| Project: | | | Requesting Agency: |
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| Investigation of faults near Sage Creek Junction solid waste disposal site, Rich County, Utah | | | Bear River Association of Governments |
| By: Barry J. Solomon | Date: 7-7-93 | County: Rich County | Job No: 93-07 |
| USGS Quadrangle: Woodruff (1414), Randolph (1439), Sage Creek (1464) | | | |

## INTRODUCTION

Rich County is developing a Solid Waste Management Plan (SWMP) to ensure adequate capacity for disposal of municipal solid waste during the next thirty years or more. The preferred option in the SWMP is the continued use, and eventual expansion, of the present landfill site near Sage Creek Junction (attachment 1). Minimum performance standards for the proper management of solid wastes in Utah have been proposed (Utah Department of Environmental Quality, 1993), and the SWMP must be consistent with these standards, if implemented. Proposed rule R315-302-1, section (2)(b)(i) states, "A new facility or a lateral expansion of an existing facility shall not be located within 200 feet of a Holocene fault unless the owner or operator demonstrates...that an alternative setback distance of less than 200 feet will prevent damage..." (Utah Department of Environmental Quality, 1993, p. 8). Roger C. Jones, Executive Director of the Bear River Association of Governments, is assisting Rich County in the development of the SWMP, and was notified of mapped faults at the Sage Creek Junction site (Dover, 1985) which may be of Holocene age. At the request of Mr. Jones, a field investigation was conducted to determine if Holocene surface rupture occurred along these faults and if further investigations are necessary to address fault hazards.

## GEOLOGIC SETTING

The landfill site is about 1.5 miles (2.4 km) northwest of Sage Creek Junction, in the eastern foothills of the Wasatch Range west of the Bear River (attachment 1). The first comprehensive geologic map of the site and vicinity (Richardson, 1941) shows the lower slopes of the foothills adjacent to the valley floor covered by Quaternary, unconsolidated deposits of "hill wash," consisting of fragments of outcropping rocks in the highlands. Upper foothill slopes are underlain by the Eocene Wasatch Formation, consisting primarily of conglomerate and sandstone, with lesser amounts of shale, limestone, and tuff. Richardson (1941) did not map any faults near the site.

The area was later remapped by Dover (1985), who revised the Tertiary stratigraphy to reflect units described by Oriel and Tracey (1970) in the Fossil Basin of southwestern Wyoming, about 20 miles (30 km) to the east. Dover (1985) also mapped rocks underlying the upper foothill slopes as the Wasatch Formation, but assigned isolated tuffaceous outcrops on the lower slopes to the overlying Eocene Fowkes Formation. Where lower slopes are covered

by younger deposits, the surficial material was mapped as Holocene gravel, "derived as a lag concentrate from erosion of nearby or underlying rocks" (Dover, 1985, p. 1). Significantly, Dover also mapped numerous northwest- and northeast-striking normal faults in the foothills. The northeast-striking faults on the lower slopes trend toward and through the landfill site. Most of these faults, including those that intersect the site, offset only Eocene rocks. The Wasatch and Fowkes Formations are commonly in fault contact, although the formations are rarely in depositional contact with apparently east-dipping beds of the Wasatch Formation underlying those of the Fowkes Formation. However, some of the faults between the towns of Randolph and Woodruff, between 10 and 16 miles (16 and 26 km) south of the site, are mapped by Dover (1985) as offsetting the Holocene gravel. Because these faults indicate possible Holocene movement and connect with faults in Eocene rocks at the landfill site, it is possible that faults at the site may have actually moved during the Holocene despite the absence of Holocene material there to indicate such recency of movement.

## DISCUSSION

I investigated two lines of evidence to determine the potential for Holocene faulting at the site. Faults in Eocene rocks on-site were inspected for evidence of Holocene faulting, and faults to the south were inspected to determine if faulting actually offset Holocene material as mapped by Dover (1985).

On-site faults in the Wasatch Formation separate resistant, coarse-clastic rocks on northwestern, upthrown blocks from similar rocks on the lower slopes of southeastern, downthrown blocks which are overlain by less resistant fine-grained rocks. Fault traces were inspected to determine the qualitative degree of scarp degradation. Initially steep fault scarps are degraded by weathering to progressively gentler and more rounded slopes through time. A number of variables affect the degradation, but one of particular significance at the landfill site is the physical properties of the material. Conglomerate and sandstone of the Wasatch Formation are competent materials that, if recently offset, should resist degradation. Topography in the immediate vicinity of the fault traces, represented by a slope break and ephemeral stream channel, was rounded. This suggests that on-site faults are older than Holocene, although their precise age cannot be determined.

Faults to the south of the landfill site were also mapped at a break in slope. However, whereas faults between Woodruff and Randolph are shown by Dover (1985) as offsetting Holocene gravel as well as rocks of the Fowkes Formation, faults to the north between Randolph and the landfill site, also mapped at a break in slope, are shown by Dover (1985) as concealed beneath the gravel, offsetting rocks of both the Wasatch and Fowkes Formations. Inspection of both areas did not reveal any scarps with topographic appearances to suggest Holocene offset, indicating that faults in both areas, if present, are not Holocene but significantly older.

Rounded topographic benches on either side of fault traces between Woodruff and Randolph are capped by a gravel veneer which is a lag concentrate from erosion of underlying conglomerates in the lower Fowkes Formation. Soil on side slopes is silty, typical of residual soils on fine-grained rocks in the Fowkes Formation. The erosion-resistant conglomerates are apparently the reason for preservation of the benches, and may either be the same bed at different elevations separated by a pre-Holocene fault, or different beds at two stratigraphic levels, in which case a fault may or may not exist. Rock exposures are nonexistent in the immediate vicinity of the fault, and shallow dips of rocks further away are inconclusive for structural interpretations.

## CONCLUSION

The term "gravel" as used by Dover (1985) is somewhat of a misnomer for the map unit on the lower foothill slopes between Woodruff and Randolph. The unit should probably be mapped as the Fowkes Formation, offset by pre-Holocene faults. The "gravels" of Dover (1985) are actually a residual soil formed by in-place weathering of the underlying Fowkes Formation after subaerial exposure of the unit. There is no evidence that the residual soil has been faulted during the Holocene, nor is there evidence that Eocene rocks have been subjected to Holocene faulting either on-site or to the south. The landfill site satisfies the performance standard related to Holocene faulting (Utah Department of Environmental Quality, 1993) and further work to consider these faults is not necessary.

## REFERENCES

Dover, J.H., 1985, Geologic map and structure sections of the Logan 30' x 60' quadrangle, Utah and Wyoming: U.S. Geological Survey Open-File Report 85-216, scale 1:100,000.

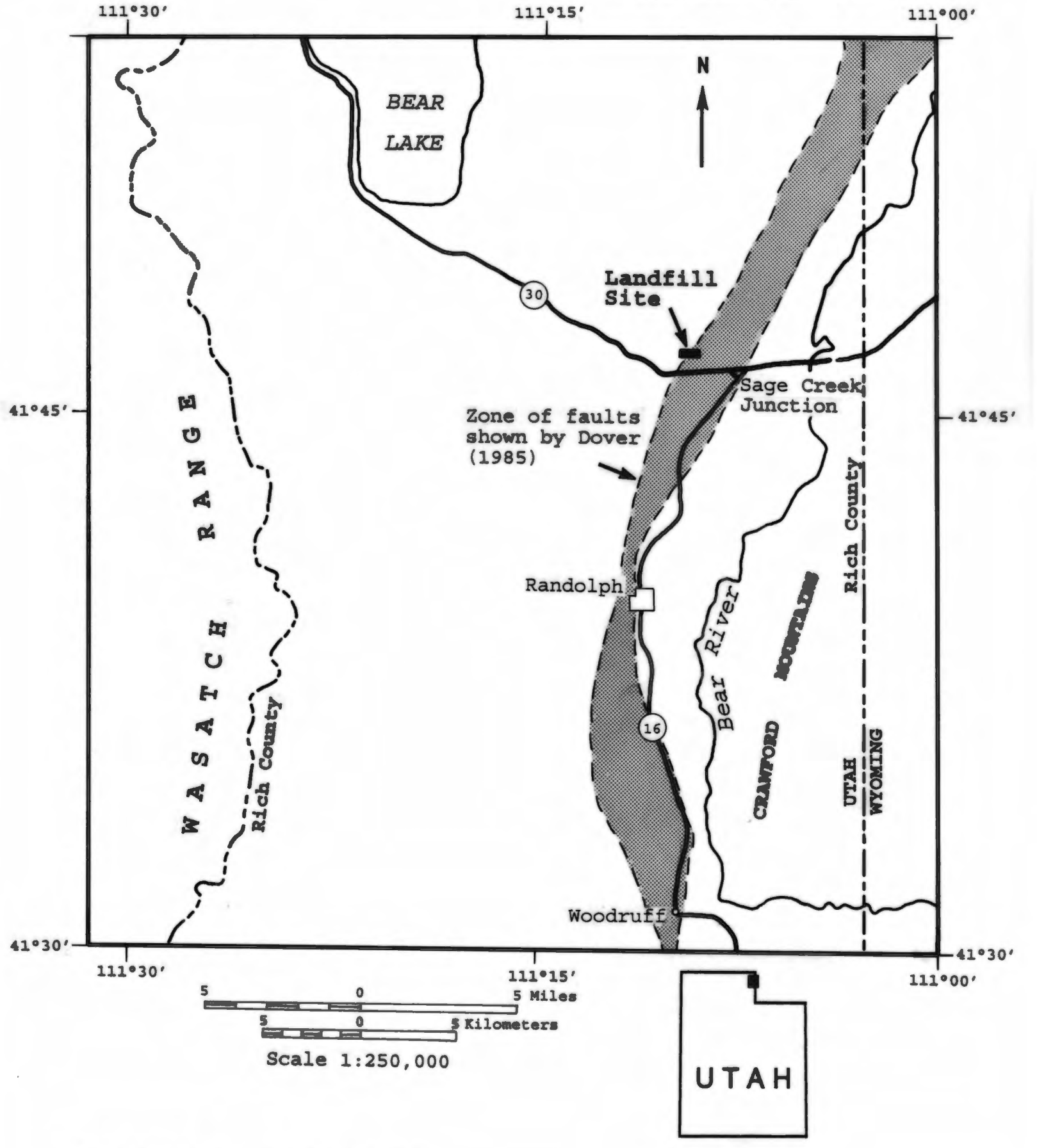
Oriel, S.S., and Tracey, J.I., Jr., 1970, Uppermost Cretaceous and Tertiary stratigraphy of Fossil Basin, southwestern Wyoming: U.S. Geological Survey Professional Paper 635, 53 p.

Richardson, G.B., 1941, Geology and mineral resources of the Randolph quadrangle, Utah-Wyoming: U.S. Geological Survey Bulletin 923, 54 p., scale 1:125,000.

Utah Department of Environmental Quality, 1993, Proposed administrative rules -- solid waste permitting and management rules -- R315-301 through 319: Salt Lake City, Utah Department of Environmental Quality, Division of Solid and Hazardous Waste, 78 p.

Attachment 1 Job No. 93-07

Base Map modified from OGDEN U.S.G.S. 1° x 2° topographic quadrangle.




Attachment 1. Location map.

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