CAFB 91

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M E M O R A N D U M

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THROUGH: Herbert Grover, HRMB, Permitting and Inspection Section

THROUGH: Edward Horst, Program Manager, HRMB

THROUGH: Bruce Swanton, Geologist III, HRMB, Technical Section

FROM: Rosilee Winn, WRSIII, HRMB, Technical Section

DATE: September 16, 1991

RE: CANNON AIR FORCE BASE

After a review of the technical data submitted by Cannon Air Force Base (CAFB), it has been determined that the following items need to be addressed as part of the pending CME investigation:

1. Landfill #5 has not been characterized adequately. This determination is based primarily on the fact that only two soil boring have been advanced with soil samples being collected for laboratory analysis. These two boring were located in Cell 3 and were advanced to 40 feet. Samples were collected at depths of 10, 15, 20, 25, 30, and 40 feet. The composite results of these analyses (as described in the "EID Approved Cannon Air Force Base Closure Plan August 1988 with Approved changes and Cannon's revised closure plan," page 15) exceeded the New Mexico Water Quality Control Commission standards for Chromium, Lead, Arsenic, Tin, and Mercury. CAFB reasoned that "this is not significant because the lowest level of value ranges were reached at the 40-foot depth. Very little would be available to groundwater which is 200 feet deeper still."

   Cell 3 was utilized late in the life of the landfill, between 1981-1982, and these boring were advanced in 1985. Therefore, contamination has travelled approximately 40 feet in 4 years. If this is the case, borings need to be advanced in older cells particularly in cells which were utilized 20 years ago or more where contamination has had ample time to reach ground water.

organics present. Laboratory analysis should be performed on soil samples with the highest concentration of organics as determined by field analysis. The laboratory analysis methods should test for volatile and semi-volatile organics (methods 8240, 8270 respectively) and metals.

If any hot spots are detected from soil sample analysis, additional in-depth investigation will be required. This will entail, at a minimum, drilling additional monitoring wells. These wells will be logged geophysically to determine permeability changes. This data will be used to design an adequate investigation for DNAPLs.

2. The chlorinated solvent trichlorofloromethane (freon) was found in the ground water of the background monitoring well (well A). Trichlorofloromethane is also a DNAPL. Once DNAPLs encounter an aquifer, there are a number of migration paths they may take. Typically, because the density is greater than water they sink to the bottom. They have been detected migrating in the opposite direction of ground water flow. This occurs where beds of the aquitard are dipping upgradient. Therefore, if DNAPLs are detected in any of the ground water samples from monitoring wells, the bottom of this aquifer should be sampled for DNAPL constituents. CAFB may consider starting this sampling in the Cobb well which was drilled to the bottom of the aquifer (top of the Dockum Group).

3. As stated in the meeting of July 18, 1991, HRMB expresses strong doubts that it would prove environmentally protective to leave any portion of Cell 3 uncapped, but committed to studying this proposal. If any hot spots are detected from the proposed coring done to be done in Cell 3 then HRMB will require CAFB to construct an impermeable layer over its entirety or remediate or excavate the extent of contamination.

There are a number of reasons for additional soil boring investigation of this landfill. These reasons are listed as follows:

A. The chlorinated solvent, methylene chloride, has been detected in laboratory samples taken from the ground surface. Methylene chloride is a Dense Non-Aqueous Phase Liquid (DNAPL) with a density of 1.3250. DNAPLs exhibit unusual physical characteristics in relation to the vadose and saturated zones. In the vadose zone, the DNAPL may collect as residual saturation (the fraction of the hydrocarbon that is retained by capillary forces). The DNAPL may perch on an impermeable stratigraphic unit or it may even flow opposite to ground water flow gradient if that impermeable stratigraphic unit has an upgradient dip.

B. There is a large degree of uncertainty in relation to the exact location of cells as well as where the cells were thought to have been when being filled.

C. A caliche zone was used as a base for the cells in the landfill. At the time the landfill was being utilized, it was thought that the caliche zone represented a somewhat impermeable layer. This is disproved in two ways:

   a. The mounding which occurs in the piezometric surface directly under the playa lake. This has occurred as a result of recharge from infiltration (this could easily occur as water accumulates in depressions were backfill has subsided in the landfill), and

   b. The fact that contamination was found in the core samples below the caliche layer.

The above reasons suggest that the entire landfill should be sampled by soil borings. The grid spacing should be approximately every 100 feet with lines perpendicular and parallel to groundwater flow direction. A minimum of 30 borings should be advanced. A number of these soil borings should be completed with casing and screens to monitor for soil-gas.

Soil samples should be taken above the caliche layer and at ten feet intervals thereafter until field method analysis indicates that there are no more volatile