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MOFFETT FIELD
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1146, 09C5, 1146CJ, 1146KS, NAS Moffett (Code 189A),
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10 JUN 1999

Regional Water Quality Control Board
Attn: Mr. Tom Berkins
1111 Jackson Street, Room 6040
Oakland, CA 94607

Subj: SUB-SURFACE GEOPHYSICAL WORK AT LANDFILL SITES AT NAVAL AIR STATION, MOFFETT FIELD

This is to inform you of our plan to use electromagnetic terrain conductivity and electrical resistivity surveys to determine the boundaries and depths of the landfills. This is a modification from the Sampling and Analysis Plan which proposed the seismic refraction method. Enclosure (1) describes the methods which will be used and the advantages of these methods over the seismic refraction survey.

Should you have any questions regarding this matter, the point of contact is Commander, Western Division, Naval Facilities Engineering Command (Attn: Ms. Chloe Jue, Code 1146CJ, (415) 877-7502).

Sincerely,

Original signed by:

ALEX E. [illegible]
Head, Environmental Restoration Section

Encl:
(1) Sub-surface Geophysical Work at Landfill Sites 1 and 2 at NAS Moffett Field

Copy to:
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2) 1146 [illegible]
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FILE ROUTING SHEET - WESTDIV 5216/1 (REV. 6/88)

NAVY/RWQCB-59

NAS MOFFETT FIELD

SUB-SURFACE GEOPHYSICAL WORK AT SITES 1 AND 2

Subsurface geophysical surveys will be conducted at both landfill locations (Sites 1 and 2) in order to aid in the determination of landfill boundaries and depths since no documentation other than aerial photographs exists to provide this information. This effort will ensure that geophysical borings, leachate wells and monitoring wells are properly located at the landfills.

Sections 2.4.3.2 and 2.5.3.2 of the Sampling and Analysis Plan and Section 4.2 of the Solid Waste Assessment Test Work Plan indicate that the preferred subsurface geophysical method to be employed would be the seismic refraction method. Based on analysis of logs from previous borings in the area and after consultation with the subsurface geophysical survey contractor, IT has elected to use two other methods to perform the investigation to determine landfill boundaries and depths.

The two methods to be used are electromagnetic (EM) terrain conductivity and electrical resistivity (ER). Seismic refraction may still be used as well if, based on the EM and ER survey results, it is concluded that it could provide meaningful information.

The EM terrain conductivity method will be used primarily to establish landfill boundaries; the electrical resistivity method will be used primarily to establish landfill depths. Seismic refraction, if used and successful, will delineate both the extent and depths of the landfills.

The electromagnetic (EM) method measures earth conductivity values over a specific point to a depth of about 18 feet. The measured values, referred to as terrain conductivity, are obtained, without direct earth contact, through electromagnetic induction as the instrument is carried about 3 feet above the ground surface. Measurements are typically taken along specific traverses or in a grid pattern to determine the lateral variation of terrain conductivity. This information can be useful for mapping the extent of dumped waste materials, the extent of certain types of contamination, changes in contamination with time, and the location of utility trenches or buried metallic objects.

Electromagnetic methods can be used wherever shallow penetration is required to qualitatively map lateral variations only, thus it is appropriate to determine landfill boundaries. Depth or thickness determinations cannot be made solely by this method. Data acquisition is rapid and non-destructive.

The electrical resistivity method provides for shallow subsurface exploration by means of electrical measurements taken at the ground surface. Typically, a co-linear array of four electrodes are placed in the ground at specific separations. Electrical current from a battery is input to the ground through the two outer electrodes of the array. The voltage drop produced by the resulting electric field is measured across the two inner electrodes. The voltage drop is dependent on the electrode separation (which is corrected for) and the electrical properties of the subsurface media. Resistivity is the inverse of conductivity. Increasing the electrode separation (spacing) will increase the depth of investigation but is limited by the resolution of the equipment. Determining the changes in subsurface resistivity can provide information in regards to thickness and lateral variation of sedimentary layers and fill material, extent of dumped waste materials, depth to ground water, relative ground water quality, extent of certain contamination, and changes in contamination with time. Because of the ability of this method to define layer thicknesses it will be used to determine landfill depths.

The seismic refraction method consists of measuring the travel times of compressional waves through the subsurface. Seismic wave energy is transmitted into the ground where it is refracted along velocity interfaces and then back to the ground surface. By measuring the travel time of seismic waves from a source (shotpoint) to detectors at known distances on the surface, the seismic velocities and thicknesses of the respective velocity layers can be determined. This information can be used to determine depth to rock, thickness of overburden or fill material, location of faults, lateral variation of sediments and rock, or certain ground water barriers. Because of the likelihood that materials that were deposited at the landfills have about the same velocity as surrounding soils and the possible presence of a high water table, there is concern that the seismic method may not clearly delineate the landfills' configuration.

It should be recognized that no method or combination of methods will produce results which are totally accurate. The methods are being employed in order to attempt to generate more information about existing conditions. If the subsurface geophysical methods do not provide what appears to be meaningful results, the chosen methods will be re-evaluated in regard to changing to another procedure(s) or even abandoned. The boundaries and depths of the landfills would then be identified based on aerial photograph interpretation.