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DATE: January 24, 1994

TO: ASARCO - Tucson, Arizona

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ATTN: Mark Miller

FROM: Tench C. Page : 702-851-3177

NO. PAGES: 13 Incl.

RE: SME publication on Yarnell as per conversation.

Regards,

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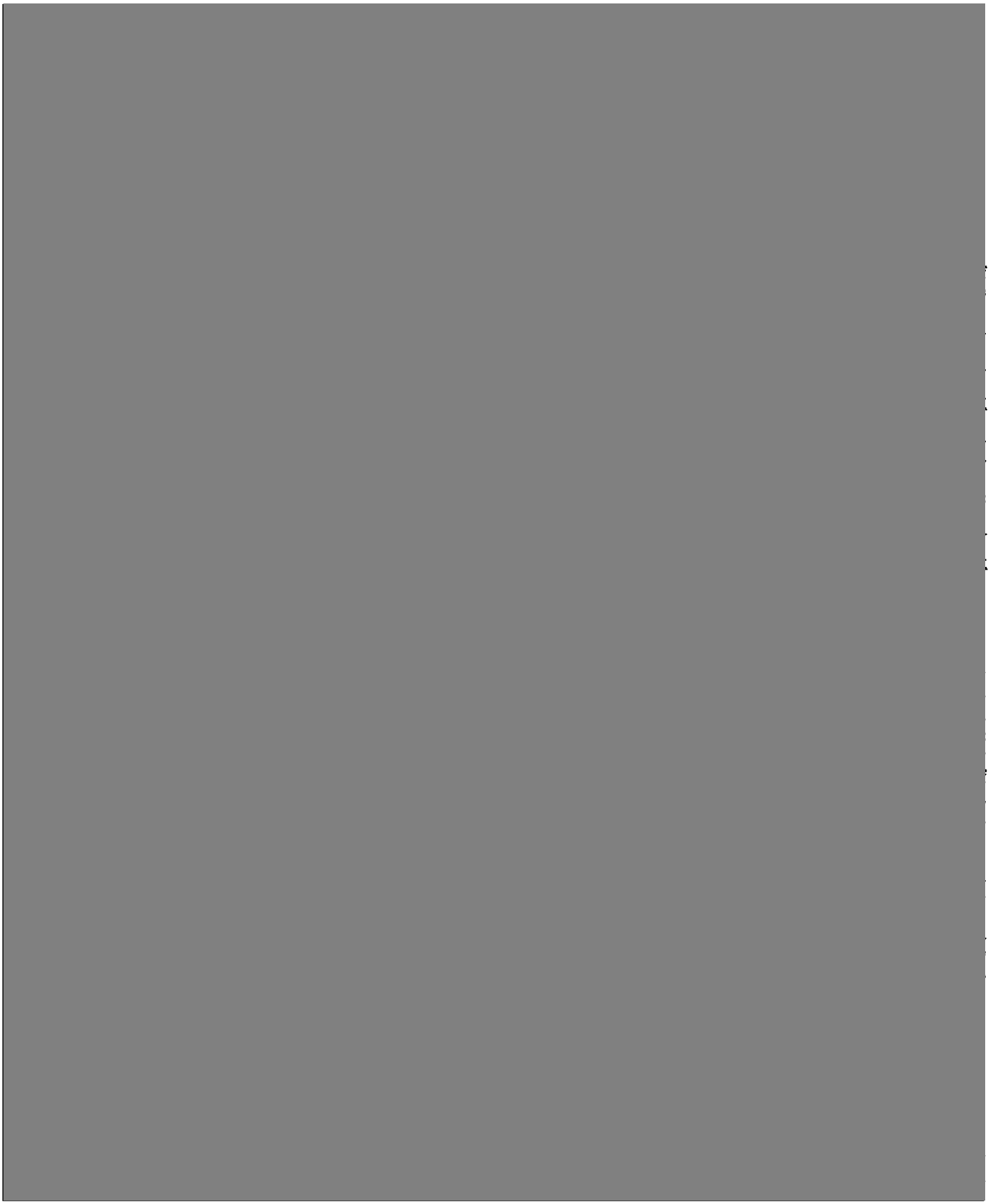

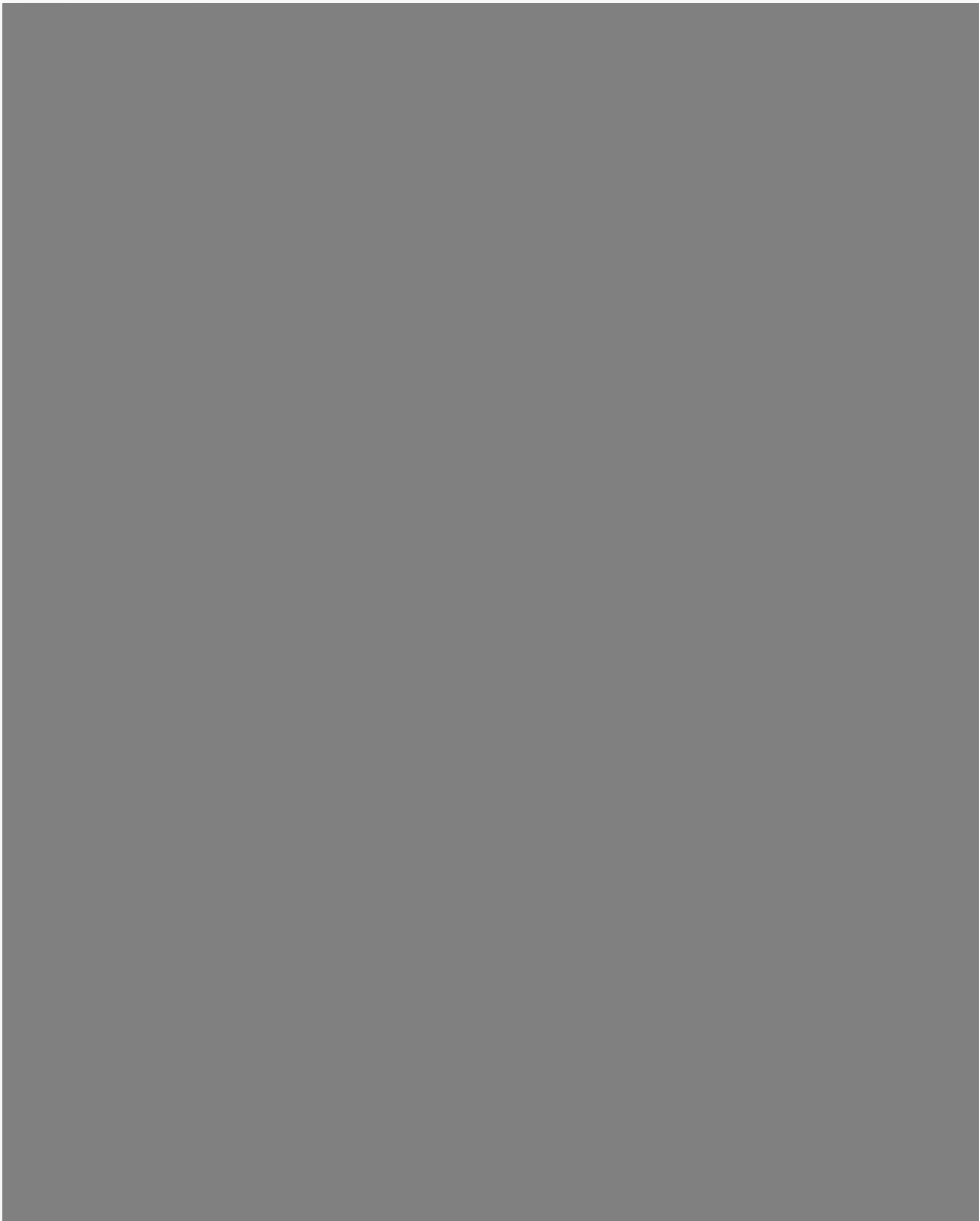

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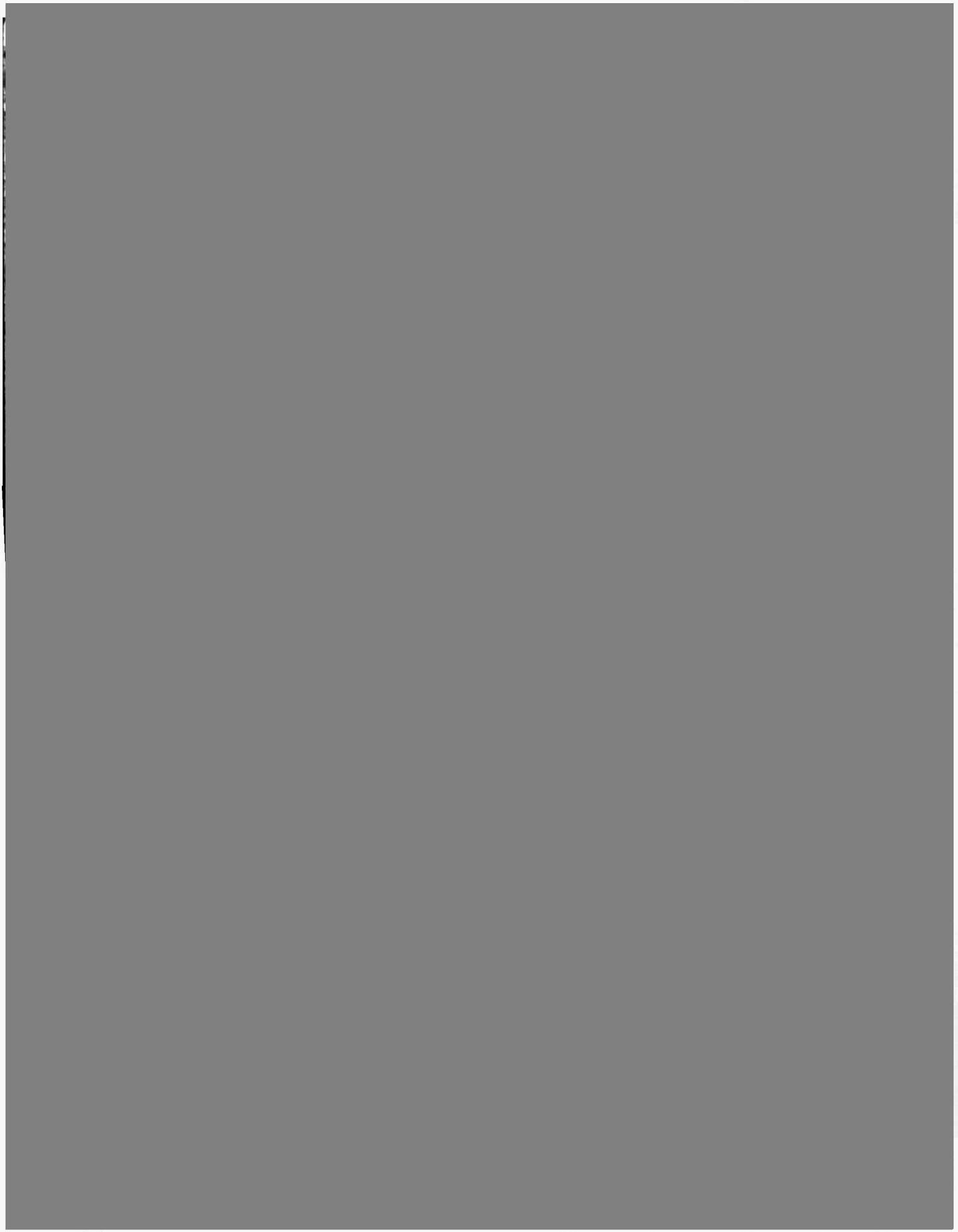

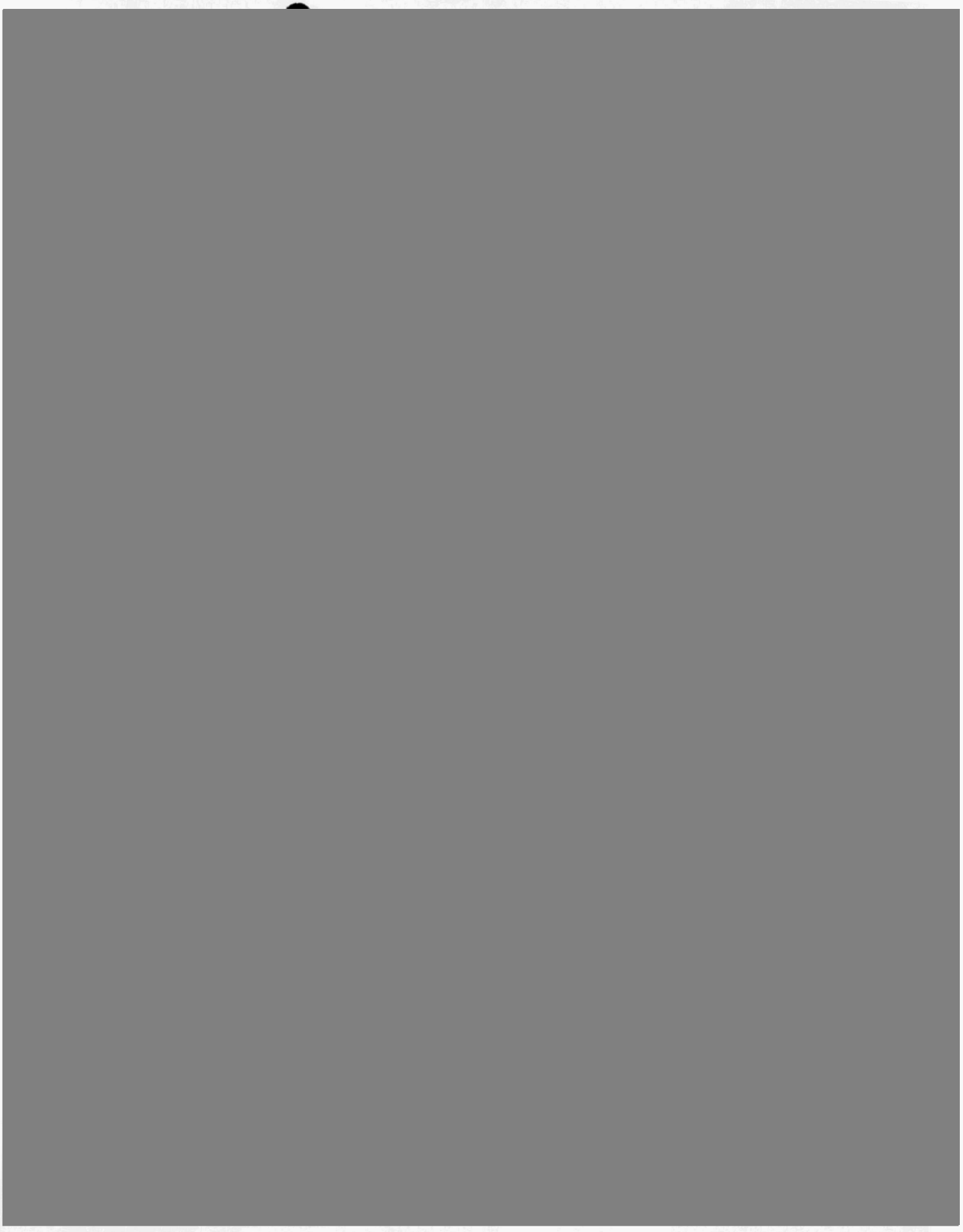

James D. Sell
PO Box 5747
Tucson, AZ 85703

Ralph A. Brandt
5104 E. Van Buren, Nr. 2047
Phoenix, AZ 85008-7021

September 18, 1997

Dear Mr. Sell,

I read an article in the September 1994 issue of *Mining Engineering,* which you had co-authored. The title of the article was "Geology and geochemistry of the Yarnell gold deposit." The article said that references are available from the authors. Could you please send me the references to this article?

I am particularly interested in any information that I can get about the Rich Hill Granite. I am associated with an individual who wants to re-open the Johnson Mine.

Sincerely,

Ralph A. Brandt

Ralph A. Brandt

involved may have been highly evolved. Salinities of 10 weight percent or less are far below those expected from more nearly pristine magmatic fluids yet are higher than salinities common to most epithermal environments. The actual origin of the mineralizing fluids and the source of the gold within the deposit remains conjectural.

The large variations in composition of the fluid inclusions from the Yarnell deposit are similar to variances described for mesothermal gold deposits in which fluctuations in pressure are thought to have resulted in the unmixing of immiscible H_2O- and CO_2-rich fluids from a CO_2-rich parent fluid (Robert and Kelly, 1987; Goldfarb, et al., 1988). Either unmixing or fluctuation between dominantly reducing and dominantly oxidizing conditions (as evidenced by deposition of both pyrite and specularite) may have resulted in gold deposition within this part of the system.

The 69 Ma age determination falls within the period of Laramide metallogenesis, which occurred between ca. 75 Ma and ca. 50 Ma (Titley, 1986) within this region. Laramide intrusives, such as the intrusive at Bagdad, that occur within the general region may have either provided magmatic components and/or increased geothermal gradients that focused the hydrothermal system. Several of these intrusives are related to precious metals deposits that are peripheral to the intrusive centers (Titley, 1986). The more felsic dikes and sills found within the area of the Yarnell deposit also suggest that Yarnell may be peripheral to a deep-seated intrusive. More work is clearly needed if the actual origin and chemical constitution of the mineralizing fluids, and the physical and chemical processes involved in deposition of gold and other elements are to be understood.

Acknowledgements

Appreciation is extended to the staff and management of Asarco Inc., Norgold Resources Inc. and Bema Gold Inc. for permission to publish this paper. A number of company reports were used, and we would collectively thank those who contributed to the project. We would also thank Bill Gay, Steve Keehner, John Malusa and Jim Rasmussen for their contributions.

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9/22/97

Dear Mr. Brandt:

Dietrich several years ago from ASARCO, and they were good enough to forward your letter to me.

Here is the references, which were published in an earlier paper published in the Transactions Vol. 294, 1993. The Sept '94 article was a modified copy of the Transactions article.

Sincerely
James D. Sell

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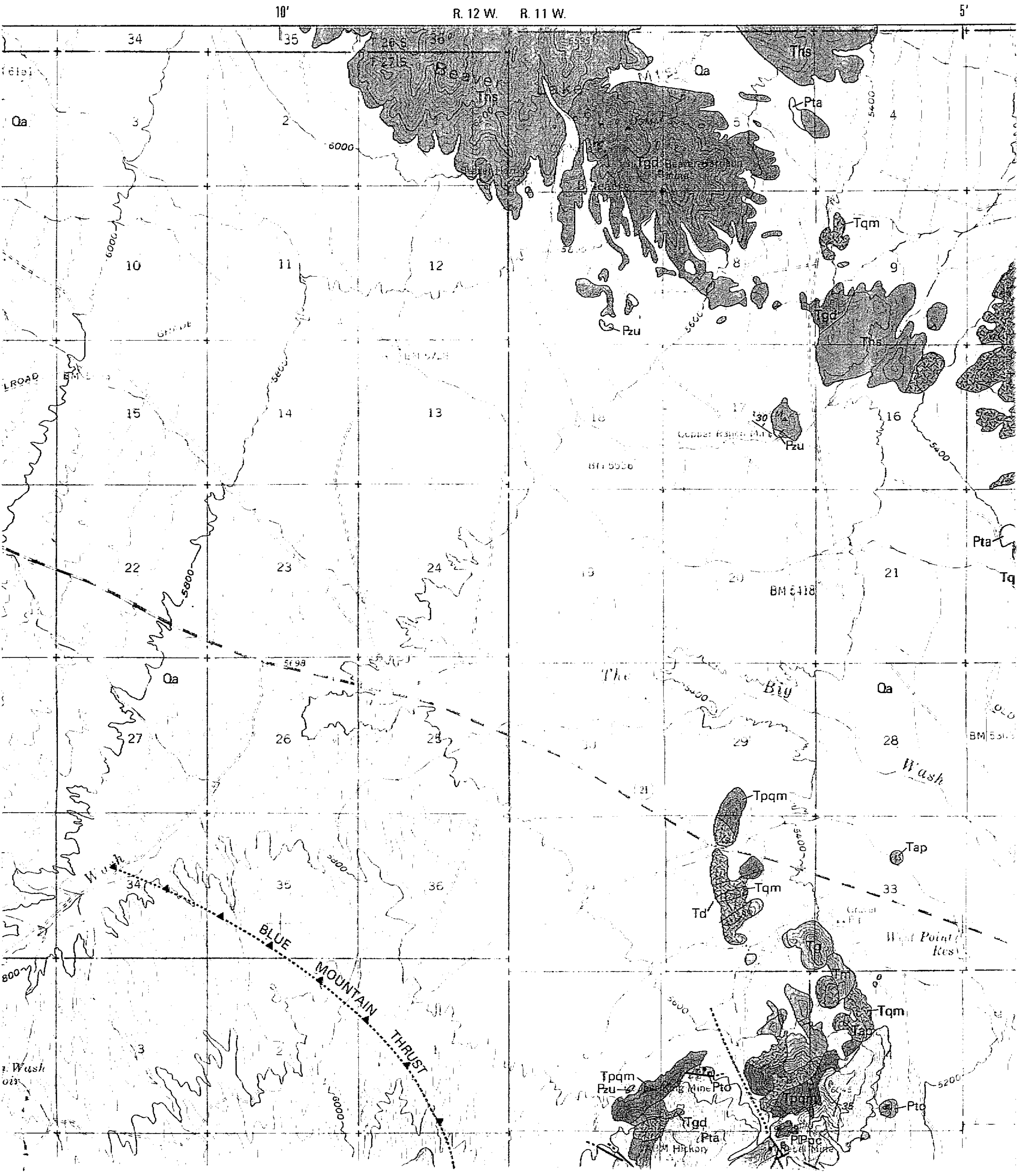
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