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OFFICE MEMORANDUM

TO : Joseph A. Mohrbacher, H-8 Solid Waste Management

DATE: March 28, 1974

FROM : Margaret Ann Rogers, H-8 MAR

SUBJECT: EQUIPMENT FOR GEOLOGIC STUDIES

SYMBOL : H8-74-137

1481 General

MAGNETOMETERS

The recharge area for the aquifer which provides the water supply for Los Alamos County is the eastern slope of the Sierra de Los Valles. The Tschicoma Formation, a highly fractured series of crystalline rocks, crops out in the recharge area. Water penetrates the Tschicoma and moves in a southeasterly direction. At depth this water moves into the sedimentary deposits of the Santa Fe Group. The sedimentary deposits of the Santa Fe Group interfinger with, or are in structural contact with or interfinger and are in structural contact with the crystalline rocks of the Tschicoma Formation. In the interest of protecting a water supply which will have increasing demands made on it, a better understanding of the relationship between the Tschicoma Formation and the Santa Fe Group would be valuable. Although at this time no new waste disposal sites are proposed near the mountain front, better knowledge of the Tschicoma - Santa Fe relationship could be the determining factor on whether any should be proposed in the future.

Since the Tschicoma-Santa Fe relationship is hidden by several hundred feet of Bandelier Tuff, the relationship cannot be determined by surface geologic mapping. Perhaps the easiest and least expensive approach to the problem of determining the relationship is with a magnetic survey. The magnetic survey could be done by LASL personnel (with the purchase of magnetometers) or could be contracted.

There are various types of magnetometers designed to be operated in specific ways which provide varying degrees of accuracy dependent upon field conditions. If magnetometers are purchased, they should be kept in a designated "field equipment area."

Cost varies: $2500 - $6000

This does not include accessories.

Another approach to determining the relationship is with a refraction seismograph. However, to get readings from the instrument it is necessary to detonate small charges of commercial grade explosives.

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PETROGRAPHIC SAMPLE PREPARATION AND ANALYSIS

A geologic map shows the outcrops (or location) of defined rock units. Before a geologic map can be made the rock units must be defined. Part of the rock unit definition is that the rock unit must be mappable. Mappability is determined by scale. However, the principal part of the rock unit definition is based on lithology --- the physical character of the rock determined megascopically and microscopically.

To determine mappable rock units one goes to the field and observes the outcrop. It is frequently possible to observe several beds (a bed is a unit although it may not be a mappable one) in a single outcrop.

Whether a bed becomes a defined rock unit or several vertically contiguous beds become a defined rock unit is based on similarity or dissimilarity of the lithology of the beds. Sometimes dissimilarity is obvious. One bed forms a cliff; the bed above it forms a slope. One bed (or series of beds) is red; another bed(or series of beds) is buff. One bed is sedimentary in origin; another is igneous in origin. And so on ... Most of the time when doing detailed geologic mapping the physical differences between beds (if any) cannot be readily determined in the field. The procedure then is to take rock samples and prepare them for microscopic study. Even if dissimilarity is obvious in the field, microscopic study provides better lithologic descriptions of the rock units mapped.

The lithology or physical character of a rock unit determines how it will weather, what its ion exchange capacity is and what porosity and permeability characteristics it has. In waste management weathering, ion exchange capacity, porosity and permeability are important items to consider in evaluating a waste disposal practice. The ability to identify lithologies which are adequate or inadequate to contain any particular type of waste affects planning of new disposal sites as well as monitoring of old disposal sites.

In a full scale mapping project considerable space is needed to store rock samples before they are prepared for microscopic study. Preparation of rock samples requires equipment space as well as table space.

Equipment used in preparation of rock samples for microscopic analysis include:

Rock saws such as the AB Cutter Hipa J-3 and the AB Isomet Low Speed Saw.
Cost: $850.00 + $875.00 -- does not include accessories

Vacuum impregnation equipment
Cost: $225.00

Thin section Grinders and polishers
Cost $850.00 -- $1,050
$495.00 -- $595.00
Accessories not included in cost.

Equipment used in microscopic study includes
Stereo microscope for study of rock slabs
Cost $160 -- $450
Does not include accessories

Polarizing microscope for study of thin sections
Cost: begins at $800.00
Does not include accessories.

TRANSIT

When doing geologic mapping it is not always possible to establish one's location and elevation as precisely as one would like using just a U. S. Geological Survey topographic map and aerial photos. A transit is used to establish precise location and corroborate "educated guesses." It can also be used to establish elevation as can an altimeter. Because altimeter readings are affected by diurnal temperature changes, the transit may be the preferred instrument for elevation determination at a particular time.

Both the transit and its accessories and the altimeter should be kept in a designated "field equipment area."

Transit cost varies: $550.00 -- $825.00
Cost does not include accessories such as tripod and rod.

PHOTOGRAPHIC EQUIPMENT

It is time consuming to make detailed geologic sketches when mapping. The purpose of the sketches is to aid in the preparation of the geologic map as well as of the accompanying text for the map. Sketches are never as satisfactory as a photograph.

Polaroid equipment has advantages for field work in that one has a photograph immediately which can be inserted and described in one's field notes.

Polaroid equipment is limited in that it is difficult to reproduce a photograph for publication or have a slide made from it. Therefore other photographic equipment is needed if the ultimate use of the photograph is publication.

Geologic mapping involves walking into areas which are not readily accessible by other means. Therefore, it is not wise to rely entirely on a professional photographer to take those photographs needed to illustrate the text for the geologic map.

Cost: $500.00

COMPILATION OF GEOLOGIC MAP

A detailed geologic map of the burial sites area provides basic data for establishing points where migration of radionuclides might take place. With this data a more precise monitoring grid can be established. Also, if the need for new burial sites arises, decision making is greatly facilitated.

A map and chart projector speeds and simplifies compilation, base map work, revisions, updating from any planimetric or topographis map as well as from aerial photos, negatives or color transparencies.

Cost: $2300.00 -- does not include accessories.

A stereo contour plotter is used with overlapping pairs of aerial photographics to measure elevations and compile vertical data.

Cost: $800.00

The Jena Sketchmaster is an aerial-photo-to-map converter. The photograph is observed subjectively and the conversion is made by manual tracing. Cost: $975.00

The equipment described should be capable of handling most cartographic problems.

The stereo contour plotter and the Jena Sketchmaster are table top equipment. The map and chart projector is 42" wide, 97" high, and 39" deep.

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