# Skookum Geologic Consulting
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# Summary of existing reports, assessment of recent sampling and proposals for future work for the Mary Ann Canyon area of the Osceola Mining District, White Pine County, NV

**Prepared for:**
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# Introduction

The purpose of this report is twofold.  1) To synthesize approximately 100 years worth of mining reports (1875-1982) from the Nevada Bureau of Mines and Geology that are catalogued by the University of Reno on the Osceola Mining District of White Pine County, Nevada, as they relate to the proposed mining operation.  Most of this portion of the report is taken verbatim from these documents, with changes to wording for clarity, to take into account the age of the reports, or to make them refer to the area of interest.  2) To outline the future efforts of Kapacke Mining and Skookum Geologic pertaining to the district.  These sections were prepared based on the data compiled from the reports and information supplied by Kapacke Mining.

Kapacke Mining has acquired 13 claims within sections 21, 22, 23, and 24 of the district (Township 14N Range 7E), a total of 980 acres (Fig 1.).  Summarized here are: 1) the interpretations of the geologic history, 2) estimates of the total volume of placer material within the Osceola Mining District, and 3) estimates of the total amount of gold removed/produced by the district.  The only new data offered by this report are 28 samples collected and processed by Kapacke Mining from within their claim blocks.

Beginning in early spring, 2010, Skookum Geologic will be providing more samples, a new geologic map of the region, and a precise Digital Elevation Model (DEM) of the claims in order to produce an accurate model of the total remaining volume of placer material.  The new samples and volume estimate will allow an accurate assessment of the potential value of the property.  Skookum Geologic will also assess the lode mining potential of the property by mapping and sampling the veins, fractures and shear zones within the bedrock.

## Geography and Climate

The Osceola Mining District is located approximately 38 miles southeast of Ely in White Pine County, Nevada (Fig. 1).  The district is adjacent to and immediately to the south and east of U.S. Highways 6 and 50 (Figs. 1, 2).  The elevation varies from 5,800 to 13,000 feet from Spring Valley to the Snake Mountain Range to the east.  The temperature varies from about minus 15° to 100°F with an annual precipitation of less than 12 inches.  The highways are generally open at all times with only limited periods of non-accessibility to the lower areas of the mountains due to snow.  Large-scale mining operations should be feasible about 10 months per year.

## Osceola District Mining History

Gold was discovered in lode deposits near Osceola townsite in 1872 and considerable quartz vein mining occurred for five years.  Placer mining started in 1877 with the discovery of values in the alluvial material at the junction of Dry and Grub Gulches, a few hundred yards southwest of the townsite  (Fig.2).  This discovery led to operations on the placer deposits that continued to at least 1975 with the major efforts from the discovery date to about 1900.  Estimated placer gold production prior to 1900 is between 3 and 3.5 million dollars.  In the 1878, on a claim in Dry Gulch, a miner found a nugget weighing 24 pounds and valued at $3600.  This nugget was stolen and carried to the nearby camp of Ward, where it was

melted into bars.  The thief eventually repented of his deed and returned the bullion to its rightful owner.  This nugget is perhaps the largest found in the state.  Intermittent mining continued to about 1940. The district was then essentially abandoned with the exception of small operations by individuals working high-grade locations along channels in the alluvial fans, particularly in the Mary Ann Canyon area.

Dry and Grub Gulches (Fig. 2) have been mined by various methods, including drift mining along bedrock, drag-line feed to stationary washing plants, hand operations on shallow bars and benches and hydraulic mining.  Hydraulic mining operation began in the 1880's when water from Lehman and Baker Creeks on the east side of the Snake Range was brought to the area by ditch.  Additional water was brought in from the south along the west side of this same mountain range.  A maximum of 2000 miner's inches was available during the peak run-off period with very much reduced flow at other periods of the year.  Around 1900, due to reduced water supply from leakage in the ditches, light snowfall, water theft and possibly other unknown causes, the hydraulic mining operation in Dry Gulch ceased.  This marked the end of major placer mining operations in the district.  Other gulches have been explored and mined by varying methods, usually small scale.

The Mary Ann Canyon area is a location of interest for major potential (Figs. 2, 3).  The operations here began with the discovery of pacer gold, reportedly in 1879.  The mining in this canyon area followed a consistent pattern of sinking shafts to "false bedrock" varying in depth from 25 to 60 feet from the surface, then drift mining along the channels, taking vertical interval of about 3 to 5 feet.  The widths of these mine "stopes" are generally less than 15 feet.  The gravel is then hoisted to the surface and washed, using either water or a dry washing method.  The area of this work was the upper part of the alluvial fan near the mouth of the canyon on the west side of the Snake Range.  The location of these operations are marked by numerous shafts, most of which are caved or in very poor repair, and their adjoining dumps.  The material in the dumps is a combination of the material from the surface to the pay zone and the waste material from the washing operations.  Sampling of these dumps is indicative but not conclusive as to the potential values for the alluvial material in the area.

A 1970's effort on the Mary Ann Canyon alluvial fan was the operations by the Cal Lake Dredge Company.  These operations were of two types.  The uppermost in elevation, near the mouth of the canyon, was a large scraper-dozer cut feeding a vibrating feeder, where the undersize material was transported to the valley for washing.  The second operation was a "Suction Dredge" using high velocity water in a venture tube to create a suction which would lift the gravel from the bottom of the dredge pond for washing through a conventional wash plant on a floating dredge.  This later operation was located in the southwest quarter of Section 23 (Fig. 1).

## Geology

The Snake Range is composed of a core of pre-Cambrian (>570m.a.) metamorphic and igneous rocks.  On both flanks, and in some cases along the lower crest line of the range, Paleozoic (570-255m.a.) sedimentary rocks are found.  These rock types include quartzites, limestone, shales and their interrelated rock types.  All have been compacted and subjected to low-grade metamorphism due to the depth of burial since deposition.  Subsequently, a granite porphyry of post-Carbiniferous (<285m.a.) age intruded the sedimentary section.  The vein deposits are found primarily in the Cambrian quartzites (505-570m.a.) as sheeted zones, and as secondary features in the form of shattered areas adjacent to sheeted zones.

The present topographic and structural form is directly related to the Basin and Range style of tectonic extension, common to most of the state of Nevada. The development of this province took place through the Late Oligocene (36-20m.a.) and may in fact have continued until after the recent glacial periods of the Pleistocene (1.6m.a.-100k.a.). Modern movements have been very minor along the faulting zones, but some earthquakes and their accompanying slip have been recorded since the state was settled.

The topography of the Basin and Range geologic province is marked by parallel mountain ranges separated by valleys, generally showing alluvial fans of detrital material from the nearby mountain ranges. This fan structure can be visualized as a section of a low cone with the apex on the mountain front and the base as an arcuate trace on the valley floor. Evidence of heavier precipitation and stream flow is shown by the variation in the sizes of the valleys or creek drainages, now definitely "undersize" as to modern water flow when compared to the alluvial material grain size. It is not reasonable that the present water flow pattern is capable of moving the larger cobbles and boulders in these fan deposits.

## Gold in the Osceola District

It is a well known fact that gold exists throughout the immense accumulations of alluvials scattered across the Osceola District, particualry in the Mary Ann Canyon area (Figs. 1-3). The history of deposition may be summarized as follows. The main mountain mass is composed of pre-Cambrian and Cambrian rocks containing veins of gold-bearing materials. Over time the breaking down of these rocks and the removal of the lighter materials by streams have left the heavier materials together, with the free gold concentrated in the channels of the ancient streams and the alluvial fans of the present ones.

The source area for placer gold in the Mary Ann Canyon area is a number of veins and shatter zones in pre-Cambrian rocks found near to and along Mary Ann Canyon and its tributaries (Fig. 3). Quartz vein mineralization is predominant with secondary fracture filling as a further source. Several adits above Mary Ann Canyon cut across a gold-bearing, iron-oxide stained quartz vein and shear zone. Two samples from these adits are reported as 6 ounces per ton, and 500 ounces per ton (Davidson, 1973). These lode gold deposits exist as highly vairiable pockets throughout the viens and fractures, the erosion of which results in the accumulations of placer gold in the alluvial fans below.

The detritus of every stream originating in these pre-Cambrian rocks carries gold to a greater or lessor degree. This is true of the ancient as well as present channels. Generally speaking, the gravels in the ancient channels are of higher unit gold content than those of the present channels. This is due to the ancient draining systems having broken down rocks whose content of gold pockets was greater than the content of those removed by present streams. However, the recent draining has caused further accumulations of gold and heavy minerals while carrying away the lighter material, thus making the entire alluvial fan a commercial placer property.

The gold is distributed throughout the gravels, although it varys in content and concentration. Irregularity of deposition is to be expected, along with only partial "freeing" of the metals from the country rock, i.e. where there has not been sufficient erosion and attrition of the rock material to free all the metal contained. Where the grades were steep and the volume of water sufficient to move all of the material, the course gold has been concetrated in a thin stratum of high-grade glod-rich ground at or near the base of the fan. This base is a bedrock or "false bedrock" of clay, caliche or similar resistant

beds upon which the metal can be held with little or no further downward migration. This was the location of the fan material worked by the early miners, and where high-grade reigons remain to this day. Depth to bedrock through the fans varies throughout the Osceola District from 10 feet to over 100 feet.

As of 1959 the total production from the areas comprising the Osceola Mining District was estimated at 131,700 ounces. 91,555 ounces was credited to placer production while 40,145 ounces to lode production. An estimated 3,500 ounces was produced from 1959 to 1968. The amount produced after 1968 is unknown to the authors at this time. A private prospector, Mike Pasik, has been successfully processing a 20-acre claim in the Mary Ann Canyon placers since 2003, establishing that the region is still a profitable, gold-producing resource.

## Characteristics of Deposit

As described above, the deposit is water laid alluvial fan. Stratification is minor but accounts for pay-streaks in upper layers. It is not foreseen at present that any of the deposit will be too low in value to pay for the processing in an efficient plant. However, in operating one should be alert for barren areas.

No boulders are seen above 3 ft diameter and rock above 10 inches is relatively scarce. Coarse material is more prominent in an open cut which exposes bedrock. Clay is plentiful but distributed and should readily disintegrate in the scrubbing section of the trommel. Gravel is firmly imbedded in hardened sand and clay but there is no evidence of cementing. Loosening should be accomplished without explosives.

The deposit provides nearly ideal working conditions. The slope of the surface is perhaps 15% with bedrock being a little steeper. This is an aid in feeding the plant and in tailings disposal. True bedrock is mainly limestone with perhaps minor areas of quartzite, shale, and possibly rhyolite. Beds dip steeply to the northwest. It is anticipated that considerable bedrock must be removed to find rich values lodged in crevices and pockets of the bedrock surface. This would be a problem with a floating dredge but with dry bedrock, the bottom can be readily and thoroughly cleaned.

### Water

Water in the west is of prime importance for any mining operation, particularly placer projects. A minimal flow of water will occur in the spring in the gulches in the area. The flow is inadequate for any type of continued operation and has been the limiting factor in past efforts. Drift mining for higher grade gravels, and then washing when water was available has been a common practice in the area. When this water was not available, the miners went to "dry washing". Capacities were thus limited to small yardages, hence the reason for the limited exploitation in the area. Kapacke Mining has access to adequate amounts of water to conduct sustained placer mining.

## Gold Content

The multitude of gold reports from the 1930's reported a broad range of gold values in terms of dollars/yard. These estimates range from < $1.00/yard to $8.00/yard; two averages are reported as

$1.32/yard and $1.78/yard.  These values are based on gold at $20.00 per ounce.  At $1,000 per ounce the range becomes < $50/yard to $400/yard and the averages become $66/yard and $89/yard.  These estimates are based on over 4700 samples taken during the 1930's around the Osceola District.

In the 1970's the economics of gold mining became viable again and another series of reports on the Osceola Mining District were produced.  Several reports include a limited number of new samples taken in order to verify the 1930's data, and confirm that there was still gold within the region.  Table 1 lists Au values in dollars per yard (Au @ $1,000/ounce) from samples reported by Anderson (1972), Davidson (1973), and Hopkins (1974).  Outliers of this dataset show only trace amounts on the low end, and over $1,000 and $2,000 per yard on the high end.  The remaining data ranges from $40 to $560 per yard.

The gold content within placer deposits is highly variable.  The heavier gold sediments settle and accumulate within the base of fluvial channels.  This results in dramatic vertical variation with much higher gold values at the base of the stratigraphy, with lesser values at the top.  There is also large lateral variation within the stratigraphy based on the width and distribution of fluvial channels.  With these variations in mind, Copeland (1975) analyzed available production figures from the Osceola Placers, and as far as possible assigned weighted statistical values as to reliability.  He indicates a *highly conservative average* of 0.013 ounces per ton, or 0.02 troy ounces per yard.  Copeland goes on to estimate that at a gold price of $170.00 per ounce this gives a gross value of $3.40/yard.  At $1000 per ounce this equates to an average price of $20/yard.  This highly conservative value is used to estimate the vale of the entire volume of placer material within a claim area.  High-grade regions will yield substantially higher returns than $20/yard.  With these factors in mind, Copeland estimated the value of 2.8 million square yards in the Mary Canyon region as follows:

> **From Copeland (1975)**
> **Reserves-** Calculations of reserves were done in the following way:
> An area on a map thought to contain placer deposits was measured by scale and found to be 2.8 million sq. yds.  This area was multiplied by 10 yards as a conservative average depth of gravel in the gulches, to arrive at a reserve figure of 28 million cubic yards.
> Reserve value @ 170 per oz
> (28,000,000)(.02 oz) = 560,000 oz
> (560,000)(.70 recovery) = 392, 000 oz
> (392,000)(170) = $66,640,000 gross.
>
> **Readjusted at modern prices and modern recovery rate of 90%: (504,000)($1,000) = $504,000,000 gross.**

Table 2 lists 28 new Au values of samples obtained and processed by Kapacke Mining from the Mav5 and Solomon3 claim blocks (Fig. 1).  Values range from $17-$417 per yard, with an average of $117 per yard. Figure 4 shows the value of these samples plotted against depth.  This plot clearly shows an increase in value with depth at all sites, strongly suggesting gold migrates and concentrates downwards as reported, and the greatest concentrations are likely found next to bedrock.

The total square acreage of the Mav5 claims is 140 acres, or 677,600 square yards.  If Copeland's average estimate of depth to bedrock of 30 feet or 10 yards is applied to these claim blocks then the potential total volume is 6,776,000 yards.  Kapacke Mining personnel report that depth to bedrock may be as high as 90 feet or 30 yards in the Mav5 claims.  This results in a potential total volume of 20,328,000 yards.  These estimates assume that the entire claim blocks are composed of alluvial fan

material, and that no material has been removed from the claim blocks. Kapacke Mining personnel estimate that approximately 15% of the material has been removed from the Mav5, therefore the remaining untouched areas yields a potential volume of ~5,759,600 yards using Copeland's depth to bedrock, and ~17,278,800 yards using Kapacke's depth to bedrock. Using Copeland's method as outlined above:

Reserve value @ $1,000 per oz and **10 yards to bedrock for Mav5 claims**
(5,759,600)(.02 oz) = 115,192 oz
(115,192)(.90 recovery) = 103,672 oz
(103,672)($1,000) = **$103,672,000 gross.**

Reserve value @ $1,000 per oz and **30 yards to bedrock for Mav5 claims**
(17,278,800)(.02 oz) = 345,576 oz
(345,576)(.90 recovery) = 311,018 oz
(311,018)($1,000) = **$311,018,000 gross.**

Mike Pasik, a private prospector, has been mining the Mav5-h claim since approximately 2003 and has reported to Kapacke Mining that the majority of the gold he has recovered is from 17' to 75' deep (Figure 1). He also reports that there is gold throughout the stratigraphy from bedrock to the surface, but for his limited small-scale operation it is not feasible for his equipment to run all the way to bedrock. He reports values ranging from $40.00 to $1000.00 per yard of gold ore. The reader is reminded that estimates of the potential value of the Kapacke Mining Mav5 claims are based at .02 troy ounces per yard, merely $20 per yard. If the lowest values reported by Pasik are applied to Kapacke's Mav5 group, the reserve value is doubled to over $620,000,000.

Kapacke Mining has an additional 820 acres of claims besides the Mav5 group; these claims are Solomon1-4 and Solomon6&7 (Figure 1). Of these claims, only the Solomon3 claim has had previous mining efforts on it (Figure 3). Reports detail that only 25,000 yards have been removed from this claim, and new samples collected by Kapacke Mining from tailings piles on Solomon3 yield an average of $41.78/yard. If the same depth to bedrock (10 yards) is assumed, these claims potentially have an additional volume of 39 million yards of placer material. If depth to bedrock is 20 yards these claims potentially have an additional volume of 78 million yards, and if depth to bedrock is 30 yards these claims potentially have an additional volume of 117 million yards. Again, this assumes that there is no bedrock at the surface.

**Reserve value @ $1,000 per oz and 10 yards to bedrock for all Solomon claims = $702,000,000**

**Reserve value @ $1,000 per oz and 20 yards to bedrock for all Solomon claims = $1,404,000,000**

**Reserve value @ $1,000 per oz and 30 yards to bedrock for all Solomon claims = $2,106,000,000**

Clearly the depth to bedrock is a major factor in estimating the total volume of placer material available. All of the historical reports and first hand accounts of Kapacke Mining Personnel indicate that the depth to bedrock is at least 10 yards in the Mary Ann Canyon alluvial fan, therefore even the conservative estimates, in terms of depth and gold content, appear to be economically viable. Significant improvement to the estimation of the total value of the claims could be done by mapping the area using

modern techniques including GPS and seismic surveying, performing a systematic sampling campaign of the placer deposit and running statistical models of these data. This would allow for much better assessment of the size of the deposit and the distribution of gold within it, as well the error associated with these estimates. These methods are discussed below in Proposed Work.

## Mining

Kapacke Mining has the rights, resources and manpower in place to move forward with the large-scale processing of the placer gold deposits within their mining claims. Weather permitting, mining is currently happening on these claims. Gold ore is extracted from the ground by open pit mining using a 225 Cat excavator with a 1.75 yard bucket and loading into a 15-yard dump truck. Material is then transported approximately 1.5 miles and stockpiled on private land where a 400-yard a day gold screen plant is located (Fig 7). Processing tailings are brought back to the excavation area and stockpiled for future backfill (Fig. 6).

On the private land, processing of the material occurs. Gold ore is loaded into the hopper of a 1998 Goldfield screen deck with a 426 Cat backhoe. Gold ore is classified down to 1/4 inch and is run through an Eddie Bogue gold wash plant. This material is passed through a gold slimmer. Material 1/8 inch and smaller is run through four, 4-spiral Neff bowls where gold is trapped. All excess water and sand is eliminated and re-circulated through two settling ponds and then into a fresh water pond for reuse. Larger material continues through the plant and over a jig with steel shot where smaller nuggets are trapped. Fines are washed into one last spiral Neff bowl for extra precaution to ensure all gold is extracted. All fines in all five Neff bowls are panned to extract the gold.

Water is pulled via a 25 hp water pump from a local fresh water holding pond that is fed from a 200 foot well and the re-circulated water from the plant. Kapacke mining has 3000 acre-feet of water rights on the claims; this is enough water to process up to 5,000 yards per day. Electricity is supplied by a Wheeler Power Plant and the processing plant is wired for 440 three phase. The plant is currently capable of running approximately 400 to 500 yards a day. In the near future a 1,500 to 2,000-yard/day gold screen plant will be added to the operation and used in conjunction with the method outlined above.

## Proposed Work

Literature Review: The literature reviewed and summarized for this report adequately described the mining history of the Osceola District and the proposed mining site up to the mid 1970's. Several of these documents were prepared to assess the viability of beginning new mining efforts in the area, including at the proposed site. Whether these operations took place and what the results were is currently unknown as no documentation later than 1975 was available. Determining the extent, type and success of these efforts would contribute valuable data as to where high yield areas are located and if they have been exploited. Additionally, geologic research of the Basin and Range has made considerable progress towards understanding the nature of the materials comprising the region and the structural deformation of these materials in the past decade. Skookum Geologic proposes to conduct a low cost and thorough review of any and all sources of information related to the area since the 1970's, including mining reports and academic studies, to collate any relevant data.

Field Study of Previous Mining Efforts:  Our literature review indicates considerable mining activity at the proposed site beginning as far back as the late 1800's (Figs. 4, 5).  A field based assessment of the scale and precise locations of these operations, as well as an approximation of the amount of material removed and tailings produced, could be quickly and cheaply performed.  Skookum Geologic proposes to include this as a critical part of any field campaign conducted at the proposed site.

Field Assessment and Modeling of Potential Yardage:  This critical value describes the total volume of detrital material comprising the alluvial fan system available for removal and processing.  Ideally it is a measurement of the area covered by the fan, the depth of bedrock or false bedrock at all locations beneath the fan, and the height (elevation) of the material above the bedrock at all locations.  Determination of this value can be done with varying degrees of accuracy.  Simple field mapping of the extent of the fan to determine area and elevation of the fan as well as approximation of depth to bedrock based on measurements taken at other similar fans in the area would give a rough value.  Low cost GPS equipment and a slightly longer field campaign would quantify the area and elevation of the fan with far higher accuracy giving a much better approximation of total fan volume.   Finally, determination of bedrock depth could be quantified using relatively simple seismic equipment, adding complexity, cost and time to the field work, but constraining with high certainty the nature and location of the bedrock.  This combination of GPS and seismic data would allow for the creation of an extremely accurate 3-D model of the fan, as well as quantifying the total surface area and geometry of the bedrock.

GIS Map of Site:  Geographic Information Systems (GIS) capture, store, analyze, manage, and present data that is linked to location (Fig. 8).  In addition to creating a detailed digital map of the area, all relevant data on the proposed site could be spatially linked to measured values.  For example, all sample locations would be indicated on the map and linked to a database containing information about the sampling technique, material sampled and assessed values of the sample.  The extent of the alluvial fan, boundary of the claim, locations of previous mining efforts and the locations of roads and streams would all be accurately and digitally recorded and easily presented in map form.  Measured and surveyed values, such as depth to bedrock, would also be spatially recorded and easily accessible.  Standard maps, such as USGS topographic quadrangles, can be imported with all digital data viewable upon the map.  As mining progresses, the extent of the worked area could be recorded and updated with relevant information, such as ounces per ton claimed, stored in databases linked to location.

Geostatistical Interpolation of Gold Distribution:  Geostatistics is a branch of statistics specifically developed to predict probable distributions of materials for mining operations.  Based on a set of spatially located sample values, geostatistics uses statistical interpolation to predict likely distributions of values between those samples, both in 2-D and 3-D.  These methods are designed precisely to deal with the high variability of gold distributions (the "nugget effect") and through years of development have proven their value in accurately assessing ore amounts and distributions.  Running geostatistical simulations would give a much more robust assessment of the value of the claim based on current samples.  Additionally, a sampling campaign developed and implemented for geostatistical analysis could create highly useful models to increase the accuracy of the claim value prediction.  Finally, as mining progressed, sample data could be constantly collected, updating and improving geostatistical models.  These would indicate where time and resources should be most efficiently used for highest yield rates.

Bedrock Mapping:  The source of the placer deposits in the district is the bedrock of the Snake Mountain range upstream of the alluvial fans.  Previous reports describe veins, fractures, iron-oxide alteration, and shear zones throughout the area.  A new detailed geologic map of the bedrock units, veins and structures of the region could be compiled and used in conjunction with new hand samples to assess the potential of the region as a lode mining operation.  Historical reports indicate that gold has been produced from lode claims, and that cobbles from the alluvial fan are gold bearing.  Therefore it is in the interest of Kapacke Mining to ascertain if gold bearing veins project at depth beneath Kapacke claims.  Furthermore limestone unit(s) may serve as a host for bulk tonnage lode prospects as is common throughout the Basin and Range province in Nevada.  Additionally it appears no mapping or modeling of the kinematics or mechanics of the geologic structures of the area has been done.  An understanding of the initiation, propagation and evolution of fractures, faults and shear zones in the area could lead to predictions of the nature and distribution of veins and gold in the bedrock of the area.

# Summary

Mining in the Osceola District, White Pine County Nevada started in the 1870's and continues to this day.  Major efforts occurred in the late 1800's, 1930's and 1970's with both lode and placer mining removing considerable amounts of gold.  Studies conducted throughout these periods indicate economically viable amounts of gold in both the bedrock and particularly in the placer deposits remain.  Kapacke Mining has 13 claims totaling 960 acres within what is regarded one of the most promising areas, the Mary Ann Canyon alluvial fan.  Analysis of 28 new samples collected and prepared by Kapacke Mining indicates an average sample value of $117/yard and shows linearly increasing gold concentrations with depth.  Rough, highly conservative estimates indicate over 17 million yards of material within the heavily sampled Mav5 A through G claims, containing over $311,000,000 of value.  Recent mining activity in the Mav5-H claim by prospector Mike Pasik indicates that this estimate is highly conservative; Pasik's minimum returns indicate a value of at least $600,000,000 within the Mav5 claims.  Additional claims held by Kapacke Mining in the area could easily add an additional volume of 39 to 117 million yards; quantities of gold are not as well constrained but conservative estimates range from an additional $600,000,000 to over $2,000,0000,000.  Planned and proposed work by Skookum Geologic Consulting will greatly constrain the accuracy of, and likely increase these numbers.  Kapacke Mining has the equipment and water rights in place to continue large-scale mining operations of these claims.

# Bibliography

Anderson, B. E., 1972, *Mining Potential of the Hogum Gold Placer District in Mary Ann Canyon of the Osceola Mining District, White Pine County*, Nevada.  8 pgs.

A Short Technical Glossary of Cornish Mining Terms, 2009, Cornish Mining World Heritage, http://www.cornish-mining.org.uk/story/glossary.htm

American Geological Institute, 1962, *Dictionary of Geological Terms*, New York: Dolphin Books, 1962

Copeland, R.W., 1975, *Osceola Gold Placer*, Report for Last Chance Mining Co., 11 pgs.

Davidson, G. A. 1973, *Gold Placer Deposit Below Mary Ann Canyon, Osceola District, White Pine County, Nevada*, 35 pgs.

Holland, J.S, 1974, *A review of coal reserves in Utah and Colorado, and a placer gold occurrence in Nevada*, Report for American Fuels Co., 16 pgs.

Hopkins, P.M., 1974, *Reconnaissance of the Mary Ann Gulch and adjoining arms, Osceola mining district, White Pine County, Nevada* , Report for American Fuels Co., 23 pgs.

Johnson, 1973, *Placer Gold Deposits of Nevada*, USGS Bulletin 1356, pp. 93-95, 101

Koschmann and Bergendahl, 1968, *Principal Gold-Producing Districts of the United States*, USGS Professional Paper 610, p. 200

Thrush, P. M. , 1968, *A Dictionary of Mining, Mineral, and Related Terms*, US Bureau of Mines

Vanderburg, 1936, *Placer Mining in Nevada*, Nevada Bureau of Mines Bulletin 30, pp. 167-173

Nevada Bureau of Mining and Geology mining district files compiled by University of Reno, http://www.nbmg.unr.edu/mdfiles/mdfiles.htm search: District: Osceola

Weeks, F.B., 1908, *Geology and mineral resources of the Osceola Mining District, White Pine County, Nevada,* USGS Bulletin 340, pp. 117-133

## About Dr. Ian Mynatt

Ian Mynatt got his B.S. in Geology from Western Washington University in 2002 and his Ph.D. in Geological and Environmental Sciences from Stanford in 2009. He specializes in structural geology and geomechanics as well as GIS, geostatistics and numerical modeling of geologic systems.

## About Gerry Griesel

Gerry Griesel got his B.S. and M.S. in Geology from Western Washington University in 2001 and 2008 respectively. He specializes in structural geology, geologic mapping, and Cordilleran tectonics.
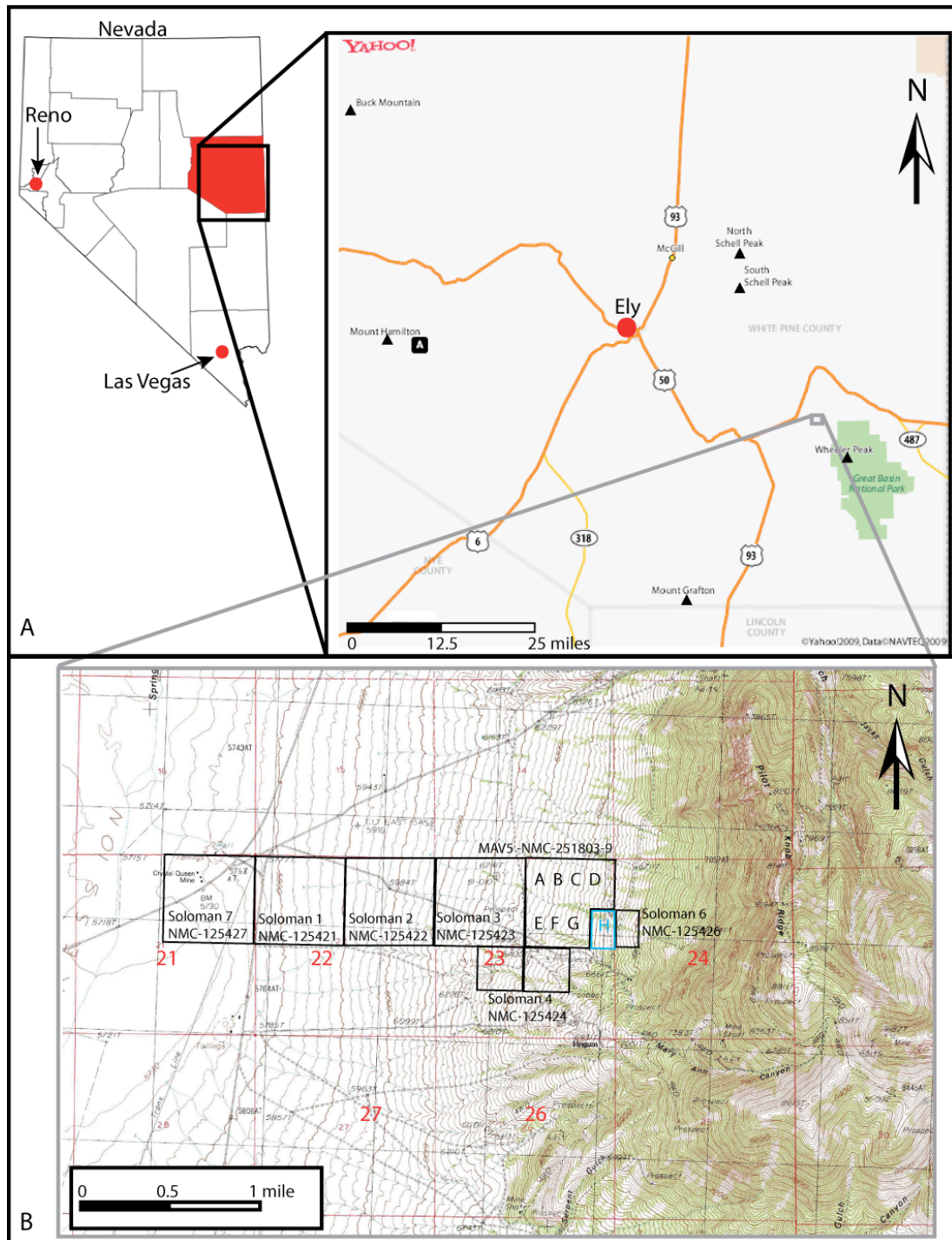
# Figures



Figure 1. A) County map of Nevada (inset) highlighting White Pine County (red); close-up shows the major highways, towns and mountains of White Pine County. B) Portion of the USGS 7.5 minute Hogum Quadrangle showing Osceola Mining District. Section numbers highlighted in red, Kapacke Mining claims outlined and labeled in black, Mike Pasik's claim (Mav5-h) outlined in blue.
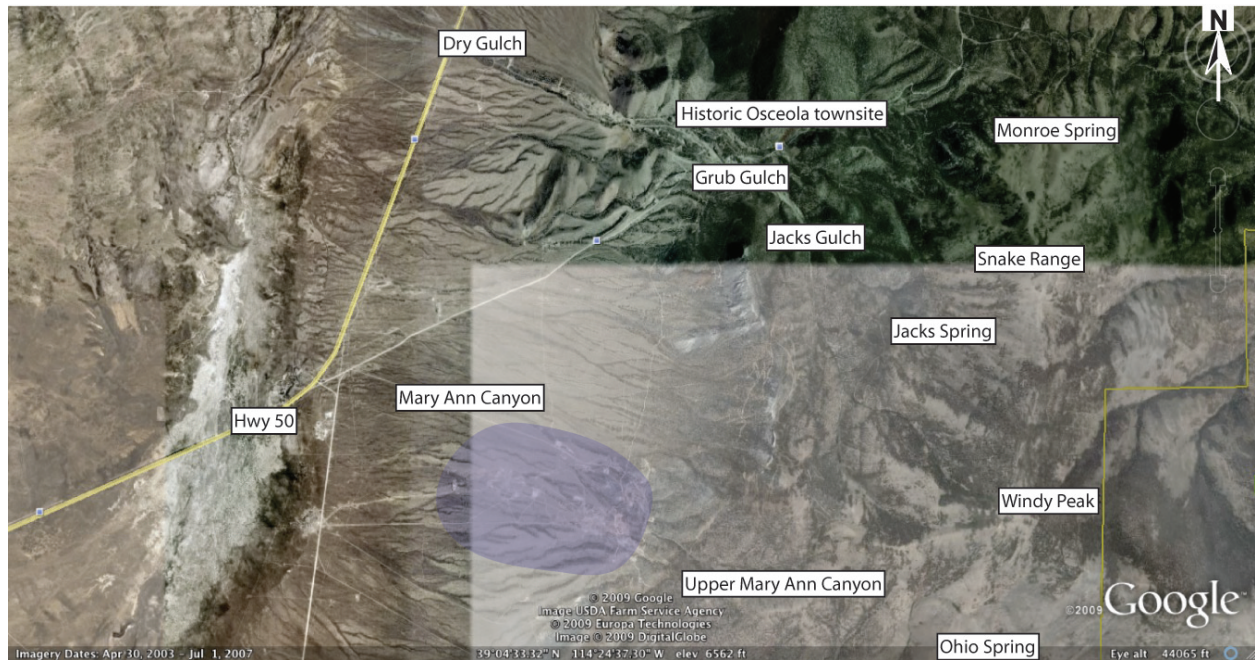
Figure 2. Satellite "Google Earth" image of the Osceola Mining District, White Pine County Nevada. Geographical features mentioned in the text include: Mary Ann Canyon, Jacks Gulch, Dry Gulch, Grub Gulch, U.S. Route 50 and Osceola townsite. Placer deposits of Mary Ann Canyon alluvial fan highlighted in blue.
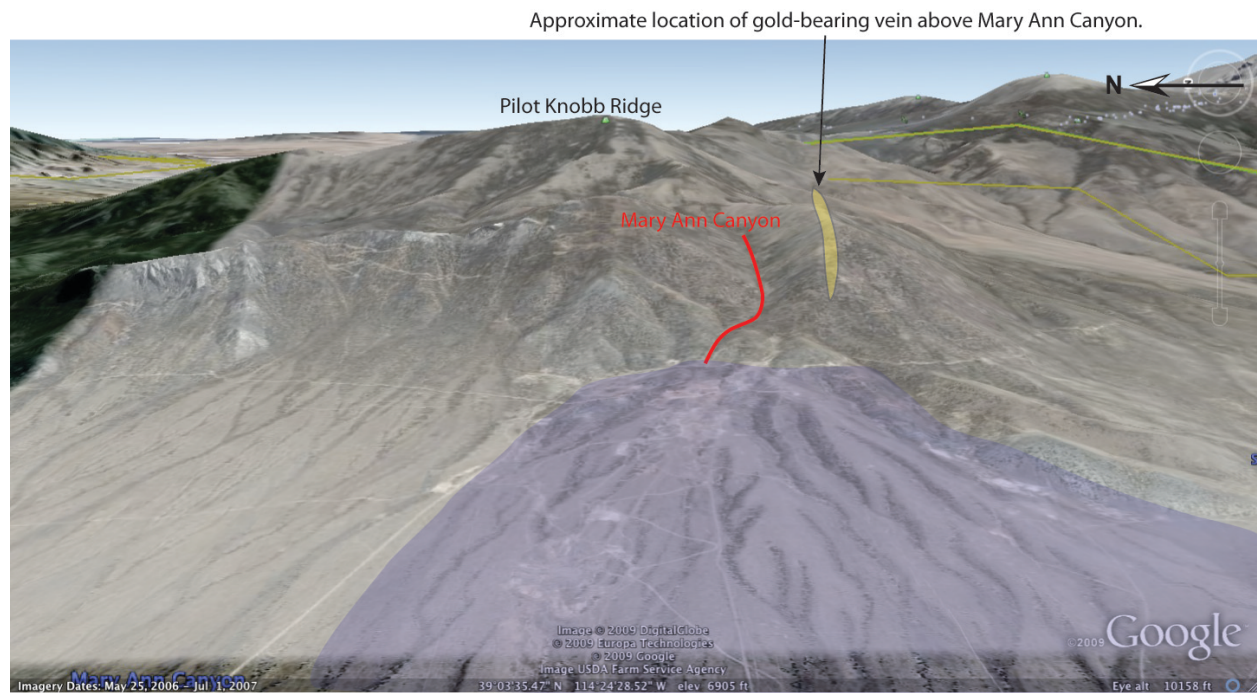
Figure 3. Three-dimensional "Google Earth" image of the Mary Ann Canyon region, Osceola Mining District; image faces due east. Placer deposits within the alluvial fan of Mary Canyon are shaded blue, gold bearing vein is shaded yellow. Majority of the Kapacke Mining claims are within the blue-shaded region.
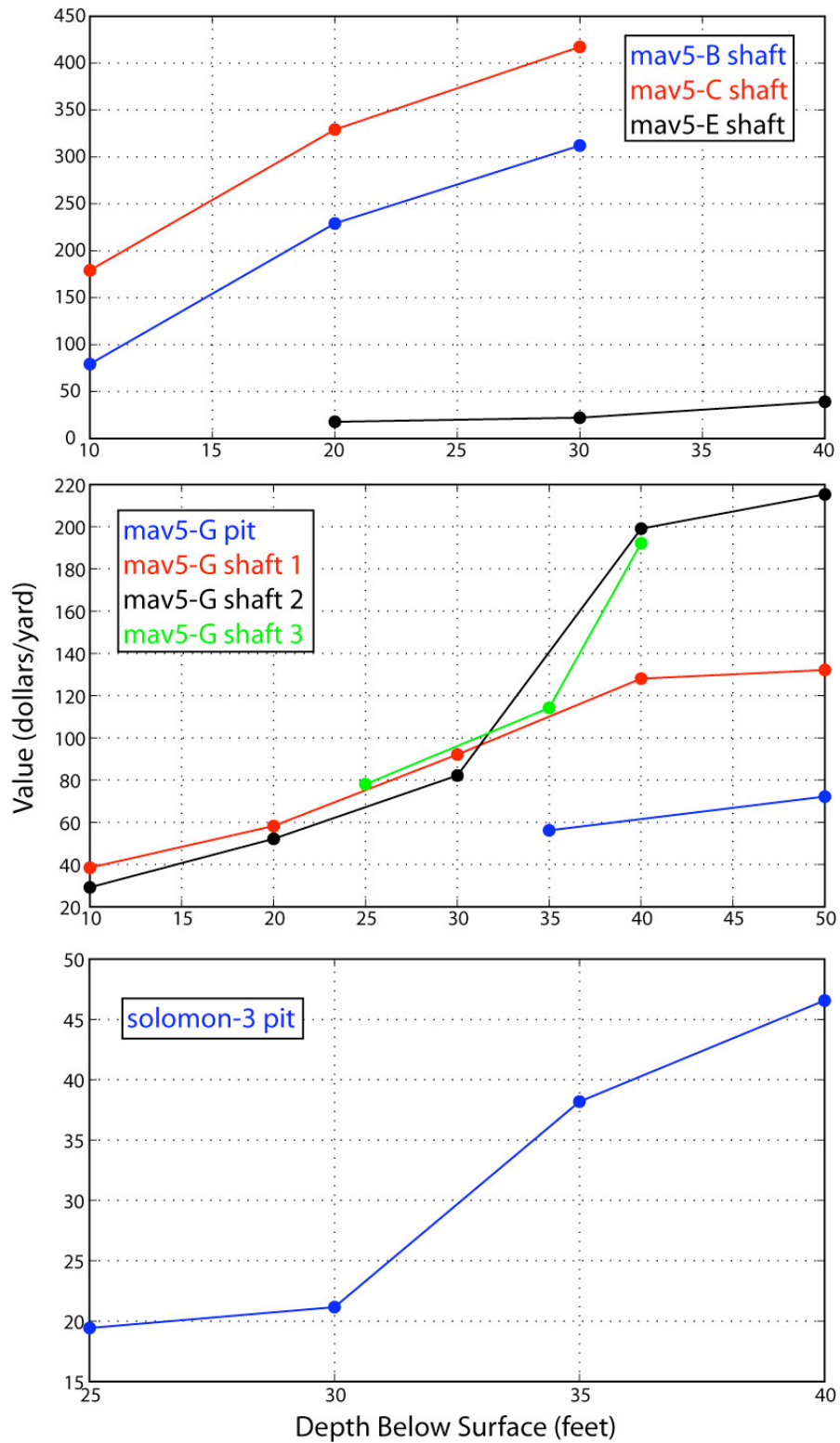
Figure 4. Plots of value of samples from Table 2 in dollars per yard against sample depth. All sample locations show near linear increase in value with depth, supporting the reports of increased concentrations of gold at depth with highest values along bedrock.

Figure 5. Photos from the Mav5 claim group (Fig. 1). A) Mav5-G pit and adit within alluvial fan placer deposit. B) Mav5-C bedrock with cm-scale veins (left) and pit within alluvial fan placer deposit (right).
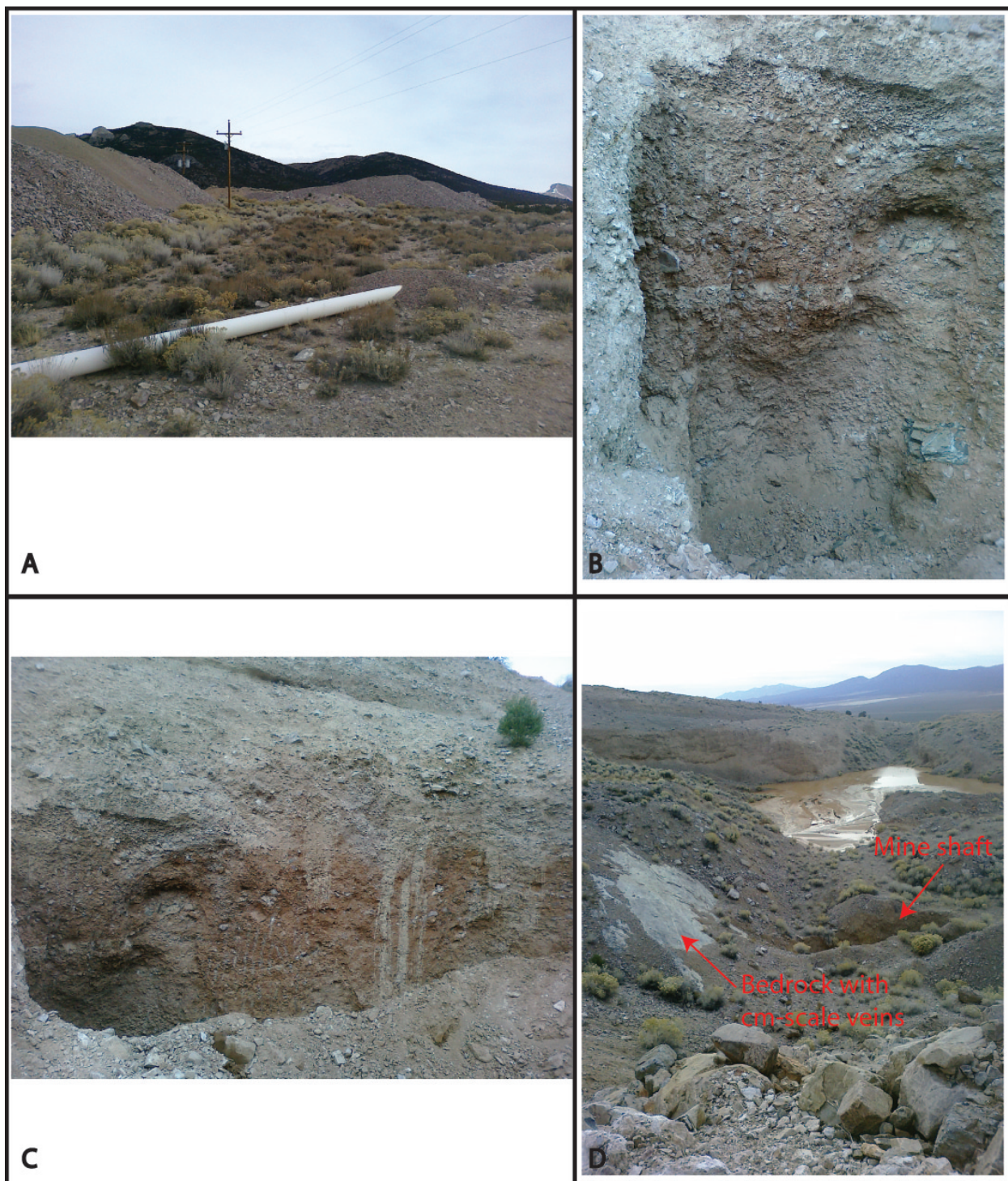
Figure 6. Photos from the claim groups.  A) Soloman 3 claim, tailings piles with confirmed gold fines, and 10-inch water pipe.  B) Close up of mine shaft within alluvial placer deposit, claim Mav5-B.  C) Close up of pit from Mav5-D claim.  D) Mav5-A claim pit exposing the thick alluvial fan sequence and bedrock with cm-scale veins.

Figure 7.  Equipment belonging to Kapacke Mining at the processing site.  Site is approximately   1.5 miles from the mine claims.

Figure 8.  Example of converting real world information into data managed using Geographic Information Systems.

# Tables

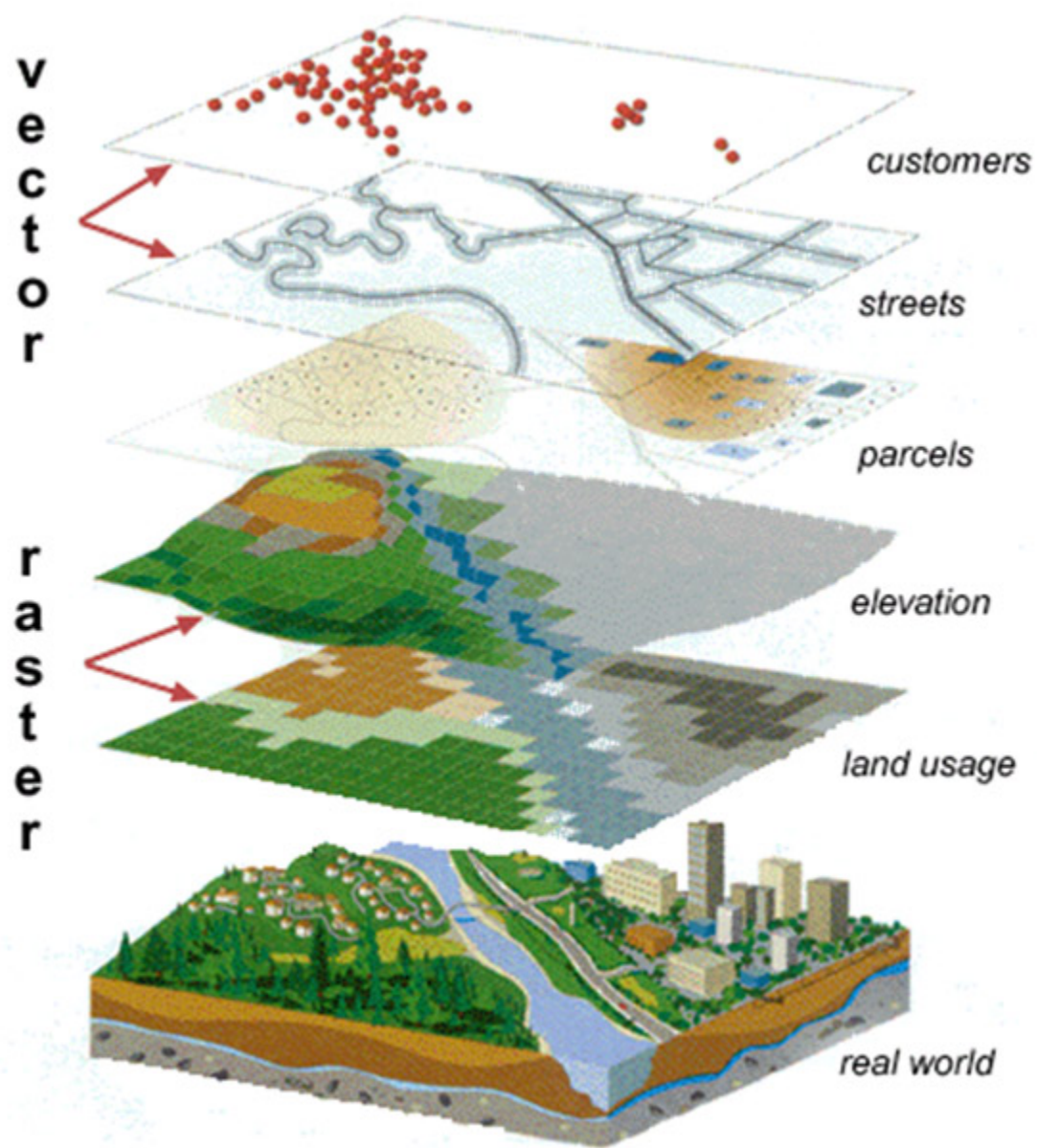| Source | Sample # | $/yd | Section # | Sample Type |
|---|---|---|---|---|
| Hopkins 1974* | 1 | trace | 22,23,24,25,27 | Shaft, 40 ft down, Mary Ann gulch |
| Hopkins 1974* | 2 | 83.70 | 22,23,24,25,27 | Mary Ann shaft 2 |
| Hopkins 1974* | 3 | 1043.55 | 22,23,24,25,27 | Sqeegee claim 5 |
| Hopkins 1974* | 4 | 469.80 | 22,23,24,25,27 | Pannings Mary Ann shaft 2 |
| Hopkins 1974* | 5 | 469.80 | 22,23,24,25,27 | Pannings Mary Ann shaft 2 |
| Hopkins 1974* | 6 | 122.85 | 22,23,24,25,27 | Bulk sample Mary Ann shaft 2 |
| Hopkins 1974* | 7 | 352.35 | 22,23,24,25,27 | Cut sample Mary Ann shaft 2 |
| Hopkins 1974* | 8 | 222.75 | 22,23,24,25,27 | Cut sample Mary Ann shaft 2 |
| Hopkins 1974* | 9 | 166.05 | 22,23,24,25,27 | Cut sample, adit, Sqeegee claim 5 |
| Hopkins 1974* | 10 | trace | 22,23,24,25,27 | Dry gulch, cut bank |
| Hopkins 1974* | 11 | trace | 22,23,24,25,27 | Grab sample, Mary Ann gulch |
| Hopkins 1974* | 12 | 2592.00 | 22,23,24,25,27 | Mary Ann shaft 2, @ base on false bedrock |
| Hopkins 1974* | 13 | not used | 22,23,24,25,27 | |
| Hopkins 1974* | 14 | 75.60 | 22,23,24,25,27 | Open cut, 4 ft below surface |
| Hopkins 1974* | 15 | trace | 22,23,24,25,27 | Open cut, 7 ft below surface |
| Hopkins 1974* | 16 | trace | 22,23,24,25,27 | Open cut, 11 ft below surface |
| | | | | |
| Davidson, GA 1973 | ON1 | 40.50 | 25 &26 | Lode sample from vein |
| Davidson, GA 1973 | ON2 | 179.55 | 25 &26 | Lode sample from vein |
| Davidson, GA 1973 | ON3 | 270.00 | 25 &26 | Lode sample from vein |
| Davidson, GA 1973 | ON4 | 33.75 | 25 &26 | Lode sample from vein |
| Davidson, GA 1973 | ON5 | trace | 25 &26 | Lode sample from vein |
| Davidson, GA 1973 | ON6 | 141.75 | 25 &26 | Lode sample from vein |
| Davidson, GA 1973 | ON7 | trace | 25 &26 | Lode sample from vein |
| | | | | |
| Anderson, 1972 | | 89.10 | 22-27 | Six 5lb samples from a trench |
| Anderson, 1972 | | 500.85 | 22-27 | 200 lb sample from bottom of shaft |
| Anderson, 1972 | | 560.25 | 22-27 | 200 lb sample from bottom of shaft |
| | | | | |
| *Hopkins data converted from grams/cubic feet, using 28 gram ounce, and 2700 lb cubic yard | | | | |

Table 1.  The gold assay values in dollars per yard of samples reported by Anderson (1972), Davidson (1973), and Hopkins (1974).  Values are calculated for $1000 per ounce for gold.

| Site | Northing (dgs) | Westing (dgs) | Depth (ft) | Value ($/yd) | Site Average ($/yd) |
|------|----------------|---------------|------------|--------------|---------------------|
| mav5-B shaft | 39.06424 | 114.41956 | 10 | 79.24 | 206.86 |
| mav5-B shaft | 39.06424 | 114.41956 | 20 | 229.16 | |
| mav5-B shaft | 39.06424 | 114.41956 | 30 | 312.17 | |
| mav5-C shaft | 39.06187 | 114.41694 | 10 | 179.16 | 308.54 |
| mav5-C shaft | 39.06187 | 114.41694 | 20 | 329.17 | |
| mav5-C shaft | 39.06187 | 114.41694 | 30 | 417.29 | |
| mav5-E shaft | 39.05823 | 114.41519 | 20 | 17.72 | 26.35 |
| mav5-E shaft | 39.05823 | 114.41519 | 30 | 22.15 | |
| mav5-E shaft | 39.05823 | 114.41519 | 40 | 39.17 | |
| mav5-G open pit | 39.05910 | 114.41299 | 35 | 56.17 | 64.18 |
| mav5-G open pit | 39.05910 | 114.41299 | 50 | 72.18 | |
| mav5-G shaft 1 | 39.05975 | 114.41617 | 10 | 38.49 | 89.80 |
| mav5-G shaft 1 | 39.05975 | 114.41617 | 20 | 58.22 | |
| mav5-G shaft 1 | 39.05975 | 114.41617 | 30 | 92.08 | |
| mav5-G shaft 1 | 39.05975 | 114.41617 | 40 | 128.06 | |
| mav5-G shaft 1 | 39.05975 | 114.41617 | 50 | 132.14 | |
| mav5-G shaft 2 | 39.05975 | 114.41617 | 10 | 29.17 | 115.57 |
| mav5-G shaft 2 | 39.05975 | 114.41617 | 20 | 52.15 | |
| mav5-G shaft 2 | 39.05975 | 114.41617 | 30 | 82.17 | |
| mav5-G shaft 2 | 39.05975 | 114.41617 | 40 | 199.08 | |
| mav5-G shaft 2 | 39.05975 | 114.41617 | 50 | 215.29 | |
| mav5-G shaft 3 | 39.05975 | 114.41617 | 25 | 78.02 | 128.12 |
| mav5-G shaft 3 | 39.05975 | 114.41617 | 35 | 114.19 | |
| mav5-G shaft 3 | 39.05975 | 114.41617 | 40 | 192.15 | |
| solomon-3 open pit | 39.06206 | 114.42588 | 25 | 19.42 | 41.78 |
| solomon-3 open pit | 39.06206 | 114.42588 | 30 | 21.15 | |
| solomon-3 open pit | 39.06206 | 114.42588 | 35 | 38.19 | |
| solomon-3 open pit | 39.06206 | 114.42588 | 40 | 46.57 | |

| Total Average ($/yd) |
|----------------------|
| 117.50 |

Table 2.  Sumary of samples collected by Kapacke Mining.  Sites where samples were taken are shown in Figure 1.