

Montana Bureau of Mines and Geology, MBMG, two reports:

1. Montana **Ground Water Assessment** Atlas No. 4, Groundwater Resources of the Lolo-Bitterroot Area: Mineral, Missoula, and Ravalli Counties, Montana, **published 2013.**

http://mbmg.mtech.edu/mbmgcat/public/ListCitation.asp?pub_id=31614&#gsc.tab=0

2. Montana Bureau of Mines and Geology Open-File Report 759. **Groundwater Quantity and Quality** near Hamilton, Montana, published April 2023.

https://mbmg.mtech.edu/mbmgcat/public/ListCitation.asp?pub_id=32556&#gsc.tab=0

Suggested Recommendations:

1. That the DEQ Evaluation Criteria for **Water Quantity** be amended for proposed developments. Specifically, require that that any existing Well Data used to support proposed new development include **ONLY** existing Well Data from wells that are:

(a). within the same Aquifer, AND

(b). have same Geology, as the parcels of land under consideration.

[Note: Well production, e.g. "gpm", is a function of the Type of aquifer, AND the Geology of the soil].

2. For **Water Quality**, DEQ's review Criteria for proposed developments include an "Arsenic Risk Assessment" evaluation. This criteria would examine whether the proposed development is located within bedrock which contains naturally occurring Arsenic (*example: large portions of the Sapphire Mountain range*). Those land parcels, found to be within this type of bedrock, would be subject to a separate, special review process to determine the probability of introducing arsenic to downstream aquifers, wells, and surface water features.

3. Consider having DEQ consult with MBMG regards their finding for arsenic. *[e.g. MBMG's laboratory testing of the water near Willow Creek, Ravalli County near Hamilton revealed levels of arsenic higher than EPA standards, see MBMG 2013 report].*

4. Consider having a Montana agency and/or Montana Bureau of Mines and Geology plot a Geological Map to isolate the locations within the State of Montana where Arsenic laden rock is found. *Example: the state of New Hampshire has specific Geological maps identifying the physical locations and boundaries of their rock containing Arsenic. These maps educate & inform the public, and guide the review and decision-making by local planning authorities and their DEQ.*

MBMG Open File-Hamilton Report 759, page 5

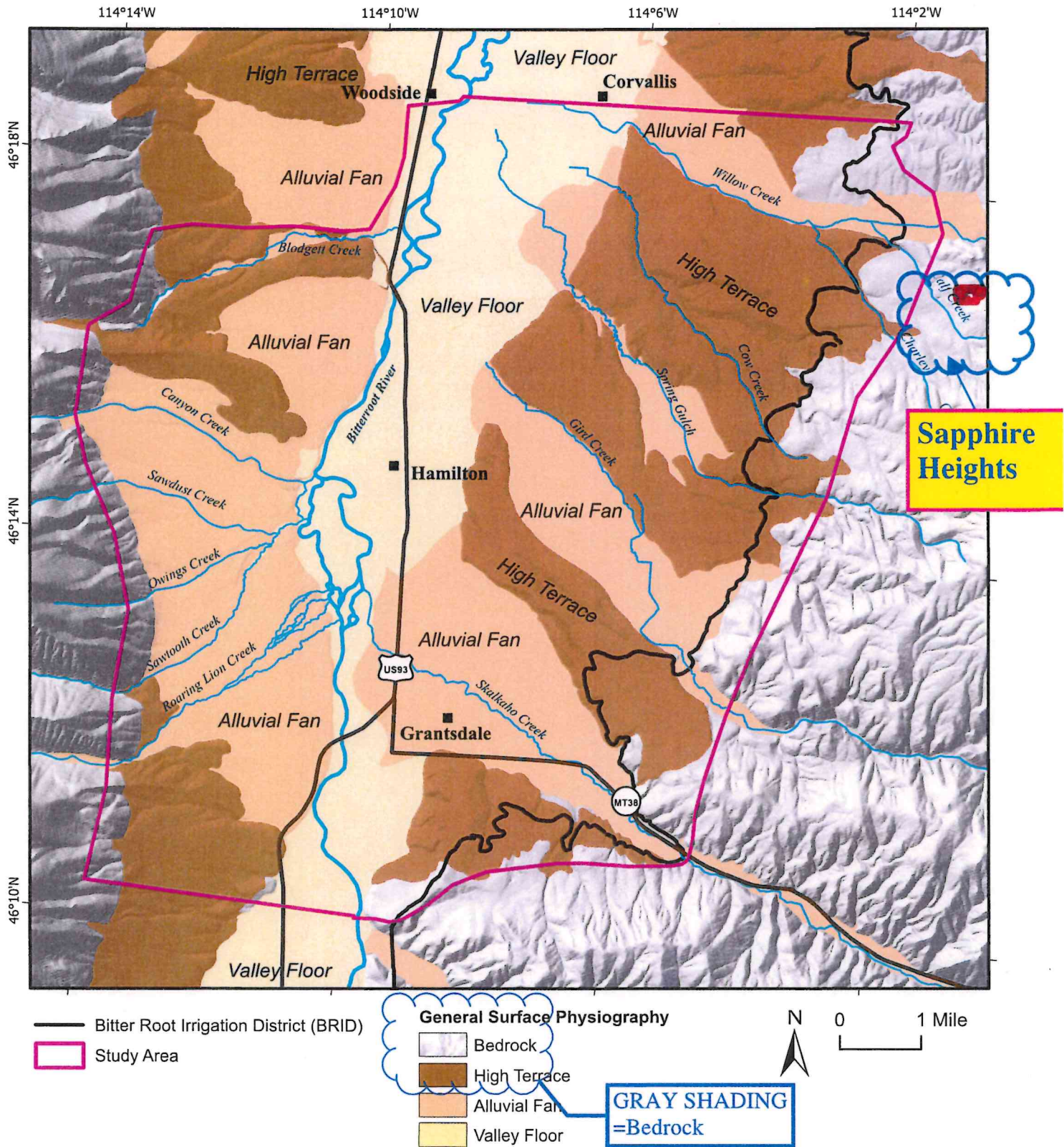


Figure 3. General physiography of the study area: the Bitterroot Mountains are to the west and the Sapphire Mountains are to the east. High terraces and alluvial fans flank the approximately 3-mi-wide valley floor. Adapted from Lonn and Sears (2001).

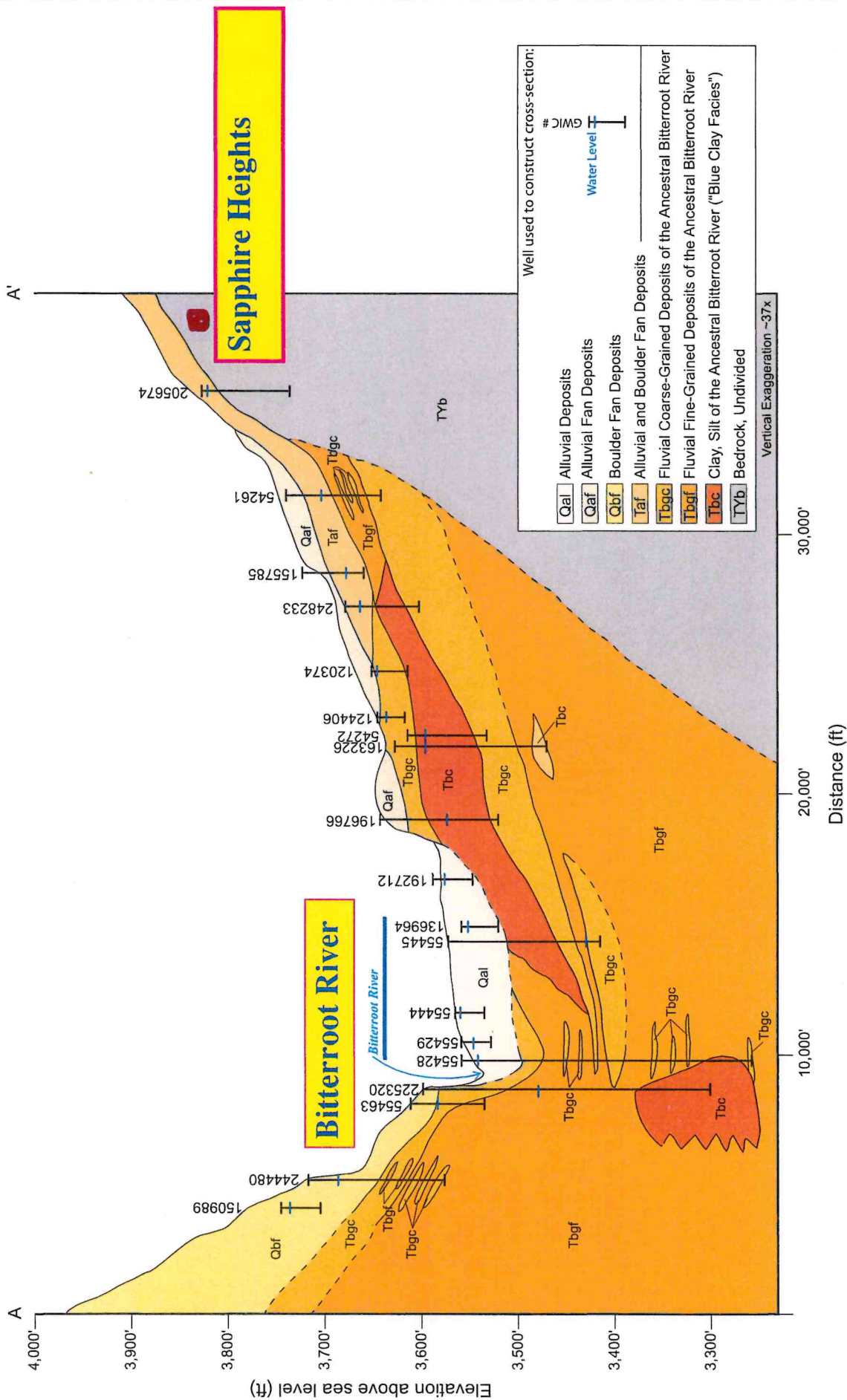


Figure 9. Cross-section A-A' through study area (see figure 5 for location of cross-section). The deep basin-fill aquifer units (generally Tbgc, Tbgf, and Tbc) underlie the shallow basin-fill aquifer units (generally Qal, Qaf, Qbf, Taf). The Ancestral Bitterroot deposits (Tbgc, Tbgf, and Tbc) and Taf can be a part of the shallow or deep basin-fill aquifers depending on the location. The bedrock aquifer (TYb) flanks the valley sediments.

MBMG-WQR 2013, page 18
also see page 8 of same report for description of these **three Types of Aquifers.**

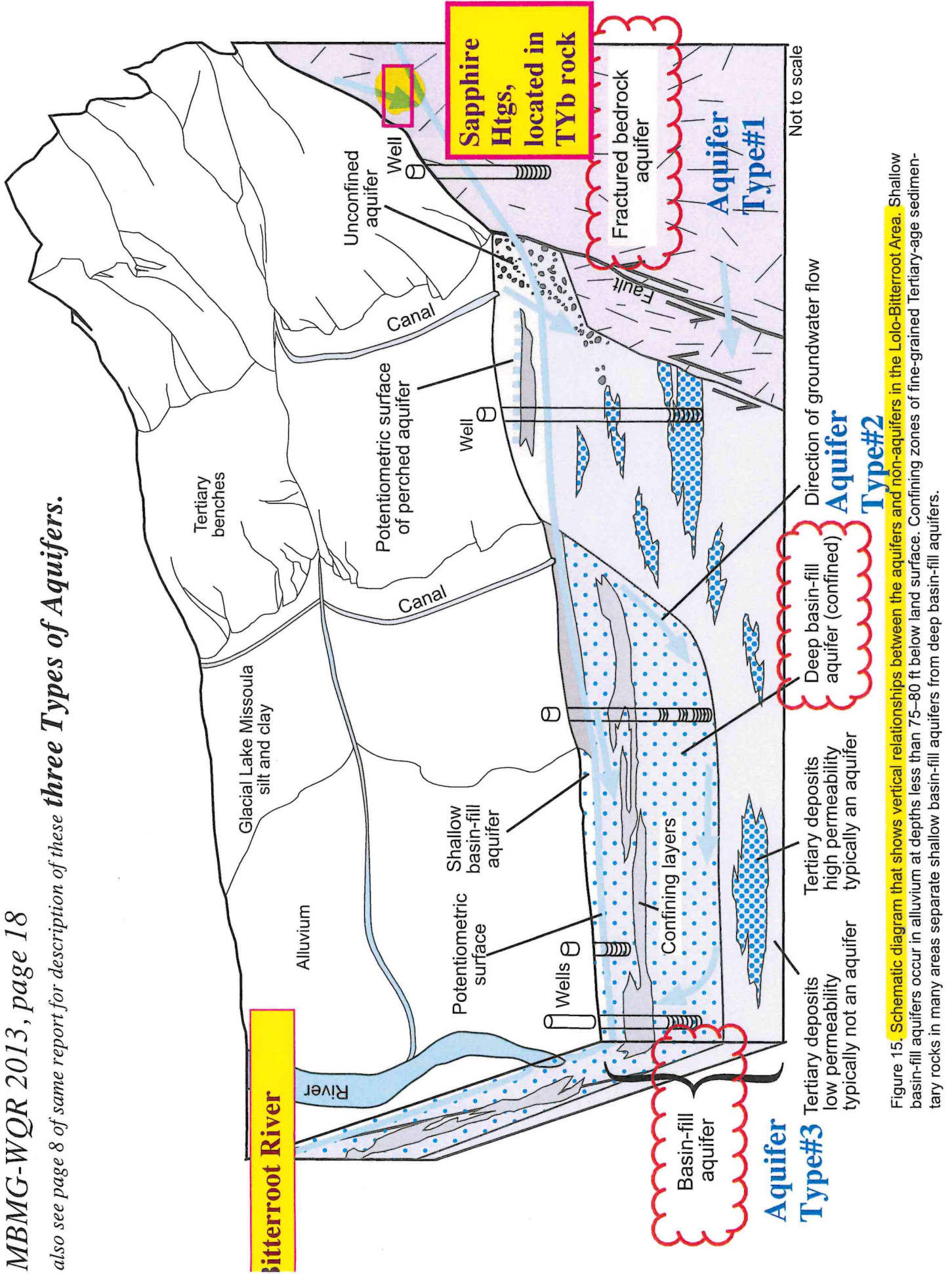


Figure 15. Schematic diagram that shows vertical relationships between the aquifers and non-aquifers in the Lolo-Bitterroot Area. Shallow basin-fill aquifers occur in alluvium at depths less than 75–80 ft below land surface. Confining zones of fine-grained Tertiary-age sedimentary rocks in many areas separate shallow basin-fill aquifers from deep basin-fill aquifers.

Larry N. Smith

Figure 1. Note. This map is part of the Montana Bureau of Mines and Geology (M&G) General Geologic Map of the Lolo-Bitterroot area. The map shows water-shed boundaries. It is intended to show the attitude of the bedrock surface in the Bitterroot Valley. The map is intended for use as a reference in the study of the geology of the Bitterroot Valley and the Lolo-Bitterroot area. It is not intended for use as a substitute for a detailed geologic map of the area. The map is intended for use as a reference in the study of the geology of the Bitterroot Valley and the Lolo-Bitterroot area. It is not intended for use as a substitute for a detailed geologic map of the area.

INTRODUCTION

The distribution of bedrock in the Lolo-Bitterroot area is important for understanding the geology of the area. The map shows the attitude of the bedrock surface in the Bitterroot Valley. The map is intended for use as a reference in the study of the geology of the Bitterroot Valley and the Lolo-Bitterroot area. It is not intended for use as a substitute for a detailed geologic map of the area.

DATA SOURCES AND MAP CONSTRUCTION

Data used in constructing the attitude of the bedrock surface were derived from a variety of sources. The map shows the attitude of the bedrock surface in the Bitterroot Valley. The map is intended for use as a reference in the study of the geology of the Bitterroot Valley and the Lolo-Bitterroot area. It is not intended for use as a substitute for a detailed geologic map of the area.

DISCUSSION

The attitude of the bedrock surface in the Bitterroot Valley is important for understanding the geology of the area. The map shows the attitude of the bedrock surface in the Bitterroot Valley. The map is intended for use as a reference in the study of the geology of the Bitterroot Valley and the Lolo-Bitterroot area. It is not intended for use as a substitute for a detailed geologic map of the area.

ACKNOWLEDGMENTS

The work was supported by the Montana Bureau of Mines and Geology. The map and text were prepared by Larry N. Smith.

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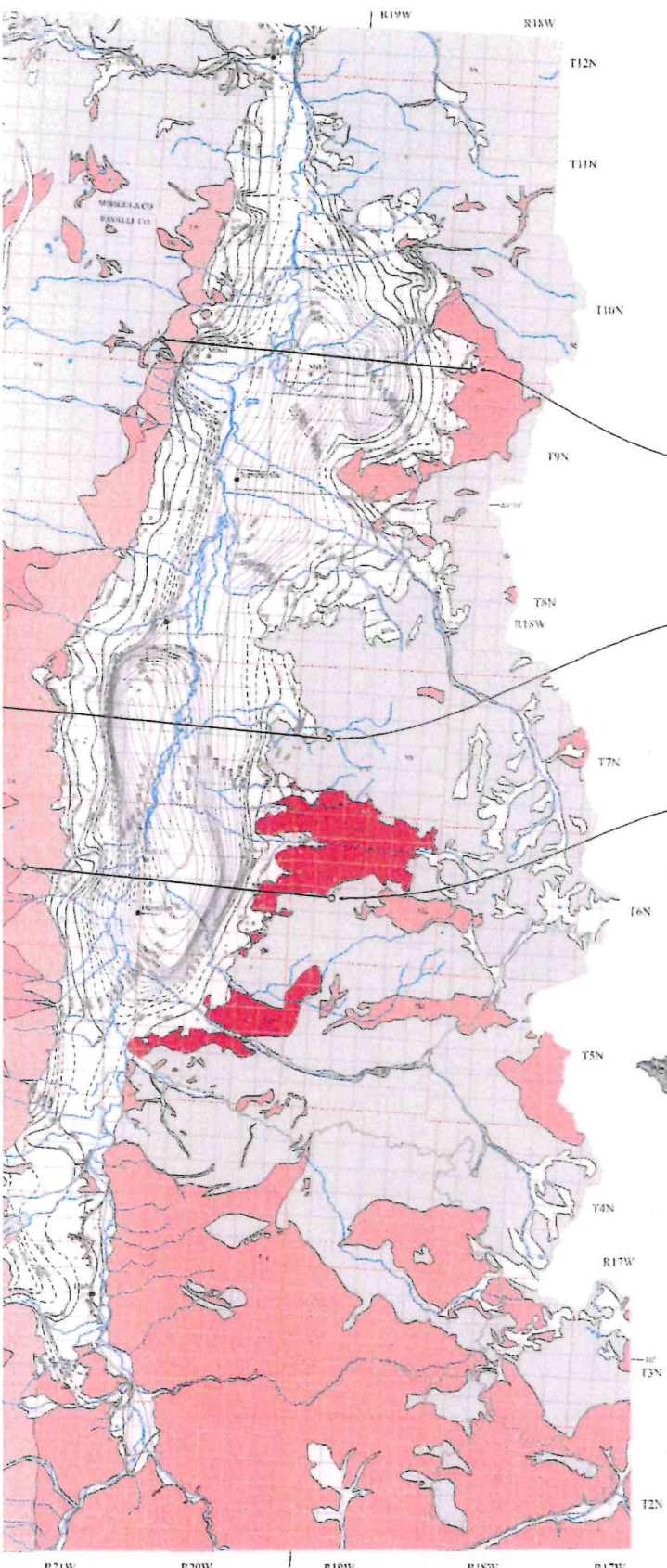


Figure 1. Attitude of bedrock in the western part of the Lolo-Bitterroot area.

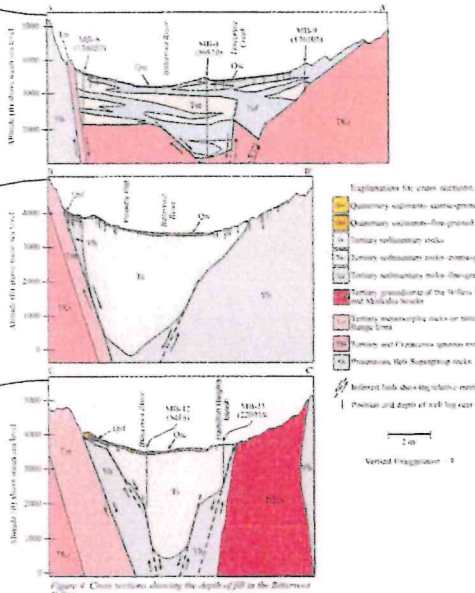


Figure 2. Cross sections showing the depth of fill in the Bitterroot Valley.

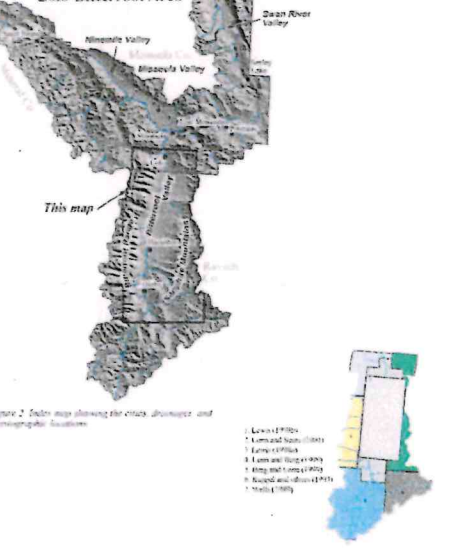


Figure 3. Index map showing the area from which contours were compiled.