Talc City Mine Group, Southern Inyo Mountains, Inyo County, California

Gregg Wilkerson, 2024

Acknowledgement and Disclaimer

The information in this paper is taken largely from published and public sources. I have reproduced this material and present it pretty much as we found it, not trying to harmonize discrepancies in mine or geologic descriptions. I have changed verb tenses for readability and have used some paraphrase. I have expanded abbreviations or special characters with full text (e.g. feet instead of ft., inches instead of “) Italics indicate quotations. Authors of the original information are indicated at the end of each paragraph. Paragraphs without a citation are our own materials. The maps in this report have been compiled and rectified from digital and paper copies of original sources that were made at different scales and in different geographic projections. Therefore, many of the maps had to be adjusted or stretched. They do not fit perfectly. Most are accurate to within 100 feet, but reproduction and projection errors can be as much as 300 feet for some maps. PLSS means Public Land Survey System. That survey data was obtained from the U.S. Bureau of Land Management website.

MRDS, 2011, Mineral Resources Data System, U.S. Geological Survey, https://mrdata.usgs.gov/mrds/. This database relies on records that, in many cases, are inaccurate or imprecise. For example, if a report describes a mine as being in “Section 9”, with no other information, MRDS plots the mine location in the center of the section. If a mine is reported in “SW ¼” of a section, MRDS plots the mine in the center of that SW quarter-section. Where I could confidently adjust an MRDS location of a mineral deposit to features identifiable in aerial photographs or topographic maps, I did so.

Help me make this report better. If you have any photographs, memories or reports for this mine that you can share, please send them to yosoygeologo@gmail.com so that I can incorporate that information and material into this paper.

Italics are quotations.

Location:

There are several mines in the area of the Talc City area. These are located at these coordinates:

18S 40E Sec. 32 MDM	36.33329999990	-117.66924000000
18S 40E Sec. 31 MDM	36.33025000000	-117.68174000000
18S 40E Sec. 32 MDM	36.33326999980	-117.66921000000
18S 40E Sec. 31 MDM	36.32937000020	-117.68031000000

Talc City is at the southern end of the Southern Inyo Mountains and southeast of Owens Lake.

Inyo County, in east central California, is the outstanding steatite province in the nation, in terms of past and present production. Most known California steatite is in or near the Inyo Range. A particularly important part of the area, embracing- the notable Talc City mine and several other deposits, is the upland between Keeler and Darwin , just south of the Inyo Range proper (Page, 1951:6).

The Talc City mine is 19 miles by road southeast of Keeler and 6 miles northwest of Darwin, Inyo County, California, in a group of hills near the south end of the Inyo Range (figs. 3 and 5). Although the area is over 5,000 feet in altitude, it is arid and provides neither timber nor water for mining. There is no city at Talc City, despite the implication of the name (Page, 1951:13)

Former Names

Trinity Talc, Frisco, Talc City, Homestake, Silver Dollar

History

The following history of Talc City is from Page (1951:13-14):

The mine was first operated briefly about 1917 or 1918 under the name of Simonds talc mine. In 1918 it was purchased from the California Talc Company by the Inyo Talc Company, which about 1922 became the Sierra Talc Company, the present owner of the mine and the largest producer of steatite in the nation. This concern has offices at 5509 Randolph Street, Los Angeles, and mills at Keeler and Los Angeles. Messrs. Franklin Booth, P. H. Booth, W. H. Booth, and Otis Booth have served as executive officers of the company, which is now owned by Mrs. Dorothy F. Dodds and Mr. Otis Booth. From 1918 to 1942, Mr. W. A. Reid was mine superintendent at Talc City; since 1942, Mr. James McNeil has held this position (Page, 1951:13-14)

During the first few years of operation, the mine provided raw material for insulating cores of Hotpoint stoves. The cores were turned out of block talc, which was then fired. It was later found that ground talc could be used for the same products, preventing great waste, and all the ore is now ground. Much talc from this mine has been sold to the paper, rubber, and cosmetic industries. However, manufacturers of electrical insulators for radio and other equipment began to draw upon the Talc City production about 1936, and by 1942 virtually the entire output was used in high-grade electrical ceramics. The mine is the largest producer of steatite in the United States, and prior to World War II it was almost the sole domestic source of radio ceramic steatite (Page, 1951:14)

Steatite from Talc Hills was partly responsible for Allied success in WWII.:

In 1941 the Planning- Branch of the U. S. Army pointed out that steatite insulators were required for all military radios, and that the domestic production of raw steatite came largely from a single source, the Talc City mine in California. At the request of Brigadier General Hines, the U. S. Geological Survey and the U. S. Bureau of Mines undertook a talc investigation which was carried on during' 1942 and intermittently thereafter (Page, 1951:6).

Area Geology

The Talc City deposits occur in a sequence of Mississippian through Permian rocks. The area of the Talc City mine was mapped by Hall and MacKevette (1958, 1962).

In the vicinity of the mine, strata strike N.60°W and dip 70° SW. From southwest to northeast the stratigraphic sequence is repeated by faulting. The formations in the mine area include:

Keeler Canyon Formation (Permian and Pennsylvanian)
Resting Spring Shale (Pennsylvanian)
Lee Flat Limestone (Pennsylvanian and Mississippian)
Tin Mountain Limestone (Mississippi)
Lost Burrow Formation (Devonian)
Hidden Valley Dolomite (Devonian)
Ely Springs Dolomite (Ordovician, upper)
Eureka Quartzite (Ordovician, middle)
Pogonip Group (Ordovician, middle and lower)

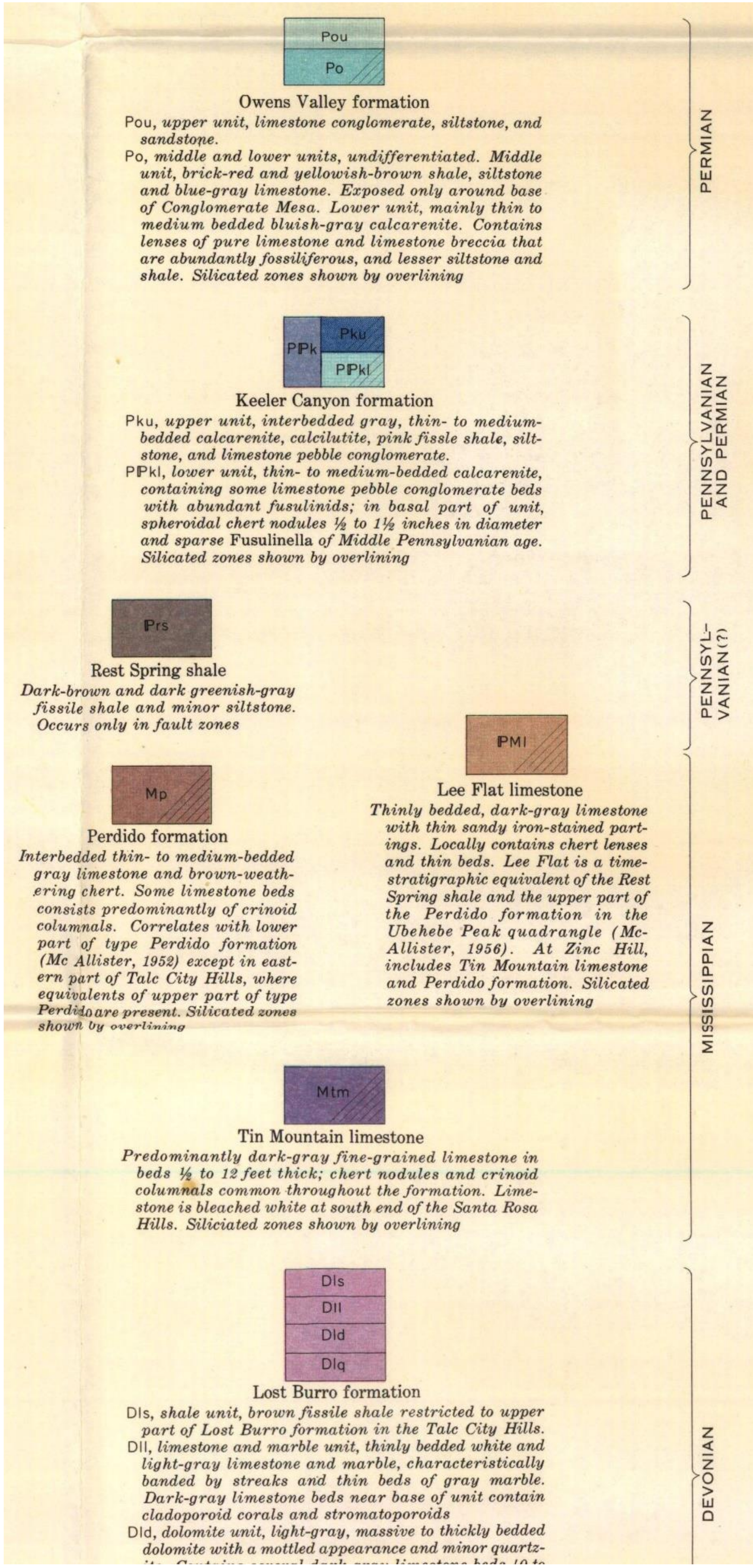

Figure 1. Devonian through Permian stratigraphy at the Talc City mine. From Hall and MacKevette, 1962.

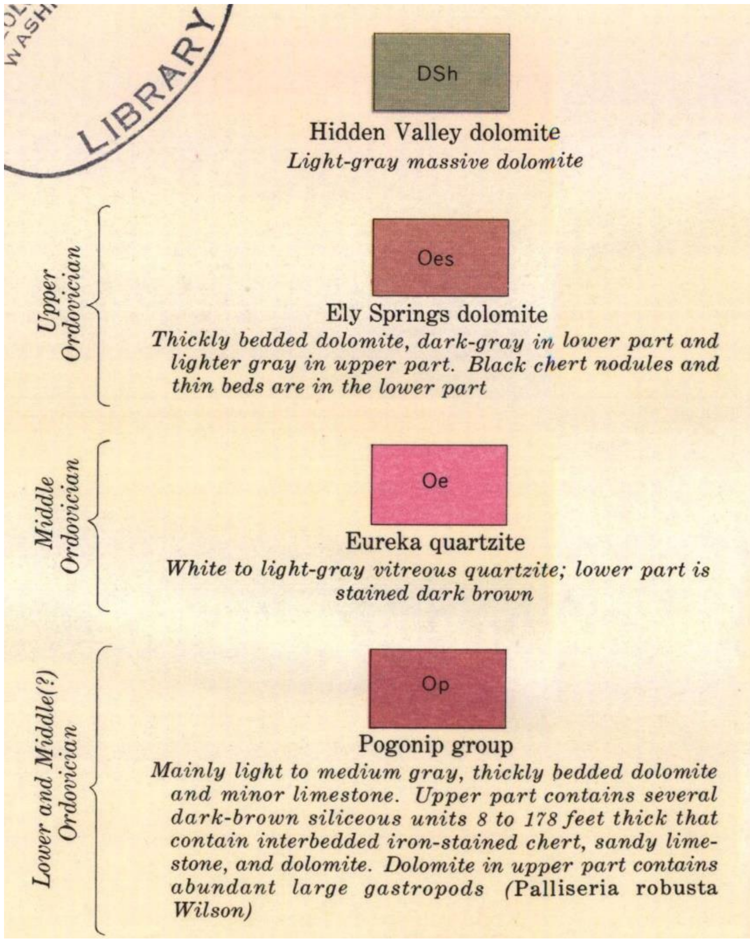

Figure 2. Ordovician through Devonian stratigraphy at the Talc City mine. From Hall and MacKevette, 1962.

Mine Geology

The most prevalent type of limestone, exemplified at the Talc City mine, is a well-stratified gray rock with subordinate thin white layers a fraction of an inch thick. Locally it is slightly fissile but is not highly jointed. During weathering it develops smooth outcrop surfaces. This rock is easily scratched by steel, and effervesces vigorously in cold, dilute hydrochloric acid. A few layers contain poorly defined crinoid fragments, and others contain minute bits of carbonized plant remains (Page, 1951:7)

Pre-dolomite faults are not positively established but are indicated by incomplete evidence. For example, at the Talc City mine early faulting is suggested by the apparent repetition of lithologic units that occur as unaltered remnants surrounded by massive dolomite. No fault is visible, but perhaps dolomitization obliterated it leaving unaltered parts of the hanging-wall block and the footwall block isolated in the expanse of dolomite. Any faults which existed prior to the hydrothermal action doubtless facilitated dolomitization (Page, 1951:9).

Contacts between rock units have favored the development of some ore bodies, as at the Talc City mine, where much of the steatite occurs along the boundaries between massive dolomite and stratified dolomite or limestone (Page, 1951:9).

Dike rocks ranging from basalt or diabase to light-colored felsite occur near the Frisco, Talc City, and White Mountain mines. The dikes cut across Paleozoic limestone and the granitic rocks, and small altered dikes have been found in the massive dolomite (Page, 1951:9).

Some folds in limestone have been practically obliterated by dolomitization, the massive dolomite retaining only a few remnants of stratified limestone. The orientation of the unreplaced strata indicates the probable pre-dolomite structure; this is illustrated at the Talc City mine (Page, 1951:9).

The major folding in the region occurred before the emplacement of the granitic intrusions, according to Knopf (1914) and is probably late Jurassic in age. It preceded, and may have facilitated, the dolomitization (Page, 1951:9).

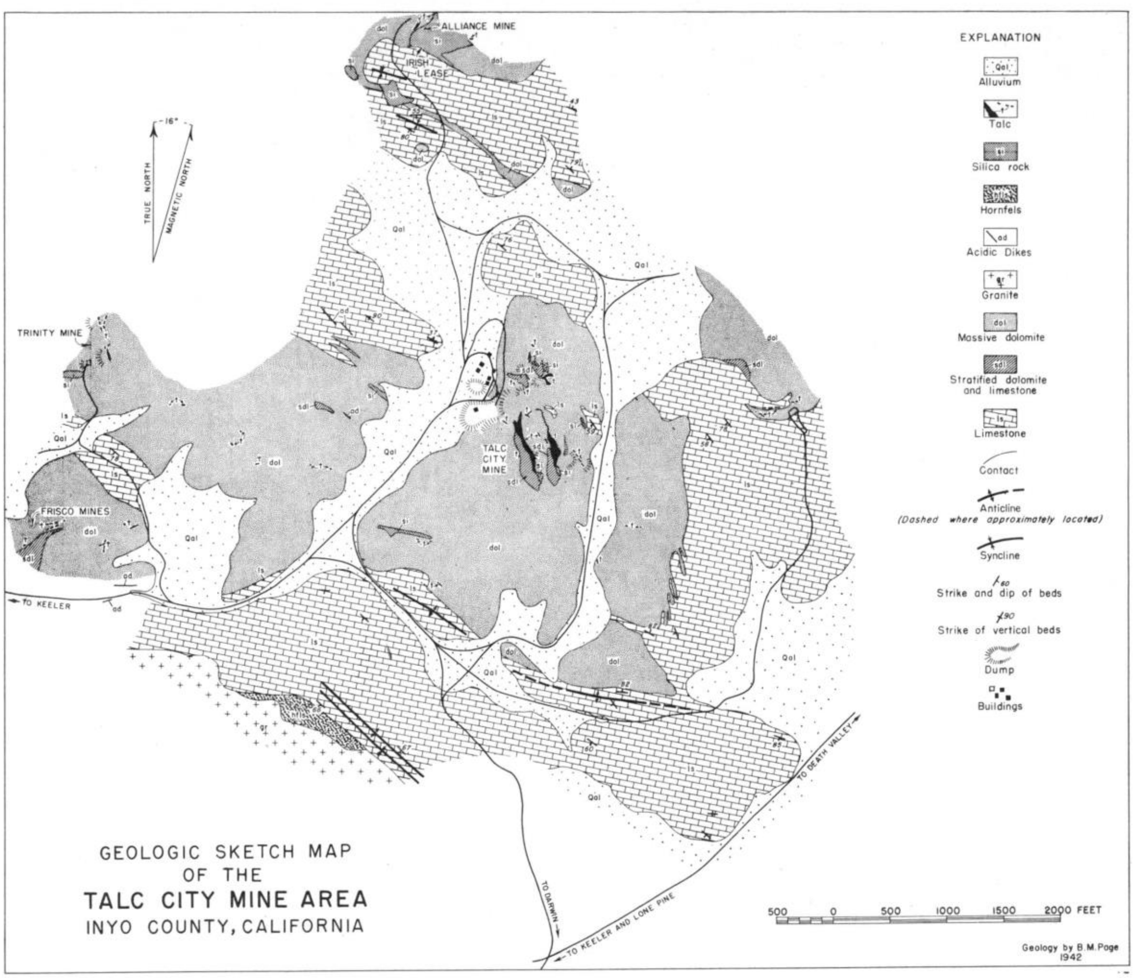

FIGURE 5.

Figure 3. Geologic map of the Talc City area. From Page, 1951, p. 10.

The talc occurs as irregular, elongated bodies in an area of massive dolomite. The dolomite is almost surrounded by Paleozoic limestone from which it was derived by hydrothermal alteration. Within the area of massive dolomite there are remnants of unaltered limestone, remnants of sedimentary stratified dolomite, and peculiar "islands" of a silica rock that resembles quartzite. A large mass of granitic rock that has intruded the limestone extends to within 3,000 feet of the mine (Page, 1951:15).

Limestone (Paleozoic?) almost encircles the mine at a distance, and small patches of it are present near the workings. Most of this limestone is gray, with a few thin white layers. (Page, 1951:15).

A stratified dolomite and limestone, different from that described above, occurs near the talc deposits. Its stratigraphic relationships are unknown, as it is principally found as isolated patches surrounded by massive dolomite. There is a marked difference between the character of the rock underground and the character on the surface. Surface exposures are distinguished by a tan to gray, smooth" buckskin" appearance, and by streaks and blebs of rusty, siliceous material that jut out in relief. Microscopic examination of the stratified dolomite and limestone collected from outcrops shows a sprinkling of coarse silt and fine sand, largely quartz, in a fin e-grained carbonate matrix. Underground, the rock r resembles shaly limestone and effervesces freely in cold, dilute acid. It is much softer, more fissile, and much less dolomitic than are exposed in surface outcrops. Probably these differences are caused by hydrothermal alteration near the ore bodies; most of the underground exposures of the stratified dolomite and limestone are in the immediate vicinity of the talc. Many of the workings within this type of rock have ragged, splintery, somewhat unstable backs and walls. (Page, 1951:15).

A silica rock closely resembling quartzite forms prominent outcrops at the Talc City mine. It characteristically occurs as isolated, discontinuous patches of peculiar shapes within massive dolomite, and its stratigraphic relationships are unknown (Page, 1951:15).

Massive dolomite, utterly different from the stratified dolomite and limestone, is the predominant rock at the Talc City mine, and envelops or borders the talc deposits. It is a product of hydrothermal alteration and was chiefly derived from limestone; it forms a tract 2,000 to 3,000 feet wide and interrupts the expanse of gray limestone that constitutes the neigh boring terrain. Within the area of massive dolomite are a few patches of unaltered gray limestone, tan stratified dolomite and limestone, and silica rock. The massive dolomite is devoid of stratification, has harsh, hackly outcrop surfaces, and ranges in color from pale gray to gray black. The single specimen tested by the writer was iron-free. The rock consists of subhedral to anhedral dolomite grains which, in most samples are 0.015 to 0.05 millimeter in diameter. The texture is coarser in the northeastern parts of the B leve1 and C level of the mine, and these coarser facies are best described as dolomitic marble (Page, 1951:15).

Diabase occurs in three or four very small dikes within the mine area. The dikes are from 2 inches to 2 feet thick, and are quite irregular, having filled branching joints in the massive dolomite. The word "diabase" is loosely applied here, as the original texture and minerals can only be surmised. Most of the rock is altered to a soft, fine-grained, dark-green material that disintegrates like shale in the open air. The best-exposed dike may be seen at the mouth of the A-level adit near the main hoist house. This dike shows a relict flow structure and amygdule of quartz and calcite. The chief mineral is matted, fine chlorite, with talc and some kaolinite. There is a sprinkling of microscopic pyrite and limonite specks, and a few minute grains of sphene (Page, 1951:15).

Ore Bodies

Without exception, the talc is associated with the massive dolomite. Some talc is in or next to the residual islands of sedimentary rock surrounded by dolomite, but some is in the massive dolomite itself. Most or all the talc of steatite grade has been derived from massive dolomite (Page, 1951:16).

More specific ore controls include the following: (1) Contacts between massive dolomite and stratified dolomite or limestone, (2) shears, and to some extent joints, within the massive dolomite, and (3) contacts involving the silica rock. Significant quantities of talc are found in places where only one of these three features is present, but all three ore controls are evident along parts of the large Central ore body (Page, 1951:16).

The talc deposits are elongated, narrow, ragged, and irregular in plan and cross section. In a general way they dip steeply toward the southwest. Some have definite hanging walls or footwalls with polished and grooved surfaces, and with thick talc gouge. "False walls" are commonplace where the ore has been sheared and slickensided internally. Some talc masses have no distinct hanging wall or footwall; some have not even a moderately regular boundary, and in some masses, the contact with the country rock is gradational. Most of the ore bodies contain at least a few "boulders" (rounded inclusions) of dolomite (Page, 1951:16).

Some large offshoots containing hundreds of tons of talc extend from the main bodies at unpredictable intervals. In contrast to the large offshoots, thin stringers of talc branch from the main talc masses, following joints; they rarely widen out into another ore body. On the other hand, stringers of talc within well-defined shears in a few places do lead to ore bodies. Even locally barren shears may serve as a possible guide to talc. One such shear, which is barren on the east side of the main ridge, may be followed to the Evening Star ore body on the west side of the hill (Page, 1951:16).

The occurrence of talc along contacts between massive dolomite and stratified dolomite and limestone requires special mention. The talc frequently grades into country rock on the side towards the stratified material. As a r-ule there is an intermediate zone of "semi-talc," which may be scratched with the fingernail, but which effervesces in acid, evidently being an intergrowth of talc and calcite. Within certain layers of this partly altered rock, true talc occurs in intermittent lenses a few inches in length. The talc in and near the stratified country rock is commonly dark brown and has stains of iron oxide, but the talk adjacent to the massive dolomite country rock is generally light-colored ore, is practically free of iron, and is of steatite quality (Page, 1951:16).

Page (1951:16-17) described four main ore bodies: West, Central, East Side and Evening Star underground maps of the East Side orebody are shown below:

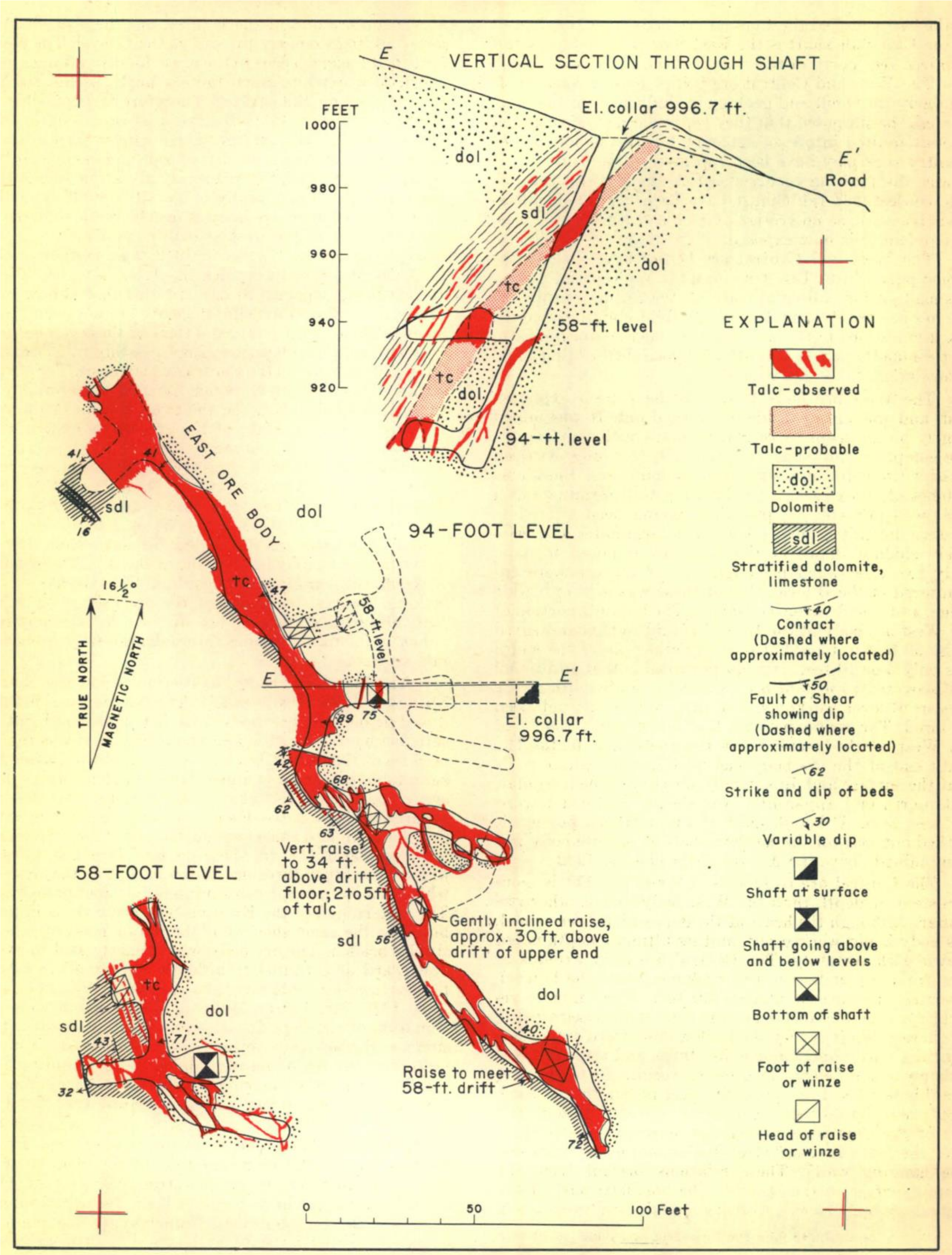

FIGURE 9. Geologic maps and section, East Side workings, Talc City mine.

Figure 4. Underground maps and cross section of the East Side workings. From Page, 1951, p. 17.

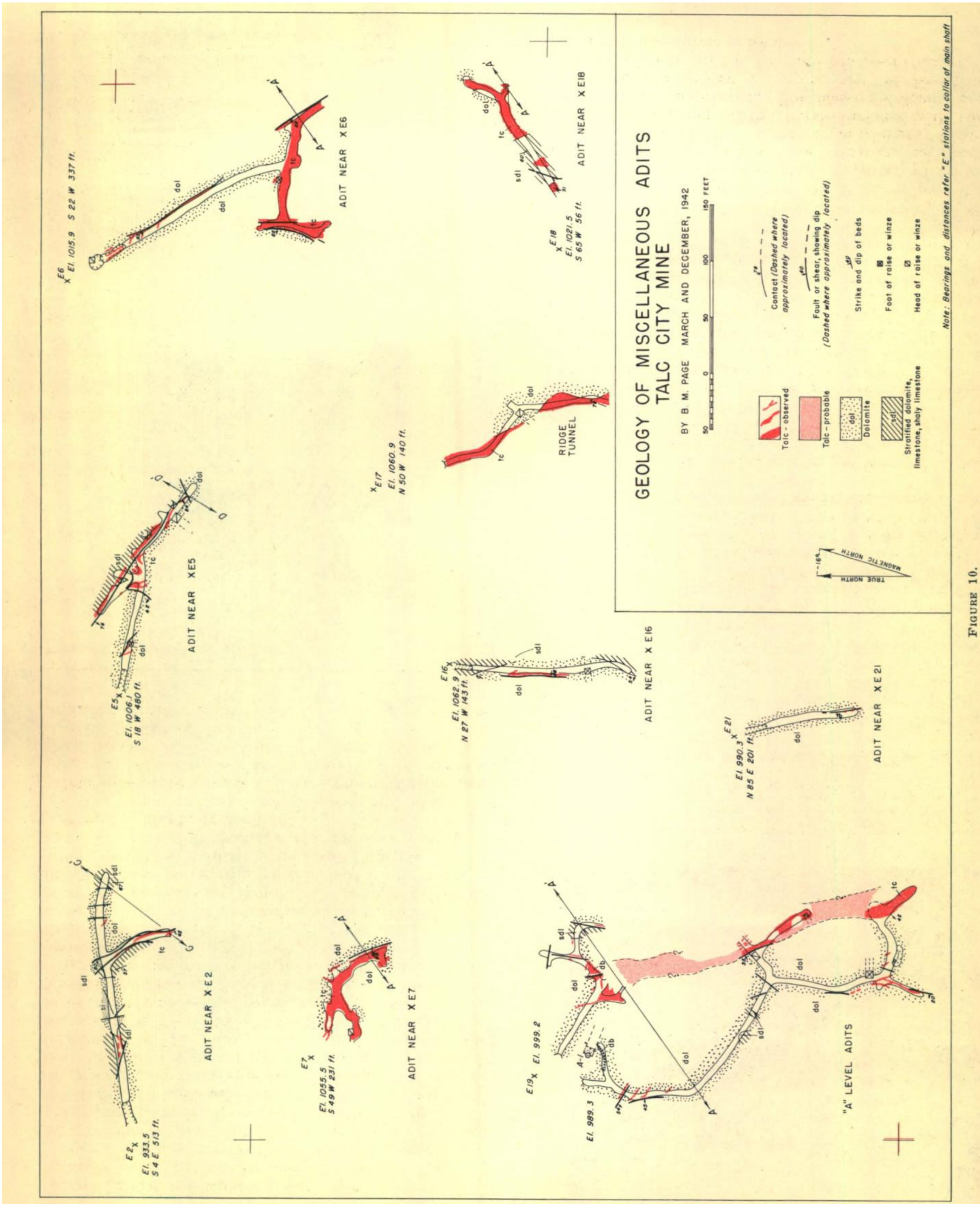

Figure 5. Underground maps of various adits at the Talc City mine. From Page, 1951, p. 19.

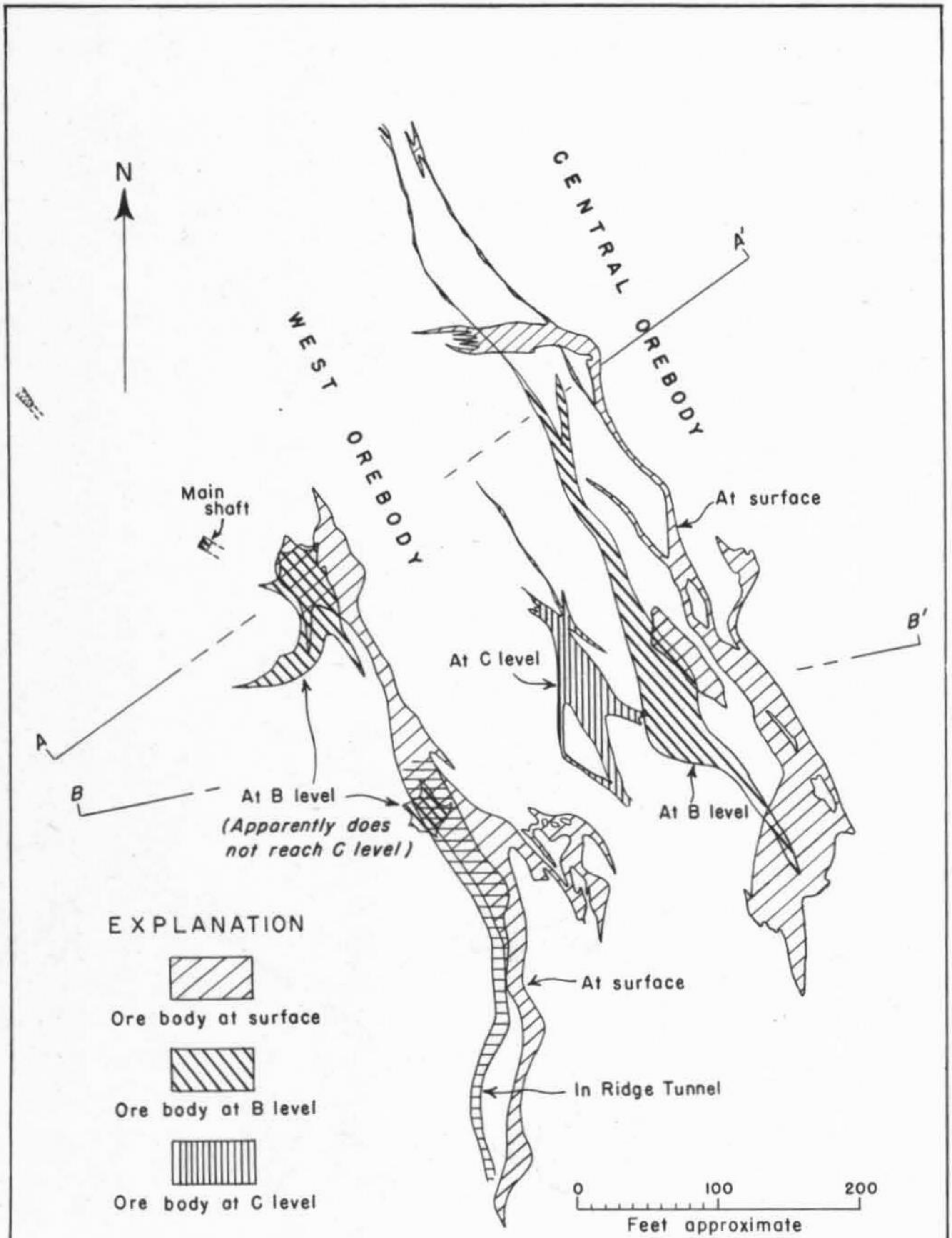

FIGURE 11. Generalized diagram of parts of the West ore body and Central ore body, Talc City mine, showing variation in shape with depth. Composite map based on incomplete data, 1942.

Figure 6. Geologic maps of the Central and West orebodies, Talc City Mine. From Page, 1951, p. 20.

Mineralogy

Mindat.org (2024) lists talc variety steatite as the main mineral at Talc City. Other minerals are

Amesite
Gold
Hematite (variety Specularite)
Quartz
Scheelite

The Talc City ore is fine-grained, with no megascopic flakes, needles, or fibers. Some of it is highly sheared and slickensided, but some is less disturbed and is moderately massive when first opened in the mine; upon exposure, incipient cracks open up and often produce a crude, irregular platy structure. The talc is softer than the fingernail but is quite brittle. Thin edges are translucent. Pale gray green, with or without a tinge of tan, is the typical color of the best steatite but some of the talc is dark gray and some is dark brown. The darkest varieties are said to contain more iron and alumina than the light-colored material, and most of them are not steatite (Page, 1951:16).

Megascopic impurities in some of the talc include limonite cubes that range from pin-point size to one eighth inch, veinlets and coarse chunks of calcite, and inclusions of dolomite or partly altered limestone country rock. Talc containing these substances is sorted out. More commonplace but less serious are thin stains of iron oxide, which do not contribute appreciable amounts of iron unless very abundant. Some thin dendritic films of manganese dioxide are also found, but these are not harmful (Page, 1951:16).

The run-of-mine ore is of steatite quality, and some of the select material is exceptionally pure. The following analyses, kindly furnished by the Sierra Talc Co., are representative of the quality being shipped as steatite (Page, 1951:16):

	SiO_2	MgO	Al_2O_3	CaO	Fe_2O_3	Alkalis	Loss on ign.
Sierramic #1	59.61	30.01	1.65	0.84	0.92	0.26	5.94
Sierra Hi-Grade #1	60.56	30.19	1.46	0.80	0.90	0.22	5.68

Figure 7. Geochemistry of shipped steatite from Talc City.

The accompanying photomicrograph (fig. 8) shows one mineral impurity only, a minute crystal of sphene. Other specimens of the talc show sparse microscopic specks of sphene, leucoxene, and an unknown mineral that occurs in extremely small equant grains of low relief (Page, 1951:16).

The steatite is essentially an aggregate of microscopic, matted talc flakes, shreds, and stubby slivers, the last mainly showing a length-to-width ratio of 2:1 or 3:1. Most of the grains are only 0.005 to 0.025 millimeter long, and most are anhedral to subhedral. There is no obvious preferred orientation of the bulk of the tiniest flakes, but the larger grains exhibit one or two directions of imperfect parallelism. Some of the largest flakes and shreds (about 0.5 millimeter long) occur at random, but others form continuous, ill-defined, crooked streaks with the talc crystals oblique to the borders of the streaks. A few of the larger shreds are in splotches with a sub-radiating arrangement. The writer has not seen any relict textures inherited from earlier minerals. Many non-steatite talcs show remnants of tremolite, but the Talc City ore does not (Page, 1951:16).

Geochemistry

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Table 1

Sample *	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	CaO	MgO	$KNaO$	*Ign. Loss*	*Total*
Theoretical	63.50	--	--	--	--	31.7	--	4.8	100
1-A	62.30	1.98	0.04	1.30	0.64	28.26	0.47	5.25	100.2
1-B	58.06	.85	--	1.21	.43	31.85	1.14	5.68	99.2
1-C	59.30	1.15	--	1.25	.08	32.08	.62	5.55	100.03
1-D	58.70	.68	--	1.28	.59	32.50	.22	5.98	99.94
1-E	60.05	.45	--	1.36	.09	32.10	.13	5.41	99.59

* The samples came from the following sources: 1-A, probably from Talc City mine; 1-B, Talc City mine; 1-C, White Mountain mine; 1-D, Lenbek mine; 1-E, Talc City mine.

Figure 8. Chemical analysis of steatite from Talc City. From Page, 1951, p. 12.

Origin

Steatite orebodies at Talc City have been formed by the hydrothermal replacement of massive dolomite (Page, 1951:3)

Development

The Talc City mine is said to have yielded 130,000 tons by early 1942. In 1941 the year's output was 5,800 tons, before the advent of the war-time steatite crisis. This crisis developed in mid-1942 and strained the capacity of the 20-year-old mine to the limit. The Talc City mine produced approximately 70 percent to 80 percent of the nation 's wartime steatite supply, an accomplishment which was only made possible by the adoption of more modern mining and engineering methods (Page, 1951:14).

The surface of the ground at the Talc City mine is characterized by large waste dumps, and by several [episodes of] subsidence where enormous gaping cracks furrow the surface of the ground (Page, 1951:14).

Underground prospecting and development have been carried out exclusively by driving new workings, with no geologic mapping (prior to 1942) and with no core drilling. Geologic *studies are now difficult because most of the older drifts and crosscuts are inaccessible* (Page, 1951:14).

Glory holes have been used in the past. The two largest are the" West" and the" Central"; in addition, there are the " Evening Star" and the "Ridge" glory holes. These were tapped by several adits. More recent stoping and drifting at deeper levels beneath the glory holes have caused caving, and at present large portions of the ground surface and old underground workings are subsiding. In the upper parts of the caved ground a good deal of country rock has become mingled with the remnants of talc (Page, 1951:14).

Since the days when talc was removed from glory holes through shallow ad its, a maze of deeper drifts and crosscuts has evolved, amounting to several miles of excavation. Not all of these workings are now accessible, but some are shown on the accompanying maps. There are two inclined shafts. One is on the west side of the principal hill, and the other on the east side. The west shaft starts at the A level and leads successively to the B level (63 feet lower than the collar), the 100-foot level, the C level (148 feet below the collar), and the D level (about 255 feet lower than the collar of the shaft). The shaft continues downward about 50 feet below the D level. The D level includes extensive workings, which were largely obstructed by caved talc and country rock at the time of the writer's field work (1942). According to Mr. Henry Mulryan, the D level was reopened and was yielding a substantial tonnage of steatite in 1946. Various intermediate levels are not reached from the main shaft directly but are connected by winzes or raises with the levels enumerated. In addition to the shaft, the nearby B level adit allows access to the workings (Page, 1951:14).

The eastside shaft was abandoned for some time and was reopened in 1942. Drifts branch from it at depths of 58 feet and 94 feet below the collar. The east side workings are now connected with the main workings, but were separate in 1942 (Page, 1951:14).

In addition to the principal shafts and workings, about a dozen miscellaneous adits and shafts are connected imperfectly or not at all with the rest of the mine (Page, 1951:14).

The talc is trammed by hand from the stopes to buckets in the shafts. At the surface the ore is carefully hand-sorted, to eliminate visible calcite, dolomite, iron oxide, and excessively dark talc. The bulk of the lump talc is of steatite grade; the screenings, however, are higher in lime and are not used for steatite. The steatite is sent by truck 19 miles to the company's mill at Keeler, on a spur of the Southern Pacific Railroad. There the talc is ground in a Raymond mill with a whizzer air separator on top, then it passes through a cyclone. Tests for lime content, color, and fineness are made frequently during each mill run. The product, which is minus 200-mesh, is sacked for shipment, representative samples being retained for reference. All shipments of Talc City steatite are now ground talc, which is nearly pure white regardless of the color of the ore. Most of the product is sent by rail to manufacturers in the eastern states (Page, 1951:14).

PHOTOGRAPHS

Figure 9. Talc City open pit. Photo by Gregg Wilkerson, July 2023.

Figure 10. Green talc at Talc City. Photo by Gregg Wilkerson, July 2023

Figure 11. Green talc boulder at Talc City. Photo by Gregg Wilkerson, July 2023.

Figure 12. Dolomite boulder at Talc City. Photo by Gregg Wilkerson, July 2023

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MAPS

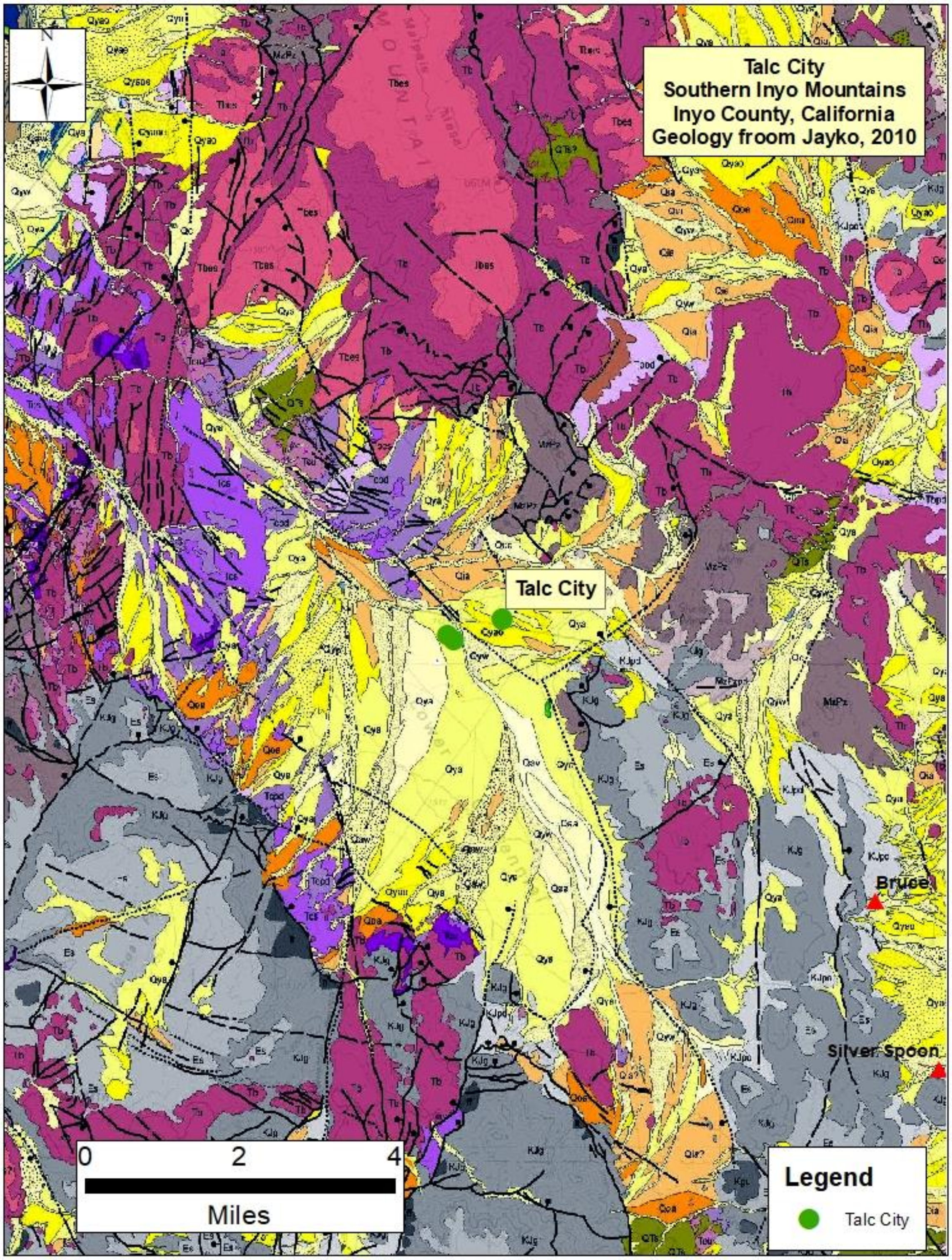

Figure 13. Regional geologic map of the Talc City Mines. From Jayko, 2010

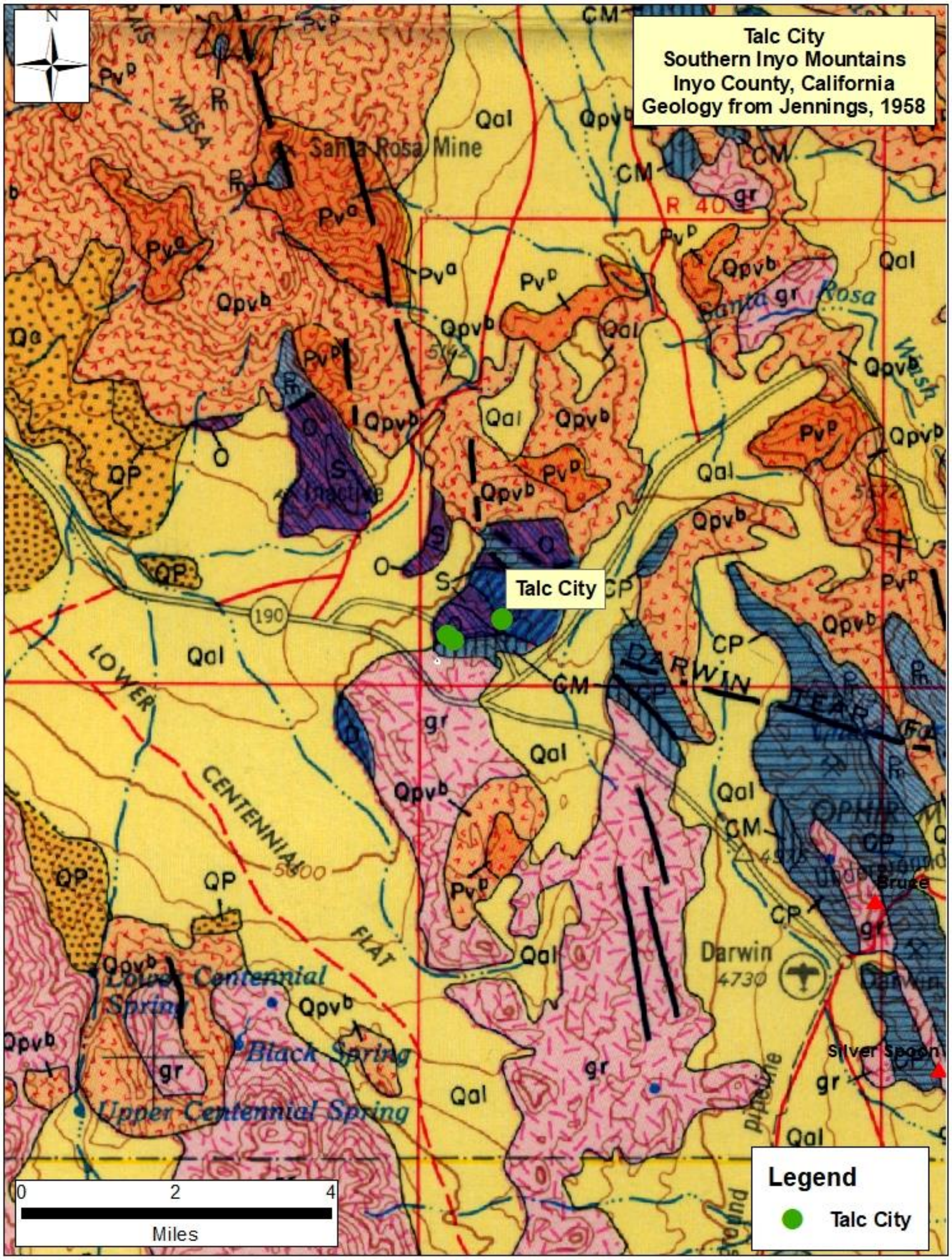

Figure 14. Regional geologic map of the Dolomite Mines. From Jennings, 1958

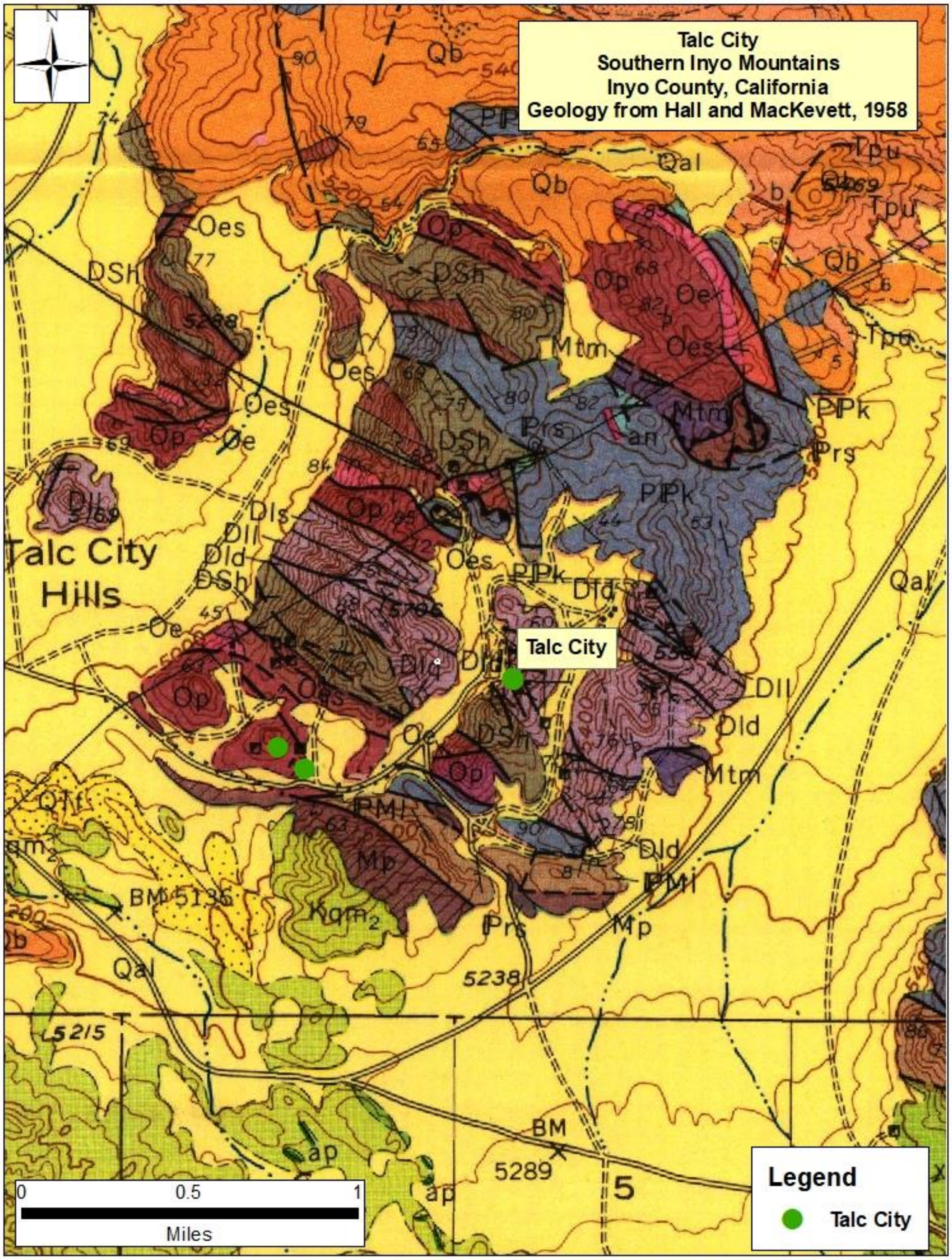

Figure 15. Areal geologic map of the Talc City Mines. From Hall, W.E., and MacKevett, E.M., 1958 and 1962

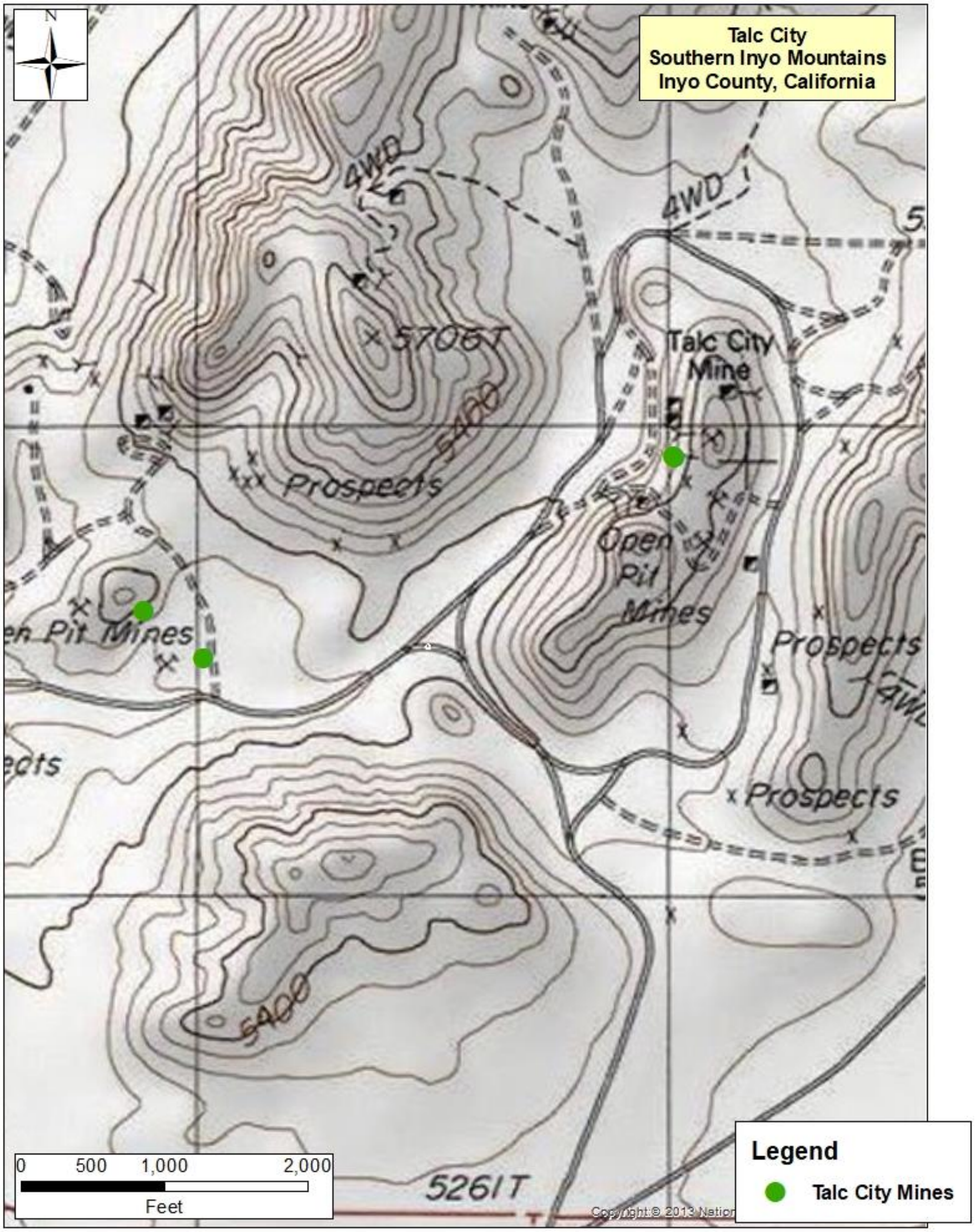

Figure 16. Topographic map of the Talc City Mines.

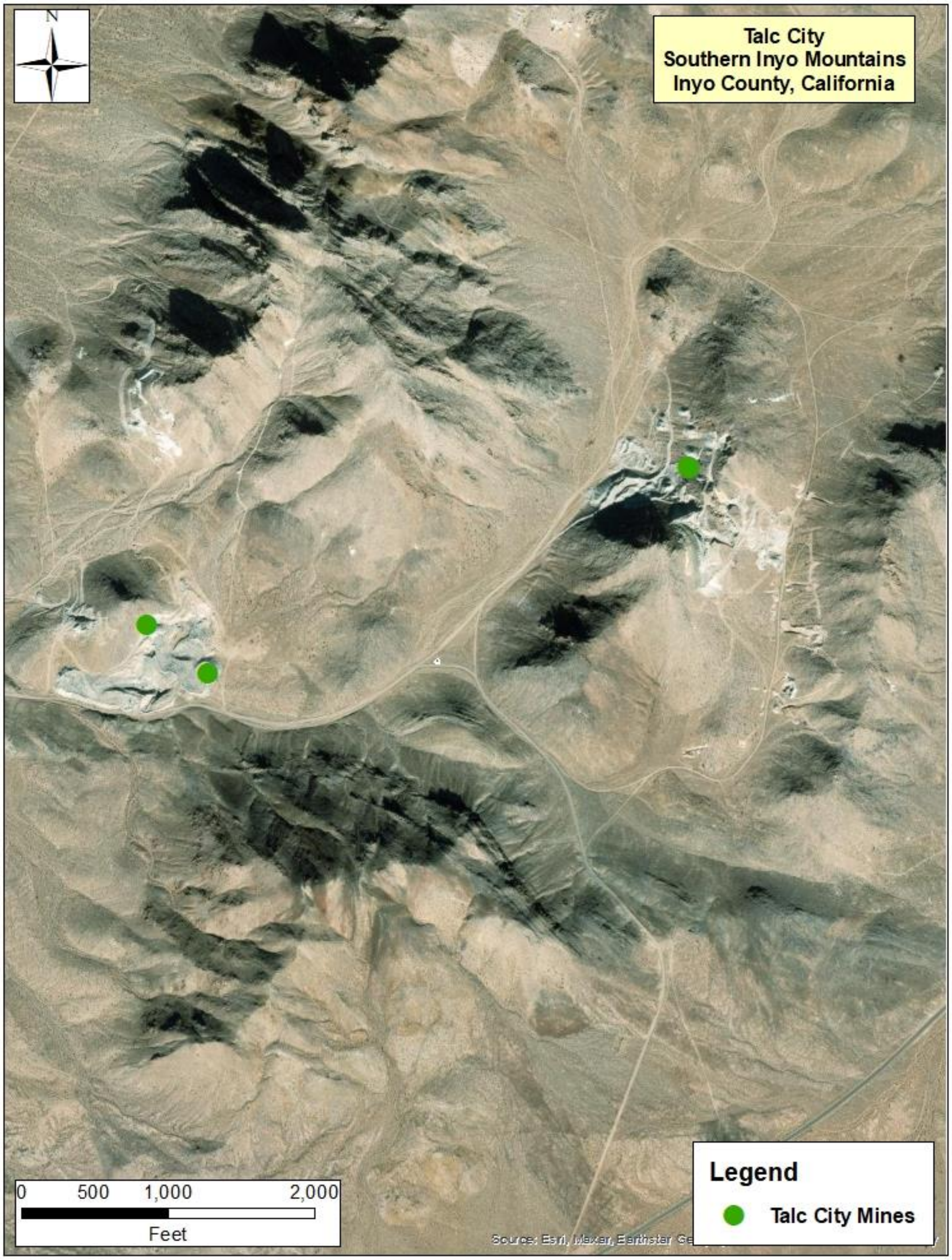

Figure 17. Aerial photograph of the main pit for the Talc City Mines.