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Carde

M E M O

TO: C.A. O'Brien, A.F. Budge  
FROM: Don White  
DATE: August 1, 1987  
SUBJECT: Data on the Jerome slippage/subsidence history

Accompanying is one full set (to C.A. O'B.) of copies of the Jerome slippage information collected to date. It is a combination of data from our own search of the U.V.X. vault, from published sources, and, most recently from a chance meeting with Bob Rivera of COCA Mines. As Bob was clearing out COCA's Jerome office yesterday I spotted a file on Jerome subsidence. I recognized none of the contents and soon learned why. Bob copied it all from data Paul Handverger keeps at his house and has never indexed, mentioned, or otherwise made known to anyone. Bob Rivera only found it by renting Handverger's home for a year with allowance to use "very voluminous" files on the U.V.X. housed there.

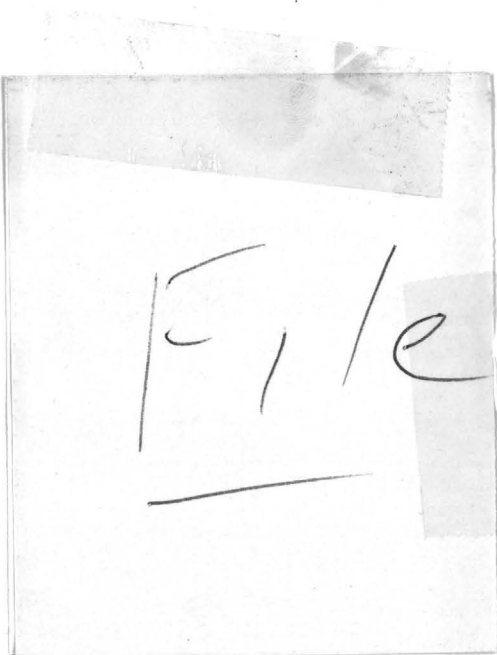
Anyway, what I have copied from Rivera's file is mostly engineering information and testimony in the 1937-38 case, ultimately arbitrated by Joralemon, some of whose correspondence is included. Attached is a list of what has been copied from Rivera's (Handverger's) file.

Other data, less text and more map-based survey data, is included on large rolled maps at the top of the U.V.X. geology vault. None of them are reproduceables.

Early in July I photographed the more prominent cracks and damage to walls, roads, and buildings in Jerome just for the record. I will caption the prints and get you a set for the file.

DW:sk

Attachment



## Jerome Slippage/Subsidence References

- Anonymous, 1930. Memorandum on separation of slippage issue into fault versus landslide components. April 30, 1938. 1½ pages, typed.
- Anonymous, 1938. Graph (cumulative curve) of percentage of total movement thru time from 1921 thru 1937, for UVX mine levels and surface. 8½"x11" graph.
- Anonymous, 1938. Miscellaneous sketched cross sections of the Jerome landslide area. 8½"x11" captioned sketches.
- Anonymous, 1938. Weather conditions and happenings, February 2\_\_ (?)th to March 5th, 1938. 1½ page typed, dictated notes.
- Anonymous, undated. Maps. 1) Town of Jerome and vicinity with drainage notes and topography and culture. 2) Nancy claim landslide, 1" = 50'.
- Carr (?), A.B., 1937. Memorandum regarding conference with Mr. Leisk, Nov. 13, 1937. Mr. Carr is attorney (in Prescott) for U.V.X. 4 type-written pages.
- Colvocoresses, George M., 1937. Letter reports to J.S. Douglas on "Jerome slippage."  
1) April 16, 1937 - 4½ pages, typed. 2) May 13, 1937 - 21 pages, typed. 3) June 1, 1937 - 12 pages, typed. 4) Jan. 14, 1938 - 7 pages, typed.
- Douglas (?), J.S., 1938. Letters to Colvocoresses and Leisk, Jan. 15, 1938. Handwritten. 1 p. to "Colvo". 3 p. to "Leisk".
- D'Arcy (?), R.L., 1939. "Notes on United Verde Extension Mine", particularly concerning backfilling, subsidence and surveys. 1½ pages, typed.
- Elsing, W.T., 1939. Testimony of witnesses, Small versus U.V.X. 46 pages of type-written personal notes of the witnesses statements and cross examinations.
- Handverger (?), Paul A., 1971. Draft report on the UVX slippage history. Labelled "Appendix A", no date or identification except for P.A.H. initials and Jan., 1971 date on a sketch cross section. 14 pages, typed plus hand written notes and revisions.
- Joralemon, Ira B., 1938. Miscellaneous correspondence to and from U.V.X. and P.D. regarding arbitration of slippage issue. March, April, May, 1938. 12 pages, typed.
- Joralemon, Ira B., 1976. Adventure Beacons. p. 353-355 on the Jerome, UV, UVX arbitration case.
- Leisk, R.D., 1937. Letter to J.S. Douglas, March 6, 1937 concerning town slippage observations and causes. 2½ pages, typed.
- Waara, J. William, 1935. Statement of J. William Waara regarding Small Building, examined Sept. 13-14, 1935. Typed report. 15 pages plus 1 page notarization.
- Waara, J. William, 1937. "High spots": by Waara. Summary of observations made upon P.D. data presentation (?) labelled "Jerome, April 16, 1937". 1½ pages, typed.

Memorandum - April 30th. 1938.

By this date conclusions may reasonably be reached without a shadow of doubt that the ground movement at Jerome should be separated in the minds of all concerned into two categories.

FIRST. The accelerated downward movement of the Hanging Wall, and.

SECOND - The landslide.

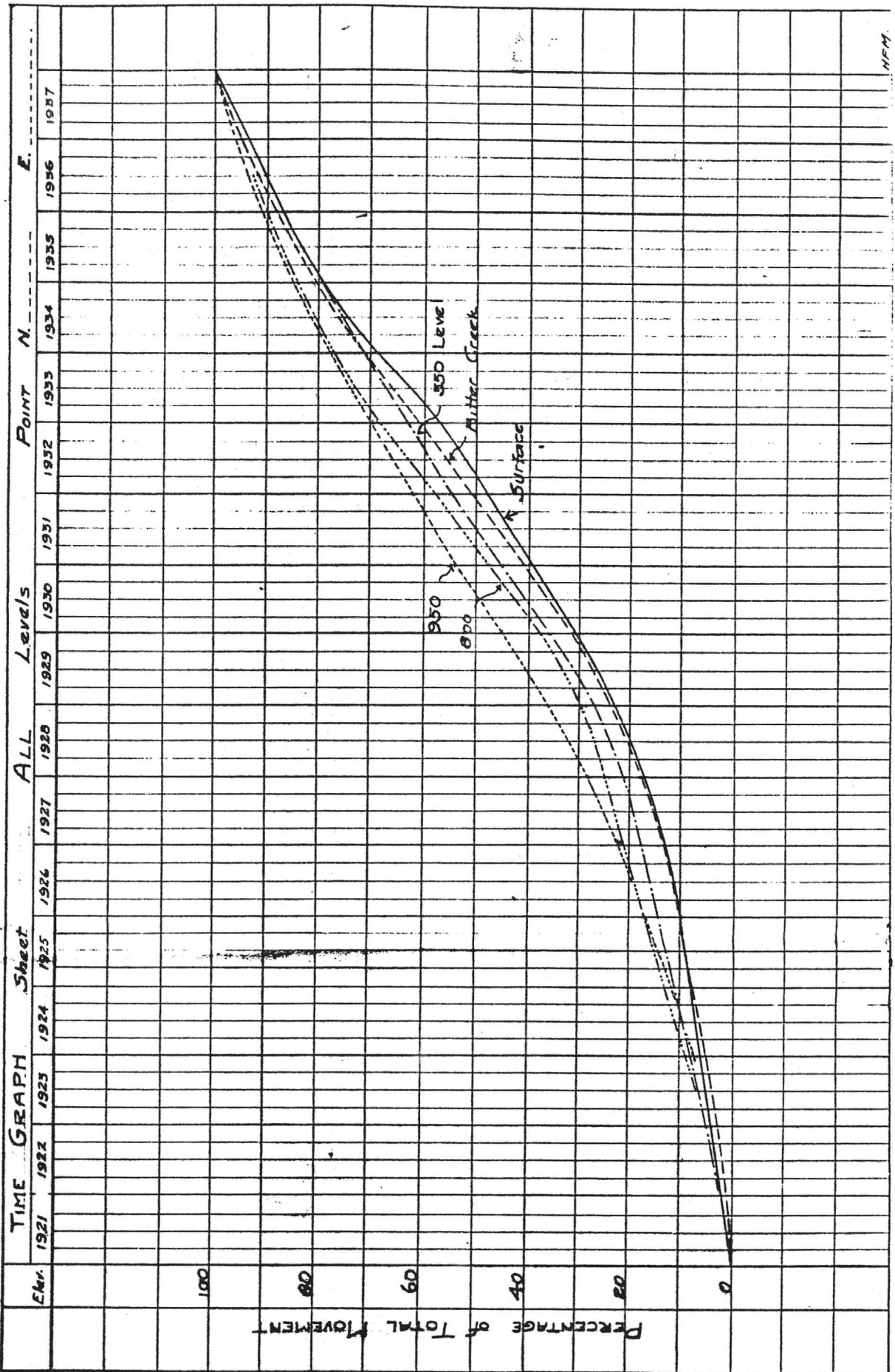
Since the entire expenditure of money by the U.V.X. now amounts to about \$300,000.00, has been due to the landslide, and since the interpretation of the arbitration agreement allows compensation for services to the U.V.X., it is not unreasonable to expect that the U.V.X. will be awarded an amount probably not in excess of \$450,000.00.

The only damage done to the town, excepting on the landslide, or above the landslide, where properties had to be bought because the extension of the landslide was not known, has been the damage done to the O'Keefe Building, and the Bank of Jerome Building, and the Clinkscales Building and the De Bross Building. The expense attaching to the acquisition of by the U.V.X. of these properties is somewhere in the neighborhood of \$17,000.00, and this amount should fairly enough be considered as separate, and for different treatment to the \$300,000.00 odd which the U.V.X. have expended on landslide.

It is conceded by all that the mine operations of the U.V.X. in no way, directly or indirectly, and at no time contributed to the landslide. Consequently, the only responsibility which the U.V.X. may have had in the accelerated downward movement of the Hanging Wall has caused the expenditure by the

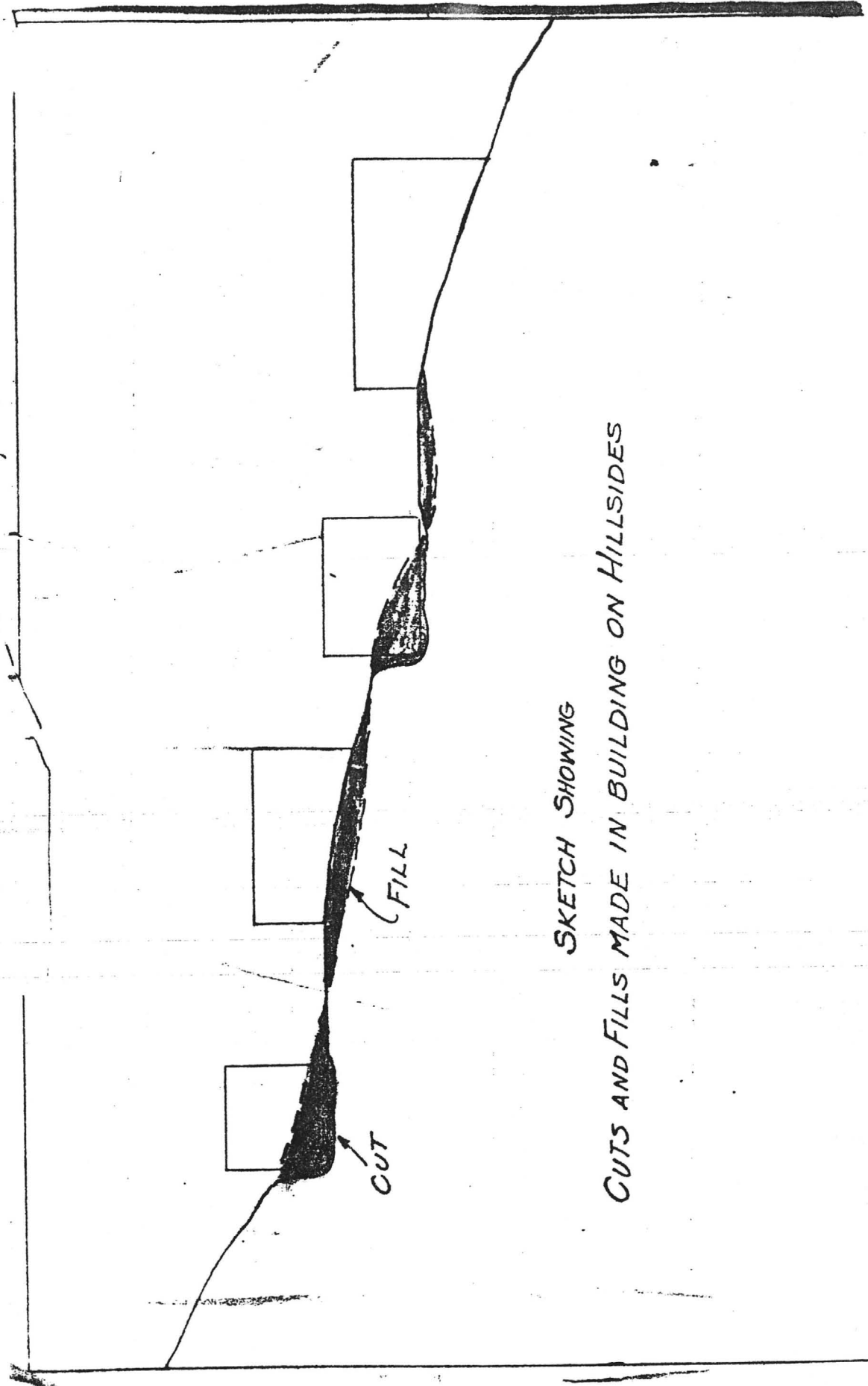
U.V.X. in the amount above set forth for the purchase of the Okeef Block, the Bank of Jerome Building, the Clinkscale Building, and their one-half interest in the De Bross House.

**CAUTION**  
 This is a Reduction  
 from the Original  
 Scale.



NFM

**CAUTION**  
This is a Reduction  
from the Original  
Scale.



SKETCH SHOWING

CUTS AND FILLS MADE IN BUILDING ON HILLSIDES

SKETCH OF

MOVING SURFACE IN LAND SLIDE AREA

MAIN STREET

BAKERY SHAFT

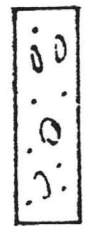
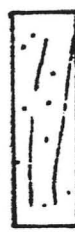
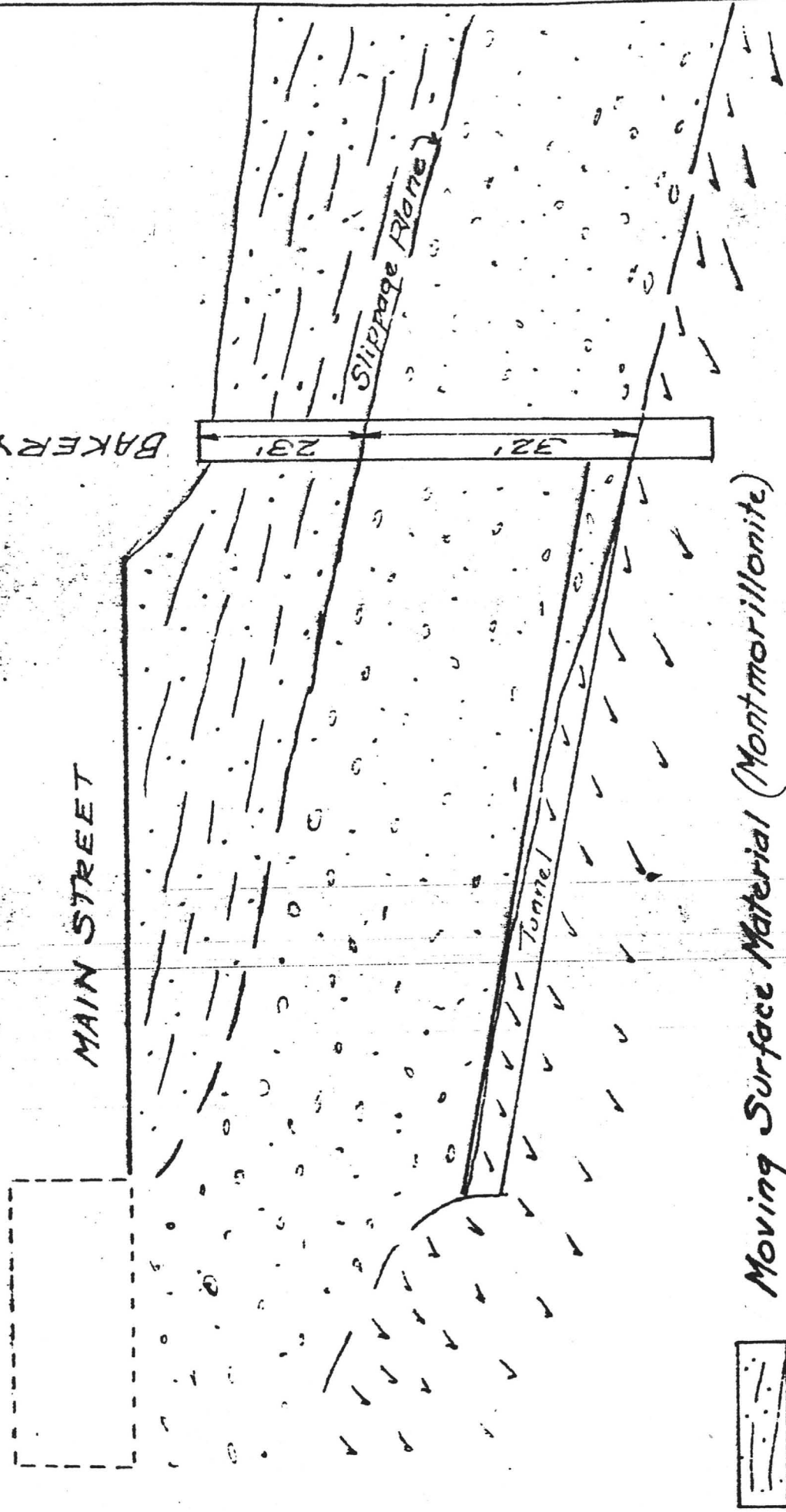
Slippage Plane

Tunnel

Moving Surface Material (Montmorillonite)

Fanlomerate. This Material moved only as part of entire Hanging Wall

Solid Lava. This likewise moved only as part of the entire Hanging Wall





WEATHER CONDITIONS AND HAPPENINGS FEBRUARY 24th to MARCH 5th., 1938

DURING THIS PERIOD THE WRITER WAS AT Douglas and has guests at his house from the East. The weather was very cloudy and rain was expected at Douglas daily. There were intermittent showers but no heavy rain fall.

On the third of March there was a heavy rainfall at Jerome during the night and in the morning, and the concrete ditch carried a considerable flow of water which is described in the statements of Mr. Mills and Mr. Waara.

At this date, of course, it was after the shaft had been sunk by the I.D. people immediately below the break in the concrete ditch.

Prior to this ~~rainfall~~ rainfall the landslide had practically ceased to move. For a month before the rainfall it had not moved ..... because of the long dry spell.

Just before the rainfall the large pipe which is placed underneath the sidewalk on the west side of Main Street had been installed, and the work was completed even to the clearing out of the rubbish which filled the culvert in the center of Main Street from the top of the hill down to its outlet. When the heavy rainfall occurred sacks were placed across the main street from the corner of the Bartlett Hotel so that but little water flowed down the pavement and got into the landslide. What little water there was on the pavement below where the sacks diverted the flow into the pipe Mr. Waara had placed some worn out pipe and had prevented any notable flow of water from overflowing into the broken up ground.

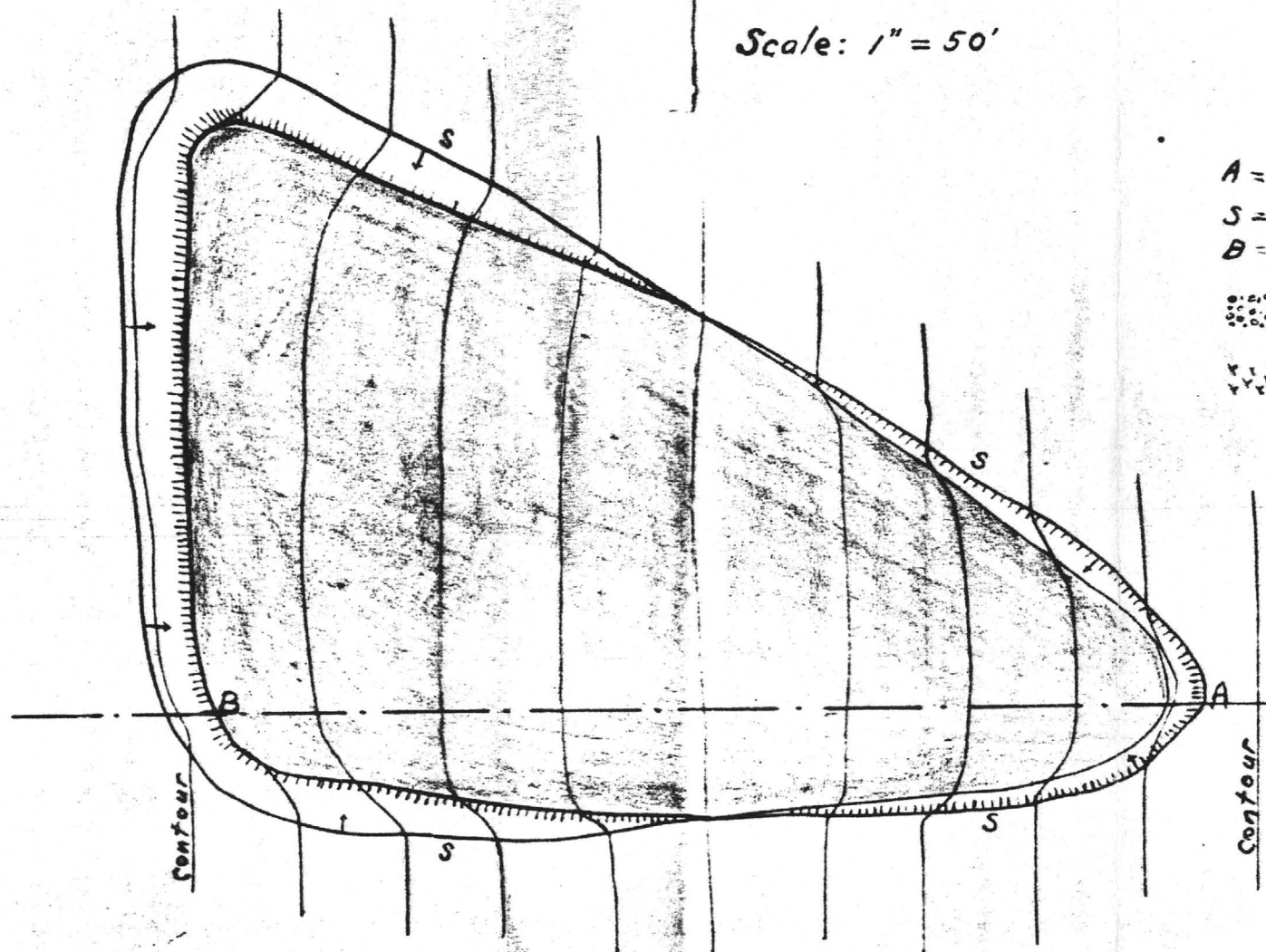
Almost immediately after the rainfall of March 3rd ~~was~~ the downward movement of the landslide started again and is still progressing, but during the past few weeks has slowed up very considerably.

Dictated April 10th. 1938

# LANDSLIDE ON NANCY CLAIM

2 MILES SOUTH FROM JEROME

Scale: 1" = 50'

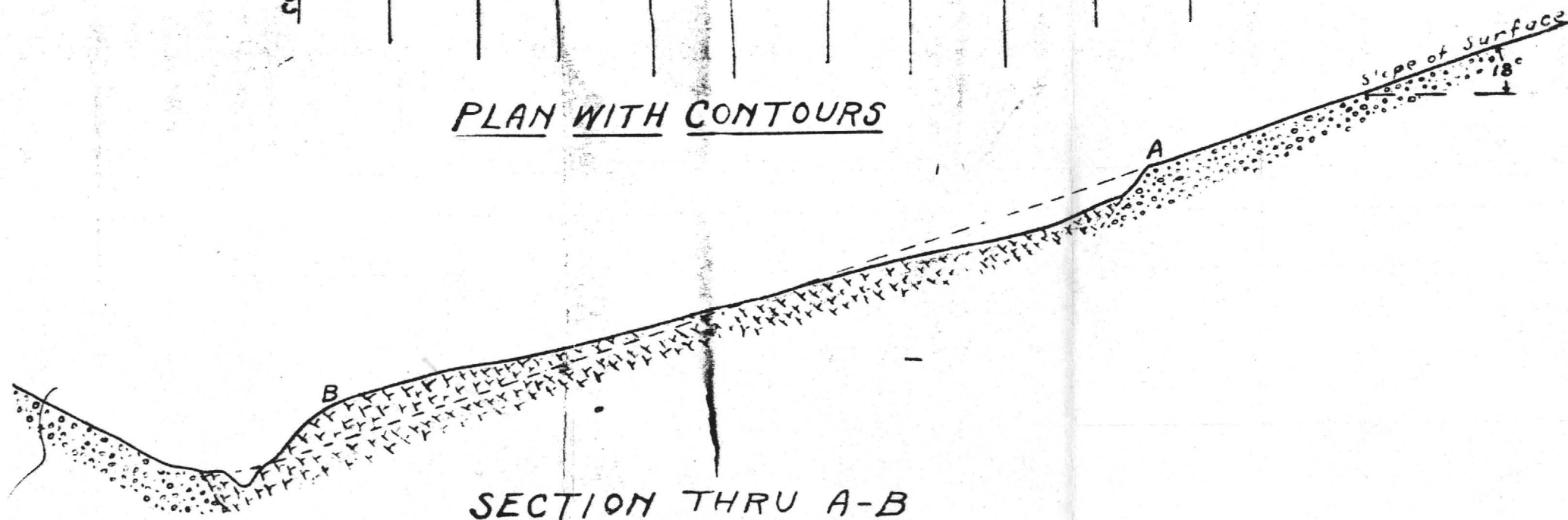


A = Apex Scarp  
S = Lateral Scarp  
B = Pressure Ridge at Toe

••••• Top Soil

∇∇∇ Creeping Soil

PLAN WITH CONTOURS



SECTION THRU A-B

B-A

77.

1	I	Area Zone A - 1937	12,990 sq. yds.
2		Total cu. yds. I	94,743 cu. yds.
3		average depth 22 feet	
4			
5			
6			
7			
8			
9			
10			
11			
12	II	Area 1941 enlargement	
13		Zone A below outcrop of slide	6,333 sq. yds.
14		Total cu. yds. II	21,100 cu. yds.
15		average depth 10 ft.	
16			
17			
18			
19			
20			
21			
22			
23			
24	III	Area of Main Street displacement	
25		and replacement by fill	2,348 sq. yds.
26		Total cu. yds. III	11,700 cu. yds.
27		average depth 15 ft.	
28			
29			
30			
31			
32			

*Jaco*

*John H. H. H.*

*Mr Douglas*  
*Col Vocoreasses April 16, 1937*

MEMO RE JEROME LANDSLIDE

The destructive earth movement in the town of Jerome seems to be a surface landslide and nothing else, it has all the earmarks of such a movement and the volume of material comprising the swell and outward bulge at the toe fully accounts for all of the material which has slumped in its upper portion, - when it is considered that much debris has been cleared up and trucked away and that other material has been carried off by the water in solution or in suspension. The portion of the surface affected by the landslide is loose soil and rock fragments resting on clay which becomes slippery when saturated and forms an ideal slipping plane for the upper soil which has a depth of 20 to 40 feet and there is no evidence that the slide extends below this plane or that the underlying caliche (fanglomerate) has moved in any similar manner.

The direction of the landslide movement follows directly along the slope of the hill and the horizontal component is from 4 to 7 times as great as the vertical drop which would not conform to any subsidence into underground excavation. The affected area probably represents a trough or depression in the ancient surface as indicated by Naara and the clay bed is the natural result of the decomposition of the one time surface of a lava flow as described by Professor Lawson.

The cause of the landslide is water seeping thru the ground from breaks in the concrete ditch and town pipe lines and the sharp break at the upper limit of the slip, - just above

Main Street, - is due to the frequent breaks in the main water pipe which ran almost directly along this line. Breaks in the concrete ditch have been frequent since it was built in 1917, and the big break (now repaired with a sheet iron casing) was caused by a surface slide resulting from overflow and leakage of the old tanks, - now removed, - and was never properly repaired from about 1930 to January, 1937.

The saturated top soil was repeatedly jarred and shaken by heavy pit blasts, particularly in 1924, 25 and 26, when on one occasion 50,000 lbs. of dynamite accidentally exploded, and on two other occasions from 235,000 lbs. to 260,000 lbs. of black powder were fired in coyote holes. The vibrations caused by these last two explosions in the landslide area must have been equal to about 1/10 of the effect of the Tokyo Earthquake which leveled nearly all the structures in its vicinity.

Entirely apart and distant from the destructive landslide, which is at present under discussion, there have been many other similar slides both in the immediate vicinity of Jerome, e.g. above the ditch and near the Hampton House and further away on the Verde Combination and Green Monster properties. All of these were caused by flow of water thru similar soils and formations and produced effects entirely similar to those which are noted in the Jerome landslide, except that there were few buildings or streets, etc., to be damaged. Excepting the Hampton House slide, which is above the Hermit slope of the U.V. Company, there was no mining in their vicinity.

Another movement which has affected a much larger area, I have termed the "block faulting" and it has resulted in the subsidence of a portion of the hanging wall of the Verde Fault over a surface area which seems to roughly represent a triangle with the Verde Fault for a base, - Ritter Creek and School Gulch for its sides. This movement was noticed many years ago, but especially since 1925, and levelling in the U. V. X. Mine proves that it has extended downward to the 1500 ft. level, but, apparently not below, so that the volume of material affected may roughly be represented as the frustrum of an inverted pyramid or prism and the volume of material affected is close to 2 billion cubic feet.

It should be noted that the limits of the landslide do not correspond with any of those of the block faulting, the upper edge of the slide being some 200 feet away from the fault and the sliding area (350' x 200') being very much smaller. While the movement of points involved in the landslide is fairly uniform in direction, the movements of points on other portions of the block fault are variable and confusing both on the surface and underground. Some points do move toward the U.V.X. stopes, - others move directly away from them, and they show a variable ratio of horizontal to vertical components.

The character and extent of this movement and particularly the fact that its depth fairly corresponds with that of the main workings in the mines, leads me to think that it may be caused by the drainage of this area resulting in a shrinkage of the sedimentary rocks on the hanging wall of the fault as these are capable

of absorbing a much greater quantity of water than the foot-wall porphyry and have a high specific yield when dewatered under pressure. Regardless of the cause of this block faulting, I do not think that it has any relation whatever to the surface landslide and the damage done by the slow subsidence of the large area has been trivial.

The U.V.I. Mine has stoped out 38,000,000 cu. ft. of ground and allowing for the shrinkage in the carefully filled stopes, decay of timber, etc., it results that there should have been just about 12,000,000 cu. ft. of voids to be filled from the overlying and surrounding rock. The caving and slumping of this rock as noted in the levels clearly prove that the self filling of these voids proceeded in a normal and logical manner and ceased entirely long before the surface was reached for the lava and soliche in the waste <sup>sl</sup> ~~rain~~ (directly above the stopes) and at other points nearby show absolutely no evidence of slumping or fracturing and on the 550' level water has stood in drifts for over three years without draining down into the stopes. No substantial increase in the flow of water into the mine has ever been noted in times of flood or bursting pipes or ditches.

While it is entirely impossible that any substantial amount of the rock swollen or shattered by the block-faulting could have slumped or caved into the mine workings (since the volume involved in the block faulting was so much greater) yet I do think that the mine workings have had some effect on the block faulting and caused a local sagging, fracturing and slumping



which would not otherwise have occurred, but, admitting the probable connection between the mining and block faulting, in no way changes the fact that neither one nor both of them together are in any way responsible for the surface landslide which, in my opinion, would have occurred in the same place and to the same extent if there had been no Verde Fault, no block faulting and no underground workings at either the U.V.I. or U. V. Mines.

*J. M. Colman*

Jerome 4/15/37.

Colvocoresses, May 13, 1937

GEORGE M. COLVOCORESSES  
MINING AND METALLURGICAL ENGINEER  
1102 LUHRS TOWER  
PHOENIX, ARIZONA

May 13th, 1937

THIRD REPORT ON JEROME SLIPPAGE.

Mr. J. S. Douglas, President  
United Verde Extension Mining Co.  
Jerome, Arizona

Dear Sir:

I submit herewith my third report on the Jerome slippage covering results of most recent investigations and a discussion of the legal phases of the situation from an engineering standpoint, which is largely based on conferences with you and your attorneys and other officials and in which I have tried to bring out some of the technical problems that will confront us if this case goes to trial.

RECENT INVESTIGATIONS.

Examinations of conditions in the town from May 3rd to May 7th show but little change in the landslide area during the past two weeks or in fact during the past month. The movement has evidently slowed up since the ditch and pipe lines have been properly repaired and also since the winter rains have ceased, yet it is still progressing gradually especially near the toe where the change house above the swimming pool has been razed and the earth and clay bank has pushed out nearly to the edge of the pool. The cement walls below Diaz Street are crowding out and breaking up and the ground under and near Conglomerate Street is pushing forward and outward all true to landslide form. At the top of the slide more cracks are opening on the up side of Main Street and at the sides the condition of the Service Drug

is becoming worse, Store, in spite of supports, / the building formerly occupied by the Jerome Meat Market will soon fall down entirely, and Selna's Grocery and the old Penney Bldg. will probably follow somewhat later.

Since the dry weather has prevailed during April and May, 1937, it is noticeable that the landslide ground has dried out to a marked degree and the movement has slowed down. This is a clear proof of the relation between the water action and the slide, for if the slide were caused by subsidence into the mine workings its rate of progress would not be effected by the surface water conditions, but it must be remembered that during periods of wet weather the sliding area was not only subject to the run off from rainfall but to the leakage from broken pipe lines and from the breaks in the ditch until this last was properly repaired some four months ago.

The second shaft near the southeast wall of the Service Drug Store had been sunk 51 feet and the bottom was still in caliche where no substantial movement is noted below the topsoil.

Conditions outside the landslide area have changed very little but some further cracking in walls and walks was noted above and along Clark Street.

The concrete ditch was in good condition with no open cracks and the sheet iron casing keeps the main break tight, although I noted signs of pressure and future breaks are liable to develop in this vicinity. There was only a very little water trickling in the ditch.

At a point just above where the culvert carries the

ditch under Giroux St. the U. V. Co. had run a tunnel for 20 feet into the hillside and at its breast were sinking a shaft which was 10 feet deep on May 6th. The formation is somewhat fractured porphyry with seams showing iron oxide. I was unable to learn the purpose of this shaft, but the workmen told me that they had orders to install a windlass and continue sinking.

The tunnel and shaft appear to be on the Hermit Claim of the U. V. Co., very close to the line of the #6 Claim of U.V.X.

A careful inspection of the Bitter Creek Tunnel was made in company with Mr. Hundrum and the profile and other surveys in your office were carefully noted. The evidence presented by the tunnel when studied in connection with the surveys shows that the entire area traversed in the hanging wall has been affected by the block subsidence. A point at the portal of the tunnel has moved horizontally nearly two feet to the northeast (i.e. away from the stopes) and has dropped vertically about 1.4' since 1918, of which 1 foot was between 1926 and 1935. Further in and toward the stopes there has been a steady sagging and a gradual increase in the vertical drop to a maximum of 10 feet over the main stope, the horizontal movement is not given on your maps but will be shown on the U. V. Surveys. The drop is very much less near and along the fault and probably nil in the footwall and in the northwest drift the drop is greatest, about 9', near the junction with the main drift and then decreases steadily regardless of its passing nearly over the 1207 stope where the drop has been only five feet, and there is absolutely no evidence here of any cup shaped depression, as is said to have been claimed by the U. V. Co. The lava and conglomerate throughout the tunnel show no definite breaks or lines of fracture

and it is evident that they have merely sagged like a sheet of iron. The fault is well marked with a little breccia and heavy clay gouge, although this is only a few feet wide, but evidence of drag and fracture is to be noted for some further distance.

The conditions presented by the Bitter Creek tunnel do not seem to me to throw any light on the cause of the block subsidence, but they confirm the opinion that a portion of this area has been drawn down in a gentle concavity by the pull from the main ore body slope of the U. V. X. although no similar conditions can be noted above the 1207. They do not suggest in any way, shape, or manner that either the mine caving directly, nor the depression in the block has fractured or broken the rock between this tunnel and the surface nor produced or helped to produce the surface landslide, the toe of which in point of fact is located 300 feet away from the line of maximum depression in the tunnel while the sections of both the main tunnel and the northwest branch which are nearest to the landslide show a much smaller drop which continues to decrease as they approach the fault.

The relative depression of the ground over the slopes is greater in the tunnel than on the surface above, but it is still <sup>far</sup> too little (less than 1° angle of slope) to have any effect in producing a landslide.

IN RE LEGAL PROOF OF CASE.

Success in fastening the responsibility for the damage caused by the landslide upon the U.V. Company and in clearing

the U. V. X. from any similar liability would seem to me to depend largely upon our ability to convince a judge or jury that:--

(a) The damage for which compensation is now sought was caused entirely by a surface landslide of limited extent, confined to an area in which the physical and geological conditions favored such a movement.

(b) The surface landslide was caused by the action of surplus water brought in by the U. V. Co. and supplemented by the earth shocks due to exceptionally heavy blasting by that company. These were the direct causes of the slide, were in themselves competent and sufficient to produce all of the effect and damage noted on the surface, they required no assistance or acceleration from any other source and actually received none from either the block subsidence in the hanging wall of the Verde Fault or the local caving and slumping which surrounds the stopes of the U.V.X. Mine.

(c) Other conditions which contributed to the slide, but did not and could not cause it, were the natural rainfall and surface run-off, the increased weight of the topsoil due to the construction of streets, houses, etc., the excavation for foundations and the denuding of the hillside of vegetation permitting the rainfall to rush unobstructed down the slopes and saturate the slimey clay in the sliding mass more rapidly and completely than would otherwise have been possible.

(d) The U. V. Co. and its subsidiary, the Water Co., were alone entirely responsible for ruining the vegetation, bringing in water from distant springs, letting loose a great quantity of surplus water to flow down into this area and for all the blasts which produced sufficient vibrations to have any loosening or

jarring effect in the topsoil. Without these primary causes neither the favorable natural conditions nor the rains and snows nor the building of the town would have sufficed to cause the slide.

In defending ourselves against the contentions which will probably be set up by our opponents we will probably be called upon to prove:

(e) That the surface landslide was not directly produced nor hastened nor augmented by the caving or slumping of ground into the U.V.X. stopes nor by the sagging of more distant areas in that direction.

(f) That the surface landslide was not produced nor hastened nor augmented by the block subsidence in the hanging wall of the Verde Fault.

(g) That the block subsidence was not directly or primarily caused by the caving, etc. due to the U.V.X. mine workings and that, even granting that the mine workings did have some effect upon portions of the area involved in the block subsidence these effects did not occur at such times, nor in such areas nor to such an extent as to in any way cause or speed up or extend the action of the surface landslide.

DISCUSSION:

To establish "(a)": I believe that the testimony of our expert witnesses should be sufficient, this can be supported by surveys showing the outward and downward movement of the ground involved along the slope of the hill and on the plane of the caliche which forms its base, by photographs, by comparison with other recognized slides which the witnesses have personally examined

and by references to Government publications and other standard treatises, (as far as these will be admitted in evidence) . I do not believe that our opponents will attempt to deny that the present destructive movement is essentially a surface landslide.

To establish (b) we must produce competent witnesses who are familiar with the history of the slide and can correlate this with the flow of water from the U. V. tanks through the broken ditches and pipe lines and also those who recall the dynamite explosion and the large pit blasts of the U. V. Co., actually felt their shocks and noted the shaking of the buildings, breaking of windows, cracking of walls and small landslides which followed closely on the blasts.

Certain records can doubtless be produced to corroborate the verbal testimony and the opinion of experts used to outline the results which would logically follow the blasting and seepage of water through the slimey clay and shaken top-soil.

On these matters we are likely to be confronted by other witnesses who will deny or minimize all of our assertions and attempt to show that leaking water and blasting had little or no effect in the landslide area since the slide itself did not directly and promptly follow upon any of the events which had been described and also because similar surface landslides are not always caused by water action or earth shocks but often by the removal of the supporting material from below, as where they follow along the edges of subsidence due to mining or where the toe of a slope is undercut by the waves of the ocean or the erosion of rivers or left unsupported through the excavations of road cuts or quarries.



To prove that the Jerome landslide was not due to the withdrawal of support at its toe it will be important to establish by surveys and calculations that the volume of creeping material has not diminished,--except as some of it has been washed or carted away,--and that it has pushed outward rather than settled downward. We can also show that the angle of the slope is far too flat to permit any movement of dry material even though the lower section had been entirely cut through.

The main assertions of (c) will probably be admitted by both parties to the controversy and it can be agreed that neither party was nor is in any way responsible for the geological or physical conditions which favored the slide, nor for the results of any acts of nature, nor for placing structures on unsafe locations, except when they were themselves the owners of these structures or in acquiring the ownership have assumed this last responsibility. The U. V. Co. may point out that the damage to surface vegetation was completed some thirty odd years ago, but we can show that the result of this denudation is cumulative as has been proven in many other parts of the world. The U. V. Co. may also seek to place some responsibility on the town of Jerome as the owner of the old fire tanks on the hill above the big break in the ditch and also of the fire lines and sewers whose bursting and leakage may have caused some damage and contributed to the general destruction.

In proving (d) we can doubtless obtain records which will show that the U. V. Co. brought in the water supply from Allen Springs, etc., built the tanks and ditches and thru their subsidiary laid the water lines through the town. The outline of the surface landslide above the ditch and just below the fire tanks

can still be seen and the ditch itself bears witness to the effects of this and carries the scars of many other breaks. Official records covering the construction and operation of the water system can doubtless be brought into court, but we may have to rely on the memory of witnesses in regard to the dates of the main ruptures of ditches and pipe lines and especially as to the length of time that repairs were delayed and the nature of the repairs when these were finally made.

Aside from any acts or statements which may be alleged to constitute admissions of responsibility on the part of the U.V.X. Co. I anticipate that by far the hardest part of our task will consist in <sup>the</sup> rebuttal of the counter charges of our opponents.

As to (e) I do not think we need to be greatly concerned for the facts will in themselves constitute our best defence.

A direct subsidence into the U. V. X. Stope would have resulted in sharp downward breaks on all sides as at Miami, and over certain coal and iron mines, but at Jerome these breaks are all from the up hill side.

The movement of the creeping ground would have been almost directly downward where here it slides forward and outward and piles up at the toe.

The rock structures from the surface to the mine stopes would have been fractured and broken more or less vertically and surface water would have poured through into the mine. Actually all the ground above the local stope caving is merely sagged, and water stands in the 550' level of the U. V. X. Mine year

in and year out while the lava and caliche directly below the top soil show no cracking at all. Moreover the time element is out of line for subsidence due to mine caving should have started before 1928, and should have been completed by '34 or '35 while the destructive landslide only started in '35 and reached its limit in '36 and '37. Calculations of rock volume involved make it wholly impossible that any caving or swelling could have extended so far from the stopes unless it were in the form of a chimney-cave which would have directly dropped a limited area of the surface straight down toward the mine and of this action there is not the slightest evidence.

Our defence in line with (f) is likely to prove far more difficult for our opponents will doubtless claim that the surface landslide was partly caused and materially increased by the block movement in a portion of the hanging wall of the Verde Fault and for the following reasons:-

(1) The block subsidence broke the bond along the fault breccia and loosened the topsoil in all of the area involved.

((2) The block subsidence cracked and fissured the entire mass, as shown by the crack in the Florencia Claim and especially that portion over which the surface landslide has developed, thus allowing the surface waters to more readily percolate through to the clay and saturate this material and the loose ground above it.

(3) The block subsidence altered the original surface slope of the hill especially at certain points of local depression over the mine stopes and thus withdrew support from a section below the slide and increased the angle of slope to a

point where the equilibrium was destroyed and a creep of the top-soil was facilitated.

To support these arguments they may introduce elaborate comparative surveys, of which I have seen only a small portion, and interpret these in such a way as to lead to conclusions which will be favorable to their contention.

Now while we must recognize the fact that a block subsidence might do all of the things which they will claim for it, I do not personally believe that in this particular case the block subsidence actually <sup>did</sup> any of these things to an extent or in a manner which would have produced or contributed to the landslide. Yet it seems to me that it will be impossible for any of our experts to positively say that it did not have any such effects until we have had an opportunity to thoroughly examine the evidence which the U. V. Co. will produce and listen to their explanation of same, comparing their data with the factual evidence on the ground and such surveys and other data as we have ourselves prepared.

We can surely show that the block subsidence affects a different and much greater area than the surface landslide and that the top of the slide does not correspond with the fault, but lies some 200 feet away from it, that the sides of the slide do not extend to anywhere near the Florencia Crack nor the other limits of the block subsidence, and that the material involved in the block subsidence does not appear to be cracked and fissured anywhere outside of the landslide except along the foot wall of the Verde Fault and along the Florencia Crack, which is 700 feet

east of the landslide and that none of this material permits the ready seepage of surface water.

We can further show that the change in the angle of slope due to the block subsidence was only produced directly along the fault,--which is way above the landslide,--and to a very small extent near the center of the block, where, even though it may partially correspond with the landslide area the alteration is so slight that it could not in itself have any possible effect in starting, speeding up, or increasing the creep of the topsoil at any point.

Even though we may be able to build up a pretty strong case against any connection between the block subsidence and the surface landslide yet I seriously fear that it may be extremely difficult to so convince a judge or jury and for this reason it seems to me that it may be very important to prove,--as under (g): that the block subsidence is not a part or extension of the mine caving or slumping and was not caused by any act of the U.V.X., even though we will all agree that the sagging of ground toward the U.V.X. Stopes did cause some additional movement in the block and an increased depression in its central portion.

Unless we can completely carry our point under (f) a defence of our position in line with (g) is likely to prove the hardest part of our task for at the outset we must make certain admissions which will tend to weaken all of our other arguments.

We shall have to agree that stoping in the U.V.X. Mine did inevitably produce some caving, breaking, and slumping

of the rock in their vicinity and for some distance above them, that this was reflected by a slumping on the 950 and 800 levels---that this again was followed by a sagging of the rock still nearer the surface as shown by the surveys on the 550 ft. level, and in the Bitter Creek tunnel. Our opponents will then have every opportunity to argue that this sagging movement progressed upward to the surface and that the maximum slump in the Bitter Creek tunnel (which seems to have occurred from 1931 to 1935) was extended to the surface before 1935 and over a fairly large area and that this slumping in effect changed the level of the slope and through forming a depression or hollow removed and weakened the support/<sup>at</sup>and near the toe of the sliding area and thus had more effect in producing the surface slide than any action of water or earth shock.

In other words they will contend that the mine caving was responsible for practically all of the surface movement which I have termed the block subsidence, that this subsidence was further manifested by forming depressions or sinks over the mine stopes and that the pull from this caving and slumping was felt as far as the Verde Fault, Bitter Creek, and School Gulch, and caused the breaks along the fault at the old hospital, along Clark St., at the Miller Bldg. and Hampton House, on the Florencia Claim and elsewhere and so greatly fractured and loosened the top soil that it began to slide,--assisted to some extent by rain, melting snow, and drainage and unavoidable leakage in the water system.

Our strongest defence against these arguments will be to secure,--if it can possibly be done,--positive evidence that the block subsidence had begun and made substantial progress before the U.V.X. started mining at all or at any rate before the excavations

had made sufficient progress to have caused any effects on the surface 1200 feet above them. The fact that the old hospital crack developed in 1923 is a strong point in our favor for at that time less than 900,000 tons of ore had been taken from the mine and, according to Leisk, neither Tally nor Searles could find evidence in the upper levels which justified them in assuming that mine subsidence was responsible for the surface crack and slump. This is further corroborated by surveys in the Bitter Creek tunnel which showed very little sagging before 1926.

But our strongest proof may be found in the records or testimony of the former City Engineers or others who should be able to substantiate the many rumors and casual statements which lead us to believe that this block subsidence had actually been noted prior to 1915 and therefore could not possibly have been caused by any act of the U.V.X..

Comparison with other block subsidences may also prove of value and I have obtained a most reliable description of such a movement at San Jose, California, where there has been no mining but only a drainage of the water bearing substrata and I think that a personal inspection and study of this location might prove most useful.

Finally, calculations of the volume of material involved,--as pointed out in my Second Report--make it seem mathematically impossible that the block subsidence could have been produced by the mine caving or even affected by this except in certain limited locations and to a very small extent.

The more essential differences between our position and that of the U. V. Co. may perhaps be summed up as follows:-

Both will agree that the destructive earth-movement in the town of Jerome is a surface landslide occurring in a location favorable to such a movement.

We shall seek to prove that this was both caused and occasioned by the acts and omissions of the U. V. Copper Co. through bringing from a distant source a large supply of water and negligently allowing a portion of this water to leak for long periods of time from broken ditches and pipe lines through a section of the top soil under the town which had already been thoroughly shaken by their dynamite explosion and heavy blasts in the pit. We shall seek to disprove that either the mine subsidence or the block faulting had any part in causing or increasing the surface landslide or that the mining was the cause or occasion of the block subsidence, although we will admit that the self filling of the voids left by the shrinkage of the mine fills did extend upwards and produced a slight sagging of the surface, too small and gradual to have any practical effect either in the landslide area or elsewhere.

The United Verde Co. on the contrary will claim that the combined effect of the mine caving direct and of the block subsidence which the mine caving produced were the efficient and primary causes of the landslide toward which leaking water contributed only to a very small extent and blasting not at all. They will also hold that the mine subsidence was responsible for the breaks in the ditch and pipes. Thus we shall contend that the slide would have resulted from their leaking ditch and pipes and the shock of their heavy blasts even if there had been no block subsidence and no



U. V. X. Mine, and they will contend that the mining produced both caving and block subsidence which would have been followed by the landslide movement even if there had been no heavy blasting and no leaky pipes or ditches and anyway that it was the mine subsidence which broke the ditch and pipes.

But if, as I now believe, the block subsidence was largely due to drainage of the Verde Fault Zone and hanging wall ground some responsibility will rest upon that U. V. X. by reason of the drainage through the Josephine tunnel and the balance of the responsibility may be shared by God and the U. V. Co. together with other old mining operators in this district.

It is also my opinion, as stated in my last report, that the mining at the U. V. X. did serve to increase and expand the subsidence of the ground affected by this movement through the pull exerted by the caving rock near the stopes upon the rock above and around this area and I am more than ever convinced that this is a fact since I have had an opportunity to examine for the first time the profile surveys of the Bitter Creek Tunnel from 1926 to 1937 and the tunnel itself as now cleaned out to and across the fault. Professor Lawson is evidently of the same opinion and so are the officials of your company. While both the element of time and calculations of relative volumes of material convince me that the U.V.X. mining could not possibly be responsible for all of the fracturing, swelling, and sagging of the ground in this block I could not deny that there has been a direct connection between the two or contend that the contour of the surface involved would be quite the same as it is today if there had been no mining at the U. V. X.

Admitting the above we again come to the vital question

of whether or not the block subsidence had any effect in causing, hastening, or augmenting the surface landslide, or even in creating a condition which made this possible. All this we should most emphatically deny and in doing so I think we shall be on fairly firm ground.

In point of time the block subsidence, we know, started in 1923, if not before. This was five or six years before the explosion and heavy pit blasts,--some eight years before the big break in the ditch and ten years before the destructive landslide was noted.

The movement of points in the area of block subsidence has been slow and fairly regular at least since the first systematic surveys were made in 1929, the additional movement in the landslide area was nil until 1935 and increased rapidly during the rainy season of 1934 and 1935, again during the summer rains of 1936 with a slowing up until the very wet winter of 1936-'37 when it reached a maximum speed only to slow down again with the repairing of the broken ditch and drier weather of April and May. No such seasonal variations were noted in the movement of points outside of the sliding zone.

The angle of the surface slope throughout the area involved in the landslide has shown little or no relative change in the past forty years. The block subsidence did cause a break or step along a section of the Verde Fault amounting sometimes to as much as four feet, but if this had helped to bring about any surface slide or creep it would necessarily have been above the fault or at least have corresponded with the fault itself. The relative change in positions of various points in the subsidence area was very slight until the landslide started and even since then there has been

no substantial change in this condition outside of the slide area as determined by surveys of Waara and Mills and such surveys by U. V. engineers as I have seen. It is true that there has been a slightly greater subsidende near the center of this area than along its edges and this may properly be attributed to the pull from the U.V.X. stopes, but the section of the surface which is in the immediate vicinity of the old U. V. X. waste raise and the U. V. X. road is not involved in the landslide. Moreover the distance from the hanging wall of the Verde Fault to the point of greatest depression is around one thousand feet and an extra surface drop of two feet (as it appears to be) in that distance would change the angle only to the extent of 0.2% or  $0^{\circ}.7''$ , which is far too slight to cause any appreciable sliding of the top soil or to act in any way similar to the cutting away of the toe of a bank or the undermining of the supporting strata as is done by streams, quarries, or roadcuts which sometimes do produce landslides with little or no help from water and earth shocks. Any slide arising from such a cause would show a more steady rate of motion and might start in dry weather, although water action would of course speed it up for a time.

No landslide could possibly have started in dry ground on such a low angle of repose as is found over any and all portions of the sliding zone and neither blasting, nor weight of buildings, nor removal of support at the toe of the Jerome landslide could ever have served to start the creeping movement of the topsoil if its lower layer or stratum of clay had not been lubricated and rendered slimey and slippery so that the underlying caliche became in effect a well greased incline plane, along which the topsoil moved with the greatest of ease.

Neither the mine caving nor the block subsidence has in any way cracked or fissured the surface of the ground except right along the line of the hanging wall of the Verde Fault which is 200' from the top of the slide and along the Florencia Creek. Everywhere else in this area that an examination is possible the lava rock and superimposed caliche, although sagged and warped to a small extent, are absolutely solid and unbroken, even under the slide itself and they show no evidence of fracturing or breaking.

It is perfectly true that when first glancing at the situation at Jerome one is struck by the relative positions of the surface slide, the block subsidence, and the mine workings, and anyone would naturally be inclined to assume that there was direct connection between all of these; that the mine caused caving, caving caused or contributed to block subsidence and block subsidence contributed to the surface slide. But careful investigation, even though it might confirm the first two premises to some extent entirely fails to support the third.

On the other hand the relative location of the landslide as compared to the once broken ditch and pipe lines, the direct tracing of the flow of water to and through the slide down along the clay seam or strata and out <sup>near</sup> its lower end, the outward movement of the creeping material and a study of the chronological record of the movements involved all support the conclusions that the leaking water slowly and progressively saturated the top soil in the creeping area, the heavy blasting shock up and loosened this top soil on the same occasions that it broke and cracked windows and buildings in the town and the effects of both actions were progressive until there was so complete a saturation of this soil and

the slimey clay between it and the caliche that the former equilibrium was upset and the topsoil slid down the hill and will so continue to slide until a new equilibrium is established, regardless of the deep seated caving and slumping into the mine workings, which does not extent to anywhere near the surface and of the slow and gentle block subsidence, which was never of a kind or quantity sufficient to have caused the slide or increased or decreased it to any extent whatever.

There are still some other factors which must be considered, including the responsibility of people who built on the clay bank and thus increased the weight of the top soil and hastened the slide. Many of these buildings, or the land on which they once stood, is now owned by the U. V. K. and in making these purchases they have doubtless assumed the liability of the original owner in this particular regard.

The effect of natural rainfall on this area must also be given due weight and will doubtless be emphasized by our opponents. The run-off from rainfall and melting snows has, of course, contributed to the saturation of the clay and thus to the slide itself and periods<sup>of</sup>/heavy rain have generally coincided with an increased rate of slippage. But these periods have also been those in which the U. V. tanks overflowed and the gap in the ditch (until recently repaired) allowed this surplus water to all come down in a concentrated area and increased the amount of groundwater in the topsoil far beyond the limit which it would have reached from any normal precipitation.

I think that it may fairly be assumed that the contour of the surface under the town of Jerome prior to 1900 represented

the normal equilibrium established by nature during many thousand years and that this would have remained unchanged from natural causes for an indefinite period in the future. It was only the excess water which first caused many small local landslides, just as the leaking tank did at the Green Monster and finally the present disastrous landslide developed due to the acts of man and at most only been slightly hastened by any acts of nature.

Your attorneys will doubtless fully investigate the somewhat complicated relations between the U. V. Copper Co., the Upper Verde Public Utility Co., and the City of Jerome. I have been informed that all of the water supply and fire protection equipment, including the three old fire tanks above the ditch, originally belonged to the U. V. Co., but sometime after 1912 the fire lines and presumably the fire tanks were taken over by the City. The sewer lines through the town belong to the City but apparently are flushed with water furnished by the U. V. Co. or the Water Company.

The breaking and leaking of fire lines and sewers undoubtedly contributed to the saturation of the top soil and clay in the landslide area to an extent which will be very difficult to determine. It would thus appear that the City of Jerome has been partly responsible for the damage caused by the landslide, but on the other hand it has been one of the principal injured parties by reason of the destruction of streets and sidewalks and the heavy repairs which have been required to keep these in a passable condition.

Yours very truly,

*S. M. Colverson*

GEORGE M. COLVOCORESSES  
MINING AND METALLURGICAL ENGINEER  
1102 LUHRS TOWER  
PHOENIX, ARIZONA

May 24th, 1937

Mr. James S. Douglas  
Douglas  
Arizona

Dear Mr. Douglas:

I have your letter of May 21st and sincerely regret that you have suffered so much from asthma. I certainly trust that you will find relief somewhere on the east coast and I should think that an ocean voyage might be extremely helpful.

I am sorry not to have seen you before you left Arizona but presume that this letter will be forwarded and I note your instructions in reference to the work at Jerome and I shall be very glad to cooperate further as may be desired and presume that you have authorized Mr. Kingston or Messrs. Cornick and Carr to call on me for further services as these are required.

I am sorry that you evidently do not feel that I should at present carry out the suggestions which I made to you during our last verbal conference in Jerome, but perhaps you may believe that I could help you along these lines at some later date.

I have noted the comment in the last paragraph of your letter and entirely agree with you that the moral obligations of your neighbors at Jerome should not be disregarded, but I did not feel that it was proper for me to go into this side of the question in preparing engineering reports on the causes of the destructive landslide nor the other earth movements in the vicinity of the town and moreover we both know that the people who are now in control of the United Verde Copper Co. cannot properly be charged with the moral wrongs committed by their predecessor even though they have assumed the legal obligation for such acts or omissions and I believe that the present management of the United Verde Co. will be disposed to give this phase of the situation fair consideration if we can once convince them that the physical facts are in accordance with our belief.

I was in Prescott part of last year and had an opportunity to talk matters over in a general way with Mr. Carr and he has given me several documents which I will go over as time permits and unless your obligations make it impossible for me to do so I shall always be ready to return.

2- James S. Douglas

for conferences at Jerome or Prescott or further study of  
the entire situation.

With best personal regards.

Yours very truly,

*S. M. Colvocozen*

GMC:DF



Colvocoresses June 1, 1937

GEORGE M. COLVOCORESSES  
MINING AND METALLURGICAL ENGINEER  
1102 LUHRS TOWER  
PHOENIX, ARIZONA

June 1st, 1937

Mr. J. S. Douglas  
c/o U.V.M. Mining Co.  
233 Broadway  
New York City, New York

RE: JEROME SLIPPAGE

Dear Mr. Douglas:

Since last meeting with you in Jerome on May 10th, Mr. Carr has turned over to me several reports and documents with a request for comment.

Pressure of my other work,--which had piled up to some extent during the past three months, has made it impossible for me to give these proper attention until the last few days, but meantime I had seen Mr. Carr on two occasions and discussed some of the more important points which are fully covered in this letter.

Commenting on JUDGE COLBY'S report of April 29th:

Referring to his page 4 it is evident that he did not clearly understand that the plane or base of the slide coincides with the seam or stratum of clay which became greasy and slippery on saturation, this was also the lower limit of the loose top soil and hence of the saturation, for the water did not penetrate through the underlying caliche which behaved like solid rock.

Referring to his page 5, Colby seems to have misunderstood the effect of heavy blasting, we have no records of large

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blasts by the U. V. Co. subsequent to 1926, but we believe that their very heavy pit blasts and explosion during 1925 and '26 served to shake up the loose top soil and make it much more easily permeable by water and it was actually the leaking water and not the blasts which acted as the trigger and set the slide in motion in or about 1933. At least that is my conclusion.

Commenting on his page 7 it should be noted that small slides did occur concurrently with the heavy blasting, according to Leisk and others.

Colby seems to approve my theory of three earth movements, but it is vitally important that others should do so if we are to make a case and Colby minimizes the possible effect of drainage which I believe may have been very important.

Referring to his page 8 it is natural that the greatest slump and sag over the U.V.X. workings should follow the joints and slips in the overlying rock rather than extend vertically upwards. In this case the dip of the Verde Fault, which is towards the northeast, seems to govern the direction of the mine caving, at least to some extent, and extend this upwards towards the southwest as noted by Colby, and I should have been forced to admit that the break along the hanging wall of the Verde Fault was actually caused by mine subsidence except for the fact that the most noticeable break seems to have occurred before this subsidence could possibly have extended up to the surface and also because the area and hence the volume of material involved in the movement which I have termed the "Block Subsidence" appears to be so much greater than could possibly be accounted for in the self filling of the voids over the U.V.X. stages.

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Referring to his page 9 I have made a lot of calculations on the volume of material involved in the mine caving and swelling but hope to be able to do more work on the basis of some mine surveys which were only completed after my <sup>regular</sup> engagement terminated, also further inspection of Litter Creek tunnel, which was then not entirely cleaned out, and certain surveys of the old surface which I understand will later be available for inspection.

Colby evidently failed to notice or recall the surface crack on the Florencia Claim and of course there are a series of cracks along the fault extending from the old U.V.X. Hospital up to a point near the Miller Bldg. and perhaps some distance beyond.

The weight of buildings, etc. on the sliding topsoil would at most be merely a contributory condition and could not have caused the slide considering the very low angle of repose on the caliche, and, as a matter of policy, I do not think that it would be wise to emphasize this point to any great extent.

I absolutely agree that the entire problem must be reduced to as near a certainty as the acquired data will permit and think this should particularly apply to the theory of two or three major earth movements.

I also agree with Colby's remarks on pages 10 and 11 in regard to the exhibits, maps, and models, and would particularly agree that the burden of proof will eventually rest on the U.V.X. for in the minds of the local residents with but few exceptions, the caving due to the U.V.X. mining has long been held to be entirely or almost entirely responsible for all of the surface

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movements in the vicinity including the cracks along the fault, the subsidence and shifting of various streets and buildings and finally the destructive landslide. It will take a lot of strong evidence to alter such a conviction.

\* \* \* \* \*

Referring to Waara's reflections on my report of February 13th, 1937.

My page 11.---This is the most important part in the entire discussion and will be referred to later. Our entire future program of study and preparation must depend on whether we recognize two or three earth movements, and it is obvious that we should all concur on this point just as quickly as possible.

My page 2.--Item c.---I assume that Waara refers to the many small surface landslides which are said to have occurred prior to 1918 or 1920, if he can prove that the present destructive landslide started before the U.V.X. had mined any large tonnage, say in 1918, then, by the same token, he will entirely destroy our theory that this was caused by the leaks from the big break in the concrete ditch which only occurred about 1930 or was in any way due to the explosion and pit blasts of the United Verde which were fired in 1925 and 1926.

Here again it is evident that we must all get together and agree on facts and conclusions.

My page 3, Item 7B.---This has been somewhat revised and clarified in my subsequent reports and the same applies to 8C.

As to 9 C, I do not think that we can omit natural drainage as the run-off from rain fall is a well established and recorded fact.

5- James S. Douglas

June 1st, 1937

My page 7.

I should not have used the word "gush" but should have termed this an "increased seepage" such as was noted by many of us including J. S. Douglas during February and March of 1937. Naturally it did not occur until sometime after a heavy rainstorm or serious leakage of pipes or ditch.

My pages 8 and 9.----I have no personal knowledge of the dates of the hanging wall subsidence and will gladly revise these statements in accordance with the evidence.

My page 10.---The fault gouge and breccia in Bitter Tunnel as I have observed it is moist and I was told that it had been much wetter in previous times, before the ground was so thoroughly drained.

\* \* \* \* \*

Comment on Waara's reflections on Lawson's report of March 8th.

I think that Waara has misunderstood Lawson's references to the red clay above the fanglomerate or at least my own understanding is quite different. It is true that we have no ground movement directly on any of the lava, but Waara has evidently overlooked the fact that there is still a great mass of lava on the upper sections of Cleopatra Hill and we know that the Tertiary flows of lava covered a much greater area. It seems to me entirely probable that the red clay under the landslide area resulted from the decomposition of some of this lava and was washed down to its present location after the fanglomerate had been formed as a result of previous erosion. Here again it is important that we should all reach an agreement.

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Page 5 can be checked with surveys especially those of Mills and the ratios of horizontal to vertical appear to be variable as noted in my reports.

Pages 8 and 9.---Waara has not considered the great mass of broken and swelled rock directly above the stopes, which self filled the voids left in these stopes. Further work should be done in calculation of volume of material, broken, and swollen and slumped from the surface. I take it that his 350,000 tons only refer to the slump in the destructive landslide.

\* \* \* \* \*

Waara's Report on meeting of May 10th, 1937.

I do not understand Waara's caption of the block subsidence as a "defensive measure." Such a movement either exists, as I believe, or it does not exist, in which case we would be both dishonest and foolish to try to invent it. Further surveys will doubtless throw some additional light on this point.

Referring to Waara's last paragraph we must first determine whether the drop toward the U.V.X. stopes is vertical or on a slope---perhaps similar to that of the Verde Fault. If the drop of any point in the actual line of subsidence is less in the Bitter Creek Tunnel than on the surface it would indicate that the block subsidence is a natural earth movement or has been caused by drainage.

After carefully going over all of the letters and reports mentioned as well as other available data I have no doubt but that all of the differences of opinion expressed can easily be reconciled with the very important exception of the question as to whether there are two or three earth movements in and near

7- Mr. James S. Douglas

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Jerome. I have followed the latter theory and described the three earth movements fully in my various reports, but if my "block subsidence" is to be rejected then it is evident that all of the displacements noted in this vicinity both in times past and at present must be classed as either having been caused by surface landslides or by mine subsidence. This does not appear to be in accordance with the facts.

Now I readily agree that in all probability the displacements noted above the fault were caused by local landslides such as were recorded from time to time in the early history of the camp and the same may be true of the movements noted near the Hampton House and elsewhere, but I do not believe that such landslides could possibly have caused the break at the old U. V. X. Hospital or other points along the Verde Fault, the displacement near the Bartlett Hotel and near the Jerome Hotel, the large crack on the Florencia Claim, the displacement of the portal of Bitter Creek Tunnel and the underground slumping at long distance from the stopes which is noted on all of the levels of the U.V.X. Mine down through the 1500. Similar slumping was noted, according to Mr. Douglas, in the Hopewell Tunnel of the U. V. Mine. Following the two movement theory it results that any and all surface movements which were not due to landslide must have been caused by caving or subsidence toward the U.V.X. stopes, which must have started prior to 1928 and continued to date, with every prospect that it will further continue in the future.

On this theory the mine subsidence may have been responsible for breaking many of the water, fire, and sewer lines

8- Mr. James S. Douglas

Jun. 1st, 1937

thus releasing water to help produce the destructive landslide, it must have been responsible for practically all of the shift and drop of portions of the town outside of the area of the destructive landslide, for the breaks at the old U. V. X. Hospital and further along Clark St., for the crack on the Florence Claim, all of the sag of the surface and in the U.V.X. Mine and if all of these movements and displacements were caused by the U.V.X. mining I fear that it will be extremely difficult to convince any judge or jury that the same cause which disturbed and slumped so large an area did not also substantially contribute to the destructive landslide which unfortunately is located so nearly over the stopes themselves.

My theory of a third movement rests principally on three bases.---

1st. My personal examination of the surface and underground conditions and of the surveys recording the extent and direction of displacements.

2nd. The statements made as to the dates when some of the movements were noted, especially the cracks at the old U.V.X. Hospital in 1923 when a comparatively small quantity of ore had been mined by the U.V.X., and

3rd. My calculations, based largely on the same surveys, as to the volume of the material which had slumped on and below the surface in comparison with the volume of material which could be absorbed in self filling the voids in the U.V.X. Stopes.

If the two movement theory is followed the U.V.X. must accept direct responsibility for any past, present, or future damage that is not clearly attributable to a surface landslide.



9- Mr. James S. Douglas

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Indirectly we may have to assume much of the responsibility for even such landslides since the mine caving would then have caused much of the breaking of water, fire, and sewer pipes and the general surface subsidence might have contributed to loosening and weakening the top soil and facilitating the seepage of the saturating water.

On the other hand if we can all agree that there has also been a block subsidence and fully develop this theory in our arguments we can also claim that no past or future damage outside the landslide area was caused by the mine caving which we can limit entirely to the area immediately above and around the slopes with its maximum surface effect amounting only to a slight sag near the center of the block due to the pull from the caved and broken ground.

The cause of the mine caving cannot be questioned, but the cause of the block subsidence is still obscure. It may be an act of nature referred to by the Professors as a "tectonic movement" due to the numerous faults of the district and stresses in the earth's crust. This was evidently the opinion of Searles (according to Leisk) when he examined the hospital break soon after it occurred and presumably Tally and his engineers agreed, since no claim was made against the U.V.M. at that time.

It may have been partially caused by the large mining excavations and piling of waste dumps, altering the normal rock pressures and equilibrium, in which case <sup>also</sup> the responsibility would rest on the U.V. Co., and it may have been caused by the drainage of the soft and porous rocks in the zone of the Verde Fault and in the hanging wall country, in which case again the U.V. and

10- Mr. James S. Douglas

June 1st, 1957

other old operators at Jerome would be the principal agents, although the drainage was completed by the U. V. X. subsequent to 1919.

But according to this theory, under no circumstances can the block subsidence have been caused by caving toward the U. V. X. stopes and hence no past or future liability for such displacements could be attributed to the U. V. X., and even though this item of damage may be comparatively small at present yet it <sup>well</sup> may/reach much larger proportions at some future date, long after the U. V. X. has ceased to mine ore and the self filling in the old stopes has been thoroughly compacted.

Again it seems to me that the recent discovery or rather development of this three movement theory will be a strong point for the attorneys when they come to explain the apparent admission of responsibility by the U. V. X. Co. in paying heavy damages for property injured by the surface landslides, which the officials of that Company might very naturally have assumed to be connected to some extent with the mine subsidence until they came to recognize the dividing line between the mine caving and the disturbances arising from the block movement.

All in all it appears to me that the definite establishment of this third movement will not only be extremely important but also very advantageous to our defence, and I greatly doubt if our opponents will be fully prepared to refute the arguments which we can submit on this particular point.

In any event it is obvious that all of us who are to take any part in the further preparation of this case should reach an agreement on this matter just as speedily as possible. Either

11- Mr. James S. Douglas

June 1st, 1937

there are two earth movements or there are three/<sup>earth</sup>movements at Jerome, and it will never do for some of us to argue in favor of one theory and find ourselves opposed by others on the same side who cannot see the matter in the same light.

Up to the present it seems that I am the only one of your investigators who has fully recognized and advocated this three movement theory unless I can include Judge Colby and Hondrum who have seemed to agree with my classification. Waara evidently disagrees and so to some extent does Professor Lawson, while others have not definitely expressed themselves one way or the other.

If I am really in error I am most anxious to correct my mistake and cooperate in developing the two earth movement theory, but if I am right I am equally anxious to convince all of the others without further delay and to gain their cooperation in confirming and expanding this theory and making it just as important a part of our arguments as the facts will permit.

Therefore, if you agree with me as to the importance of block subsidence and the three movement theory, I should like your authority to continue my investigation, <sup>as you may desire,</sup> on this point especially, first of all conferring with your local attorneys and the other engineers so that we could draw up a definite statement of our joint opinions and then, if their views can coincide with mine, in further studying the effects of this movement on the ground and other similar movements, especially the one at San Jose, California, by comparison with which I hope to prove our point and show that block subsidence <sup>as</sup> well as the surface landslides have in no way followed the mining of the U.S.M. ore bodies.

12- Mr. James S. Douglas

June 1st, 1937.

I have not as yet attempted to comment in detail on Mr. Carr's outline of proof, because it seems to me that the settlement of this basic theory must precede any complete preparation of the technical and legal phases of the case and until this is done it seems that we might be working at cross purposes among ourselves.

Yours very truly,

*S. M. Colver*

GEORGE M. COLVOCORESSES  
MINING AND METALLURGICAL ENGINEER  
1102 LUHRS TOWER  
PHOENIX, ARIZONA

*L.A. 1/15/38*

*Colvocoresses  
Jan 14, 1938*

*David 1/15/38*

January 14th, 1938

Mr. James S. Douglas  
New Rosslyn Hotel  
Los Angeles, California

Re: Jerome Slippage

Dear Mr. Douglas:

On the morning of the 12th instant, I called on L. S. Gates at the office of Ellinwood and Ross and we had a very friendly conference at which P. G. Beckett was also present.

I told them that I had suggested such a meeting several months ago and that you had recently authorized me to carry out the suggestion and I started the discussion by pointing out that during the past several years the United Verde Extension Company had been paying for all of the damage at Jerome although every one of us who had investigated the facts, while fully recognizing the mine caving and subsidence which had taken place directly over the Extension stopes, were firmly of the opinion that these movements had in no way caused or contributed to the surface landslide which had wrecked a portion of the town. I added that such a situation was manifestly unfair and could not be expected to continue indefinitely and that I sincerely hoped that it might be terminated by some friendly settlement rather than by the Courts.

Both Gates and Beckett, while not in any way admitting my contentions of fact, expressed a strong desire to avoid litigation with the United Verde Extension Company and particularly

2- Mr. James S. Douglas

January 14th, 1938

✓  
? to settle their differences before either party should be legally attacked by out-siders on account of the damage at Jerome. It was agreed between all of us that any litigation between the two companies would be an extremely long, drawn-out and expensive procedure, involving appeals and re-trials and costing both sides a great deal of money which had far better be used for the settlement of such claims for damages as could be proved just and legitimate. Moreover, it was mutually recognized that the record which would be established in any court proceedings of this nature would be extremely unfortunate for the mining industry in general and for the Phelps Dodge Corporation in particular, since their own evidence would tend to establish the effects of mine subsidence over a wide area and this evidence would doubtless be used by other people in other places, perhaps to the great damage of the Phelps Dodge Company or its subsidiaries.

Gates mentioned that the prospective litigation would be likely to cost his Company as much as \$250,000 which they were prepared to spend, so it may be assumed that he would propose to fight this case to a finish if this became necessary, but, conversely, it might also be assumed that he would be willing to make a very substantial payment in settlement in order to avoid such enormous legal expense plus the possibility of an adverse final decision. ?

During the course of the conversation Gates mentioned that a number of proposals for settlement had been made to him

3- Mr. James S. Douglas

January 14th, 1938

? by you or your associates, none of which, from his standpoint, seemed fair or logical, but he did say casually that if it had been proposed that Phelps Dodge should assume the liability for 70% of all past and future damage, that this might have formed a logical basis for negotiation. I do not wish it to be inferred that Cates either proposed or offered to accept a settlement on that particular basis, but it may be that he mentioned this figure merely as a "feeler" which might be worth following up if the total damage to which such a settlement could refer should be definitely limited in point of area and in point of time. The area should, I think, be bounded by the Verde Fault, Bitter Creek and School Gulch and the period of time should be limited to all damage occurring or alleged to have occurred subsequent to some definite date and prior to January 1st, 1940. It would also seem important to exclude all claims of either company against the other except in respect to property acquired, purchased or repaired in settlement of damage.

*Shin was  
Don 2/3/47  
ac. James.*

?  
.

? While details of the relative responsibility were not extensively discussed, it appeared to me from our conversation that both Cates and Beckett were fully prepared to recognize that the liability for a large portion of the damage at Jerome should properly be assumed by the Phelps Dodge Corporation and that they were quite ready to consider any firm offer that might be made which did not throw the entire burden or a very great percentage of it upon their Company. However, they seemed to believe that it would be impossible for the two companies to

4- Mr. James S. Douglas

January 14th, 1938

*Shay advised that agreement?*

agree between themselves upon the relative proportion of the damage which should be paid and Cates felt that this could only be settled through the use of an umpire to whom both sides should submit their evidence and arguments. He stated that he was absolutely unwilling to enter into any such arbitration proceedings except under the terms of a legal and binding document of the character of the agreement which was drawn up last summer.

*Disputed by them?*

To this arbitration agreement, both Cates and Beckett repeatedly referred, saying that it had been prepared and executed after much consideration on the part of the officials and attorneys of both companies and they seemed to consider that this was the best basis which could be used for negotiating a compromise settlement, stating that they still considered this agreement in full force and effect although they were prepared to take steps toward its cancellation unless further procedure along the line contemplated could be carried through in the very near future. They seemed to regard this course necessary because of the probability of litigation from outside sources.

From their standpoint, the only difficulty in promptly proceeding along these lines, was caused by the failure to agree upon the arbitrator or umpire provided for in the said agreement. Cates repeated his positive refusal to accept G. H. Dowell as umpire for both Cates and Beckett, while expressing the highest personal affection and regard for Dowell, stated that they did not consider him qualified by training or experience to deal with such a problem and believed that the umpire should



5- Mr. James S. Douglas

January 14th, 1938

?  
be some high-class man with wide experience in geology, ground-  
movement and mine subsidence and also one who had had no recent  
connection with the controversy at Jerome. Gates suggested,  
as suitable men, either Donald H. McLaughlin, Professor of  
Mining Engineering at Harvard, who had recently been working on  
subsidence at the Homestake Mine, or F. W. MacLennan, formerly  
of Miami, and he added that neither he nor any of his staff had  
ever approached either of those men on this subject. I know  
very little concerning McLaughlin, but it would appear to me  
that MacLennan should be exceptionally well qualified for the  
task unless there are some reasons, unknown to me, which would  
make him unacceptable to the United Verde Extension Company.

I mentioned the name of George S. Rice, formerly with  
the United States Bureau of Mines and a recognized authority  
on mine subsidence, but Gates, while not definitely disapproving,  
said that he thought Rice was getting too old and would not  
prove very efficient.

*Frank -  
How  
function  
out of 2 let?*

It was brought out in the discussion that Dowell is  
now a very sick man and might not be physically able to assume  
the position of umpire and since I have had similar information  
from other sources it seems that under any circumstances you  
may be forced to nominate some other arbiters.

Not being personally familiar with the terms of the  
arbitration agreement (although I did not let Gates know that  
such was the fact), I did not feel competent to make any  
recommendations to you until after having gone over this agree-

6- Mr. James S. Douglas

January 14th, 1938

?  
ment in detail with Messrs. Cornick and Carr, but if you should believe that the terms are still acceptable to the United Verde Extension Company, then it would seem that there is no obstacle toward settling this controversy out of court excepting only the choice of an arbiter and I think that it should be possible to agree upon some mutually satisfactory party.

*Letter not  
have done  
this?*

✓  
In order to intelligently complete this letter, I spent yesterday in Prescott with Messrs. Cornick and Carr, going over the existing arbitration agreement and their comment on same. As a result of this discussion, I personally do not believe that you should agree to proceed under its present terms and conditions which, as Mr. Cornick has pointed out, not only fail to protect you in several important respects, but are so vague and indefinite that their practical application would seem certain to be attended by numerous disputes and possibly further litigation.

?  
If it should still be found impossible or inadvisable to work out a compromise settlement on a straight percentage basis, with proper limitations as suggested above, then it seems to me that it would be to your best interest to request that the present agreement should be clarified and modified and I am inclined to think that Cates and his attorneys would agree to such a proposal and defer any proceedings toward cancellation or their insistence upon the appointment of an arbiter until that document had been substantially revised. It might prove impossible to change the terms in a manner altogether to our liking, but

7- Mr. James S. Douglas

January 14th, 1938

I am confident that substantial improvement could be made.

Before I left the office, Cates repeated his earnest desire to work out a friendly settlement on any fair and mutually equitable basis, he said that he would be glad to discuss the matter with me again if I had any concrete suggestions to offer and that he would be in Arizona for some two or three weeks and hoped that it might be possible to make some definite progress before he returned to the East. It seems to me, and I believe also to Mr. Cornick, that this would be equally to our advantage, but I do not feel that I could or should go any further until I have had an opportunity to discuss the matter with you in person.

If you agree with this opinion and are not promptly returning to Arizona, I should be glad to run over to Los Angeles for a day and then follow the matter up with Cates as you might desire. Please let me hear from you by wire if you wish me to come over.

Yours very truly,

*S. H. Colverson*

GMC:mf

P.S. I am enclosing a carbon of this letter in case you wish to forward same to Leisk or some one else.

*Copy to R. D. L. 1/15/38.*

*Containing  
Prot.*

*No need.*

*Good.*

Douglas  
Jan 15, 1938

Copy <sup>this</sup> ~~only~~ to C.P.S. L.S. 1/15/38

Allen Leick

The enc copy of letter  
from Coloe. came today -  
we are making headway -

My guess is that you + Coloe.  
should go up against <sup>McClendon</sup>  
(P.O.'s v.F.) + Peter when

you get to June + even  
out the matter to a finish -  
??? . . . ???

There marked copy to you in  
margin Page 1. ✓

Page 2. ✓ ? I don't know  
where - - "Propose to fight the  
case to a finish" Cit's bluff -  
getting else -

1/21/38 Page 3. Important - we must  
know from Coloe. just what  
was said about 70%

ROZ Page 2 1/15/38  
"The ... Time ... etc"

Important -

Page 4. They know that they  
violated the agreement.

"Very near future" ???

Shall never be able to justify

policy largely just saying  
the State is ...

... ???

Page 5. If ...

... none of these -

"... is a very ..."

... out of the question

but has served our purpose

Page 6. He ...

in going to ...

... without

... consent.

R.D. & Page 3 1/15/38

Page 7. by letter remains 3  
weeks in limbo - progress  
may be made during his stay  
& you should try to be in  
Sioux by Jan. 26<sup>th</sup>

Enc. copy my letter to Colvo.  
Henry is important - letter  
lost without, it becomes if  
the chatter starts that P.O.T

U.V.X. has in accord one  
or two of the append beyond  
may not something -

I may be in till Monday  
eve. possibly Tuesday -

Will write you when I know -

Pls. write me when you get  
the letter. Don't let us bother to

discuss further by mail

Your sincere

Douglas Jan 15, 1938

2 A. 1/15/38

Dear Colwo,

Your good letter  
came this morning - Yes

We are making headway -

Regret your going to C.C.  
I have reasons for this that  
I will tell you about.

Am sure you impounded them  
with urgency for utmost  
desire. If not - do so.

I shall be here till Tuesday  
& will see you soon -

Remember the word

Yours truly,  
D. Douglas  
1/15/38  
C.C.

~~Don White~~

D'Arcy(?) ~1939(?)

NOTES ON THE UNITED VERDE EXTENSION MINE - Probably by Mr. R.L. D'Arcy  
~ 1939 U.V.X. Chief Mine Engineer

The United Verde Extension Ore Zone occupies an area in the hanging wall of the Verde fault about 1500 ft. along the strike of the fault by 600 ft. across. The ore is located in an area of Precambrian schists.

Ore has been mined from the 1900 level to above the 800 level in the schist areas, the bulk coming from between the 1600 and 1100 levels. Some ore has also been mined from the 700 to 300 level in a conglomerate formation in the north end of the ore zone.

Producing levels

The mine has produced 4,110,000 tons of ore. The main orebody produced 2,100,000 tons, in round numbers; the 819 orebody, in the quartz area above the main orebody, produced 200,000 tons. North of the main orebody, the 1507 veins produced 350,000 tons, the 1207 country 475,000 tons. The remainder, some 475,000 ore tons come from smaller orebodies scattered thruout the mine.

webs(?)

Productive ~75%  
819-  
1507-vein  
1207

Mining in the main orebody began in 1916. Stopes were started in the central portion of the orebody and also near the west edge. Later stopes were started in the east end of the orebody. From then on mining consisted in whitling slices off the ore mass until it was mined out. The mining was carried in steps, so the operations of the different levels did not interfere. The result was that the 1300 level was mined slightly ahead of the 1400, the 1400 ahead of the 1500, and so on.

Mining methods

The ore was mined by the ordinary square set method, with a Mitchell slice used in mining some of the pillars.

Over a period of years it was established that 90% of the square sets mined were filled; and that better than 90% of each set was filled [12 to 13 - 17 cuft. cars per set]. The fill may be assumed to compact 20%. The amount of compacted fill then is  $.9 \times .9 \times .8 = .648$  or 65% of original volume. The timber left in the stopes will run from 8 to 9% by volume. Assuming 50% of the timber rots out, there remains 4% as fill. This leaves voids of 31% of the excavation.

Backfilling

The fill was obtained from the usual development work consisting of drifts raises and shafts, and a surface glory hole. Considerable waste was also sorted out in the stopes, in the outside orebodies.

The excavation made thru mining is very nearly 36,000,000 cuft. or 1,333,000 cu. yds. A figure of 9 cuft. was used in estimating ore reserves. In estimating ore production a figure of 30 tons per square set of 247 cu.ft. was used. This method was used over a period of many years, and production figures checked very closely with shipments to smelter. This gives 8.25 cu. ft. per ton. Allowances for a certain amount of overbreak in mining raises this figure to 8.7 or 8.8.

Volume & density

After mining operations had been carried on for a few years a cave developed in the quartz area above the main orebody. This cave extended up thru the quartz and finally checked itself in the schist areas which it encountered from the 1100 level up. The mining of the smaller orebodies did not develop caves, except of very local character.

Caving

30 tons per square set in subside ore



The effect of mining operations has been to cause a sag in the overlying rock formations with the greatest sag directly over the main orebody, diminishing from this point in all directions.

*Subsidence*

In the fall of 1921 the U.V.X. began the development of two new levels, the 950 and 550. These levels were driven for prospecting purposes. Both of these levels passed over the Main Orebody area. A level record dated March, 1918 of a frog at 816/817 in this area gives the elevation as 4340.33. The next record, dated September, 1921, gives 4340.19, a difference of .14 ft. in a 3½ year period. This marks the beginning of sagging of the formations. The next record, dated January, 1924, gives the elevation as 4339.29, a difference of .90 ft. over the 2 year, 4 month period. Sometime during 1923, a dislocation of the hanging wall of the fault was noticed at the old U.V. hospital, at a point 800 ft. above the described area on the 800 level. This is the first recorded instance of movement of the hanging wall block, to our knowledge.

The hanging wall block involved in the sag has settled slowly and very evenly. On the Bitter Creek Tunnel elevation the drop on the fault is about 2.5 ft. on the footwall proper and about 1 ft. on the hanging wall slip. On the east side there has developed a more or less vertical fracture, extending from below the 1300 to above the 550 level. To the south there is no discernible break on any level. The formations here simply sagged. This is also the case on the north end, with the exception of the 950 level, where some cracks have appeared in a quartz area in that end. The area involved is roughly 800 ft. x 1100 ft. on the 950 level. On the surface it comprises the area between School Gulch to the south, Bitter Creek to the east and north and the Verde fault to the west. The greatest amount of sag on the 950 level of which we have record is 14 ft. This amount is carried up past the 800 level. On the 550 and Bitter Creek elevations the sag amounts to about 12 ft.

During the years that the movement of the hanging wall block has been in progress extensive development work and mining has been carried on in the block.

It necessitated raising track and backs of drifts from time to time. But the movement has been so even and gradual that the rock structure within the block is still virtually undisturbed in the Precambrian from the 950 level up, and but very little disturbance is shown in the conglomerate and lava above. This condition also persists on the surface along the Daisy road and in the hillside above.

Elsing 1939

SMALL VS. U.V.X.

SMALL VS. U.V.X.

W. T. ELSING NOTES

SMALL v. U.V.X.

May 17, 1939

Testimony of HOWARD FIELDS.

I am a graduate of Michigan 1913 and took work at the University of Minnesota. I worked at Cerro de Pasco with General Development Company in Alaska and at other mines, including a lease near Salt Lake City and also in Rico, Colo. I then worked for American Smelter & Refining Company in Denver and El Paso. I am familiar with the Town of Jerome and have visited it occasionally since 1925. In the fall of 1936 I spent considerable time evaluating the U.V. Mining Company, since then I have visited Jerome on occasion and since Oct. 1938, I spent considerable time there. I know the streets, Main and Hull. The plaintiff's property is on Main Street.

I received some data from UVX and from the maps, etc. I was able to locate where the mining operations were, the geology of the district, etc.

Plaintiff's Exhibit 1 was admitted into evidence over objection. It is a UVX stope map. The stopes being painted in green and the cross hatching which was originally on it was removed.

Plaintiff's Exhibit 2 was introduced over the same objections. It is a cross section 211 feet north of the one shown in Exhibit 1. As you approach the center of the ore body in the mine, the more intensive the ground is honeycombed with drifts, and that is why it has more marks

on this cross section. The ore body is irregular.

Exhibit 3 was introduced over the same objections. It is a vertical cross section 211 feet north of Exhibit 2. It indicates that there was a search for ore across the fault.

Exhibit 4 was introduced over same objections. It represents the cross section 281 feet north of the same in Exhibit 3.

Exhibit 5 was introduced over same objections. It is the UVX cross section 211 feet north of Exhibit 4.

Plaintiff's exhibit 6 for identification, a map of Jerome with stopes projected to the surface was not admitted on the ground that it was based on a map taken from an American Scientific Press publication.

I have traced the area of subsidence in Jerome, starting on Clark Street above Lyons' residence. In front of a red sandstone building is a break. To the northeast along a concrete floor are several more breaks. The Main Street pavement shows evidence of several breaks. From Main Street down there is talus so the breaks are hidden. On the UVX road it is clear that there was a sinking and the road built up. There is a long break off the UVX road. (Probably he refers to the florentia) It happened many years ago. There is a waste raise above the UVX road and northwest from there a road leading up to town, Juarez Street, I think. (He probably means Beal Avenue) This road shows definite subsidence and

was rebuilt. At the coal bunker which has a cement foundation, there is a crack. 200 feet west of the Saben house there is a distinct crack.

The concrete flume had to be repaired with pipe because of breaking. Further to the southeast there ~~are~~ several breaks in the rear of the old hospital, now the Club House, and there are cracks in the retaining wall on Clark Street. The plaintiff's property is in this subsidence area, close to the center. On Main Street the pavement has been broken. There is a slight area which is secondary to the subsidence movement. It begins where First Street runs into Main, that is the street that runs by the Bartlett Hotel. The slide begins there and goes 200 feet down Main Street to the Small property. All the area has slid out and there are tumbled down buildings on it. The Small property is about 100 feet from the tumbled down area. I went through Small's property. I think the walls are made of brick and they are cracked -- both walls so you can see through them.

The UVX gave me some figures about their mine that stated that 3,870,000 tons were removed by the square set stope filled method. (Fields here described theoretically the sets are filled 100%, but the men are human and they do not fill in the corners.) It is difficult to fill over 90% and it is safe to say that 50% of the volume occupied by timbers is lost because of the decay of the timbers. I calculate the void space as being 30% of the total excavation according to the UVX figures of excavation amounting to

36,000,000 cubic feet after the fill with the 30% void space. The void would hold 30 buildings the size of this court house, but the 36,000,000 cubic feet is distributed under the mountain. Considering the number of tons mined and method of mining, I would estimate that there is 55,000 feet of drifts, raises, shafts, etc.

I would say that if you had a homogeneous mass, a concentrated void is more weakening than where the voids are distributed, but in a fractured void distributed voids are more weakening to the surface.

(The court adjourned at 5:15. Fields has not finished his testimony.)

May 18, 1939. A.M.

Mr. Fields took the stand to resume his direct testimony began yesterday.

In order to discover an ore body it is necessary to drive cross cuts, drifts, raises, etc. Holes are of necessity made when stoping begins, timbers are put in. They are only temporary supports when used in square setting. Eventually the square sets are filled with waste material which more effectively supports the roof than do the timbers. When the square sets are filled it is done to the best of the ability of the Company's employees. Sometimes the waste is shoveled in, sometimes dropped in from cars and sometimes put in through chutes. Filling is the least romantic job in mining and so the square sets are never completely filled. Crevices are left in them, then the timbers crush and decay, and once movement starts it is very difficult to stop it. When crushing begins the voids in the square sets have to be filled and so the material above the stope caves in, thus compacting the fill. As you all know, when you dig a hole you can only get about two-thirds of the material back into the hole again, then the ground settles and you have to fill in again. In a square set stope you have material thrown in and then the weight of the overlying material causes it to fall into the voids. If you take the drifts, etc., which honeycomb the country and those voids which are in the square sets it gives you a hole which has to be filled.

From the UVX figures of 36,000,000 cubic feet excavation, I believe that there are 11,000,000 cubic feet of voids which have to be filled. That is what caused the subsidence.

From the cross sections through 900 feet of excavations along the Town of Jerome the width of the ore zone is in excess of 500 feet. Exhibit No. 4 shows the maximum vertical distance of the stoped areas which amounts to 1100 feet. Exhibit No. 5 shows the stope closest to the surface. It is roughly 400 feet below the surface.

The full plane might be called a bedrock surface.

When a hole is left in the mine it begins to fill by the collapse of the rock above because of gravity. The direction of the caving is controlled by the line of weakness. In this case the line of weakness is the Verde Fault. Because of gravity the roof would fall vertically, but the line of weakness is along the fault. I think that the collapse of the roof would progress along the Verde Fault and come up directly under the town of Jerome.

(Plaintiff's Exhibit 6 for identification was offered and admitted. It is a map of Jerome with the subsidence area outlined. It also shows the cross section exhibits projected to the surface.)

On the flume above town is a distinct crack caused by subsidence rather than sliding. It is a result of a cantilever action. It is caused by subsidence because the result was a crack shaped like a V. It is a beautiful example. There is another one by Lyons' house and the sidewalk shows something,



and another on School Street and one on the UCX road. At this point there is a well defined crack. Subsidence lines would look like the lines of a weather map. Following along the UVX road there is evidence of sinking and bringing the road back to grade. The road up Juarez Street has also been filled. At the coal bunker the scale pit is a typical break. To the southeast is a long concrete flume. I believe it settled 10 feet. An iron pipe was put in and at the F. D. Club House there is marked movement.

Small's property has decided breaks from the natural result of sinking for the breaks are typical of the sinking type. This area (referring to Zone A) has no buildings. In 1936 the buildings were torn down. The sinking area is very large. The overlying earth is a talus consisting of rock, sand and gravel, at least on the hanging wall side of the fault. As a result of subsidence a large number of secondary movements have occurred in the over burden. There is evidently a clay seam and with this subsidence movement there is naturally a slight area in line with the stopes. It is entirely separate from subsidence and represents a movement along the clay seam. The slide has caused the ground to move 25 feet and it is the slide that caused the wrecking of the building, but if it had not been for subsidence the equilibrium would not have been disturbed so the slide was caused by the subsidence.

Small's property is within 125 feet of this totally demolished area. The buildings were destroyed naturally by

this slip and were torn down because of their condition. Main Street has been so broken up that it is impossible to tell what is sinking and what is slippage, but sinking at the Miller Building is clear.

Wherever there is vertical movement there must also be horizontal movement. The lines on Exhibit 6 are taken from the UVX cross sections. Excavations probably extended between the lines. One of these lines reaches as far as Main Street. It represents the slope that is closest to the surface.

Underground movement in Jerome is caused by the mining and the cracks in the Small building were caused by the mining operations and sinking would have happened whether there were buildings on the ground or not.

Here ended Mr. Field's direct examination.

CROSS EXAMINATION of Mr. Fields.

Mr. Kingdon told me that he had heavy ground and feared subsidence.

The first few months of my study, in October or November, was only casual. I passed through Jerome four or five times on another matter and investigated conditions then for about an hour each time. I walked around the slide area and noted failure of the pavement on Main Street. Next I went in February and March and visited Jerome five or six times, then spending the major portion of the day -- about five hours, altogether it was about 35 hours. This was general investigation. I discussed the matter with townspeople and looked around. I also made a couple trips in April. It would be about ten hours in April and I looked at the central part. I cannot recall what I saw then. I began my real work about ten days ago, though some of the ten days may have been in April. I talked about the situation with Sullivan who has the hotel and I drove around to convince myself of subsidence. I rode and I walked around all the points that I have mentioned.

May 18, 1939

After recess until 2 P. M. and entry of stipulation that the case be tried by the eleven jurors, cross examination of Howard Fields was resumed.

He referred to UVX cross sections as follows:

Section 1. The highest stope is 750 feet below Main St., and 410 feet in horizontal or lateral position from Main St.

Section 2. 550 feet vertically below Main Street is a drift. The nearest stope vertically 725 feet and laterally is a drift 175 feet, horizontally the stope is 275 feet.

Section 3. There are no workings vertically below the Small building. The nearest working is 140 feet to the northwest in the footwall side of the Verde Fault and is a drift. The closest stope is 900 feet vertically below Main Street and 812 feet in a horizontal position.

Section 4. Shows no working vertically below Main St. There is a drift which probably comes from Bitter Creek Tunnel 360 feet vertically below Main Street and 125 feet horizontally. The nearest stope is 770 feet vertically and 250 feet laterally of Main Street. This section is 281 feet north of Section 3.

Section 5. The nearest stope below Main Street is 400 feet horizontally and 703 feet vertically. (?)

There is the end view of the drift 365 feet below Main Street on Bitter Creek Tunnel.

The cross examination ended, and re-direct commenced.

Re-direct examination of Howard Fields.

I think there must be workings between these sections, but I have never seen them, although, knowing mining practices, there must be. From the cross sections I can tell nothing about Bitter Creek on Section 2. The nearest drift vertical to Main Street is in the footwall, 225 feet and 235 feet to the northwest of a vertical line through the Small property.

In regard to the time spent on the job, I feel that I have given ample time to draw a logical conclusion.

End of Re-direct examination.

SAM SMALL, the plaintiff took the stand. As the court reporter has transcribed his testimony, it is not herein included.

RALPH PENA was sworn for the plaintiff and took the stand.

I have lived in Jerome 9 years; six months and worked for the UVX in the mine for  $8\frac{1}{2}$  years. I have had three or four different jobs in the mine, beginning as a pipe setter and also did some trackman work. I observed sinking of tracks in the mine. I had to raise them up several times and I observed broken rocks all around. The rocks were not standing very solid. I observed the filling of stopes with waste, but I don't know whether any stopes were not filled. I have been all through the mine. It would take several days to walk through the mine, probably three. I can walk 20 or 30 miles a day, but I cannot tell whether there were 50 miles or

two miles of drifts. I never measured any of the drifts. It is usual to raise track. I raised track from the 1700 level -- the bottom level, and on up.

TOM STEWART was sworn for the plaintiff and took the stand.

I am a valuation engineer and appraiser. I have devoted all my time since 1930 to evaluating for various things. I have done a good deal for the State and have had experience in construction of buildings. I am familiar with Jerome. I have appraised property there and know properties since June, 1916. I was in Jerome recently -- May 1st to 6th, except for one day in Prescott and became acquainted with the Small property. I also examined the surface soil. The building was in very bad structural condition, three cracks from footing on North wall to fire wall. All the walls except the front wall have vertical cracks from the footing to the fire wall. The major area of the wood floor is cracked and tips to southeast. Wall bulges and is out of line and apparently out of plumb. The Southwest corner has a bad separation at the west end of the south wall. The wall apparently is leaning away. That is the major structural damage. In my opinion, the character is such that it must have been done by sinking. Cracks go the entire height of the building and you can see through them. The south wall bulges and the foundation has moved. On August 10, 1936, assuming that the building was in good condition, what would it cost to repair the structure? - - \$8,000.00. Remove foundations along north

and south walls and footings and foundations on east wall. It would be necessary to remove all the walls except the front one, shove the floor up and fix the ceiling, put in new foundations and substantially build a new building. (Above is a hypothetical question and answer.)

The building, after spending \$8,000.00 would not be as good as it was in 1936. The physical value of the building is \$8,500.00, and the land is valued at \$3,500. The building is worth \$250.00 salvage value. The lot worth approximately \$500.00.

Plaintiffs' exhibit 13 for identification.

It represents approximate present condition along Hull Ave. 100' - 125' from Small's property.

One crack is caused by sinking, the others by tension or lateral motion.

Exhibit 14 for identification.

It represents fractures and represents some place the witness did not know.

Exhibit 15 for identification. Admitted

It was taken 80' north of Small's property and to the east of the Main Street .

#### CROSS-EXAMINATION

I am not a realtor. Must know rental value. Population and number of people who go by. Past experience. Have been living in Jerome and acquired knowledge of rental values. I am a qualified engineer. I believe slipping and subsidence settled at unequal rate. (Cracks smaller at bottom than at top.)

One crack that is no different lies 15' east in south wall. Corresponding crack on north wall of building. One is wider at the bottom than at the top. (He only speaks of land sinking, not mine subsidence). Inadequate walls in size will sink in clay. 45' wide - runs 62' back - 19' extension. The corner cut out belongs to someone else. One story in front and three in back. Sidewalk line 23' different in elevation between Hull and Main Streets. I do not know how deep the foundations are. One 28" to 30" in clay. The trench is 7' or 8' and narrows down to 3' and 2' deep in clay. I saw a pipe and coal chute which leads outside, 12" in diameter, head in oven top of foundation. Manhole in sidewalk in street. I last saw the manhole Saturday the 6th of May. The trench measures 4" x 8"; 4" x 4" posts of which one is in the bottom of trench



May 19, 1939

TOM STEWART cross-examination and re-direct examination continued.

(I was not there to take notes)

A portion of the transcript is being written up.

The plaintiffs rested their case, and after Motion for Directed Verdict was denied, the defendant put Ernest Douglas on the stand.

He testified that he had been an editor of a newspaper in Jerome from 1916 to 1925. He spoke of a few pipe breaks, but nothing definite and was not cross-examined.

COLVOCORESSES was sworn for the defendant and took the stand.

He qualified himself as a mining engineer and testified that he had spent long periods of time in Jerome subsequent to 1936. He then testified as to the general geological conditions, speaking of the various types of strata in Jerome, said that the UVX ore body once overlay the PD mine, that the Verde Fault is the line representing the 1600 foot drop (and 900 foot southerly throw) which would indicate to the jury that the Verde Fault was at least nine miles long. He testified that the Town of Jerome was built on a mud flow, mentioning calchie. He referred generally to defendant's Exhibit 2 (UVX cross section).

At 5:00 o'clock he was turned over to the plaintiff.

J. WILLIAM WAARA takes the stand for the defendant.

I first went to Jerome in 1906 and have been there every year since then. I have done a good deal of survey work in the district and in the last three years have spent about 75% of my time studying the situation in Jerome. (He was thereupon qualified as an expert.)

The Verde River is at an elevation of 3400 feet. The Town of Jerome 5100 feet and Mingus Divide 8,000 feet. The town is situated on the steep portion of Cleopatra Hill, the upper areas of which are in rock, the lower in overburden consisting of clay and rock mass. This latter overlies a cemented material. (Whereupon defendant's Exhibit B, a plat of the Town of Jerome with over-burden outlined, was admitted in evidence) The brown lines indicate the course of the Verde Fault through Jerome, the blue, the lower boundaries of over-burden and the green, the upper boundaries of over-burden. The heavy dots indicate where bed rock shows through over-burden. The course of the Fault is north and south. The dotted lines in green represent separated over-burden areas. The lower brown line is the main line of the Verde Fault and the upper is a spur. West is the top of the map. (Whereupon Waara described the course and location of these various lines on the map.)

Excavations have been made all over Jerome, for buildings, tunnels have been dug and trenches for water and sewer line and shafts have been sunk. The Post Office shaft is located on Lot 5, Block 8, 60 feet east of Hill Avenue and midway between First and Conglomerate Streets. The shaft is 4 feet by

4 feet, was sunk 30 feet. The first 12 feet was through clay and rock mass and is the point where water was intercepted. The pit was started in the spring of 1936. It was continued downward through clay and rock mass to a depth of 38 feet, At a point 27 feet below the collar was a slippage plane where a change in the clay and rock mass took place, for the material below the plane consisted of a firmer clay and rock, though there is no difference otherwise in the composition. The slippage plane indicated the line of movement between the upper materials and the lower. (Here definitions of dip and strike were given.)

A drainage pipe in this area was found intact. I put in sets and spiling. The next shaft is in the Service Drug No. 1. It was sunk 44 feet through clay, caliche and into pink conglomerate. Water was encountered at the 20 foot level and there was slippage plane just below this water level. At the 23 foot level there was a layer of black soil 2 feet thick. It represented some old surface condition and used to be the old level of the earth. The pit was used to put in concrete piers. The dip of the plane is to the southeast, the strike to the southwest. The Service Drug No. 2 pit was sunk 47 feet and a churn drill hole put down  $9\frac{1}{2}$  feet. In the bottom water was encountered at the 10 foot level and continued down to the 20 foot level. On the 36 foot and 38 foot levels were found slippage planes dipping to the east about 38 feet. The shaft was in moving ground.

In the Bakery shaft water was encountered at the 25 foot depth. The slippage plane had a strike not quite parallel

with Main Street and dipped to the east. Water was encountered in the Ritz shaft at 10 feet and there was a slippage plane were. Another slippage plane was found at the depth of 38 feet. The strike of the first plane was east and west. The strike of the second, north and south. The first dip was to the south, the second to the east. ( Exhibit G, a picture taken in the Ritz shaft looking north between the 5 and 10 foot levels was admitted in evidence.)

Four piers were put in in front of the Boyd Hotel. The first was about 18 feet below the floor of the building. Piers were set four feet in conglomerate to protect the building from rapid slide movement. No water was found, but there was a slippage plane at about 10 feet below the floor.

Two trenches were dug known as the Tisnado trenches. They are about 150 feet northeast of the Small Building. One was 5' x 8' long and the other 7' deep by 12' long. They were both in red clay and rock mass. The rocks are angular and elongated. These rocks are generally not more than a foot long, averaging six to eight inches and 2 to 4 inches thick. There is water in both trenches. The southerly trench is south of the Main water course and the northerly trench is on the south side of the main water course. In December 1935, there was an excavation at the southeast corner of the old Ritz Theatre. It was easterly of the Ritz Shaft on the westerly side of Hull Street. This is where Ernest Douglas's newspaper was and is the pit that he mentioned. The northerly wall bowed in towards the pit and water was found in the bottom of it. The pit is in red clay and rock

mass. It is 9 feet below the basement floor. Water was found and so was the gold ground level. The earth indicating fill. There was an excavation for a pier at the southwest corner of the old Penney Building on the east side of Main Street. The collar of the pit was 12 feet below the wall. It was through a red clay and rock mass 7 feet below the collar. Conglomerate was not reached. Water came in from the west. The City well is an old timbered shaft, full of water to 7 feet of the collar which was sunk around 1922. I siphoned out the water and measured to a depth of 23 feet. I examined it at 15 feet and found the red clay.

There is a shaft in the basement of the old Bank of Clemenceau Building, south of the Clinkscale Building. The collar of the shaft was about 8 feet below the level of Main Street, along the south wall of the building. It was sunk 26 feet below the basement floor. The old surface would be about 15 feet above the basement floor. The clay and rock mass was encountered and 6 feet below the basement floor water came in. There was slippage planes in this shaft.

Pits are found in the Kelly Garage on lots 26 and 27, Block 3. The pits were concreted in but the walls of the northerly pit broke and I was able to see the clay and rock mass.

There are also trenches on the west side of Hull Avenue, in the rear of the Plumbing Shop and across the street is another one showing the red clay mass. Excavation were made on Krottinger Road and at the parking lot where the Valley View Hotel was. (Recess and I missed some testimony here.)

The over-burden mass is homogeneous, plain, and has the same consistency from top to bottom. At one time there was vegetation on the slopes. When the over-burden was laid down it came to rest in ancient water course. The town is on a relatively flat area. The over-burden had come to the angle of repose. The hillside was brush covered and when people came into the district, buildings were constructed, excavations made, ditches dug, pipes laid and all the timber and vegetation was removed from the town area. Roads were built around the mountain and cuts made in the hillsides and there were fills. Various types of retaining walls were constructed in the rapid slide area. 65% of the earth was covered by buildings or pavements. The rainfall was taken from the roofs through eaves-troughs and the water discharged on the earth. The rainfall penetrated into the ground. All of the retaining walls that I have observed are in over-burden. The occupation of the district caused it to be cut up and that destroyed the original equilibrium or angle of repose. Then the weight of improvements had some effect. The UVX started operations about 1914.

Defendant's D for identification, a photograph of Jerome taken in 1901 was offered and the offer withdrawn.

Defendant's E, the Town of Jerome in 1906 was admitted. Two slides were pointed out upon the photograph.

Defendant's F, Jerome in 1906 or 1907 was admitted.

(Noon Recess and I missed the first half hour when Defendant's G and H were admitted).

Defendant's I, Jerome in 1917, was admitted.

There is no difference between a scarp caused by a landslide and one caused by mine subsidence.

Defendant's J, Jerome in 1920, was admitted.

Defendant's K, Jerome in 1921, was admitted.

Defendant's L, a photograph of Hull's house in 1915, was admitted.

Defendant's M, Jerome in 1914, was admitted.

Defendant's N, Jerome in 1916, was admitted.

Defendant's O, Jerome in 1930, was admitted.

Defendant's P, a photograph of an embankment south of the UV Apartments, taken in March, 1938, was admitted.

Water came out of the embankment by the Episcopal Church. I have noted slide conditions in Jerome. In 1935 I saw a slide condition in School Gulch, east of the Jerome Transfer Building. An old survey by me showed slide conditions below the Town of Jerome. There are springs in School Gulch and other places, and 1915 I observed what are known as weep holes. In the Post Office shaft there was a flow of 150 gallons per 24 hours. There was water in the Liberty Theatre. It was constructed in 1918 and there was water there then. There was water in the Connor Hotel Building in 1916 and in 1915 there was water in the southeast corner of the Bartlett Hotel building and there has always been water in the City Well. There were pipe line breaks in 1915, '16 and '17. The old pipe in Jerome was steel and in 20 foot lengths. When the new pipe was put in (around 1917?) a new system was installed, using cast iron pipe in 5 foot lengths with

bolted joints (here Waara drew a picture of the pipe ends). The original drainage system was by ditch running down the old County Road past the Miller Company store and discharged in the area opposite the City Hall. The ditch was about  $1\frac{1}{2}$  feet deep and 3 feet wide. Then there was a ditch running around the mountain and discharging about at the intersection of Giroux and Magnolia Streets.

In 1916 or 1917 the ditch was extended. The drainage system was not adequate.

(Recess)

Dayton couplings were used in Jerome and also swing joints to permit movement of pipe. From 1914 to 1920 I re-surveyed some claims. The course and distances had changed and in some instances the distances were shorter or longer.

The sewer system was installed in 1918 or 1919, prior to that time sewage was taken care of by the individuals and was either discharged on the surface or in cesspools on the slope towards Bitter Creek.

There is a storm drain between the intersection of Hull and First. The water was carried down Conglomerate Street, across some lots to Ritz Street and was discharged in what is now the landslide area. There would be breaks in the storm drain at the lower end which caused slippage and the storm drain would progress upwards. There is also a storm drain in School Gulch.

I examined the fill in 1937. It is a concrete culvert 2 feet wide under the pavement. I found debris in it. It was choked with rock, slag and form lumber and iron, etc.



This was at Main Street. I also opened it up at the fork of School and Main Streets and also at the ~~inter~~section of Hull and Main. There is sectional block pavement opposite Jerome Hotel and on down Main Street. There used to be an ancient water course at Conglomerate Gulch. It intercepted all of the underground flow from Cleopatra Hill and carried it into Conglomerate Gulch. The movement of the landslide reacted on buildings. On east Main Street the Bank of Jerome showed damage in 1917. Movement was from the north to the south. The Clinkscale building was crushed in and the Small building, Krotinger Building, Boyd Hotel and Valley View and Peckebidge Building damaged. There was a reaction to the Jerome Hotel and then on to the Jerome Transfer Building.

The moisture content in this area increased as time went on. The area subsided. The Boyd Hotel was lubricated by the water from the culvert discharging below Ritz Street until the equilibrium of the land was lost. Repeated movement of the ground was first noticeable March, 1936, opposite the Boyd Hotel and the Post Office shaft moved 13 inches in 12 days. When the rapid moving area broke away from the slower moving area, movement in the latter appeared to cease. We repaired some buildings in Jerome. The piers at the Service Drug went down 30 feet. The Small Building is 50 feet outside of the rapid slide area.

Defendant's Q, a plat of the rapid slide area, was admitted in evidence and described. The slippage plane inclined. The upper part of the landslide sank, while the lower part raised.

Defendant's R, with cross section of the landslide area, was admitted in evidence. Waara spoke of levelling.

(Court adjourned)

May 23, 1939.

WAARA on the stand.

Defendant's Exhibit S was admitted. It is a sample of clay, dried, weathered and cracked, taken from the Bakery shaft.

Defendant's T admitted. A sample of clay taken from the slippage plane at the Bakery shaft. It was damp and the gloss was shown to the jury. When the clay gets more moisture than these samples, it become slick. The clay is deposited in the ancient water course and rests on conglomerate. The water comes down to the clay and enters it at various levels and then seeks certain channels. Do to earth creep, excavations, etc., underground water courses have been cut up. This is shown by the location of springs which existed at certain places and now have changed. As normal channels were cut up the water took other ones. It took years and years for the water to be distributed and movement was in direct proportion to the growth of the Town. The rate of the movement was very very slow, but after the ground started, pipes broke and more water was added, finally breaking the equilibrium of the earth and causing the rapid slide area to break away. When the ground dried it cracked more and thus allowed more water to run.

(Here Waara sketched the progress of water running down a channel and finding a new course.)

Defendant's Exhibit R, a cross section of the slippage plane which was introduced into evidence was explained.

The earth sank as well as slid.

Defendant's V-1 and V-2, photos of the toe of the landslide, taken April, 1938, were introduced.

Defendant's U-1, U-2 and U-3, photos of the toe landslide taken later than V-1 and V-2, were admitted. Water continued to run into Zone A. It is intermittent. The water comes from the area above the fault. Main Street has an elevation of 5150 feet.

#### Slides outside of Jerome.

Calumet and Jerome, Verde Combination. Foot of slide at level of Mescal Gulch, running west to east. The head is on the south side of the Gulch. The slide is 200 feet wide and was caused by lost angle of repose when the toe of the slide was cut away.

Gadston or Nancy slide is  $1\frac{1}{2}$  miles from Jerome on the lower edge of the Verde Fault and is in over-burden. The cause is indefinite. It was caused by water flowing into the head. The toe has not been cut. It is about as flat as the slide in Jerome.

The Green Monster is five miles from Jerome below the Fault on the spur mountain area at about the same elevation as Jerome. ( Here objection was sustained to future testimony.)

#### Small Building.

I examined the Small Building in 1935. (Defendant's Exhibit W-1 and W-2 were admitted. They are plans of the main floor of the Small Building as of 1935 and 1939.)

Defendant's X-1 and X-2 were admitted. They show the north elevation of the north wall of the Small Building looking north as if inside the building, showing the conditions of 1935 and 1939. The footings of the building are 24" wide, the wall is 13". There is no overlapping of the footings. The cracks coincide with the bond of the footings. The concrete in the building is a mixture of sand, cement and slag. The concrete is lean, looks like popcorn and is full of voids. One of the cracks is  $1\frac{1}{4}$ " wide at the bottom and 1" at the top.

Recess for lunch. I missed the first half hour of Warra's testimony when Exhibits Y and Z were introduced.

Defendant's AA-1 and AA-2 were admitted. They show the basement of the Small building in 1935 and 1939, showing that conditions were the same.

Defendant's AB-1 and AB-2 were admitted, they show the front elevation of the Small Building in 1935 and 1939. They are the same in 1936. Repairs were made, the windows were plumbed and new display windows put in. There has been no change since then. The concrete below the windows was improved in 1936. There is no tie between the walls.

Defendant's AC-1 was admitted. It shows the rear elevation of the Small Building, looking west as it appeared in 1935.

Defendant's AC-2 was admitted, showing the same elevation as of 1939. The two plans are substantially the same.

Defendant's AD was admitted. It is a photo of the Small Building.

Defendant's AE was admitted. It is a photo of the rear of the Small Building. The concrete is now the same as it was in 1935. The pouring scars can not be seen. They are more than 2" deep and show lack of aggregate in the material. The rear wall was under cut from a point below the old footing to the depth of the new footing which is at least 2 feet. The new footing is probably 4 feet below the old one. On the slope of the building there is a difference of 14 feet. The front foundation is on fill and foreign particles are imbedded in the material, such as copper wire, a stock of wood, glass and crockery. Not only was the rear wall under cut, but also the south wall opposite Haskin's Service Station. Haskin's wall was constructed by excavating along the Hull Avenue front and along the south wall of the Small Building, and at the level of Hull Avenue for 30 feet westerly. The footings of the Small Building are from 4 to 10 feet higher than the floor of the Haskin Service Station. The north wall of Haskins is flush with the south wall of the Small Building. In order to place the north wall of Haskins, materials against and underneath the footings of the south wall of the Small Building had to be taken out. The north wall of the south store room, beneath the store room level and the east wall of the north store room, beneath the storeroom level is against the concrete wall, being the west and south sides of Defillipis. It is level with Hull Avenue and in constructing the west and south walls of Defillipi's building, adjoining footings of the walls of the Small building were undercut to the level of Hull Ave.

The cuts were about 5 feet deep. The weight of the buildings increases the pressure and compresses and settles into the clay. When a building is undercut all the same material is taken out and concrete poured in against and under the voids. The building is thus exposed to settle and the increased pressure has the effect of producing unequal stress, causing cracks. The bottom of the posts, that is, the floor supports, rest on the ground on small boards. Some of the posts rest upon the clay banks of the ditch. In 1935, the posts were loose and they were loose too in 1939. In 1935 the floors were out of level, sloping towards Hull, and the same condition existed in 1939. In the latter year the floor was 9 to 11 inches out of level. The settling of the floor was not due to the cracks in the building. The plaster in the north store room in 1935 was in fair condition. There were some cracks. The south store room had areas where plaster had dropped out. The plaster had been repaired in 1936 and in 1939 was in fair condition, and in the same condition as in 1935. In 1939 the building was in the same condition. There were stains on the walls, evidence of depreciation, etc., as in 1935. The cracks in the north wall of the north storeroom were repaired. The plaster cracks were repaired and the sections of floor put in beneath the display window. The front was squared up, two plate glass windows installed and concrete curbing installed underneath the display windows. Repairs were limited to the north storeroom and in front of the north storeroom, and it is in substantially the same condition now as in 1936, and the

whole building is abustantially in the same condition as it was in 1935. Evidences of fire in the building showed in 1935 and 1939. Assuming in 1926 or 1927 a fire occurred in the south store room of the Small Building, and that it took three or four hours to put it out, and three or four hoses were used, in my opinion the brick and concrete would be effected and water would damage the footings. In 1935 the floor joists above the center of the building were scarred and the older stringers were scarred. A new flooring had been put in. I climbed up between the ceiling and the roof and found evidence of the fire and places where the central joists and rafters had been re-enforced. New work had been done opposite the bulge in the wall. The bulge occurred opposite the south center of the building. The bulge extends 3 or 4 inches outward from the main part of the wall and continues to the front pilaster. The wall inside was re-plastered after the fire and, in my opinion, the bulge was caused by the fire. The southwest corner of the building leans to the south and the northwest corner leans to the south. They are at opposite ends of the wall. The lean happened long before 1935 as shown by the framing of the windows. The glass was square, but the frame was not.

Defendant's AD shows this and it existed in that condition in 1935.

#### Cost of Repairs.

It would cost about \$100.00 to repair the cracks in the wall. That would be filled with neat concrete of fine aggregate. The cement would be forced in, that is grouted or



Repairs could be made upon the front of the building -- on large plate glass and the frame squared up to protect the glass in the south front store room. That would cost \$175.00.

To put the plaster in good condition would cost \$149.00. The damage to the building is not attributable to subsidence. In the apartments the posts are set in the concrete of the building and not, as testified to by Mr. Stewart. The condition of the walls is not due to mining. If these repairs were made the building would be in better condition than it was in 1935.

#### Subsidence Breaks.

Mr. Fields testified to certain breaks. The break in School Gulch is the same now as it was in 1935. There is no break by Lyon's residence. (Here Waura mentioned the Methodist Church). There is a crack on the hogback above the UVX road. Fields has placed the boundaries of subsidence 150 feet from this crack. The UVX Road has not been rebuilt. School Gulch crosses the road. In the first week in August of last year a storm washed debris across the road and piled it up to a depth of several feet. This debris was dug out and a channel made to permit the water to run down the Gulch. I examined the waste raise on the north side of Conglomerate Gulch. It is about 40 feet in diameter and inclines to a cone 15 feet below the surface. The area of this raise represents the amount of filling that was taken into the mine. There is no cracking in the earth around the waste raise. The Beale Road has never been rebuilt, though

it was regraded after the storm and the ditch to it was all done by the storm. There is a crack in the scale pit of the coal bunker. It is opposite the south half of the east side of the coal bunker. I first observed it in September, 1935. I don't know that it is a subsidence crack. It is adjacent to the scale and it could have been caused by the swinging of the platform, by the weight of trucks, or by poor construction. (This answer was stricken) In my opinion the crack was caused by the swinging of the platform against the concrete by trucks passing over it at a high rate of speed. There is no sidewalk by Saben's house.

The break in the concrete flume was caused by a slide from the Lone tank and the lower break in the concrete flume was caused by movement in the upper slide area. That is the slide area from the Lone tank. The break at the old Club House is a break on the fault line. The fault break extends to south of the administration building and ends in retaining wall. There has been no perceptible change in any of these cracks since 1935. There is a concrete swimming pool where the toe of the slide comes to the barrier. It was built prior to 1935 and is northeast of the point where the toe comes to the surface. There was a change house on the west. The swimming pool is 25 feet by 50 feet. It has not cracked and there is no change in its condition.

A cross cut was driven from the Bakery shaft westerly towards the Toggery Store on the west side of Main Street.

The cross cut ran along the contact between the conglomerate and lava. It was driven on a slope of probably 1 to 3 feet and it exposed the lava for 110 feet. I examined the lava and found no cracks.

Taking into consideration what I have observed in Jerome and testified to, the fire, slippage and weak footings were the principal causes of damage to the Small Building. In my opinion the damage was not due to mine subsidence.

Surveys were made in 1937, 1938 and 1939 and the relation of points opposite the Small Building have not changed during that period.

The witness was given to the plaintiffs.

Court adjourned until May 24th at 10 o'clock A.M.

May 24, 1938.

WAARA on the stand.

It would cost \$25.00 to put the building in the same shape as it was in 1936. They would have to grout some cracks in the wall and grouting would make them as strong as they ever were.

#### CROSS-EXAMINATION

(I missed the first part of this )

Waara explained the position of the stopes and marked them on the map. The big stope is something like 300 feet by 250 feet in horizontal dimensions on the 1400 level and extends up some 600 feet. The stope in the 800 area covers about two levels. It is 200 feet north and south and 100 feet east and west. The stope leading up under Main Street is about 400 feet below the surface. The stope in the 800 area is 600 feet below the surface. The stope in the 550 area is 400 feet below the surface. It is small and comes up in the middle area of Block 7. This stope is a scattered proposition.

dynamite is used to blast out the stopes. 36,000,000 cubic feet of material has been taken out of the stoped areas and in addition to this is the material taken out of drifts, raises, etc.

Back of the Episcopal Church bed rock appears to come to the surface, also in the area around Magnolia where it comes to the surface.

I personally observed a slide under the Lone Tank in

1911 and up to the present date. The material has moved from 10' to 11' since 1911. It moved 5' by 1915, by 1920, 2 or 3' more. By 1925, 3 or 4 feet and by 1930 in the neighborhood of 13'.

The slide in Mexican Town moved 18 or 20 feet. It extended up to the center line of block 7. The Hampton moved easterly at a right angle to Hull Avenue.

(Plaintiff's Exhibit 16, a picture of the road at the Hampton House slide, taken in about 1937, was introduced.)

I observed WX boarding house formed in 1911. By 1920 there had been 75% or 80% of the movement. The WX was constructed in 1917 or 1918. 80% of the slide had been completed by that date. In 1916 or 1917 the slide at the end of what is now the U V Apartments had moved 5 feet north of east. Up to that time there was only creep, no rapid movement. The rapid movement was around 1918. Since 1918 the ground has slid horizontally about 1 foot down the hill. The UV Apartments were built after the slide. There were slides in the area midway between the Montana Hotel and the tanks. I have observed these slides since 1911. One was a creeping slide and then became a flash slide in 1917. That was south of the Montana Hotel and after 1917. There has been a general washing away of material and cutting into bed rock so that now there are a series of but today there is only creeping. Since 1917 the creep movement has been about 1 foot. The creeping and rapid slide were easterly. There was a rapid slide in 1926 at the Episcopal Church. It started across the road above the Hampton House and at the top of the slide the

the movement was 5 feet in an easterly direction.

The stope under Main Street comes to within 400 feet of the surface. Some workings may come closer to the surface, but none extend further than Main Street. Other stopes are below Main Street. One comes to about Hull Street, about to the northeast of block 15. If the Main stope were projected up it would probably be under Lot 19 and would extend south a little distance. The south side of Conglomerate Gulch is the most southern extreme of the main stope and is opposite the Letter S which I put on Defendant's Exhibit B. (Here he examined the cross section maps of our maps in evidence.)

The defendant's L is a picture of Hull's house, taken about 1916. Above the brown line on the map there was a slide. Substantially back of house 49. The slide was about 40 or 50 feet at that point. It took an easterly course and started at the side of the Club House. Bed rock comes out at the Club House. There was movement on the Fault there and it occurred 15 years ago. There is an escarpment to and above the Club House. The Club House was built about 1918 and escarpment is an exposed face, a bluff and edge of table land where one surface is higher than another. The Club House is on the hanging wall of the Verde Fault. Where the Fault crosses School Gulch there is a clay and rock fill. Above the Fault line rocks are exposed, One Hundred Fifty feet higher than where it crosses School Gulch. Where it crosses School Gulch there are only boulders. The floor at the rear end of the building and lots 11 and 12

Block 5 is about 10 feet below the original surface and the footing of the wall is about 3 feet below the level of the floor, and it is still in clay and rock mass so there it is over 13 feet deep. In my opinion there is 30 feet of clay and rock mass.

Below Ewing's Transfer Barn there is a break in the clay and rock mass 25 feet deep. The rapid slip area is what we call Zone A. On Main Street the over-burden is 30 feet deep. The first movement was in Zone C. There ~~were~~ separations in the pavement prior to 1935. I first observed the movements in Zone C in 1935, but casually observed them in 1916. I first noticed separation of the pavement in 1930 on Main Street. I observed movement of about 7 or 8 inches at the point where we have been taking observations.

The Bank of Clemenceau shaft shows the record of movement zig zag to the southeast, the southwest and the southeast. That is since 1934. I did not mean to say that the movement here was deepseated.

The Miller Company store was in Zone C. The walls of the Clinkscale building were crushed in. The Bank of Clemenceau was damaged and the Small Building. The front of the Krotenger building and continuing on down through the Bcyd Hotel, Sullivan Apartments, Valley View and the Peckeridge Building on Lot 15, Block 4. The further~~est~~ north is the Bank of Clemenceau. Movement of the shaft in Zone C is 8" to 10". The horizontal movement is 6". I determined this from an indicator in the bottom of the Clemenceau shaft. The pipe was set in concrete, setting vertical in the column of the shaft. The pipe was later abandoned and a new marker used.

I started my work on Zone A in 1935. The horizontal movement there varied 20 to 30 feet depending on the point of observation. The greatest movement horizontally was in the slide area marked in yellow and dated 1938. I refer to Defendant's exhibit Q. ( This is the plan of the slide area.) The most movement began in block 21, lot 13 and in a direction southeast. Zone A did not start to move in 1934, it started in 1938 and moved about 25 feet. Part of the 30 foot movement commenced in 1915. A creep of the ground was known to have existed in this area in 1915, 1916 and 1917. Prior to the installation of new sewers, pavings, etc. It became rapid on August 3, 1936. I had been recording movements then in that area from August 3, 1936, as moved roughly 20 feet. (Wines asked a leading question - if movement in 1936 had not been 30 feet and Waara answered in the affirmative.)

After the start of the movement it was generally continuous varying at different points in depths. The head of the slide at the Boyd Hotel has moved 20 feet as ascertained from an old sidewalk. The concrete floor at one place slipped to the north about 1 foot and sank 1 foot. It is right on the fault. The movement of the hanging wall was downward and to the north. I first observed the condition of the floor in 1935 so the cracking must have happened before then. (Reference was then made to the Lyon's residence, the florenzia crack, the coal bin and Saben's house. The concrete floor broke in 1924 and its destruction was completed by 1937. It was repaired prior to 1938. The last break to the south in the flume is in the floors and walls. The upper portior is about 1 foot higher than the



lower. There is a 6 inch offset.

Court Adjourned.

May 25, 1939.

Waara on the Stand and his cross-examination continues.

The sidewalk by the Boyd Hotel is 20 feet below the surface. The street is 60 feet wide. The sidewalk is about 4 feet under the surface. We repaired the Boyd Hotel and we repaired the drugstore. There is a concrete basement to a garage which was in the rapid slide area. It retained its shape, but lost its position. The east and south walls were not concrete. The garage appears to have sank most on the northwest corner and gives the appearance of being 4 feet lower.

The Post Office Building sank most in the northwest corner. The sidewalk has sunk  $1\frac{1}{2}$  to 2 inches below the building. The evidence of vertical sinking at the Club House was 4 to  $4\frac{1}{2}$  feet. It shows up most at the south end of the present building. I determined this from observation and not from survey, though I took a survey in 1937 and 1938 at the Club House. The major portion of the sinking was prior to 1935. This I determined from personal observation.

I made a survey for vertical sinking on Main Street, starting below the Grammer School and going up to Main and Hull. I used as a starting point a highway mark, put in in 1933 on Lot 1, Block 4 in the Mountain View sub-division. I assumed the corners of the highway figure and re-surveyed their survey. The aggregate vertical sinking for all time since has been in Jerome at the Boyd Hotel is about 5 feet from September 1935 to 1939. (?)

Prior to 1935 it was  $5\frac{1}{2}$  feet, from 1933 to date. Prior to 1933 there was a vertical sinking 3 feet, a total of  $8\frac{1}{2}$  feet at that point.

At the Kelly Garage the vertical sinking has been about 5 feet since 1935 and 3 feet prior to then. At the southeast corner of the intersection of Ritz and Conglomerate Streets, since 1935 there has been sinking 5 feet, prior to that 3 feet. The southeast corner of the Miller Building, opposite Jerome Avenue, there has been a sinking of 1 foot. Before 1936 there was a drop from  $3\frac{1}{2}$  to 4 ft aggregate about 5 feet. At First Street and Main on the west side, the vertical sinking has been from  $4\frac{1}{2}$  to 5 feet, aggregate since 1935. There has been 1 foot movement and  $3\frac{1}{2}$  feet prior to that. That is at the point of the Bank of Clemenceau shaft.

(Reference was made to the City Hall.)

The flume above town was first repaired in 1936. It cracked about 1924, wouldn't hold water in 1930 and stayed that way until 1936. Pipes were broken by ground movement. The pipes were under both high and low pressure. There is an increase of saturation from rainfall. This was by the removal of brush and carrying of water into town, but the flume did keep water out of town that used to come in. The angle of the slippage plane is 1 foot vertically to 3 feet horizontally, about  $15^\circ$ .

(Here the witness measured with a protractor the angles as shown on Defendant's Exhibit R.)  $15^\circ$  is too high, it is closer to  $10^\circ$ . The three causes of damage to the Small Building are fire

poor construction of the building and slippage.

Re-Direct examination.

I have been employed by UX especially to study this problem. There are no ~~ore~~ bodies north of those shown on Plaintiffs' exhibit 1, a cross section of the stopes. On section 5 at its tip the stope is 4 feet. (Here Waara repeated the stope figures that he had previously given and his examination was concluded.

CHARLES E. HUGHES, called for the defendant.

I have lived in Jerome for 46 years, since I went there in 1893. I used to deliver groceries for the T. J. Miller Company. I was City Clerk in 1904 to 1906 and from 1916 to 1917 I was connected with the city as councilman. I was in the hauling business from 1907 to 1922 and since then have been in the insurance and real estate business. I am familiar with surface conditions in Jerome. In 1893 there were about 200 people in Jerome. All the houses then were around the present business section. I have observed landslides in Jerome. In 1898 there was a slide which we paid particular attention to. It occurred back of what is now known as the Penney Building on the east side end of Diaz Street. There was surface movement of dirt and about  $\frac{1}{2}$  acrea of ground moved. There was a movement where the Sullivan Hotel now is caused by people pouring water out of the building. The Liberty Theatre is on Jerome Avenue. There were buildings from the Connor Hotel around the Liberty was water which might have been caused by people throwing out

slop. The Victory Store is east on First Street about 600 or 700 feet from the Small property and northwest of it. In 1903 there were buildings around there. Harry Crain had one. The ground slipped and moved a building. 1903 there were heavy rains that washed down the hill. In 1905 Hull had a home close to the old Club House, rain came down and his house settled. The tank above town broke in 1905 or 1906, but it didn't do much damage. On the east side of Diaz Street there was a slide which started around the Wigwam. Fire lines and pipes would always break. There is a slide up at Saben's house. Between 1912 and 1914 some buildings were wrecked by slipping ground and on the south end of Main Street a property belonging to Crain slipped.

The Bank of Clemenceau was built in 1912 or maybe earlier. The cracks appeared 90 days after it was built.

The City had fire tanks about 150 to 200 feet above Giroux Street. There was a slide below these tanks.

I have been in the real estate business, owned property and have bought and sold it. I know the Small Building and have been by there every day. I knew it in 1936 and on August 10th. In fair condition it had a value of \$2,000. As of August 10, 1938 I would say it was valued at \$1,500, but I would require the owner to give me a little bonus for upholstering. I was in it ten or 12 days ago. The value in the condition it is in now is \$1250.

In 1930 there were 125 business houses and 5 or 6 of these were vacant. Now there are 40 occupied and 35 unoccupied. In 1936 the business people had not given up hope and probably

about 20 establishments were vacant. In August, 1938, 50 were occupied and 40 were vacant. Economic conditions are poor, the UVX threw out 140 or 150 men and 750 were lost at the UV in 15 minutes.

#### CROSS-EXAMINATION

In 1930 conditions became bad in the rapid slide area. Buildings began to fall. two or three years ago. There is no more value for lots any place.

#### RE-DIRECT EXAMINATION

People have left the community. Two thousand of us now have to earn a living from 350.

## HARRY DICUS TAKES THE STAND

I live in Jerome.

I first went there in August, 1895 and with the exception of one year stayed there continuously. I was a boilerman for six years and worked for the T. F. Miller Company for six years. I was councilman from June, 16, 1916 to 1918. I was in the blacksmithing business from September 1904 and had a blacksmith business in the H & H Garage which is in the center of the rapid slide area.

In 1916 or 1917 I put a steel structure over the building, but it fell down because of the snow. The soil was always wet. The Post Office is in the rapid slide area and the ground there is always wet and slick. I have observed small slides and remember the one which covered the back of the Rothermell building. That was some years before I was on the council. There is a movement above the Hampton House which included the Episcopal Church. I remember the tank on the hill breaking up but it did not do very much damage, and I remember the ground movements in Mexican town. There were slides which would tumble down a house and some people had to move out of houses above Sabens. There is a stucco house which had to be torn down because of slipping ground. The pipe lines were more or less always breaking and that was probably caused by earth movement. The Bank of Jerome, a brick building, started to move not long after it was constructed. I built seven or eight houses, business and residences on the hill slopes, several of which were constructed before UVX started operations. They wouldn't stand up. I had to jack up the buildings because

they would get out of level, especially if they were not on bed rock.

#### CROSS EXAMINATION

The real sliding did not commence until the latter part of 1936. That was when the Post Office began to sink. The Bank of Jerome did not have much foundation.

#### J. J. CAIN

I visited Jerome in 1898 for a few months and later came back in the fall of 1909. I worked for Fisher of Prescott. He was the organizer of the company. UVX closed in April, 1938. I was a hoistman attended to the compressor and did mechanical work. The Little Daisy shaft is one-half a mile West of the present shafts. Work was started on the new shaft in 1913. productions commenced in 1916, 1917 and 1918. I was a stockholder at times and worked for Dave Morgan and George Kingdon who were the general managers. I have observed land movement between UVX and Hampton House. There used to be a green strip where sewers discharged and Dave Morgan planted some trees and built a rock wall, but the wall slid away. That was in 1913 or 1914. A year or two later there was one to the north, quite a bit larger which went to the boarding house. It carried a house down the hill. I don't recall any of the UVX road. In 1910 there was a slide. There was a power line from a sub-station in the pit past the Little Daisy and to the Jerome Verde. From 300 to 400 feet power poles slid down the hill. That was between the Hampton House and UVX.

I was a member of the City council from 1916 to 1918 and was the Mayor of the town. We had trouble with fire lines, etc. There were three lines, water, fire and sewer, all broke at different times. I went by the Boyd Hotel almost every day and noted changes in the sidewalk. I noticed them in 1916, 1917, and 1918. I talked with Crain about them and he built new sidewalks. He finally had to put in three. I used to come up Conglomerate Road to Dicus' and on home and went over the rapid slide area. Main, Clark and Hull area began to move in 1916. There were cracks in the sidewalks from 1913 to the time the mine was closed. There was no sinking of the collar of the shaft.

As a transcript has  
been ordered, I do not  
write up my notes - June 15, '39.  
Bill.



INTRODUCTION

~~Jerome, Arizona, is located about 90 air miles north of Phoenix on the steep east flank of Mingus Mountain where the town overlooks the scenic Verde Valley and the Mogollon Rim.~~ <sup>JEROME</sup> ~~The town~~ was founded in the late 1800's

with the discovery and development of the great United Verde massive sulphide ore body. Subsequently, the bonanza ores of the United Verde Extension were discovered. During the World War I period and early 1920's, the town had <sup>REPORTED</sup> a population of over <sup>10,000</sup> ~~20,000~~ people living on the slopes of Cleopatra Hill.

The center of Jerome had some minor land creep problems during its early history culminating in a major earth movement in 1936. This paper describes the conditions and events that are pertinent to the understanding of <sup>THE SLIDE</sup> ~~this~~ 1936 slide. Most of the information was gleaned from court records concerning the effects of the land movement. <sup>THE COURT RECORDS</sup> Property owners sued the two major copper companies as being responsible for causing the slide. Other information concerning this slide was learned during my <sup>10</sup> ~~6~~ years in the area from direct observations and discussions with older residents.

Jerome is now almost a ghost town with less than 300 residents and many abandoned and wrecked buildings. At present one of the effects of the slide is a famous Jerome tourist attraction known as the Traveling Jail, a building which has moved <sup>DOWN THE</sup> over a hundred feet from its original site. Every month thousands of tourists <sup>UNFAMILIARLY</sup> cross the toe of the landslide to observe an excellent mine model in the State Mine Museum at Jerome which <sup>ITSELF</sup> was prepared for evidence at the landslide court trials. The most important heritage of the slide is the lesson for future town builders of land movement causes and effects.

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## HISTORY OF LANDSLIDING IN JEROME

Earth creep and sliding were first noted in Jerome in 1898 and 1903. A single small slide with 10 to 20 feet of movement occurred in 1901 in the footwall rocks of the Verde fault below the water tanks. This is the only footwall slide reported in the Jerome area with all the others located in the Verde fault hanging wall rocks. Earth creep during 1905 destroyed part of the red-light district of Jerome. A 1906 photo revealed typical slide phenomena including earth cracks, and bulging and hummocky ground. In 1912 the New Bank of Jerome broke apart 90 days after completion of construction due to creep occurring under the building. The United Verde Extension lost a transmission line during 1913 and 1914 on the main slide area as the poles collapsed. Noticeable creep occurred in 1914, and a photo taken that year showed a major zone of creep and sliding. In 1915 water pipes broke due to "creep of soil and slippage" according to the local papers. The breaking of water mains occurred throughout Jerome's history as recorded by newspaper articles, official town records and by residents' observations. Two unstable creeping areas were indicated on 1918 photographs. One was about 150 feet by 275 feet and the other was about 300 by 500 feet. A noticeable escarpment had developed in the main slide areas. The Mexican home section of Jerome was totally destroyed by creeping soil during 1918, and it was not rebuilt in that area which ultimately became the main slide zone. A survey of claim corners made in 1914 followed by a resurvey in 1920 indicated definite measurable movement of claim corners relative to each other had occurred. In 1921 the streets were paved, but due to the constant breakage of water pipes in certain localized areas, removable cement blocks were placed over the pipes in these areas to make these sections accessible

for the inevitable repairs. The town records show that the sidewalk in front of the Boyd Hotel was built in 1917, and rebuilt twice more in 1920 and 1936 due to land movement. \*

The greatest slippage occurred in 1932, but the most rapid movement occurred in August 1936 when the slide moved 13 inches in 12 days. Creep continued into the 1940's. At present there is no movement occurring.

SLIDING PLANE

*DURING THE PAST FEW MONTHS, MUCH STUDY WAS CONDUCTED ON THE SLIDE.*

C The plane of sliding was located by six shafts plus pits and trenches, and one churn drill hole. The depth of the shafts ranged from 23 to 72 feet. In the shafts the depth to the plane of slippage varied from 10 to 38 feet, and the water level was usually at or below the level of the slippage plane.

O The cross section map of the plane of slippage submitted with this report was based upon evidence seen in the various excavations. In one shaft two slide planes were observed, one at 10 feet and another at 38 feet. The former had an east-west strike and dip to the south, the latter had a north-south strike and dip to the east. One tunnel near the United Verde apartments had three timber sets, a standard set, a smaller set inside, and finally a spreader set inside this last set due to the shifting ground. An old land surface is evident below the slippage plane.

SPRINGS

Jerome, with an annual rainfall of <sup>47.5</sup> ~~47~~ inches has a reputation of soggy ground with many seeps and springs noted in the early days. In 1915 springs were reported at the Ritz Theater block; School Gulch; Lot 5, block 8; and the Bartlett Hotel. The spring on Lot 5, block 8 made 150 gallons per day increasing to 5,000 gallons per day during the rainy season. Other springs

\* ONE MAN WHO DROVE HIS CAR INTO HIS GARAGE AWOKE TO FIND OUT HE COULD NOT DRIVE THE CAR BACK OUT AS THE APPROACH HAD SUNK 18" OVERNIGHT. RITZ DAILY STAR 10 NOV 1936

\* The Verde Copper News created the first direct public reference to the town's movement in Feb 1925 by an out-of-town journalist, however the people ridiculed the writer and chose to ignore the article.

10-4-36

were reported on Lot 10, block 8 in 1935, at the Liberty Theater in 1937, and on Lot 7, block 11 in 1938. The flow of the springs fluctuated considerably with some disappearing as others appeared. For example, the spring at the Ritz Theater disappeared in 1936.

#### GEOLOGY

The geology of the Jerome area consists of Precambrian volcanic and intrusive rocks which have been sheared, folded and faulted. ~~The igneous and associated tectonic activity culminated with the emplacement of massive sulphide copper ore bodies.~~ The area was very weakly metamorphosed and major faulting occurred. Marine sedimentation began in the Paleozoic with the deposition of sandstones followed by limestones and shales. There is little evidence of Mesozoic activity in Jerome. The next event was the formation of multiple fissure eruptions of basalt during the Tertiary. Minor tuff sequences are interbedded in these flows. A ~~second~~ major period of faulting then occurred with the formation of the west side of the Verde Valley by ~~large scale~~ major normal movement along the Verde fault and associated parallel faults. The steep east side of Mingus Mountain is a fault scarp. ~~This fault zone had two periods of movement—Precambrian and Tertiary with about 2,500 feet of total throw and 2,000(?) feet of total heave.~~ The Tertiary period of ~~fault~~ movement accounted for 1,500 feet of vertical movement. The Verde fault is a major geologic phenomenon in the Jerome area shattering the surrounding rocks, and in particular the hanging wall rocks hundreds of feet out from the actual fault zone. ~~The fault during both periods of movement cut the ore zone and down faulted the UVX ore body from its previous place above the UV ore zone.~~ The Verde fault strikes about N. 30° W. in the vicinity of

Jerome, and dips  $58^{\circ}$  easterly under the UVX ore ~~body~~. There are some cross faults in the area which add some complexity to the geology and create additional zones of shattering in the rocks. A major shear zone is located on Cleopatra Hill just west of Jerome.

The present day topography reflects the erosion of the fault scarp. Abundant alluvial and colluvial material is found on the mountain front. The geologically recent weathering of the Tertiary basalts has promoted the development of clays of the montmorillonite variety.

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Y There are five landslide zones in the Jerome area. The present site of Jerome is on one of these ancient slide areas and is the subject of this paper. The second is called the "C & J"<sup>slide</sup> and is just south of town near Deception Gulch. It is about 100 feet by 60 feet in size. The "Verde Combination" slide is located about 1 mile south of Jerome on the south side of Deception Gulch. This slide is about 350 feet wide and 550 feet high with 3 to 4 foot scarps. The "Nancy" slide is located  $1\frac{3}{4}$  miles south of Jerome. It is about 200 feet high and 100 feet wide on a slope very similar to Jerome. The fifth slide is located near the Green Monster prospect about 4 miles south of town. All of these slides occur on the hanging wall side of the Verde fault in alluvium and weathered basalt.

Y The local geology of the Jerome slide area can be divided into two parts---the hanging wall and the footwall based upon the Verde fault zone. The hanging wall consists of sheared Precambrian quartz porphyry which has been ~~hydrothermally~~ altered to sericite and chlorite. There is some Precambrian <sup>diorite</sup> gabbro and other volcanic rocks in the <sup>insulate zones</sup> area in minor amounts. The surface consists of talus and alluvium a few feet deep. The alluvium is cemented in places near the surface by caliche. The dip of the footwall slope is greater than  $25^{\circ}$ .

The hanging wall rocks upon which most of Jerome is built consist of the Precambrian complex overlain by Paleozoic sediments, Tertiary basalts and alluvium. The hanging wall increases in thickness and completeness of section eastward due to the dip of the fault. There is evidence of an ancient water course underneath the surface clay and rock mass which connects with the present drainage. It has been buried by recent alluvium and earth creep material. The overburden appears to be layered unstratified alluvial flow material.

The UVX ore body was found in the hanging wall rocks in 1914 and extensive mining started in 1916. The UVX ore body is located in the hanging wall area below and easterly over a thousand feet from the ~~center~~ of the City of Jerome. <sup>(VERDE) STOPS ARE</sup> ~~the ore is~~ located along a strike length of about 1,500 feet roughly parallel to the Verde fault, and the ore zone has about a 600 foot width. Most of the stopes are located between the 1100 and 1600 foot levels.

The UVX mined 3,940,000 tons of ore by square sets ~~and then filling the sets~~ <sup>were filled</sup> as mining progressed. The square sets were considered temporary and the fill was permanent. The rock runs about 8.5 ~~cu~~ cubic feet per ton. The rock removed amounted to 1,436,571 cubic yards. It was assumed that about

90 percent of the 185,000 square sets was filled and 90 percent of each set was filled. The fill was dumped in from cars and chutes, and then shoveled by men. <sup>And this job was settled by water.</sup> Records indicate over 400,000 yards of clean fill was added to the mine from the fill pit on the surface. The timbers which filled about 9 percent of the volume were assumed to have become crushed and decayed with about a 50 percent loss in <sup>their</sup> volume.

In summarizing the above information, approximately 30 percent of the excavations were left as void spaces. There was another 55,000 feet of development including drifts, raises, etc.

East

JEROME

5100 M.S.L.

VERDE  
FAULT

Tertiary  
Basalt  
and  
Gravel

Paleozoic  
Sediments

5500

7000

9000

9500

Quartz  
Porphyry

4100 M.S.L.

Qtz.  
Porph.

Quartz and  
Gossan

Tuff

Quartz  
Porphyry

Acid  
Volcanics

11000

12000

13000

14000

15000

Massive Sulphide


Diorite

Rhyolite

19000

3100 M.S.L.

GEOLOGICAL SECTION  
 U.V.X. MINE  
 SKETCH SHOWS U.V.X. ORE BODY  
 RELATIVE TO JEROME'S EAST LIMIT.  
 SECTION TRENDS N68°E



PAH Jan 1971

The closest stopes to the town are 750± feet horizontally away from the edge of the town. The main stopes are located 900 feet below and 800 feet horizontally away from the present Main Street of Jerome.

#### UNITED VERDE EXTENSION SUBSIDENCE

A sag and collapse occurred over the main UVI ore stopes. This caving occurred in the more intensely fractured rocks associated with the hanging wall rocks of the Verde fault zone. <sup>(\*)</sup> Fourteen feet of sag was measured on the 950 level and 12 feet in the overlying 550 and Bitter Creek levels. Detailed observations recorded by mine engineers in private reports are described below:

\*The observations on the 1300 level in the drift directly south of the Edith Shaft are as follows:

400 ft. south	Tension cracks.
465 ft. south	Sharp drop of one foot in the bottom.
465 ft. to 510 ft.	Sag in drift.
510 ft. to 570 ft.	Badly crushed.
570 ft. to 660 ft.	Two or three feet of grading up bottom - sag.
660 ft. and beyond	Not available due to crushing.

Observations on the 1300 level drift west from the main tunnel toward the main orebody are as follows:

90 ft. to 120 ft. west	Tension cracks.
120 ft. to 170 ft. west	Series of breaks displacing the bottom of the drift 4 ft. downward.
170 ft. west and beyond	Further sagging of drift and destruction.

Observations on the 1100 level 750 feet south of the Audrey Shaft and west and directly above the previous observations:

110 ft. west	Bottom of drift down one foot.
150 ft. west	Bottom of drift down two and one-half feet.
190 ft. west	Bottom of drift down one foot.
240 ft. west	Bottom of drift down three feet.
Beyond 240 ft.	Destruction.

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(\*) The capping over the main ore body was breaking and settling in 1922. In 1923 the capping, from above the 1100 down to below the 1200, was broken. By 1924, the subsidence was down from the 1100 to below the 1500 and the capping was arching. By 1926, the upper levels were broken to the 950 level.



Observations on the 550 level, which is 550 feet above the 1100 level. The observations are in the drift south of the Edith Shaft and approaching the main orebody.

300 ft. south	Slip.
360 ft. south	Slip.
400 ft. south	A two foot break with heavy ground and quite a noticeable downgrade to the south.
540 ft. south	One foot drop.
560 ft. south	Three (3") inch tension crack.
630 ft. south	Slip.
Beyond this, a slump in drift with ponding of water.	

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Observations on the Bitter Creek Tunnel level southwest of the portal and crossing over the main orebody.

210 ft. to 320 ft.	Badly broken ground - timbered.
320 ft.	Evidence of grading up of several feet.
320 ft. to 600 ft.	Ground badly broken with a steep downgrade.
660 ft.	Slips.
600 ft. to 1180 ft.	Grading up at bottom. This portion of the drift was driven in 1926-1927.
1180 ft.	Crushing on fault plane with sag to the northeast.
1180 ft. to 1270 ft.	Definite sag to the northeast.
1270 ft.	4- $\frac{1}{2}$ ft. drop on Main Verde fault to the northeast. Red clayey gouge. Fault dipping 65° to the northeast.

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These observations are not all that were noted and are only some examples of the evidence of progressive slump toward the mining area."

Y  
The size of the sag zone is about 800 by 1100 feet between School Gulch on the south, Bitter Creek on the east and north, and the Verde fault to the west. ~~Sag zones were evident as early as 1923 particularly in the brittle quartz area above the main ore body.~~ Underground tracks had to be raised several times, particularly near the stope areas. Elevation measurements on a railroad frog indicated that the frog was at 4340.33 feet (m.s.l.) in March 1918, 4340.19 feet (m.s.l. ) in September 1921 and 4339.29 feet (m.s.l) in January 1924. Most of these zones died out in the overlying schist, with

many vertical fractures noted from below the 1300 level to above the 550 level. In 1923 the first fracture was noted at the surface 800 feet above the top of the subsiding zone. A cantilever type break was observed in a concrete flume on the surface over one of the fracture zones associated with the edge of the subsiding area. The rate of subsidence increased during wet periods, particularly 1934-35 and 1936-37. The subsiding area is bounded in part by fractures and in part by bending. The sag area is located in the zone of sliding.

### C UNITED VERDE MINE

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The United Verde mine which is located northwesterly of the town and above the main slide zone had no direct effects upon the land slides, however, some of the major open pit blasting was attributed to be an indirect cause. In 1924, 1925, and 1926, there were two blasts of at least 125 tons of powder plus an accidental blast of 25 tons of dynamite which caused some damage to property in Jerome.

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A series of rock slides in the United Verde pit which is <sup>not</sup> ~~in any way~~ related to the <sup>1911</sup> Jerome slide is of general interest. In June 1929, a rock slide of 25,000 tons occurred. This prompted management to monitor the slide area by setting about 20 concrete survey markers in place. A uniform rate of movement was noted for 18 months, then a rapid increase occurred. A slide was predicted for the 20th month. In March 1931, the 20th month, 1,000,000 tons of rock fell into the pit. However, precautions had been taken and neither men nor equipment was lost. Continued monitoring was practiced, and another fall was predicted in 1936. In March of that year, 400,000 tons of rock slid into the pit confirming their predictions. More information on these slides is available in a 1934 A.I.M.E. technical

publication #551 on "Ground Movement and Subsidence at the United Verde Mine" by Mills; and also Arizona Bureau of Mines Bulletin 178 on "A Brief History of the United Verde Open Pit, Jerome, Arizona" by Alanus.

#### LEGAL BACKGROUND

In Jerome, most of the land was owned by the mining companies, however, there were parcels owned by the town, local businesses, and people for home lots. These privately owned parcels were owned to a depth of 25 feet and according to Arizona law any damage to their property caused by mining, made the mining operator responsible for damages.

In 1938 a group of Jerome people started civil suit proceedings against the United Verde Extension company. This suit sought to establish that the mining of the UVX ore body caused the surface slide to occur in Jerome. It was charged that mine sag and subsidence over the ore bodies caused the surface material up slope to slide down slope towards the sag. The UVX's principle defensive argument stated that the sliding had a long pre-mine history and was due to pre-existing geologic conditions, and also that the subsidence and sliding were two different unassociated phenomena. Furthermore, the town of Jerome added to the sliding problem by bringing in quantities of artificial water as well as adding the weights of buildings on to poorly selected land sites. The UVX tried to throw the case out of court because the mine had no workings vertically under the plaintiff's ground, and since there was no subsidence in the Plaintiffs ground, the company was not responsible directly or indirectly. Much of the defense was based upon attempting to separate the occurrence of vertical mine subsidence from the horizontal sliding land effects. The company wanted to accept responsibility only for land directly over their underground workings.

It was shown during <sup>the</sup> trial that the failure of the buildings in Jerome was not due to mine subsidence but to the failure of building supports due to land sliding. The distinction between sliding and subsidence was difficult to establish. Arizona law did not hold surrounding property owners liable if they placed too much weight on an area causing land movement, but did hold adjoining property owners liable for any movement resulting from excavation and resulting land movement.

C Jerome was a dying town during the 1930's. The depression put 750 men out of work in 1929, and the closing of the UVX in 1938 put another 150 people out of jobs. Building occupancy dropped from 90 percent to 20 percent during the 1930's. Rents also dropped, and as a result, funds for proper maintenance decreased and the buildings were becoming run-down. This economic condition prompted the land owners to try to get what they could from a rapidly deteriorating economic situation.

P Ira Joralemon became an out-of-court arbitrator <sup>in the major civil suit case</sup> in 1938 and the case was settled with <sup>the city of Jerome and</sup> ~~all the landowners with the UVX paying 55 percent and the United Verde paying the remaining 45 percent.~~ <sup>Exact final settlement</sup> The ~~exact~~ amount is not known, however <sup>but I have heard indirectly that the total sum paid by the companies was</sup> less than \$500,000.   
The UVX paid 55% and the UV paid the remaining 45%

Y CONCLUSIONS

Jerome is built on a terrace where the general slope of the hill flattens out for a few hundred feet. The terrace results from sediments being deposited from streams and sheet wash which drains off of Cleopatra Hill. The entire hill slope was built upon by the mines and people of Jerome without regard for the geologic conditions. For example, the vegetation was <sup>with</sup> removed <sup>for construction</sup> excavations were made, <sup>OR KILLED BY SMOKE UNCONTROLLABLE</sup> cut and fill was utilized for buildings and roads,

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P  
Y

and retaining walls were erected. Approximately 65 percent of the ground in the slide area was covered or paved by man's structures. The trenches, flumes, storm drains and catch basins were and still are inadequate to handle the rainfall in the built-up section of town. Sewage was dumped on and into the ground. <sup>A SEWER SYSTEM WAS NOT MADE UNTIL 1918.</sup> Breaks in the storm drains and water flumes added more water to the unstable areas---in fact, the entire storm drain system is located in the slide area. Some of the subsurface water courses were cut off by construction in Jerome. The intermittent dry periods between the wet periods formed cracks in the barren ground which permitted rapid inflow of water.

A well-developed striated slippage plane dipping 15° formed in a clay horizon. The hanging wall clay and rock material was wet and gummy. The rocks and soil below appeared to be somewhat different material and are firmer in strength. ~~It is postulated that, as slides would have occurred in dry ground at the present angle of repose.~~ <sup>ADDITIONAL</sup> A typical slide occurred in Jerome as shown by the development of an apex area, edges, arches and a basal bulge. This slide moved by creep in its early years culminating in a rapid movement in 1936. At the head of the slide many of the buildings including the Post Office, the Boyd Hotel, the Miller Building, City Hall, and the Bank of Clemenceau sank about 4 feet. There appears to be a relationship of the major slide area to a broken water ditch. The flume above town which carried water to the water tanks had four main breaks, one of which was permitted to leak from 1930 to 1936 without being repaired.

The Jerome Landslide can be attributed to the movement of an earth mass of clay and rock fragments along a pre-existing zone of creep. The disruption of the soil by excavation and construction plus the added weight of surplus water and buildings accompanied by increased pore water

Set the stress for pressure along near-surface water courses caused major land creep and eventual sliding to occur. It is my opinion that the mines did not cause the sliding by any mining action and that the zone of influence of the subsidence over the UVX ore body was not responsible for the slide.

The UVX MINING <sup>AND RESULTING SUBSIDENCE</sup> OVER THE BONAZZA ORE BODY WAS RESPONSIBLE FOR CAUSING THE NATURAL SLIDING OF THE THROTTS <sup>THE OCCURRENCE</sup> SURFACE <sup>fractures and subsidence</sup> ~~which occurred~~ AT THE TIME OF THE NATURAL SLIDING OCCURRED ~~PROBABLY~~ INDICATES A CORRELATION. THE LOCATION OF THE MAIN SLIDE ABOVE THE MAIN UVX BONAZZA STOPS FURTHER CONFIRMS THE RELATIONSHIP BETWEEN THE MINING SUBSIDENCE AND THE SLIDING. THE NATURAL U.U. BLASTS <sup>PROBABLY</sup> ~~WAS~~ ~~NOT~~ CONTRIBUTED TO THE ORIGINAL MAIN SLIDE STRUCTURE. ~~THE~~

The James slide had all the natural requirements for a slide and man's works ~~presupposed~~ triggered the final movement.

At present the slide is relatively stable, however no structures exist on the slide and no monitoring is being accomplished. 14

Drainage from final channel into pass

C

Y

Ira B. Joralemon  
315 Montgomery Street,  
San Francisco,

COPY

R. D. J. 4/18/38  
R. D. J.

Joralemon, 1938

April 14th. 1938.

United Verde Extension Mining Co., and  
Pheke Dodge Corp.,

Gentlemen:

Following is a suggested order of procedure for the arbitration hearings on ground movement at Jerome:

1. On the first day of the hearing, - according to present plans on May 6th, - I should like to receive a written history of the ground movement and of mining operations that may have had some bearing on it. This should include:

- a. The subsidence itself, with approximate times of the principal movements, and with maps if available.
- b. Periods during which mining of various levels and parts of the underground orebody were mined.
- c. Approximate dates of heavy blasting in the open pit.

I hope it will be possible to have this history agreed on by engineers of both parties, so that it will form a definite basis for the ensuing arguments. All controversial matter should therefore be omitted from the history.

After receiving the history I think it will be best to recess until Monday morning, May 9th. so that I may become somewhat familiar with the problems before the presentation of controversial matter begins.

II. Beginning on May 9th, both parties should present their claims, drawing lots to see which shall come first. As much of the material as possible should be in the form of written reports, maps, etc., with copies for the opposing party. This can be reinforced by oral statements if desired, and by trips underground or on the surface. Representatives of both parties would be at this meeting, but I would prefer to have all argument postponed until later. I would of course ask any questions that seem necessary to clarify the statements. Following this hearing there would be a recess of such time as may be agreed on, to allow each party to prepare replies to claims by the other party and to allow me to study the data. During the recess it may be advisable to visit other districts described as examples of ground movement.

III. Following this recess, another hearing would be held at which reply arguments, - written as far as possible, - would be submitted. I would ask any questions that seem necessary, and either party could present written questions regarding doubtful points in the reports or claims of the other party. As far as possible I want to avoid any oral argument, that might bring out statements based on insufficient reflection or study.

IV. If there are still doubtful points, another recess to prepare data and a final hearing could follow.

If either party wishes to take advantage of the services of outside engineers or others who will not be readily available for more than one hearing, the above procedure can be modified by receiving and discussing their data within a short period.

The question as to whether or not there should be stenographic reports of hearings will depend on how much oral discussion the two parties desire. As far as I am concerned, I could make sufficiently detailed notes for my own use. I suggest that a stenographer be employed only if one or both parties request it.

I have decided not to visit other districts before the hearing begins, as it would be fairer to make such visits, if any, after arguments have been made. I will, however, study the articles on ground movement that are available here.

The above plan is made without any knowledge of the sort of presentation that both parties have planned, and so is subject to change if it does not suit your convenience.

Yours very truly,

(Signed) Ira B. Joralemon.

cc Messrs. Douglas, Cates & Beckett.



United Verde Extension Mining Co.

  
April 29th, 1908.

Mr. Ira B. Jerusalem,  
215 Montgomery St.,  
San Francisco, Calif.

Dear Sir:

I have just returned from New York and find your  
letter of April 21st.

For my part, I don't believe we need any stenographer,  
but if you require one no doubt an efficient person will be  
available.

Yours very truly,

United Verde Extension Mining Co.,

By \_\_\_\_\_

President.

cc. to  
Mr. L.B. Gates, President Phelps Dodge Corporation,  
40 Wall St., New York.

IRA B. JORALEMON  
222 MONTGOMERY STREET  
SAN FRANCISCO

April 21, 1938

Mr. Louis S. Cates, President  
Phelps Dodge Corporation  
40 Wall Street  
New York, N.Y.

and

Mr. James S. Douglas, President  
United Verde Extension Mining Co.,  
Jerome, Arizona

Gentlemen,

Acknowledging Mr. Cates' wire of April 20th and Mr. Douglas' wire of April 21st I shall of course keep the entire matter in question confidential.

As I stated in my last letter I plan to reach Jerome on the evening of May 5th. I shall go to the Jerome Hotel and be ready for work the next morning.

If you decide that it will be advisable to keep a record of any verbal proceedings I hope that your local representatives will be able to arrange to have a court stenographer available, as any other stenographer would have a hard time in keeping up with verbal statements. It might be, however, that some stenographer in the office of Ellinwood and Ross, which firm I think has represented both of you and so would be neutral, would be able to handle this work. As I have no idea how much verbal explanation the various engineers will want to make in addition to their written statements and data I have no idea whether or not such a stenographer will be necessary and so will leave this to you.

Yours very truly,

*Ira B. Joralemon*

IBJ:AC'C

COPY

Ira B. Joralemon  
515 Montgomery St.,  
San Francisco,

April 21, 1938.

Mr. Louis S. Cates, President  
Phelps Dodge Corporation,  
40 Wall St.,  
New York N.Y.

and

Mr. James S. Douglas, President  
United Verde Extension Mining Co.,  
Jerome, Arizona.

Gentlemen:

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Yours very truly,

(Signed) Ira B. Joralemon.

IBJ: AO'C

Douglas, Arizona,  
March 22nd, 1938.

Mr. Ira Jerusalem,  
#1601 California Commercial Union Building,  
San Francisco, California.

Dear Mr. Jerusalem:

We, the companies writing you this letter, request that you undertake for us the question of arbitration of our respective responsibilities for ground movement in the Town of Jerome.

We wish you to make a study and reach a decision, based upon an arbitration agreement executed June 24, 1937, a copy of which is attached, the interpretation of which we jointly depend upon you to make, such decision to be made in conformity with what you consider fairness and justice after being presented with such evidence and statements as either company may submit and such other statements and evidence as you may desire to obtain or have submitted to you.

We trust that you may undertake to comply with this request, and wish to have you give us an estimate of what your charges will be.

Please reply to this by addressing Mr. Gates at Douglas, and Mr. Douglas at Jerome, and oblige

Yours very truly,

UNITED VERDE EXTENSION MINING COMPANY

BY \_\_\_\_\_ President.

PHILPS DODGE CORPORATION

BY \_\_\_\_\_ President.

UNITED VERDE EXTENSION MINING COMPANY

Douglas, Arizona  
March 22nd, 1938.

Mr. L. S. Cates, President,  
Phelps Dodge Corporation,  
#40 Wall Street,  
New York City, N. Y.

Dear Mr. Cates:

Confirming conversations with  
Mr. Beckett, I am enclosing herewith signed  
letter to Mr. Ira Joralemon, along with a copy  
of the agreement.

Please sign the letter and  
send the enclosed agreement with it, and address  
it to what I believe is Mr. Joralemon's present  
address, #1601 California Commercial Union Building,  
San Francisco, California, and oblige

Yours very truly,

President.

JSD:M  
Enc

*James  
4/2/38*

**PHELPS DODGE CORPORATION**

**40 WALL STREET**

**NEW YORK**

**March 29, 1938. z**

**J. S. Douglas, Esq.,  
Douglas, Arizona.**

**Dear Sir :**

**This will acknowledge receipt of your  
letter of March 22nd and to advise you that I  
have signed the joint letter to Mr. Joralemon un-  
der same date and have forwarded it to him via  
airmail today.**

**Yours very truly,**



**P r e s i d e n t .**

**cc Mr P G Beckett  
Douglas, Arizona.**

*Handwritten notes and scribbles at the bottom of the page, including the name 'Beckett' and other illegible markings.*



Douglas, Arizona, April 9th. 19381

Mr. Ira Joralemon,  
San Francisco, Calif.

315 Montgomery Street,

Dear Sir:

We acknowledge receipt of your letter of April 4th. and thank you for your compliance with our request. The flat charge of \$10,000.00 and expenses will be satisfactory to us.

We note the time you have available and would suggest May 4th as to date suitable to us for your commencing the work at Jerome, at which date we would be prepared to have our engineers ready to submit our respective data and evidence to you.

We note you expect to have a few days available in the week commencing April 18th and if during that period you should decide to make a short preliminary visit to Jerome for the purpose of sizing up the situation and deciding on the way that the work should be undertaken, we would suggest you stop at the Jerome Hotel, have no discussion on the ground movement controversy with any person in the employ of either company, and that the reason for your visit be kept entirely confidential.

Will you please advise us promptly, by air mail, whether the date set meets with your convenience; also, in due course, the particular procedure you would like to follow in regard to submission of data and evidence from both sides.

Yours very truly,

UNITED VERDE EXPANSION MINING COMPANY  
BY \_\_\_\_\_  
President.

PHELPS DOGE CORPORATION  
BY \_\_\_\_\_  
President

By \_\_\_\_\_  
Vice President.

*P.G.B. 2 copies  
5/19/38*



IRA B. JORALEMON  
225 MONTGOMERY STREET  
SAN FRANCISCO

*Jerome*  
*4/6/38*  
*10:10 A.M.*

April 4, 1938

Mr. James S. Douglas, President  
United Verde Extension Mining Company  
Jerome, Arizona

and

Mr. Louis S. Cates, President  
Phelps Dodge Corporation  
40 Wall Street  
New York, N.Y.

Gentlemen,

In reply to your letter of March 22d I shall be very glad to undertake the arbitration of your respective responsibilities for ground movement in the town of Jerome. As most of my time is taken for the month of April I could spend only a few days at Jerome during the week of April 18th. I can arrange to spend as much of the time during May and June on this case as is necessary.

If it should be impossible to obtain all of the evidence and reach a decision by June 25th it would be necessary for me to postpone further consideration of the case until about the end of August, as I must be away on an extended trip for two months.

As I have little idea how much evidence there is to consider, it is hard for me to estimate the amount of charges. I therefore suggest either a retainer of \$5,000 plus \$100 per day and expenses for time spent in this work or a flat charge of \$10,000 and expenses.

Yours very truly,

*Ira B. Joralemon*

IBJ:AO'C

IRA B. JORALEMON  
225 MONTGOMERY STREET  
SAN FRANCISCO

*4/18/38 11 A.M.*

April 13, 1938

Mr. James S. Douglas, President  
United Verde Extension Mining Co.,  
Jerome, Arizona.

Mr. Louis S. Gates, President  
Phelps Dodge Corporation  
40 Wall Street  
New York, N.Y.

Mr. P. G. Beckett, Vice President  
Phelps Dodge Corporation  
Douglas, Arizona

Gentlemen,

Absence from San Francisco delayed me in answering your letter of April 9th. I find I must be in Reno for a directors' meeting on May 3d and so can hardly reach Jerome in time to start work on the 4th. If convenient for you I suggest that I reach Jerome on the evening of the 5th ready to start work on the morning of May 6th.

It is probably not worth while for me to make the preliminary visit to Jerome about April 18th. I think I can put in the time to better advantage studying the technical articles that have been written on the subject of subsidence in other districts. As I am to be in Madison, Wisconsin from April 25th to 29th I may be able to go East a few days early to visit some of the iron properties in which there has been subsidence.

I am working up an order of procedure which I will send to you within two or three days. In principle I want to carry on the work as a piece of scientific research in which each party will have time to carefully consider the claims and theories of the other party and to make thoughtful replies. I think this will be much more satisfactory than it would be to follow court procedure with cross examination and arguments that must be more or less hasty.

Yours very truly,

*Ira B. Joralemon*

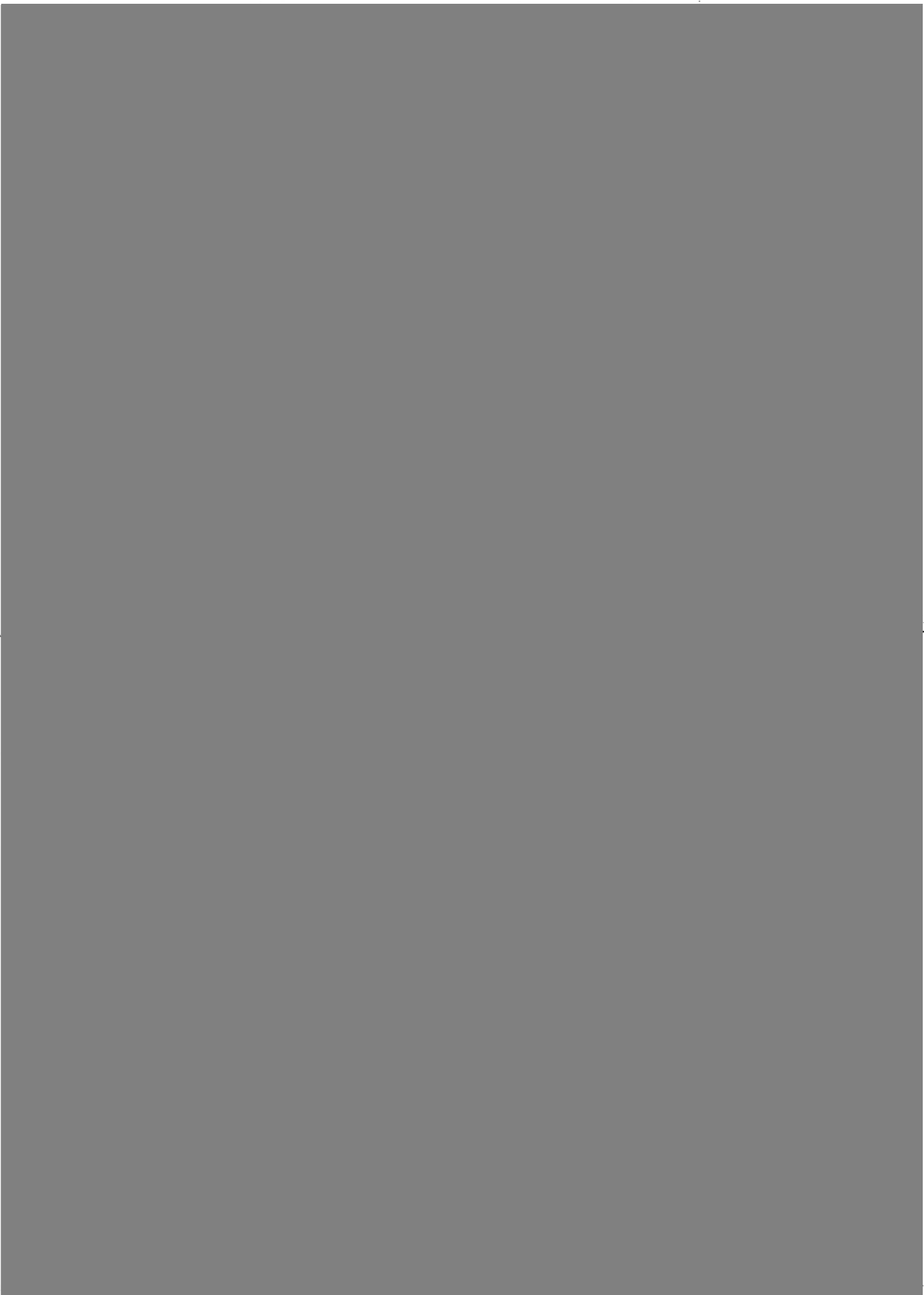
IBJ:AO'C

convince prospective clients that my head was more important than my weakening legs.

World War II made the transition more complete. After it there was less frequent adventure but the occasional journeys were even more exciting than before.

*Toralemon, Ira B ; 1976 ; Adventure Beacons*

**Valuation and Arbitration**



Leisk March 6, 1937

March  
8th  
19 37

AIRMAIL

Confirmation

Mr. J. E. Douglas  
Douglas, Arizona

Dear Mr. Douglas:

I have just received your special delivery letter asking me to bring my letter to you of February 8, 1935 on the subject of slippage or ground movement at Jerome up to date. In a way this is difficult to do because I have been out of close contact with the situation for nearly a year, and my last actual inspection of the town was made early in last July. Events that have transpired since last summer have been reported to me by letter and also verbally by Mr. P. G. Beckett of the Phelps Dodge Corporation when I saw him in Denver in September. At the same time, as we all realize, there is such a thing as getting too close to a problem and I feel that during the time I have been away from Jerome that I have been able to weigh the evidence with less confusion and to develop in my mind a clearer picture of what has actually been taking place.

Events of the past two years and particularly of the last one have brought me down to the definite conclusion that the primary and fundamental cause of the greater part of the serious damage that has been caused in Jerome is due to a landslide, which in turn is due principally to saturation by water. To my mind the more recent phases of the ground movement are quite distinct and different from the earlier and comparatively minor damage which began to manifest itself some years ago when heavy blasting was being done in the United Verde pit, and when settlement was noticeable in the upper levels of the United Verde Extension mine. At that time we were inclined to try and make the cracking of walls of buildings in the town fit a theory of a combination of the effects of heavy blasting and underground mining. While we were aware that poor drainage and saturation of soil on a steep mountain side was the cause of numerous small slides to which we could point specifically, we did not realize that a situ-

ation had slowly been developing that could produce a major slide involving a large part of the central portion of the town, and we did not realize that the scattered cracks and evidences of disturbances in this area might be the first warnings of a general slide which did not reach its maximum intensity for many years.

My first suspicions that poor drainage and resultant saturation of the soil under the foundations of the buildings in Jerome might be the real cause of the trouble, came when I discovered that a large triangular piece of ground back of the town and above the Verde fault had moved down the hill some four or five feet. The apex of this triangle had been occupied by one of the water tanks of the United Verde Copper Company or their subsidiary, the United Verde Public Utility Company. This tank had frequently overflowed down the hill side. The large storm sewer which serves to keep flood water from entering the United Verde pit crossed the triangular area below the water tank. The sliding of this piece of ground broke the storm sewer and offset the line of the sewer at the point of breakage some four or five feet. This break had permitted drainage water in the storm sewer to escape into the ground above and back of the town of Jerome.

One result of this slide was damage to several United Verde dwelling houses which necessitated their removal. Here was a case of ground moving as a result of saturation caused by improper drainage. It was back of the Verde fault and, therefore, could not be attributed in any way to the underground mining operations of the United Verde Extension Mining Company. Obviously if a slide could take place at this point, similar slides could be expected within the town below this area. Such slides, although their cause might not be so readily apparent, could be due to the further migration of this water through the ground underneath the town. This would be aggravated by leakage from broken water and sewer lines in the town itself, which latter condition had been known to exist for many years. The United Verde Copper Company, while aware of the break in their storm sewer above the town, made no serious attempt to repair it or to keep it in repair even after the slide had caused the destruction of several of their houses.

The peculiarities of the ground movement in the town never fitted satisfactorily with the subsidence theories in point of timing. The subsidence theory would not explain many peculiarities that were noticed in the earlier manifestations of damage in the town particularly in horizontal shearing movements in concrete walls and floors which were out of all proportions of the vertical component.

Mr. J. S. Douglas  
Page #5

Also severe compressive stresses were set up causing buckling of sidewalks and pavement, a thing not readily explained by subsidence but easily the result of a landslide action. The cycle of events and the recent intensification of movements will not correlate at all with the conditions known to exist underground at the United Verde Extension mine.

As I view the thing now, to attribute the present conditions at the town of Jerome to mining operations of many years past, requires one to lean on coincidence to a degree entirely unwarranted by the facts. I feel convinced now that slippage above the bedrock horizon is the real offender and that its natural causes have been aggravated by indifference shown by the United Verde Copper Company and its successor to the importance of drainage matters under their control.

This is the picture as I now have it in my mind based upon my previous contact with the problem and the information that has come to me more recently.

Yours very truly,

R. D. LEISK

RDL  
mm

*They have controlled the city  
Committee since 1895?*

COPY

*Completed  
12/9/37*

*Carr(?) ~~12/9~~  
Nov. 13, 1937*

**Memorandum re conference with Mr. Leisk, on November 13, 1937:**

On Saturday, November 13, 1937, Mr. R. D. Leisk came to the office about 10:30, and we discussed the Jerome slippage matter until noon and for another hour and a half after luncheon. Mr. J. S. Douglas was present for a short time before noon and for a short time during the afternoon session. The following matters were discussed and the decisions indicated were made:

1. In view of the fact that a statement was made by Mr. Douglas in his "ruminations" that 2,000,000 cubic yards of waste had gone into the mine, and in order to compute the amount of fill in the stopes and the shrinkage thereof, a computation is to be made of the total volume of waste that was broken and used for filling during the life of the mine. In this connection, a check is also being made of the board measure of timber that went into the mine with proper allowances for timber used in drifts and in the Josephine tunnel. The P. D. has made such a computation and this computation of ours is to check theirs, and to correct Mr. Douglas' statement regarding yardage in which there was evidently an error.
2. In this connection, a computation of the volume of gob from the drifts, tunnel and waste raises is being made. In connection with this, allowance must be made for the waste from the Edith shaft dumped on the surface making the mine yard, the waste from the outer portion of the tunnel dumped at portal prior to the making of connections with the inner portion of the tunnel, and the amount of waste dumped along the railroad.
3. An estimate is also being made of the volume of rock passing below various horizons in the mine and a comparison of these volumes passing below the various mine levels and the volume of surface displacement shown by surface is being made. In connection with these three matters, I understand that Messrs. Mills, Hondrum and Waara are all collaborating, and that these computations and estimates will be checked with the information shown on the reports, maps and graphs procured from P. D.
4. The suggestion was made that progressive stope maps be prepared in accordance with our previous request, showing the existence of pillars of ore in the mine until some years after stoping commenced, and showing the breaking of the capping reported. Mr. Leisk stated that during the mining operations they found that these pillars



Memorandum re conference with Mr. Leisk:

were settling as a result of crushing at their bases, and believes that a mushroom shaped portion of the capping was moved with the settling of the pillars. In view of the fact that there are records of sinking along levels of the main ore body prior to the time that the ore pillars were stoped out, this probably was the fact. This data should be closely checked with the data as to the sinking of levels above the main ore body in the program to ascertain the time when the effect of stoping operations could have reached the surface. Mr. Leisk believes that in addition to the plats of the various levels attached to Mitke's reports, which we have seen, there are such plats of levels showing stope operation for the other years. Mr. Leisk believes that a complete file of these stope maps can be made up without the expenditure of a great deal of time, and approved of Mr. Mills doing this work.

5. Mr. Leisk's plan, proposed to Mr. Douglas, is that there should be some person directing and controlling all of the technical preparation for submitting our case, and he stated that he was proposing to Mr. Douglas that Mr. Mills, in whom he has great confidence, be placed in charge of this work, and that it should be left to his judgment as to what preparation is desirable. This, of course, contemplates that the others working on the investigation and our office make suggestions to Mr. Mills. Mr. Leisk did not say that Mr. Douglas directly agreed to this program, but we will proceed at least temporarily on the assumption that this is the case. In this connection, Mr. Leisk stated that Mr. S. E. Smith would be the one to supervise and direct the negotiations with property owners and the Phelps Dodge Corporation in regard to claims to be adjusted and properties to be purchased. We suggested that Mr. Smith be consulted and have some control over the further investigation work insofar as authorizing its expense is concerned. I do not know what the final outcome of this proposal has been. Mr. Leisk stated that Mr. Mills would have to spend some time in Gallup, but that he could spend a good deal of time at Jerome, and could do considerable work in carrying on investigation and in drafting and preparing the records of the data we are securing.

6. Mr. Leisk agreed that it was desirable and necessary to have a further conference among the engineers and

Memorandum re conference with Mr. Leisk:

attorneys interested in the preparation of our case to check down through the facts which have been found in order to develop these facts in a detailed and systematic way, and reach an agreement on them. After such checking of the facts, there can be further discussion and agreement as to the theories. At the time of this conference with Mr. Leisk, the P. D. were delivering to us numerous other records, graphs and maps, and it was decided that time should be given to digest and check the data shown therein before having another conference. He stated that during his presence here, he had had conferences with Messrs. Colvo, Waara, Mills and Hondrum, but that they had been of a general nature and had not attempted to run down through the facts of the case in a systematic manner. A further suggestion that we would offer in this connection is that a detailed outline of these facts be prepared on which notations could be made as to which one, or ones, of the engineers has personal knowledge of each of the facts and would be used in testifying as to them.

7. Mr. Leisk stated that he and Mr. Douglas were not contemplating a formal hearing before the arbitrator, if one is appointed, nor the cross examination of opposing witnesses, or argument of attorneys. He believed that it would be proper to get our data all in shape and let the arbitrator examine our data as well as that of the P. D. and then come back to us to answer such questions which might not have been finally answered by our or the P. D. data. I stated that I believed it might be very dangerous to submit our case in such a manner, that we would like the opportunity of cross examination and of argument to the arbitrator, and I further stated that it was my belief that the attorneys for P. D. would have a similar attitude. Mr. Leisk agreed that we could not control the matter entirely and that upon the appointment of an arbitrator, it will be necessary to have a preliminary conference between the engineers and attorneys of both companies and the arbitrator, and determine upon a set of instructions to the arbitrator, as to the course of procedure. If we proceed in our present course each party will have the other party's factual data by the time the arbitrator is appointed. It is my thought that copies of our reports and statements of theories be submitted to the P. D. as well as to the arbitrator, and that we be given copies of their reports and theories, and after each party and the arbitrator has had opportunity to

Page 4

Memorandum re conference with Mr. Leisk:

digest these reports and theories, then to have a hearing before the arbitrator, at which time cross examination of opposing witnesses can be had and a final argument made to the arbitrator. In any event, it appears necessary that before presenting our data to the arbitrator, all of the statements of the engineers will have to be brought up to date in one comprehensive report.

8. There has been a definite decision to proceed on the plan that we will arbitrate, unless further difficulties arise. Although the risks incident to arbitration of having to pay a larger portion of the damage than we believe we are responsible for over a longer period of time than we believe we could be responsible for have been considered, it has been decided to proceed to arbitrate rather than to call a halt at this time on all our negotiations and stand any suits by the P. D. or the property owners which may result.

9. In connection with the above mentioned plan, we are to continue negotiations for settlement with the property owners in Jerome and at the present time are working on a settlement with Tinsado, involving a purchase of property from Charles E. Hughes, and working on settlements with The Bank of Arizona in regard to four of its lots in Zone "A", with Selma and with the Shea estate heirs. It is agreed that in this connection we are to make our deal with the property owners without consulting or advising the P. D. officials or attorneys, and then when the deal is made ask their approval.

10. It was again suggested that we attempt to secure the survey data and plats made and prepared in connection with the installation of the sewer system in the Town of Jerome in 1918 and 1919 from the Los Angeles firm of engineers which did this work. We agreed that it was somewhat of a "stab in the dark", but might produce very valuable data, and that there is reasonable probability that we would be able to get the data from the engineering firm. Mr. Douglas was present at the time of the discussion on this point, and although Mr. Leisk and I both favored an attempt to secure this data at this time, Mr. Douglas stated that the matter could wait awhile.

A. B. C.

STATEMENT OF

J. WILLIAM WAARA

Re: SMALL BUILDING

Examined Sept. 13-14, 1935

This building is located on lots 12, 13 & 18, Block 3, Town of Jerome, Yavapai County, State of Arizona. At the present date it is used as follows; Dry Goods store in the east store room, and a carpenter shop in the west store room. There are no other occupants in the building.

The building is a concrete structure, having two floors; the business floor and a basement apartment floor. It extends from Hull Avenue on the north to Main Street on the south, the latter being the business frontage of the building. Side walks and paved streets are in on both streets opposite this building.

This building is located on a gentle sloping hillside, not as steep as the mountain side above Jerome. The slope is parallel with the long axis of the building. No excavation was made for the apartment floor rooms, as they are located at the rear of the building. There is no embankment against any of the walls of the original building and the only excavation done on the premises was for the footing and foundation walls, which excavation was in the form of a trench wide enough for the requirements of footing.

The footings were made of concrete having a width of 20 to 24 inches and a depth of 20 to 24 inches. The footing rest on natural surface soil of the district, a red clay and stone mass commonly known to rest on caliche and bed rock laying in the order named.

The foundation, resting on the footings, is a 12 inch concrete wall constructed to the business floor level of the structure on all sides. The concrete is not re-inforced. The foundation has a varying height from about two feet on the south wall to about twenty feet on the Hull Ave. end. The Hull Ave. end of the building has been changed

somewhat from the original lines at the ground level. When Hull Ave. was paved, the dirt along and under the level of the footings, was removed, and a new footing and foundation was placed along the full length of this building. The height of the old footings above the present walk grade is four feet. It is impossible to determine the depth of the new footings and foundation below the walk grade. It is presumed that this work was done by and at the expense of the Town of Jerome, as part of the paving project.

The footings of this structure were exposed and possibly under cut by the owner, Haskins, of the building to the east of this structure on the Hull Ave. frontage and extending back toward Main Street for a distance of about 32 feet. Haskins built a reinforced retaining wall against the easterly Small building footing, foundation, and soil under said footing, for the purposes of making a place of business under his frame building and facing Hull Ave. This wall is twelve inches thick and said to be heavily re-inforced with steel and railroad rails. The height of the Small building footings above the Haskins ground floor is four feet for the first 25 feet southerly and ten feet for the next seven feet. The back wall of the Haskins store room is a retaining wall and extends easterly at right angles from this point, being twelve feet in height, above the floor.

The footings of this Small structure were exposed and possibly under cut by the owner Felippi of the building to the west of the Small building Hull Ave. frontage, and extending southerly 19 to 25 feet, it being an irregular shaped structure, on fractional lot No. 19 of this Block No. 3. Felippi built a concrete wall along the easterly and southerly boundaries of his lot and against the foundation wall footing and soil under said footing. This concrete wall is 15 inches in thickness and is not known to be re-inforced. The height of the Small building

footings above the Felippi floor at the front is four feet, and ranges similarly to the Haskins dimensions as the distance varies from the Hull Ave. front. The southerly wall of the Felippi building forms a retaining wall for the soil under the Small building footings as well as being a foundation wall for the Felippi building.

There are no protective retaining walls constructed to protect this building. The footings and foundation walls act as retaining walls for whatever material which may be pressing against them, by their trench walls.

The main part of the building resting on the concrete foundation heretofore described is constructed of red brick of standard type. The walls on the north, west and east sides are 12 inches in thickness.

The south side, being the frontage of the building, is of frame construction with sash transom, eight plate glass display windows, two doorways and pressed steel sheeting over transom sash, to top of wall and cornice.

The roof is of flat solid deck construction with composition covering, flashing up against fire walls, draining toward Hull Ave.

There are no additions to the original structure.

The interior of the original structure consisted of two completed business store rooms. That part of the building under the store rooms was left in the customary substructure condition with post, girders, and joist exposed in the rough. The store rooms are of the average type business store rooms. The floors are of Oregon pine matched, plastered walls and ceiling. The display windows are of frame construction with four plate glass windows to each business front. The entrances are single doors. Their approaches from the streets are concrete walks on incline from sidewalk to door.

Some time in about 1926, apartment quarters were built under east store starting about thirty-six feet from front of building and extending to Hull Avenue. These apartments were entirely inclosed within the original foundation walls and had three outside window openings. A similar

room was built under the rear of the west store room and adjoining the Felippi wall. The apartments under the east store room consists of three rooms of average size. The rooms had plastered walls and ceilings. The room under the west store room was not finished. The walls were of 1x4 Oregon pine, also the floors.

## GENERAL CONDITIONS FOUND

### EAST WALL:

The east wall bows easterly, or out, about three inches from the original line of the wall at a point about 22 feet from the southeast corner. A crack in the center of this bow extends from a hair line at the ground to 1/2 inch at the top of the concrete foundation, and reduces to a hair line again about ten feet above the concrete. The southerly or Main street side of the crack is 3/4 inches east of the rear or Hull Ave. side of the crack.

At the ground level below this crack, the concrete foundation wall separates from the footing as we go north widening to one inch and then reducing to a contact twelve feet away. The double wall of Haskins and Small starts at the latter point. The Haskins wall is 12 inches thick and of re-inforced concrete appearing to be in 1st class condition. At right angles and running easterly from the southerly end of this Haskins wall is a short wall 30 inches in length leading to an open space in the back wall of the Haskins store room. This space exposes the natural soil which stands vertical of its own support. A celotex covering hides this from view.

Looking from the roof of the building down along the east wall, it appears to be straight and uniform to the level of the lintel of the front transom glass over display windows. Except for crack at bulge above mentioned, the east wall looks to be in good condition for the concrete and brick work.

A few check observations were made for walls etc. as to their condition of plumbness. The unit of measure was a 28 inch carpenters level, and the deflection from the wall at its ends in inches is the relative unit or ratio of deflection from plumb. For example, if the wall were out of plumb one inch in the length of the level, it was recorded in the notes as 1-28 meaning 1 inch in 28 inches. The direction of leaning is



EAST WALL Continued.

also given considering the long axis of the building to be north.

South east corner leans north  $\frac{3}{8}$  in 28,

" " " leans east  $1 \frac{3}{8}$  in 28

South east corner at top of wall or 24 feet above ground is practically plumb north and south.

Southeast corner at top of wall leans east 1 in 28

The northeast corner is plumb both ways at ground level.

The north east corner at the top of the wall, or 42 feet above the sidewalk, is plumb both ways.

The center along the east wall at the top or 50 feet from the ground is plumb.

NORTH WALL

Old base footing is 48 inches above sidewalk, wall shows joint plainly. The soil was excavated from under original footing and concrete wall replaces to below sidewalk level. This wall is 22 feet long fronting on Hull Ave. Large rock was used as plumb in the new concrete footing and is now exposed showing a poor pouring job. The workmanship of the original Small structure shows pouring scars no blemishes. A small contraction crack appears at lower east window.

East of the old doorway the original foundation leans north  $1/2$  in 28

West of the old doorway, the original foundation is plumb

The Felippi building east wall forms a double wall at the westerly end of the Small north wall. This Felippi wall is thirteen inches thick, acts as a support for the soil under the footings of the Small west wall.

The brick work of the whole north wall is in good condition. There is a small contraction crack at the east window,

The top of the north wall is 42 feet above the sidewalk.

WEST WALL:

South of the northwest corner, only a short portion of this wall is visible from the outside. At the northwest corner, the southwest corner of the Felippi building joins it. At the ground level a crack appears about 30 inches south of the corner dips upward toward the north and is about 12 inches from the corner six feet above ground. It then continues vertically to the top of the concrete foundation where it is 6 inches from the corner. It then continues vertically to a point 12 inches from the corner at the top of the building. Here a few loose brick appear offset from the wall about four feet below the top. This point is at a chimney, and is a local condition only.

From the top of the building the west wall appears practically straight and in good condition. Some cracks are recorded from observations made within the building and are reported under the caption of interior headings.

The southwest corner leans easterly  $1 \frac{3}{8}$  in 28

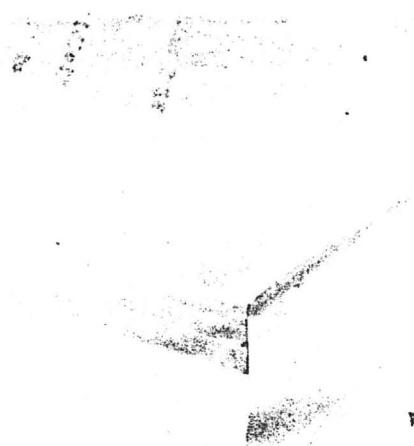
leans north  $\frac{3}{4}$  in 28 height 20 ft.

horizontal observation shows drop  $\frac{3}{4}$  in 28

to the east,

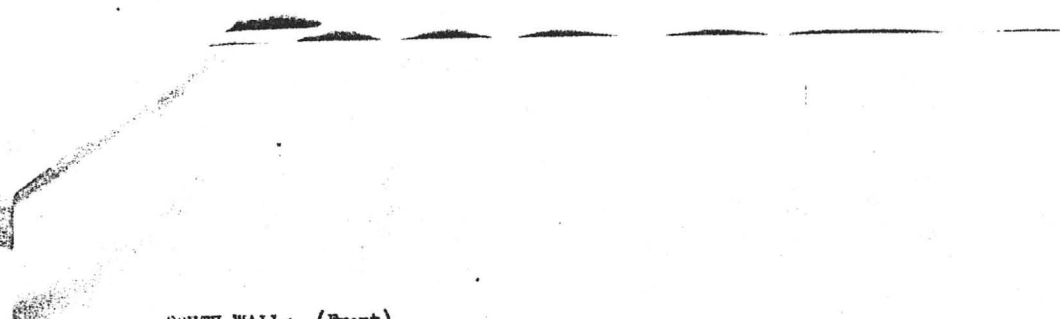
The northwest corner is plumb, both ways, full height.

The Felippi building was constructed after the Small building. The grade of Hull Ave. on which Felippi building fronts is lower than the foot-grade of the Small building and accordingly Felippi excavated up to the wall and soil under the Small building and constructed a concrete wall against said soil and wall, thus forming the easterly and southerly walls of the Felippi building. This concrete wall was extended against the Small building to the top of the wall which made a double wall in each case. Both of these Felippi walls are plumb and in good condition, showing no cracks. The west and north walls of the Felippi building appear in 1st class condition, no blemishes, some pouring scars, no cracks, no twist and not leaning. The Felippi concrete walls probably contain scrap steel re-inforcing. The



WEST WALL Continued.

north west corner of the Felippi building is plumb both ways. The north wall is plumb. The building is three story well constructed. This additional description of the Felippi building is considered advisable due to its close physical relation with the interior walls of the Small building.



SOUTH WALL: (Front)

This wall constitutes the business front of the building. It has the usual appearance of store fronts. The frame work of this wall is entirely of wood between the ends of the east and west walls. The two stores are separated by a partition wall used as a bearing for the front frame work. The front is covered with sheet metal finishing above the ceiling level and metal cornice covers the top of the wall, the balance is stucco above footing.

Between the top of the plate glass display windows and the store ceiling, across the whole front, a transom sash has been built in. A wooden girder forms the lintel above this sash. This girder has pulled away from the west wall two inches toward the east.

The stucco work and concrete wals approaches to the doors, are in bad condition due to light construction and cracking. An automobile has hit the west plate glass corner post of the west store room, it is stated. The lean of the corners at both ends of the front or south wall has been recorded in description of west and east walls at their south ends. The plate glass corner post and sash show a more pronounced leaning than the building corners due to their light construction.

The studding in the front above sash is 2x4 with 1x8 bracing. It appears to be very light construction. The horizontal members appear to be level as the top of wall on the roof is level.

The plate glass on east side entrance to east store is cracked. Both front plate glass of the west store room are cracked.

INTERIOR OBSERVATIONS:

Basement or First Floor.

The space under the east store room for a distance of forty feet north is unfinished and appears as the usual substructure of a building. One original girder ran lengthwise of the building and under the partition wall between the two stores. This girder consists of 3 two by 12 planks nailed together, and is supported by similar post placed at about ten feet centers with no diagonal bracing. The floor joist rest on this girder and the outside wall. The joists are 2x12 spaced sixteens apart. The original work did not provide additional support for these joists.

When the bakery oven was placed on the business store room floor about 30 feet from the front, a 12 foot girder consisting of three 2x6 was placed under the oven for additional support. The bakery oven was set up practically opposite the bow in the east wall and may have been a cause of its failure, due to its weight.

A fire centered near the northeast corner of this ground floor section, and ranged upward to the roof. After this fire, three additional rows of girders were placed under the two store rooms. These girders were 4x6, with similar post irregularly spaced. The fire was not sufficient to wreck the building however on this floor the wood was scorched, and the east wall was subject to considerable heat.

The rear section of space under the east store remained unfinished until a three room apartment was built in. These rooms were constructed in the ordinary manner wooden partitions, plastered walls and ceilings, with matched 1x4 Oregon pine flooring. The floor joist are 2x6 on 24 inch centers. The girders are two rows of 2x6 with 2x6 posts for support. Post rest on wooden blocks resting on the ground. The girders and posts are not tied to the building concrete walls and posts have no diagonal bracing. The work in building this apartment shows poor construction methods and the sagging in this apartment is due to that alone. The chimney is in good shape.

Basement or 1st floor continued.

The walls and ceilings of the apartment show the plaster needs repairs. The walls require about 50 percent replacement and the ceilings 100 percent. These repairs are not warranted until substructure of apartments is rebuilt.

Under the rear of the west store room, a basement room was built in later. This room is finished with 1x4 pine partition walls and the plain concrete of the outside walls. The ceiling is open, showing the 2x12 joist of the business store room floor. The floor is 1x4 Oregon pine on joists, in good condition and level.

A one inch crack in concrete east wall appears about 22 feet south from the northeast corner. This crack is not visible on the outside due to adjoining building above, and Haskin wall at the same level. There is no offset to this crack.

The crack at the bow in the east wall description shows through the wall. The east wall is plumb 25 feet south of the northeast corner, inside S. E. apartment room.

A 1/4 inch crack appears 15 feet from front on west wall, a one inch crack appears 24 feet and 1/4 inch crack appears 37 feet from said corner. No offset shown in these cracks. A 1 1/4 inch crack appears 51 feet from front. This crack shows offset, the south section of wall offsets to east one half inch. A crack at the northwest corner appears similar to outside description. The inside corner shows separation to one half height of room. Wall against Felippi wall east and west is in good condition, also wall against Felippi running north and south.

INTERIOR OBSERVATION

East Store Rooms on Second Floor.

The walls adjoining the Felippi building are in good condition. The ceilings of the rear half of the east store room are cracked, show signs of roof leakage, and water caused cracks. Ceiling in front of store in good condition. The partition wall of this store is in good condition. Cracks appear opposite rear half.

There are no cracks in the walls other than mentioned. The crack at the bow in the east wall does not show through the brick into the store room.

I observed a cord of split oak piled up on this floor about twelve feet from N. E. Corner, and about a ton of lump coal in a box at the north-west corner of the store room.

WEST STORE ROOM:

The walls adjoining the Felippi building are in good condition. The ceiling is in fair shape, shows some water stain in front and also in rear portion. The partition wall is in good condition. These walls are all plastered, also ceiling.

A one inch crack appears 24 feet from front, ranging upward this crack is 18 feet from front. This wall is brick. The crack appears to be a continuation of the crack observed in concrete mentioned heretofore. A 1 3/4 inch crack appears 51 feet from front, but does not show offset as mentioned in concrete foundation below. The rear wall leaves ceiling being two inches wide at the west wall and tapering toward partition. This is apparently caused by crack at 51 foot point. The outside crack at N. W. corner of building does not show inside on this floor.

The west wall leans as follows at respective distances from front.

At 8 ft. 1 1/2 in 28

24 ft. 5/8 in 28

40 ft. plumb

64 1/4 in 28 this is N. W. Corner



A lightly constructed mezzanine floor has been built in at the rear of this store room. This floor is not tied to the building walls.

CEILING AND ROOF OBSERVATIONS:

The ceiling joist are 2x6 on two foot centers. The rafters are the same. The joist bear on the partition wall and east and west building walls. The walls are 12 inch brick to the joists and 8 inch from there up to the top. The joist having a bearing of 8 inches on the walls. Rafters have a bearing of three to four inches.

The studding on the partition wall is 2x6, solid bridging construction. Four rows of cross bracing ceiling joist to rafters have been built. One row at each wall and one row on opposite sides of the partition wall. Odd pieces of lumber averaging 1x6 were used for this work.

The fire area between roof and ceiling over east store room extends about twenty feet west from east wall, and north of south wall from 25 to 45 feet. Ten rafters and ten joists were repaired by placing parallel 2x6 material alongside, with additional diagonal bracing. The joist and rafters were badly burnt however still holding their form.

The roof is one inch solid covered decking. Composition roof covers this decking.

A crack 24 feet from front shows through the wall on the west. Another crack            feet from front on the inside of the building is not visible here.

Question No. 1:

In view of the defective conditions of the said property, which you have just found, is this building, in your opinion, safe for occupancy at this time?

Answer:

This building is now safe for occupancy. Future examinations should be made to determine conditions of safety for occupancy.

Question No. 2:

In view of the defective conditions of said property which you have just found, will this condition, in your opinion, without regard to ordinary depreciation, become worse in time and if so will the conditions develop rapidly or slowly?

Answer:

This condition will continue to become worse, unless natural or mechanical means are encountered or used to offset movements. The change in conditions may be at irregular intervals, however the rate may be decreasing from rate of past observations, over any period of time.

Question No. 3:

What has caused or contributed to these defective conditions:

Answer:

- A. Bearing capacity of earth and rock over-rated.
- B. Footings have not been placed on firm caliche or bed rock.
- C. No uniformity of distribution of pressure between footings and caliche or bed rock.
- D. Footings of building insufficient for rating assumed.
- E. Lack of re-inforcing in footing.
- F. Undermining of footings by Town of Jerome, Haskins and Felippi.
- G. Lack of sufficient posts, diagonal bracing, and girders under floors.
- H. Lack of re-inforcing in concrete foundations.
- I. Lack of bond between southerly ends of west and east walls.
- J. Workmanship throughout sub floor of apartments very poor

K. Damage caused by fire.

L. Damage caused by overloading floors with coal and wood storage.

Question No. 4:

If this building had been constructed at the place where it now stands at the time at which it was constructed and the faulty construction or causes of the defective conditions you have mentioned had not existed, and ordinary maintenance work had been done on it, what, in your opinion would be the present condition of this property:

Answer:

Good.

A F F I D A V I T

STATE OF ARIZONA, )  
                          ) ss.  
COUNTY OF YAVAPAI. )

J. William Waara, being first duly  
sworn, deposes and says:

That he is the person who subscribed his name to the foregoing statement; that he has read the foregoing statement and knows the contents thereof; that the foregoing statement truthfully states the facts as he found them at the date of said statement, and the conclusions from those facts at which he arrived at the date of said statement; and that while the said facts and conclusions are fresh in his mind he now certifies that they are true in detail, in substance and in fact.

William Waara

Subscribed and sworn to before me this -3rd-  
day of October, 1935, A. D. 1935.

[Signature]  
Notary Public.

My Commission Expires 5-15-38.

A F F I D A V I T

STATE OF ARIZONA. )  
                          ) ss.  
COUNTY OF YAVAPAI. )

Chas. W. Sauer, being first duly sworn, deposes and says:

That he is the person who subscribed his name to the foregoing statement; that he has read the foregoing statement and knows the contents thereof; that the foregoing statement truthfully states the facts as he found them at the date of said statement, and the conclusions from those facts at which he arrived at the date of said statement; and that while the said facts and conclusions are fresh in his mind he now certifies that they are true in detail, in substance and in fact.

Chas W Sauer

Subscribed and sworn to before me this -3rd-  
day of October, 1935, A. D. 1935.

[Signature]  
Notary Public.

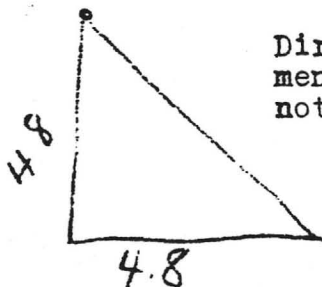
My Commission Expires 5-15-38.

Waara April 16, 1937

HIGH SPOTS: BY WAARA

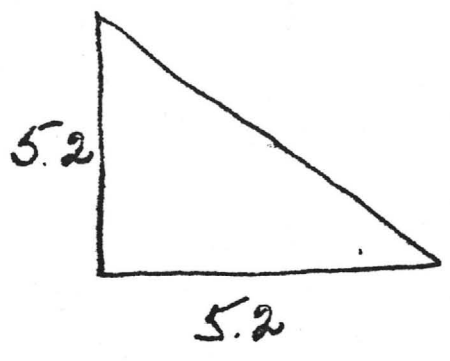
- (1) Movement of Zone A, South side being in compression, (not in direction of ore body).
- (2) Movement of Zone C, a separate movement, under Zona A's slippage plane.
- (3) Movement of bed rock in Zone D above Carlson residence, also under four houses directly below 3 tanks.
- (4) No visible sign of separation of Zone C from stationary ground.
- (5) Ground movement at Little Daisy Shaft, at first considered due to waste dump, may be related to Zone "C" movement.
- (6) Man Hole below road at Florencia crack has dropped more than ground at triangulation point, near crack above road.
- (7) Level profile of P. D. maps just above main ore body shows greater subsidence over leasterly section than that over section closer to fault. Why?
- (8) Movement in Zone C is S. E. whereas, subsidence over 1407 country should influence movement to N.E.
- (9) P. D. level records show drop and horizontal movement

at Hospital



Direction of horizontal movements at these two points was not shown on sheet shown us.

At Miller's Store

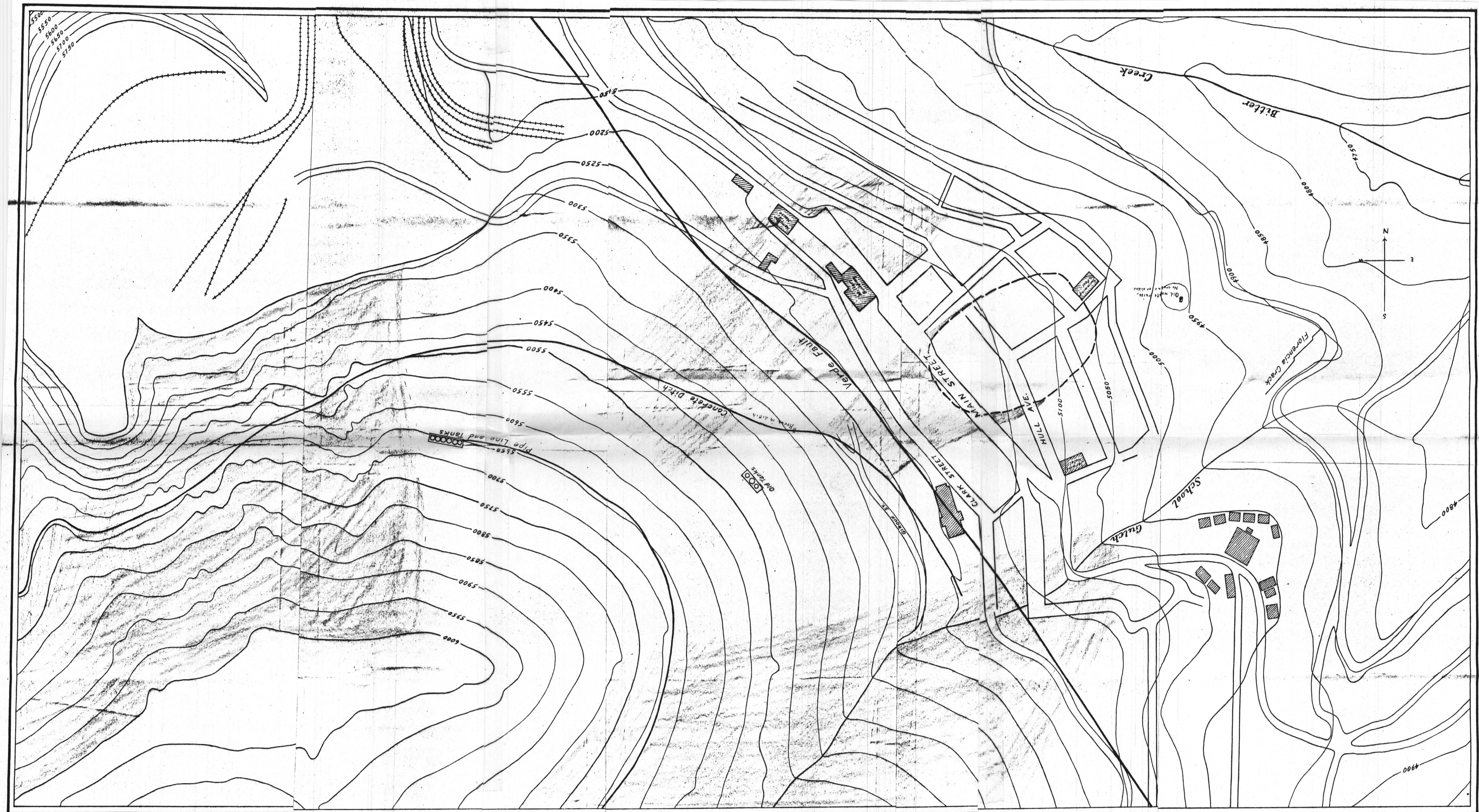


A distance of 750 ft. separates these two points.

- (10) P.D. model of U.V.X. definitely shows Florencia fault striking south of Main ore body and intersecting fault. This model and Florencia fault as shown, greatly encourages block faulting theory.
- (11) Strike and dip of slippage plane in Zone A.

Phx. 4/19/37

Has the portal of Bitter Creek gone down as much as at the fault?



**CAUTION**  
 This is a Reduction  
 from the Original  
 Scale.

**TOWN OF JEROME AND VICINITY**

Artificial Drainage Zone from broken Ditch & Pipelines.  
 Natural Drainage