

2340 0019

(275)

ITEM 26

SEE 9 PLATES

THE ORE RESERVES AND PROSPECTIVE POTENTIALITIES
OF THE STORMY DAY MINE AND
THE ADJOINING MINING CLAIMS
Gerlach area, Pershing County, Nevada

By
IRA E. KLEIN
Geologist

June 1955

SOME PLATES AND OR MAPS TOO LARGE TO COPY
FOR COMPLETE REPORT SEE FILE

TABLE OF CONTENTS

INTRODUCTION	3
Purpose and Scope	3
Location, Access and Topography	4
Property and Water Rights	4
 GEOLOGIC FEATURES PERTINENT TO THE ORE RESERVES	
ESTIMATE OF THE STORMY DAY MINE AND THE	
PROSPECTIVE POSSIBILITIES OF THE ADJOINING CLAIMS	5
General statement	5
Regional Geology	5
Mineral deposits	7
 BRIEF REMARKS ON CURRENT OPERATIONS	10
 ORE RESERVES	10
General Statement	10
Stormy Day Mine	10
Prospective potentialities of the Northern Groups	11

LIST OF APPENDICES

(Photocopies of some exhibits in report of John Uhalde, Oct. 1954, on completion of government sponsored DMEA projects)

1. Sample map of Drift on No. 11 Adit (225') level, made and sampled under DMEA loan in 1953. A-1
2. Report of Assays by Abbot Hanks, Inc., San Francisco, on above. A-2
3. Ore Shipments in 1954 from development raises from the Adit #11 level to Adit #2 level). A-9B
4. Eastern Ore Settlement Sheet for typical shipment to Gatchell Mines, Redhouse, Nevada from same developments as above. A-11
5. Metallurgical ^{Report} of U.S. Bureau of Mines, Reno, Nevada A-21
6. Metallurgical Report of Western Machinery Co., San Francisco A-24

MAPS (in pocket)

1. Plan of mine levels, with assay data and some geologic features.
2. Longitudinal section (semi-diagrammatic due to incomplete surveys), showing blocks of developed, probable, and possible ore within limits of exploration.

INTRODUCTION

Purpose and Scope

An examination of the Stermay Day tungsten mine and the adjoining Milky Way, Thrasher, and Thraebert groups of mining claims was made at the request of Mr. Arthur L. Damon of the Nev-Tah Oil and Mining Company. Three days were spent on the properties - May 14, 15 and 21, 1955. The express, or immediate, purpose of this assignment was to determine the ore reserves at the Stermay Day mine and to evaluate the potentialities for tungsten mining of the northern properties covered by the aforementioned three groups of claims. This report presents my findings in that respect. The broader objective - toward which the foregoing field observations and analysis of data may be considered a preliminary stage - is the more complete appraisal of the geologic situation at these tungsten deposits as a basic step in the exploitation and development of the proven and indicated ore and the exploration of untested parts of the Stermay Day mine and adjoining properties. The writers findings concerning the ore reserves and prospective potentialities are therefore advanced preliminarily, and are subject to refinement or possible modification with more complete investigations involving engineering and geologic surveying and sampling which time did not permit in the collection of data for the present report.

Beside the field inspection and essential part of the work leading to this report was the critical review of a report of October 1954 prepared by Mr. John Uhalde who managed the property since Dec. 23, 1953 for the Medec Mines and Exploration Co. This report describes the situation at the mine with the completion of a successful program of explorations sponsored by the Defense Minerals Exploration Administration involving diamond drilling, crosscutting and drifting, and bulldozer stripping. Documentary material contained in this report and government sponsored tests, ore dressing studies, and settlement sheets of typical shipments to custom mills have been taken from this source.

Virtually all the accessible underground workings and the surface prospect pits, bulldozer cuts and short adits were inspected by the writer. In the inspection of the prospects on the Milky Way and Thrasher groups I was guided by Mr. J.J. Thrasher of Gerlach, the discoverer of the Stermay Day Mine, to various ore showings and points of interest.

It is not within the scope of this report to give a complete description of the geology, mine plant and developments. The documentary material of an objective nature previously mentioned have been appended to show sources on which the writer drew to make his estimates, and also for the general information of those making use of this report. The development and current operations at the mine are briefly discussed. Also a plan drawing of the mine workings

showing some geology and assay data; and a longitudinal section, which is somewhat diagrammatic because of lack of survey information particularly for the stopes and raises, showing blocks of developed, probable and possible ore are included (in pocket). The findings on the ore reserves and prospective potentialities, presented rather summarily, in keeping with the preliminary nature of the work, are given in the concluding section of the report.

Location, Access and Topography.

The Stermy Day Mine is in the Hecker Mining District. It is on the west side of the Selenite Range, commonly called Limbo Range, in Pershing County, Nevada. It is 16 miles south of Gerlach on the Western Pacific Railroad. It lies 2½ miles east of a paved highway linking Gerlach to Reno about 130 miles south.

The mining claims for the large part lie at an elevation of 5000 to 6000 feet in a mile-wide desert foothill belt of low to moderate relief eroded in a steeply tilted sequence of limy sedimentary rocks and volcanic "caprocks" which lie west of a rugged mountainous terrain.

The topography is highly favorable for initial development by short cross-cut adits and even it appears in places by drift-adits to depths of a few hundred feet. Shafts should not be necessary for mining or exploration until operations are in a fairly advanced state such as the Stermy Day mine now approaches.

Access roads from the mine to the northern claims or from the paved highway which skirts the mountain front can be readily made at low cost and easily maintained. Several miles of fair truck road have already been constructed to various sites of exploratory activities.

The climate is entirely conducive to all-year operations - surface as well as underground. Although the region is arid, water resources appear adequate. They are discussed farther in the following section.

Property and Water Rights.

36 unpatented mining claims laid out in a north-south pattern over a distance of approximately 21,66 feet comprise the holdings. These are divided into the following contiguous groups:

- The Stermy Day group of 9 claims, on two of which - No.1 and 5, almost all the mining is localized;
- The Milky Way group of 6 claims, also referred to as the Stermy Day Extension group,
- The Thrasher group of 4 claims, and
- The Thraebert group of 16 claims, arranged in pairs along the north end.

These 36 claims covering about 720 acres appear to very thoroughly cover the potentially productive area and insure good access.

Water rights for mining and milling purposes are held on Jenny Creek about a mile distant from the camp. The millsite claims in Township 30, Range 23 East are located so as to be supplied from the Western Pacific Railroad water main. Water for camp use is obtainable from nearby springs. The No. 11 adit makes water for immediate mining needs.

GEOLOGIC FEATURES PERTINENT TO THE ORE RESERVES ESTIMATE OF THE STORMY DAY MINE AND THE PROSPECTIVE POSSIBILITIES OF THE ADJOINING CLAIMS.

General statement.

The scheelite-bearing tactite deposits on the west front of the Selenite Range which are covered in this examination are very typical, almost an ideal case, of the tungsten occurrences found along the contacts of Paleozoic and Mesozoic(?) limestones and the late Mesozoic granodioritic batholiths and their associated satellitic offshoots over a broad belt extending northeastward through the Sierra Nevada Range in central California and across western Nevada. The Bishop district in California and the Mill City district in Nevada are outstanding examples of regions where highly productive contact-metamorphic or pyrometamorphic scheelite deposits have been developed, and are now operating on a large scale. The Nightingale district which lies about 60 miles to the south of the Stormy Day, also in Pershing county, has a long record of successful operation of deposits whose geologic features, structurally and mineralogically, are notably similar to those at the Stormy Day mine.

Neither the regional geology or the mineral deposits of the area have been the subject of published reports or maps. Topographic maps are also not available. Unpublished information and aerial photographs by the U.S. Geological Survey and other government agencies are believed to be available. A comprehensive survey of the mining properties of interest or for that matter normal exploratory work should make use of these sources. It is also noteworthy that an important gypsum deposit which is mined on a large scale from an open pit by the U.S. Gypsum Co. and a less developed gypsum deposit reputed to be held by a major industrial concern lie a mile or so north of the Thraabert group.

Regional geology.

The Selenite Range has as its core a granodioritic batholith. The intrusive contact of this igneous body and the calcareous sedimentary formation it has invaded and locally metallized with tungsten runs in nearly north-south direction along the western foothills of the range for a distance of about four or five miles covered by the claims of interest.

The principal sedimentary rock invaded by the granodiorite is a thin-bedded shaley limestone comprising a formation at least several hundred feet thick, with intercalated thicker-bedded purer limestone members. In a broad way the intrusive relations are structurally concordant as the sediments were generally noted to have a north-south

strike and 50 to 70 degrees westerly dips paralleling the intrusive contact. In the northern part of the Stormy Day Mine and in the prospect adit on the Thraebert the sub-parallel nature of the intrusive contact and the sedimentary structure is clear. In detail, however there are many irregularities in the contact relations - chiefly in the form of sill-like tongues which suggest that the contact is actually cutting across the stratification with depth, dike-like offshoots-often aplitic, and cupolas or "islands" of granite. At the Thrasher group there is a rather large embayment of the limestone by the batholith. South of the main developed ore bodies at the Stormy Day mine the contact becomes strongly discordant and cuts obliquely and very irregularly in a south-westerly direction across and intertonguing with the bedded limestone.

Since the continuity of the granite-limestone contact is of prime importance as it assures persistence with depth and laterally of the main requirement for ore occurrence, the regional subconcordance of the intrusive relations and the large thickness of the limestone are considered highly favorable features of the regional geology. Irregularities along the contact are indicated by some of the ore occurrences to have a marked control over the distribution of tungsten metallization within metamorphosed contact zone; however the better ore bodies in the Stormy Day and the showings in the prospects favor the simpler more concordant intrusive relations.

Tertiary age (?) volcanism was widespread in the area, and in fact appears to dominate the geology of the country to the north and east of the Selenite Range. The older steeply-dipping marine limestones along the western foothills are covered by more gently tilted basaltic lava beds. These lavas do not cover the contact where observed in the area of interest, although they were noted to approach it closely in the Thrasher group of claims. Since they do not appear to cover the granite-lime contact to any great extent at least, the occurrence of these volcanics will not complicate the mining or exploration.

Post-mineral andesite-porphry dikes, probably related to the same period of igneous activity as the basaltic lavas, have been noted in a few places crossing the limestone near the contact. Such an east-west trending 5 to 10 foot wide dike is conspicuous at the surface at the Stormy Day mine deviding the ground up by the underground workings from the relatively unexplored terrain to the south. Where this or similiar dikes cross the mineralized contact zone they will form small barren bodies which can be left as pillars, and only minor mining problems are anticipated because of the presence.

Post-mineral faulting, with displacements small enough however to only present minor development problems, are fairly common in the Stormy Day Mine and in the prospect adit on the Thraebert claims. There appear to be two sets of normal faults. The more evident are an near-vertical east-west set which displaces the variably metallized contact zone so that the drifts along the contact head into the granitic footwall or limestone hanging wall after the pass through a fault. Getting back on the contact is a fairly simple proposition if the geologic situation is in hand. There is some evidence of north-south trending faults with dips with downthrown side on the west which could cut out the contact zone over appreciable vertical intervals. They could conceivably

cut out the contact zone, and hence potential ore bodies, over vertical intervals so as to complicate exploration for downward extension of ore sheets in some parts of the district; but here again if the geological situation is appreciated and the displacement is not too large it will not be an obstacle. On the other hand, in the course of my inspection, I saw no indication of a major fault such as might have such an effect.

Mineral Deposits.

Scheelite occurs as finely disseminated crystals in a gangue of fairly coarsely crystalline garnet, epidote, quartz and calcite. The scheelite is in apparent close association in the deeper unoxidized parts of the ore sheets of the Stormy Day mine with the iron sulfides - pyrrhotite and pyrite - which in places amount to ten or more percent of the ore. Further information on the mineralogic and textural features and the metallurgy of the ore is presented in the appendix. To a depth of about 100 feet the ore is highly oxidized and has a crumbly, often gossan-like structure resulting from the replacement of the pyrrhotite and pyrite by limonitic iron oxide. This oxidation process appears to have caused a small but appreciable enrichment in the grade of several thousand tons of ore. The deeper workings of the mine are in completely unoxidized ore - the transition occurring between about 100 and 150 feet - so that the tenor of the primary ore is not being misconstrued as higher than it actually is because of the enrichment of the oxidized ore.

The ore bodies are scheelite-bearing "sheets" in the garnet-epidote rock referred to as tactite, which has formed irregularly over a width of inches to tens of feet as a replacement of the limestone along its contact with the intrusive granodiorite. In the Stormy Day Mine between the ore bodies and the granodiorite a one to two foot coarsely crystalline grey quartzose, locally molybdenite-bearing material believed to be a greisen or silicified border phase of granodiorite is prominent and quite continuous. The peripheral silicification of the granodiorite and the occurrence of iron-sulfides are taken to be ore indicators in prospecting the tactite.

The limestone has been recrystallized over a width of about one-hundred feet bordering the contact. This metamorphosed rock ranges from a sugary-textured pure marble to a rock containing much pale green epidote and pinkish garnet - which is properly called a calc-silicate hornfels. The variation in the amount of calcite and silicates reflects the purity of stratified limestone hostrock. The hornfels, although characteristically paler colored than the tactite, may be mistaken for tactite with the consequence of misguided exploration, for the hornfels is barren. Also the purer limestones and their sugary-marble derivatives are more favorable as host rocks for the development of tactite, and for the availability of calcium for reaction with the ore-forming solutions emanating from the granodiorite for deposition of scheelite, which is calcium tungstate.

The scheelite bearing tactite bodies in the Stormy Day Mine have measured thickness of up to 16 feet; however, on the whole the ore bodies are in the order of four to ten feet thick. Near the surface at the Stormy Day mine, the ore body has been exposed over a length of 160 feet and although offset a few feet by a fault is believed to extend north for an unknown distance. It has surface width of 12 feet. At 20 to 50 feet below the

surface, the ore body, here highly oxidized and appreciably enriched as noted earlier, may be 20 or more feet wide as indicated by development work, in progress at the time of my examination, which had not reached the footwall.

Thus far the significant ore-showings and proven ore bodies appear to be along the main contact zone and not on the smaller intrusive offshoots such as are prominent in the south end of the Stormy Day mine. However the shallow rather wide ore body mentioned above appears to be localized either in a footwall "roll" or flattening of the contact, or in a trough between the main body and short tongue-like offshoot. The southern termination of an ore body on the south end of the drift off the No. 11 adit appears to have as its structural control a steep northwesterly plunging trough formed by a thick sill-like offshoot of the here highly discordant granodiorite.

The influence of post-mineral faulting and post-mineral dikes has been discussed in a preceding section. Unless strike faults with large dip-slip components are more important than was evident during the preliminary inspection faulting should not have a serious effect on the mining potentialities with depth.

In the underground workings at the Stormy Day mine the contact has been explored over a length of 300 feet along drifts at 105 and 125 feet below the surface, and over a length of 350 feet along a drift at 225 feet. Three ore sheets, each 50 to 70 feet wide dipping 50 to 60 degrees west, extend from the upper to the lower level. The central block is fully developed, the others partially. Above the 105-125 level the two southern ore sheets are joined into the wider and thicker flatter dipping single body which has been exposed at the surface. The northern crescent is inferred to also continue to the surface, but to be offset to the east by a small fault. The surface in this part of the contact zone has not been stripped of a cemented bouldery overburden which although thin is obstinate to clear even with a bulldozer. The inference concerning northern extension is based on the occurrence of ore float and the abrupt termination of the 125' thick ore body against marble along a brecciated zone interpreted to be a fault of small displacement found in the underground development.

The central orebody has been proven to extend below the No. 11 Adit level (225') as a result of the diamond drilling phase of a D.M.E.A. sponsored exploratory program. In this operation a station was slashed in the southwall of the No. 11 adit and 4 holes were drilled which crossed the contact 100' down dip from the drift off this adit. Three of these holes intercepted the central orebody. These holes only explored a 90 feet lateral distance along the contact zone. Obviously the number and spacing of the holes was not wide enough to prove downward extension of the other crescents. (This remark is not made as criticism of the drilling program but to note their severe limitations) Also two holes were drilled to cut the contact 85' further down dip. These cored mineralized but not ore-grade tantalite at points only 30' apart in the contact zone. This suggests a possible bottoming of the central ore body. However because of the short distance along the contact sampled by these tests their negative results is not cause of discouragement, in view of the proven facts of ore occurrence in the better explored parts of the contact.

The inherently discontinuous nature of metallization in contact metamorphic deposits makes bottoming of some cresshoots a normal situation in the best of mines. However depth below the surface has absolutely no significance within the vertical intervals involved in ordinary mining operations in this type of mineral deposit which formed at depth of many thousand of feet and owe their present near surface occurrence to uplift and erosion. The probability of finding other ore bodies by exploring the contact at the deeper elevations is just as good as on the drifts on the 105-125' and 225' levels.

On the Milky Way group two strong ore-grade creppings of mineralized contact which is generally obscured by overburden have been found in surface prospecting. A drill hole spotted to test the contact 200' below the southern of these showings cored a mineable width of ore comparable to the unoxidized ore of the Stormy Day mine. The contact zone is gashed deeply by a canyon a hundred yards or so south of the drill site. Scheelite is reported in the tactite exposures in the canyon. It appears that backs of a few hundred feet can be obtained by locating the portal for an exploration drift in the canyon with obvious advantage over crosscutting through the limestone to reach the contact. More exploratory drilling and at rudimentary engineering and geologic surveying will be required to check this idea.

On the Thraebert group, about three miles north of the Milky Way, a surface showing was investigated by a crosscut which was successful in finding marginal-to fair milling grade ore along the contact at about 125' below the surface. The mineralized contact pinched out about 15' north of the crosscut, and a few feet beyond faulting put the heading in the limestone hanging wall. Getting back to the contact to explore it further simply involves turning east. The drift to the south was more encouraging. It followed a thin but mineable width of ore about 60'. The breast was partially in ore of an estimated $\frac{1}{2}$ to $\frac{3}{4}$ percent grade. The main significance of this prospect is proof of the persistence of tungsten metallization this far north on the contact.

The Thrasher group is located between the Milky Way and the Thraebert groups. Here a large embayment of the granodiorite batholith cuts westward across the regional strike of the limestone. On the east-west striking and vertical-dipping southern contact of this offshoot three prospect pits spaced 100' apart expose a 4' thickness of oxidized tactite. The center pit is in fair grade ore. Here again, as in the Thraebert prospect the main significance is the proof of tungsten metallization over the long contact zone. Some unsuccessful short holes on these claims by previous holders can be discounted as not highly significant on geological grounds even with cursory inspection.

Of the three groups of prospects the Milky Way appears to merit priority in an exploratory program, which appears justified if kept on a moderate scale and geared to the Stormy Day operations. The geological situation regionally and from the standpoint of the nature of the mineral deposits, is interpreted from my reconnaissance to be favorable for the discovery and extension of ore bodies in the Stormy Day Mine, and for the development of ore bodies comparable to these on the Stormy Day on the mining claims to the north.

BRIEF REMARKS ON CURRENT OPERATIONS.

At the time of the writers inspection during the period May 14-21, 1955 development work was going on in two places in the mine - in the oxidized ore between the 125' level and the surface, and in the primary ore above the 225' level in the northernmost of the ore bodies. Striping of developed ore can be started when desired. Ore being mined in the current development was being stored in stopes above the 225' level. Work of an exploratory nature was in progress in the south heading of the drift on the 225' level. Scheelite-bearing tactite of sub-ore grade was showing up in the breast after following barren granite-marble contact a short distance. The operation was under the supervision of Mr. John Uhalde who as noted in the introduction has managed the property since December 1953.

My impression of the mine layout, development procedure, equipment, safety, and employee morale was excellent.

ORE RESERVES

General statement.

Whether or not mineralized rock - in this case tungsten-bearing tactite - is "ore" depends on mining costs and market conditions. A cost study by the previous management presented in the report referred to in the introduction, based on 1500 tons per month production including mining, development, milling, acid treatment, and hauling shows a direct total cost of \$14.60 per ton. Based on current \$63 per unit price and a recovery of 85% or better, a cut-off grade of 0.25% over a mining width of 5 feet was used to define "ore". (This value approximates a minimum quality necessary to produce at no loss. It must not be confused with an average grade which necessarily be higher for a profitable operation.)

Another condition implicit in an ore reserve estimate is the depth, or vertical range involved. Thus in the figures advanced below, "developed ore" has its bottom set at the 225' level; "probable" ore approximately by the evidence of core drilling below this level; and "possible" ore occurrence is strictly a matter of geologic inference - supported of course by tangible evidence of ore showings.

Stormy Day Mine

The ore reserves of the Stormy Day Mine to a depth of 400 feet below the outcrop of the contact zone, including the relatively unexplored mineralized ground south of the main workings, is estimated at 53,000 tons of scheelite-bearing tactite with minimum grade and thickness of ore shoots as specified above in the definition of "ore".

This 53,000 tons of ore is further classified as follows:

Developed Ore	23,000 tons with an average grade of 0.7% WO_3 of which about 10,000 tons of the highly oxidized portions have grade 0.7 - 1.0 %.
Probable Ore	17,000 tons with grade of more than 0.25% but probably no higher than 0.7%
Possible Ore	13,000 tons with grade as above.

Below the depth of 400' covered in the above estimate, and laterally over a distance along the contact zone of 500', it is inferred that a possible 10,000 tons of ore can be developed per hundred feet of depth. Exploration, development, and mining costs necessarily increase with deeper operations. The geologic situation is believed favorable of tungsten deposition well beyond the probable range of economic mining which is probably in excess of 1000 feet. Assuming a depth of 1000' a prospective potential of more than 100,000 tons of milling grade ore is indicated.

Prospective Potentialities of the Northern Groups.

The Milky Way, Thrasher, and Thraebert prospects are too little explored to make any sound estimate of ore reserves. However, it is my opinion that systematic exploration with close geologic and engineering control, with priority to the Milky Way group, offers good possibility of developing one or more mines comparable to the Stormy Day, and some smaller producers.

Ira E. Klein

Ira E. Klein

STORMY ~~THE~~ MINE

Read connecting mine to highway with Selenite Range in
background and mine in middleground.

Cro bin at Adit No. 11

PORTAL VIEWS



Adit No. 11 at Stormy Day Mine



Prospect adit on Thraebert group.

STORMY DAY MINE

Ore body exposed by bulldozer stripping, near final development underground.



Hole-through of development raise on hanging wall of the ore body.



Looking south from raise along strike of ore body, Mine Superintendent Uhalde is about 90 feet away on the footwall contact.

THRASHER GROUP OF CLAIMS

• JUN • 55



Exploratory access road

• JUN • 55



Tactite ore-showing in prospect pit