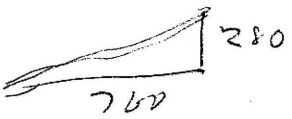
copy for Lehi

$= \frac{280}{700}$



21°

$\tan \_\_ = \frac{280}{700}$

December 14, 1998

Mack G. Croft
10562 North 6250 West
Highland, UT 84003

Dear Mack:

Thank you for showing us around the Johnson Pass quadrangle. It was a great day. The weather was excellent and the geology fascinating. Field trips, with the chance to spend a day in the field with other geologists and to learn from someone who knows the geology of the area so well, are always my favorite part of this job.

Of course, the main purpose of the field review is to review the field mapping early enough to provide constructive feedback while you are still in the field stages of the work. Following are some general comments that I hope will be helpful for you. We discussed some of these in the field.

- You have obviously worked out a lot of thorny stratigraphic and structural problems and resolved many discrepancies between the various old maps of the area. My impressions were that you have a good handle on the strata in the quadrangle.

- We talked about mapping some of the key marker beds and the Long Trail Shale. John Welsh sent me the enclosed packet of information that should help you identify and map these.

- The strange high-angle, down-to-the-east fault north of the highway in the northwest part of the quad: Your map shows it as vertical in some places, dipping slightly westward in others, and slightly eastward in others. Your map also suggests the possibility that you are dealing with an unconformity rather than a fault since strata are not greatly offset, and are basically in correct stratigraphic order. It would be worth the effort to try to constrain the attitude on this fault/contact through detailed field mapping and measurements.

- The same fault appears to cut the big block of Great Blue north of the highway, but seems to pass under the low-angle fault bounding the block of Great Blue south of the highway. There is a problem with cross-cutting relationships in this area. Could the big block of Great Blue north of the highway have been emplaced later than, and cover, the high-angle fault?

- We discussed the possibility that your low-angle thrust faults are actually low-angle, top-to-the-west detachments faults. This theory does a better job of explaining your younger-over-older thrust relationships. You may want to explore this idea further.

- Dotted faults by definition are covered and can't serve as contacts. If these faults are older than the surficial deposits, then the surficial deposits cover them. Its extremely rare to have the geologic contact and the fault in exactly the same place. If they are in the same place in a spot or two, show the dotted fault directly on top of the contact. Having seen your field area, I'm sure the bedrock/surficial contact wanders back and forth whereas the faults are straighter. This has very important earthquake hazard implications, and its important that we clearly show whether the fault cuts the surficial deposits or not.

- You really need to have more strikes and dips in such a structurally complex area. Also, if you can show the axes of the minor folds, it will help constrain the structural interpretation.

- As we discussed, more surficial deposits need to be mapped. There is a lot of alluvium and colluvium in the mountains that needs to be mapped. Its hard to give a deposit size limit, but in general, we map key surficial deposits down to a few tens of feet across, and general alluvial deposits down to roughly 80 feet in average diameter; we generalize colluvial deposits since they are ubiquitous in an area like this, but we map larger deposits that obscure bedding and contacts. We consider the surficial deposits to be very important - they are where most geologic hazards occur, where most construction occurs, and they are important construction resources. When I look at your map and see the Manning Canyon as 100% exposed, I know something is wrong. The Manning Canyon is never well exposed in Utah - we're lucky to find a few scruffy outcrops in the bottom of a wash somewhere. Its much more useful to show the user where those few outcrops are and mapped the rest as colluvium, landslide, and/or alluvium. Likewise, to a lesser extent, with other formations. It seemed to me that most north slopes especially were at least 50% covered. Most small washes are choked with mixed alluvial and colluvial materials, which we map as Qac.

- Are there remnants of the QTf unit on the low Oquirrh hills on the east side of the range? Also, I think you can divide the QTf unit into at least two map units based on age, older and younger, and possibly three.

- The relationship between the QTf unit and the bedrock is one of the most important relationships in the quadrangle. We saw at the stop high on the east flank of the mountain that QTf deposits are present west of the fault scarp and are offset by the fault, whereas younger alluvial material in the washes was not cut. These deposits and relationships, and similar deposits, need to be mapped. This will be critical in unraveling Quaternary fault history of the quadrangle.

- We discussed the possibility of another basin and range fault out in front of the Oquirrh hills on the east side. We could see a lineament on the photos. You may want to investigate this further.

- Several of your contacts need to be refined. They climb up and down contours and don't V in streams and washes properly. Remember that the map will be published with a very fine 6x0 line - any slight errors on the original will be greatly magnified on the published map. Make sure that any place someone might try to do a 3-point solution, they will get the results you intend. In places where you can't actually see the contact, calculate its position to reflect your intended dip angle. I recommend drafting the contacts with a 3x0 rapidograph. Also, I suggest using fewer dashed contacts - reserve dashed contacts for places the contact is very approximated.

- I suggest dividing the Qs unit. It looks on the map like it is strongly reworked in places by alluvial processes. I suggest Qes - eolian sand, and Qae - mixed alluvial and eolian sand. Also, can you see older alluvial or lacustrine deposits poking through the Qs in places?

I've enclosed a couple of maps from Dave Miller and Lehi, the leading experts on Great Basin mapping. I propose you use these maps as models for your mapping, and try to approximate their detail in mapping surficial and bedrock units and contacts. I also suggest using their Lake Bonneville deposits nomenclature. Also, Lehi told me he would be glad to provide advice and suggestions. He is even happy to go out into the field with you. I hope you will take advantage of his help - he is often a lot of help to me. He has a lot of good ideas on how to improve geologic maps, and has a good sense for what needs to be mapped.

I hope you find these suggestions helpful. You've made a good map, have worked out a lot of complex stratigraphic and structural issues, and have done a lot of nice work. With the suggestions above, you will have an excellent publication. This area is seeing a lot of increased interest due to some of the military and environmental concerns at the military bases, and this map is going to be very valuable and often used.

We haven't yet received your air photos, but we should have them soon.

Best regards

Grant C. Willis
Mapping Program Manager

cc:
Jon King
Lehi Hintze
Bob Biek