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RM00-461

Report on

GRANITE WASH DISTRICT  
HENRY MOUNTAINS AREA, UTAH

June, 1945



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by  
A. H. Coleman, Leonid Bryner,  
and J. W. Hill

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UNION MINES DEVELOPMENT CORPORATION  
GRAND JUNCTION FIELD OFFICE  
GRAND JUNCTION, COLORADO  
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Granite Wash District  
Henry Mountains Area, Utah

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*WMS*  
~~Union Mines Dev. Corp.~~

Grand Junction, Colo.

Mr. Robert H. Ridgway  
18th Floor - 50 E. 42nd Street  
New York City 17

June 22, 1945

Letter of Submittal  
Granite Wash District  
Henry Mountains Area, Utah

Dear Mr. Ridgway:

Attached is a report and set of maps covering the Granite Wash District, Henry Mountains Area, Wayne County, Utah.

This district was mapped, studied, and a report written by A. H. Coleman. Coleman's report was considered inadequate and it was revised and rewritten by Leonid Bryner, who acted as Coleman's assistant during the course of the survey. Bryner was assisted by J. W. Hill in estimating the ore reserves of the district. Hill is familiar with the deposits of the locality from his work with U. S. Vanadium Corp. and Metals Reserve Company.

The type of mineralization is rather limited in size and habit of occurrence and is widely dispersed. An inferred reserve of about 10,000 tons has been calculated. There is insufficient positive or indicated ore to warrant setting up calculations.

The district habit of ore occurrence is not uncommon in the Colorado Plateau vanadium-SOM region. This type of deposit is only amenable to small scale operations such as exploitation by individual entrepreneur miners during periods of high prices.

Respectfully submitted,

*Benj. N. Webber*  
Benj. N. Webber

BWW/dab



Granite Wash District  
Henry Mountains Area, Utah

INTRODUCTION

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Location and Accessibility

The Granite Wash District lies along the east flank of the Henry Mountains, in Wayne and Garfield Counties, Utah (see Index Map, Fig. 1). From about 5 miles south of Hanksville it extends south approximately 22 miles to North Wash where it connects with the Trachyte District which is described in a report by A. M. Mastrovich, dated December, 1943. The average width of the mapped area between Hanksville and North Wash is about 2 miles, a distance corresponding to that between the east and west limits of the Morrison outcrop.

Green River is the nearest base for supplies and the nearest railway shipping point. It is on the main line of the Denver and Rio Grande Western Railway, between Salt Lake City and Grand Junction, Colorado. Via U. S. Highway No. 50, Green River is 111 miles west from Grand Junction and 188 miles southeast from Salt Lake City. Up until February 28, 1944 vanadium ore was being accepted at the Metals Reserve stockpile at Thompsons, 27 miles east of Green River on U. S. Highway No. 50.

Hanksville has a post office but no store. It is accessible from Green River by 62 miles of dirt road (State Highway No. 24). From Hanksville southward, a dirt road parallels the eastern margin of the Morrison outcrop to the Trachyte ranch.

During winter and during periods of torrential rains in summer, the roads south from Green River may be impassable for a week at a time. Between Green River and Hanksville, Iron Wash and the Muddy River especially are likely to offer difficulties after heavy rains. Since the road from Hanksville to Trachyte crosses the drainage from the Henry Mountains, it may also be rendered temporarily impassable by floods. However, whenever dry weather prevails, heavy trucks may be driven over these roads.

Although the mineralized area is, on the average, not more than 3,000 ft. in an airline from the Hanksville-Trachyte road, it is very poorly served by branches from this road. There are 3 or 4 such branches, but they are barely passable in a one-half ton pickup truck.

Field Methods

The field work was done by Party No. 1 of the Union Mines Development Corporation. The personnel of this party consisted of A. H. Coleman, party chief, Leonid Bryner, Louis Moyd, and G. W. Massler, Jr.

A tent camp was established four miles up Granite Wash from the Hanksville-Trachyte road, on the homestead of Cornelius and Riter Ekker. The advantages of this campsite consisted in a good spring, a location fairly central to the district, and accessibility by road.

Since no suitable base map was available, a triangulation system on the scale of 1 in. = 2000 ft. was laid out by means of a telescopic alidade. Triangulation was carried north from the baseline used by A. H. Mastrovich and party in mapping the Trachyte District. In the course of mapping, the following section corners were tied in:

- SW. corner Sec. 7, T. 31 S., R. 12 E.
- SW. corner Sec. 3, T. 31 S., R. 11 E.
- SW. corner Sec. 19, T. 29 S., R. 12 E.
- SW. corner Sec. 21, T. 30 S., R. 11 E.

Contacts between formations, mineralized showings, main drainage, and roads were mapped by Brunton, locations being obtained by intersection from points in the triangulation system.

Prospecting was accomplished on foot, along the Salt Wash outcrop. Usually two men worked together at this, walking abreast. It was often necessary to traverse a certain length of rim two or three times in order to prospect it completely.

Forty-four columnar sections on a scale of 1 in. = 40 ft. were taken at intervals throughout the district. This was usually done by members of the party individually, leveling up from the lower contact by Brunton and compensating for the dip of the beds by setting it off on the clinometer. The purpose of these columns was to show the variations in thickness and lithology of the Salt Wash member of the Morrison formation.

Ten profile sections, on a scale of 1 in. = 1000 ft., were made. This was done by Brunton-tape traverse along straight lines roughly normal to the trend of the outcrops. It required two to three men working together.

The mineralized outcrops were numbered and described in the course of mapping and prospecting.

#### General Purpose of Survey

A small amount of high-grade ore is known to have been mined and shipped from the district as early as the first World War.

It was the purpose of the present survey to evaluate what was left of these resources, and to find any ore that may have been overlooked. There was also the broader purpose of observing and recording information of regional importance concerning the stratigraphy, structure, sedimentation, and general geology of the Salt Wash member of the Morrison formation.

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Acknowledgements

Cornelius and Riter Ekker of Hanksville proffered information on the district and allowed the party use of their homestead for a campsite.

Ted Ekker acted as wrangler during the two weeks it was necessary to use horses, and Darys Ekker spent a day with the party in order to insure that all the known ore showings were seen. Both were compensated for their services.

Mrs. Maxfield of Hanksville greatly helped party morale with her cooking.

The microscopic work on Column No. 47 was done by Carl H. Broedel of Union Mines Development Corp., and his findings are imbodyed in the discussion of Salt Wash stratigraphy.

GEOGRAPHY

Physiography

The physiography of the district reflects its main structural feature; namely, a series of relatively conformable, flat-lying, sedimentary beds tilted up on the west by the Henry Mountains intrusive.

Corresponding to the east margin of the Morrison, Summerville, and Curtis outcrops, where these sediments dip from 1/2 to 2 1/2 degrees west, is a deeply indented escarpment, 100 to 500 ft. high. Here the Summerville usually forms a cliff, as do the thicker sandstone beds of the Salt Wash member of the Morrison formation, especially where it immediately overlies the Summerville formation.

Erosion remnants of the Summerville and Entrada along the base of this escarpment give rise to the picturesque rock forms known as "stone-babies" and "Demoiselles".

Deep embayments occur in this escarpment where drainage from the Henry Mountains crosses it. The drainage gives rise to headwalls in the stream channels, especially where they traverse the massive beds of the Salt Wash sandstone.

From Granite Wash southward, the western margin of the Salt Wash and the underlying Summerville and Curtis are upturned to an angle of about 14 degrees, thus forming a hogback, the steep side of which faces the Henry Mountains. Here also the Summerville usually forms a cliff, and this cliff commonly continues up into the Salt Wash.

Eastward drainage from the Henry Mountains breaches this hogback, but in most cases the streams first have been deflected

along its base to points where the hogback arches out farthest east, the breaches occurring at such points.

The terrain between the east and west margins of the Salt Wash roughly corresponds to the dip-slope of that member, being relatively flat except for the arroyos which dissect it and an occasional butte, often capped with alluvium. Through this part of their course, the gradient of these arroyos is fairly even.

The vicinity north of Granite Wash differs from that to the south in the absence of the hogback. This difference may be due to a lack of upturning of strata in comparison to the area south of Granite Wash.

### Topography

The Index Map (Fig. 1) is based on a sectional aeronautical chart published by the U. S. Coast and Geodetic Survey. This chart is the only published large-scale map of the area showing topography available.

Taken as a whole, the district has a gentle slope from west to east and an abrupt slope along those two margins.

The most southerly triangulation point on the crest of the hogback has an elevation of 5,857 ft., while about 6 miles north of there, where the crest ends, its elevation is 5,901 ft. At the east margin, the top of the escarpment near the south end of the district has an elevation of 5,159 ft. while 18 miles north of there this escarpment shows an elevation of 4,506 ft.

At the east margin, where the strata break off abruptly in a bluff, the relief between the toe and top of the bluff varies between 100 and 500 ft. and probably averages about 300 ft.

The maximum relief between the crest and toe of the hogback is about 500 ft.

Elevations were obtained by vertical angle shots to known points in the Trachyte District.

### Water Resources

There are no permanent streams in the district. Bull Creek, Granite Wash, and North Wash may carry a small flow up through the first part of August. However, the duration of flow varies greatly as it depends on the melting snow in the Henry Mountains.

Numerous springs in the district supply up to 10 gallons per minute each. These springs generally occur near the Summerville-



Salt Wash or Salt Wash-Brushy Basin contacts.

Poison Spring is the only one that has been improved by the U. S. Grazing Service, a storage tank and water box for stock water having been installed. From the standpoint of quantity and quality, the spring in Granite Wash at the campsite appears to be the best in the district.

The water rights on Bull Creek are owned by the Fairview Ranch.

Dutler Wash, about a mile from where it emerges from the Salt Wash rim, has been diverted and dammed to form a small reservoir for serving stock. It contained water through the beginning of July, 1944, but was subsiding rapidly at that time.

A small reservoir was found about half a mile north of the branch leading from the Trachyte-Hanksville road to Poison Spring. It was dry during June and July, 1944, except for short periods following summer rains.

### Vegetation

Sage brush of the "white" variety is very common throughout the district. There is enough bunch grass to afford grazing for a few horses and cattle in all seasons.

The canyons contain isolated stands of cottonwood. Pinon and juniper begin to appear at the east margin of the district, increasing toward the west as the elevation increases, yet never attaining enough abundance to be classified as forest.

Timber can be secured at Sawmill Basin, about 10 miles southwest of the Fairview Ranch. Here, pine and aspen is available for mine props. Sawmill Basin is readily accessible by truck or car over a road built by the CCC.

### Climate

The climate may best be described as arid. Annual rainfall averages around 9 in. and is fairly evenly distributed among the seasons. Light snowfalls occur in winter, and in summer precipitation usually takes the form of heavy, very local showers that last for short periods.

Summer days commonly bring temperatures of 90° F. or more. The daily average variation of temperature is on the order of 40° F.

## GEOLOGIC RELATIONS

### Areal Distribution of Cartographic Units

#### Entrada Formation

On the west margin of the district the Entrada sandstone of Jurassic age outcrops along the base of the Salt Wash hogback. Here it is exposed continuously from the south boundary of the map (Utah-hm-7) to the point on the northeast flank of Bull Mountain where the hogback terminates.

Along the east margin there is a corresponding exposure of Entrada that disappears about 4,000 ft. south of where Butler Wash crosses the Hanksville-Trachyte road. About  $3\frac{1}{2}$  miles north of there the Entrada emerges again for a distance of about 1 mile. There are only two more exposures of it, besides the foregoing; namely, about 1,000 ft. of outcrop  $\frac{1}{2}$  mile south of Granite Wash, and about 1 mile of outcrop just ~~west~~ east of Station 28, at the north end of the south sheet (Utah-hm-7).

The thickness of this formation is indeterminate because its lower contact is covered.

#### Curtis Formation

The Curtis formation overlies the Entrada and outcrops just above it. Its outcrop has the same north limits as the Entrada, but pinches out toward the south, disappearing about  $\frac{2}{3}$  of a mile south of Butler Wash on the east rim, and on the west rim near where Granite Wash breaches the Morrison hogback. On the west rim the Curtis is exposed in its total thickness. On the east rim the Curtis is continuously exposed except for about 2 miles near its north extremity, and 2 miles near its south extremity where alluvium covers it. In places along this rim where the Entrada is covered, alluvium also obscures the base of the Curtis.

#### Summerville Formation

The Summerville formation overlies the Entrada and Curtis, where the latter is present, and is exposed continuously along the west rim in the steep face of the Morrison hogback. All along this hogback its total thickness shows, but in the outcrops along the east rim, its base is covered with alluvium for a total of about 4 miles.

#### Morrison Formation

The Salt Wash member of the Morrison formation overlies the Entrada, Curtis, and Summerville, and shows continuously along the east and west rims of the district. Its outcrop also occupies a large portion of the area between the east and

west rims. Outliers of the Brushy Basin member of the Morrison formation and alluvium occupy the rest of this area. North of Granite Wash, the overlying Brushy Basin to the west limits the Salt Wash exposures in that direction. In the south half of the district, erosion has eliminated the top of the Brushy Basin. However, in the north half, where the Brushy Basin is capped in a few places by small outliers of Dakota sandstone, its total thickness is exposed.

### Dakota Formation

The Dakota sandstone, of Cretaceous age, has a very limited distribution. It occurs only in the north part of the district where it forms a rim in three small buttes and a cap rock in four others.

## Stratigraphy

### JURASSIC SYSTEM - SAN RAFAEL GROUP

#### Entrada Formation

The thickness of this sandstone is indeterminate because the lower contact is not exposed in the district. However, according to Baker<sup>1</sup>, the Entrada about 25 miles northeast of the Henry Mountains, on the Green River desert, is about 450 ft. thick, while at the Circle Cliffs, according to the same authority, the Entrada is about 1,050 ft. thick. Interpolation between the thicknesses at these two areas indicates a thickness of about 750 ft. in the district covered by the present report.

The Entrada as exposed within the district varies from a reddish-brown mudstone to a fine-grained sandstone, with some interbedded gray-white to cream-white beds. These lighter beds are more resistant to weathering than are the reddish beds. The formation contains some thin shale seams of limited extent.

Erosion weathers the formation into fantastic columns and bosses. It forms the valley floor at the base of the rims. A marked local angular unconformity was noted between the Entrada and Curtis formations.

#### Curtis Formation

This formation varies from 30 to 35 ft. in thickness except in the southern portions of the district where it pinches out rather suddenly. It consists of fine-grained, thin-bedded, glauconitic shale and shaly sandstone. Its color is grayish-green, and slight cross-bedding is locally evident. It is

<sup>1</sup>Baker, A.A., et al, Correlation of the Jurassic Formations: U.S.G.S. Prof. Paper 183, Plate 4, 1936.

non-resistant to erosion and forms slopes. Some gypsum was noted, with chalcedony replacing some of the gypsum.

### Summerville Formation

This formation varies in thickness from 109 to 160 ft. It consists of thinly bedded, reddish-brown and grayish-white mudstone or very fine-grained sandstone. Included are large quantities of bedded gypsum as well as secondary veinlets of gypsum cutting across bedding planes. Quantities of chert and chalcedony are also present. The formation is notable for its even, well-defined bedding, and for the fact that most of these beds are under one foot thick. Although soft and non-resistant to erosion, it is protected by the relatively resistant capping of the Salt Wash sandstone, thus forming striking vertical cliffs. The contact between Summerville and Salt Wash is gradational.

### JURASSIC SYSTEM--MORRISON FORMATION

#### Salt Wash member

The importance of this member consists in the fact that it is the locale for all the known ore in the district.

Where the Salt Wash is exposed in a bluff or cliff it appears as a series of irregular, discontinuous sandstone beds interbedded with maroon to grayish-green mudstones. Limestone interbedded with shale and sandstone occurs throughout the base of the member up to about 70 ft. above the lower contact. But through the rest of the member, sandstone predominates over other rock and also forms the most striking outcrops. Individual beds 40 ft. thick are common and will often make a sheer cliff. Some of these beds attain a thickness of 75 ft., and some are less than 1 ft. thick. Pale gray and pale tan are common colors of the weathered surface. Lensing will often change the thickness of a bed by as much as a foot in a distance of 3 feet. Widespread and complex cross-bedding is another characteristic, cross-bedding being the rule rather than the exception. The top and bottom of the sandstone beds are usually clearly defined by overlying and underlying mudstones, but within the sandstone itself, the cross-bedding and horizons marked by changes in grain size are usually rather obscure. This is apparently the result of poor sorting during deposition. Where the original surface of contact with overlying or underlying mudstone is exposed, this surface commonly will be found undulating and bumpy. The basal surface sometimes exhibits a network of mudcrack casts.

Specimens were taken from various horizons of the Salt Wash in Column No. 47. A pulverized portion of each specimen was examined microscopically at a power of 45x, using both reflected and transmitted light. There were 33 specimens in all, covering



a stratigraphic range of 346 ft. The results of this examination are summarized below.

Except in the lower 40 ft. of the column, where limestone, shale, and gypsum are common, the visible exposures are essentially of sandstone. It is a quartz sandstone in which the estimated grain diameter varies from 1/32 mm. to 2 mm. The grains are sub-angular to sub-rounded, and seldom well-sorted. The only other grains that approach quartz in abundance are of chert.

The two chief cements appear to be calcium carbonate and clay. They are usually associated with each other and the carbonate seems to predominate slightly.

Secondary silica, barite, and limonite also occur as cements, widespread in small amounts, but rarely present in any quantity.

Accessory minerals are not abundant and consist mostly of resistant minerals, such as tourmaline and zircon, which may survive several cycles of sedimentation.

What is called mudstone in this report has been described as shale or as siltstone in some other reports. It seldom has the platy parting of typical shale. In some places it may grade into a typical siltstone, if grain size is the criterion for distinguishing between siltstone and mudstone. This distinction was not attempted in the field.

In the Salt Wash of the district, mudstone is second in abundance to sandstone. Its position in cliffs of sandstone is usually marked by a groove. Where it is interbedded with sandstone beds of about the same thickness as itself, a slope usually results. Its thickness is as irregular as that of the sandstones and it is even less continuous. Though its usual thickness appears to be between 1 and 3 ft., in some cases it will reach 10 ft. The beds, however, are by no means uniform from top to bottom. Shaly and liny phases are common, and changes of hue occur longitudinally as well as vertically.

The basal phase of the Salt Wash differs distinctly from the overlying portions. However, the contact of this basal portion with the overlying beds is gradational. From the columns taken throughout the district, the average thickness of this basal phase is about 50 ft., but reaches as high as 75 ft. It is characterized by sandstone, shale, and limestone in about equal quantities and in beds averaging about 1 ft. in thickness. Lenses and beds of gypsum are common also. In general, the series is slope-forming, though a 5- to 10-ft. cliff often occurs at the base. This feature may be due more to the sapping action of the underlying, soft Summerville than to any extra softness of this portion.

The common color of this basal portion is pale gray with a faint greenish cast. Most of the limestone in the Salt Wash occurs here, but occasionally a thin, isolated bed will be found higher up in the series. In such cases it is usually associated with the mudstones. Beds within the Salt Wash seldom show any correlation from column to column.

A comparison of columnar sections shows that along the east margin of the district the Salt Wash decreases from 340 ft. at a point  $1\frac{1}{2}$  miles south of Butler Wash to a thickness of 210 ft. at a point about 16 miles north of there. Along the west margin, the thickness decreases from 447 ft. at a point about 7 miles above the southern boundary of the district to 220 ft. at a point 7 miles farther north. Other columns bear out these trends. The direction of maximum decrease in thickness is somewhere west of north. A columnar section (No. 46) taken north of the district, 13 miles due west of Hanksville on the Hanksville-Notom road, showed a Salt Wash thickness of only 80 ft., mainly gypsum.

#### Brushy Basin member

Where the section is completely exposed, the thickness varies between 210 and 313 ft. The lower 60 to 70 ft. is a rusty to dark-brown, medium- to coarse-grained sandstone with some grit in evidence. It also contains interbedded conglomerate with pebbles up to 1 in. in diameter. In this conglomerate there is some local cross-bedding. The remaining upper portion of the member consists of dark pink, reddish-brown, grayish-white and greenish-gray shales and mudstones. Interbedded with these shales and mudstones are occasional thin beds (less than 2 ft. thick) of sandstone that is fine- to medium-grained and shows local cross-bedding. Quantities of chalcedony were noted. The upper portion of the Brushy Basin, where shales predominate, weathers to characteristic "Bad Land".

Only four complete sections were obtained and these were distributed over a north-south span of 7 miles, in the northern part of the district.

#### CRETACEOUS SYSTEM

##### Dakota Formation

In the northern part of the district where the section is completely exposed, the Dakota was found to be 30 ft. in thickness. It was not studied in detail. A 4- to 6-ft. coal seam about 10 ft. below its upper contact was noted.

##### Jancos Formation

This formation was not exposed in its entirety. It was observed only to the extent of noting a basal sandstone unit containing abundant "oyster" beds.

## Structure

The sedimentary beds in the east part of the district dip gently westward toward the Henry Mountains. This dip, which appears to be regional, varies from  $1/2$  to  $2\frac{1}{2}$  degrees. The strike is generally NW-SE., although local E.-W. strikes were noted. Along the base of the Henry Mountains, the effect of the Henry Mountain intrusive appears in the upturning of the sediments, the dip being toward the east and reaching a maximum of 34 degrees. The result of these two opposite dips is a syncline having a wide, gently-dipping east limb and a narrow, relatively steep west limb. In the north part of the district where the Salt Wash outcrop veers away from the Henry Mountains, the west limb fades out and the structure becomes a homocline with a gentle westerly dip.

During the uplift, a section of sediments, including all the local formations from the Entrada through the Mancos, was broken away and left on the higher flanks of the Henry Mountains. The thin strip of Salt Wash that remains there was prospected but not mapped as only one ore showing (No. 1) was found there, and it seemed a relatively unimportant one.

## District Habit of Ore Occurrence

The average length of mineralized outcrop is 30 ft. and its thickness as seen in the face averages less than 1 ft. Mineralization almost invariably consists of silicified, carnotite-stained logs or vegetal matter, surrounded by vanadiferous sandstone and shale; it is confined to the Salt Wash member of the Morrison formation.

## ORE DEPOSITS

### History and Production

"Near Trachyte Creek the Standard Chemical Company has done a large amount of development work, and in 1914 shipped considerable ore."<sup>2</sup> Probably some of this ore came from the district under consideration, as it is known to have produced ore that early.

Thirty-one of the thirty-three outcrops described in this report, namely the ones lying along the east rim of the Salt Wash outcrop where it parallels the Hanksville-Trachyte road, were located by Cornelius Ekker et al of Grand Junction. It has since been reported that the claims covering these outcrops have been sold to the Canadian Radium and Uranium Corp. of New York. In addition, all open ground between these outcrops

<sup>2</sup>Butler, B.S. et al, Ore Deposits of Utah: U.S.G.S. Prof. Paper 111, p. 630, 1920.

from Butler to North Wash has been located, regardless of ore showings, by the same concern, under the group name of "Congress." This latter location is reported to comprise some 65 claims.

### Mineralization

Mineralization occurs in sandstone or sandy shale surrounding fragments or logs of silicified fossil wood which in turn shows mineralization in the form of a yellow or greenish-yellow stain. The mineralized sandstone is gray to dark gray, because of the presence of a vanadiferous clay, and sometimes is impregnated with yellow and greenish-yellow specks. The yellow mineral is probably carnotite, and the greenish-yellow is likely to be pintadoite, a secondary form of vanadium.

The fossil wood, in some cases, has been found to be impregnated with gypsum (outcrop No. 25); it often has a carbonaceous appearance.

The sandstone immediately surrounding the ore usually has a rusty tint, due to the presence of limonite. The vanadiferous sandstone often contains shale partings of a dark hue that suggests good values in vanadium and SO<sub>2</sub>.

Mineralization was found at the following stratigraphic heights above the base of the Salt Wash: 50, 180 to 210, 230 to 235 ft.

Outcrops in the same immediate vicinity--that is, within about 200 ft. of each other--appear to occupy practically the same horizon. Outcrop No. 1 was the only one differing markedly in this respect, its stratigraphic position being only 50 ft. above the base of the Salt Wash. This showing, however, is 4 miles or more from any other showing in the district (see also under "Structure" above).

### Description of Occurrences

A total of 33 mineralized outcrops were noted and located on the map. With the exception of outcrop Nos. 1, 32, and 33, all of them lie in a narrow strip between Butler Wash and North Wash. No. 1 is in that portion of the Salt Wash that lies high on the east flank of the Henry Mountains.

The following is a description of individual occurrences: Location bearings are magnetic throughout these descriptions.

#### Outcrop No. 1

Located S. 45° W., 18,000 ft. from Sta. 3. Outcrop is 8.0 ft. long with an average thickness of 0.2 ft. It is 50 ft. above the base of the Salt Wash. The outcrop is vanadiferous sandstone with a fair showing of carnotite. It appears to contain much carbonaceous material. There is a small open cut on the outcrop. Not sampled.



Outcrop No. 2

Located N.  $57\frac{1}{2}^{\circ}$  W., 1000 ft. from Sta. 7M. Outcrop is 30 ft. long with a thickness of up to 2.0 ft. It is 200 ft. above the base of the Salt Wash. The outcrop is vanadiferous sandstone with fragments of silicified, carnotite-stained wood. Worked by open-cut. Not sampled.

Outcrop No. 3

Located N. 43 W., 1200 ft. from Sta. 7M. Outcrop is 30 ft. long, with an average thickness of 1.0 ft. It is 200 ft. above the base of the Salt Wash. The outcrop is vanadiferous sandstone with carnotite-stained, silicified wood fragments. Not sampled.

Outcrop No. 4

Located N.  $9^{\circ}$  W., 2700 ft. from Sta. 7M. Outcrop is 60 ft. long, with average thickness of 0.5 ft. It is 230 ft. above the base of the Salt Wash. The outcrop consists of silicified logs and fragments, stained with carnotite. The surrounding sandstone is vanadiferous. The outcrop was worked by open-cut. Sample No. 1050 (1708) was taken here by cutting a 0.5-ft. channel across the bed. The results of this sample were as follows: 0.12% SO<sub>3</sub> and 1.10% V<sub>2</sub>O<sub>5</sub>; 0.09% SO<sub>3</sub> by electroscope.

Outcrop No. 5

Located N.  $0^{\circ}$ , 3400 ft. from Sta. 7M. Outcrop consists of 5 showings as follows: length 10.0 ft., thickness 1.5 ft.; length 15.0 ft., thickness 3.0 ft.; length 20.0 ft., thickness 2.0 ft.; length 15.0 ft., thickness 2.0 ft.; length 20.0 ft., thickness 1.5 ft. The outcrop is 230 ft. above the base of the Salt Wash. The outcrop consists of silicified wood, stained with carnotite. The surrounding sandstone is vanadiferous. Worked by open-cut. Poor outcrop. Not sampled.

Outcrop No. 6

Located N.  $21\frac{1}{2}^{\circ}$  W., 3400 ft. from Sta. 7M. Outcrop consists of 3 showings as follows: Length 10.0 ft., thickness 0.5 ft.; length 5.0 ft., thickness up to 0.75 ft.; length 10.0 ft., thickness up to 0.75 ft. The outcrop is 230 ft. above the base of the Salt Wash. Outcrop consists of vanadiferous sandstone with traces of carnotite. Poor showing. Not sampled.

Outcrop No. 7

Located N.  $3^{\circ}$  E., 3800 ft. from Sta. 7M. Outcrop is 4.0 ft. long, with average thickness of 0.3 ft. It is 200 ft. above the base of the Salt Wash. Outcrop consists of carnotite-stained, silicified logs. Surrounding sandstone is vanadiferous. Worked by open cut. Not sampled.

Outcrop No. 8

Located N.  $10\frac{1}{2}^{\circ}$  E., 4050 ft. from Sta. 7M. Outcrop consists of a thin surface area, 12 by 7 ft., of vanadiferous, carnotite-stained, sandstone and shale. It is 200 ft. above the base of the Salt Wash. Poor showing. Not sampled.

Outcrop No. 9

Located N.  $7^{\circ}$  E., 4050 ft. from Sta. 7M. Outcrop is a silicified log, 4.0 ft. long and 1.5 ft. in diam., faintly stained with carnotite. It is 200 ft. above the base of the Salt Wash. Not sampled.

Outcrop No. 10

Located N.  $10\frac{1}{2}^{\circ}$  E., 4950 ft. from Sta. 7M. Outcrop consists of an area 3 ft. sq. of loose, carnotite-stained, silicified wood fragments. It is 200 ft. above the base of the Salt Wash. Not sampled.

Outcrop No. 11

Located N., 6900 ft. from Sta. 7M. Outcrop consists of a silicified log, 10.0 ft. long, and stained with carnotite. Surrounding sandstone is vanadiferous and shows traces of carnotite. The outcrop is 203 ft. above the base of the Salt Wash. Worked by open cut. Not sampled.

Outcrop No. 12

Located N.  $3^{\circ}$  E., 7125 ft. from Sta. 7M. Outcrop is a carnotite-stained, silicified log. One hundred ft. west and 120 ft. east of this point, there is some more carnotite-stained, silicified wood. Outcrop is 203 ft. above the base of the Salt Wash. Not sampled.

Outcrop No. 13

Located S.  $15\frac{1}{2}^{\circ}$  E., 1025 ft. from Sta. 7. Outcrop is 15.0 ft. long and 3.0 ft. thick. It is 225 ft. above the base of the Salt Wash. Outcrop consists of a silicified log, slightly stained with carnotite. Worked by open-cut. Not sampled.

Outcrop No. 14

Located S.  $83^{\circ}$  E., 400 ft. from Sta. 7. Outcrop consists of a shallow pile of carnotite-stained, silicified wood, covering an area of 12 by 12 ft. It is 203 ft. above the base of the Salt Wash. Worked by open cut. Not sampled.

Outcrop No. 15

Located N. 11° W., 1000 ft. from Sta. 7. Outcrop is 60.0 ft. long, with an average thickness of 0.3 ft. and a maximum thickness of 1.0 ft. It is 235 ft. above the base of the Salt Wash. Outcrop consists of vanadiferous sandstone with some carnotite stain. Worked by open-cut.

Sample No. 1053 (1714) was taken here by cutting a 1.0-ft. channel across the bed. The results of this sample were as follows: 0.16% SO<sub>2</sub> and 2.68% V<sub>2</sub>O<sub>5</sub>; 0.255% SO<sub>2</sub> by electrocope.

Outcrop No. 16

Located N. 3½° W., 1500 ft. from Sta. 7. Outcrop is 20.0 ft. long with an average thickness of 0.2 ft. and a maximum thickness of 1.0 ft. It is 235 ft. above the base of the Salt Wash. Outcrop consists of vanadiferous, carnotite-stained sandstone with some fragments of carnotite-stained, silicified wood.

Sample No. 1055 (1710) was taken here by cutting a 1.0-ft. channel across the bed. The results of this sample were as follows: 0.44% SO<sub>2</sub> and 2.64% V<sub>2</sub>O<sub>5</sub>; 0.33% SO<sub>2</sub> by electrocope.

Outcrop No. 17

Located S. 6° E., 1100 ft. from Sta. 6. Outcrop is 25.0 ft. long and 0.2 ft. thick. It is 210 ft. above the base of the Salt Wash. Outcrop consists of carnotite-stained, silicified log. The surrounding sandstone is vanadiferous and carnotite-stained. Worked by open-cut. Not sampled.

Outcrop No. 18

Located S. 43½° E., 1150 ft. from Sta. 6. Outcrop is 30.0 ft. long with an average thickness of 0.4 ft. and a maximum thickness of 1.0 ft. It is 235 ft. above the base of the Salt Wash. The outcrop consists of vanadiferous sandstone with fragments of carnotite-stained, silicified wood. Sandstone also shows traces of carnotite. Worked by open-cut.

Sample No. 1054 (1711) was taken here by cutting a 1.0-ft. channel across the bed. The results of this sample were as follows: 0.37% SO<sub>2</sub> and 3.18% V<sub>2</sub>O<sub>5</sub>; 0.26% SO<sub>2</sub> by electrocope.

Outcrop No. 19

Located S. 7½° W., 800 ft. from Sta. 6. Outcrop is 10.0 ft. long and 0.5 ft. thick. It is 210 ft. above the base of the Salt Wash. Outcrop is vanadiferous sandstone with a trace of carnotite. Worked by small open-cut. Not sampled.

Outcrop No. 20

Located S.  $7\frac{1}{2}^{\circ}$  E., 750 ft. from Sta. 6. An area of vanadiferous float, 20 by 5 ft. May have been storage dump for outcrop No. 19. Not sampled.

Outcrop No. 21

Located S.  $54^{\circ}$  E., 900 ft. from Sta. 6. Outcrop is 50 ft. long with an average thickness of 0.2 ft. and a maximum thickness of 0.5 ft. It is 210 ft. above the base of the Salt Wash. Outcrop is vanadiferous sandstone and silicified log. Both sandstone and log show carnotite. Worked by open-cut.

Sample No. 1052 (1713) was taken here by cutting a 0.5-ft. channel across the bed. The results of this sample were as follows: 0.50% SO<sub>2</sub>, 2.86% V<sub>2</sub>O<sub>5</sub>; 0.36% SO<sub>2</sub> by electroscope.

Outcrop No. 22

Located S., 450 ft. from Sta. 6. Outcrop consists of 150 ft. of discontinuous ore lenses. The maximum thickness is 0.5 ft. It is 185 ft. above the base of the Salt Wash. Outcrop is vanadiferous sandstone with carnotite stain. Several mineralized logs are present. Worked by open-cut. Poor showing. Not sampled.

Outcrop No. 23

Located N.  $56^{\circ}$  E., 500 ft. from Sta. 6. Outcrop consists of 8 small showings extending over a length of 125 ft. The average thickness is 0.3 ft. It is 210 ft. above the base of the Salt Wash. Outcrop consists of carnotite-stained logs and vanadiferous sandstone. Worked by open-cut. Poor showing. Not sampled.

Outcrop No. 24

Located N.  $110^{\circ}$  W., 480 ft. from Sta. 6. Outcrop is 6.0 ft. long and 0.5 ft. thick. It is 210 ft. above the base of the Salt Wash. Outcrop is of vanadiferous sandstone and shale. Poor showing. Not sampled.

Outcrop No. 25

Located N.  $52^{\circ}$  W., 2550 ft. from Sta. 6. Outcrop consists of 2 small showings, each 5.0 ft. long and with a maximum thickness of 2.0 ft. It is 200 ft. above the base of the Salt Wash. Outcrop consists of vanadiferous sandstone and silicified wood. Both are impregnated with carnotite. N.  $55^{\circ}$  E., 180 ft. from the above point, is a third small and similar showing. Outcrops were worked by open-cuts. Poor showing. Not sampled.



Outcrop No. 26

Located N. 58° W., 3300 ft. from Sta. 6. Outcrop is 50.0 ft. long with an average thickness of 2.0 ft. It is 200 ft. above the base of the Salt Wash. Outcrop consists of silicified, carnotite-stained log, surrounded by a halo of vanadiferous sandstone. Worked by open-cut. Poor showing. Not sampled.

Outcrop No. 27

Located N. 80° E., 820 ft. from Sta. 5. Outcrop is 30.0 ft. long, with an average thickness of 0.2 ft. and a maximum thickness of 0.5 ft. It is 200 ft. above the base of the Salt Wash. The outcrop consists of vanadiferous sandstone with shale partings. There is a trace of carnotite. Worked by open-cut.

Sample No. 1051 (1712) was taken here by cutting a 0.5-ft. channel across the bed. The results of this sample were as follows: 0.10% SO<sub>3</sub>, and 1.12% V<sub>2</sub>O<sub>5</sub>; 0.12% SO<sub>3</sub> by electroscope.

Outcrop No. 28

Located N. 65° E., 2000 ft. from Sta. 5. The outcrop is 40 ft. long with an average thickness of 1.0 ft. It is 200 ft. above the base of the Salt Wash. Outcrop is of vanadiferous sandstone with fragments of silicified, carnotite-stained wood. Worked by open-cut. Poor showing. Not sampled.

Outcrop No. 29

Located N. 21° E., 1550 ft. from Sta. 5. Outcrop is a carnotite-stained, silicified log. It is 200 ft. above the base of the Salt Wash. Worked by open-cut. Poor showing. Not sampled.

Outcrop No. 30

Located N. 35° W., 2000 ft. from Sta. 5. Outcrop is 2.0 ft. long, with an average thickness of 0.5 ft. and a maximum thickness of 1.5 ft. It is 195 ft. above the base of the Salt Wash. Outcrop consists of carnotite-stained, vanadiferous sandstone. Twenty feet vertically below this point is a carnotite-stained, silicified log, practically all mined out. Log was about 20 ft. long and 1 ft. in diameter.

Sample No. 1049 (1709) was taken here by cutting a 1.5-ft. channel across the bed. The results of this sample were as follows: 0.78% SO<sub>3</sub> and 4.03% V<sub>2</sub>O<sub>5</sub>; 0.40% SO<sub>3</sub> by electroscope.

Outcrop No. 31

Located N. 27½° W., 2000 ft. from Sta. 5. Outcrop is 20 ft. long and 0.8 ft. thick. It is 185 ft. above the base of the

Salt Wash. The outcrop is of vanadiferous sandstone with shale partings. There is a fair showing of carnotite. Worked by open-cut, and 4-ft. adit.

Sample No. 1056 (1715) was taken by cutting a 0.8-ft. channel across the bed. The results of this sample were as follows: 0.44% SO<sub>3</sub> and 3.74% V<sub>2</sub>O<sub>5</sub>; 0.30% SO<sub>3</sub> by electroscope.

#### Outcrop No. 32

Located N. 66° E., 13,850 ft. from Sta. 37. Outcrop consists of fragments of carnotite-stained, silicified wood, scattered over an area 10 by 40 ft. Not sampled.

#### Outcrop No. 33

Located S. 73° E., 2800 ft. from Sta. 8. Outcrop is 15 ft. long and 0.3 ft. thick. It is 180 ft. above the base of the Salt Wash. Outcrop is of vanadiferous, carnotite-stained sandstone; evidently an impregnation from a mineralized log which has been mined out. Worked by open-cut. Poor showing; not sampled.

### CONDITIONS AFFECTING MINING

Most of the showings occupy the bench between the brink of the Summerville-Salt Wash cliff and the base of the bluff formed by the lower bed of the Brushy Basin member. This bench varies between an even, almost level surface and a steep slope broken by a succession of projecting sandstone beds. The majority of workings thus occupy comparatively flat terrain. A few occur in the steep face of a projecting ledge. The locality would be easily accessible from a road contouring along the bench. In fact, there is such a road, but it is practically impassable in its present condition.

The disposal of tailings should offer no special problem since the Summerville-Salt Wash cliff is close to most of the workings.

Underground mining has not been undertaken here except in one case where a 4-ft. adit was driven. The fact that most of the ore is found in the flats led to its extraction from shallow pits. Where it is exposed in a vertical face, as in at least two cases, mining along a flat slope requiring timber support might be necessary.

Timber and water resources have already been described under the headings "Vegetation" and "Water Resources". However, the deposits so far developed are too small and superficial to have required timbering. If any water was used in mining, it must have been hauled, since none has been developed at the deposits.

## ORE RESERVES

The type of mineralization described under "Ore Occurrences", as well as the limited scattered exploration pits and outcrops, suggest the best classification of the ore reserves of this district to be inferred ore alone.

Therefore, the area between Butler Wash and North Wash containing the ore-bearing outcrops has been designated as inferred ore block No. 1 (see South Area map Utah-hm-7 and -7A). This area includes the workings numbered 2 to 31 inclusive.

This is the only ore reserve block considered in this report. The other three ore exposures, numbers 1, 32, and 33, are isolated occurrences with insignificant reserves.

This block of inferred ore is calculated to contain 11,490 tons of ore assaying 0.354% SO<sub>2</sub> and 2.952% V<sub>2</sub>O<sub>5</sub>. The average width is calculated as 0.39 ft.

The detailed calculations are set forth in Table I, Sheet 1, and summarized in Table II, Sheet 1. The ore block No. 1 is outlined on the supplemental areal map (Utah-hm-7A).

### Method of Calculation

In the standard method of ore reserve calculations, three types of ore are recognized; namely, positive, indicated, and inferred.

The inferred ore in this district is ore for which quantitative estimates are based largely on the geologic character of the deposit and for which there are eight channel samples and detailed measurements of average widths. The estimates are based on an assumed repetition for which there is geologic evidence. The area is limited by the known ore exposures on a definite ore trend in the Salt Wash member (see geologic map Utah-hm-7, 1" = 2000').

The ore reserves are usually further classified into three grades of SO<sub>2</sub>: Grade 1 contains 0.15% or more SO<sub>2</sub>; Grade 2 contains from 0.08% to 0.15% SO<sub>2</sub>; and Grade 3 ore contains 0.005% to 0.08% SO<sub>2</sub>. According to this classification, the ores of this district are Grade 1.

The tonnage was calculated as follows: (1) The total area of the block was determined with a planimeter; (2) The average width is the average of the observed average thicknesses of the ore exposures as described (this average width is not equal to the average width of the samples); (3) The volume of the block is reduced by a factor of mineralization (0.81%) which represents the distribution of the ore within the volume; and (4) The volume was divided by 14, a conversion figure representing the number of cubic feet in one ton of ore in place, thereby

arriving at the number of tons of ore in the block (see tonnage calculation for Table I, Sheet 1).

The eight channel samples taken from ore exposures within this block supply representative analytical data that was used to calculate the amount of the  $SO_3$  and  $V_2O_5$  products (see Table II, Sheet 1).

The above samples are posted on the supplemental South Areal map (Utah-hm-7A). The following sequence of figures apply: Field number, office number, width in feet and tenths, % $SO_3$  electroscopic (E), %  $SO_3$  chemical, %  $V_2O_5$  chemical; the letter (R) designates that chemical analysis was run in the U. S. Vanadium Corp. laboratory, Rifle, Colorado, and the letter (E) that the electroscopic analysis was run in the laboratory of the Grand Junction Field Office.

#### Exploration

All the workings, with the exception of Nos. 1, 32, and 33, occur in a zone 18,000 ft. long that has an average width of less than 3,350 ft. The prospect pits and outcrops are scattered throughout this zone.

Since many of the exposures are at, or near, the surface of the ground, and as the ore is of Grade 1 quality, a Geiger-Mueller counter reconnaissance survey might yield some results.

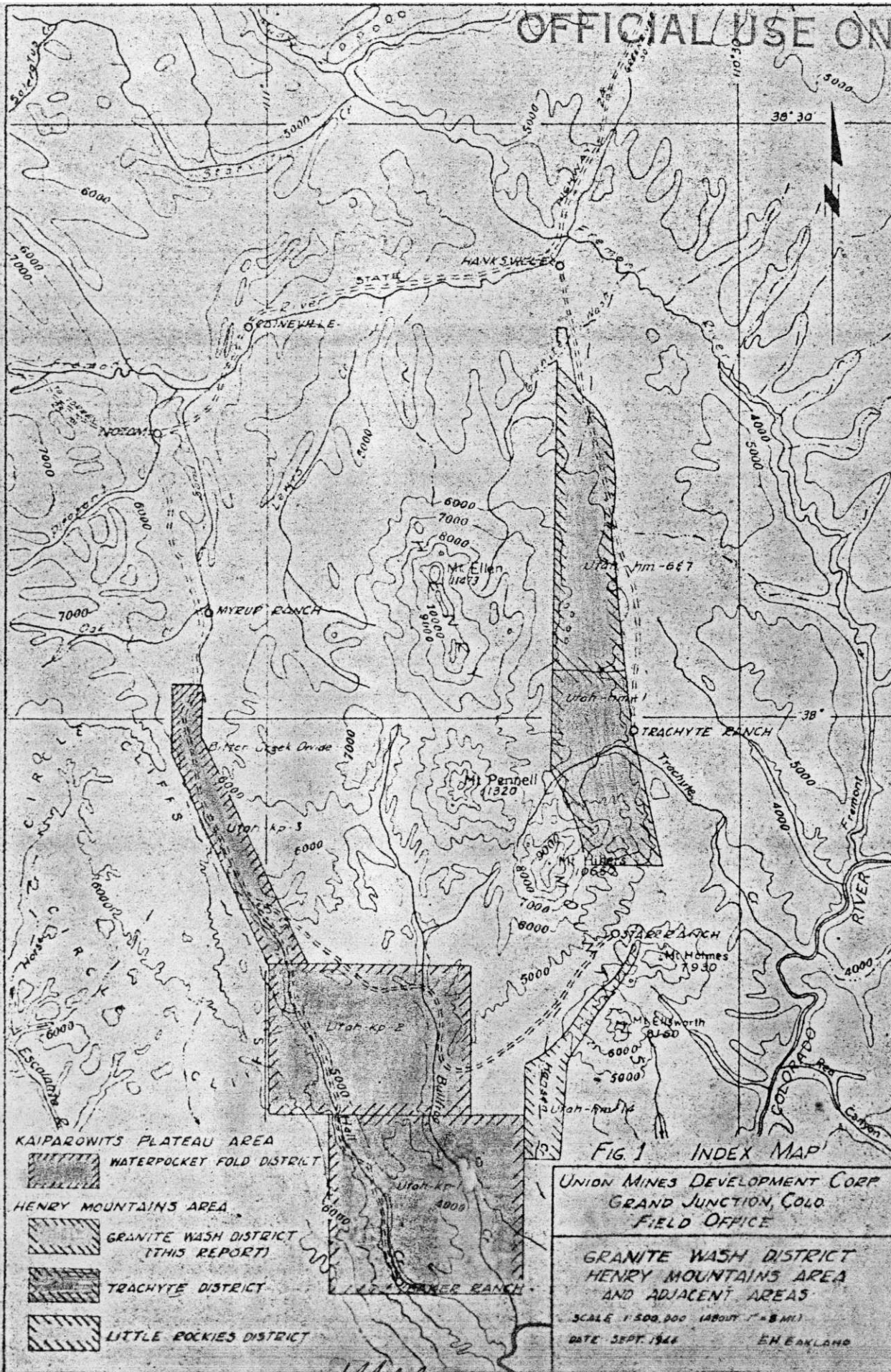
The known habit of distribution of ore deposits in this district is such that the locality is not amenable to exploration by core drilling. Ore in the known workings could be extracted and an exploration plan designed thereafter in the light of any additional geologic data that might be gained.

A. H. Coleman  
Leonid Brynet  
J. W. Hill

LIST OF LARGE MAPS TO ACCOMPANY REPORT

<u>Description</u>	<u>Scale</u>	<u>File No.</u> <u>Utah-nm-</u>
Geologic Areal Map, North Area	1 in. = 2000 ft.	6
Geologic Areal Map, South Area	1 in. = 2000 ft.	7
Supplemental Map, South Area	1 in. = 2000 ft.	7A
Geologic Sections (profiles) Nos. 1 - 10	1 in. = 1000 ft.	8
Stratigraphic Columns Nos. 1 - 9; 15 - 17	1 in. = 40 ft.	9
18 - 32; 34 - 36	do.	10
10 - 14; 37 - 39	do.	11
40 - 45; 47	do.	12
Note: Column Nos. 10 - 14, 33 - 46 not used.		
Correlation of Profile Sections	1 in. = 40 ft.	13

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- KAIPAROWITS PLATEAU AREA
- WATERPOCKET FOLD DISTRICT
- HENRY MOUNTAINS AREA
- GRANITE WASH DISTRICT (THIS REPORT)
- TRACHYTE DISTRICT
- LITTLE ROCKIES DISTRICT

FIG. 1 INDEX MAP

UNION MINES DEVELOPMENT CORP.  
 GRAND JUNCTION, COLO.  
 FIELD OFFICE

GRANITE WASH DISTRICT  
 HENRY MOUNTAINS AREA  
 AND ADJACENT AREAS

SCALE 1:500,000 (ABOUT 1"=8MI.)  
 DATE SEPT. 1944 E. H. KILGORE

Union Mines Development Corp  
 Grand Junction Field Office  
 Grand Junction, Colo.

For Table No. I, Sheet No. 1  
 Calc. by L.B. Date 3/17/45  
 Checked by J.V.H. Date 5/28/45

Area HENRY MOUNTAINS  
 District GRANITE WASH

Subtitle INFERRED ORE

### Tonnage Calculation

Usage widths here used are obtained from various sources. For methods used see report.

Block No.	Avg. Widthn Ft.	Area of Block Sq. Ft.	Area X Width Cu. Ft.	Min. Factor %	$\frac{Cu. Ft. \times MF}{14} = T$ Tons
1.	0.39	50,902,000	19,851,780	0.81	11,490

SCALE ONLY

*[Handwritten signature]*



Union Mines Development Corp.  
 Grand Junction Field Office  
 Grand Junction, Colo.

Area HENRY MOUNTAINS  
 District GRANITE WASH

Table No 4 Sheet No 1

~~SECRET~~

For methods of calculating tonnages and grades see report.

Subtitle INFERRED ORE

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Calculated by: L. Bryner Date: 3/17/55

Checked by: J.W.H. Date: 5/28/55

Sampling				Analytical Data						Calculated Data							Remarks			
Working	Field No	Office No	Width	% SOQ Elect	width x %	% SOQ Chem	width x %	% V <sub>2</sub> O <sub>5</sub>	width x %	Avg Width	Wtd Avg % SOQ Elect	Wtd Avg % SOQ Chem	Wtd Avg % V <sub>2</sub> O <sub>5</sub>	SOQ lbs Elect	SOQ lbs Chem	V <sub>2</sub> O <sub>5</sub> lbs	Ore Reserve Tons	Working No	Remarks	
4	1-050	1708	0.5'	0.090	0.045	0.120	0.060	1.100	0.550											
15	1-053	1714	10'	0.255	0.255	0.160	0.160	2.680	2.680											
16	1-055	1710	10'	0.330	0.330	0.440	0.440	2.640	2.640											
18	1-054	1711	10'	0.260	0.260	0.370	0.370	3.180	3.180											
21	1-052	1713	0.5'	0.360	0.180	0.500	0.250	2.860	1.430											
27	1-051	1712	0.5'	0.120	0.060	0.100	0.050	1.120	0.560											
30	1-049	1709	15'	0.400	0.600	0.780	1.170	4.030	6.045											
31	1-056	1715	0.8'	0.300	0.240	0.440	0.352	3.740	2.992											
			6.8'		1.910		2.852		20.077	0.85'	0.290	0.419	2.952	66,642	96,286	678,370	11,490	1		

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~~SECRET~~





Descriptions of mineralized outcrops

The following descriptions of mineralized outcrops is taken directly from the Union Mines Development Corporation Reports within the area, and where changed will be noted. Local bearings are magnetic throughout these descriptions. Bearing and distance from stations not included.

Outcrop No. 1

Located S. 45<sup>°</sup>W., 18,000 ft. from Sta. 3. Outcrop is 8.0 ft. long with an average thickness of 0.2 ft. It is 50 ft. above the base of the Salt Wash. The outcrop is vanadiferous sandstone with a fair showing of carnotite. It appears to contain much carbonaceous material. There is a small open cut on the outcrop. Not sampled.



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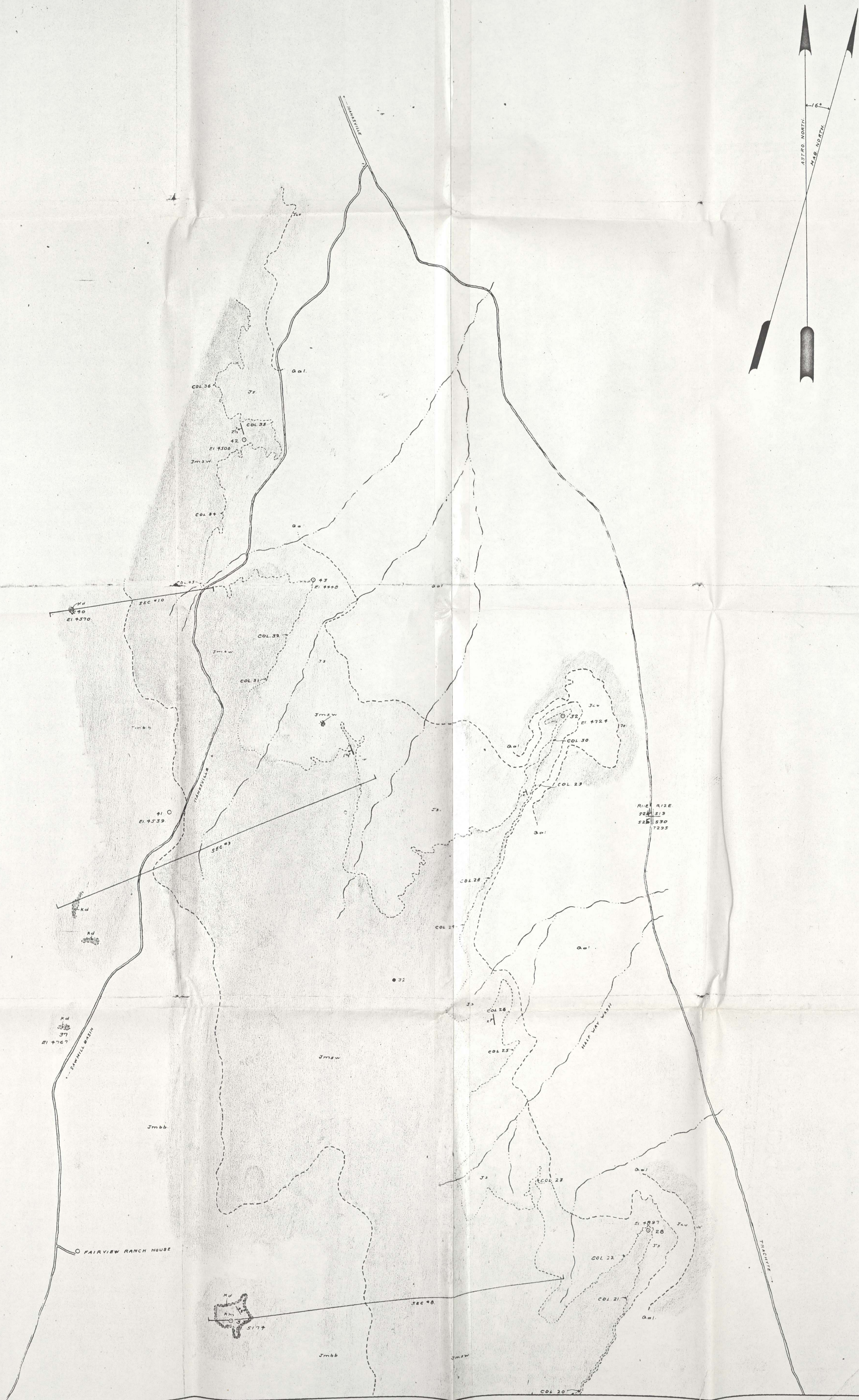
**GRAND JUNCTION, COLORADO 81501**

**303 - 242-3561**





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CRETACEOUS	
Km	Mancos formation
Kd	Dakota formation
Morrison formation	
Brushy Basin member	
Jmsw	Salt Wash member
JURASSIC	
Js	Summerville formation
Jcv	Curtis formation
Je	Entrada formation

— — — — —	Observed contact
- - - - -	Inferred contact
==	Main road
---	Minor road
o	Triangulation point
•	Mineralized showing

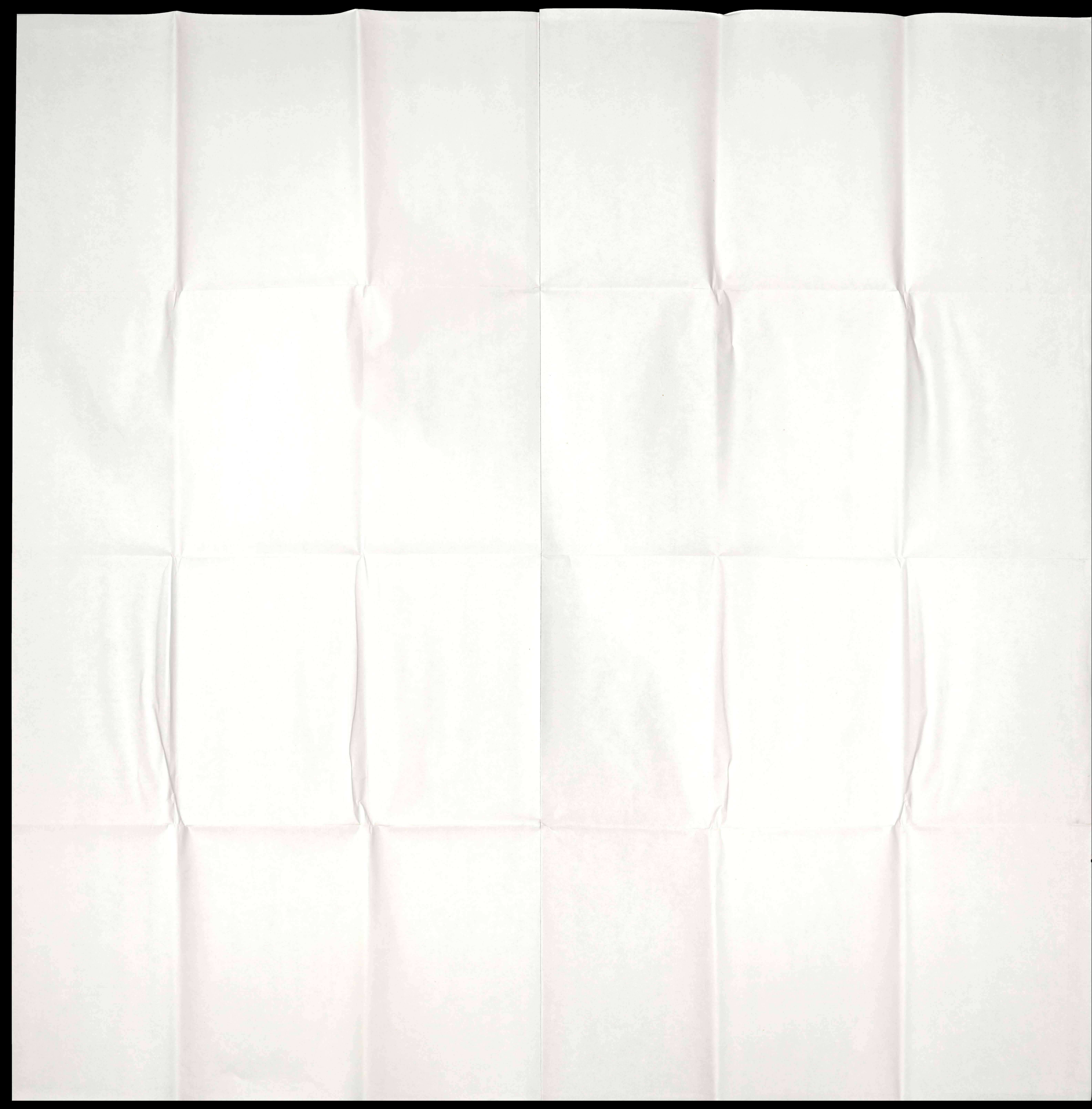
NORTH AREA Rm461  
UNION MINES DEVELOPMENT CORP.  
GRAND JUNCTION, COLO.  
FIELD OFFICE

TITLE: HENRY MTS. AREA  
GRANITE WASH DISTRICT.

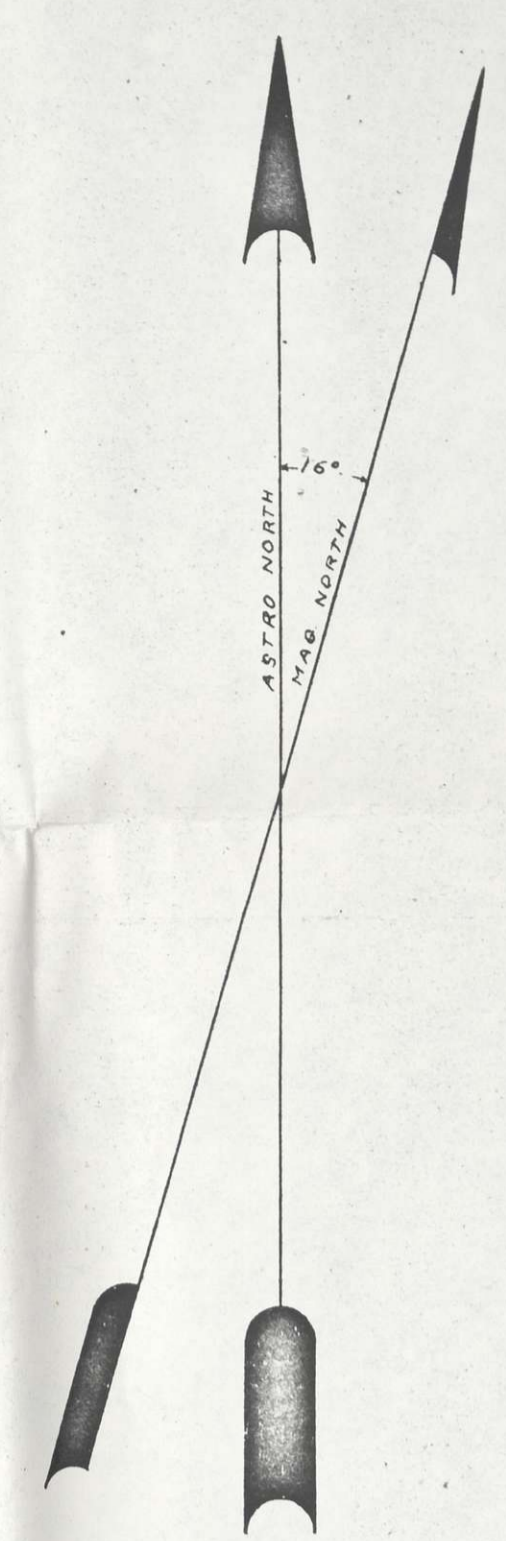
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DRAWN BY: BRYNER, MOYD, HASSLER, COLEMAN.  
TRACED BY: A. H. COLEMAN.  
GEOLOGY BY: A. H. COLEMAN & PARTY.

Utah-67 RMO-461









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LEGEND

- |   |   |  |
|---|---|--|
| <p>CRETACEOUS</p> <p>JURASSIC</p>   | <p>Km</p> <p>Kd</p> <p>Jmbb</p> <p>Jmsw</p> <p>JS</p> <p>Jcu</p> <p>Jt</p>  | <p>Mancos formation</p> <p>Dakota formation</p> <p>Morrison formation</p> <p>Brushy Basin member</p> <p>Salt Wash member</p> <p>Summerville formation</p> <p>Curtis formation</p> <p>Entrada formation</p> |
| <p>-----</p> <p>-----</p> <p>-----</p> <p>○ 17</p> <p>● 26</p> <p>○ 15</p> <p>● S1053</p> | <p>Observed contact</p> <p>Inferred contact</p> <p>Main road</p> <p>Minor road</p> <p>Triangulation point</p> <p>Mineralized showing by number</p> <p>Mineralized showing and sample (field number)</p> |  |

SOUTH AREA RND 461

UNION MINES DEVELOPMENT CORP.  
GRAND JUNCTION, COLO.  
FIELD OFFICE

TITLE: HENRY MTS AREA  
GRANITE WASH DISTRICT

SCALE: 1"=2000' DATE: AUG. 9, 1944

DRAWN BY: BRYNER, MOYD, HASSLER, COLEMAN.

TRACED BY: A.H. COLEMAN.

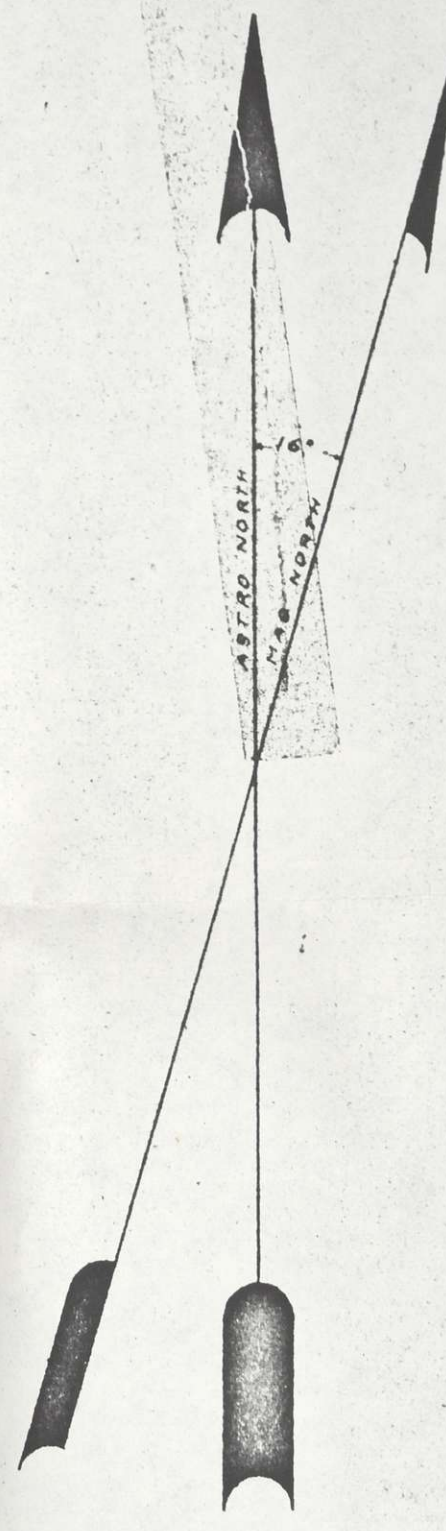
GEOLOGY BY: A.H. COLEMAN & PARTY.







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JURASSIC  
CRETACEOUS

- Km Mancos formation
- Kd Dakota formation
- Jmbb Morrison formation
- Jmsw Brushy Basin member
- Jsv Salt Wash member
- Je Summerville formation
- Je Curtis formation
- Je Entrada formation

LEGEND

- - - - - Observed contact
- - - - - Inferred contact
- == Main road
- Minor road
- o 17 Triangulation point
- o 26 Mineralized showing by number
- o 15 Mineralized showing and sample (field n)
- o 1053 SOQ ≥ 008%
- o SOQ < 008%
- ▭ Inferred Ore Block

ADDITIONAL DATA ADDED MAY 1945  
 SUPPLEMENTAL MAPSOUTH AREA  
 UNION MINES DEVELOPMENT CORP  
 GRAND JUNCTION, COLO  
 FIELD OFFICE

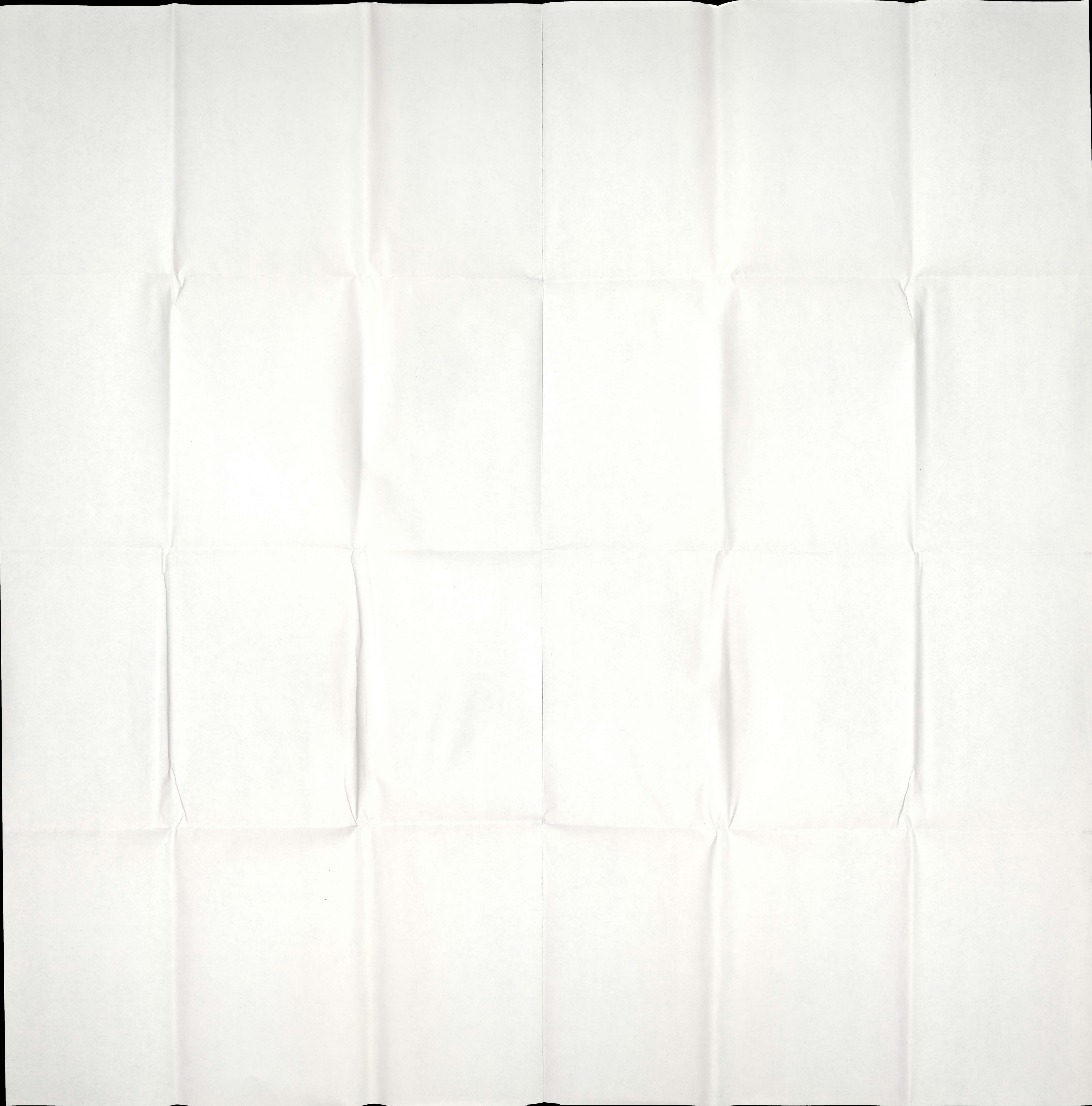
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 DRAWN BY: BRYNER, MOYD, HASSLER, COLEMAN  
 TRACED BY: A.H. COLEMAN  
 GEOLOGY BY: A.H. COLEMAN & PARTY.

Utah-hm-7A Rmo-461

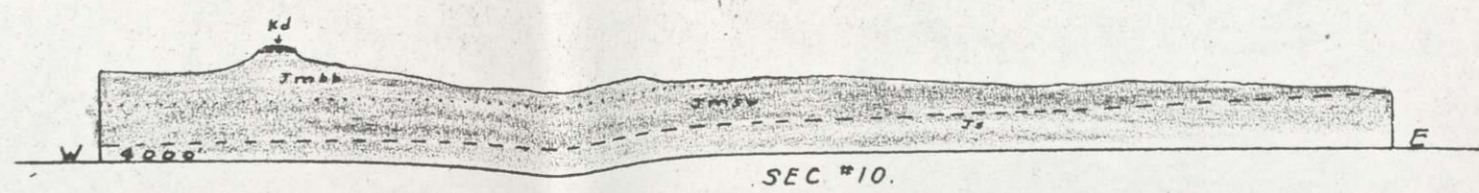
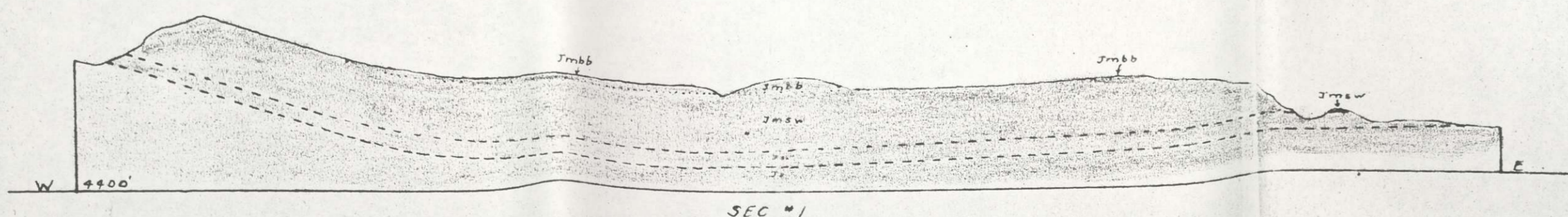
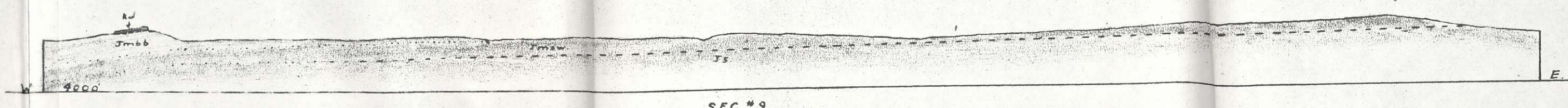
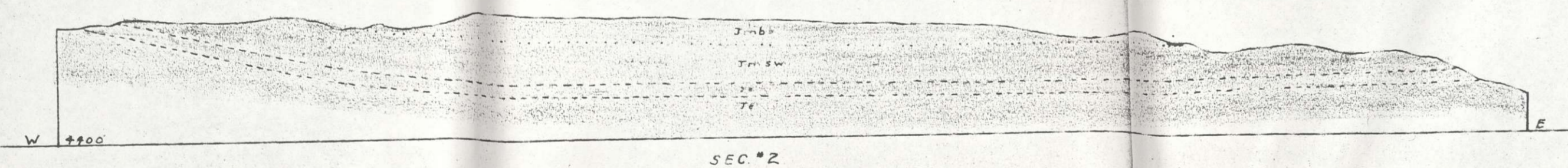
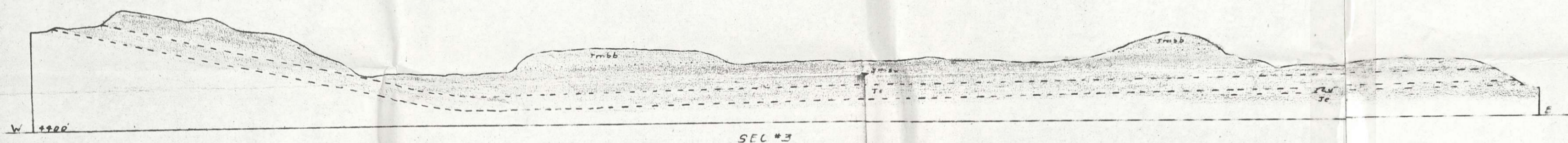
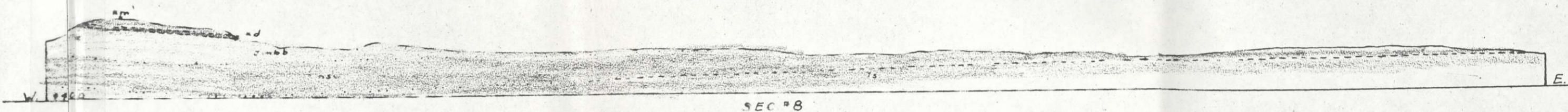
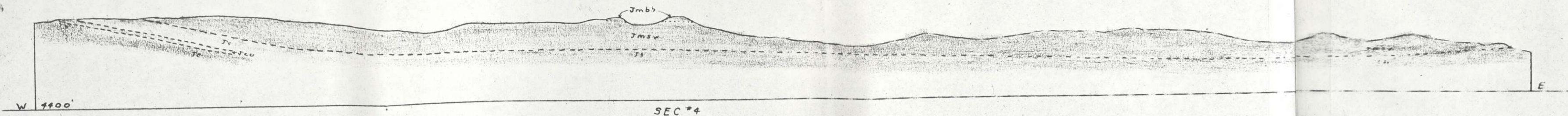
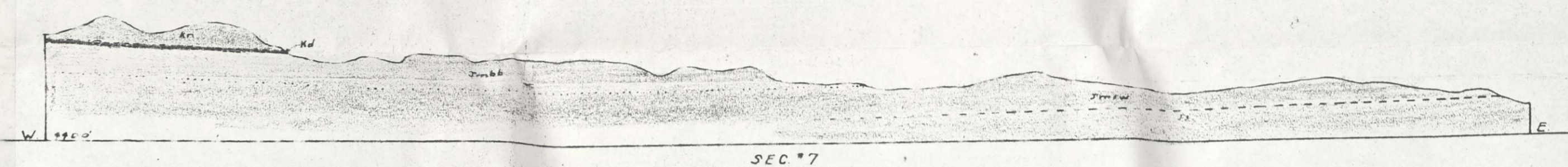
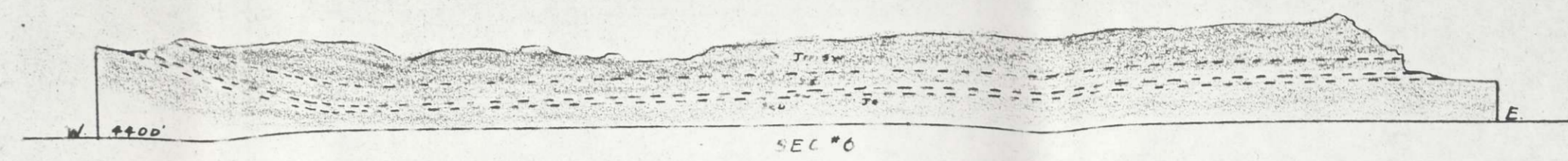
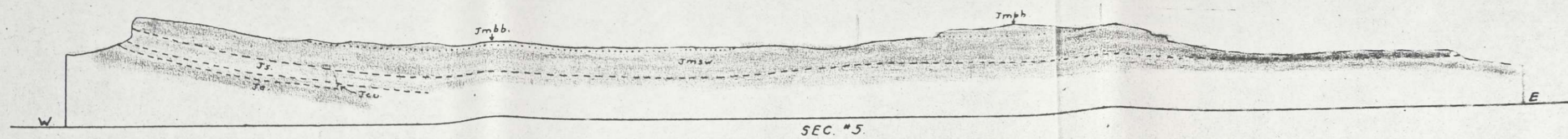


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 S 1049-1709-05-240(E) 0.78-4.03(R)  
 S 1051-1712-05-012(E) 0.10-1.12(R)  
 S 1052-1713-05-036(E) 0.50-2.86(R)  
 S 1054-1711-10-026(E) 0.37-3.18(R)  
 S 1055-1710-10-033(E) 0.44-2.64(R)  
 S 1053-1714-10-025(E) 0.60-2.68(R)  
 S 1050-1708-05-008(E) 0.12-1.10(R)









DECLASSIFIED

LEGEND

- |          |            |                       |     |
|----------|------------|-----------------------|-----|
| JURASSIC |            | Mancos formation      |     |
|          |            | Dakota formation      |     |
|          |            | Morrison formation    |     |
|          |            | Brushy Basin member   |     |
|          |            | Salt Wash member      |     |
|          |            | Summerville formation |     |
|          |            | Curtis formation      |     |
|          |            | Entrada formation     |     |
|          | CRETACEOUS |                       | Kmb |
|          |            |                       | Kb  |

PROFILES 1-10 *Russ 461*

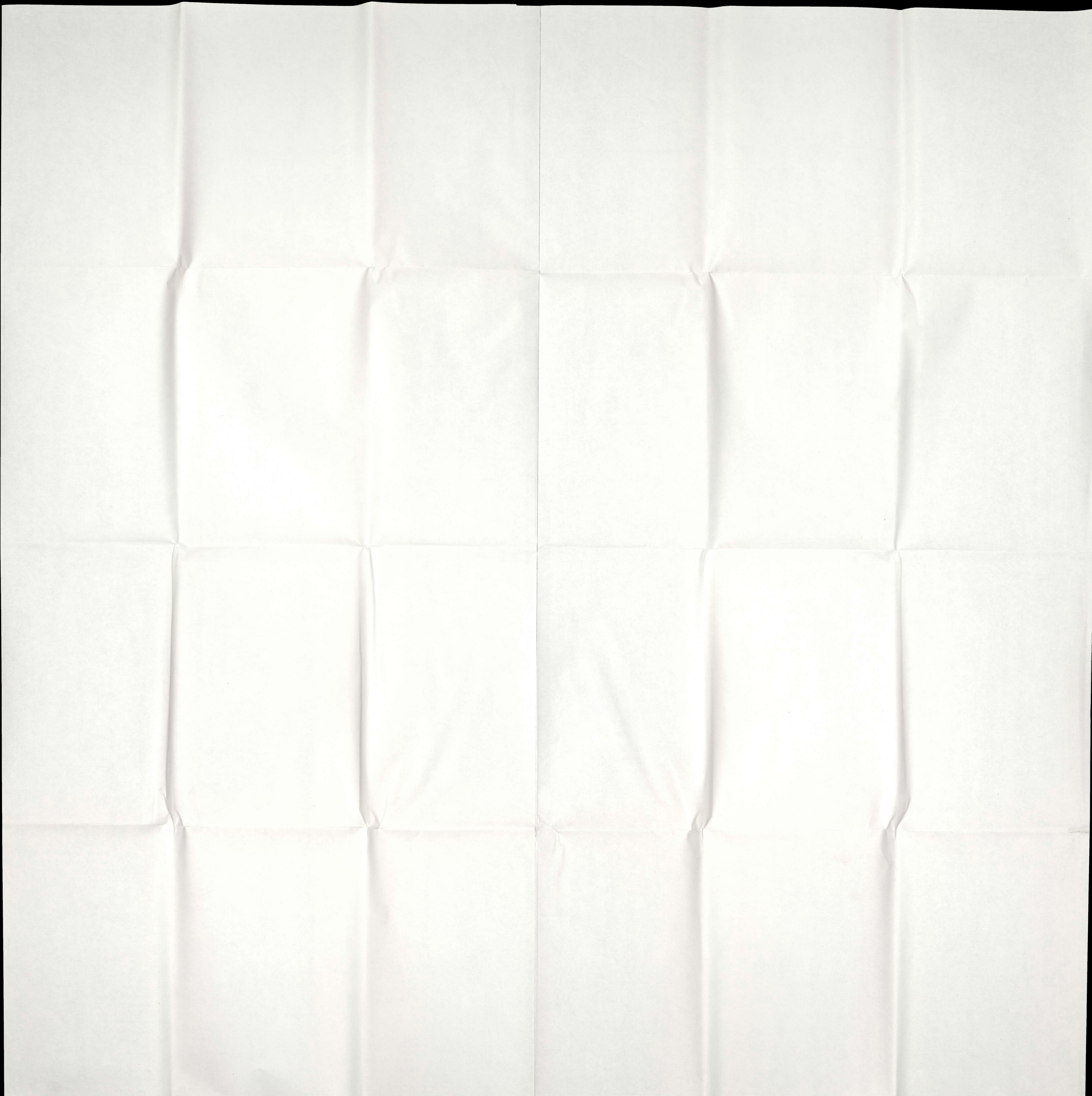
UNION MINES DEVELOPMENT CORP  
GRAND JUNCTION, COLO.  
FIELD OFFICE

TITLE: HENRY MTS AREA  
GRANITE WASH DISTRICT

SCALE: 1" = 1000' DATE: Aug 10, 1944  
DRAWN BY: BRYNER, MOYD, HASSLER, COLEMAN  
TRACED BY: A.H. COLEMAN  
GEOLOGY BY: A.H. COLEMAN & PARTY

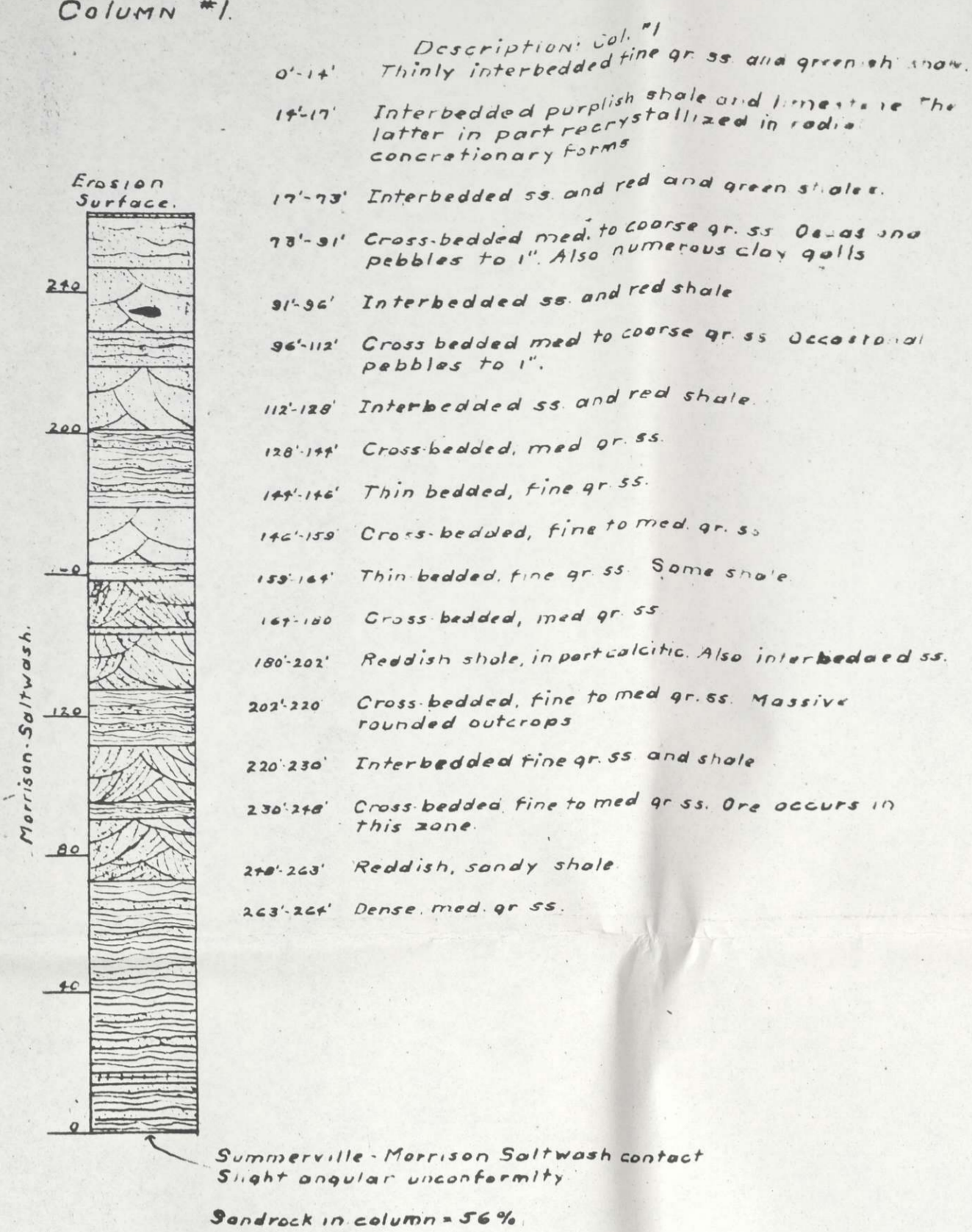
Utah-hm-8 ✓ RMO-461



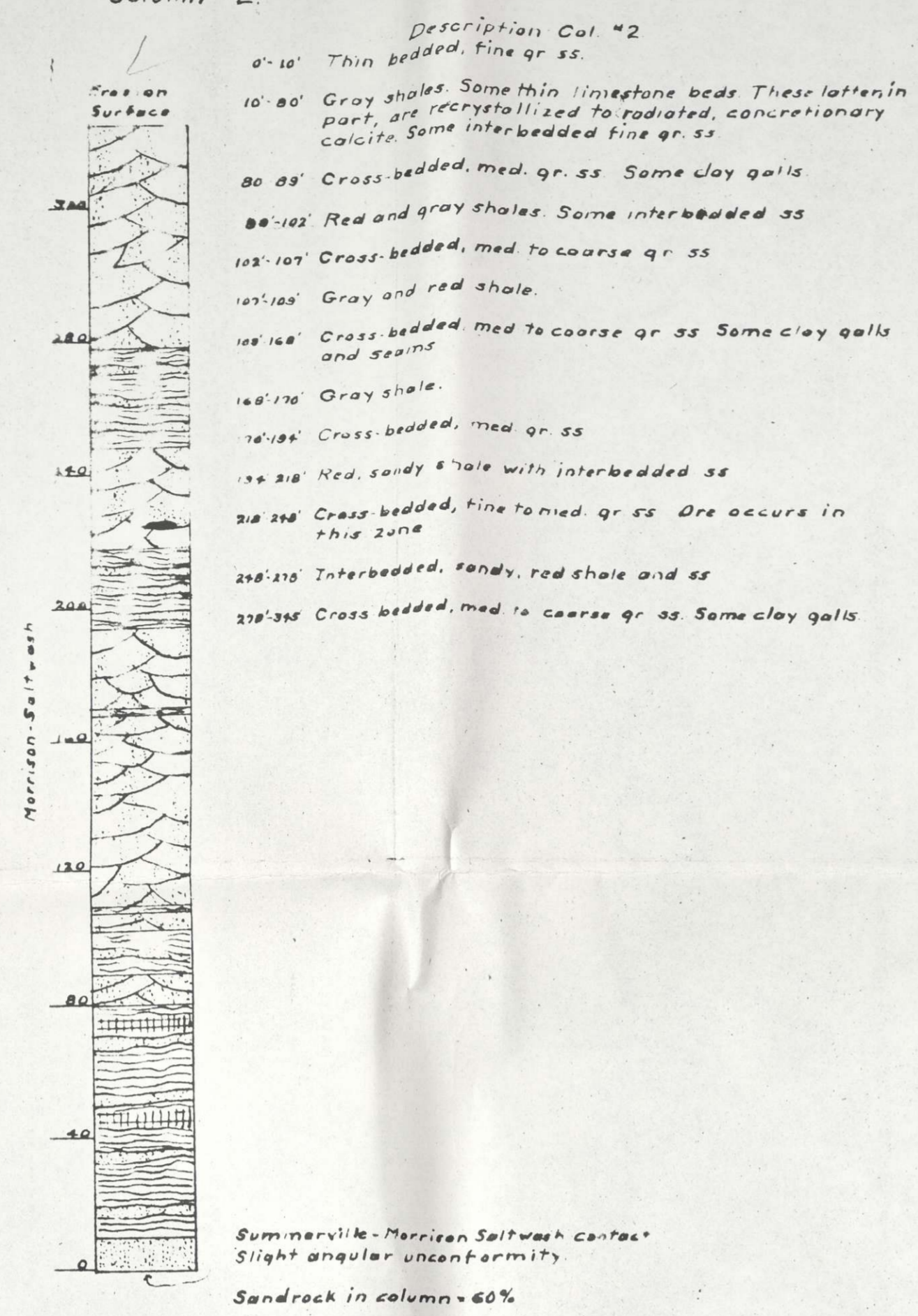




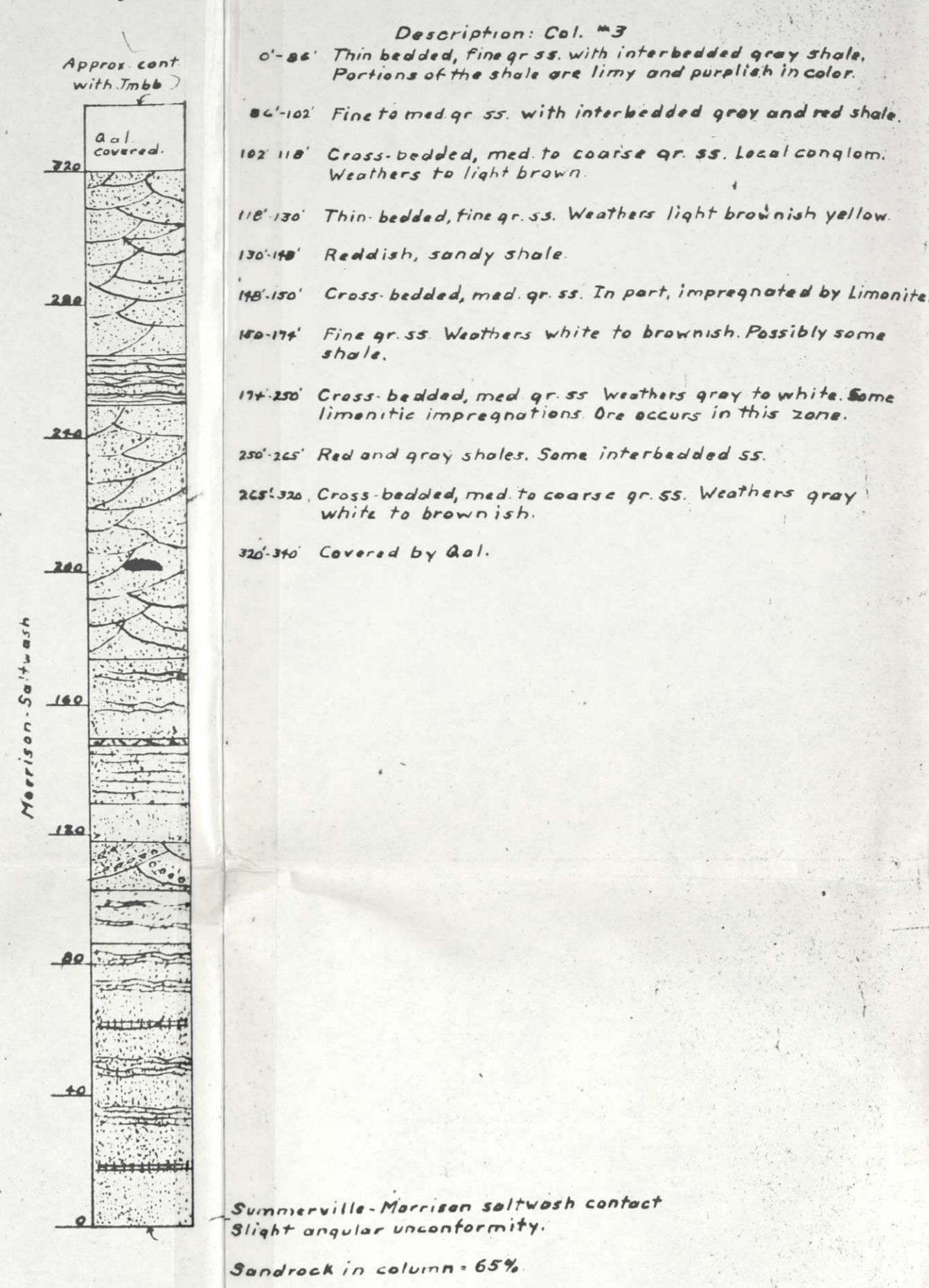
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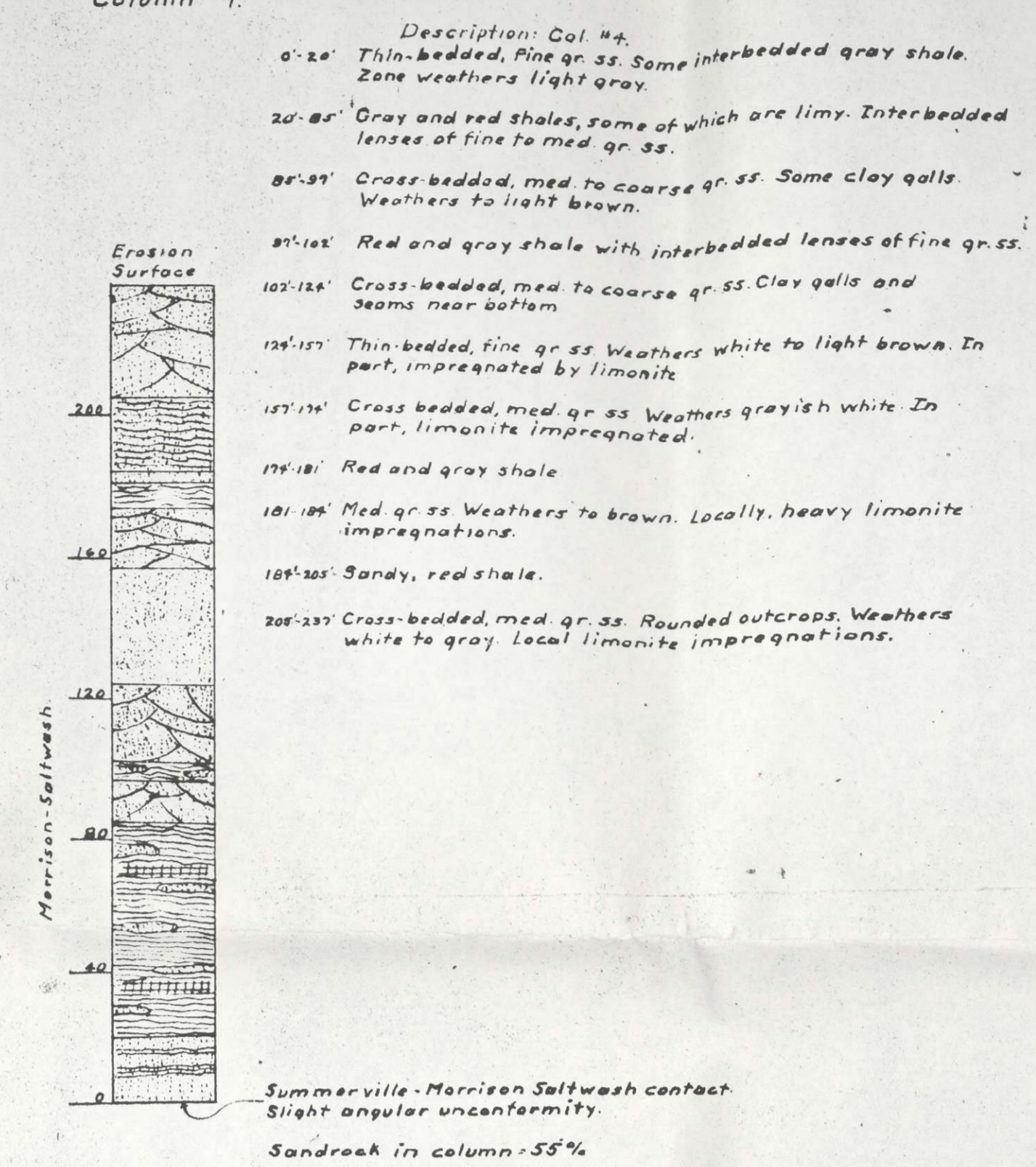
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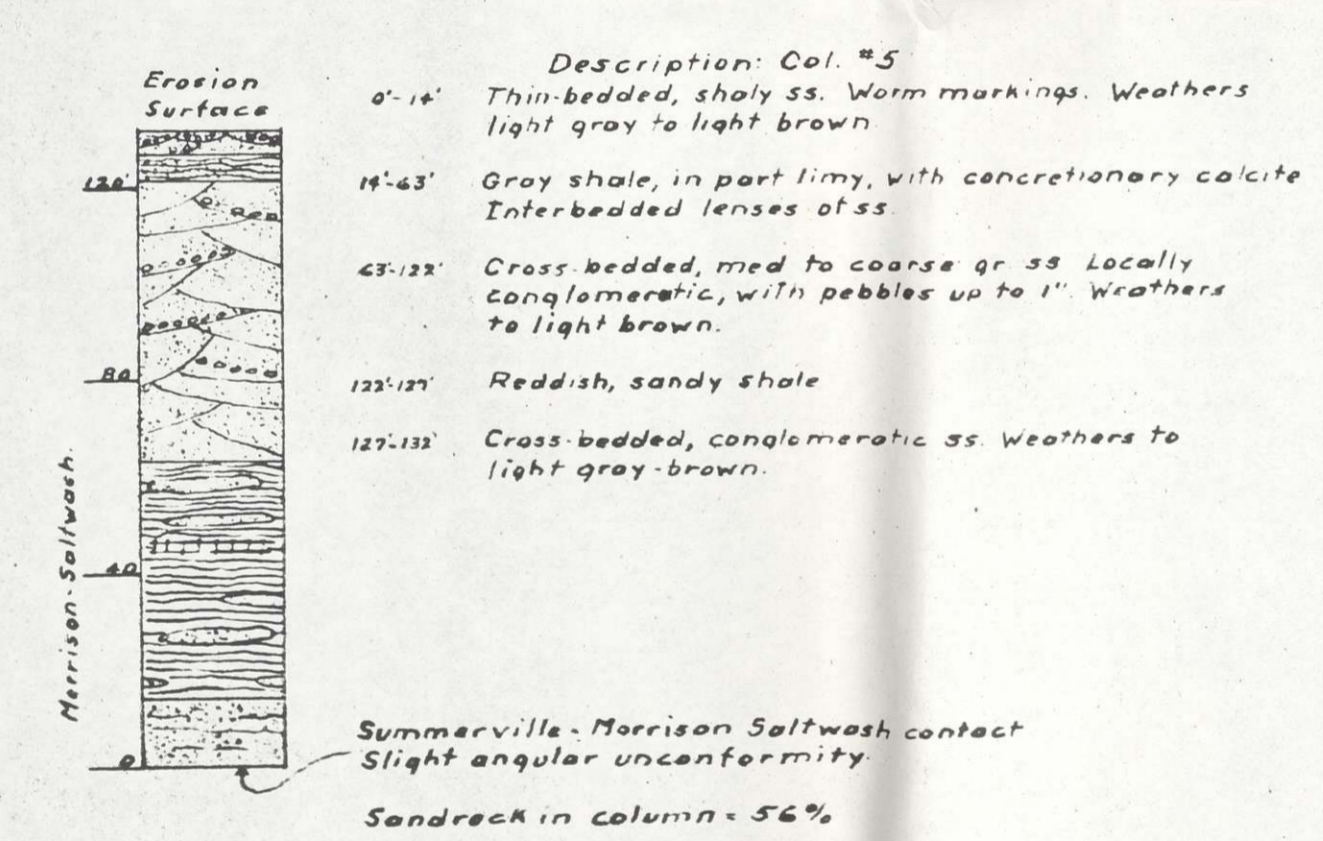
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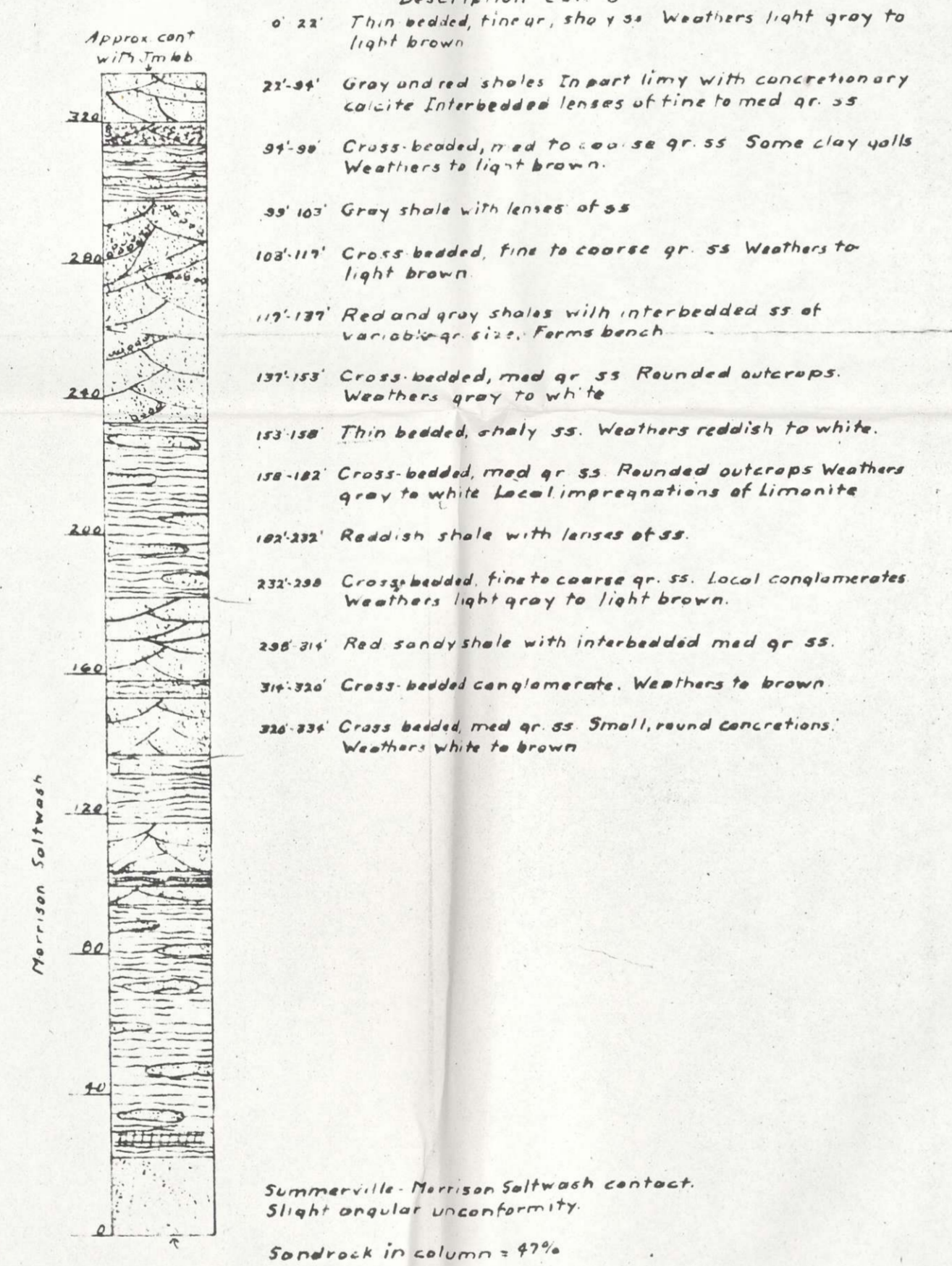
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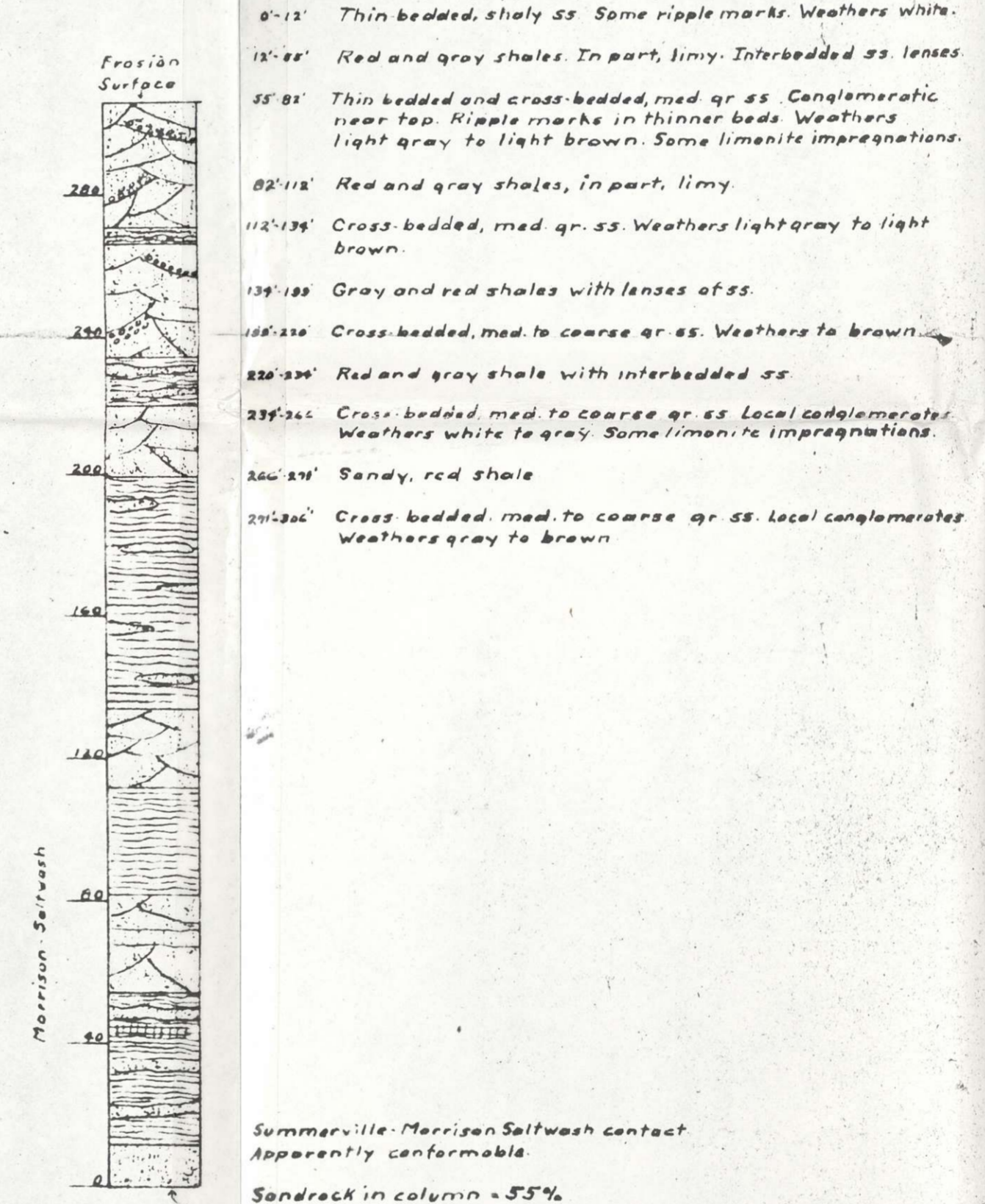
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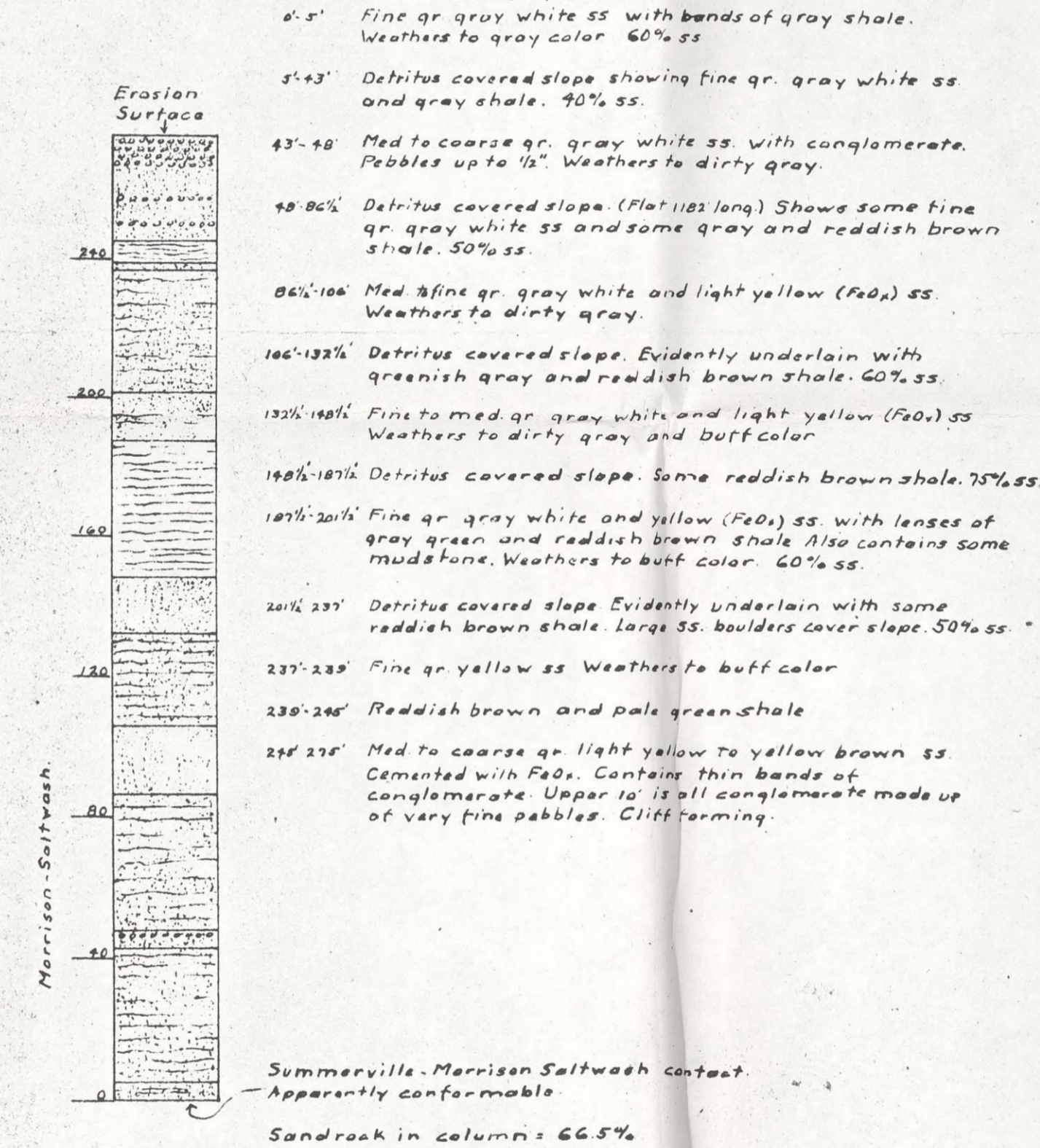
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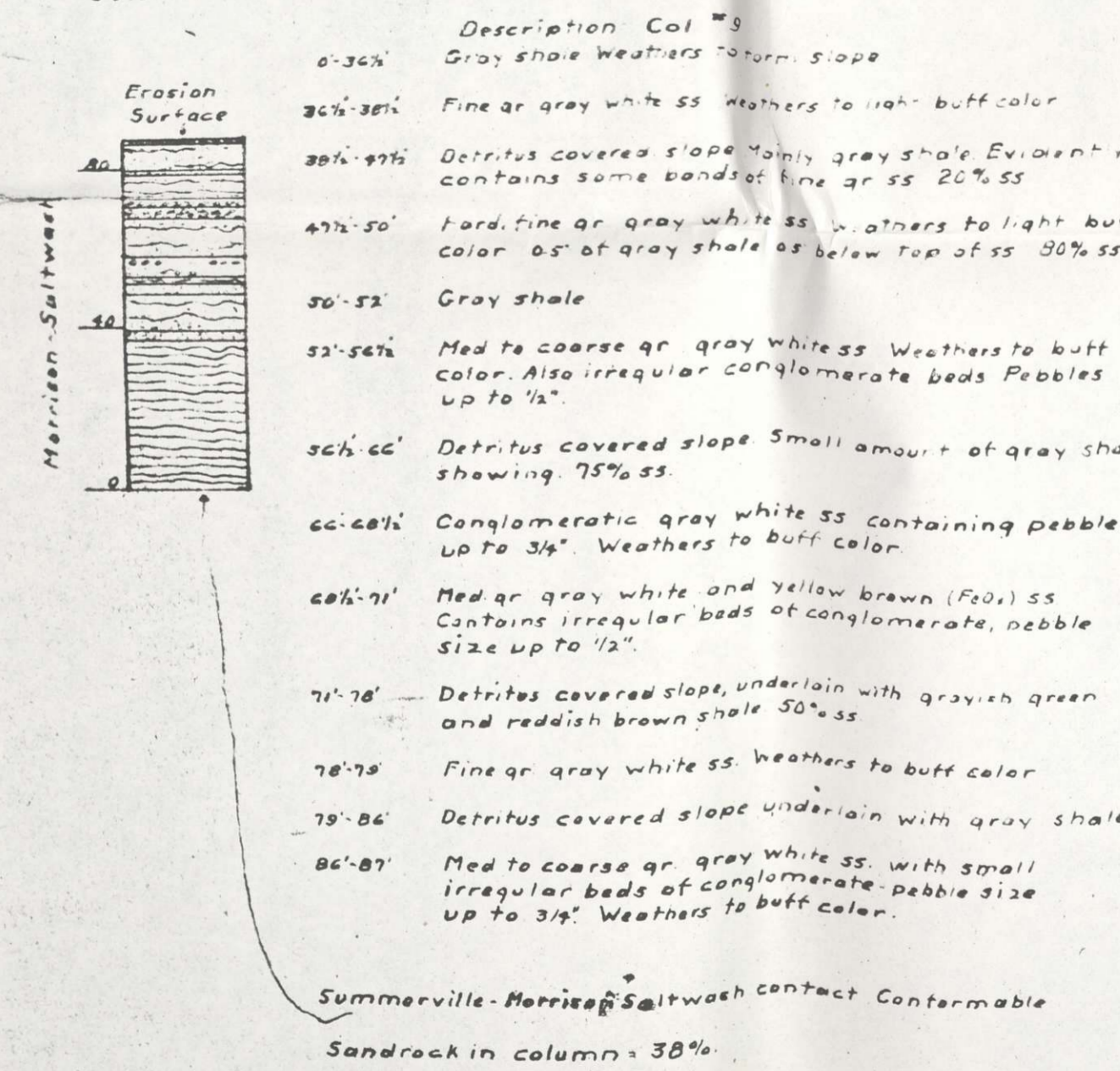
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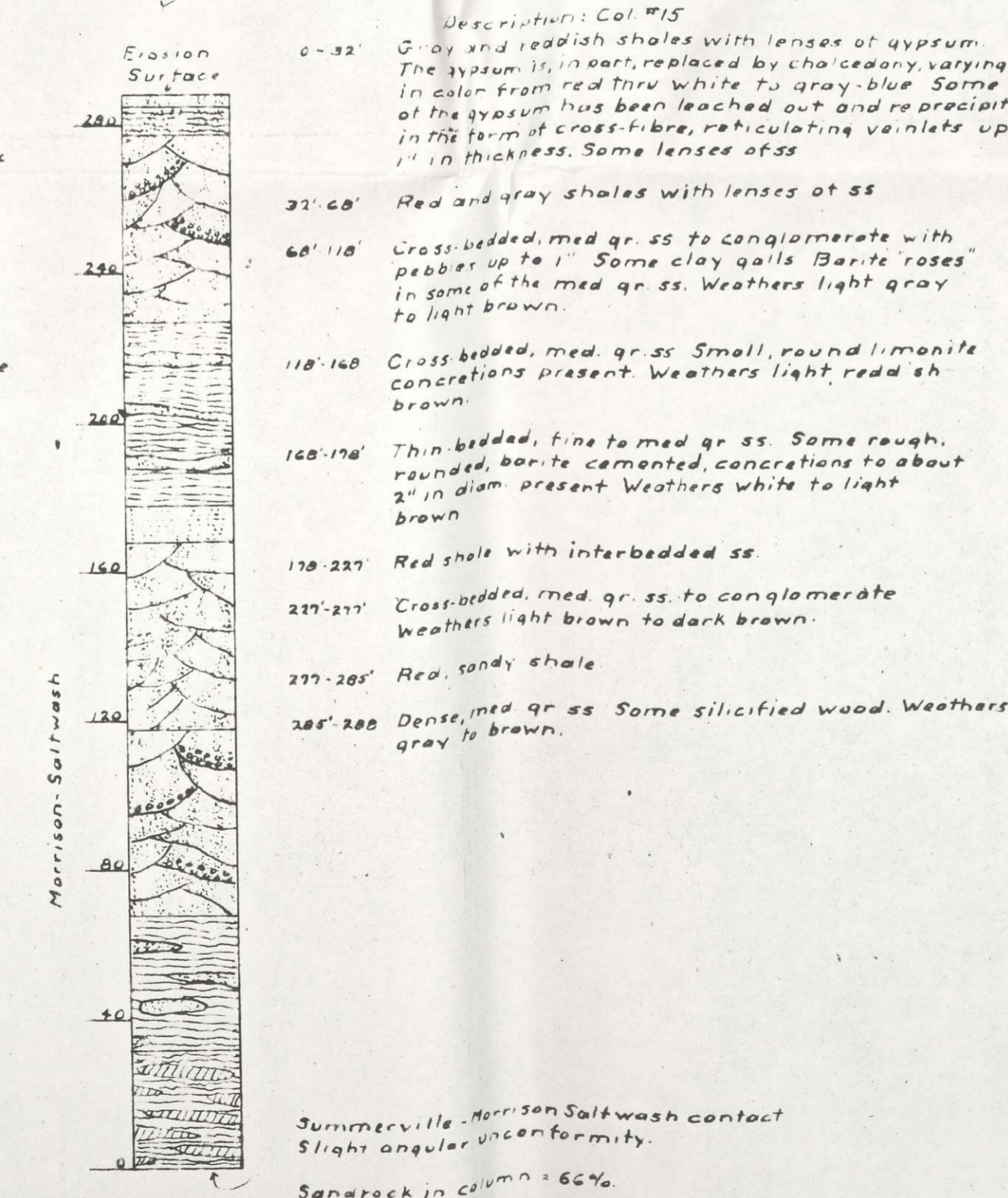
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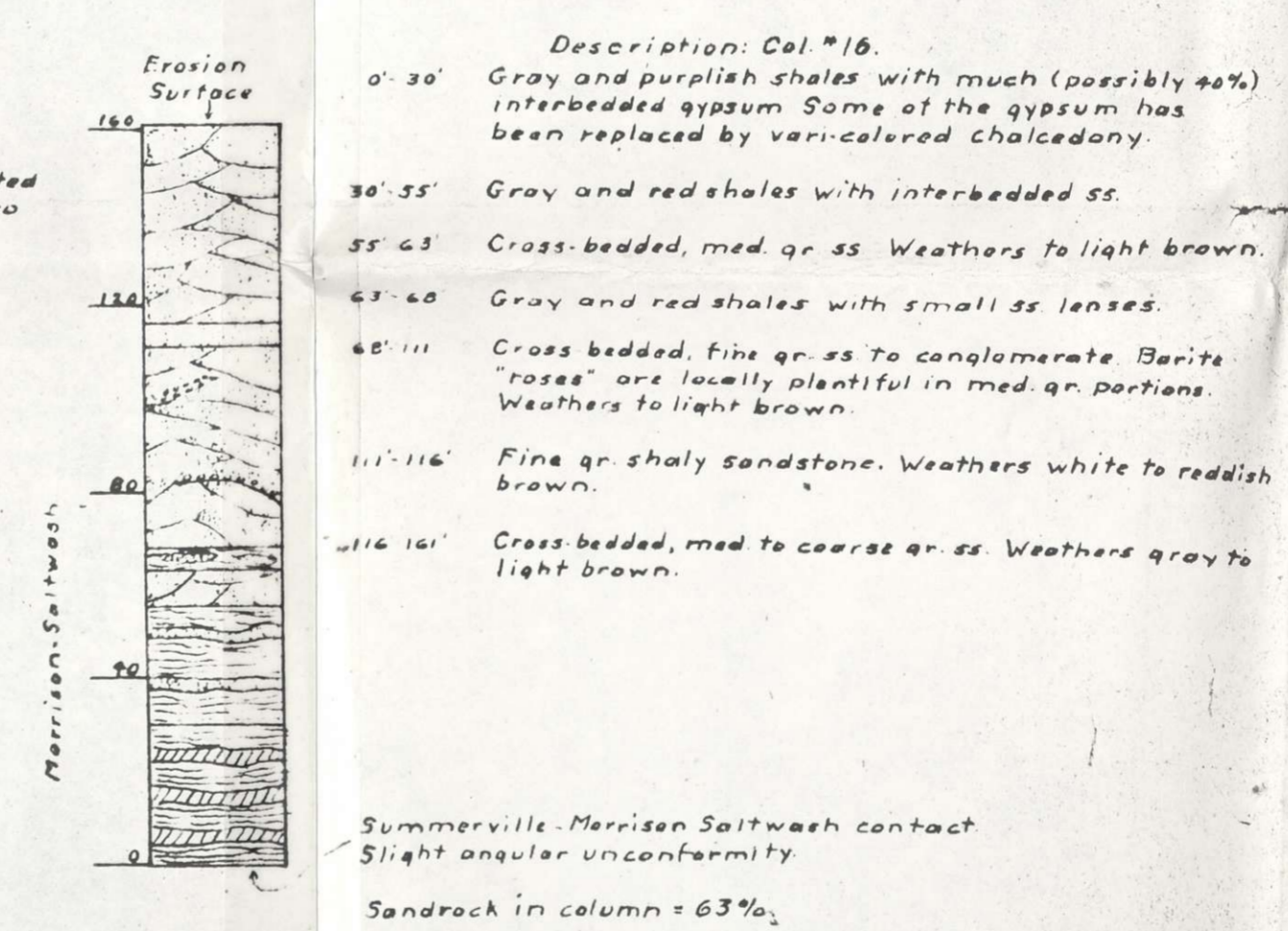
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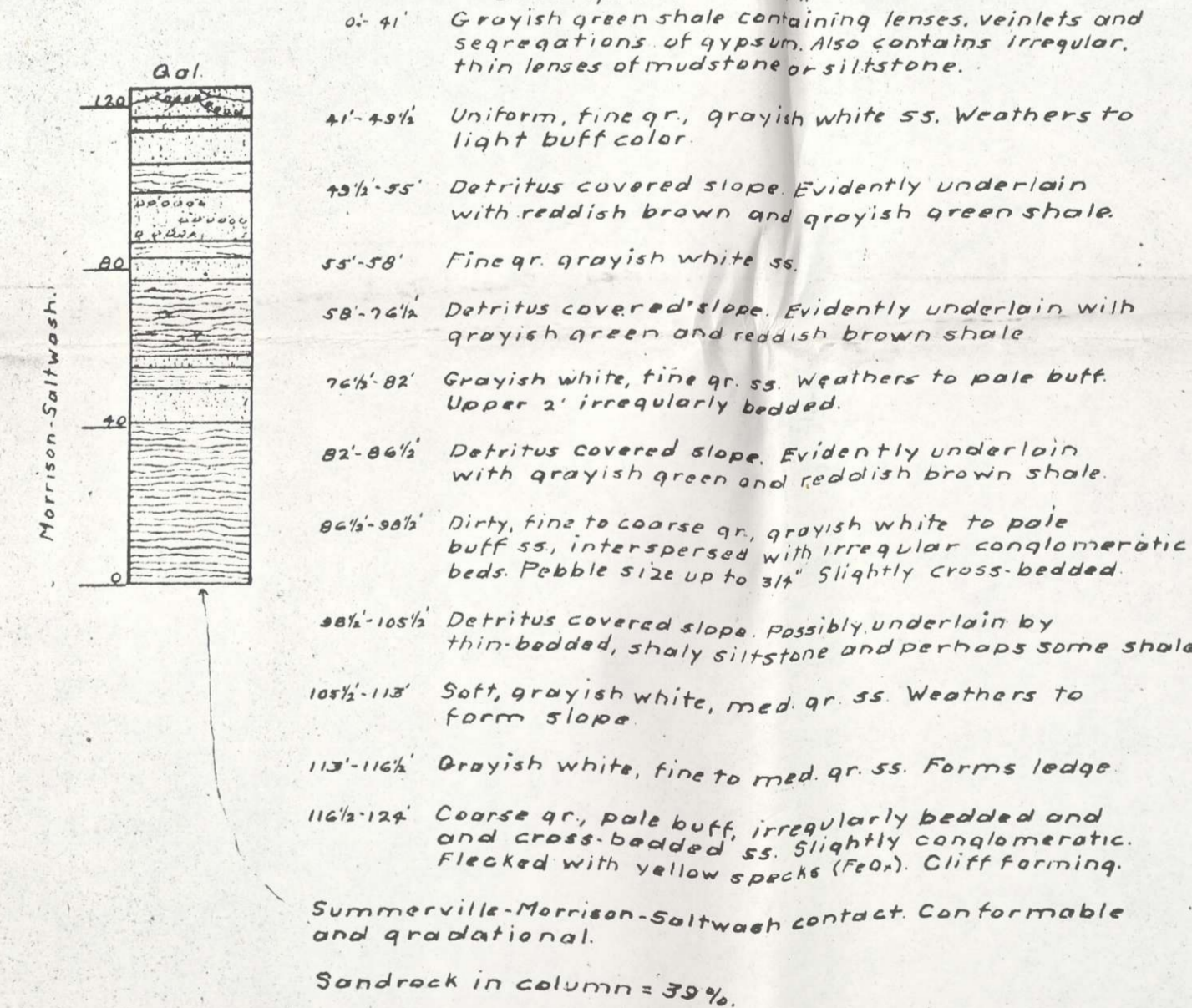
Column #15



Column #16



Column #17



Columns 1-9, 15-17 RMD 46

UNION MINES DEVELOPMENT CORP  
GRAND JUNCTION, COLO  
FIELD OFFICE

TITLE: HENRY MTS AREA  
GRANITE WASH DISTRICT

SCALE: 1"=40' DATE: AUG 1, 1944

DRAWN BY: MOYD, HASSLER, COLEMAN

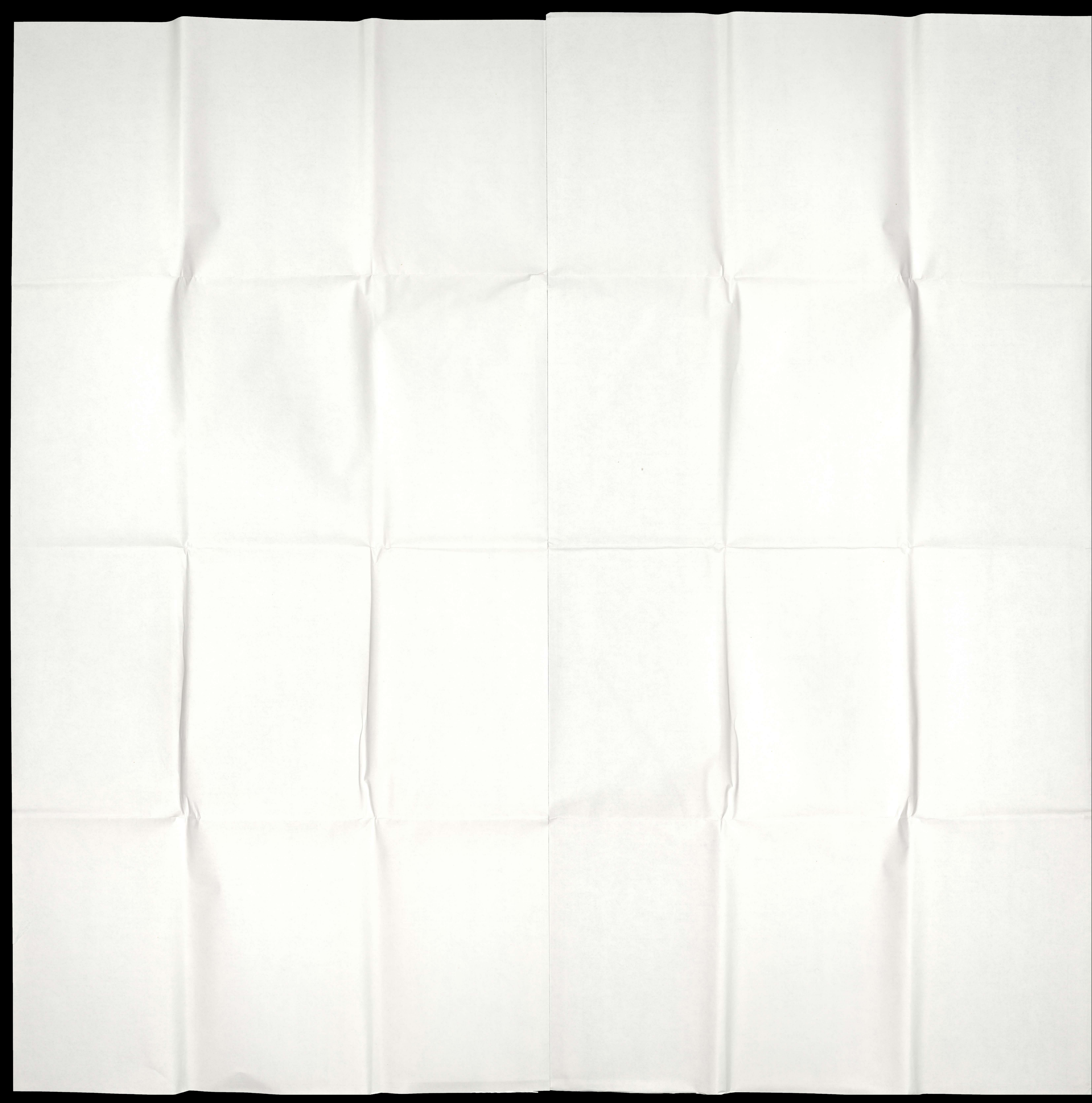
TRICED BY: A.H. COLEMAN

GEOLOGY BY: A.H. COLEMAN & PARTY

Utah-hm-9

DECLASSIFIED







Column #18

Description Col #18  
 0'-24" Grayish green shale containing lenses, veinlets and segregations of gypsum. Also contains irregular lenses of mudstones and siltstones.

24'-30" Grayish white, med gr. ss. Contains yellow flecks (F64).

30'-35" Detritus covered slope underlain by grayish green and reddish brown shale.

35'-37" Detritus covered slope underlain by grayish green and reddish brown shale. Possibly contains some soft ss. lenses.

37'-50" Detritus covered slope probably underlain by shale and lenticular, fine gr. ss. About 30% ss.

50'-52" Med to coarse gr., grayish white ss. Some small lenses of conglomerate, pebble size up to 3/8".

52'-64" Reddish-brown shale.

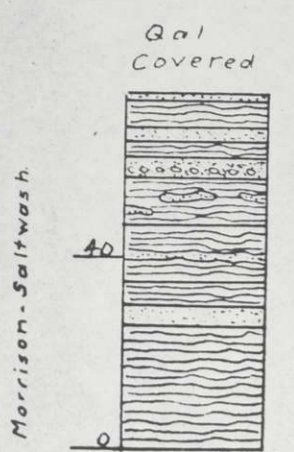
64'-67" Hard, well cemented (F20), med gr. to coarse gr. ss. Yellowish buff in color.

67'-72" Detritus covered slope underlain by grayish green and reddish brown shale.

72'-79" Well cemented, grayish white, med. gr. ss. Contains scattered pebbles up to 3/8".

Summerville-Morrison Saltwash contact Conformable and gradational.

Sandrock in column = 24%.



Column #19

Description Col #19  
 0'-24" Grayish green shale containing lenses, veinlets and segregations of gypsum. Also contains irregular lenses of mudstones and siltstones.

24'-30" Detritus covered slope, evidently underlain by soft, grayish green and reddish brown shale. Some evidence of thin beds of fine gr. ss. 25% ss.

30'-37" Well consolidated, grayish green and reddish brown shale. Contains irregular lenses of fine gr. ss., grayish white in color.

37'-50" Grayish white, med gr., massive ss. Weathers to light buff. Forms cliff.

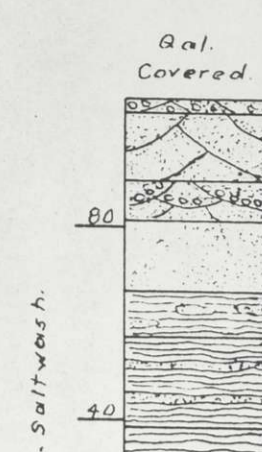
50'-52" Pale buff, very coarse gr. to conglomeratic ss. Pebble size up to 1/2". Marked cross-bedding.

52'-104" Massive, grayish white, fine to med. gr. ss. Forms cliff. Slight cross-bedding.

104'-107" Conglomeratic ss. Pebble size up to 3/8". Cross-bedded.

Summerville-Morrison Saltwash contact. Shows slight erosional unconformity.

Sandrock in columns = 54%.



Column #20

Description Col #20  
 0'-55" Gray shale containing bands of gypsum.

55'-60" Fine gr., gray white ss. Weathers to light buff color.

60'-70" Detritus covered slope. Evidently underlain by gray shale, 20% ss.

70'-74" Fine gr., gray white ss. Weathers to buff color. Contains thin beds of light gray to blue gray shale 30% ss.

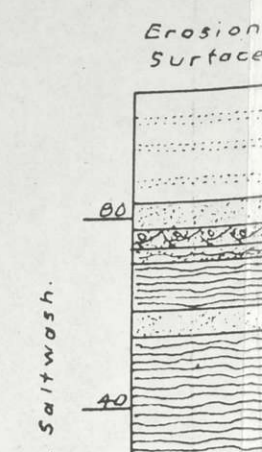
74'-77" Gray white conglomerate. Pebbles up to 3/8". Cross-bedded. Weathers to buff color.

77'-83" Fine gr., gray white ss. Weathers to dirty gray color.

83'-102" Flat slope to top of column. Detritus covered between thin beds of fine gr., gray white ss. The latter weathers to dirty gray color, 20% ss.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 33%.



Column #21

Description Col #21  
 0'-45" Gray shale containing bands of gypsum.

45'-47" Fine gr., gray white ss. Weathers to dirty gray and light buff color.

47'-52" Detritus covered slope. Evidently underlain with gray shale and fine gr., gray white ss. 20% ss.

52'-53" Fine gr., gray white ss. Weathers to light buff.

53'-54" Detritus covered slope with some gray shale showing thru. 30% ss.

54'-57" Irregular conglomerate beds interbedded with med. gr., gray white ss. Conglomerate pebble size up to 1/2". Slight cross bedding. Weathers to dirty gray and light buff color.

57'-70" Detritus covered slope showing 4" bed of med. gr., gray white ss. in place. Also some blue-gray shale exposed in places. Also some gray shale 50% ss.

70'-76" Fine gr., gray white ss. Cross-bedded. Weathers to buff color. Also contains some gray shale 80% ss.

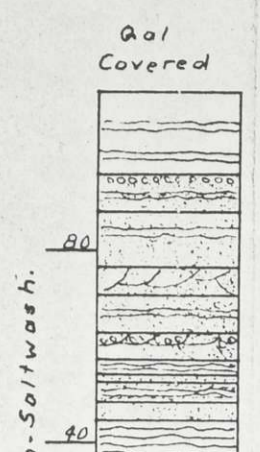
76'-87" Blow sand covered slope. Med. gr., gray white ss. exposed in places. Also some gray shale 50% ss.

87'-94" Med. gr., light buff, with interbedded light green shale. Top 2' is an irregular conglomerate with pebbles up to 1/2". Weathers to buff color. 25% ss.

94'-113" Some gray shale in place, showing thru a blow sand covering. Quantities of small pieces of silicified wood. 60% ss.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 43%.



Column #22

Description Col #22  
 0'-20" Gray shale containing beds of gypsum.

20'-24" Fine gr., gray white ss.

24'-29" Detritus covered slope underlain by gray shale and fine gr., gray white ss. 10% ss.

29'-37" Fine gr., gray white ss. Weathers locally to light buff.

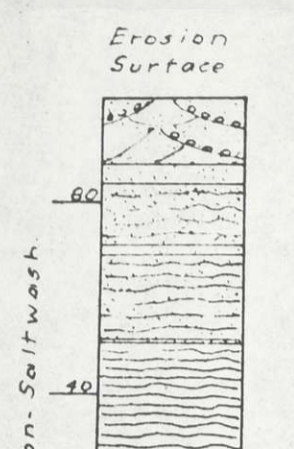
37'-44" Detritus covered slope. Evidently underlain by gray shale and fine gr., gray white ss. 25% ss.

44'-48" Fine gr., gray white ss. Weathers to dirty gray and locally to light buff color.

48'-102" Med. gr., gray white ss. with irregular conglomerate beds. Pebbles up to 3/8". Cross-bedded. Weathers to dirty gray color.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 28%.



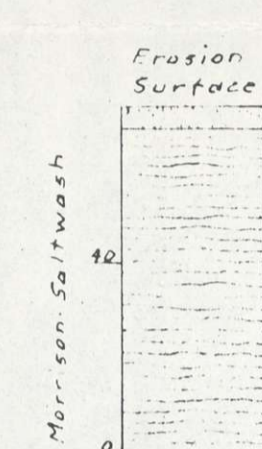
Column #23

Description Col #23  
 0'-20" Gray shale containing beds of gypsum.

20'-24" Med. gr., gray white ss. Weathers to a buff color. This bed may not be in place at this point but may have been dropped somewhat by effect of erosion.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 53%.



Column #25

Description Col #25  
 0'-12" Gray shale containing beds of gypsum.

12'-14" Fine gr., gray white ss. interbedded with gray shale ss. weathers to pale buff. 20% ss.

14'-45" Detritus covered slope showing gray shale interbedded with minor amount of ss. 20% ss.

45'-60" Fine gr., gray white ss. Weathers to buff color.

60'-68" Detritus covered slope underlain by gray and reddish brown shale interbedded with med. gr., gray white ss. The latter weathers to buff color. 70% ss.

68'-92" Med. gr., gray white, conglomeratic ss. Pebble size up to 1/2". Weathers to buff color.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 18%.

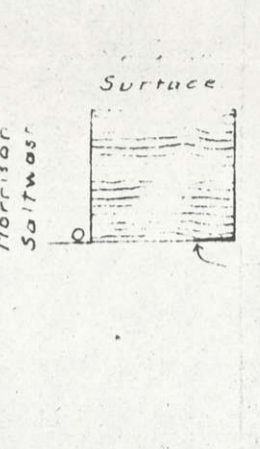


Column #26

Description Col #26  
 0'-12" Gray shale containing beds of gypsum.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 0%.



Column #27

Description Col #27  
 0'-32" Gray shale and mudstone. Contains some gypsum.

32'-33" Med. gr., gray white ss.

33'-38" Gray shale.

38'-44" Fine to med. gr., gray white ss. Cross-bedded. Weathers to buff color. 85% ss.

44'-55" Detritus covered slope. Evidently underlain by gray shale interbedded with fine gr., gray white ss.

55'-56" Fine gr., gray white ss. Weathers to buff color.

56'-60" Gray and blue gray shale interbedded with mudstone.

60'-79" Fine to coarse gr., gray white ss. Cross-bedded. Weathers to buff color.

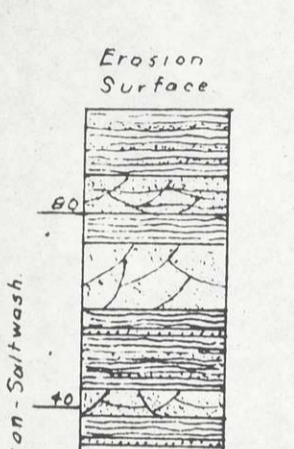
79'-80" Gray and brown shale.

80'-88" Med. to coarse gr., gray white ss. Cross-bedded. Weathers to buff. Some thin, interbedded seams of brown and gray shale. 50% ss.

88'-103" Detritus covered slope. Underlain with gray and brown shale interbedded with fine gr., gray white ss. 50% ss.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 33%.



Column #28

Description Col #28  
 0'-20" Gray shale and mudstone with beds of gypsum.

20'-24" Med. to coarse gr., gray white ss. Cross-bedded. Weathers to buff color.

24'-26" Blue-gray shale and light green mudstone.

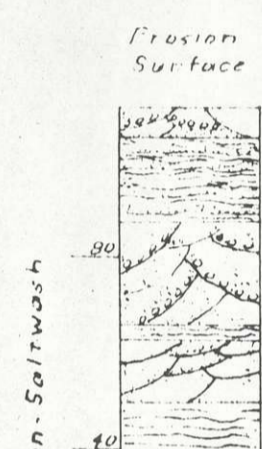
26'-27" Med. to coarse gr., gray white ss. interbedded with an irregular conglomerate. Weathers to buff color. Some thin seams of gray and reddish brown shale. 80% ss.

27'-105" Detritus covered slope showing gray white, med. gr. ss. interbedded with small amount of gray shale. 75% ss.

105'-111" Med. to coarse gr., gray white to light buff, conglomeratic ss. Cross-bedded. Weathers to buff color.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 44%.



Column #29

Description Col #29  
 0'-47" Thin beds of gray shale, pale green mudstone and gypsum.

47'-51" Fine gr., gray white ss. Cross-bedded. Weathers to buff color.

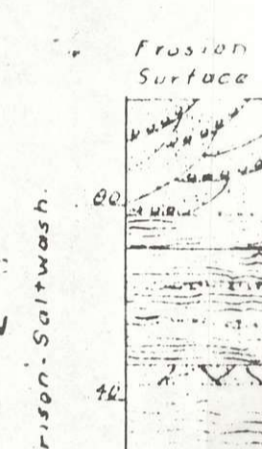
51'-71" Detritus covered slope. Evidently underlain by gray and reddish brown shale, interbedded with some thin beds of fine gr., gray white ss. 10% ss.

71'-78" Blue-gray, pale green and reddish brown shales interbedded with some thin mudstone lenses.

78'-104" Fine to coarse gr., gray white ss., interbedded with irregular conglomerate beds. Cross-bedded.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 26%.

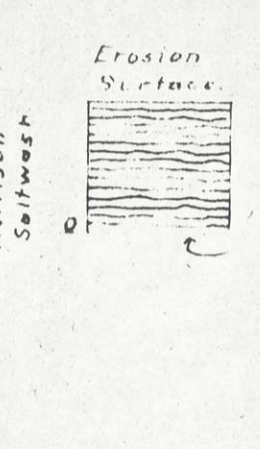


Column #30

Description Col #30  
 0'-23" Thin beds of gray shale and mudstone with interbedded gypsum.

Summerville-Morrison Saltwash contact. Conformable.

Sandrock in column = 0%.



Column #31

Description Col #31  
 0'-27" Grayish green shale containing lenses, veinlets and segregations of gypsum. Also contains irregular lenses of mudstones and siltstones.

27'-32" Grayish green and reddish brown shale interbedded with lenses of buff, shaly ss. or siltstone.

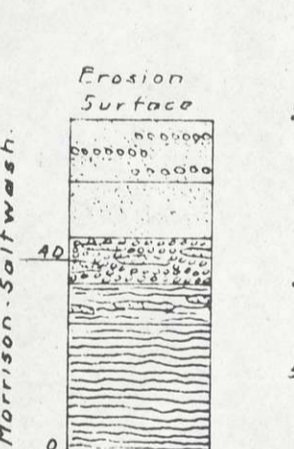
32'-41" Massive buff conglomerate. Pebbles up to 1". Contains few lenses of med. gr., buff ss.

41'-56" Irregularly bedded, fine to med. gr., grayish white, soft ss.

56'-60" Interbedded lenses of conglomerate and fine to med. gr., buff ss. Conglomerate pebble size up to 1/2".

Summerville-Morrison Saltwash contact. Slight erosional unconformity.

Sandrock in column = 49%.



Column #32

Description Col #32  
 0'-33" Grayish green shale containing lenses and veinlets of gypsum. Less gypsum in this section than where this bed is elsewhere exposed. Contains some interbedded siltstone.

33'-41" Soft, irregularly bedded, grayish white, fine to med. gr. ss.

41'-48" Greenish gray and reddish brown shale interbedded with irregular siltstone lenses.

48'-57" Dirty, conglomeratic, buff ss. Conglomerate lenses vary in thickness from few inches to 4". Pebble size up to 1". ss is med. to coarse gr. Slight cross-bedding.

57'-63" Massive, irregularly bedded, med. to coarse gr., grayish white ss. Strong cross bedding.

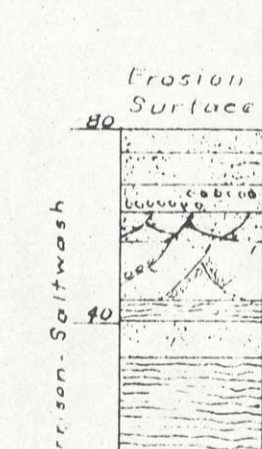
63'-65" Irregular, conglomeratic ss. Pebble size up to 1/2".

65'-75" Detritus covered slope underlain by very soft, irregularly bedded, fine gr., grayish white ss.

75'-80" Massive, med. to coarse gr. with some grit, grayish white ss.

Summerville-Morrison Saltwash contact. Conformable and gradational.

Sandrock in column = 54%.



Column #34

Description Col #34  
 0'-24" Grayish green shale containing lenses, veinlets and segregations of gypsum. Also contains irregular lenses of mudstones and siltstones and limy ss. or impure ls.

24'-26" Fine to med. gr., grayish white ss.

26'-41" Detritus covered slope, underlain by greenish gray and reddish brown shale.

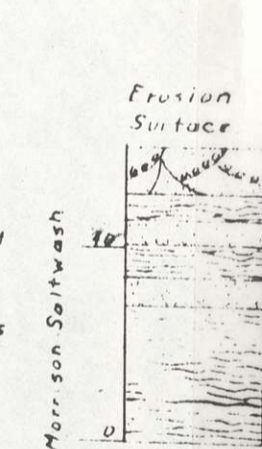
41'-45" Fine to med. gr., grayish white ss.

45'-51" Detritus covered slope underlain by reddish brown shale.

51'-61" Dirty, conglomeratic ss. Conglomerate is in lenses from 3" to 3". Thick. Varies from coarse sand gr. size to 1/2" pebbles. Slight cross-bedding. Buff color.

Summerville-Morrison Saltwash contact. Conformable and gradational.

Sandrock in column = 34%.



Column #35

Description Col #35  
 0'-42" Greenish gray shale containing lenses, veinlets and segregations of gypsum. Also contains irregular lenses of mudstones and siltstones and of limy ss. or impure ls.

42'-46" Massive, buff, conglomeratic ss. Varies from coarse sand gr. size to 1" pebbles.

46'-50" Detritus covered slope, underlain by greenish and reddish brown shale.

50'-53" Grayish white, fine to med. gr. ss.

53'-55" Detritus covered slope, underlain by reddish brown shale.

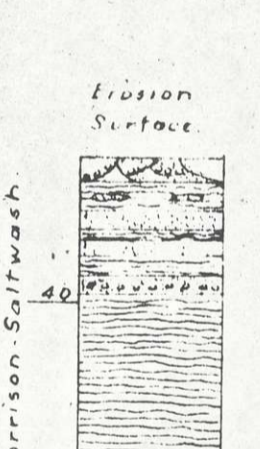
55'-59" Soft, irregularly bedded, grayish white to greenish white ss.

59'-65" Detritus covered flat slope. Underlain by reddish brown shale. Contains some thin lenses of soft, grayish white ss. 25% ss.

65'-70" Dirty buff conglomeratic ss. Conglomerate is lenticular, varying in thickness from 2" to 2". Grain size varies from med. gr. to 3/4" pebbles. Strong cross-bedding.

Summerville-Morrison Saltwash contact. Slight erosional unconformity.

Sandrock in column = 29%.



Column #36

Description Col #36  
 0'-26" Grayish green shale containing lenses, veinlets and segregations of gypsum. Also contains irregular lenses of mudstones and siltstones and of limy ss. or impure ls.

26'-32" Detritus covered slope underlain by greenish and reddish brown shale.

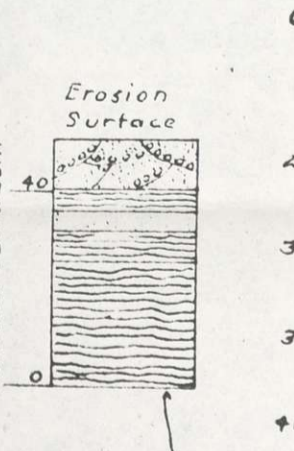
32'-36" Grayish white, irregularly bedded, fine to med. gr. ss.

36'-41" Detritus covered slope, underlain by reddish brown shale.

41'-51" Massive conglomeratic ss. Conglomerate is in lenses, varying from 1" to 2" in thickness. Grain size varies from coarse sand gr. to 3/4" pebbles. Slight cross-bedding.

Summerville-Morrison Saltwash contact. Conformable and gradational.

Sandrock in column = 27%.



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Column 18-32, 34-36

UNION MINES DEVELOPMENT CORP  
 GRAND JUNCTION, COLO  
 FIELD OFFICE

TITLE: HENRY MTS. AREA  
 GRANITE WASH DISTRICT

SCALE: 1"=40' DATE: AUG 4, 1944  
 DRAWN BY: HASSLER, COLEMAN  
 TRACED BY: A.H. COLEMAN  
 GEOLOGY BY: A.H. COLEMAN & PARTY

U.S.G. 44-10

AMD-461





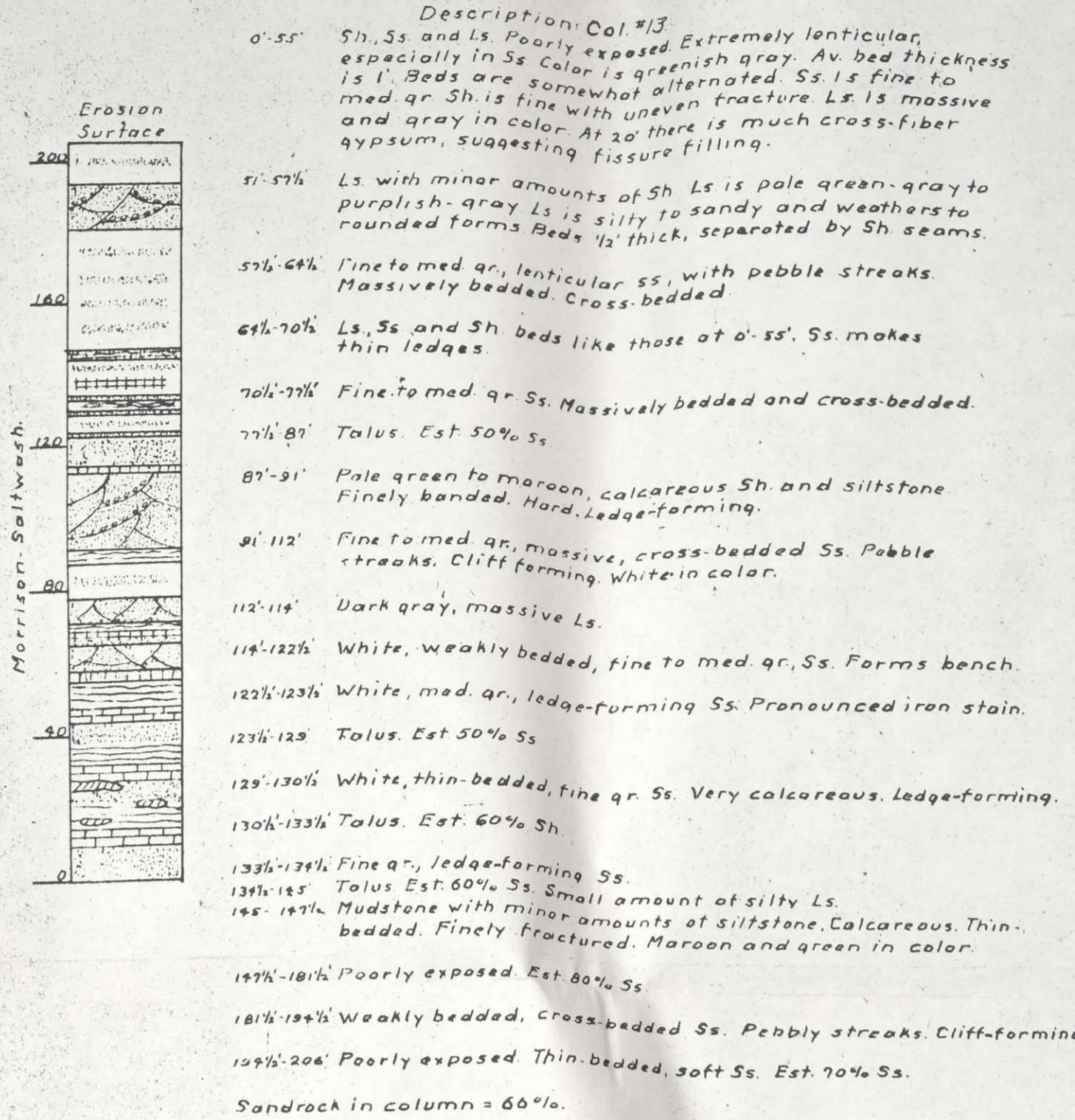
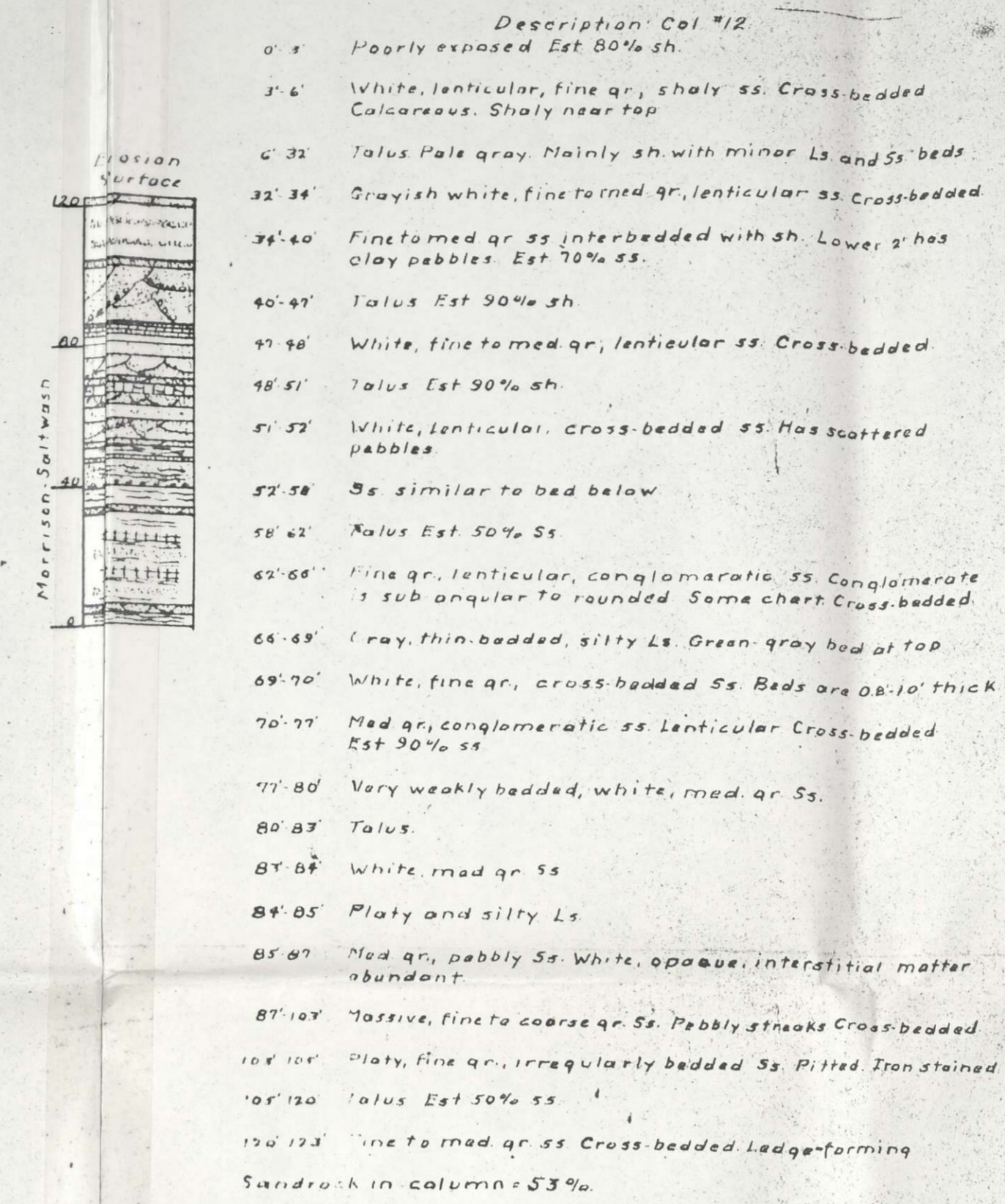
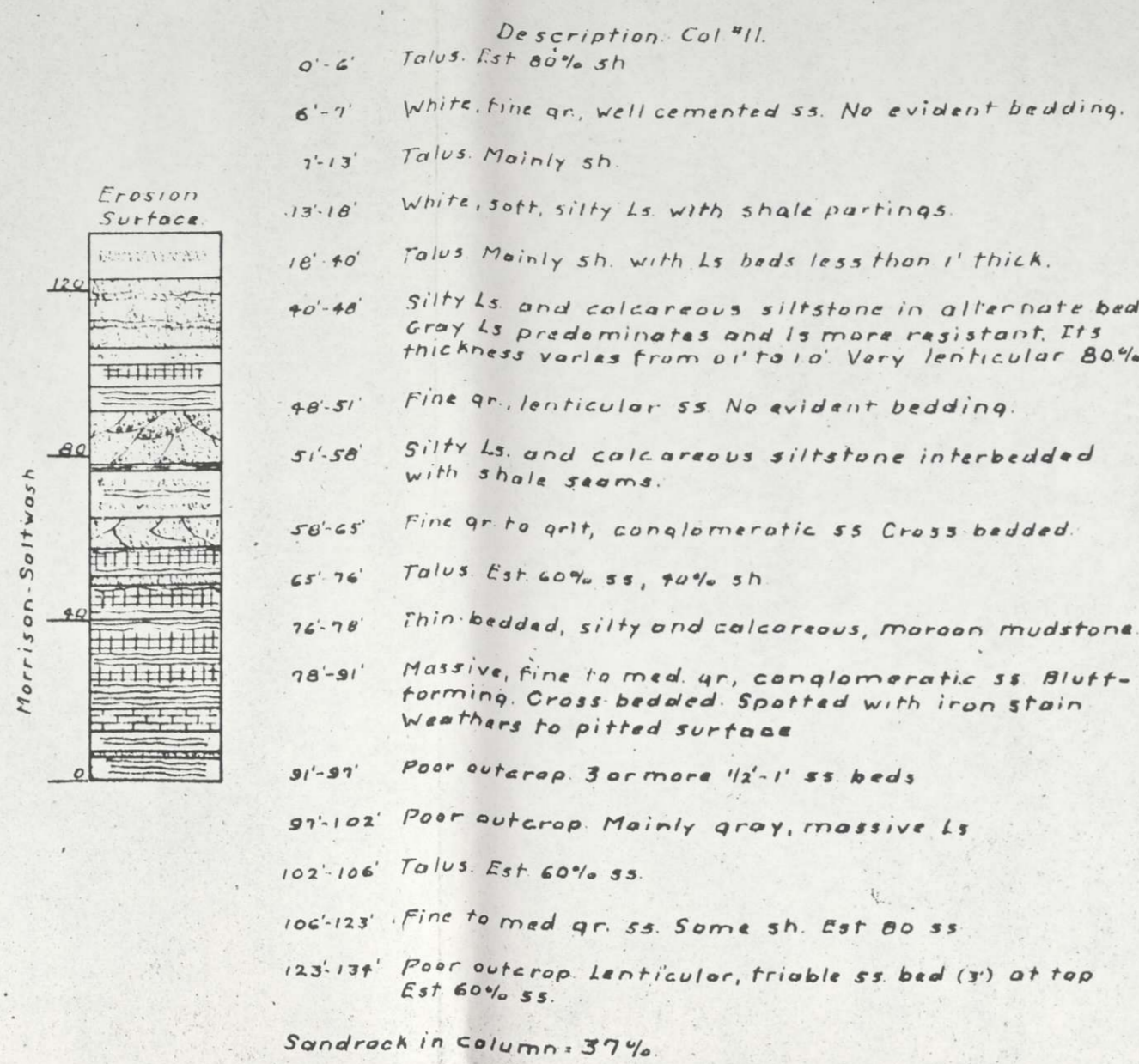
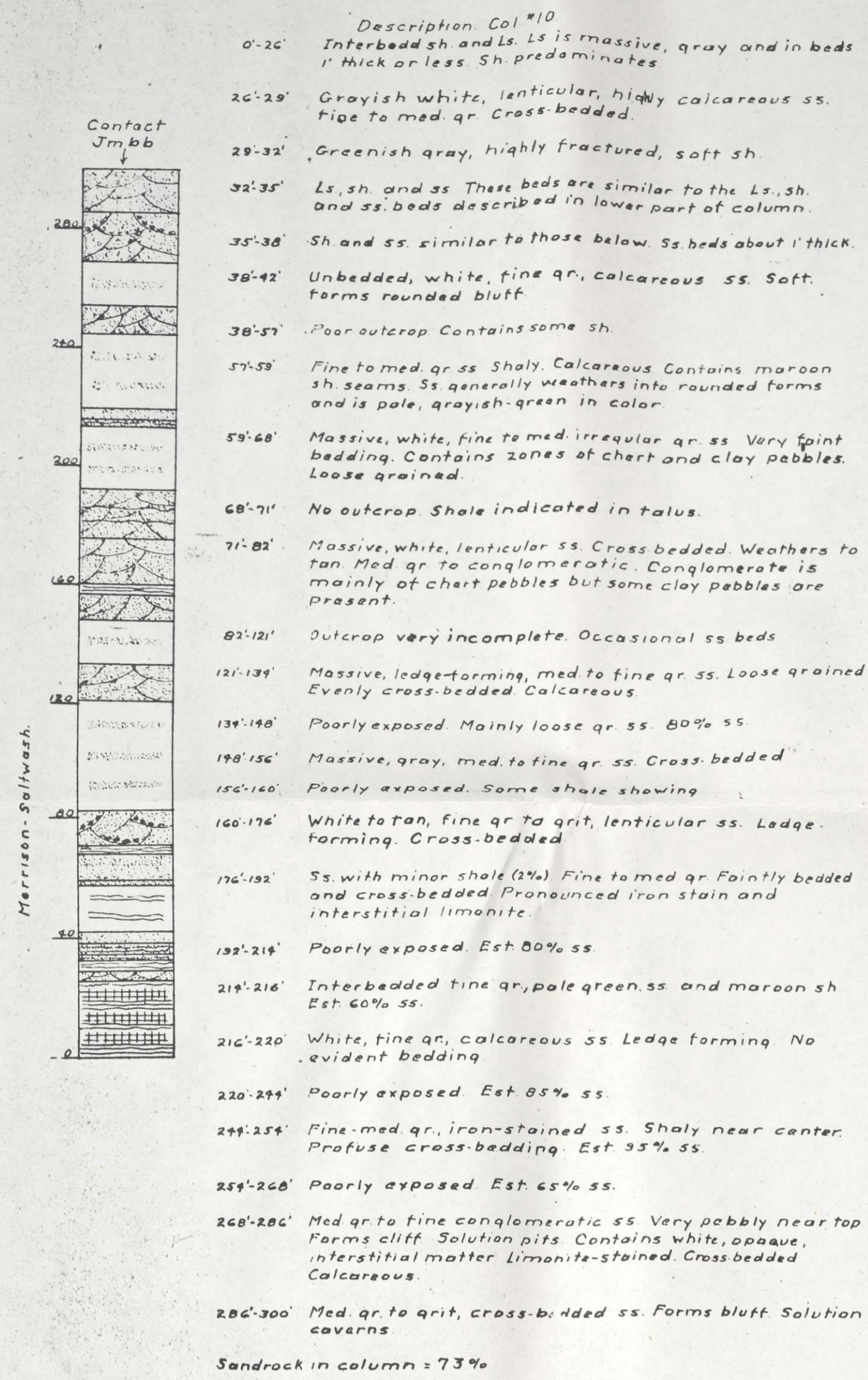


Column #10

Column #11

Column #12

Column #13

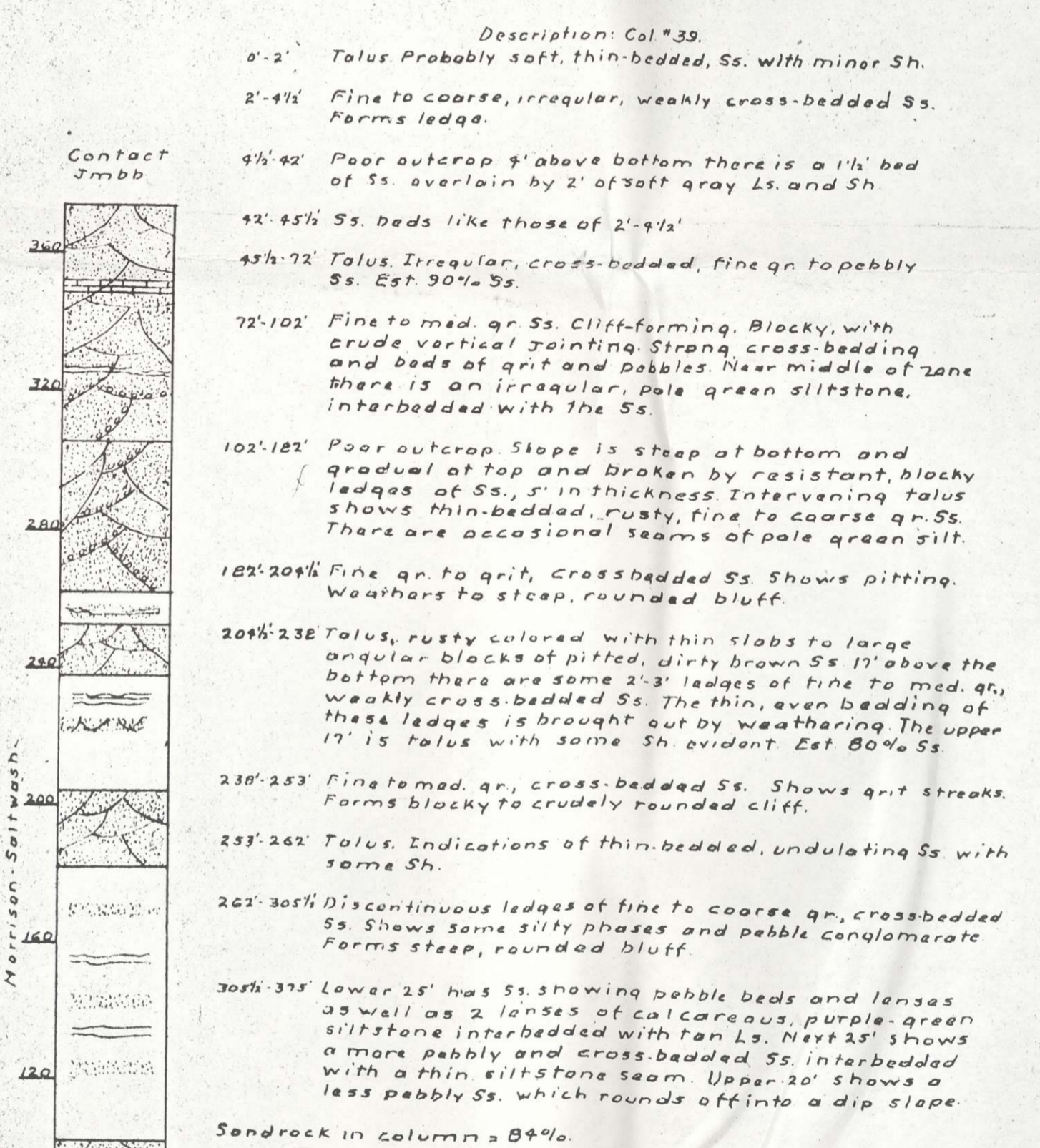
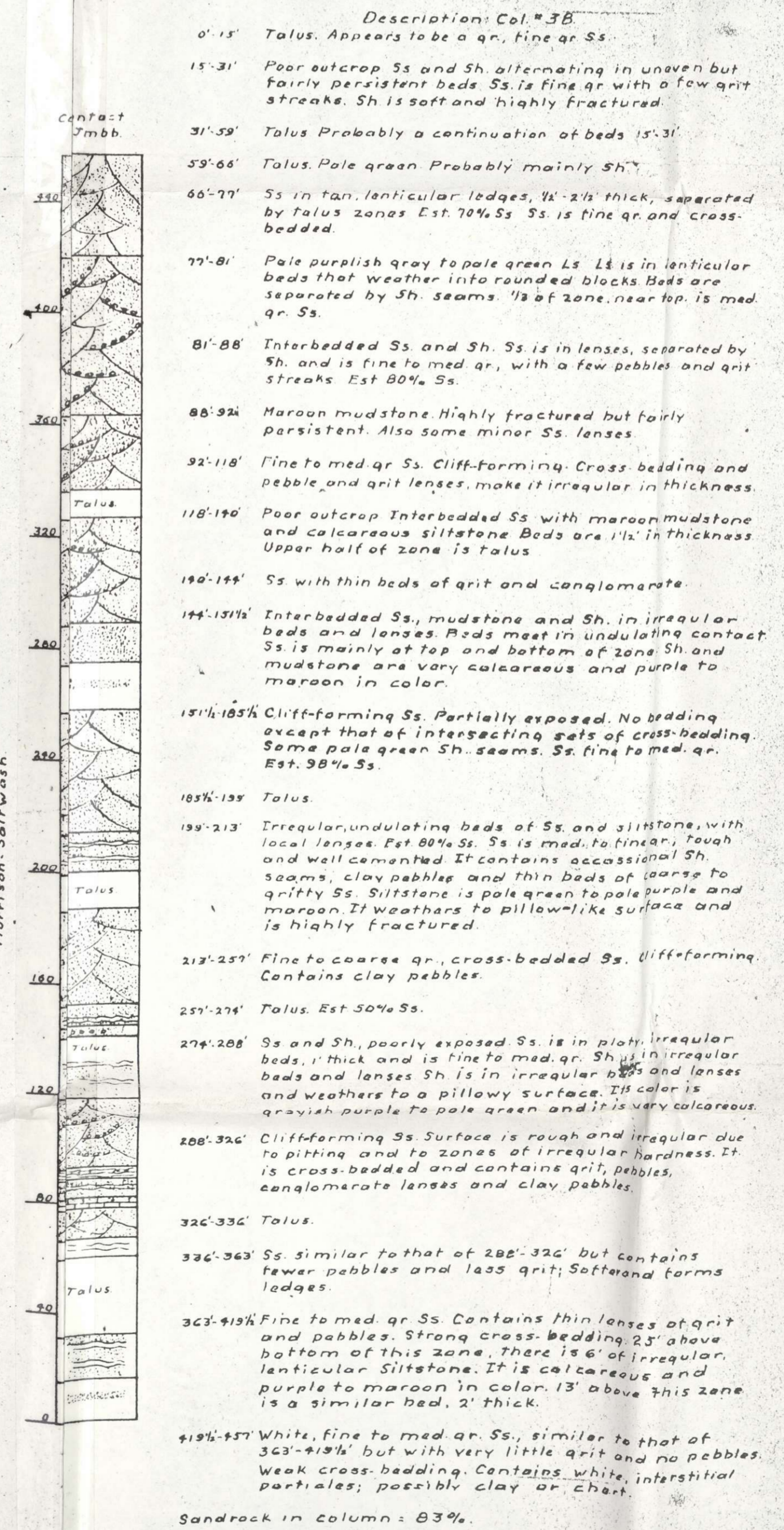
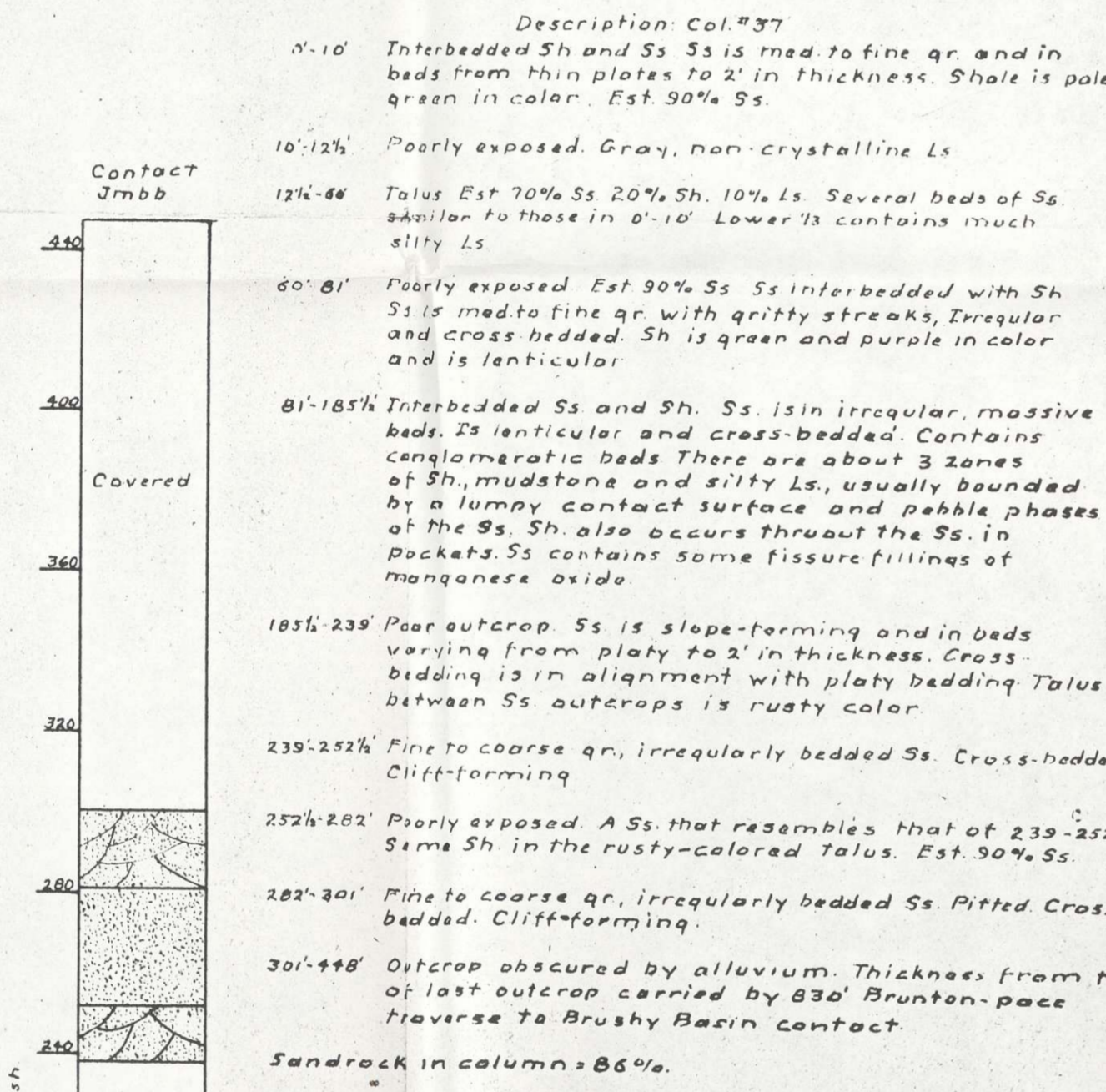
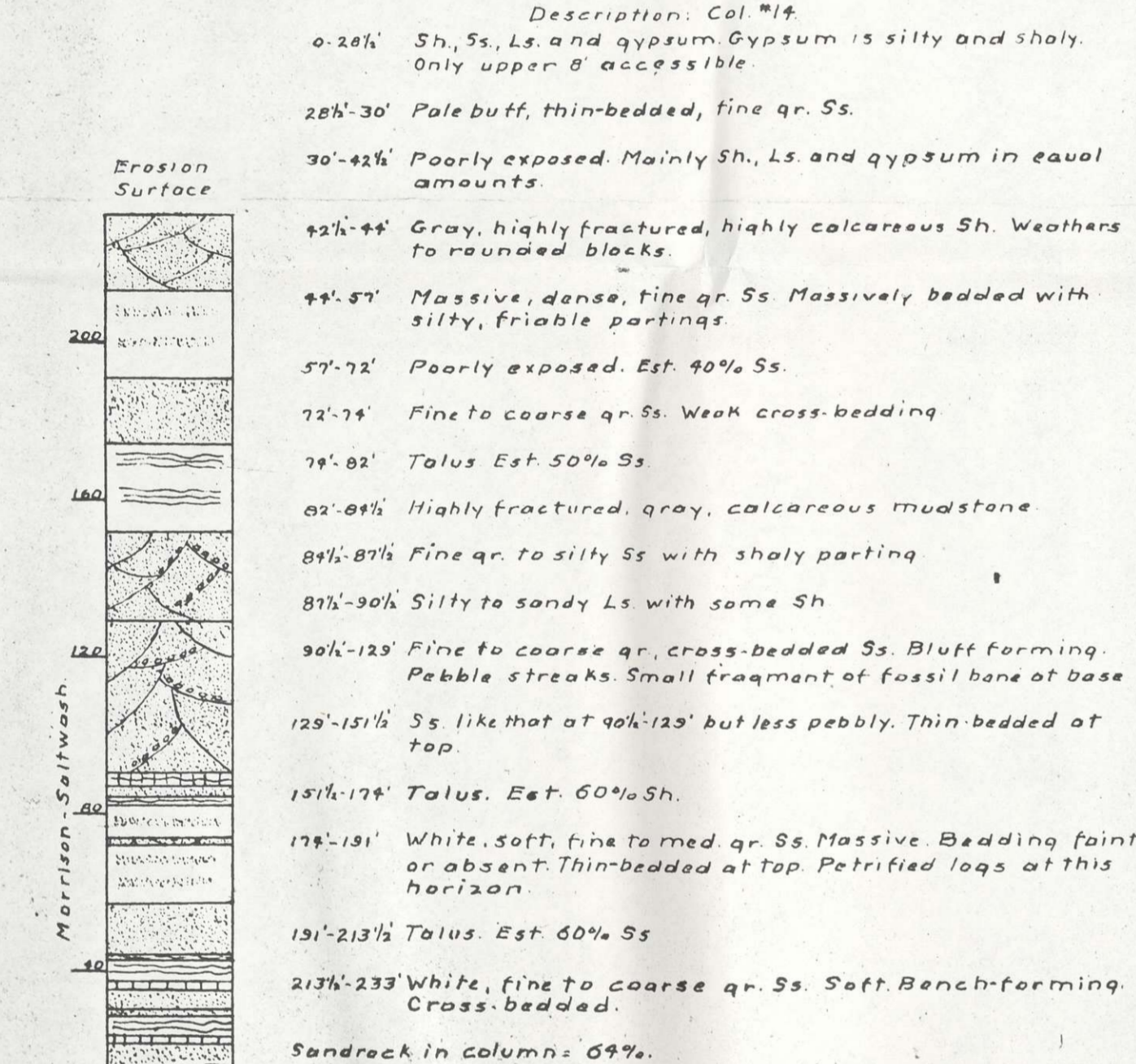


Column #14

Column #37

Column #38

Column #39



Note: All Ss. in these columns appears to be calcareous in varying degrees. It consists mainly of sub-angular to rounded quartz grains. Its weathered surface is pale tan to grayish white and its fresh surface is white to grayish-white.

Columns 10-14, 37-39 Rm 461

UNION MINES DEVELOPMENT CORP  
GRAND JUNCTION, COLO.  
FIELD OFFICE

TITLE: HENRY MTS AREA  
GRANITE WASH DISTRICT.  
SCALE: 1"=40' DATE: AUG 10, 1944.  
DRAWN BY: L. BRYNER  
TRACED BY: A.H. COLEMAN  
GEOLOGY BY: A.H. COLEMAN & PARTY

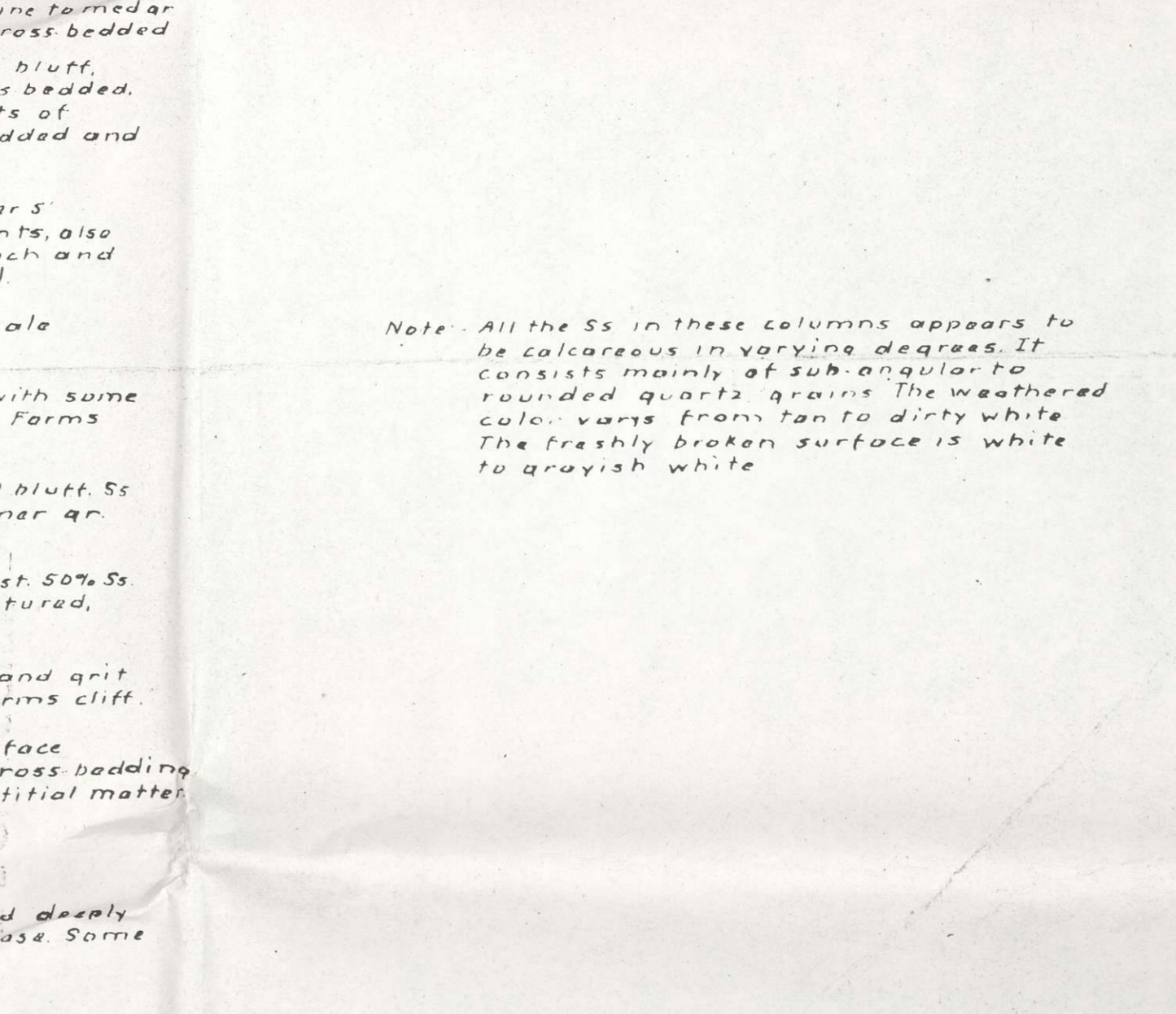
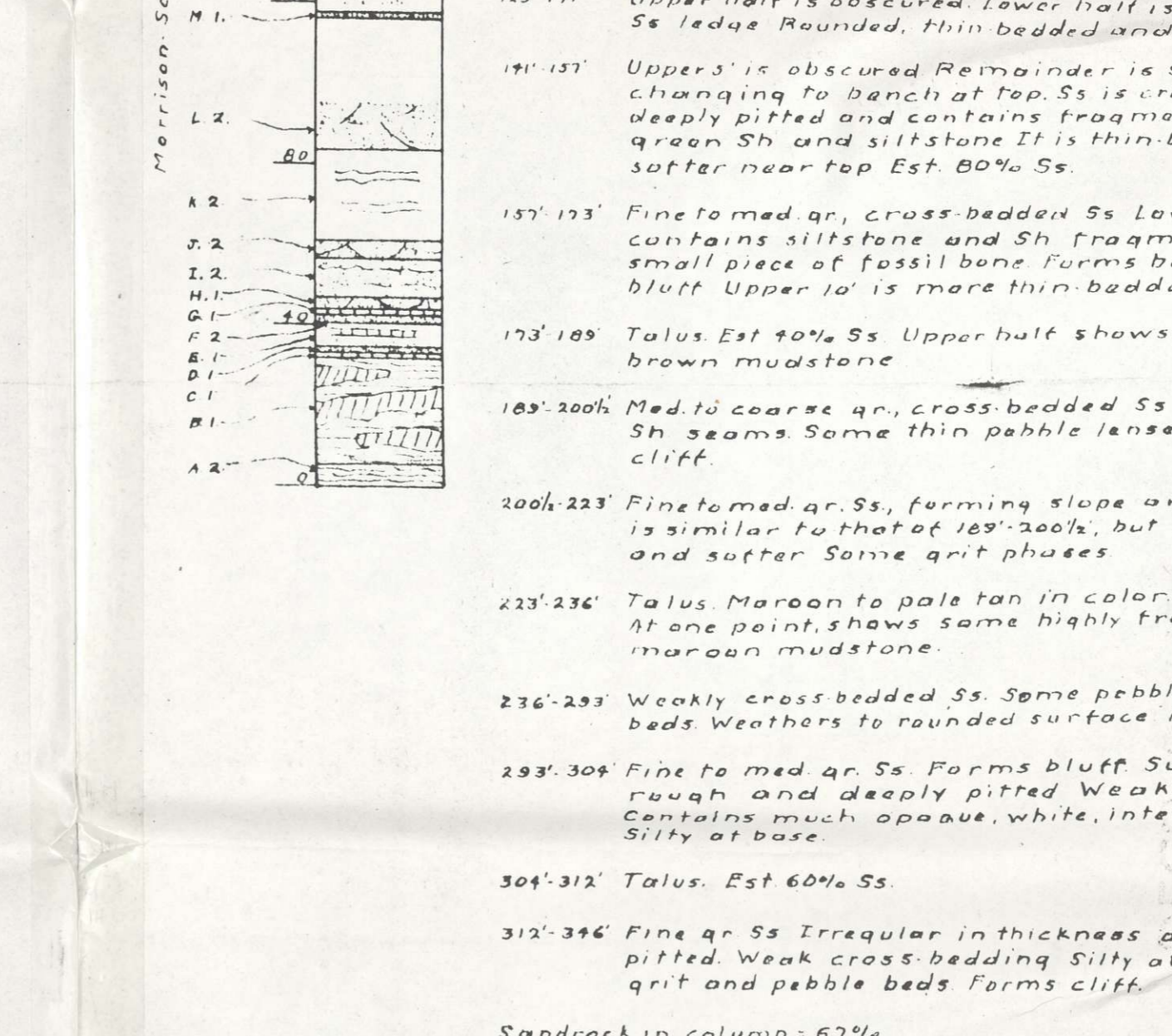
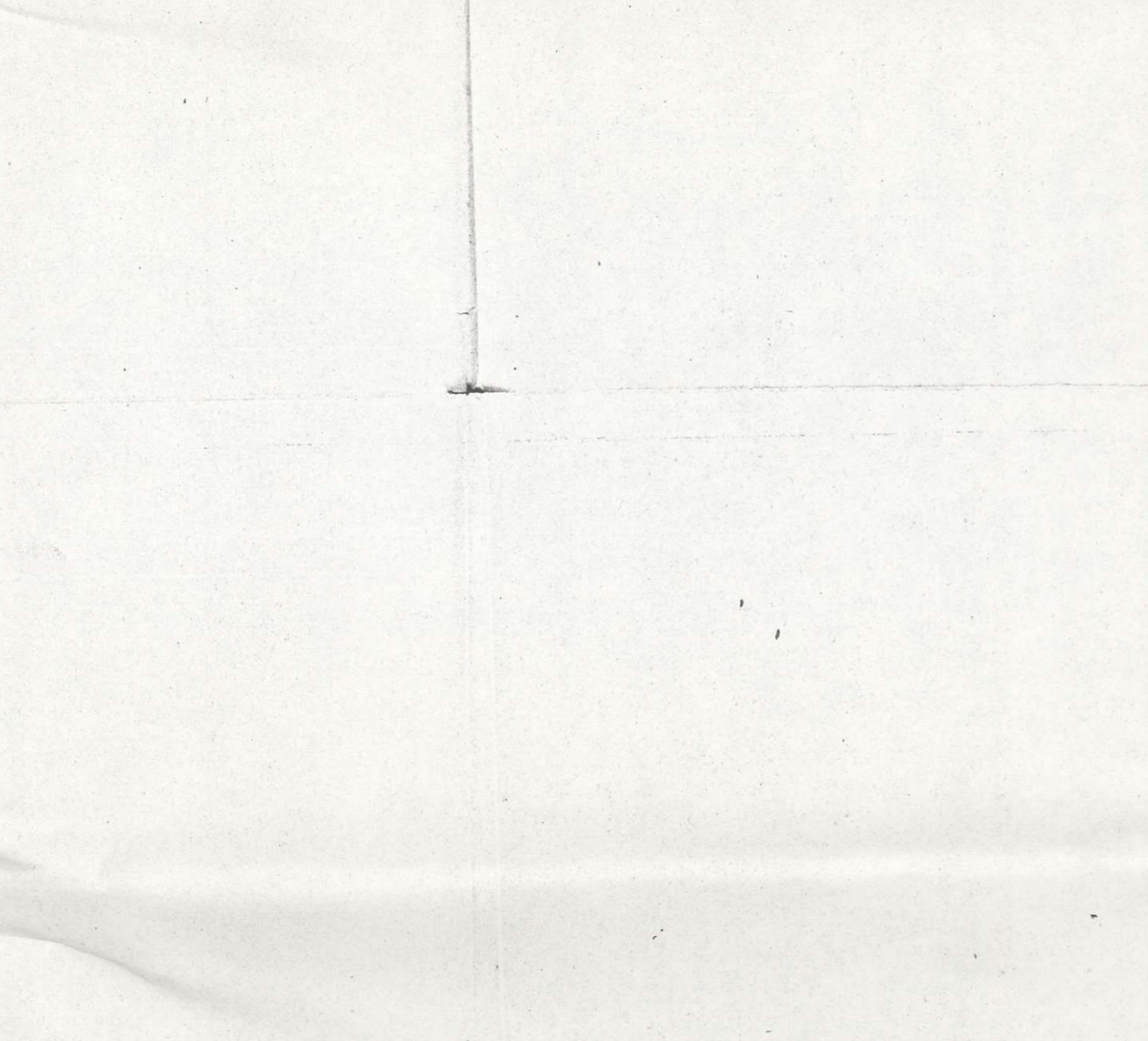
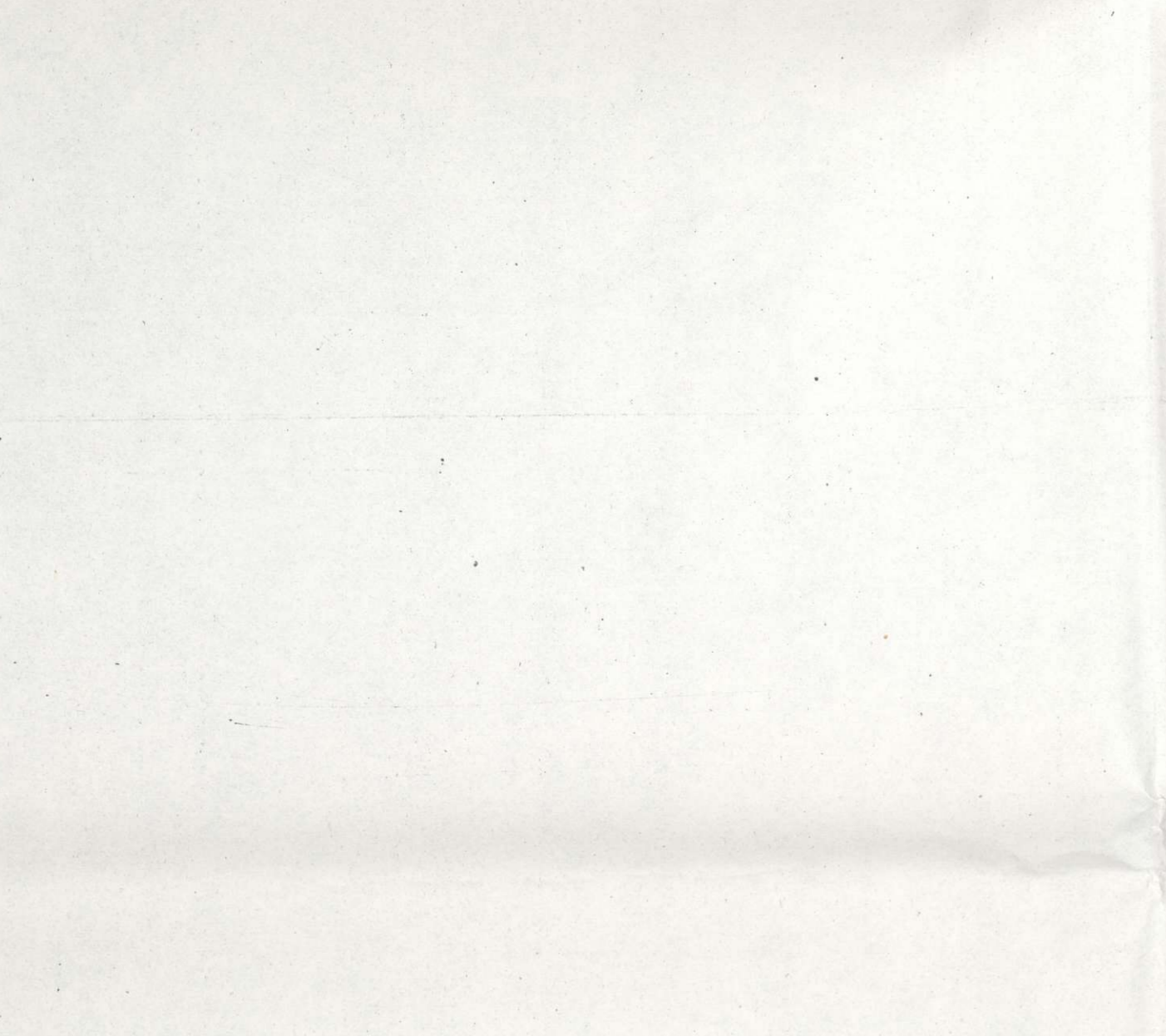
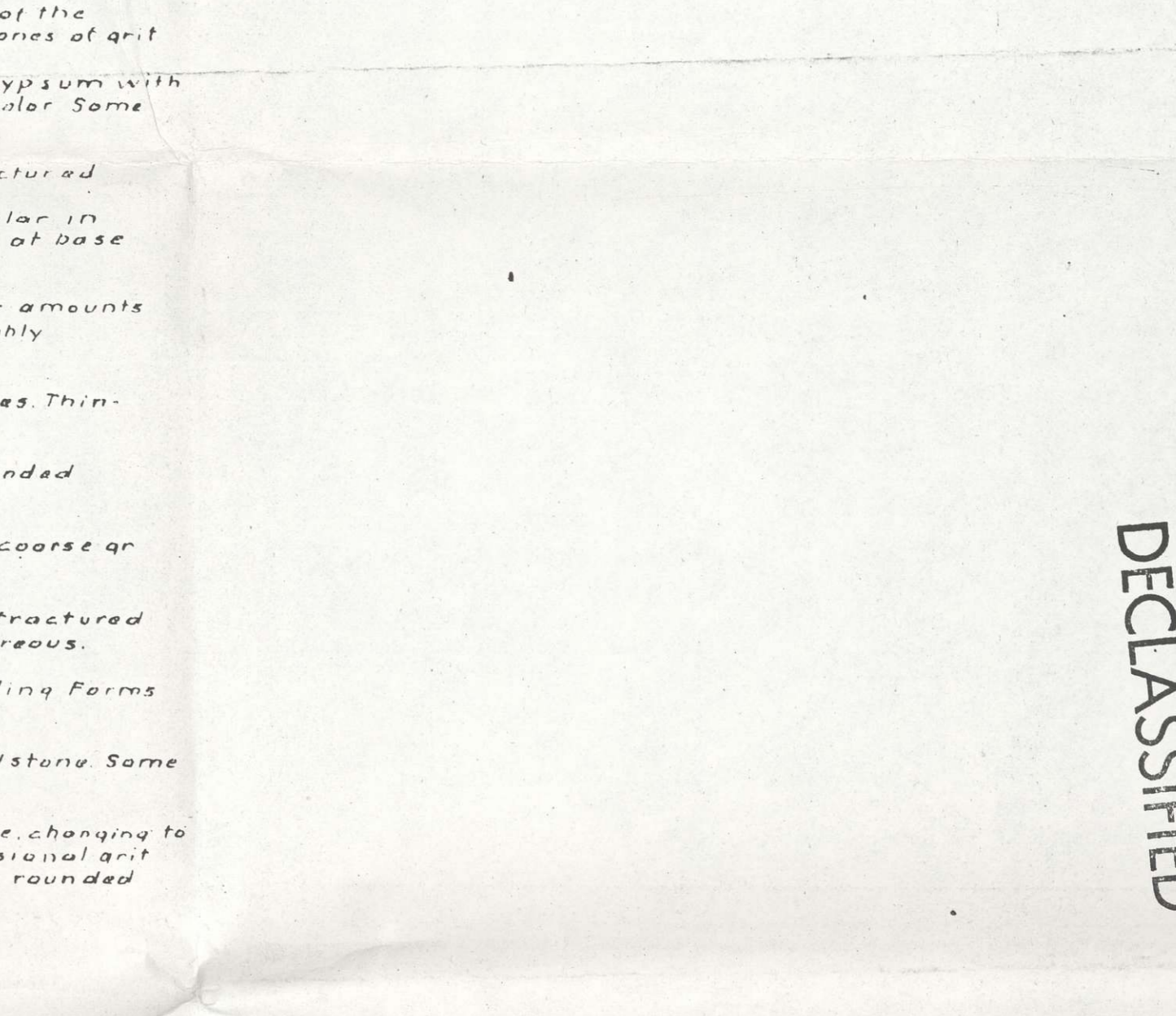
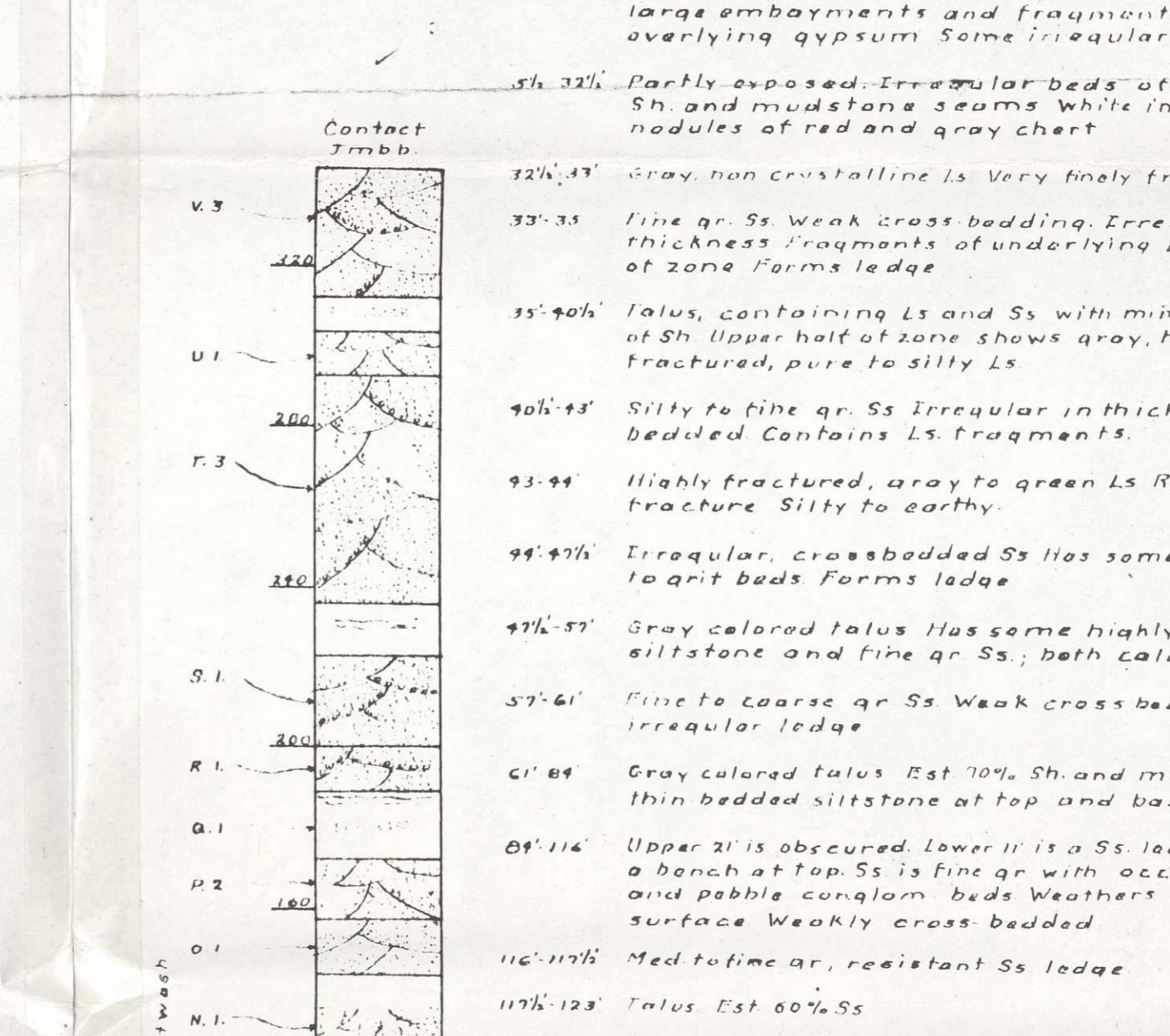
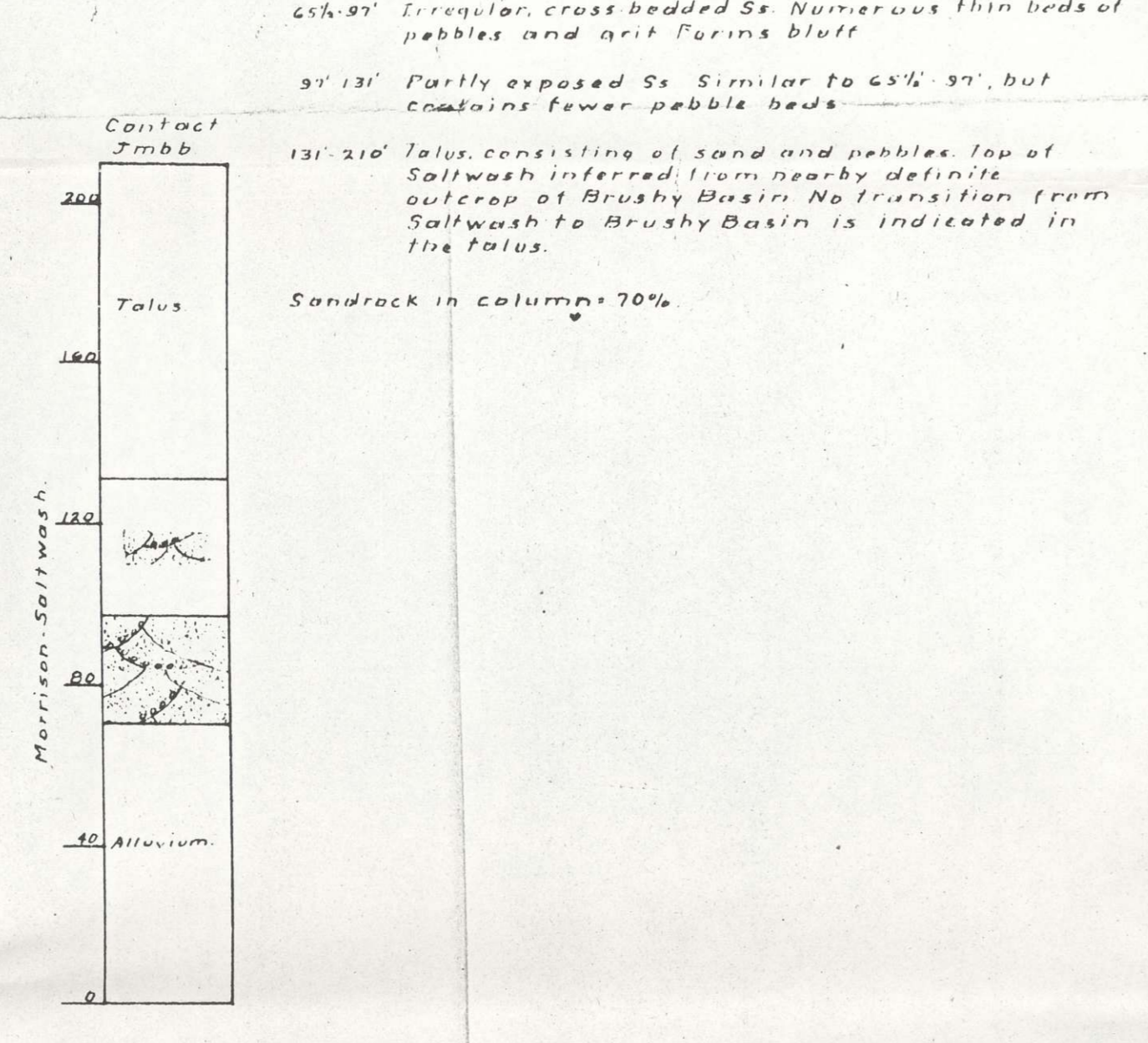
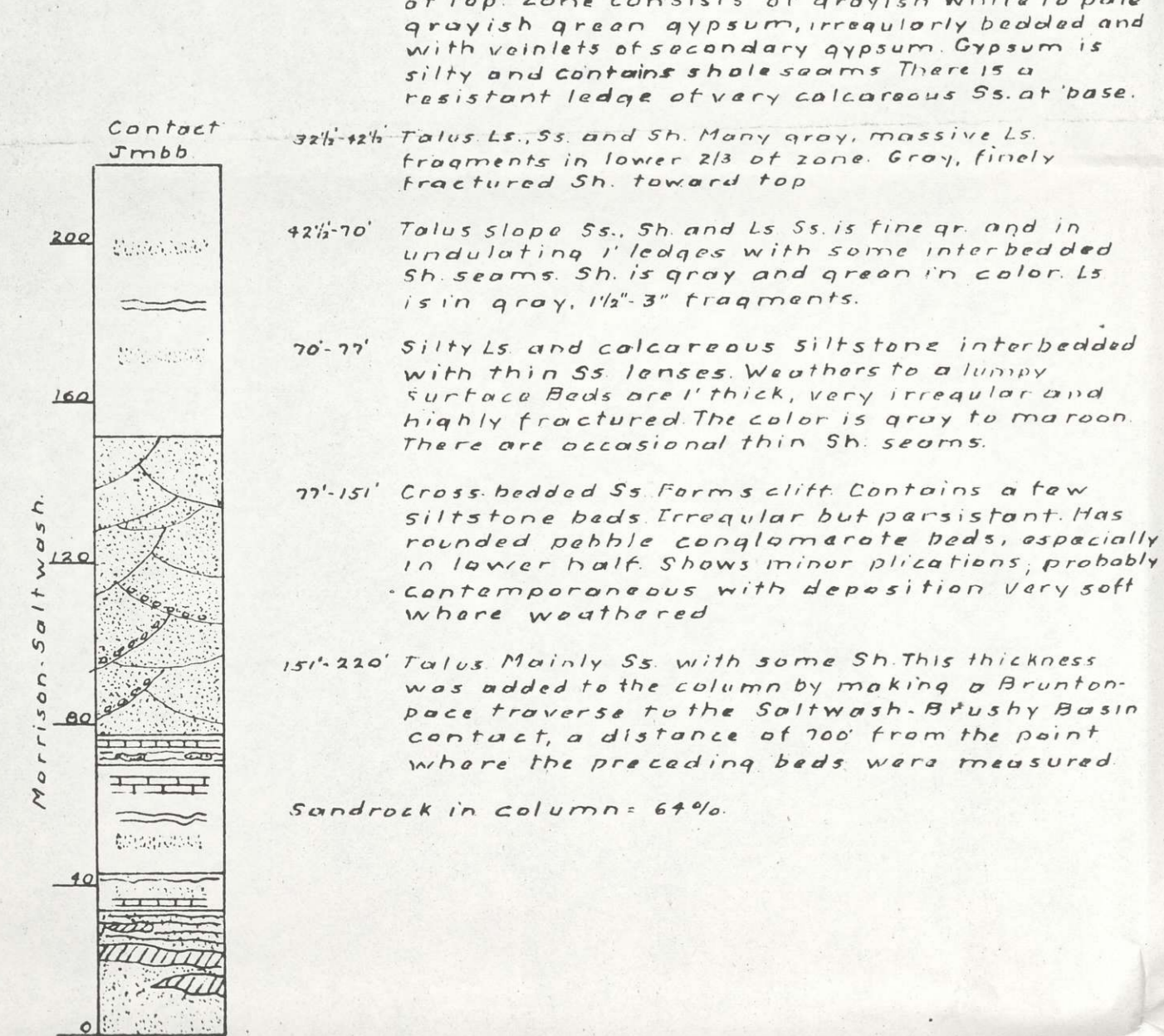
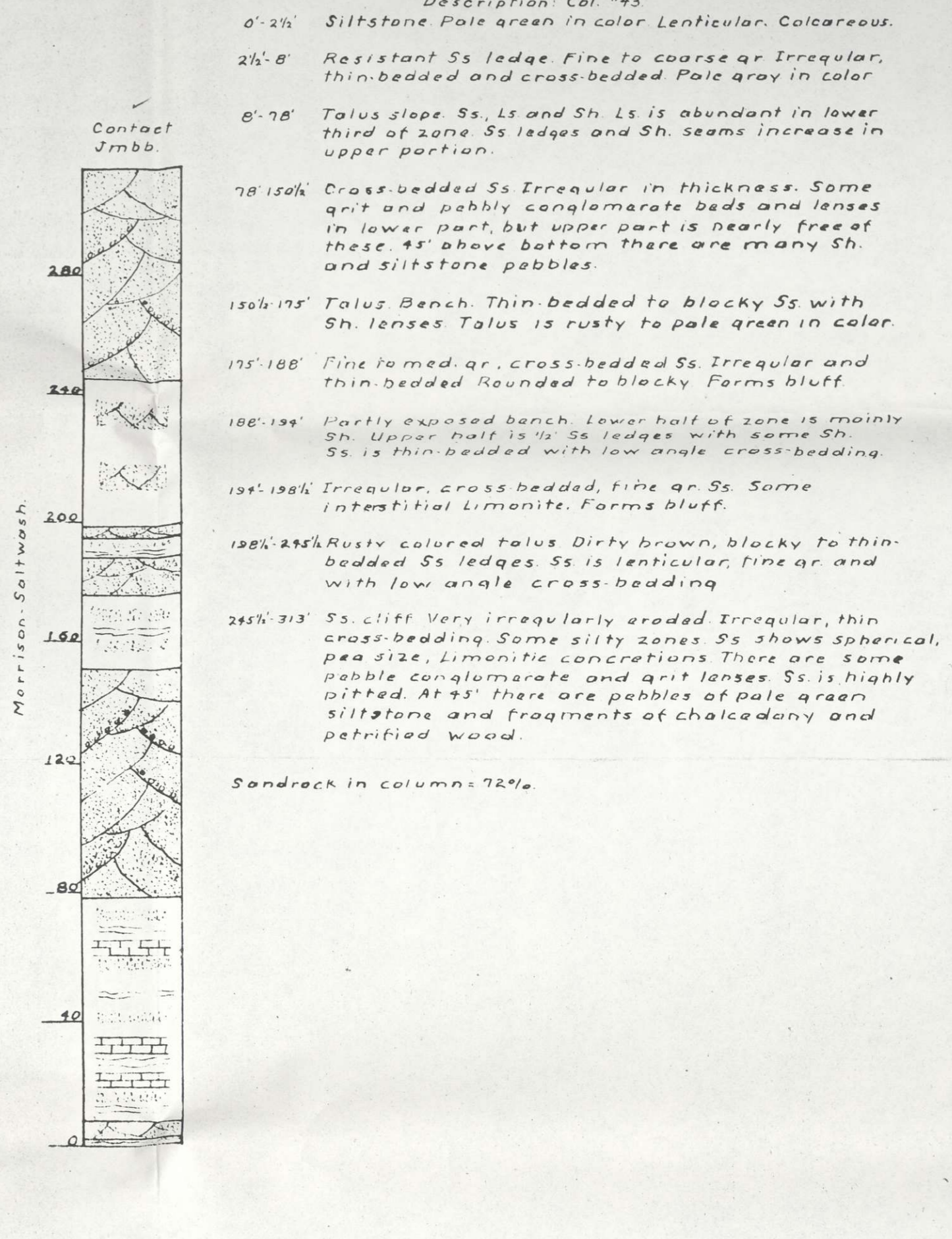
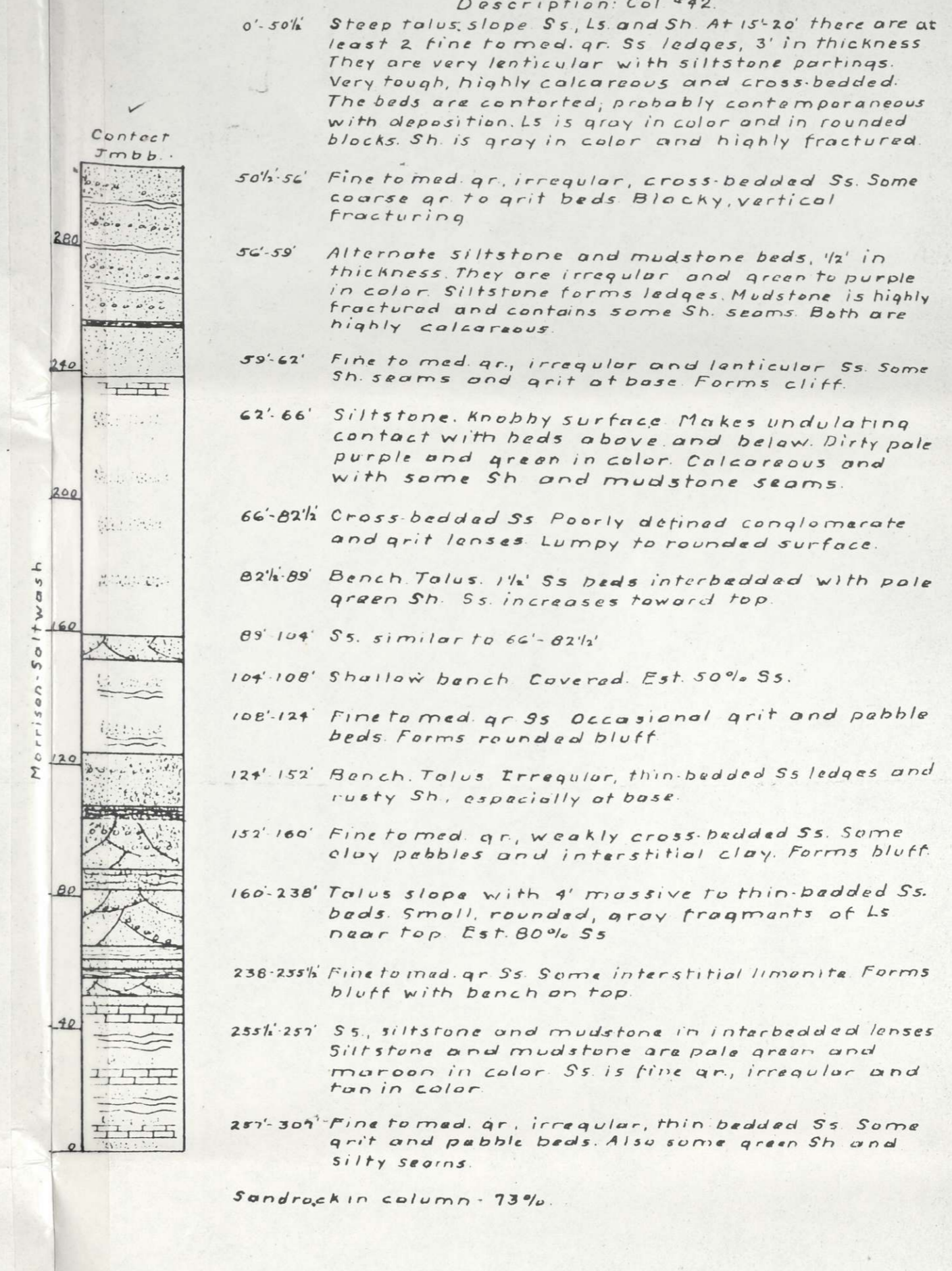
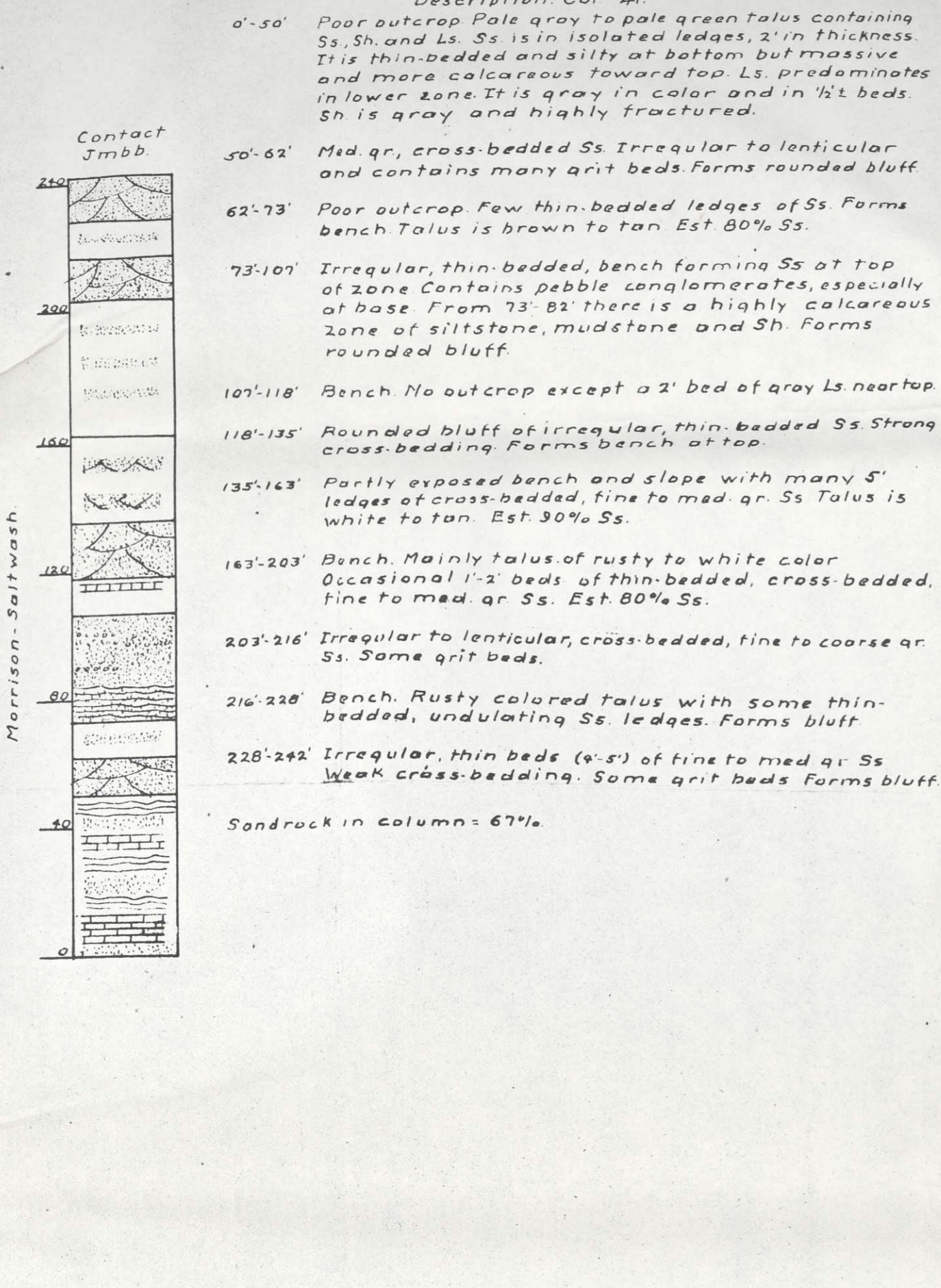
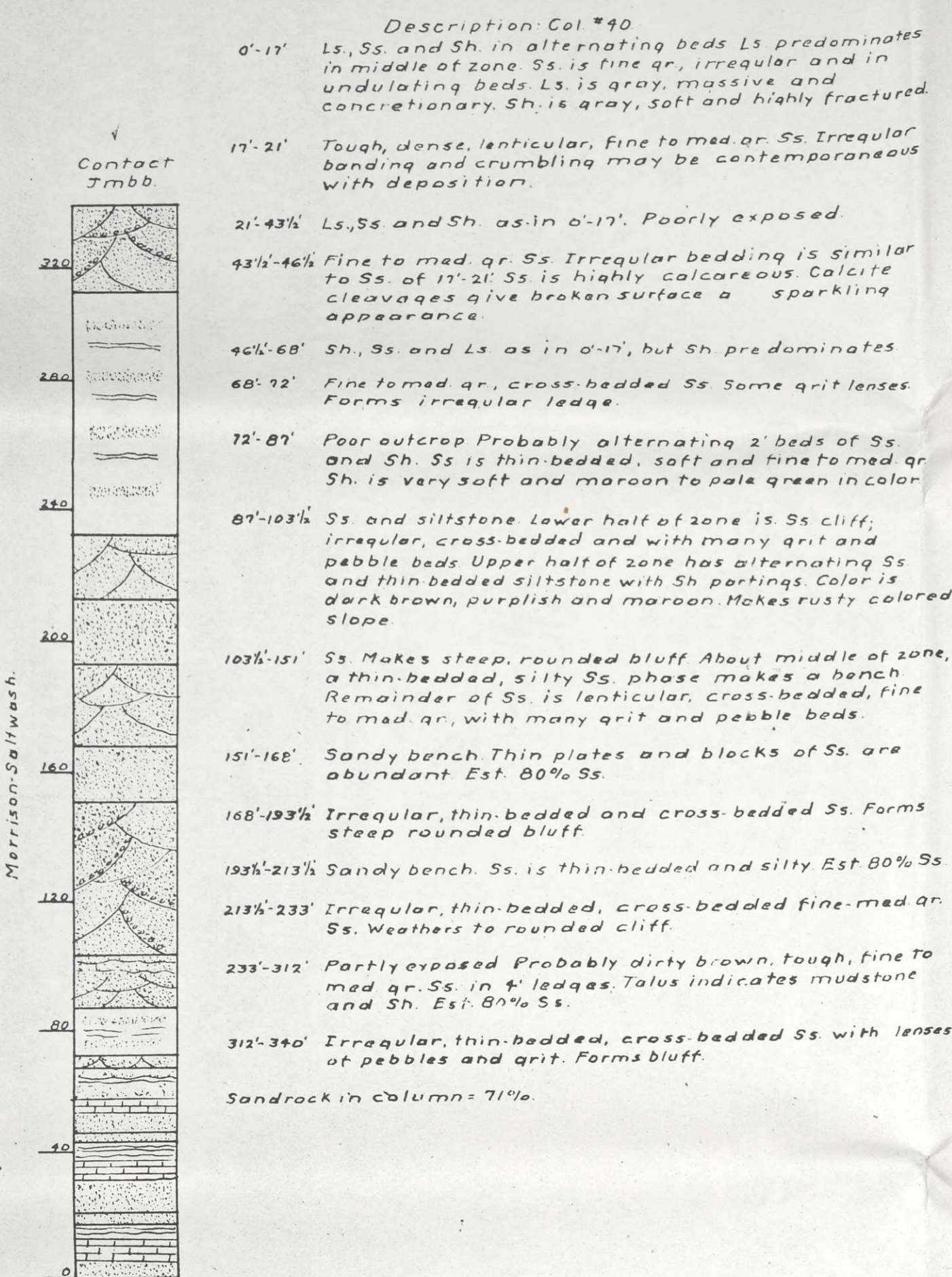
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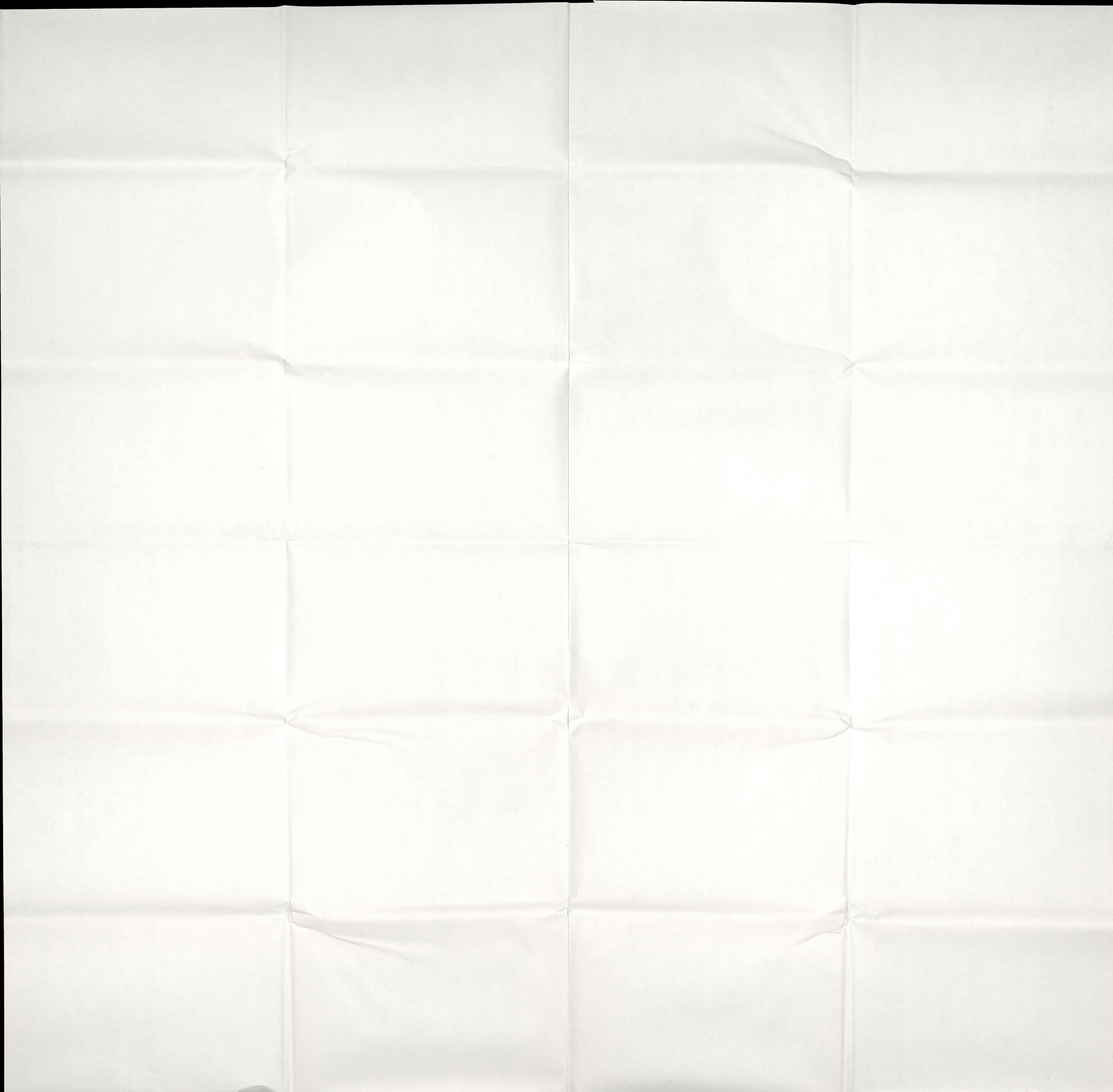
Columns 40-45, 47  
 UNION MINES DEVELOPMENT CORP  
 GRAND JUNCTION, COLO.  
 FIELD OFFICE

TITLE: HENRY MTS. AREA  
 GRANITE WASH DISTRICT.

SCALE: 1"=40' DATE: AUG. 9, 1944  
 DRAWN BY: L. BRYNER.  
 TRACED BY: A.H. COLEMAN.  
 GEOLOGY BY: A.H. COLEMAN & PARTY.

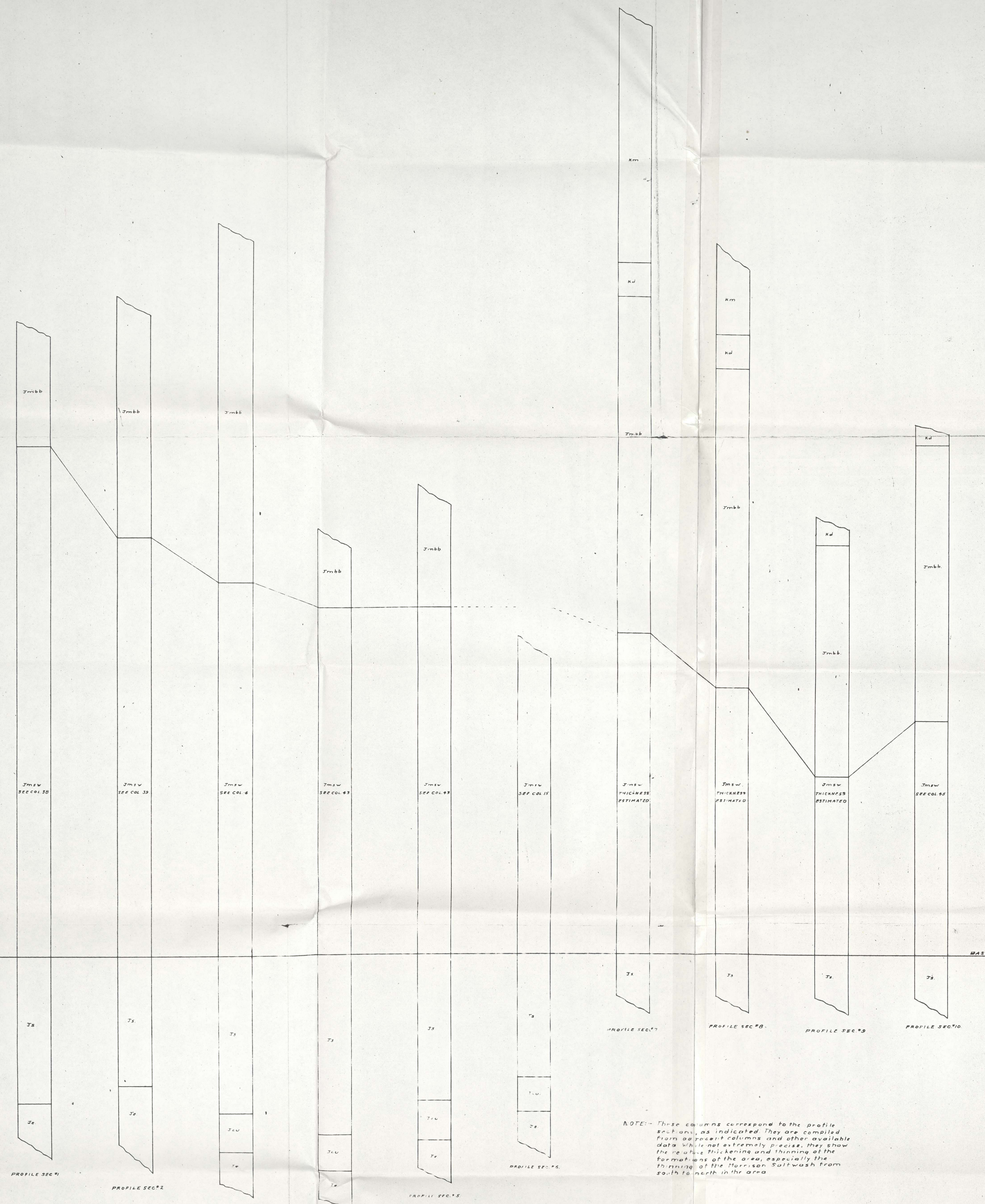
Utah-hm-12 RMO-461







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**BRUSHY BASIN FORMATION.** The lower 60-70' of this formation is a rusty to dark brown, med. to coarse gr. Ss, with much grit evident. It also contains inter-bedded conglomerates with pebbles up to 1" size. There is local cross-bedding. This portion of the Brushy Basin might be correlated with the Westwater member of the Upper Morrison, but it does not resemble the Westwater where seen elsewhere and is therefore thrown into the Brushy Basin in this area. The remaining upper portion of the formation consists of dark pink, reddish-brown, grayish-white and greenish-gray shales and mudstones. Inter-bedded with these shales is an occasional thin bed (less than 2") of Ss that is fine to med. gr. and shows local cross-bedding. Quantities of chalcidony were noted. The upper portion of the formation weathers to a characteristic "Bad Land" appearance.

**MORRISON-SALTWASH FORMATION.** See detail columns for description.

**SUMNERVILLE FORMATION.** Consists of thinly bedded, reddish brown and gray white mudstone or very fine gr. Ss. Contains large quantities of bedded gypsum as well as secondary veinlets of gypsum cut across bedding planes. Considerable chert and chalcidony noted. Some fibrous barite veinlets were noted, cutting across bedding planes. The formation is notable for its even bedding, few beds being over 1" in thickness. Also soft and non-resistant to erosion, in this area, it is protected by the more resistant Morrison capping and forms vertical cliffs.

**CURTIS FORMATION.** Consists of fine gr. thin-bedded, glauconitic shale and shaly sandstone. It is grayish green in color. Shows slight cross-bedding locally. It is non-resistant to erosion and forms slopes. Some gypsum was noted, with chalcidony replacing the gypsum.

**ENTRADA FORMATION.** Reddish-brown, mudstone to fine gr. sandstone. Contains inter-bedded gray white to cream white beds that are more resistant to weathering than are the reddish beds. Shows strong cross bedding between bedding planes. Also contains some thin shale seams locally. It is not very resistant to weathering in this area. Wind erosion weathers it into fantastic columns and bosses. It forms the valley floor in this area.

**NOTE:** These columns correspond to the profile sections, as indicated. They are compiled from detail columns and other available data. While not extremely precise, they show the relative thickening and thinning of the formations of the area, especially the thinning of the Morrison Saltwash from south to north in the area.

Correlations	
UNION MINES DEVELOPMENT CORP. GRAND JUNCTION, COLO. FIELD OFFICE.	
TITLE: HENRY MTS AREA GRANITE WASH DISTRICT	
SCALE: 1" = 40'	DATE: AUG 10, 1944
DRAWN BY: A.H. COLEMAN	
TRACED BY: A.H. COLEMAN	
GEOLOGY BY: A.H. COLEMAN & PARTY.	
RMD-461	



