 2	12.4	12	28	27	330	270	2	2
Duplicate Pair 3	3.1	3.7	7	8	250	300	2	2

Inhouse Standard Reference Materials are routinely included by SGS Mineral services in their MMI analytical protocol. Based on 18 samples on an internal standard there is generally good agreement between replicate analyses for the standard reference material MMISRM14 (n=18) with accepted or recommended values. Results for gold report a range of 25.1-36.5 ppb vs. a recommended value of 44.1 ppb.

Gold or silver were not identified in the analytical blanks included with the Millennium soil samples during MMI analysis indicating there is no systematic contamination of the soil samples originating in the laboratory

The author is satisfied that the Mobile Metal Ions soil geochemical data is accurate and reproducible and suitable for use in this report.

6.2.5 Results

The results for gold and silver from the 2008 survey are illustrated in Figures 5, 6 and 7 for gold on each of sections 17, 18 and 20, respectively. The results indicate well defined gold anomalies on each of the three sections.

On section 17 MMI results define a broad, east-west-trending gold anomaly in the approximate center of the section defined by four samples with response ratios of up to 225 times background. An areally restricted but high-contrast three-sample gold anomaly occurs to the north of the "central" gold anomaly. In each case the higher Au responses are haloed by lesser Au responses with response ratios of approximately 10RR or ten times background.

The northeast corner of section 18 is marked by a very high-contrast gold response of up to 225 times background and cores a multi-sample gold anomaly in the northeast corner of the section. The anomaly is open to the east and north. There are isolated moderate-contrast (<50RR) responses in the southern portion of the section.

An arcuate zone of strongly elevated gold anomalies occurs in the southwest corner of section 20. This anomaly is non-truncated and open to the south and west, is high-contrast and multi-sample in nature. The high-contrast responses are encapsulated by lower-contrast (10RR) responses.

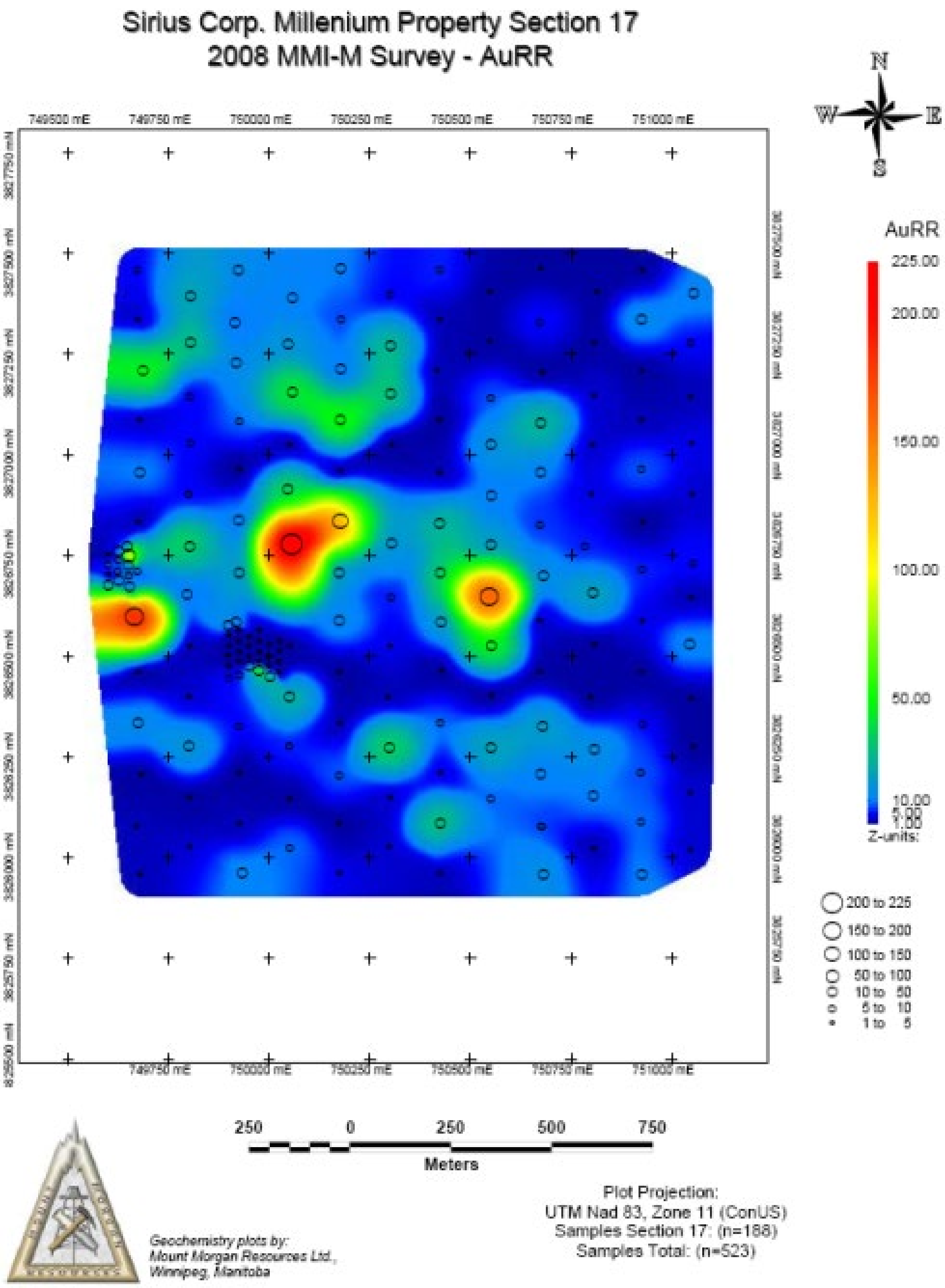


Figure 5. Results for MMI gold analyses, section 17, Millennium Gold Project.

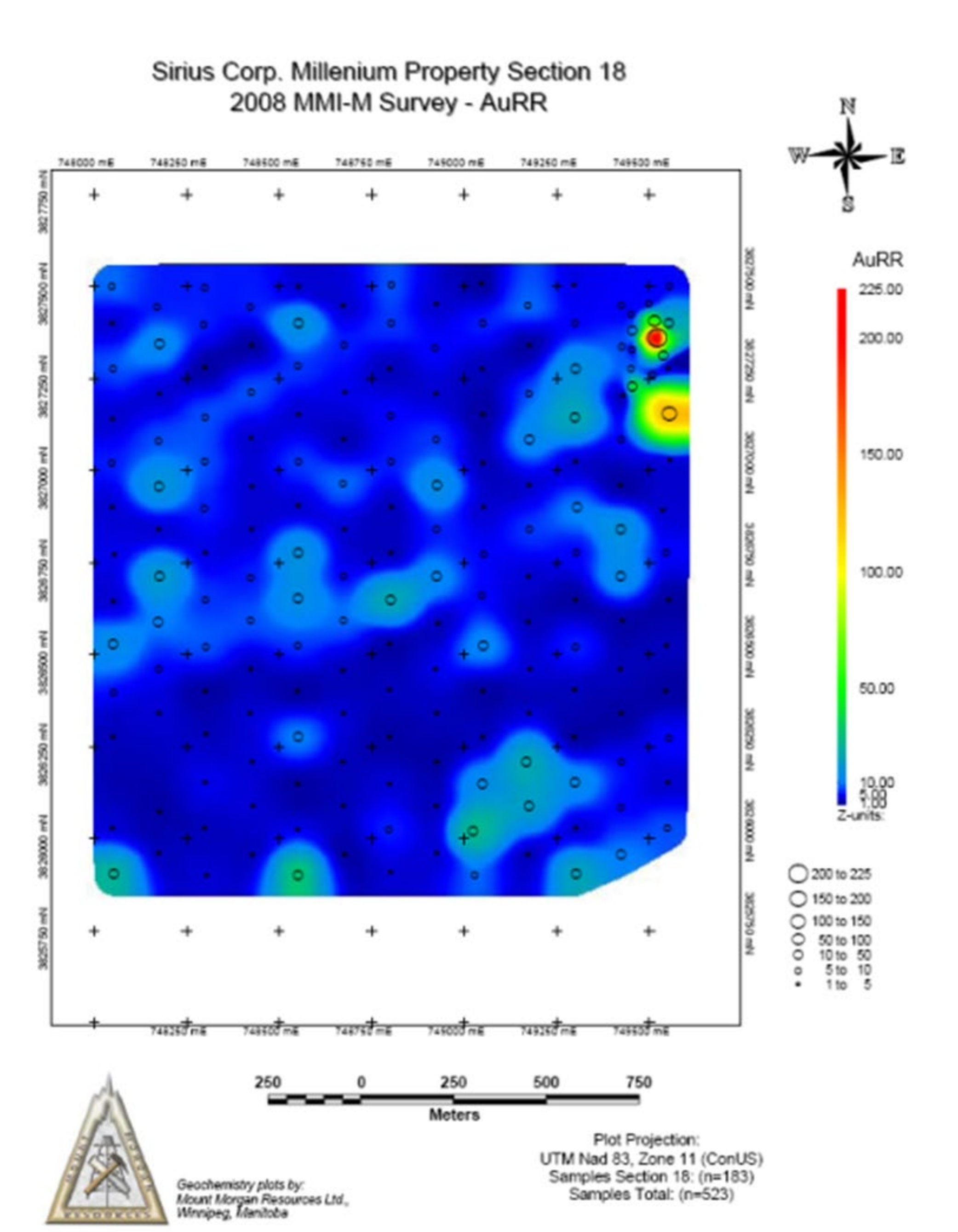


Figure 6. Results for MMI gold analyses, section 18, Millennium Gold Project.

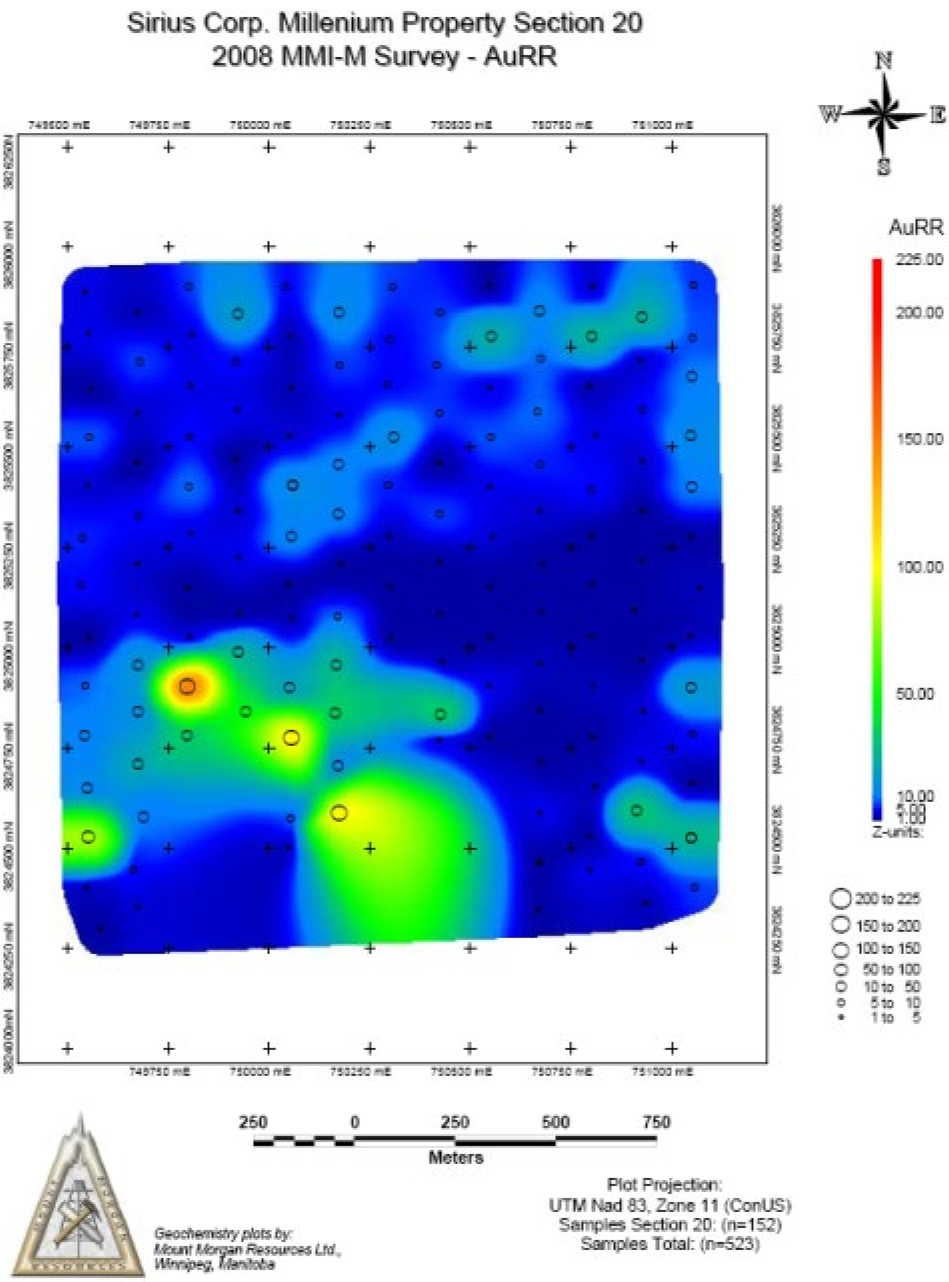


Figure 7. Results for MMI gold analyses, section 20, Millennium Gold Project.

6.3 Geophysics

<u>6.3.1 Zonge Engineering Ground Magnetic Surveys</u>

Zonge Engineering undertook ground magnetic surveys in 2008. The magnetic survey consisted of a 16-line kilometer survey with a nominal station spacing of 1 meter. A Gems Systems GSM-19 magnetometer was used for the survey. Results indicate the magnetic field is high over most of the survey grid except for the north-northeast corner of the section where a moderate magnetic low is present. High magnetic response forms a northwest to southeast linear trend across the grid. Data quality was considered good and the trends were interpreted to represent coherent magnetic trends related to geologic structure, composition, and mineralization. Existing mineralization on section 17 appear to correlate with lithologies characterized by strong magnetic susceptibility.

The Zonge surveys were re-interpreted by El Condor Minerals Inc. in 2011 (Figure 8) and were based on an interpretation based on the combination of magnetics with a limited two-line I.P. survey (Figure 9) completed by Durango Geophysical Operations in 2011. Five magnetic lows were recognized on the section and are labelled 1a and 1b, 2, 3, 4 and 5. Known gold mineralization at Westley Hill correlates well with magnetic low 1a and 1b although this interpretation is somewhat subjective due to widely spaced survey lines. Low 1b is the eastern continuation of 1a. The remainder of the magnetic lows occur in the general vicinity of known gold mineralization and are interpreted as worthy follow-up targets.

The IP-resistivity survey is based on two widely spaced lines although data was considered excellent. The IP responses are low and are not necessarily caused by sulphide mineralization but potentially due to alteration clays, zeolites, or manganese oxides. Disseminated pyrite or other sulphide minerals were not ruled out. Sulfides are certainly a possibility based on the correlation of an 8+ millisecond response with known gold mineralization at Westley Hill. The strongest modeled IP response is noted to occur at depths between 50 and 100 meters which is well below the best gold mineralization in drill hole M-4 which occurs from surface to a depth of 30 meters. A high resistivity zone of 250 to 500 ohm-meters appears to correlate with the drill-indicated gold mineralization at Westley Hill. This response extends from surface to anywhere from 25 to 60 meters in depth. At drill hole M-4 the high resistivity zone extends from surface down to 30-40 meters in depth and corresponds with the Westley gold mineralization.

Based on the combination of the magnetic and IP surveys a high resistivity response that correlates with a magnetic low provides the most direct correlation to the drill indicated gold mineralization at Westley Hill.

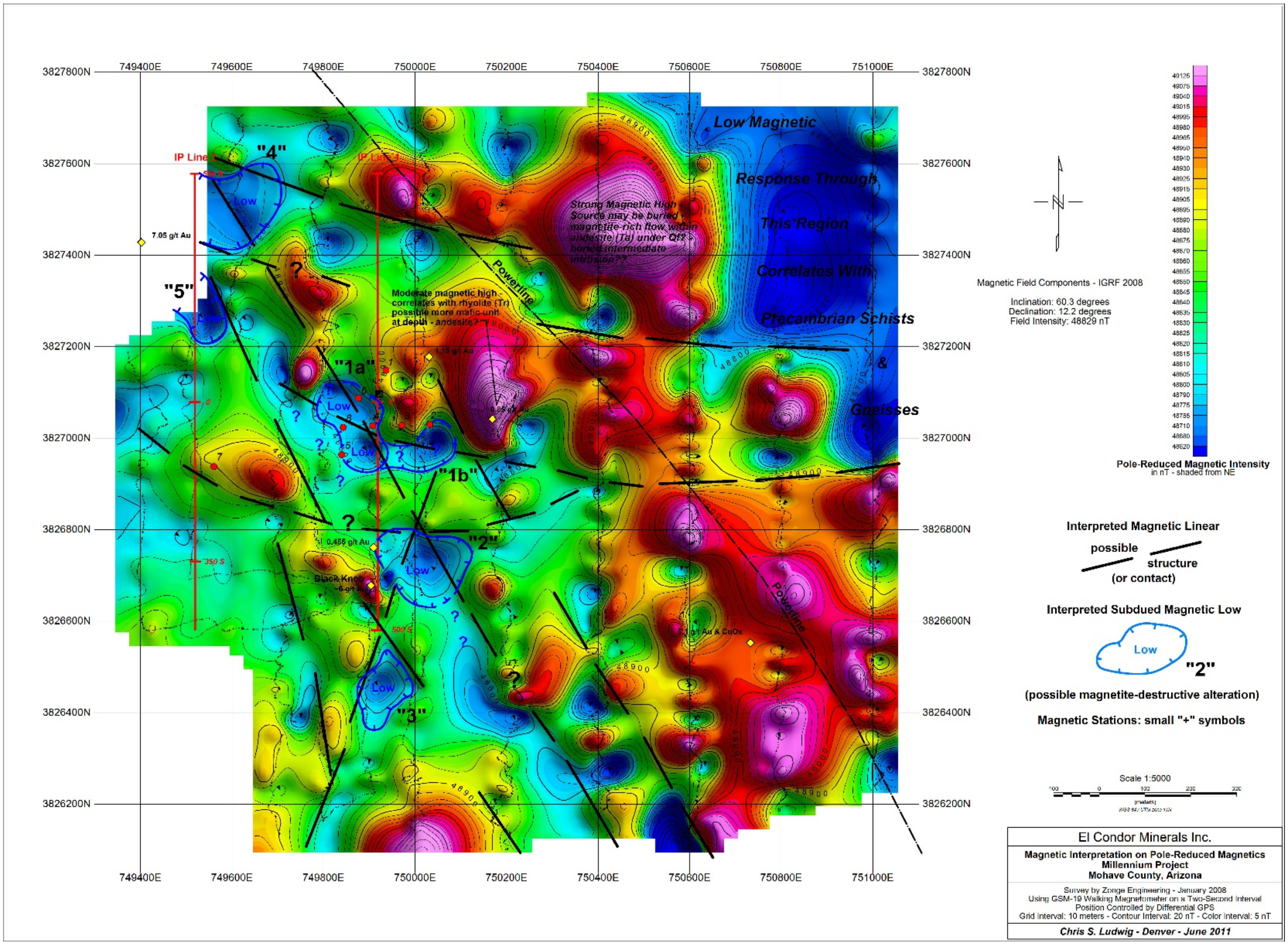


Figure 8. Pole-reduced magnetic interpretation with magnetic lows 1a, 1b, 2, 3, 4 and 5, section 17, Millennium Gold Project.

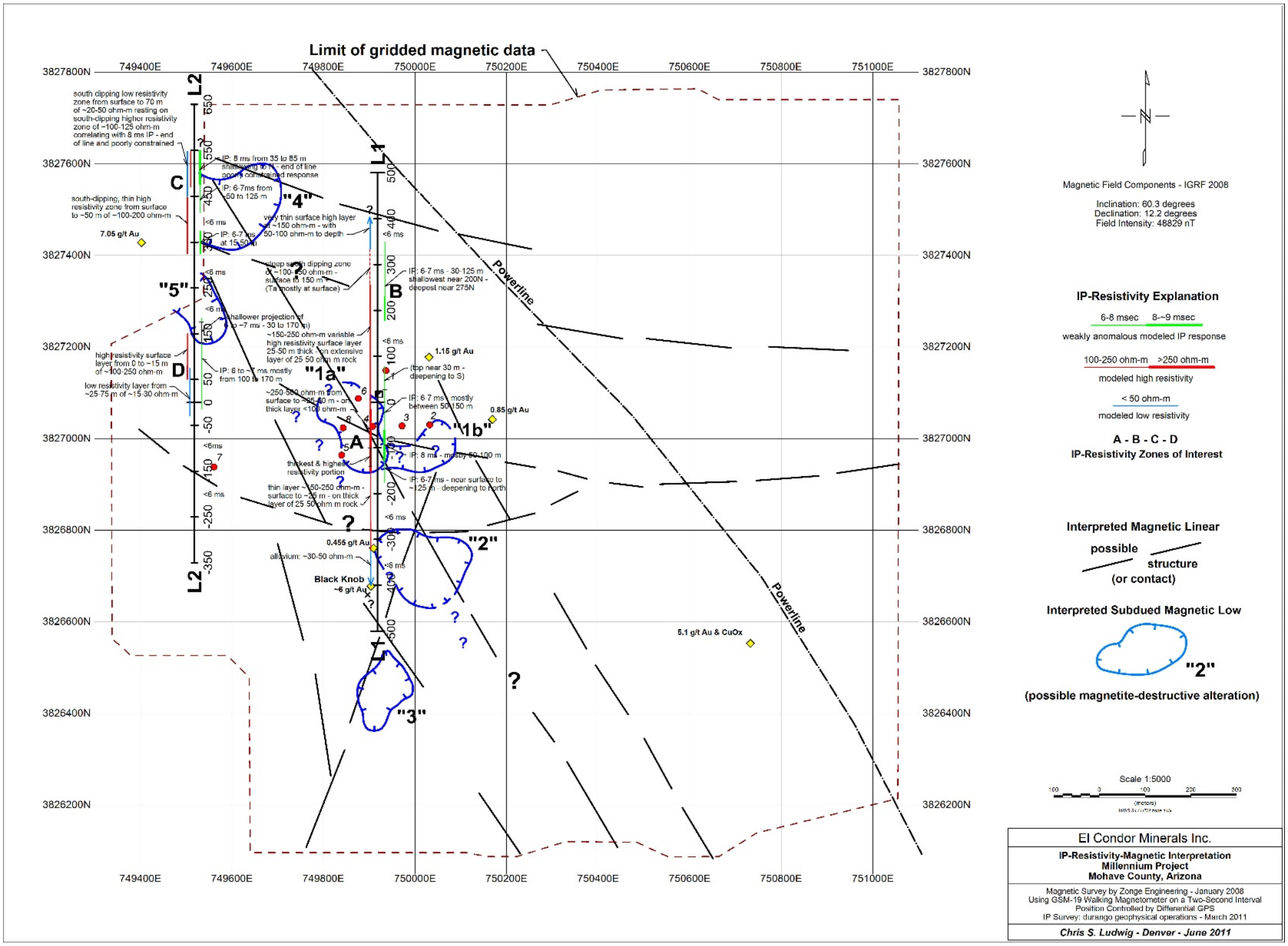


Figure 9. Combined pole-reduced magnetic survey and a two-line induced polarisation survey, section 17, Millennium Gold Project.

6.3.2 Arcan Magnetic and VLF-EM Surveys

A combined magnetic and VLF-EM survey was undertaken by Arcan Minerals Corp. in 2017 utilizing a combination magnetic and VLF-EM GSM-19 instrument, manufactured by GEM Systems of Richmond Hill, Toronto. The readings were taken in two directions as follows:

1. 10-meter stations along 10 lines spaced at 100 meters separated lines for a total survey length of 16,000 meters.
2. 10-meter stations along 3 lines spaced at 50 meters for a total survey length of 4,800 meters.

For the magnetic survey, the diurnal variation was monitored by a base station. For the VLF-EM survey, two transmitters were read for the north-south lines, namely, Cutler, Maine, at 24.0 kHz and LaMoure, North Dakota, at 25.2 kHz; and two transmitters were read for the east-west lines, namely Jim Creek, Washington, at 24.8 kHz and LaMoure, North Dakota, at 25.2 KHz.

The magnetic survey results were corrected for diurnal drift, plotted and contoured in plan. The VLF-EM results for each transmitter were Fraser-filtered, plotted, and contoured on one plan map, and the in-phase, out-of-phase, and Fraser-filtered values were profiled on a second plan map. Magnetic trends in section 17 are depicted in Figure 10 and are attributed to the various lithologies that underlay the property and to crosscutting structures. The general trend of the magnetic fabric varies from east-west in the southern portion of the section to northwest to southeast in the north. Historic mineralization on section 17 occurs within lithologies with a strong magnetic signature. VLF-EM trends across section 17 trend east-west and known mineralization on the property, marked by the presence of rock samples depicted as white circles (Figures 11 and 12) occur in association with elevated EM signatures. The strong northwest-trending EM response in the northeast corner of section 17 is attributed to a powerline.

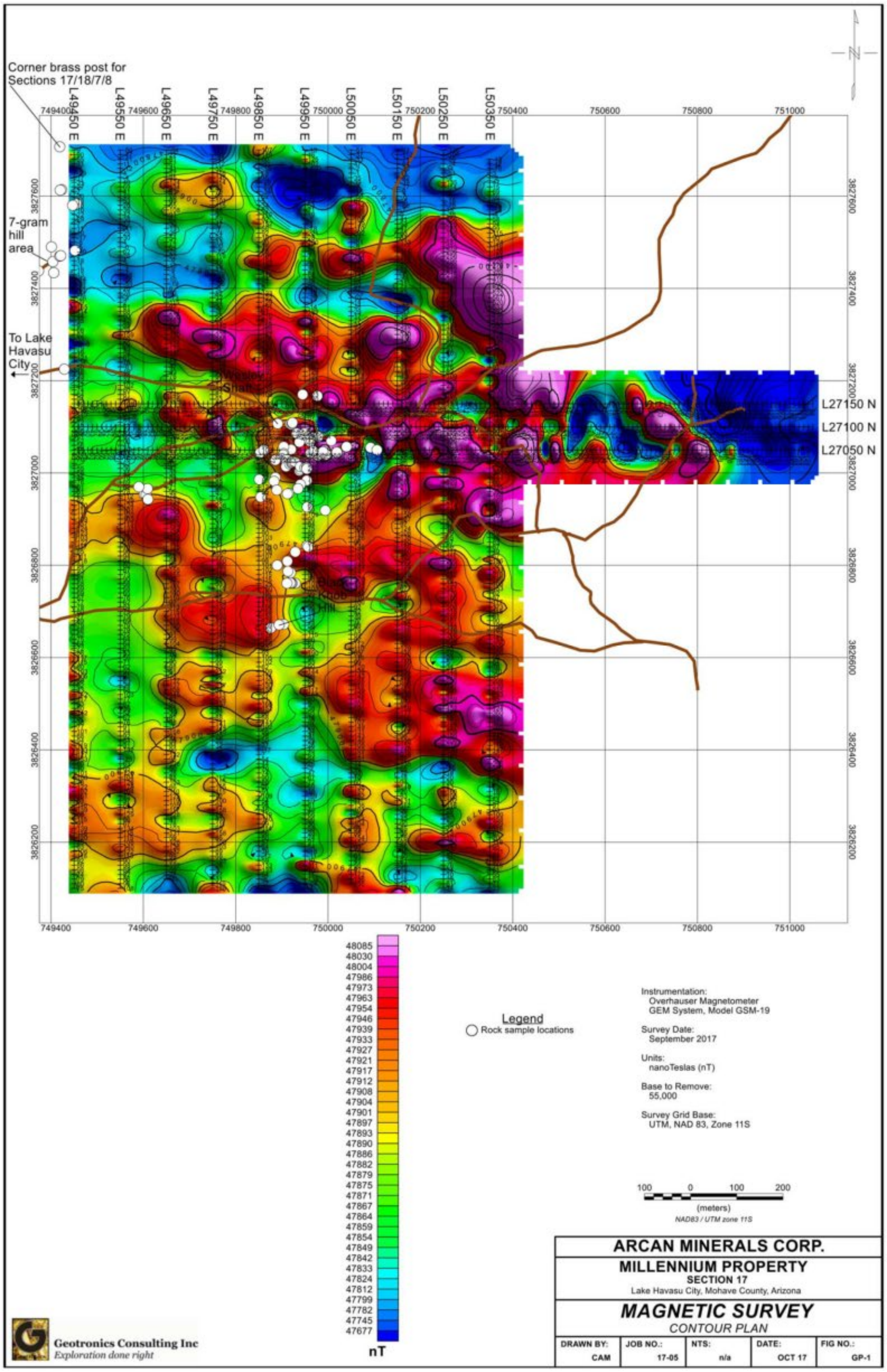


Figure 10. Magnetic survey results, section 17, Millennium Gold Project. Historic rock sample locations are marked by white circles.

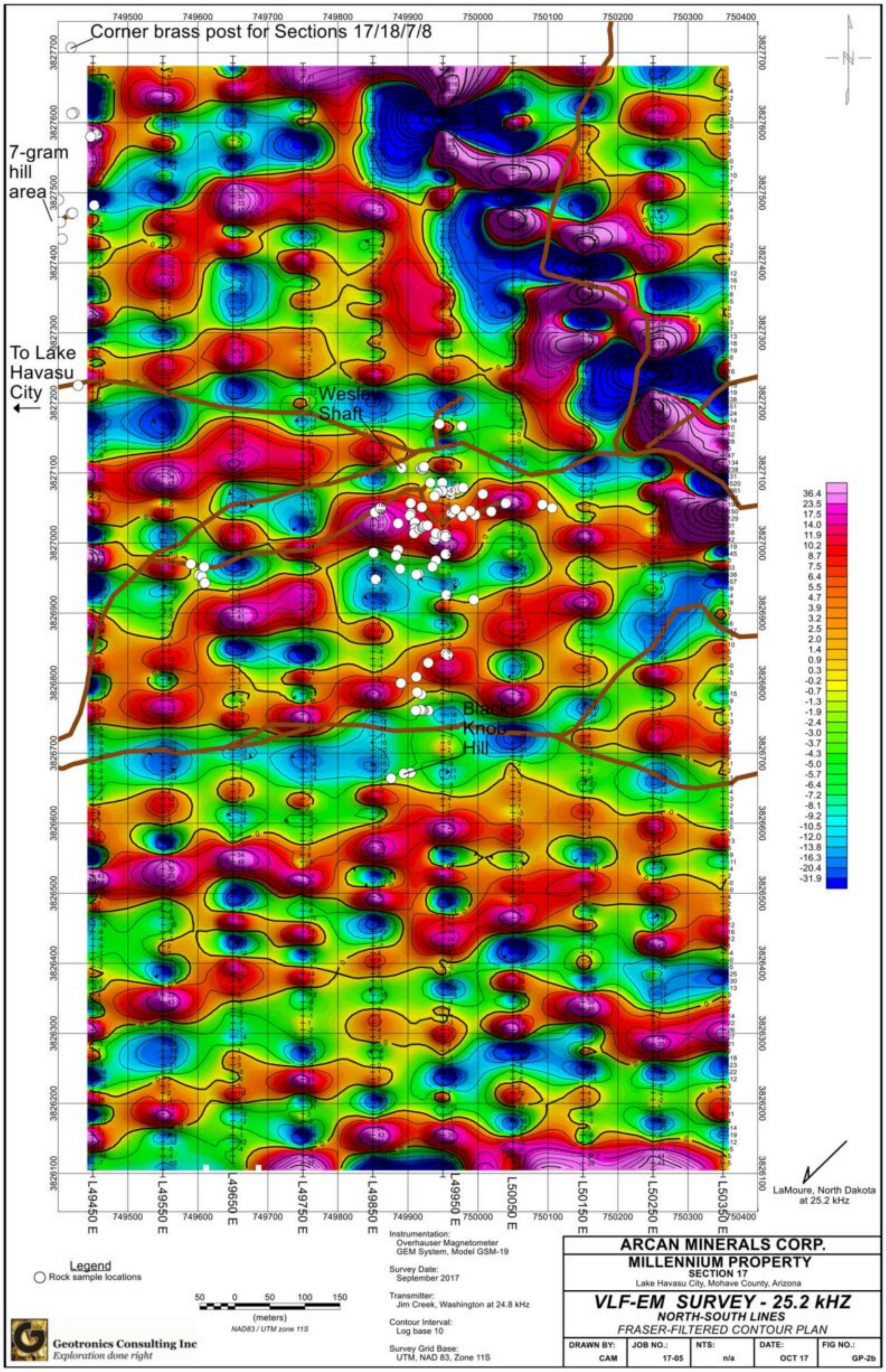


Figure 11. Contoured VLF-EM survey results (25.2 kHZ), section 17, Millennium Gold Project.

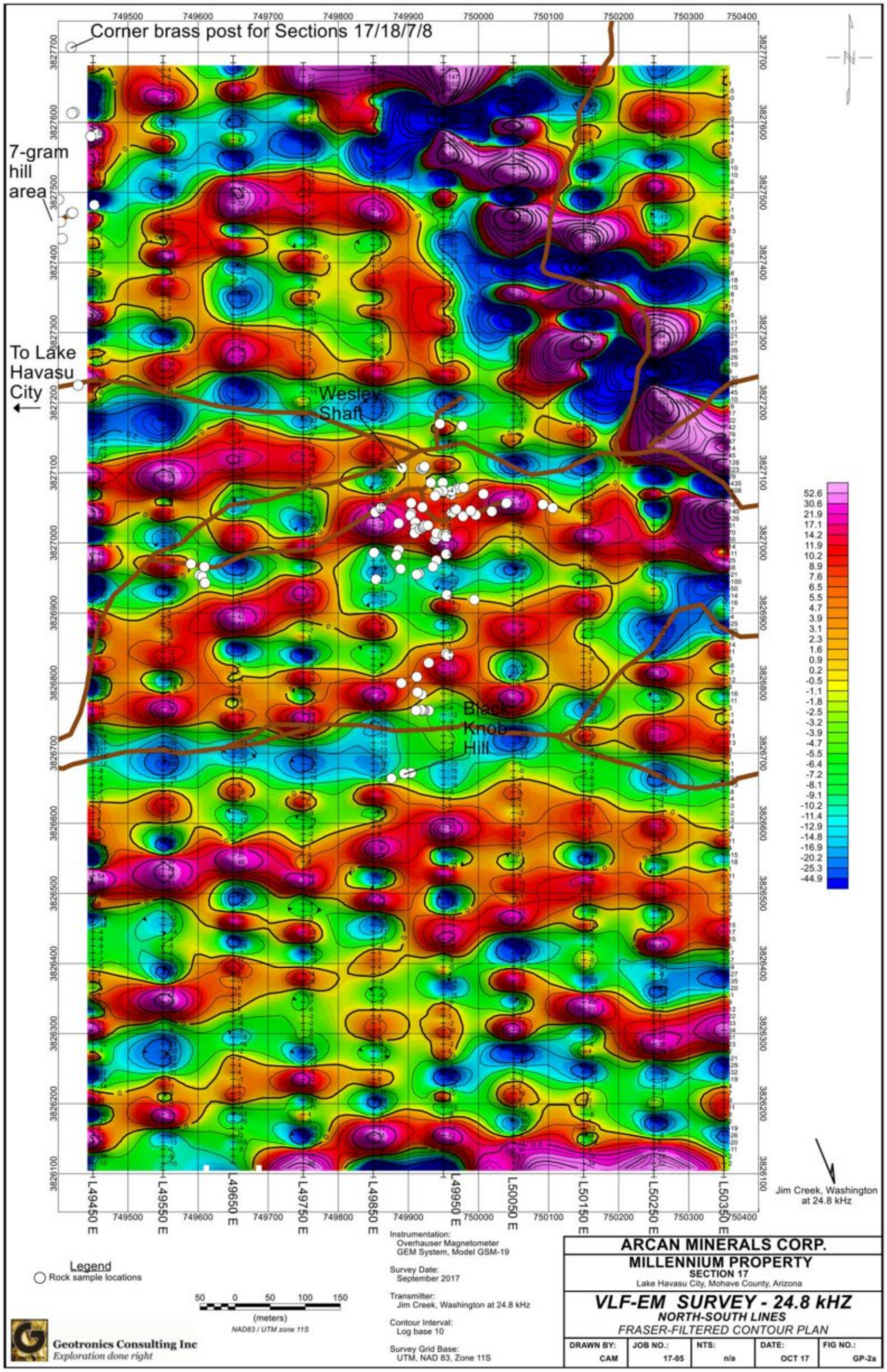


Figure 12. Contoured VLF-EM survey results (24.8 kHZ), section 17, Millennium Gold Project.

7: GEOLOGICAL SETTING AND MINERALIZATION

7.1 Introduction

The regional geology is shown on the U.S.G.S. map i2308 Geologic Map of the Mohave Mountains at 1: 48000 scale (Howard *et. al.,* 1999) in Figure 13 (https://pubs.usgs.gov/imap/i2308/) and in a more focused view in Figure 14. There is neither a published 7½ minute quadrangle geological map nor a regional 1 x 2 degree geological map for the Lake Havasu City area.

The principal area of interest lies within a suite of Miocene-age volcanic rocks comprising interbedded mafic and silicic flows and minor clastic units which lie unconformably on Precambrian-age gneissic rocks. Intruding both rock units are dikes, sills and laccolithic-like bodies of rhyolitic composition. The region is structurally complex with detachment faulting occurring to the northwest (Tumarion and Boulder Mine faults), to the southeast (Crossman Peak fault), and to the west (Whipple Mts. fault). Associated listric faulting resulted in a southwesterly tilt to the various rock units. Northeast-striking tear faults compound the situation. A northwest trending set of steeply dipping faults adds a further complexity and in the case of the Mohave Mountains, a range-front fault separates a mountain block from a pediment block (Irving, 1997).

7.2 Regional Geology

The Millennium property is situated in the Crossman Block in the Mohave Mountains area which in turn surrounds Lake Havasu City, Arizona, in the Basin and Range physiographic province. The Mohave Mountains and the Aubrey Hills form two northwest-trending ranges adjacent to Lake Havasu (elevation 132 m; 448 ft) on the Colorado River. The low Buck Mountains lie northeast of the Mohave Mountains in the alluviated valley of Dutch Flat. Lowlands at Standard Wash separate the Mohave Mountains from the Bill Williams Mountains to the southeast. The highest point in the area is Crossman Peak in the Mohave Mountains, at an elevation of 1519 m (5148 ft).

The area of interest lies within a terrane characterized by major low-angle normal faults (commonly called detachment faults) of Miocene age (Davis *et al*., 1980; Howard and John, 1987; John, 1987a; Davis and Lister, 1988; Davis, 1988; Carr, 1991). Proterozoic metamorphic and igneous rocks, Cretaceous plutons, and Tertiary dikes underlie the map area. Tertiary volcanic and sedimentary rocks overlie the Proterozoic rocks. Tilting to the southwest in the Miocene along northeast-dipping normal faults resulted in steep to overturned dips of lower Miocene strata and the Proterozoic-Tertiary nonconformity. The faulting relates to down-to-northeast motion on the deeper Whipple Mountains-Chemehuevi fault (Howard and John, 1987). Upper Miocene to Quaternary deposits overly the deformed rocks. The largest of the tilted fault blocks is the Crossman block, centered in the map area (Crossman plate of Howard *et al*., 1982b). Other large tilt blocks are the Bill Williams, Buck, and Tumarion blocks. Smaller tilt blocks or slices are present in the Standard Wash, Aubrey Hills, and Boulder Mine areas. Proterozoic and Mesozoic Rocks Granite gneisses are the predominant Early Proterozoic rocks in the map area. Scattered amphibolite bodies help to define large folds in the gneiss terrane. Amphibolite is associated with white garnet-bearing gneissic pegmatite in the northwestern part and farther southeast in the Crossman block. Remnant metasedimentary rocks and fine-grained biotite granite gneiss and younger foliated monzogranite crop out in the northern part of the area in structurally high positions of the pre-Tertiary crustal section. Augen gneiss occurs in structurally intermediate levels of the section and becomes more foliated and more mafic with paleodepth. The deepest rocks in the exposed crustal section are dominated by garnet-spotted leucocratic gneiss in which pervasive garnets, now mostly retrograded, suggest high-grade metamorphism. Granite and quartz monzonite in Standard Wash are tentatively correlated with rocks of Middle Proterozoic age (about 1400 Ma) described by Anderson and Bender (1989). An aeromagnetic high is associated with the quartz monzodiorite (Simpson *et al*., 1986). The Standard Wash granitoids are not mapped in the Crossman, Bill Williams, or Buck blocks. Swarms of Middle Proterozoic ophitic diabase dikes intrude the gneiss and granitoids. The dikes (Yd) are similar to diabase dikes distributed widely in Arizona and southeastern California and are interpreted to have an age of about 1100–1200 Ma (Wrucke and Shride, 1972; Hendricks and Lucchitta, 1974; Davis *et al*., 1980; Howard *et al*., 1982a; 1982b). The dikes cut older folds and fabrics without deflection. Their generally northwest strikes and steep dips restore to subhorizontal when Tertiary tilting defined by the dip of lowest Tertiary strata is removed. Hence the dikes are intrerpreted as originally horizontal sheets. They are mapped to paleodepths of as great as 14 km below the Proterozoic-Tertiary nonconformity. Cooling ages obtained on Proterozoic rocks by the fission-track (zircon) and potassium argon (K-Ar) methods range from 46 to 1372 Ma (table 1; Nakata *et al*., 1990). Mineralized quartz veins in the Mohave Mountains contain sulfides and precious metals (Light *et al.*, 1983). The veins cut the Proterozoic diabase and are cut by Tertiary dikes and have a minimum age of mid-Cretaceous as determined by isotopic dating: medium-grained white mica in altered gneiss associated with the veins yielded K-Ar ages of 90 to 102 Ma; numerical cooling ages on fine-grained white mica and zircon are 52 to 78 Ma; Nakata *et al.*, 1990). The Mohave Mountains and adjacent ranges are near the northeastern limit of the Cretaceous magmatic arc (Burchfiel and Davis, 1981; John, 1981; John and Wooden, 1990). Cretaceous rocks in the Mohave Mountains area may be apophyses of the deeper batholithic terrane exposed to the west in the Chemehuevi Mountains (John, 1987b). Granodiorite and porphyritic granite in the northern part of the map area are correlated to Late Cretaceous rocks of the Chemehuevi Mountains Plutonic Suite (John, 1987b, 1988; John and Mukasa, 1990; John and Wooden, 1990). Rocks in the Mohave Mountains area that may be either Cretaceous or Tertiary in age include a northeast-striking rhyolite dike dated by K-Ar on biotite at 62 Ma, northeast-striking dikes of lamprophyre and quartz porphyry, and small stocks of granite and diorite that yielded middle Tertiary K-Ar ages on biotite and hornblende.

7.2.1 Cenozoic Lithologies

The lowest stratified Tertiary unit (Tac) is arkosic conglomerate and sandstone, locally redbed, which is assigned an Oligocene or early Miocene age. It nonconformably overlies deeply oxidized Proterozoic rocks and forms the base of a heterogeneous, dominantly volcanic section of otherwise early and middle Miocene age (Nielson, 1986; Nielson and Beratan, 1990; Beratan *et al.*, 1990). The volcanic rocks consist of mafic and silicic lava flows, volcaniclastic flows and breccias, air-fall tuff, and tuff breccia. The Peach Springs Tuff of Young and Brennan (1974), a regional ash-flow tuff, crops out high in the lower Miocene part of the section. The sedimentary rocks include arkosic conglomerate and conglomeratic sandstones derived from Proterozoic sources, sandstone and sedimentary breccia derived solely from reworked volcanic rocks, and fanglomerate, sandstone, and claystone from mixed sources. The lower part of the Tertiary section is intruded by silicic and mafic dikes that may be feeders for some of the flows. The dikes are part of a dense swarm of northeast-dipping Tertiary dikes that pervades the pre-Tertiary basement of the Crossman block. This Mohave Mountains dike swarm forms about 15 percent of the rock volume in the Crossman block (Nakata, 1982) and accounts for a northeast-southwest crustal dilation of 2–3 km that occurred during regional tectonic extension. The K-Ar ages considered most reliable as intrusive ages for the swarm range from 19.2±0.5 to 21.5±0.5 Ma. The Peach Springs Tuff is dated from Kingman, Arizona, at 18.5+0.2 Ma (Nielson *et al.*, 1990). The steeply dipping to overturned oldest part of the Tertiary section is overlain successively by units of early Miocene to middle Miocene age having progressively shallower dips, in places without obvious unconformities between strata. Tthe stratified units were deposited during tilting, therefore and they likely record sedimentary influxes that relate to the tilting and faulting. Conglomerates low in the section are largely roundstone. Higher units include lacustrine strata deposited in closed structural basins. Fanglomerates and landslide megabreccias crop out high in the section. North of Lake Havasu City a gently dipping latite flow (Tadf) dated by K-Ar at 19.9±0.5 Ma overlies more steeply tilted flows and strata (Tfts) from which an age of 19.2±0.5 Ma was obtained. The 30° and greater angular unconformity between the latite flow and underlying strata records the tilting of the Crossman block (Nielson and Beratan, 1988), so the age of tilting can be interpreted as near 19.5 Ma. Stratal dips indicate that tilting of other blocks ranged from before to after deposition of the 18.5–Ma Peach Springs Tuff. A middle Miocene fanglomerate unit represents the first of two distinct periods of post detachment alluviation. Capping it are rhyolite and olivine basalt flows that were dated at 12.2 to 8.6 Ma (Suneson and Lucchitta, 1983; Nakata *et al.*, 1990). They and the underlying fanglomerate are relatively undeformed compared to older strata, but in the southeastern part of the map area they are faulted and are tilted gently southwest, the same direction as older steeper tilts. The Bouse Formation of late Miocene and Pliocene age was deposited mostly in quiet water along the valley that was later to be followed by the Colorado River. Undeformed upper Miocene to Quaternary piedmont sedimentary deposits record a second period of alluviation. These deposits are fanglomerates composed of unsorted to poorly sorted, coarse, angular to subangular clastic debris derived from the exposed pre-Tertiary and Tertiary rocks. The fanglomerates interfinger with river-laid sand and gravel along the Colorado River west of the study area. Most of the fanglomerate deposits are at least as old as Pleistocene and probably formed a series of large, coalescing alluvial fans. The depositional surface was nearly completely dissected, with levels of erosion generally below the soil profile, on the west side of the mountains where drainages flow directly into the Colorado River. Dissection, planation, and reworking is largely responsible for a series of inset terraces and washes veneered by successively younger parts of the piedmont unit. Soils are progressively less well developed on younger units (Wilshire and Reneau, 1992).

<u>7.2.2 Tertiary Structure</u>

Structural relations in the Crossman block indicate that it was tilted as a largely coherent block. The lower part of the Tertiary section dips steeply to overturned. The tilt persists at deeper structural levels in the block, as shown by the consistent steep orientations of rotated Proterozoic diabase sheets, subparallel to the lower Tertiary section. The Tertiary Mohave Mountains dike swarm maintains a moderate northeast dip across the block and is generally unbroken by faults. The evidence for tilting of the Crossman block implies that it exposes a cross section that represents progressively greater crustal depths from southwest to northeast. This section represents 10 to 15 km of crustal thickness if the Crossman block is unbroken and tilted at least 75° (Howard and John, 1987). Amphibolite bodies within the block trace Proterozoic folds that argue against much internal disruption of the block by Tertiary faulting, except where faults are mapped.

The Crossman block may have been translated 40 km from Chemehuevi Valley, where the western Whipple Mountains below the Whipple Mountains detachment fault expose a footwall of similar dike swarms and Proterozoic gneisses (Carr *et al.*, 1980; Dickey *et al.*,1980; Davis *et al.*, 1980, 1982;

Howard *et al.*, 1982a; Davis, 1988; Lister and Davis, 1989). The Whipple Mountains-Chemehuevi detachment fault projects eastward beneath the Crossman block and is inferred to juxtapose it against deeper mid-crustal mylonitic gneisses. An abrupt northeast termination of the Crossman block at its originally deep end is proposed to explain a steep gravity gradient at this position which led Simpson *et al*. (1986) to model a steep boundary between denser rocks underlying the exposed Crossman block against less dense bedrock to the northeast, under a thin sedimentary cover. A curving family of northwest-striking faults including the Wing fault cut the northwestern part of the Crossman block. These faults are steep, they cut the Mohave Mountains dike swarm, and they appear to have significant pre-dike-swarm displacements of gneiss units. Based on the generalized crustal section inferred for unbroken parts of the Crossman block, each fault of the Wing-fault family appears to attenuate crustal section, juxtaposing originally shallower rocks against originally deeper rocks to the north. Chloritized rock is present on the northeast side of the Wing fault but not on the "shallow" side, a pattern reminiscent of chloritized footwalls of low-angle normal faults in the region. Based on the resemblances to low-angle normal faults in the region, the steep Wing fault perhaps was rotated from an originally smaller dip. The Boulder Mine and Standard Wash areas expose numerous fault slices in synformal arrays structurally over the Crossman, Bill Williams, and Tumarion blocks. The faults in the Aubrey Hills and the Boulder Mine area mostly dip at low angles, and those in the Standard Wash area are inferred to also. Fault traces concave to the northeast in the Standard Wash area are consistent with synformal shapes and low northeast dips for the faults. The southeast-dipping Powell Peak fault bounds the Tumarion block against higher blocks of the Boulder Mine area, and the southeast-dipping Crossman Peak fault similarly bounds the exposed Crossman block against higher blocks of the Standard Wash area. Measured striae on the latter fault strike northeast in a direction parallel to the direction of extension and regional fault slips, including slip on the deeper Whipple Mountains and Chemehuevi detachment faults (Davis *et al.*, 1980; Howard and John, 1987; John, 1987a). The Crossman block is connected at depth below the Standard Wash area and the Boulder Mine area with the Bill Williams and Tumarion blocks. This interpretation is based on (1) the alignment of Tertiary strata in the three upended blocks; (2) the moderate (30–40°) dip of the exposed Powell Peak and Crossman Peak faults; and (3) the synformal array of higher blocks in the Boulder Mine and Standard Wash areas (Howard *et al.*, 1982a; Howard and John, 1987). An alternate interpretation is that the Crossman Peak and Powell Peak faults are syndepositional transfer faults, and that the Crossman block does not intervene between the Standard Wash area and the Aubrey Hills.

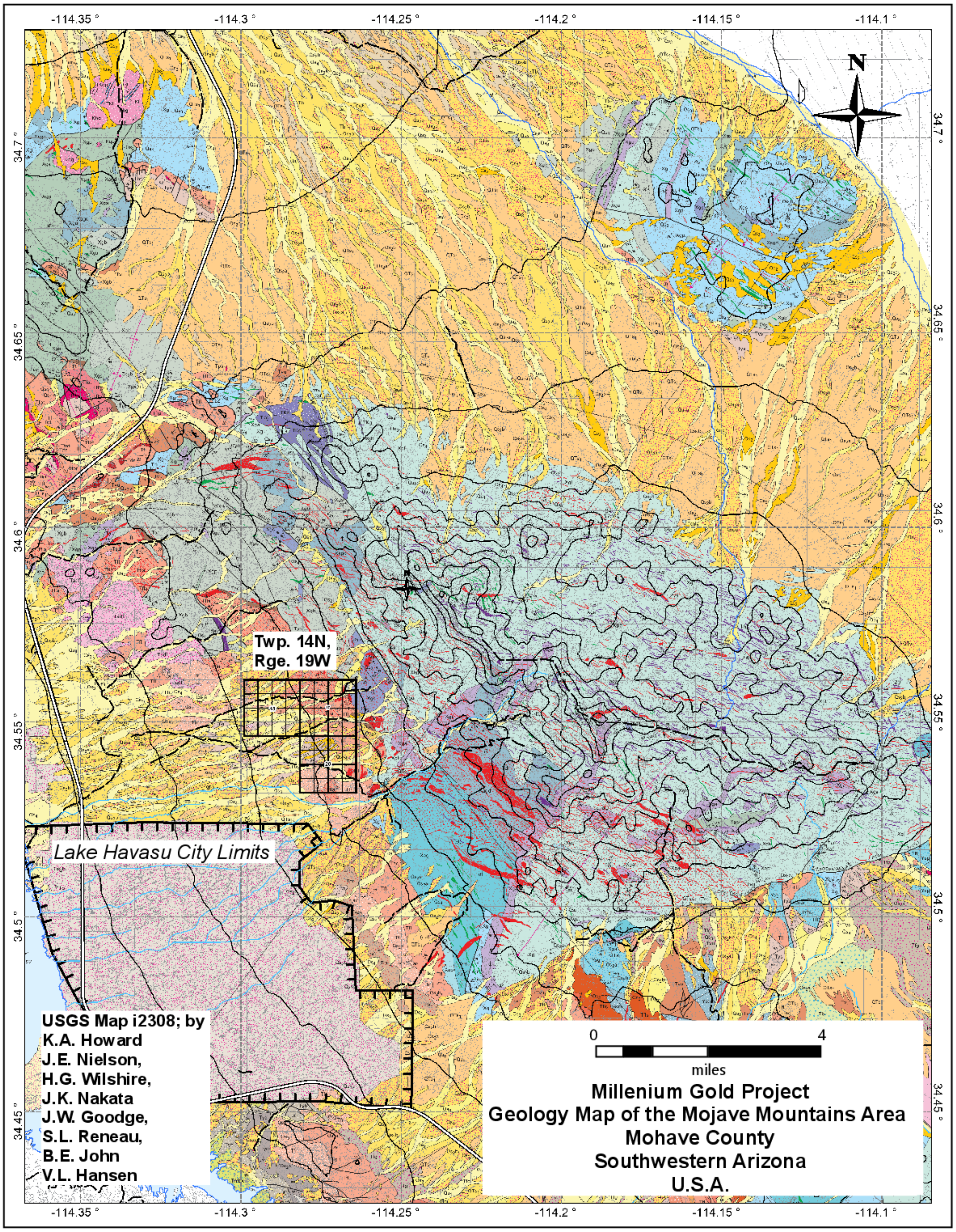


Figure 13. Regional geological setting of the Millennium Gold Project (Howard et al., 1999; https://pubs.usgs.gov/imap/i2308/). Legend for Figures 13 and 14 is reproduced below.

DESCRIPTION OF MAP UNITS

STRATIFIED DEPOSITS AND ROCKS

d — **Disturbed ground**—Ground disturbed for urban development in Lake Havasu City. Overlies chiefly Piedmont sedimentary deposits

QTt — **Talus deposits (Holocene to late Miocene?)**—At Black Mountain. Basalt blocks. Calcrete as thick as 1 m commonly veneers basalt rock rubble in nearby mountain ranges, suggesting that blocks form stable surfaces as old as several million years

Qrd — **River deposits (Pleistocene)**—Gravel and sand characterized by well-rounded cobbles and pebbles deposited by Colorado River

Piedmont sedimentary deposits (Holocene to Miocene?)—Light-gray to reddish fanglomerate deposits about 1 m to more than 35 m thick; variable but commonly subequal proportions of clasts of volcanic and plutonic rocks. Deposits are unfaulted and undeformed. Units are subdivided on basis of geomorphic expression. Units 4, 3, and 2 are pediment terraces developed mainly on deposits of unit 1 (QTs_1) and have no or only thin veneers of new deposits. Divided into:

Qs_4 — **Unit 4 (Holocene)**—Equivalent to units Q_4 and Q_3b of Bull (1974). Fill of active channels: sand, pebbles, cobbles, and boulders affected by modern floods. Channels unvegetated or occupied by trees and abrasion-tolerant shrubs. Also sand, pebbles, cobbles, and boulders forming bar and swale topography 0.5 to 1 m above active channels. Deposits sustain more varied vegetation than active channels. No soil development

Qs_3 — **Unit 3 (Holocene)**—Equivalent to unit Q_3a of Bull (1974). Fill of inactive channels, 1 to 4 m above local active channels. Sand, pebbles, cobbles, and boulders; commonly has coarse bar and swale surface texture overlying better sorted, finer grained substrate. Surface pavement weakly to moderately varnished. Where present, soil horizons include vesicular A horizon as thick as 2 cm, nonargillic B horizon as thick as 24 cm, thin carbonate pebble coatings from surface to 1.5-m depth

Qs_2 — **Unit 2 (Pleistocene)**—Locally divided into:

Qs_2b — **Subunit B**—Equivalent to unit Q_2b of Bull (1974). Moderately dissected surfaces 1 to 17 m above adjacent drainages with well-developed varnished pavement, inset into subunit A or into substrate of subunit A. Substrate of coarse to medium, poorly to moderately sorted, bedded to massive gravel as thick as 4 m; in sharp contact with underlying unit QTs_1 or older sedimentary deposits. Diversified vegetation community restricted mainly to drainages. Vesicular A soil horizon 1 to 7 cm thick, nonargillic B horizon as thick as 25 cm, argillic Bt and Btk horizons as thick as 50 cm, Bk and Bkm calcic horizons as thick as 130 cm

Qs_2a — **Subunit A**—Equivalent to unit Q_2a of Bull (1974). Moderately to well-dissected surfaces 4 to 17 m above surfaces of adjacent washes, or 1 to 6 m above surface of unit Qs_2b with well-developed varnished pavement. Substrate of coarse to medium, poorly sorted, generally massive gravel as thick as about 4 m thick, in sharp contact with underlying finer grained unit QTs_1 or older sedimentary deposits. Diversified vegetation community in drainages. Where present soil horizons include: vesicular A horizon as thick as 6 cm, nonargillic B horizon as thick as 35 cm, argillic Bt and Btk horizons as thick as 100 cm, and Bk and Bkm calcic horizons as thick as 150 cm

QTs_1 — **Unit 1 (Pleistocene, Pliocene, and late Miocene?)**—Equivalent to unit Q_1 of Bull (1974). Dissected surfaces with no relict pavement, underlain by coarse- to medium-grained, poorly to moderately sorted, bedded to massive gravel 1 to 35 m thick. Measurements made in backhoe pits show soil structure: vesicular A horizon as thick as 5 cm, nonargillic B horizon as thick as 20 cm, argillic Bt and Btk as thick as 55 cm, and Bk and Bkm calcic horizons as thick as 200 cm. Petrocalcic zone commonly drapes over ridges underlain by unit QTs_1. Underlies deposits related to younger erosional surfaces at depths of a few meters on east side of Mohave Mountains

Tb — **Bouse Formation (Pliocene and late Miocene)**—Close to Colorado River consists of white, buff, or pink sandstone, gypsiferous claystone, and basal limestone. Near U.S. Highway I-40 north of Mohave Mountains a subaerial facies is present composed dominantly of reddish sandstone and thin interbedded gravels

Tob — **Olivine basalt (late Miocene)**—In southeastern part of map area. Vesicular, black to brown olivine basalt with intersertal to diktytaxitic texture. Overlies rhyolite unit (Tr) and fanglomerate unit (Tfg). Whole-rock age determined by potassium-argon (K-Ar) method on Mohave Springs Mesa flow is 8.6±0.3 Ma (Suneson and Lucchitta, 1983) and on Black Mountain flow is 11.1±0.3 Ma (*table 1, No. 1). Vent for Mohave Springs Mesa flow is identified by Suneson and Lucchitta (1983) in Castaneda Hills southeast of map area. Flows 20 to 160 m thick. Queried steeply dipping patch (foliation measured on vesicular layering) east of Black Mountain (SE 1/4 sec. 33, T. 14 N., R. 16 W.) possibly is an underlying unit

Tbr — **Breccia (late or middle Miocene)**—In eastern Standard Wash. Breccia composed of gneiss, quartz monzodiorite, and andesite clasts, including rocks from units Tda, Ysqm, and Xgl. Underlies unit QTs_1. Probably a landslide deposit derived from Mohave Mountains. May also include outcrops of in-place Proterozoic bedrock

Tvu — **Volcanic and sedimentary rocks, undivided (Miocene)**—Volcanic rocks ranging from basalt to rhyolite and interbedded with (or intruded into) sandstone and arkosic to volcaniclastic conglomerate

Tr — **Rhyolite (middle Miocene)**—In southeastern part of map area consists of pumice breccia, air-fall and ash-flow tuff, perlite, and glassy rhyolite flows; phenocrysts of quartz, sanidine, and plagioclase; K-Ar sanidine age on ash-flow tuff is 12.7 Ma (table 1, No. 2). North of Lake Havasu City, a flat-lying rhyolite flow remnant that overlies tilted airfall tuff yielded a K-Ar plagioclase age of 10.9 Ma (W.A. Rehrig, oral commun., 1982). Underlies olivine basalt (Tob) and overlies fanglomerate (Tfg) and older units. Correlative with silicic volcanic rocks of Suneson and Lucchitta (1983) in Castaneda Hills, which have K-Ar ages that range from 10.3 to 15.1 Ma, and with rhyolite and silicic volcaniclastic rocks of Sherrod (1988) in Monkeys Head quadrangle. In map area as thick as 150 m

Tfg — **Fanglomerate (middle Miocene)**—Fanglomerate composed predominantly of locally derived clasts. Contains fragments of chloritic gneiss near Crossman Peak fault; elsewhere rich in clasts of volcanic or plutonic rocks. East of Lake Havasu City clast population changes abruptly from dominantly volcanic rocks to dominantly granitic gneiss as matrix changes from purplish to reddish. Attitude typically is subhorizontal but locally dips reach 35°. Overlies older Tertiary deposits with angular unconformity. Underlies rhyolite (Tr) and olivine basalt (Tob) units. Correlative with Osborne Wash Formation of Davis and others (1980). Highly variable in thickness

Tmbx — **Megabreccia (middle Miocene)**—Exposed only in Aubrey Hills, near Lake Havasu. Megabreccia derived from white mylonitic two-mica granite gneiss and from dikes of dark gabbro—rocks typical of footwall of Whipple Mountains detachment fault in western Whipple Mountains, 20 km to west (G.A. Davis, oral commun., 1985). Includes undeformed blocks hundreds of meters across. Striae along base of deposit and drag folds in underlying sedimentary rocks suggest that deposit is a landslide that was emplaced from southeast direction. In places, base of deposit is marked by load casts and intervening injections consisting of breccia mixed with sand or shale from substrate. Correlated with megabreccia deposit of northern Whipple Mountains (Dunn, 1986). Unit overlies basalt, tuff, and sandstone unit (Tyb). Thickness more than 200 m

Younger conglomerate basalt, and tuff (middle and early Miocene)—Correlative with upper part of arkose of Keenans Camp of Suneson (1980). Overlies Peach Springs Tuff of Young and Brennan (1974). Divided into:

Tys — **Sedimentary and interbedded pyroclastic rocks**—Mapped in northwestern and southeastern parts of map area. Conglomerate, fanglomerate, red and brown arkosic sandstone, buff to white volcaniclastic sandstone, tan to red-brown claystone, and interbeds of white air-fall tuff. Local lahar or volcanic mudflow deposits. Conglomerate ranges from dominantly volcaniclastic with tuffaceous matrix containing subrounded pebbles of Peach Springs Tuff, to dominantly arkosic with quartz sandstone matrix containing clasts of gneiss and granite. Clasts of coarse-grained granite (Ysg) and lesser quartzite (Coconino Sandstone) are present near Mohave Wash (sec. 22, T. 13 N., R. 17 W.). Locally boulders are as much as 3 m across. Fanglomerate commonly has purplish matrix and predominantly subangular volcanic clasts. Locally contains large internally brecciated masses of plutonic or volcanic rocks, probably derived as landslides, similar to megabreccia unit (Tmbx). Dips range from 12° to 90°. Overlies Peach Springs Tuff. Thickness highly variable, as much as 1400 m

Tyb — **Basalt, tuff, and sandstone**—In Aubrey Hills. Black vesicular olivine basalt flows; interbedded lacustrine or playa deposits of buff volcaniclastic sandstone, shale, mudstone, thin limestone, and white waterlaid tuff; and local fluvial conglomerate. Locally silicified. Conglomerate-clast assemblages range from volcanic to mixed volcanic and plutonic rocks. Correlative with strata in arkose of Keenans Camp of Suneson (1980). Unit generally dips 35° to southwest, but locally near faults dips as much as 50° to north. Queried outcrops 2 km east of Pittsburg Point (sec. 23, T. 13 N., R. 20 W.) are fine-grained andesite. Basalt present as stacks of flows as thick as 12 m. Thickness 100–120 m

Tyc — **Conglomerate, sandstone, and tuff**—In Aubrey Hills. Buff to white pebble conglomerate and medium-grained sandstone, and laterally persistent beds of white waterlaid tuff. Local limestone interbeds in sandstone. Conglomerate clasts are predominantly rounded pebbles of mixed volcanic and plutonic rocks; volcanic types include pebbles of Peach Springs Tuff. Sandstones are crudely layered and commonly have large-scale low-angle crossbedding. Unit resembles sedimentary parts of basalt, tuff, and sandstone unit (Tyb) but has a larger proportion of poorly sorted fanglomerate. Grades to southeast into lithologically equivalent fan-slope facies of unit Tycs. Overlies rhyolite tuff, flows, and domes (Tfr). Correlative with sedimentary and pyroclastic rocks (Tys) in other parts of map area. Thickness as much as 200 m

Tycs — **Conglomerate and sandstone**—In Aubrey Hills. Brown to red-brown conglomerate and coarsely stratified pebbly sandstone. Upper part of unit is conglomerate with sandstone interbeds. Average grain size of conglomerate is fine pebble, and maximum clast size is 7 cm. Sorting is fair to poor, with no distinct crossbedding. Clasts are predominantly angular to subangular and derived from mafic to intermediate volcanic rocks and Peach Springs Tuff. Rarer clasts are rounded granite, gneiss, and chloritic gneiss. Unit becomes generally finer grained to northwest, where it grades into coeval unit of fluvial and lacustrine deposits of conglomerate, sandstone, and tuff (Tyc). Overlies Peach Springs Tuff (Tps). Correlative with part of sedimentary and pyroclastic rocks (Tys) in other parts of map area. Thickness as much as 500 m

Tbt — **Basalt and tuff (middle or early Miocene)**—East of Lake Havasu City and in northwestern part of map area. Comprises basalt and tuff of uncertain stratigraphic position relative to Peach Springs Tuff of Young and Brennan (1974). On east side of Lake Havasu City consists of olivine basalt and interbedded tuff and sedimentary rocks characterized by variable dips 10° to 45° southwest; resembles lithologically tuff and basalt flows (Tfot) and to a lesser degree stratigraphically higher basalt, tuff, and sandstone (Tyb); overlies rhyolite tuff, flows, and domes (Tfr). In northwestern part of map area includes an olivine basalt flow with numerical K-Ar age of 14.6 Ma (whole-rock; table 1, No. 3); flow dips steeply in conformity with underlying rocks of unit Tfl, and it underlies rocks of sedimentary and pyroclastic rocks (Tys); similar basalts nearby underlie and overlie Peach Springs Tuff

Tadf — **Andesitic and dacitic flows, dikes, and sills (early Miocene)**—North of Lake Havasu City. Variably altered intermediate lava flows and volcanic breccia capped by silicic plagioclase-bearing welded tuff. Gently dipping. Potassium-argon numerical ages overlap age of Peach Springs Tuff: basal pyroxene-plagioclase-biotite latite flow (SiO_2, 59.5 percent; K_2O, 11.2 percent—19.9±0.5 Ma (biotite, table 1, No. 6); capping welded tuff—17.9±0.5 Ma (plagioclase, table 1, No. 5). Unconformably overlies steeper dipping Miocene volcanic rocks (Tfls, Tfla) and Proterozoic rocks. Thickness as much as 130 m

Tps — **Peach Springs Tuff of Young and Brennan (1974) (early Miocene)**—Welded crystal-lithic ash-flow tuff with salmon-pink matrix. Commonly contains adularescent blue sanidine crystals; also biotite, plagioclase, and hornblende; rarer pyroxene, sphene, and quartz. Rich in large fiamme, relatively poor in lithic fragments. Black vitrophyre locally present near base. Extensively exposed in northern Mohave Mountains and Aubrey Hills, where tuff commonly is partly to highly silicified and contains zones of secondary brecciation. Unit dips 30° to 60° southwest. Age of Peach Springs Tuff determined by argon-argon ($^{40}Ar/^{39}Ar$) techniques is 18.5±0.2 Ma (Nielson and others, 1990). Potassium-argon numerical ages on unit are more variable (Glazner and others, 1986; table 1, Nos. 4, 7). Thickness in map area as much as 100 m

Flows, tuff, and sedimentary rocks (early Miocene)—Divided into:

Tfr — **Rhyolite tuff, flows, and domes**—In Aubrey Hills and east and north of Lake Havasu City. White stratified air-fall tuff, interbedded flows and domes, and intrusions of plagioclase biotite-hornblende rhyolite. Attitudes highly variable. In area north of Lake Havasu City tuff is commonly silicified and (or) oxidized and invaded by compositionally equivalent domes; underlies unit Tadf. Northeast of Lake Havasu City rocks are silicified and oxidized tuff, partly perlitic rhyolite flows, and massive biotite-bearing crystal-poor rhyolite intrusive into Tertiary and Proterozoic rocks; dips range from 24° southwest to locally vertical and overturned. Dips probably reflect both tectonic and considerable local original dips of deposits. In Aubrey Hills unit comprises dominantly flows with vitrophyric bases, monolithologic avalanche breccia, and minor tuff, all of biotite rhyolite; dips are 35° to 45° to southwest. Interfingers toward southern Aubrey Hills with unit Tfl and locally with unit Tfob. Thickness increases from south to north, to 400 m

Older conglomerate, basalt, and tuff—Correlative with lower part of arkose of Keenans Camp of Suneson (1980). Underlies Peach Springs Tuff of Young and Brennan (1974). Consists of:

Tfob — **Basalt, sandstone, and conglomerate**—In Aubrey Hills. Localized unit of altered basalt and andesite or latite flows interleaved with pebbly coarse sandstone and cobble conglomerate. Conglomerate contains mixed volcanic and plutonic clasts, locally very coarse (as much as 2 m across), of coarse-grained granite, gneiss, and schist. Underlies Peach Springs Tuff. Overlies tuff and basalt flows (Tfot), which represent similar but older depositional and eruptive events. Unit grades to northwest into unit Tfl. Thickness as much as 650 m

Tfos — **Tuff, sandstone, and basalt**—In Aubrey Hills. White air-fall tuff, probably waterlaid, interbedded with sandstone, siltstone, and altered basalt flows. Tuff layers are reddened at contacts with overlying basalt flows. Unit contains at least one large mass of internally brecciated diabase, probably a landslide block. With exception of basalt flows, unit represents a depositional environment similar to lacustrine parts of unit Tys, but predates Peach Springs Tuff. Unit interfingers to west and northwest with basal flows of unit Tfob, which it underlies, and to north with upper parts of unit Tfot, which it overlies. Thickness to 750 m

Tfot — **Tuff and basalt flows**—In Aubrey Hills and north of Lake Havasu City. Interbedded air-fall tuff, tuff breccia, conglomerate, and andesitic or basaltic flows. Locally tuff is minor so that unit is predominantly basalt flows and mixed-clast conglomerate with volcaniclastic matrix and boulders as large as 5 m in diameter. Clasts are mostly porphyritic granite, gneiss, amphibolite, schist, and more rarely, andesite. Contacts between tuff or conglomerate and basaltic flows contain peperite, and flow bases are pervasively altered, indicating extrusion of flows over saturated sediments. Dips range from 30° to 80°. Underlies Peach Springs Tuff north of Lake Havasu City and underlies units Tfob and Tfos in Aubrey Hills. Maximum thickness 350 m

Tfl — **Lava flows, sills, tuffs, and sedimentary rocks**—Commonly altered mafic to silicic lava flows and sills interleaved with arkosic and tuffaceous beds, including fine to coarse sandstone, conglomeratic sandstone and conglomerate, welded tuff, and tuff breccia. Individual beds cannot be traced more than a few meters along strike. Lava flows and sills include augite-oxyhornblende-plagioclase andesite(?) (±biotite), hornblende-hypersthene-plagioclase andesite(?) with plagioclase partly altered to potassium feldspar; relatively unaltered hornblende-biotite-quartz-sanidine tuff; hornblende-biotite-sanidine rhyolite porphyry flows with vitrophyric bases, variably altered basalt(?), distinctive trachytic-textured "turkey-track" or "jackstraw" porphyry, lithologically similar to units Tflp and Tfls. Andesite(?) and basalt(?) have contents of SiO_2 and K_2O that resemble latite and trachyte, which may be due to metasomatic additions of these components. K-Ar ages that are considered most reliable as volcanic ages are as follows: rhyolitic flows, north and south of Lake Havasu City, 19.2±0.5 Ma, 19.1±0.6 Ma, and 20.5±1.6 Ma (all on biotite; table 1, Nos. 9–11); basalt sill(?), in north part of Lake Havasu City, 17.9±0.7 Ma (whole-rock; table 1, No. 8); basaltic andesite flow north of Lake Havasu City, 21.5 Ma (whole-rock; W.A. Rehrig, oral commun.,1982). Sedimentary deposits including arkosic fanglomerate are locally interbedded with rhyolitic and mafic flows, but may be surrounded or partly to wholly assimilated by mafic or intermediate lavas or sills. Queried unit Tfl? beneath arkosic conglomerate and sandstone unit (Tac) north of Lake Havasu City (sec. 35, T. 15 N., R. 20 W.) may consist entirely of intrusive rocks. Thickest sections are from 700 to 1200 m thick. Locally mapped as:

Tfla — **Altered lava flows and sedimentary deposits**—Northwest of Lake Havasu City. Altered lava flows interbedded with sandstone and conglomerate containing predominantly andesite(?) clasts. Includes some "jackstraw" porphyry lithologically similar to unit Tflp. Dips are between 40° and 90°. Contains abundant dikes of mafic to intermediate rocks (Tda,Tdl). Correlative at least in part with unit Tfl. Underlies andesitic and dacitic flows, dikes, and sills (Tadf)

Tfll — **Andesitic to latitic sills and flows**—In Aubrey Hills and Standard Wash. Tan to brown bodies of altered orthopyroxene-bearing andesite, latite, or dacite that form prominent ridges. Sills assimilated sedimentary beds like those of unit Tflf. Feeder dikes for sills or flows are locally prominent. Dips as much as 60°. Maximum thickness about 200 m in Standard Wash; much less in Aubrey Hills

Tflt — **Tuff breccia**—In Aubrey Hills and Standard Wash. Pink to buff, welded to unwelded, unsorted tuff breccia with abundant lithic clasts. Interbedded with mafic flows of unit Tfl. Thicker and welded in Aubrey Hills; thinner and unwelded in Standard Wash. Maximum thickness 135 m

Tflf — **Sedimentary and fragmental volcanic rocks**—In Aubrey Hills and Standard Wash. Fluvial and lacustrine sedimentary rocks include conglomerate with boulders as coarse as several meters, mixed arkosic-volcanic conglomerate, and yellowish-green volcaniclastic siltstone and sandstone, commonly with pumiceous matrix. Fragmental volcanic rocks are lithic volcanic breccia, pumice breccia, and tuff, all of moderately to highly potassic rhyolite. Interbedded with unit Tfl. Parts of unit are intruded and partly to wholly assimilated by mafic flows of unit Tfls; this relation is best exposed at south end of Aubrey Hills. Maximum thickness is 140 m, may have been much thicker before emplacement of lava flows and sills

Tflp — **Andesite porphyry**—North of Lake Havasu City, and in Aubrey Hills and Standard Wash; lithologically similar rocks are present elsewhere in other units (Tfls, Tfl, Tfla, and Tdap). Porphyry believed to have original andesitic composition, commonly altered to latite by metasomatic addition of SiO_2 and K_2O. Commonly called "turkey-track" or "jackstraw" porphyry because of trachytic texture characterized by aligned phenocrysts of tabular plagioclase as long as 10 mm, which locally are concentrated at flow tops. Also characterized by smaller equant grains of green pyroxene, which commonly are concentrated in or near flow bases. Dated by K-Ar at 19.8±0.6 Ma (whole rock, table 1, No. 13); if high K_2O (3 percent) in dated sample reflects metasomatic enrichment, then date may reflect age of metasomatism. Maximum thickness about 400 m

Tfls — **Andesite porphyry and sedimentary rocks**—In Aubrey Hills and Standard Wash. Interbedded sandstone, conglomerate, and "turkey-track" or "jackstraw" andesite(?) porphyry. Thin bed of limestone caps unit in southern Aubrey Hills (secs. 13 and 14, T. 19 W., R. 12 N.). Unit produced by intrusion of lavas as flows or sills into conglomerate and tuffaceous to arkosic sandstone, lithologically similar to unit Tflf. Conglomerate is dominantly rounded pebbles of granite, gneiss, and other Proterozoic rocks, and minor volcanic rocks. Sedimentary rocks are engulfed or partly to wholly assimilated by lavas. Thickest sections exposed range from 300 to 700 m thick

Tac — **Arkosic conglomerate and sandstone (early Miocene or Oligocene)**—Conglomerate and sandstone containing clasts of locally derived gneiss and granitoid rocks, locally with red oxidized matrix. Nonconformably overlies Proterozoic rocks of same lithologies as clasts. Locally includes andesitic and basaltic clasts of unknown provenance. Maximum thickness 200 m

INTRUSIVE ROCKS

Tdr — **Rhyolitic dikes (middle Miocene)**—North of Lake Havasu City and east of Arizona Highway 95. Vertical dikes of frothy, flow-banded rhyolitic porphyry containing biotite, plagioclase, quartz, and hornblende phenocrysts. Potassium-argon age on large dike 15.1±0.4 Ma (plagioclase, table 1, No. 14)

Mohave Mountains dike swarm (Miocene)—Divided into:

Tdm — **Diorite and fine-grained mafic dikes (middle? and early Miocene)**—In eastern Mohave Mountains, dikes as long as 3 km of fine- to medium-grained hypidiomorphic granular biotite-hornblende diorite cut andesitic dikes (Tda) and leucocratic dikes (Tdl); potassium-argon numerical ages (21 to 27 Ma on hornblende, table 1, No. 15) are suspected to be older than geologic age because of approximately 20-Ma age inferred for older leucocratic dikes (Tdl). Small dikes north of Lake Havasu City cut andesitic and dacitic flows, dikes, and sills (Tadf)

Tdap — **Andesite porphyry dikes (early Miocene)**—Trachytic-textured dark-gray andesitic dikes having aligned tabular plagioclase phenocrysts, like "jackstraw" or "turkey-track" lava flows (Tflp). Generally cut andesitic dikes (Tda) and leucocratic dikes (Tdl) but locally are cut by them. A K-Ar numerical age of 42.7 Ma (plagioclase, table 1, No. 16) conflicts with probable Miocene intrusive age of unit

Tda — **Andesitic dikes (early Miocene)**—Gray to black, dark-brown-weathering, hornblende andesite, diabase and microdiorite, generally containing small amounts of clinopyroxene phenocrysts; rare interstitial quartz. Xenoliths of gneiss are present locally. Dikes rarely vuggy, chilled margins common. Most dikes are concentrated in Proterozoic rocks but some also cut Miocene volcanic rocks, including unmapped dikes in andesite porphyry (unit Tap) in Standard Wash area. Where in contact, most dikes of this unit cut leucocratic dikes (Tdl). Potassium-argon hornblende, plagioclase, and whole-rock numerical ages of 29 to 78 Ma on unit (table 1, Nos. 17–20) conflict with probable early Miocene geologic age and may reflect excess argon. Most dikes dip northeast at moderate angles. Dikes range from 0.3 to 10 m thick, average 2.3 m

Tdl — **Leucocratic dikes (early Miocene)**—Pattern indicates areas of abundant intrusions, including dikes and stocks. Dacite, altered andesite(?), and subordinate rhyolite and aplite. Intrusions of this unit in most cases are cut by andesitic dikes (Tda). Textures include hypidiomorphic granular, spherulitic, and aphanitic types. Granular rocks crop out as knobs and rolling hills; finer grained aphanitic equivalents form spires. Dark-gray chill zones are common and grade inward toward light-colored central zones. More silicic types are cream to light gray on fresh surfaces, weathering to pale orange and shades of brown. Plagioclase and lesser biotite phenocrysts are common; hornblende, quartz, and alkali-feldspar phenocrysts are less common. Potassium-argon ages on biotite range from 19.2±0.2 to 20.8±0.5 Ma on 3 widely separated dikes (table 1, Nos. 22–24) and are interpreted to indicate a probable intrusive age of about 20 Ma. Dikes of this unit are concentrated in Proterozoic rocks; they invade Miocene volcanic units (Tfll, Tfl, Tfls) on west side of Mohave Mountains and in Standard Wash. Most dikes dip northeast at moderate to shallow angles

Tgd — **Granodiorite and quartz diorite (early Miocene)**—Small exposure in central part of map area, 3 km north of Crossman Peak (sec. 9, T. 14 N., R. 18 W.). Biotite-hornblende granodiorite and biotite-hornblende quartz diorite. Granodiorite is characterized by stubby hornblende phenocrysts as large as 1 cm; idiomorphic texture at margin of body suggests hypabyssal intrusion; contains epidote of possibly magmatic origin; may be a coarser grained equivalent of leucocratic dikes unit (Tdl); modal composition shown in figure 5. Associated quartz diorite appears to merge into a northwest-trending dike of andesitic dikes unit (Tda); K-Ar age on biotite from quartz diorite, 21.5±0.5 Ma (table 1, No. 25)

TYd — **Dikes, undivided (Tertiary to Middle Proterozoic)**—Most dikes are andesite and may be same as andesite dikes of unit Tda. Basalt (Miocene?) present in Bill Williams Mountains. Felsite and aplite present west and southwest of Mohave Springs. A northeast-trending rhyolite dike (Cretaceous or Paleocene?) 2 km southeast of Crossman Peak contains sphene, alkali feldspar, biotite, quartz, and plagioclase phenocrysts and resembles in outcrop leucocratic dikes unit (Tdl), but for its northwest strike and older K-Ar age on biotite: 62.3±1.6 Ma (table 1, No. 28). A hornblende microdiorite dike containing biotite and clinopyroxene in Bill Williams Mountains cuts and has chilled margins against metamorphic fabric of augen gneiss; it yielded a K-Ar numerical age on hornblende of 332 Ma (minimum age?—table 1, No. 29) and may be Proterozoic. Unmapped minette present in southeast Mohave Mountains 3 km northwest of Black Mountain

TKqp — **Quartz porphyry dikes (Tertiary or Cretaceous)**—Near northwest corner of map area. Granodiorite porphyry having phenocrysts of sphene, hornblende, biotite, alkali feldspar, prominent quartz, and plagioclase. Cuts biotite granodiorite unit (Kbg). Dikes trend northeast

TKl — **Biotite lamprophyre dikes (Tertiary or Cretaceous)**—In northwest corner of map area. Dark northeast-trending dikes, having chilled margins against biotite granodiorite unit (Kbg). Biotite phenocrysts conspicuous. Also contains plagioclase phenocrysts and groundmass alkali feldspar

TKg — **Granite (Tertiary or Cretaceous)**—In north-central part of map area (6 km southeast of Boulder Mine, in and near sec. 20, T. 15 N., R. 19 W.). Light-gray sphene-bearing hornblende-biotite monzogranite (fig. 5). Color index 5–8 percent. Locally granophyric. Forms a small pluton and satellitic dikes. Resembles in outcrop biotite granodiorite unit (Kbg). Intrudes and is closely associated with diorite (TKd). Angular xenoliths in intrusion breccia are pictured in figure 10 of Howard and others (1982a). Potassium-argon numerical biotite age of 18.1±0.5 Ma (table 1, No. 26) is probably a minimum age

TKd — **Diorite (Tertiary or Cretaceous)**—In north-central part of map area (6 km southeast of Boulder Mine, in T. 15 N., R. 19 W.). Hornblende diorite. Ranges to quartz monzodiorite and granodiorite. Contains small amounts of biotite and clinopyroxene. Texture and grain size vary widely. Cuts ophitic diabase dikes (Yd) and Proterozoic gneiss; cut by granite (TKg). Potassium-argon numerical age on hornblende (32 Ma; table 1, No. 27) is of uncertain significance. Unit also includes a small intrusion in Standard Wash area (sec. 23, T. 13 N., R. 19 W.)

Kpg — **Porphyritic granite (Late Cretaceous)**—Near center of map area. Small stock of medium-grained muscovite-biotite monzogranite to granodiorite intrudes Proterozoic gneiss. Coarse-grained alkali-feldspar phenocrysts are zoned by inclusions of other minerals. Resembles porphyritic unit of Late Cretaceous Chemehuevi Mountains Plutonic Suite (John, 1987a, 1988; John and Mukasa, 1990; John and Wooden, 1990) mapped 10 km west of map area

Kbg — **Biotite granodiorite (Late Cretaceous)**—In northwestern part of map area (T. 16 N., R. 20 W.). Light-gray, equigranular, medium-grained (2-mm grain size), sphene-biotite granodiorite and monzogranite. Color index 6 to 9. Plagioclase euhedral and oscillatory zoned. Inferred to belong to a single pluton also exposed west of map area on Powell Peak, near where a K-Ar age on biotite of 72.0 Ma was obtained (Nakata and others, 1990). Resembles biotite granodiorite unit of Late Cretaceous Chemehuevi Mountains Plutonic Suite (John, 1987b, 1988; John and Mukasa, 1990; John and Wooden, 1990) mapped 10 km west of map area

Yd — **Ophitic diabase dikes (Middle Proterozoic)**—Dark-gray to black dikes. Dike margins commonly chilled. Ophitic to sub-ophitic, locally metamorphosed and foliated. Rocks contain 40 to 50 percent plagioclase laths 1 cm or larger set in a matrix of secondary green hornblende and local relics of pigeonite and augite. As much as 6 percent primary red-brown biotite commonly is present. Dikes are conspicuously dark on aerial photos. Typically weathers recessively to olive brown or locally dark purplish brown. Dikes are 1 to 20 m thick, averaging 3.7 m where measured by Nakata (1982) in Mohave Mountains. Most dikes dip steeply, subparallel to nonconformably overlying Tertiary strata where present in same fault blocks, indicating that dikes were subhorizontal prior to Tertiary tilting. Intrudes coarse-grained granite unit (Ysg) and older rocks and is intruded by biotite granodiorite (Kgd), granite (TKg), and younger rocks. Correlated with Middle Proterozoic diabase intrusions and extrusions in Death Valley, eastern Mojave Desert, Grand Canyon, and southern Arizona that are thought to be about 1100 to 1200 Ma in age (Fitzgibbon and Howard, 1987; Fitzgibbon, 1988)

Granitoids of Standard Wash (Middle Proterozoic?)—Present in upper plate of Crossman Peak fault. Divided into:

Ysg — **Coarse-grained granite**—Red-weathering, coarse-grained monzogranite characterized by coarse tabular gray to cream phenocrysts of alkali feldspar, commonly rimmed by plagioclase. Color index about 11±5, locally as high as 28; mafic minerals (biotite and opaques, rarely hornblende) are aggregated. Also includes lesser amounts of red-weathering medium-grained equigranular biotite granite and leucogranite. Locally contains biotite-rich lenses 1 or 2 m thick or amphibolite enclaves. Locally finely laminated. Lithologically similar to, and tentatively correlated with, Parker Dam granite of Anderson (1983) and Anderson and Bender (1989), dated by uranium-lead method at 1401 Ma. Also resembles porphyritic granite subunit of augen gneiss unit (Xap). Grades to and locally cuts quartz monzonite (Ysqm)

Ysqm — **Quartz monzonite**—Dark-gray, locally reddish-weathering, monzogranite, quartz monzonite, granodiorite, quartz monzodiorite, and quartz diorite. Medium- to fine-grained, equigranular to seriate. Color index mostly 15 to 20, ranges from about 12 to 25. Contains medium-grained spots of plagioclase and hornblende, but most mafic mineral grains (biotite, hornblende, and opaques) are recrystallized to clots of fine and very fine grains. Alkali feldspar is interstitial. Generally massive but locally well foliated. Lithologically similar to, and is tentatively correlated with, Bowmans Wash pluton of Anderson and Bender (1989) dated by uranium-lead method at 1407 Ma

METAMORPHIC ROCKS

Augen gneiss (Early Proterozoic)—Coarse to medium-grained biotite orthogneiss characterized by augen of alkali feldspar. Present in several bodies. Garnet present in small bodies north of Crossman Peak fault southeast of Crossman Peak (sec. 35, T. 14. N., R. 18 W. and sec. 6, T. 13 N., R. 18 W.) and in a large body in Bill William Mountains that yielded a U-Pb age (zircon) of 1642 Ma (table 1, No. 36; Wooden and Miller, 1990). Unit tends to be least metamorphosed and most felsic where closest to Proterozoic-Tertiary nonconformity. Bodies southeast of Lake Havasu City and in Bill Williams Mountains are accordingly divided into gradational lithotypes varying subtly in degree of metamorphic fabric development and in modal mineralogy (fig. 6). Gradational variation is interpreted as reflecting a paleodepth profile before Tertiary tilting. Divided into:

Xap — **Porphyritic granite unit**—Least foliated unit. Coarse- to medium-grained porphyritic monzogranite (ranging to syenogranite and granodiorite). Color index 5 to 20, mostly about 10. Igneous texture is recrystallized but foliation is not pronounced except for local mylonite zones. Contains xenoliths of leucocratic granite gneiss (perhaps Xgl) and amphibolite in northwestern part of map area (Howard and others, 1982a, fig. 8 photo). Small body of syenogranite in southeastern Mohave Mountains (sec. 35, T. 14 N., R. 18 W.) contains garnet, hornblende, and muscovite and cuts fabric in adjacent gneisses. Lithologically similar to coarse-grained granite unit (Ysg)

Xag — **Granite augen gneiss unit**—Intermediate to units Xap and Xagd in composition and development of metamorphic texture. Medium- to coarse-grained augen gneiss of monzogranite (ranging locally to syenogranite and granodiorite) composition. Color index mostly between 5 and 22. Mylonite and ultramylonite zones present in Bill Williams Mountains. Cut by ophitic diabase dikes (Yd). Cut in Fall Springs Wash (Mohave Mountains) by undeformed veins of aplite and pegmatite and in Bill Williams Mountains by veins of garnet-bearing pegmatite resembling spotted leucocratic gneiss unit (Xgl)

Xagd — **Granodiorite augen gneiss unit**—Medium- to coarse-grained augen gneiss and equigranular gneiss of granodiorite and lesser monzogranite composition. Contains hornblende in some areas, subordinate to biotite. Rare biotite-rich enclaves are oriented parallel to foliation. Cut by isoclinally folded garnet-bearing pegmatite dikes and by veins and blobs of purplish or bluish quartz. Also cut by ophitic diabase dikes (Yd). In Buck Mountains unit includes unmapped other kinds of gneiss; quartz in augen gneiss is bluish or purplish and present as discrete eyes. Near Fall Springs Wash (Mohave Mountains) locally includes hornblende granodiorite augen gneiss containing plagioclase augen

Xg — **Gneiss, undivided (Early Proterozoic)**—Unit is divided according to dominant rock type but, as mapped, each of following units also includes rocks characteristic of other units:

Xgl — **Spotted leucocratic gneiss**—Light-medium-gray, medium-grained granite gneiss and locally pegmatitic gneiss. Quartz is gray to lavender. Color index 0 to 10. Garnet and dark spots (commonly garnet-cored spots of chlorite, brown to green biotite, phlogopite, epidote, and amphibole, representing pseudomorphs after garnet and possibly pyroxene) commonly form feathery or plumose trains several centimeters long in outcrop. Granulitic texture and pervasive retrograded garnets suggest rock may have been metamorphosed to high grade

Xgp — **Pegmatite and monzogranite**—In northwestern part of map area, unit consists of medium-grained, light-colored foliated monzogranite and associated pegmatite; monzogranite contains biotite, biotite and muscovite, or biotite and garnet, and yielded a K-Ar numerical age on biotite (interpreted as a cooling age) of 597 Ma (table 1, No. 42). Elsewhere unit consists of white garnet-bearing gneissic pegmatite (±muscovite) commonly associated with amphibolite; locally exhibits granophyric igneous texture

Xga — **Amphibolite**—Color index 25 to 60. Locally exhibits relic gabbroic textures; contains cummingtonite rimmed by hornblende, pseudomorphs consisting of hornblende, clinozoisite, white mica, and cummingtonite, and rarely augite. Small unmapped bodies present throughout most gneiss units. K-Ar numerical age of 1372 Ma on hornblende in Buck Mountains (table 1, No. 43) is interpreted as a cooling age

Xgs — **Metasedimentary rocks**—Dark-gray feldspathic quartzite, garnet quartzite, metaconglomerate(?), and aluminous schist and gneiss. Mineral assemblages include (a) biotite, K-feldspar, sillimanite, garnet, and muscovite; (b) garnet, cordierite, sillimanite, and biotite; (c) biotite, muscovite, plagioclase, and K-feldspar, (d) K-feldspar, muscovite, biotite, and garnet; and (e) plagioclase, garnet, and biotite. Most muscovite is replacing sillimanite. Garnet is locally chloritized. Metaconglomerate(?) contains pebblelike aggregates of sillimanite, sericite, and quartz

Xgb — **Biotite gneiss**—Fine- to medium-grained, medium-gray biotite granitic gneiss. Mostly of monzogranite composition; alkali-felspar commonly more abundant than plagioclase. Color index about 9. Locally contains garnet. In places layered or veined by dark-bordered veins a few centimeters thick of leucocratic gneiss (ptygmatically folded). Cut by pegmatite associated with spotted leucocratic gneiss unit (Xgl). Resembles gneiss of Virginia May Mine in Turtle Mountains, Calif., 50 km southwest of map area (pictured by Howard and others, 1982b, fig. 3). Probably largely orthogneiss but also includes probable paragneiss where quartz-rich, aluminous, or associated with metasedimentary rocks unit (Xgs)

*Some ages listed in table 1 record cooling younger than age of rock (especially for Proterozoic rocks); other ages are anomalously older than probable rock age (especially for dikes) and may result from excess argon (Nakata and others, 1990). Description of Map Units mentions ages that are believed to reflect crystallization age of sampled rock units.

Contact

Fault—May show dip. Dashed where inferred, dotted where concealed. Bar and ball on downthrown side. Teeth on upper plate of low-angle normal fault. Arrows show strike sense of displacement

Strike and dip of bedding
- 60 **Inclined**
- **Vertical**
- 80 **Overturned**

Strike and dip of igneous foliation
- 60 **Inclined**
- **Vertical**

Strike and dip of metamorphic foliation
- 50 **Inclined—**Degree of dip is unavailable for several localities
- **Vertical**
- **Horizontal**

Trend and plunge of lineation—May be combined with foliation symbol
- 30 **Mineral lineation**
- 20 **Mylonitic lineation**
- 25 **Fold axis**

Anticline—May show plunge. Dotted where concealed

Syncline—Dotted where concealed

Antiform—Showing plunge. Defined by gneissic foliation and metamorphic rock unit

Brecciated rock—Tectonic breccia

Quartz vein

45 **Dip of dike**

△ 3 **Locality of dated sample(s)**—Listed in table 1

For sale by U.S. Geological Survey, Map Distribution, Box 25286, Federal Center, CO 80225

Available on World Wide Web at http://geopubs.wr.usgs.gov/data.html

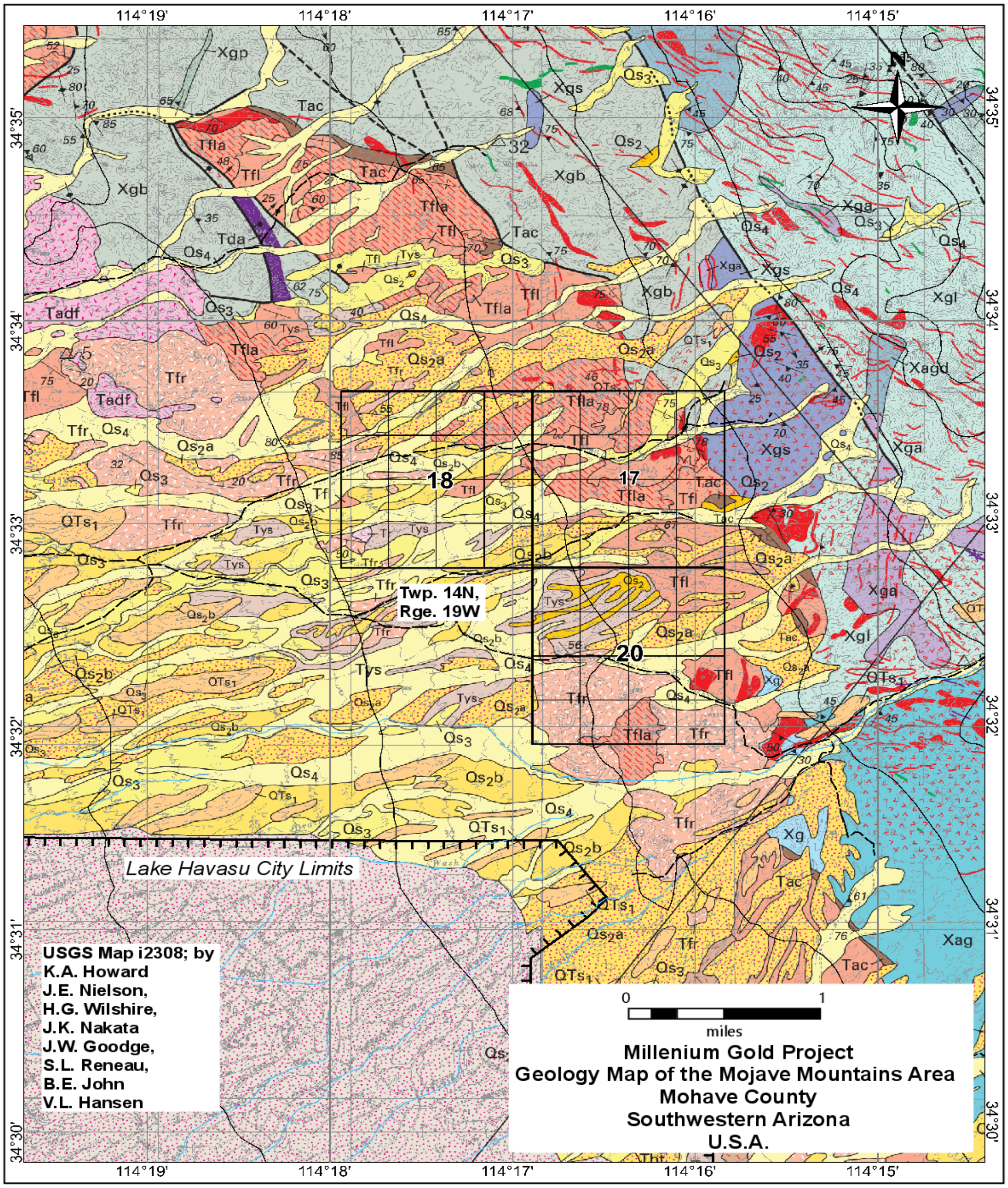


Figure 14. Regional geological setting of the Millennium Gold Project (Howard et. al., 1999).

7.3 Local Geology

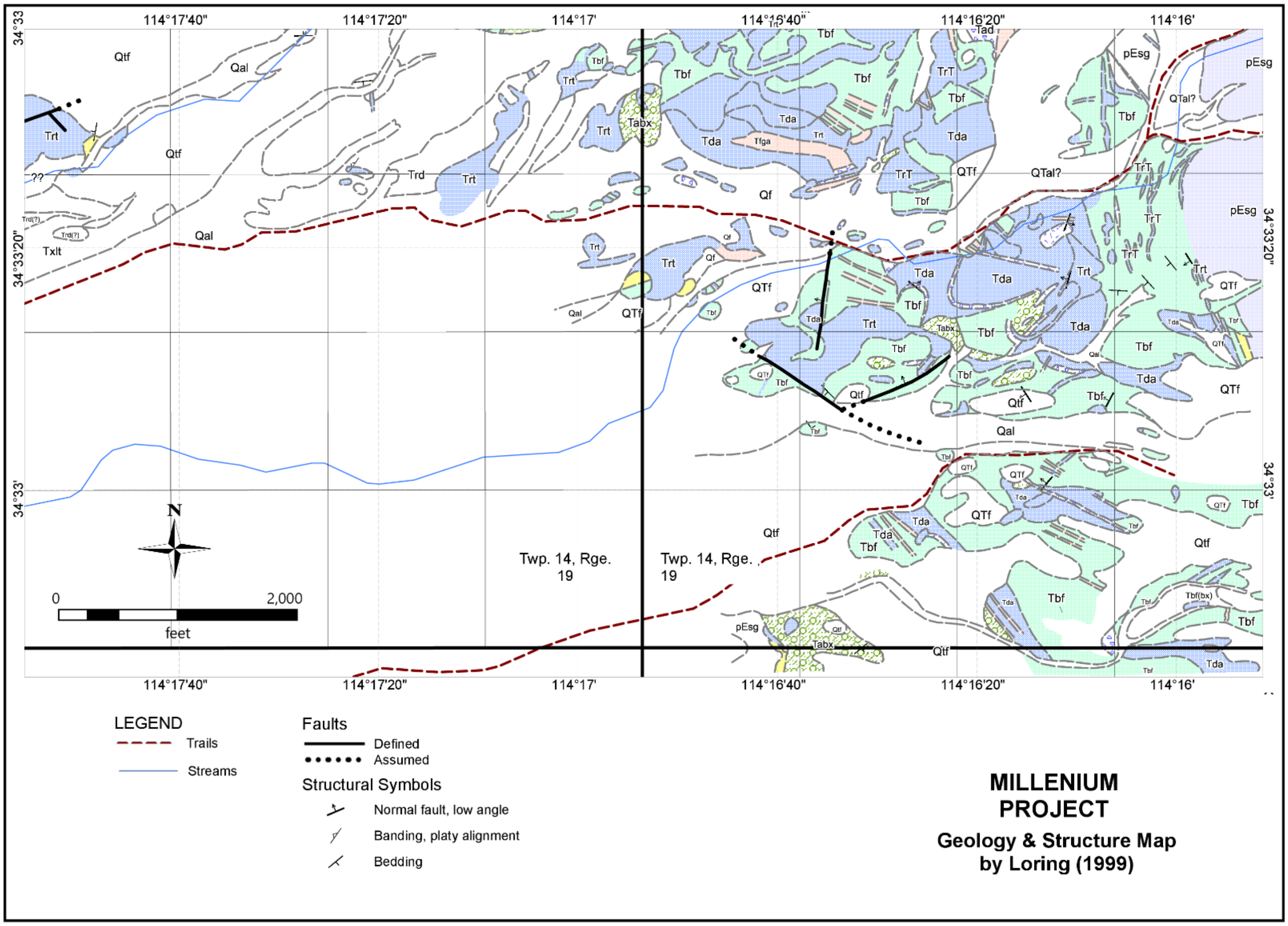
The geological setting of the Millennium property was recently described by Miller (2017) after a property visit. Much of this discussion was derived from this report. Miller was guided on the property examination by a geological map for sections 17 and 18 prepared by Loring (1999; Figure 15).

7.3.1 Sections 17 and 18

7.3.1.1 Stratigraphy

The Millennium property in sections 17 and 18 is underlain by a subaerially deposited bimodal sequence of texturally variable mafic volcanic rocks including plagioclase-phyric trachytic flows, flow breccias and laharic breccias. These mafic rocks are overlain by felsic quartz-phyric rhyolite-dacite volcanic rocks and possibly fine-grained intrusive equivalents. The felsic flow rocks contain medium-grained quartz phenocrysts and the presence of vesiculated felsic volcanic flows and texturally variable breccia types indicate the parental felsic magmas were likely volatile-rich. Coeval mafic and felsic magmatism.is indicated by the crosscutting relationships between mafic dikes and felsic rocks and the presence of angular breccias supports phreatomagmatic eruptions.

Unsorted angular breccia mounds form distinctive topographic relief on the property and these features are interpreted as autoclastic debris mounds associated with felsic vents and as breccias adjacent to fissure vents. Felsic eruptive centers at Westley shaft and ‘7-gram Hill’ are spatially related to gold mineralization in these areas. Felsic volcanic rocks and angular breccias generally trend ENE in the Westley shaft area and this trend has been interpreted to be a primary volcanological feature on the property related to eruptive volcanic centers. These volcanic rocks do not display a penetrative foliation and are not folded.


114°17'40"
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34°33'20"
N
0
2,000
feet
Twp. 14, Rge. 19
LEGEND
Trails
Streams
Faults
Defined
Assumed
Structural Symbols
Normal fault, low angle
Banding, platy alignment
Bedding
MILLENIUM PROJECT
Geology & Structure Map
by Loring (1999)

GEOLOGY LEGEND

SYMBOLS

All symbols follow U.S.G.S usage

NOTES

1) Tda and Trt are major intrusive phases but may be extrusive locally
2) Trt is largely emplaced in low-angle extensional faults which otherwise would not be exposed
3) Some extension may displace ore targets from implied source rocks

LITHOLOGY

Post-Mineral Rocks

Qal	Recent alluvium
Qf	Pleistocene fanglomerates and alluvium
QTal	Plio-Pleistocene alluvium
QTf	Pliocene fanglomerate
Tf	Older, rare fanglomerates, strongly tilted east

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Trd	Rhyolite domes and dikes, >20% quartz phenocrysts
Trt	Trachyte-rhyolite dikes, leucocratic; intrude low-angle faults
Txlt	Crystal-lithic tuffs; possible tuff rings; units highly tilted
Tec	“Epiclastic” sediments, may overlie Txlt as well as mafic volcanics
Tap	Porphyritic andesite dikes
Tad	Dacite-andesite dikes; 5-10% Feldspar laths
Tda	Dacite-andesite porphyry; compound stock with 10-30% feldspar laths, locally visible quartz
Tfga	Fine grained andesite dikes, often in swarms; pre- and -post Tda
Tbf	Basaltic andesite flows, often in flow breccias (bx)
Tabx	Agglomeratic Tuff breccias, interbed with Tbf, low in section
Tag	Agglomerate, basal volcanic unit,local and erratic
Tss	Pre-volcanic sandstone channels on crystalline basement
pE	Precambrian rocks; q – quartzite, sg – schist and gneiss; a – aplite, g – granites; p - pegmatites

Figure 15. Geology on sections 17 and 18 after Loring (1999).

7.3.1.2 Structure

The mineralized and altered bimodal volcanic rock sequence on the property is marked by numerous multi-directional fracture patterns. A detailed structural analysis of these patterns has not been undertaken however sustained block faulting and rotation related to Miocene extension tectonics, syn-extension volcanism and post-volcanic readjustment are likely explanations for the formation of the fractures.
~~~~~~

Large scale ENE-trending fault zones are interpreted from topographic lineaments, displaced contacts, mafic dykes that parallel these trends, cleaved domains adjacent to the topographic lineaments and significant accumulation of felsic breccia adjacent to some of the lineaments. These characteristics suggest these faults are syn-volcanic and controlled the distribution of breccia domes and eruptive centers, mafic dyke emplacement and hydrothermal alteration which utilized these structures. The intersection of east-west structures with northwest structures related to extensional tectonics may be responsible for focusing felsic volcanism and hydrothermal corridors.

7.3.1.3 Hydrothermal alteration and gold mineralization

An alteration map giving alteration assemblages based on geological mapping by Loring (1999) is given in Figure 16. The observed assemblages are interpreted as typical of focused and unfocused hydrothermal discharge related to hydrothermal conduits in and adjacent to felsic domes. The proximal gold-related proximal alteration assemblage is represented by hydrothermally bleached felsic volcanic rocks that have been silicified, variably sulphidized, carbonatized and sericitized and mafic volcanic rocks that have been hematized.

To the east and northeast, out bound from the proximal alteration is a domain of propylitization, chloritization and epidotization. The volcanic sequence in the northwestern half of section 18 and beyond consists of white altered mafic and felsic volcanic rocks that have been overprinted by argillitization. This argillitized terrane is the signature of steam-heated ground that is associated with and distal to focused hydrothermal outflow in modern hydrothermal districts and volcanic terranes. Well bedded red and green chert was identified proximal to an area of siliceous breccia and aerially extensive argillic alteration in section 17. This chert is interpreted as a sinter or hot spring deposit and the location of this sinter within an area of extensive argillic alteration is compatible with the presence of acidic alteration accompanying hot spring pools. The chert is interstratified with felsic detritus which may represent debris flows into the hot pools or explosive boiling episodes that fragmented hot spring sediments and adjacent felsic volcanic rocks. The sinter represents a remnant basinal paleosurface strata that is related to the gold-bearing stockwork breccia vein complexes. A summary of alteration patterns described above and based on the mapping of Loring (1999) and summarized by Miller (2017) is given in Figure 17.

The Cordex Zone is a mineralized stockwork fault zone trending ~220^{o}/40^{o} and hosted in an altered plagioclase porphyritic lithology of intermediate composition. The zone occurs on section 17 and is well exposed in a several meter-high east-west-trending outcrops. This fault transecting this area with northwest side down was traced to the southwest for about 50 meters based on the presence of narrow stringers of malachite-coated carbonate veins. The stockwork is zoned with peripheral limy green propylitic alteration grading into a gray bleached carbonate stockwork through a chloritized, sericitized and carbonatized mafic volcanic rock. Disseminated secondary copper minerals appear throughout the carbonatized volcanic rock and as coatings on the carbonate veins. Geochemically this carbonatized structure has an elemental signature of Au+Ag+Cu+Hg+Sb+Zn and is typical of low sulphidation epithermal systems. The zone is interpreted as a synvolcanic venting site. Saunders (2019) in his report to the property owners after a tour of the Millennium property describes quartz veins and alteration facies.

Quartz veins are localized either within rhyolite breccia or proximal to the rhyolite. They have two main trends with several secondary trends. The main trends are northerly varying with within 10 degrees either northeast or northwest and east-west. Dip attitudes on the veins vary significantly and have no discernable preferred orientation. A secondary set of veins strike either northwest or northeast. Assay data confirms good gold grades when quartz veins are present.

Calcite veins occur as fracture and void fillings and typically form a propylitic alteration assemblage outward from the silicified zones. One calcite vein was found within the silicified rhyolite zone and two shallow dipping northeast trending calcite veins were mapped within silicified units. Calcite veins typically do not display a preferred orientation.

Hematitic veins occur outwards from the brecciated rhyolite intrusion and are typically associated with strong siicification of the trachyandesite unit. The hematite veins have an east –west dominant trend with a weaker northeast trend. The hematitic zones in the silicified breccias are also following the silicified zones at a south 70º east trends. The hematite is peripheral to the rhyolite and may be an alteration feature from the silicification of the andesite. In most cases the altered rhyolite is marked by highly anomalous gold values.

Silicified zones have a strong south 70º east trend and extend outward from the rhyolite. The zones include andesite with well developed quartz stocks and pervasively silicified and hematized andesite breccia. Strongly silicified and brecciated units have little to no original fabric remaining such as flow banding. The southeast trending silicified zones are likely following structural zones however they are devoid of structural fabric.

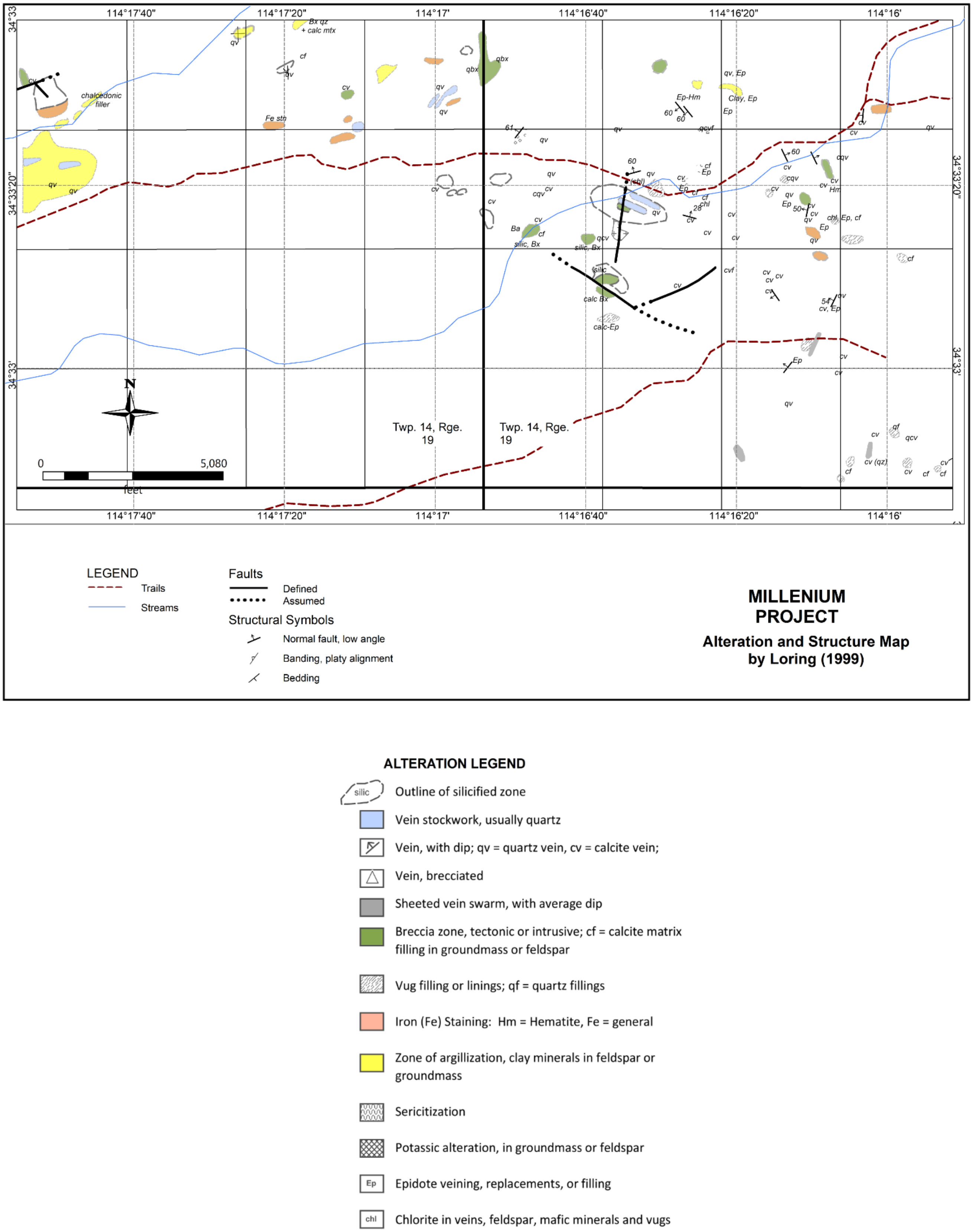


Figure 16. Alteration and structure map for sections 17 and 18 (Loring, 1999)

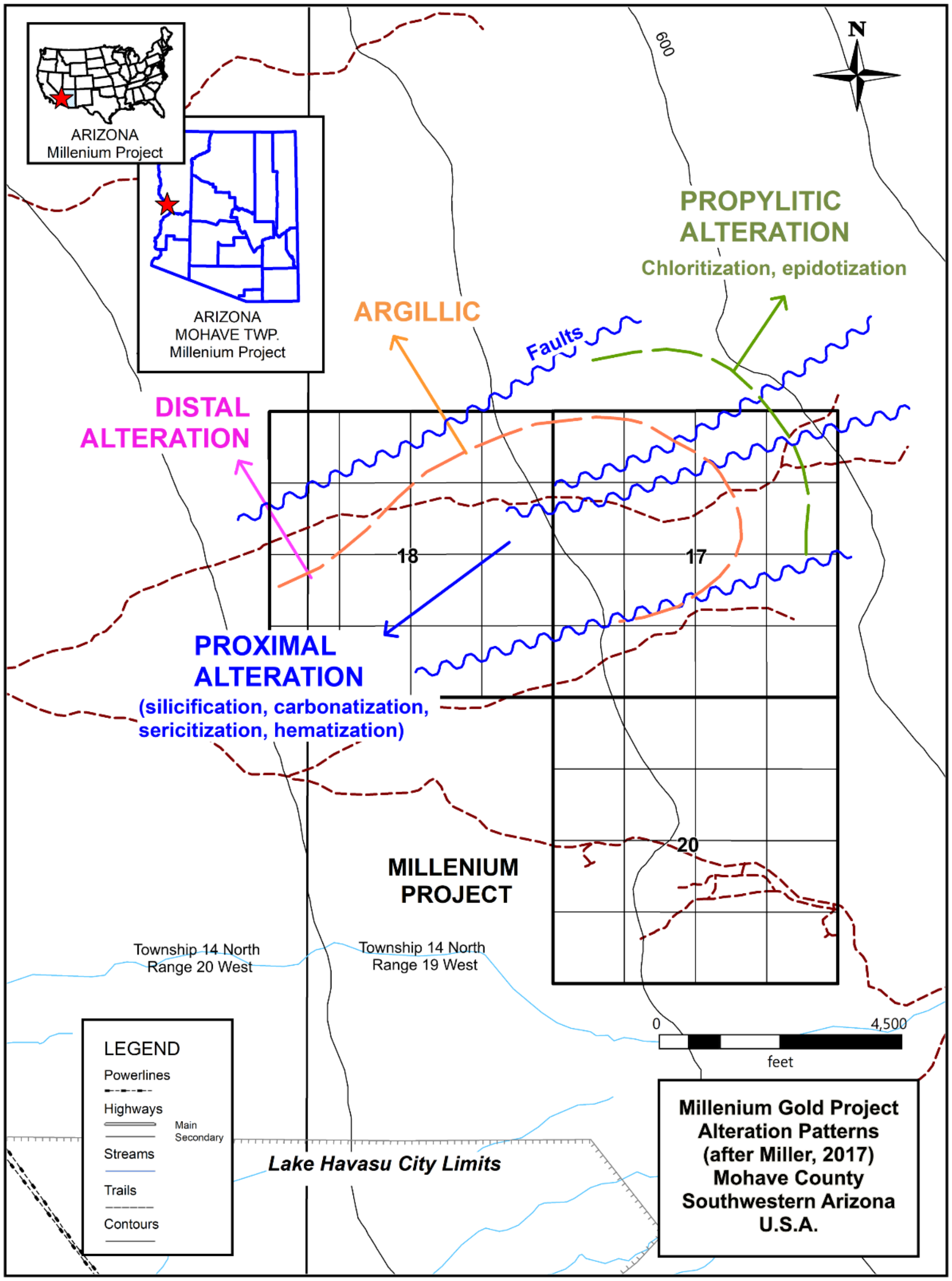


Figure 17. Alteration patterns based on mineralogical observations (Loring, 1999) at the Millennium Gold Project.

7.4 Section 20

7.4.1 Lithology

Lithologies exposed in section 20 are similar to those in Sections 17 and 18. Vertical relief in this section is significantly greater than in Sections 17 and 18, and is attributed to down-dropped fault preservation, the size of this eruptive center and/or slight differences in erosional level. Saunders (2019) geology map is presented in Figure 18.

Thick sequences of welded tuff and graded lithic tuff-ash beds are present and these bedded units have been steepened to between 40 to 55°. Significantly, these pyroclastic units strike ~E-W and dip south, an orientation that is contrary to the commonly presented southeast striking and southwest dipping volcanic stratigraphy on the other sections. Thick accumulations of polylithic rhyolitic breccias and flow banded breccias interpreted as proximal vent facies and coarse pyroclastic aprons with interstratified flows are also present.

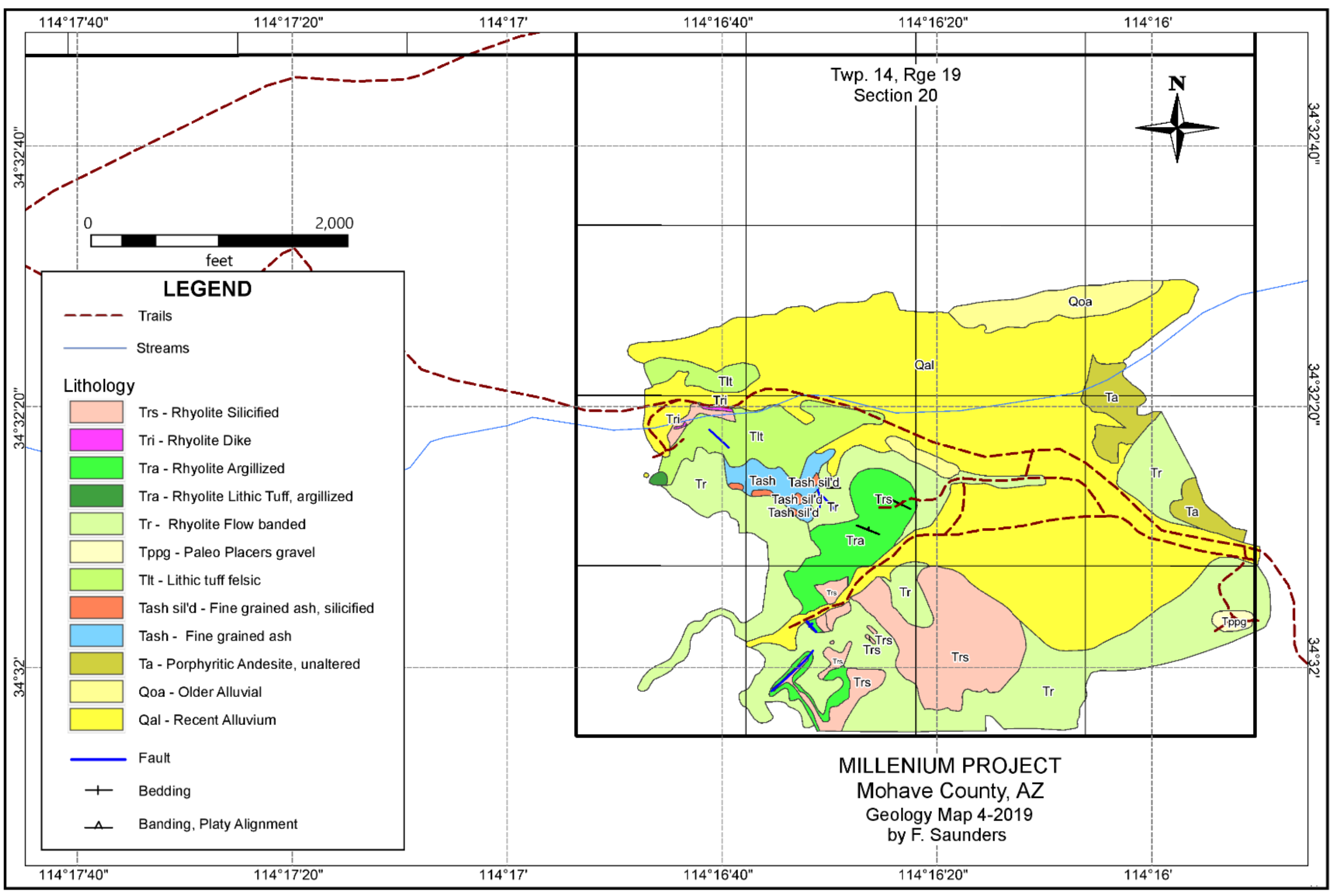


Figure 18. Geology on section 20 (after Saunders, 2019).

7.4.2 Structure

Based on a review of the section 20 geology by Miller (2017) the distribution of felsic and mafic volcanic rocks is controlled by an approximate east-west trending structure that also controls felsic eruptive centers in Sections 17 and 18.

7.4.3 Hydrothermal alteration and gold mineralization

Volumetrically large accumulations of proximal vent facies felsic volcanic rocks are flanked by terrane that is characterized by topographically low white-colored argillized outcrop mounds. This alteration type and topographic expression is comparable to the area northwestern of the Westley shaft area. Controls on gold mineralization on section 20 and sections 17 and 18 are poorly understood given that economic gold grades are present in all lithologies and in different structural trends.

8: DEPOSIT TYPES

8.1 Introduction and Theory of Formation for Epithermal Gold Deposits

The Millennium gold property is an example of a low sulphidation volcanic-hosted epithermal zone of gold mineralization which is one of the most important deposit types in the Basin and Range Province. Although there are many styles of low sulfidation gold systems the tectonic environment in which they form is generally one of oblique subduction. Meteoric waters of variable compositions and temperatures interact with magmatic fluids that have migrated away from an intrusive source rock. This interaction occurs at relatively shallow depths in the crust and in many instances are eroded to form associated placer gold deposits. There is a gradation of metals in these deposits which trends from gold +/- copper at depth to gold with base metals at intermediate depths, and finally to gold-silver at the highest crustal levels. Gold grades in epithermal gold deposits can attain bonanza grades of more than 1000 g/t gold in some instances. Well known examples of this deposit type include Round Mountain (Nevada) which is an open pit mining operation exploiting shallow vein sets and deeper zones of dissemination. The deposit is 277 Mt grading 1.2 g/t gold. Another example is the Sleeper deposit also in Nevada that is 55Mt grading 1.45 g/t gold for 2.6 million ounces of gold.

Fluid boiling, attributed to a drop in the confining pressures as the mineralizing fluid approaches the surface, is the main control for gold deposition. Figure 19 illustrates an example of a preserved low and high sulfidation vein system with structures channeling mineralizing fluids to surface. Alteration is less pervasive in low sulphidation deposits than high sulphidation gold deposits and is often confined to the mineralized structure unless this structure intersects a permeable lithology which then channels the fluids away from the structure and mineralizes the permeable unit. Variation in the ore, gangue, vein textures and alteration styles in a low sulphidation epithermal gold deposit are given in Figure 20. Alteration varies in intensity with proximity to the mineralized structure and with depth.

Mineralizing fluids in low sulphidation systems have a neutral to weakly alkaline pH with elevated mercury and arsenic contents associated with the gold. Upon reaching the surface the mineralizing fluids cool and silica is precipitated to produce a deposit of siliceous sinter. Low sulfidation veins are often well banded with alternating layers of silica and carbonate minerals with open space filling textures. The replacement of calcite by silica indicates that the mineralizing fluid has boiled which is required for gold deposition.

Gold in low sulfidation epithermal fluids is complexed with sulfur and it is the destruction of this complex that a reduction in pressure as the fluid nears the surface and fluid boiling accomplishes.

The zone where this occurs is referred to as the boiling zone which occurs at a certain depth below or up to the level of the water table. Gold will remain soluble below the boiling zone where only small amounts of gold will be deposited whereas above the boiling zone where boiling has ceased there will be much less gold deposited.

Gold deposit economics will be significantly impacted depending on the physical characteristics of the boiling zone which is strongly influenced by the temperature of the fluids, the amount of ground water mixing, the rate of flow and the length of time the system is active. Boiling zones can vary in size from 50 to 800 meters in thickness.

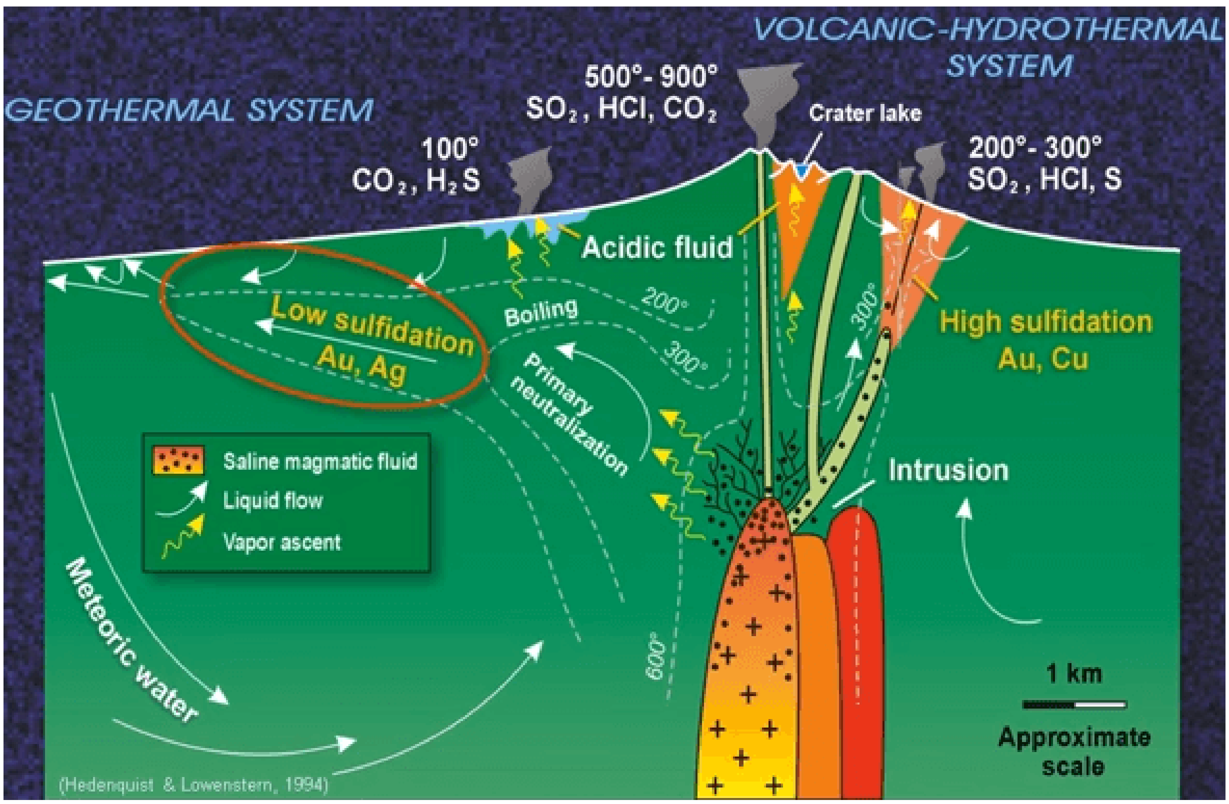


Figure 19. Conceptual representation of a low sulphidation gold mineralizing system.

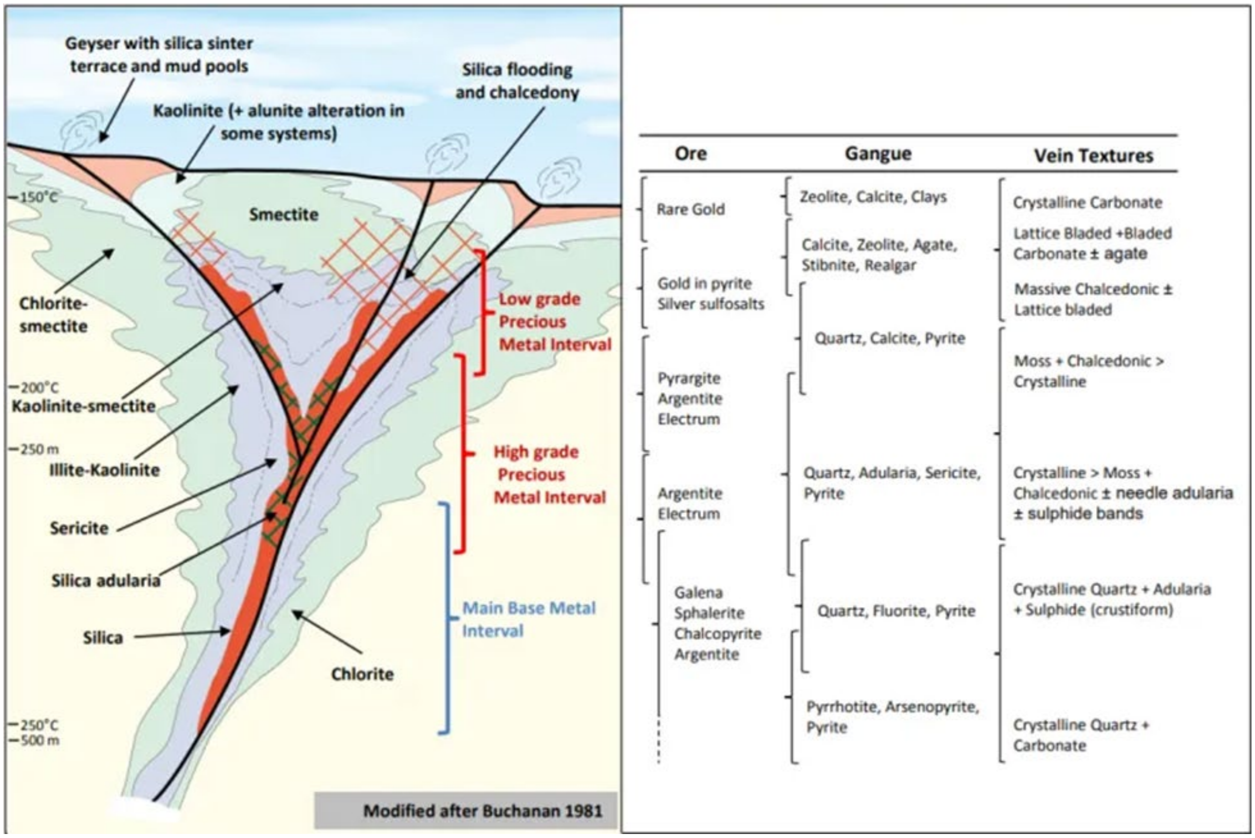


Figure 20. Schematic diagram illustrating ore, gangue, vein textures and alteration styles in a low sulphidation epithermal gold deposit.

8.2 Application of the Low Sulphidation Deposit Model to Exploration

Historic and recent property examinations to date, including detailed geological mapping and observations by numerous exploration companies on sections 17, 18 and 20, have documented the classic features of a low sulphidation gold deposit at the Millennium property. The mineralization and alteration of the host rocks are exposed at surface and in diamond drill core at shallow depths and underscore the important features of low sulphidation deposits and how they will influence exploration. Overburden depths are variable on the property but do not exceed the capacity of exploration technologies applied to date.

The bimodal volcanic sequence on sections 17 in the Westley shaft area as well as adjacent areas to the east, north and northwest have been hydrothermally altered during a felsic volcanic-hydrothermal episode. The hydrothermal alteration is zoned and is represented by silicified-sericitized-carbonatized-sulphidized gold-bearing volcanic rocks. This central mineralized area grades into peripheral propylitic rocks and distally into argillic steam-altered argillization. This zonation is typical of alteration associated with low sulphidation epithermal gold-silver systems.

Figure 21 is a schematic diagram based on geologic observations by Miller (2017) summarizing mineralization and related alteration at the Millennium property. In this figure the shallow near-surface mineralization observed and tested at Westley Hill is positioned at the top of the proposed epithermal system. Additional mineralization at depth would be consistent with the model.

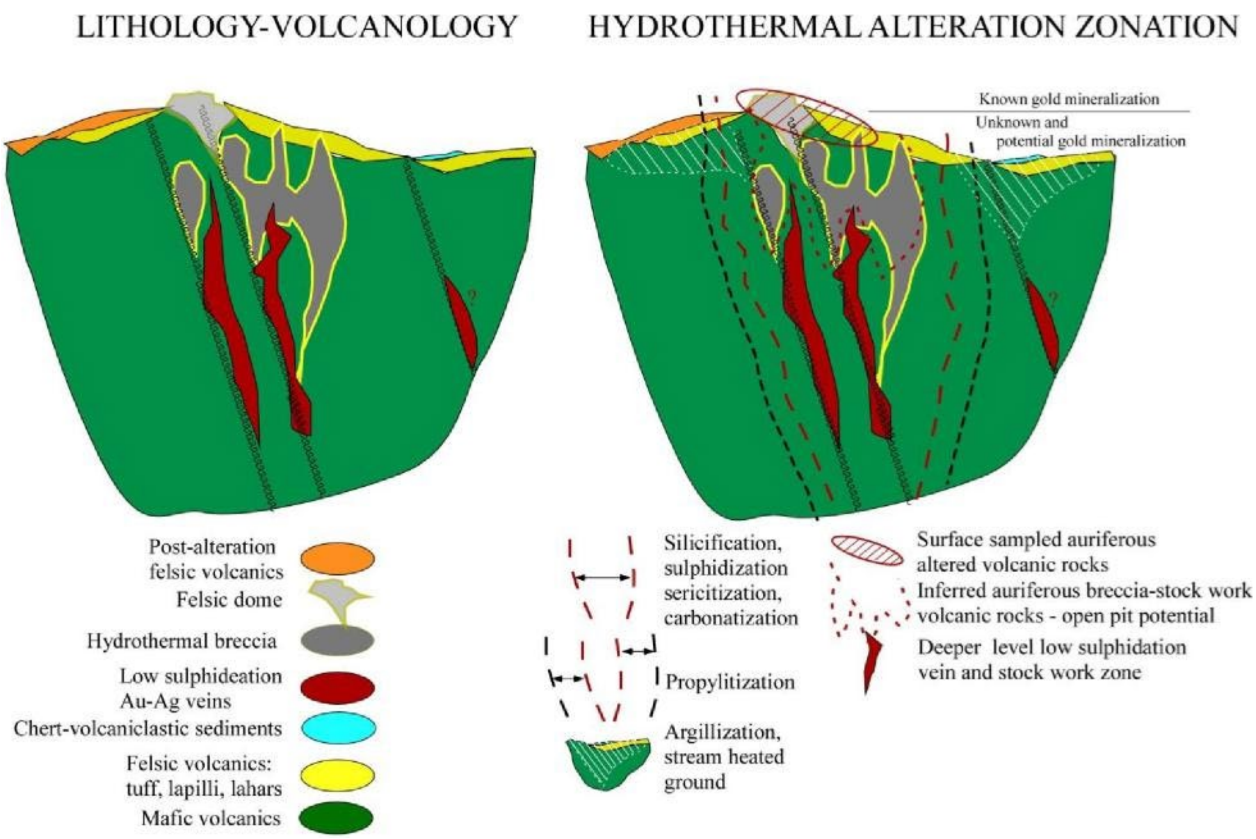


Figure 21. Schematic diagram illustrating interpreted geological and mineral deposit relationships in relation to known surface mineralization at Westley Hill and the subsurface potential from different styles of gold-silver low sulphidation epithermal mineralization (Miller, 2017).

Geophysically, the use of induced polarization (IP) is ideal for the assessment of low percentage disseminated sulphide in the altered host rocks at the property. Both conductivity, to define the presence of sulphide mineralization, and resistivity to characterize the extent and nature of alteration and structure, provide optimum parameters for diamond drill targeting. In areas of the property where highly prospective lithologies are suspected the application of innovative geochemical methodologies such as Mobile Metal Ion Technology can pinpoint anomalous concentrations of metals in the soils related to mineralized zones and assist drill targeting particularly when linked with the results of IP geophysical surveys. MMI technology can qualify IP responses and minimize the drill testing of barren sulphide mineralization. Limited magnetic surveys have successfully defined magnetic lows or zones of magnetic mineral destruction due to alteration effects.

Both IP and MMI Technology have been successfully utilized in small scale or orientation programs on the property and have demonstrated their worth in defining drill targets. The techniques can be readily applied to mineralized zones at shallow crustal levels as occur at Millennium to detect anomalous concentrations of precious and base metals and demonstrated in a low sulphidation epithermal deposit model.

9: EXPLORATION

There has been no current exploration undertaken after 2019 on the property.

10: DRILLING

There has been no drilling on the Millennium gold property except early holes drilled by Westley Mines (1998).

11: SAMPLE PREPARATION, ANALYSES AND SECURITY

This report is constructed with historic assay and other survey data since there has been no current exploration on the property. Much of this information consists of assay data for rocks, soils and stream sediments provided by large North American-based analytical laboratories in support of exploration companies. The author of this report is satisfied that the analyses were done according to accepted industry practices and standards at the time they were reported. The author was personally involved in the sample acquisition and analysis and subsequent interpretation of historic Mobile Metal Ions (MMI) soil geochemical data and is satisfied with the accuracy and precision of the data. SGS Mineral Services (Vancouver, Canada) undertakes its own quality assurance and quality control measures to ensure accurate and precise data. The author considers the data used in this report to be of good quality and satisfactory for use in this document.

12: DATA VERIFICATION

The Qualified Person undertook field work at the Millennium property in 2020 and has reviewed historic analytical certificates supplied by numerous analytical laboratories in the U.S.A. and Canada. The reproducibility of internal and international standards assayed within the sample stream were checked and the Qualified Person is satisfied that the sampling procedures and data are reliable for the purposes of this report. Independent check sampling of drill core from exploration undertaken in 1998 could not be undertaken as the core is unavailable.

13: MINERAL PROCESSING AND METALLURGICAL TESTING

The author of this Technical Report is not aware of any mineral processing and/or metallurgical testing that have been carried out on the Millennium property or of any metallurgical problems that would adversely affect development.

14: MINERAL RESOURCE ESTIMATES

Mineral resource estimates have not been undertaken on the Millennium property.

15: MINERAL RESERVE ESTIMATES

Mineral reserve estimates have not been undertaken on the Millennium property.

16: MINING METHODS

Mining methodology has not been undertaken on the Millennium property.

17: RECOVERY METHODS

A review of recovery methodology has not been undertaken on the Millennium property.

18: PROJECT INFRASTRUCTURE

The Millennium property is easily accessed by a combination of paved and gravel roads and is 2 miles northeast of Lake Havasu City with a population of 55,090 (2018). All modern conveniences and services are available there. Access to Lake Havasu City is by road via Arizona State Route 95, which meets Interstate 40 to the north of the city and Interstate 10 to the south. Lake Havasu City Municipal Airport, is a city-owned public-use airport located 6 miles north of the central business district of Lake Havasu City. The airport is used primarily for general aviation and has scheduled service to major centres. A 230 KV electric transmission line corridor trends northwesterly to southeasterly through the northeast quarter of the northwest quarter of section 17 on the Millennium property.

19: MARKET STUDIES AND CONTRACTS

Market studies and contracts have not been undertaken on the Millennium property.

20: ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

An archeological and cultural resource reconnaissance of Arizona State Trust Lands included the Millennium project in 1997. The assessment consisted of closely spaced traverses across select areas of the property over a period of 6 days. Areas of examination included the northwest quarter and the north one-half of the southwest quarter of section 17 and the northeast quarter of the northeast quarter of section 18 in T14N, R19W.

No significant historic cultural resources were identified other than a shaft and claim monuments and some evidence of post-World War 2 training activities by the military. It was noted that a 230 KV electric transmission corridor crosscuts the northeast quarter of the northwest quarter of section 17 bearing in a northwest to southeast direction. Prehistoric cultural resources such as routes of travel or areas of procurement were absent from the area. The distance of the property from the Colorado River is too great to have attracted prehistoric occupation. Petroglyphs, artifacts, trails, sleeping circles or prehistoric cairns were all absent (Musser-Lopez, 1997).

A second review of the Millennium property was undertaken in 2008 as part of a cultural and native plant survey triggered by the submission of a Plan of Operation by the Sirius Corporation. A list of native plant species was compiled as part of the native plant survey (Dockens, 2008). The cultural resources survey concluded that no historic properties would be adversely affected by the planned drill program and that the project should be allowed to proceed unaffected (Florie, 2008).

21: CAPITAL AND OPERATING COSTS

Capital and operating cost assessments are limited to those activities common to an early-stage exploration property.

22: ECONOMIC ANALYSIS

An economic analysis has not been undertaken on the Millennium property.

23: ADJACENT PROPERTIES

There are no other properties immediately adjacent to the Millennium Project that contain similar mineralization. However, in the general area of Millennium there are significant numbers of deposits of similar style mineralization. Two examples are given below and illustrate similarities in tenor of mineralization, alteration of host rocks and placement in the upper levels of a low sulphidation epithermal mineralizing system. Figure 22 illustrates the locations of the Castle Mountain and Moss Mine Projects in relation to the Millennium Gold Project.

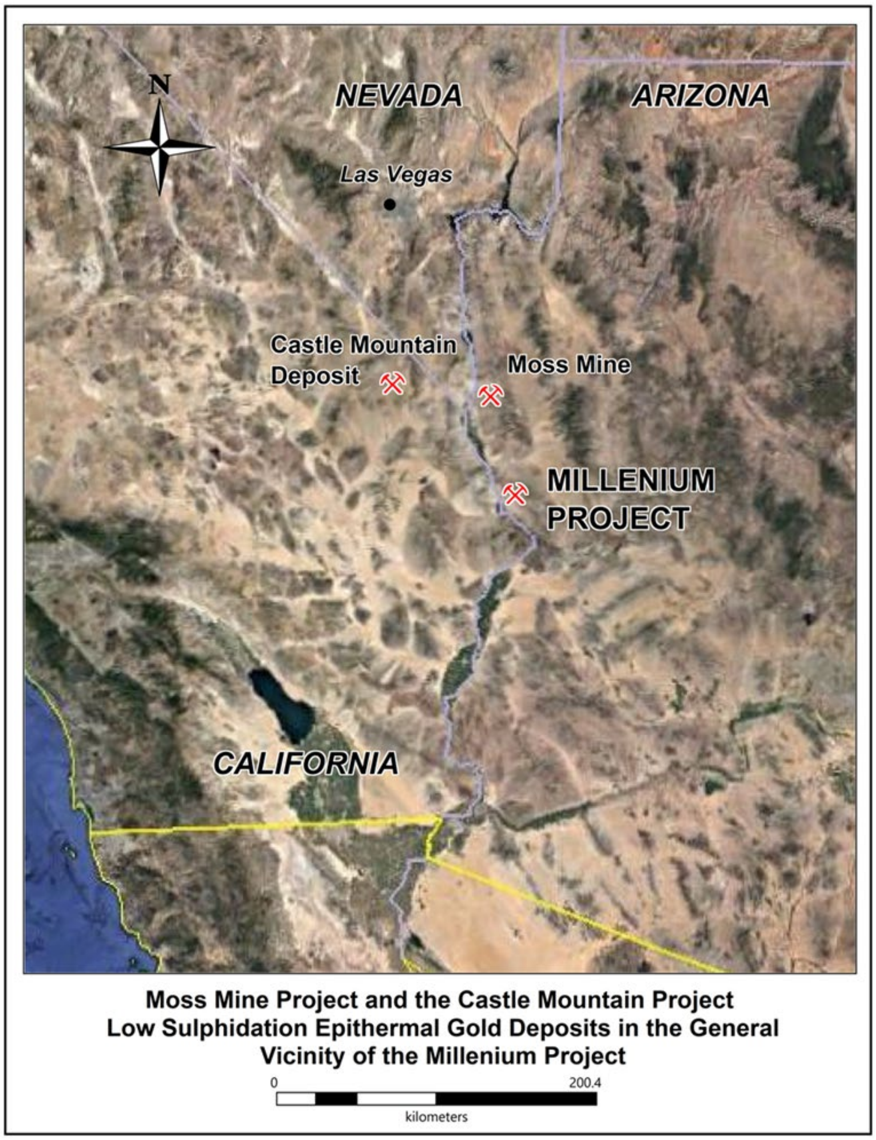


Figure 22. Low sulphidation epithermal gold deposits in the general vicinity of the Millennium Gold project.

23.1 The Castle Mountain Deposit

The Castle Mountain open-pit heap leach gold mine is located approximately 75 miles northwest of the Millennium property in San Bernadino County, California. Physiographically, it is situated in the Hart Mining District at an elevation of ~4500 feet (1372 m) in the southern portion of the Castle Mountains Range. The Castle Mountains Range is in the eastern Mojave Desert within the southern Basin and Range Province.

Geologically, Proterozoic metamorphic and plutonic rocks form the basement of the Castle Mountains. These are overlain by pre-volcanic sediments, and Miocene sedimentary and volcanic rocks. Metamorphic Proterozoic basement is exposed along the northeastern flank of the Castle Mountains and consists of a massive sequence of biotite schist, biotite gneiss and meta-granite. Only local narrow zones of hydrothermal alteration and weak gold mineralization have been encountered in basement rocks. Locally overlying the metamorphic basement rocks is a poorly sorted, clast-supported conglomerate with local well-bedded sandstone up to 180 feet (55 m) thick locally referred to as “PC Seds”. Unconformably overlying the PC Seds is the regionally extensive Peach Springs Tuff unit. The Miocene-age Castle Mountains Volcanic Sequence (CMVS) includes all volcanic units above the Peach Springs Tuff and below the Piute Range volcanic rocks. The CMVS consists primarily of rhyolitic domes, flows, and felsic tuff, and lesser andesitic, latitic, and basaltic lava emplaced during three intrusive-extrusive episodes between ~18.8 and ~13.5 Ma. CMV rocks are the primary host of epithermal gold mineralization at the Castle Mountain Project.

The project hosts a disseminated low-sulphidation epithermal system, which is identical in many respects to other epithermal systems of the Basin and Range province. Gold is primarily hosted in late-stage rhyolite volcanic units within zones of silicification and brecciation associated with northeast-southwest trending/southeast dipping fault structures (Figure 23). Most of the mineralisation occurs as very fine-grained native (free) gold and electrum, disseminated in quartz-stockwork veins and microfractures within strongly silicified and brecciated rhyolite flows, domes and associated sedimentary rocks. Gold mineralisation is believed to have centred along the main northeast-trending structural corridor. The project is estimated to produce 2.8Moz of gold over its initial mine life of 16 years.

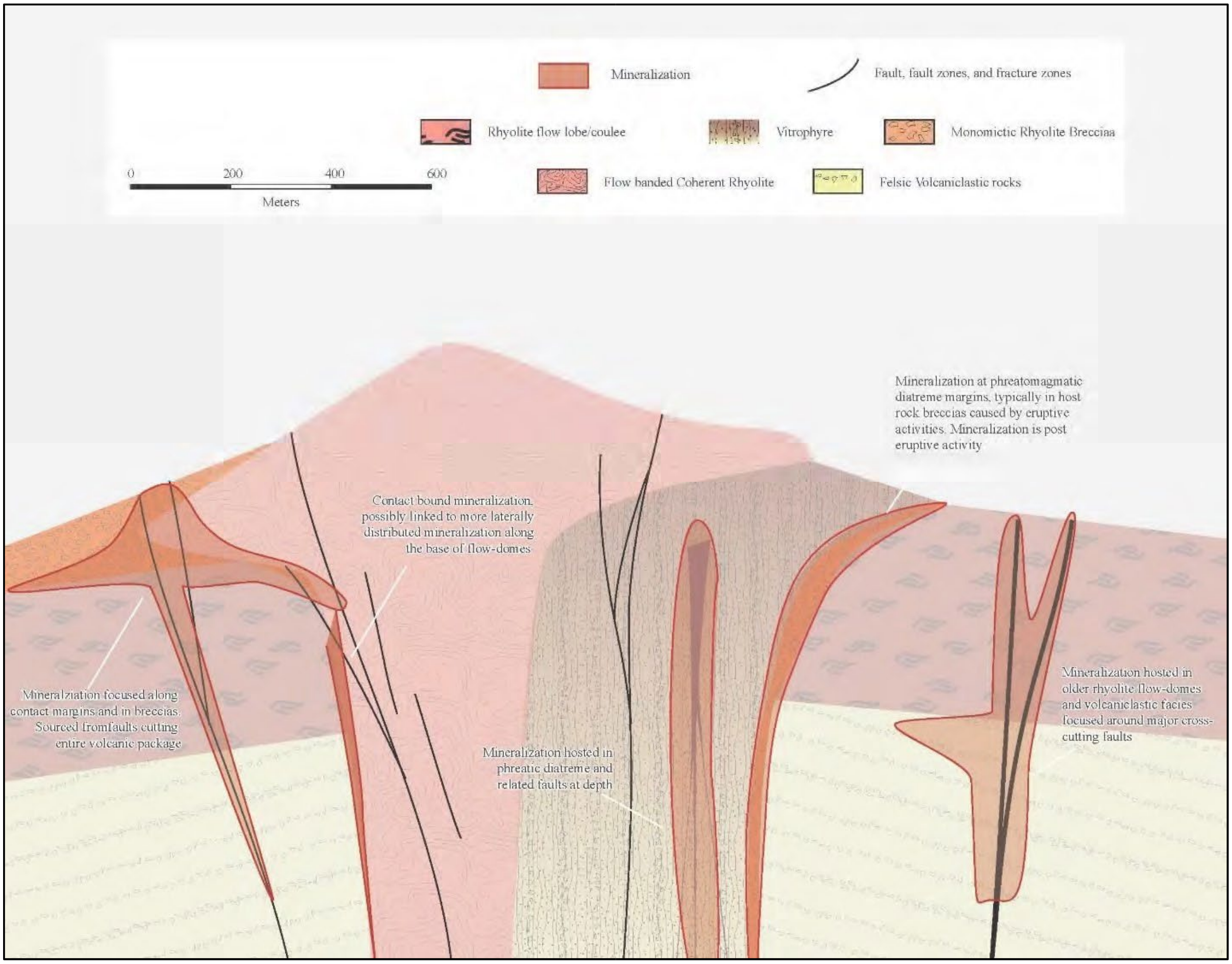


Figure 23. Schematic model for zone of gold mineralization found on the Castle Mountain property (Nicholls et al., 2017).

23.2 The Moss Mine (Stone *et. al*., 2014)

The Moss Mine Project area occurs in the historically significant Oatman Mining District of Mohave County, Arizona approximately 30 miles north-northeast of the Millennium property. Mineralization in Oatman Mining District is hosted by a series of west-northwest to northwest trending, north dipping faults with up to 91 m to 183 m of dip-slip displacement and localized quartz veins, rhyolite dykes and plugs. The veins are sulphide-poor with quartz, calcite, adularia, chlorite and electrum. Quartz pseudomorphs after calcite are common. Quartz textures vary from banded chalcedonic to coarsely crystalline, but the majority is banded and fine grained. Pale green fluorite is an abundant gangue mineral that often contains included gold. Fluorite is rare elsewhere. Most of the historical gold production came from the Tom Reed vein and the Gold Road vein. The age of mineralization is poorly constrained to the time interval between approximately 22 and 11 Ma (DeWitt *et al.,* 1991). Host rocks are the Moss porphyry, a uniform monzonite to quartz monzonite porphyrytic intrusion. It is coarse grained with 4 mm to 10 mm diameter plagioclase phenocrysts with biotite and lesser hornblende.

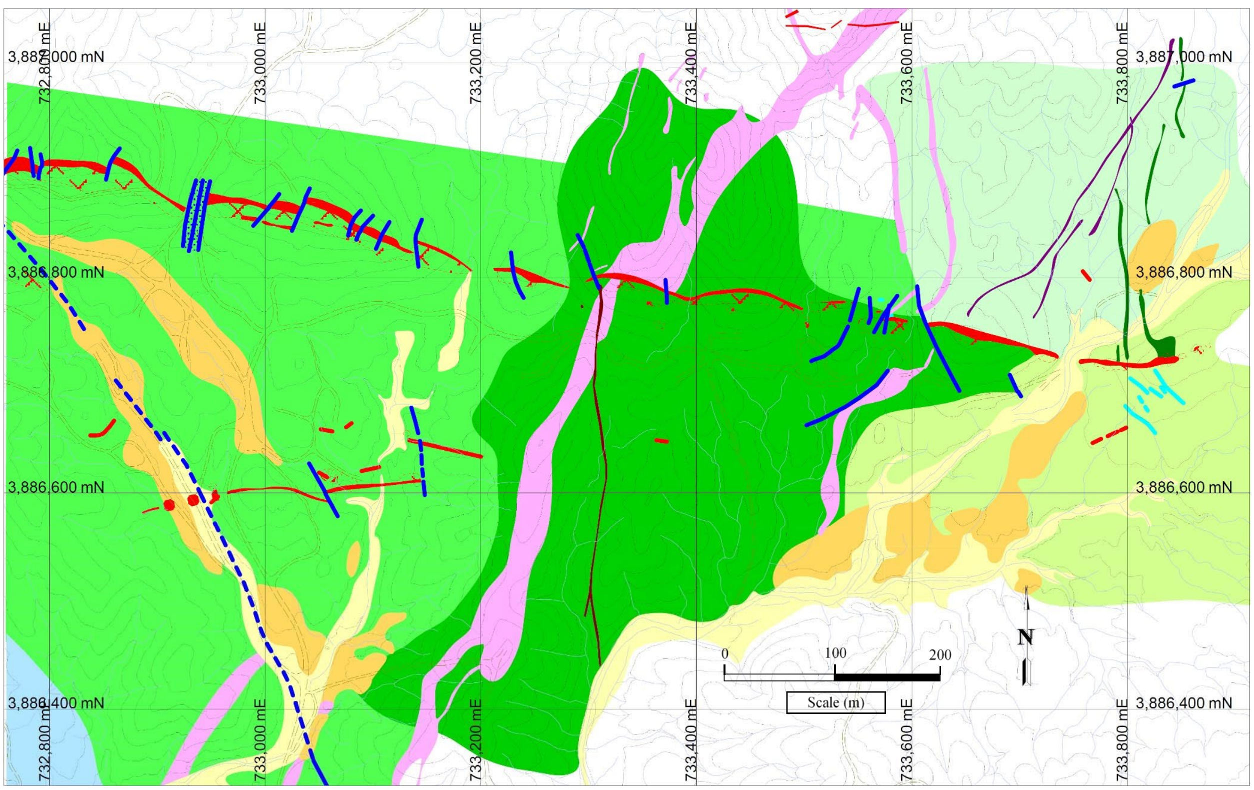
Cuffney (2013) describes the Moss Mine as a breccia vein that ranges from nearly solid white quartz and/or calcite through quartz-calcite with small clasts of wallrock, to brecciated wallrock veined and cemented by quartz-calcite. The hangingwall of the vein contains scattered thin quartz-calcite veins and breccia veins over many tens of feet. Quartz-calcite veining may occur either as thin planar veins (often quartz veins with calcite cores), irregular veins with sinuous borders, or highly irregular breccia infillings.

The gold-silver mineralization of interest is associated with quartz-calcite veins and stockworks and extends from surface to at least 370 m below surface within a boiling zone defined by the bladed textures in quartz pseudomorphs after calcite. The upper levels of the paleo-hydrothermal system have been removed by erosion. Mineralization is predominantly native gold and silver-rich native gold/electrum. Au:Ag ratios vary between 80:20 and 20:80). Hudson (2011) reports that native gold, electrum and acanthite are often intergrown, although some gold grains are isolated. Hudson (2011) also notes that the gold-silver mineralization typically occurs as inclusions in calcite grains and rarely were encapsulated in quartz. Subsequent analysis of quartz-calcite ratios and gold grade shows that the higher grades tend to follow quartz. Native gold varies between one to 20 microns.

The Moss deposit is a brecciated and steeply dipping (average 70˚) quartz-calcite vein and stockwork system which extends over a strike length of approximately 1,400 m. It is a low sulphidation (adularia-sericite) epithermal vein type described by Henley and Ellis (1983) and Heald *et al*. (1987) and Figure 24. A resource estimate for the Moss Mine is presented in Table 8.

Table 8. Moss Gold Mine mineral resource estimate (Stone et. al. 2014).

Category	Tonnes	Au	Ag	Au	Ag	AuEq	AuEq
(0.25g/t cut-off)		g/t	g/t	(oz)	(oz)	(g/t)	(oz)
Measured	4,860,000	0.97	10.4	152,000	1,630,000	1.10	172,000
Indicated	10,620,000	0.66	8.7	225,000	2,980,000	0.77	263,000
Measured+ Indicated	15,480,000	0.76	9.3	377,000	4,610,000	0.87	435,000
Inferred	2,180,000	0.55	5.6	38,000	390,000	0.62	43,000



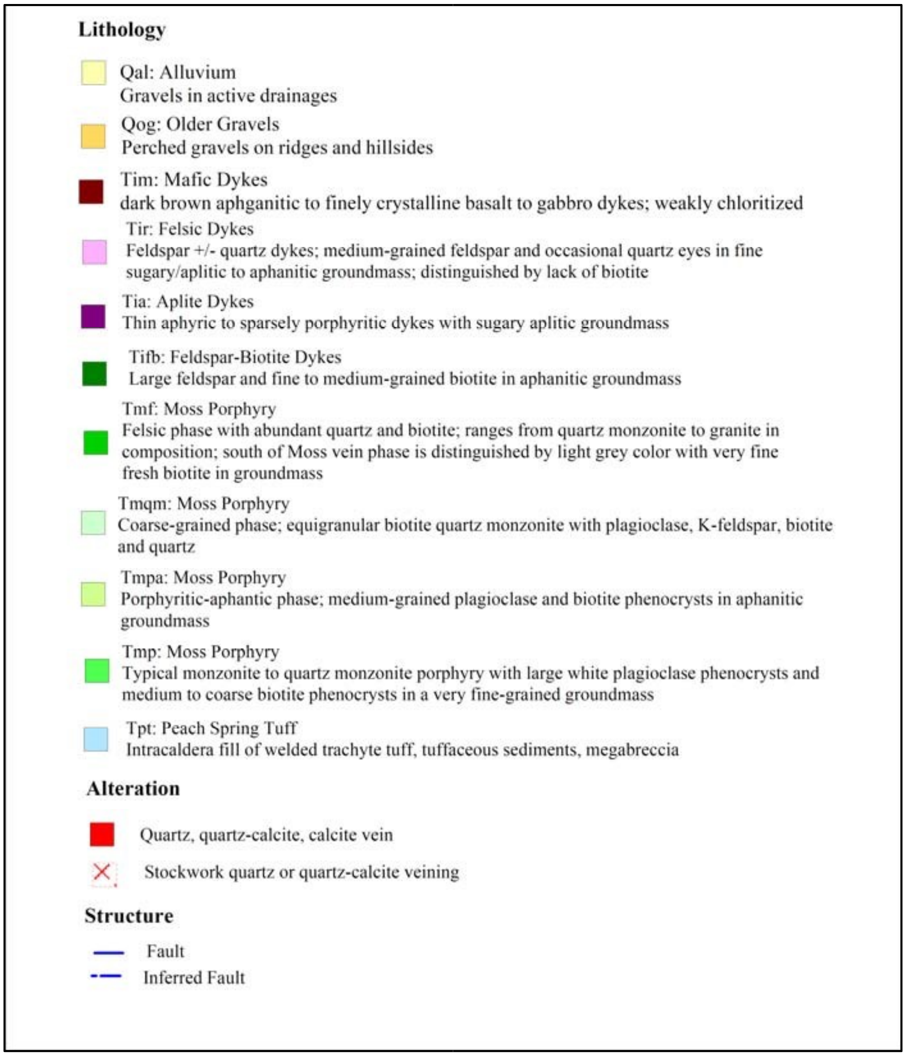


Figure 24. Geology map of the Moss Mine project area.

24: OTHER RELEVANT DATA AND INFORMATION

Mark Fedikow QP is not aware of any additional information that is required to make this Technical Report understandable and not misleading.

25: INTERPRETATION AND CONCLUSIONS

The Millennium property is an early-stage exploration property with high prospectivity for low sulphidation epithermal gold mineralization. One drill program in 1998 documents the presence of gold mineralization in a geological setting that representative of the upper levels of an epithermal mineralizing system. Exploration based on a variety of orientation surveys utilizing ground geophysics, rock chip geochemistry and innovative soil geochemistry supported by detailed lithological and alteration mapping have all resulted in positive results in the form of highly anomalous gold assays and indirect indications of this in the subsurface. These orientation surveys provide the framework for property-wide exploration and support the interpretation of high prospectivity. The application of the low sulphidation model is well supported by the lithological, structural and alteration characteristics displayed on the property by historic work and confirmed during the recent property visit.

The geological base for the Millennium Gold Property is a sequence of bimodal volcanic rocks deposited in a subaerial environment. Lithologically, the base comprises mafic volcanic rocks with the superimposition of multiple felsic volcanic eruptive centers each with diagnostic lithologic characteristics. The presence of unsorted rhyolite breccia aprons, phreatomagmatic breccia, coarse pyroclastic units and localized hot spring siliceous sedimentary rocks localize syn-volcanic hydrothermal alteration and gold mineralization. The zonation of hydrothermal alteration facies about these felsic centers is evidenced by silicification, carbonatization, sericitization and sulphidation with gold that grades outwards into propylitic and distal argillic alteration. These alteration facies were produced by the interaction between meteoric and magmatic fluids.

The Millennium Project is well suited for ongoing exploration based on detailed geological mapping with strong emphasis on structure, prospecting and rock chip sampling. In overburden-covered areas Mobile Metal Ions Technology soil geochemistry can provide an innovative solution to “see through” this cover. A variety of geophysical methods have defined distinctive signatures to historic gold mineralization on the property and offer useful exploration-supportive technologies.

26: RECOMMENDATIONS

The confirmation of historic gold mineralization intersected in the Westley Hill area during an 8-hole drill program in 1998 is a prerequisite for ongoing exploration. Successful confirmation of gold mineralization at Westley Hill will support an ongoing integrated exploration program. Gold mineralization was intersected at shallow depth by historic drilling and therefore the confirmation of drill indicated gold mineralization cannot be overemphasized. A three-hole drill program based on core rather than percussion drilling is recommended at Westley Hill.

An induced polarisation survey based on conductivity to define zones of disseminated sulphide in hydrothermally altered silicified felsic volcanic rocks and the measurement of resistivity to delineate silicified zones related to structures and potential gold mineralization would provide the framework for this drill program. A core-based drill program would test I.P. responses and provide sufficient material for assay and additional exploration-supportive work including providing important structural information in the third dimension to support detailed mapping. Correlations between drill holes will be enhanced and material made available for ongoing studies such as mineralogy and alteration studies.

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