NOV - 8 1989

MEMORANDUM FOR: John Starmer, Section Leader
Technical Branch
Division of Low Level Waste Management
and Decommissioning, NMSS

FROM: Joel Grimm, Geologist
Technical Branch
Division of Low Level Waste Management
and Decommissioning, NMSS

SUBJECT: TRIP REPORT: GEOLOGICAL DATA REVIEW, GRAND JUNCTION AND RIFLE, COLORADO, UMTRA PROJECT DISPOSAL SITES

On October 18-20, 1989, I traveled to Albuquerque, New Mexico, to visit the U.S. Department of Energy (DOE) Uranium Mill Tailings Project Office. The purpose of the trip was to review data derived from geological samples collected from the proposed disposal sites for Grand Junction (Cheney disposal site) and Rifle (Estes Gulch disposal site), both in Colorado. My observations are summarized in this report. The complete data derived from the review are included in my working site files, and will provide NRC staff with input to complete an independent analysis of site characteristics. The observations I made will become a significant part of my Technical Evaluation Reports, issued upon review of DOE's final remedial action documents.

I performed the data review by observing samples stored by DOE's contractors at laboratory/warehouse facilities in Albuquerque. I was assisted in the data review by Gerald Lindsey and Donald Metzler. Dale Hammermeister assured that all of the samples were delivered from the sites in time for my review. The samples in question consist of drill core collected at the sites during site characterization and installation of monitoring wells. The borings were sampled with continuous core from the top of bedrock to total depth. My observations were recorded as lithologic logs of the core, or in the case of one deep boring, lithologic descriptions of selected intervals of the hole.

From our previous meetings with DOE, and review of DOE submittals, it is evident that success of proposed remedial actions will rely in part on the stratigraphic and lithologic characteristics of bedrock underlying the disposal cells. My observations are valuable because unweathered bedrock outcrops are not found at the disposal sites.

Grand Junction - Cheney Disposal Site

As you already know, the Cheney site consists of colluvial and fluvial deposits overlying Cretaceous Mancos Shale. On May 5, 1989, DOE and its contractors presented us with new interpretations of hydrostatigraphic conditions of the site, and a new disposal cell design to account for a number of assumed technical shortcomings of the site. The new design relies in part on characteristics of bedrock.

I selected core from four newly drilled borings located in the area of the revised disposal cell location. Well locations are indicated in the enclosures. Each of the holes was completed to approximately 200 foot depth. One was drilled at a 30° angle from vertical, designed to indicate vertical fractures if they are present beneath the site. In addition, another hole was bored to a depth exceeding 880 feet deep penetrating the entire Mancos section and some of the underlying rocks.

The upper 10-15 feet of each core consisted of deeply weathered shale. Core recovery here was poor, generally less than 70%. The rock was extremely fractured, shattered, and softened by weathering or by the drilling process. The shale was weathered to light grey to yellowish-brown color, probably indicating the oxidation of iron. The rock is at least slightly mineralized with carbonate. Also, fractures and partings contain growths of both calcite and gypsum crystals.

Below this uppermost unit, the cores indicate a thin transitional less-weathered zone. The shale becomes more uniformly dark grey, fractures are less common and predominantly coincide with bedding planes. Within 20 feet of the bedrock surface, all the core samples indicate that the Mancos consists of hard, dense, dark grey claystone. The rock remains weakly calcic and pyrite crystals are commonly observed on fresh breaks. Naturally occurring fracture spacing is about 1 per foot or less, and fresh fractures caused by drilling and handing commonly expose fossil imprints. In each hole, no significant stratigraphic or lithologic variations occur to at least 200-foot depth.

The hole drilled at an angle of 30° successfully penetrated a fracture or fault zone approximately 90-100 feet down the hole, or 45-50 feet horizontally from the hole. I note, however, that the fracturing and crumbling of the core samples could have been induced by technical difficulties encountered during drilling. It is important to report here that circulating fluid was lost in some of the holes, and drillers were required to switch to air-rotary drilling. This information leads DOE's consultants to believe that rock fractures are common enough to provide substantial ground-water flow paths.

Finally, the hole drilled to 880 feet provided samples of lithologies other than the typical Mancos claystone. Below 805 feet, the rocks become black organic shale, non-dense vitreous black coal, and a variety of hard and dense green and grey claystones and siltstones. These deep rocks have no carbonate, and the claystones probably represent weathered ash deposits.

Rifle - Estes Gulch disposal site

The proposed disposal site consists of silty and sandy pediment deposits overlying steeply dipping Eocene Wasatch Formation rocks on the flank of Grand Hogback (see my site visit trip report dated October 12, 1989). I selected

Distribution: Central File # WM-64 and WM-62

NMSS r/f	LLTB r/f	JSurmeier	JGrimm	JStarmer
PLohaus	JGreeves	RBangart	MBell	MDunkelman
FSpane, PNL	DLeske, DOE	FBosiljevac, DOE		

PDR Yes: [✓] No: [ ] Reason: Proprietary [ ] or CF Only [ ]

two holes for logging from this site. Each one was drilled at an 45° angle in order to intersect a suspected fault zone and penetrate a wider variety of rock strata which lie nearly vertical beneath the site.

These cores extended 200 to 250 feet into the Wasatch. In each hole, samples consist mainly of interbedded sandstone and mudstone. The predominant lithology is medium-grained, salt-and-pepper grey sandstone. It is noncalcareous, poorly cemented, porous and permeable, and routinely discolored by mottled purplish clay. The mottling appears to be due to translocation of the clays by ground water movement following deposition. The sandstones contain a few sparse lenses of pebbly conglomerate. The interbedded mudstones are mostly dark purplish grey claystone. Fractures in this rock are mostly polished with clay deposits, display slickensides, and some contain paper-thin deposits of calcite.

The well drilled toward a suspected fault zone succeeded in penetrating a very fractured zone of rocks at 92 to 108 feet. Core recovery was as poor as 10% in most of this interval. It remains to be seen if this data agrees with the suspected location of the fault.

Conclusion

My stratigraphic, structural, and mineralogic observations will be reported to site hydrologists and geotechnical engineers. If you need to discuss my observations in more detail, please feel free to see me at your convenience.

Original Signed By

Joel Grimm, Geologist
Technical Branch
Division of Low Level Waste Management
and Decommissioning, NMSS

Enclosure:
Site Index Maps

OFC :LLTB	:LLTB	:LLTB	:LLWM	:LLWM
NAME:JGrimm/TJ	:	:	:	:
DATE: 11/04/89	:	:	:	:

OFFICIAL RECORD COPY

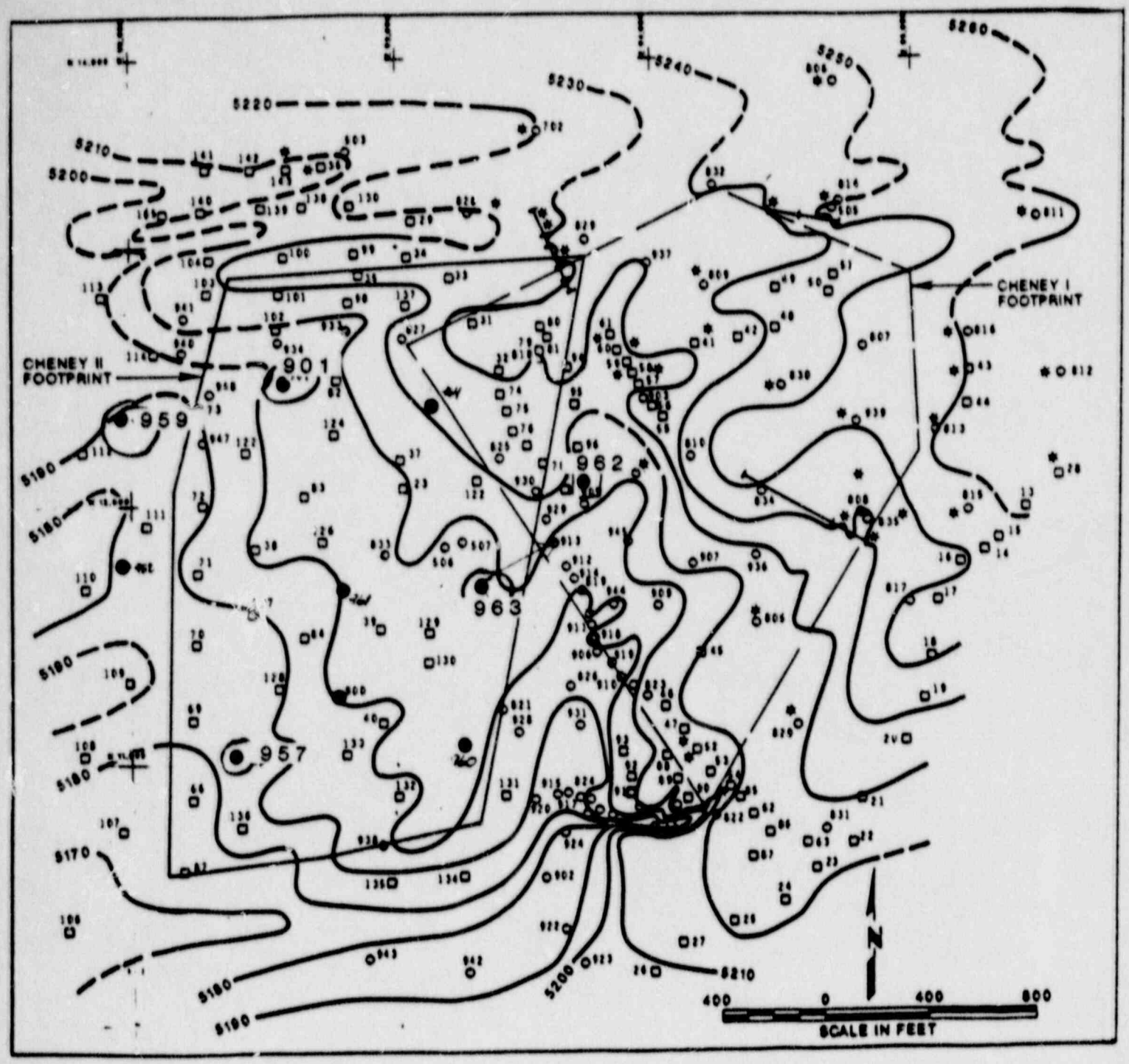

Figure 1: Bedrock contour map of the Cheney disposal site showing the former proposed cell location (footprint I) and revised location (footprint II). Coreholes 901, 957, 959, and 963 were logged, while hole 962 samples were selectively observed. Borehole 963 trends N65E and plunges 60 degrees from horizontal.

Enclosure 2

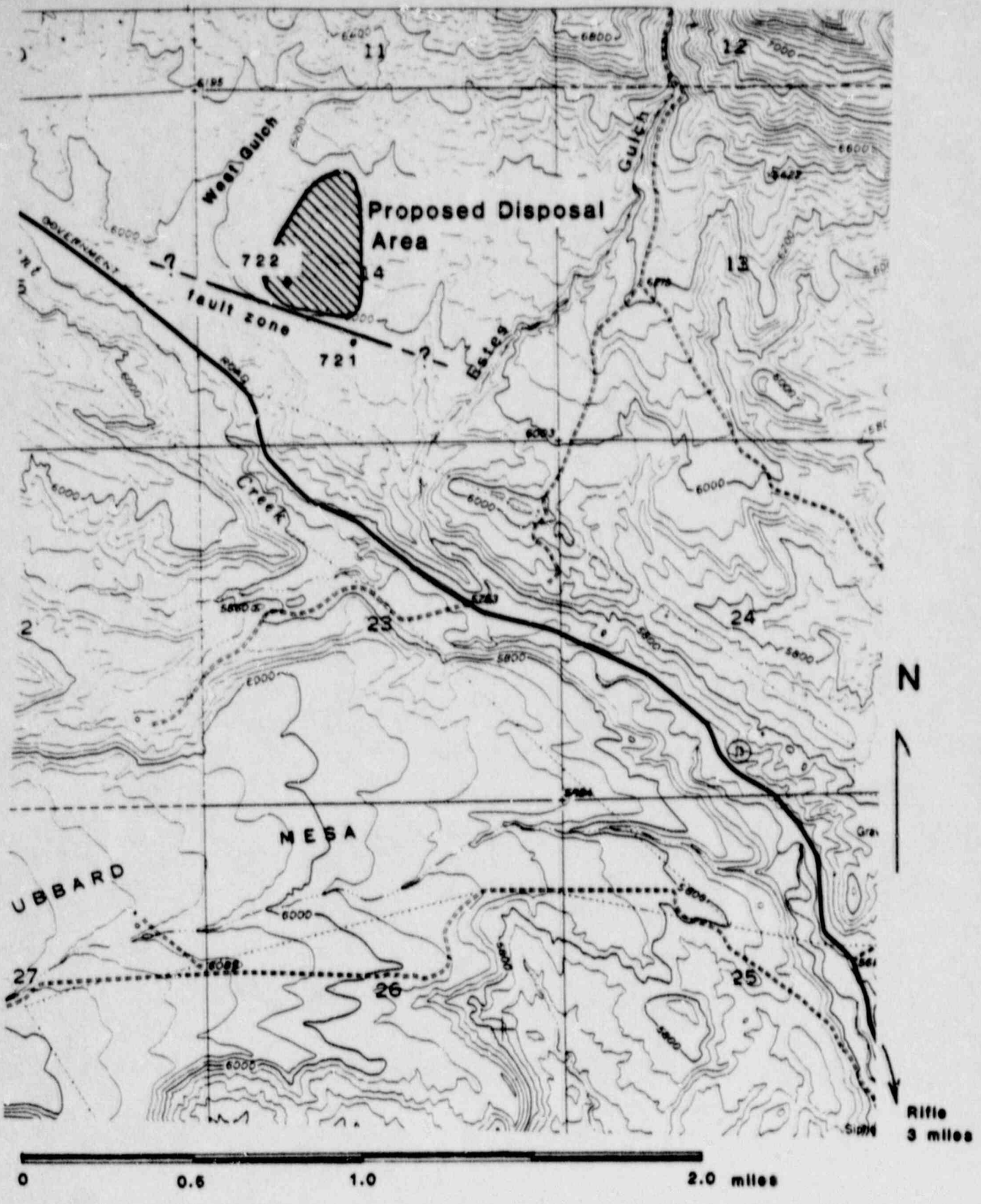

Figure 2: Topographic map of the Government Creek - Estes Gulch area showing the proposed disposal site, suspected fault location, and locations of logged boreholes. The boreholes trend N20E and plunge 45 degrees.