3M Corporate Health Physics

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3M

November 11, 2004

Mr. Kenneth O'Brien
Chief, Decommissioning Branch
US NRC Region III
2443 Warrenville Road, Suite 210
Lisle, Illinois 60532-4352

Subject: 3M Work Plan for TCAAP

Dear Mr. O'Brien:

Enclosed with this letter is 3M's Work Plan for Characterizing Cs-137 Contamination at TCAAP. This work plan was developed in response to the expectations of the NRC as presented in a series of telephone conversations during October 2004. The intent of this work plan is to demonstrate that the area surrounding the site formerly leased by the 3M Company on the Twin Cities Army Ammunition Plant (TCAAP) meets the unrestricted release criteria of the US NRC.

As described in detail in the work plan, there are two phases to this effort. In Phase 1, areas of soil contamination will be identified. Soil samples will be collected and analyzed to determine whether contamination is in microsphere form. If the activity is in microsphere form, Phase 2 will be performed to determine whether dose rates in the area meet the US NRC unrestricted release criterion of 25 millirem per year.

Details of this work, such as the schedule and laboratory performing the soil sample analyses, will be communicated to Mr. George McCann as they are determined. We hope to begin this work next week and proceed as promptly as weather permits.

Should you have questions concerning this please contact me at 651-736-0740.

Sincerely,

Frederick B. Entwistle
Manager, Corporate Health Physics

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3M Work Plan for Characterizing Cs-137 Contamination at TCAAP

Background Information

In September 2004 representatives from the US Nuclear Regulatory Commission (NRC) identified locations on the Twin Cities Army Ammunition Plant (TCAAP) in New Brighton, Minnesota, that contained detectable cesium-137 contamination. 3M previously held a license to manufacture radiation sources containing cesium-137 in a facility near the locations of the contaminants. In the early 1990s 3M decommissioned the site used for radiation source production at the TCAAP. A final status radiological survey of the site performed in 1993 by 3M demonstrated that the site met the NRC's unrestricted release criteria. The NRC released the area in 1994. In 2004 the NRC surveyed locations of the TCAAP that were not included in the 1993 survey. The NRC subsequently identified the physical form of the contaminant to be consistent with the microsphere form produced by 3M. The NRC has requested that 3M further characterize the area surrounding that released in 1994 to demonstrate that it qualifies for unrestricted release.

Site Information

The area surveyed by the NRC is north of Johnson Road and west of Snelling Avenue, immediately north of the former buildings 589 and 511. Phase 1 survey work and sampling will be performed in this area. This area is immediately west of the southwest corner of the former 3M occupied site. The area has been mowed and raked to facilitate survey work.

Phase 2 will encompass a 20-meter wide band surrounding the former 3M occupied site and extending to the west to include the entire area surveyed by the NRC.

Survey Objectives

The survey is designed to characterize Cs-137 contamination outside of the area previously released and to demonstrate it meets NRC unrestricted release criteria. The survey will be split into two phases. The purpose of Phase 1 is to obtain characterization information as detailed below to support the assumptions used in developing this work plan. Phase 2 will survey the area surrounding the previously surveyed 3M location and the area recently surveyed by the NRC to demonstrate compliance with NRC's unrestricted release criteria. Figure 1 illustrates the locations included in Phase 1 and Phase 2.

The pertinent regulatory requirements for demonstrating that the land is suitable for unrestricted release are listed in Title 10, Code of Federal Regulations, Part 20.1402. A total effective dose equivalent of 25 millirem per year to the average member of the critical group from all pathways is the applicable limit.

Cesium contamination from 3M operations is primarily in the form of 100 micron diameter zirconium pyrophosphate microspheres where the cesium is strongly bound in the matrix of the microsphere. As such the cesium is not respirable and is insoluble in

water. Inhalation and ingestion via the water pathway are not reasonable pathways of exposure. Soil samples taken by NRC suggest that a very small fraction of the bound cesium may have leached from the microsphere and may be present in the soil immediately surrounding the microsphere. NRC did not obtain sufficient samples to produce quantitative results to characterize the magnitude of cesium migration from the microsphere.

In Phase 1 3M will identify contaminated areas, measure the dose rate 1 meter directly above these areas, remove the contamination, and sample surrounding soil in order to gather additional information regarding the potential for non-microsphere cesium-137 contamination. 3M will obtain a minimum of 60 soil samples (3 samples each from 20 potentially contaminated areas) for this analysis.

3M expects that the amount of cesium-137 that may have migrated from the microsphere to be sufficiently small to produce soil concentrations that are less than the 11 pCi/g soil subsurface screening value for Cs-137 listed in Table B.2 of NUREG-1757, Vol. 1, Rev. 1, Consolidated NMSS Decommissioning Guidance.

If the results of the sampling demonstrate that any cesium leached from the microsphere produces subsurface soil concentrations less than the screening value, 3M's assumption is that no pathways other than direct exposure may be considered to contribute toward the 25 mrem/year unrestricted release limit in 10 CFR 20.1402. Therefore only the external exposure pathway will be considered during Phase 2 monitoring. As the microsphere contamination is a surface deposition, the microspheres are preferentially distributed toward the soil surface. Future activities on the site that disturb the soil will randomly mix the microspheres in the soil. As there is no process that will naturally bring the microspheres to the soil surface, dose rates in the future will decline with radiologic decay.

Organization and Responsibilities

The survey will be performed by a team of qualified personnel currently employed by 3M Corporate Health Physics. Supervision and overall direction of the team will be provided by Frederick Entwistle, Certified Health Physicist (CHP), Manager of Health Physics and Corporate Radiation Safety Officer for 3M. Field measurements and sample collection may be under the direction of Michael Lewandowski, CHP, advanced health physics specialist, or Nicolas Bates, senior health physicist. Mr. Lewandowski has prior experience performing environmental surveys with Oak Ridge Associated Universities' Radiological Site Assessment Program and with the Uranium Mill Tailings Remedial Action Project. Mr. Bates has extensive experience performing NUREG/CR-5849 surveys with the US Air Force. Instrument calibration will be directed by John Bauhs, CHP, advanced health physics specialist. Radiological safety in the field will be directed by the field team leader.

All members of the survey team will attend in-house training on the use of field instrumentation, survey techniques, sample collection, and radiological safety practices. Training documentation will be maintained.

Survey Plan

Ludlum Model 3 ratemeters with Ludlum Model 44-10 two inch by two inch sodium iodide scintillators will be used to survey for the presence of cesium-137 soil contamination. These instruments will be electronically calibrated using a Ludlum Model 500-1 pulser following existing written procedures. Each instrument/detector combination will then have its response to cesium-137 documented according to a written procedure developed specifically for this activity. The response of each instrument to an approximately five microcurie cesium-137 check source will be determined under laboratory conditions. Prior to use each day in the field each instrument will be response checked with the same cesium-137 check source to verify that it responds appropriately. Records of the response checks will be maintained.

During Phase 1, surface scans of gamma radiation will be performed within the identified survey area. Scans will be performed by moving the sodium iodide detector from side to side at about 0.5 meter per second while walking over the survey area. The response of the instrument will be observed using the audio output as well as the meter dial of the instrument. Areas of elevated response defined as qualitative increases in the count rate of at least twice the typical background rate will be investigated for the presence of soil contamination.

Twenty locations identified with elevated readings (greater than 2 times background) will be marked for sampling. A Bicron Microrem tissue-equivalent scintillator will be used to measure the gamma dose rate 1 meter directly above the possible contamination. Soil will be removed and placed in a plastic bag until the Model 3/44-10 demonstrates that the location is not distinguishable from typical background. An additional soil sample around the excavated site will be taken for analysis of possible non-microsphere cesium contamination. A contact surface count rate will be recorded after contaminant removal. All sample bags will be securely closed, appropriately marked, and transferred the same day to 3M's Corporate Health Physics laboratory for analysis or packaging prior to shipment to a contract analytical laboratory.

Soil samples from areas identified as contaminated will be examined for the presence of a microsphere. If found, the microsphere will be removed from the surrounding soil. Analysis will be performed to quantify the Cs-137 activity for each sampling location for:

- Identified microspheres (as applicable)
- Soil associated with the microsphere(s)
- Surrounding soil

3M expects that data obtained during Phase 1 will support the assumption that any cesium-137 leached from microspheres under environmental conditions will result in subsurface soil concentrations that do not exceed the 11 pCi/g screening value listed in

NUREG-1757, Vol. 1, Rev. 1. This will also support the assumption that the Cs-137 is microsphere bound and hence not available for the inhalation or ingestion pathways. In this case, Phase 2 monitoring will be performed by measuring the gamma dose rate at a distance of no more than 1 meter above the surface of the ground in the area surrounding the previously surveyed and released 3M locations and in the area recently surveyed by the NRC as shown in Figure 1. Dose rate measurements will be obtained using a Reuter-Stokes Model RS-131 high pressure ion chamber. The ion chamber will be calibrated by the manufacturer on an annual basis. Measurements will be taken in at least 4 locations in each 10 m by 10 m grid square consistent with the guidance provided in draft NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, Section 4.2.3.

Background response levels for each field instrument and for the high pressure ion chamber as well as background soil samples will be acquired from a location on the TCAAP away from the survey area with no history of radioactive material use.

If the data from Phase 1 does not support the assumption that the Cs-137 is bound to microspheres, the work plan will be modified and resubmitted to the NRC for review.

Radiological Safety

Field personnel who collect contaminated soil will wear gloves to minimize contamination. Field personnel performing scanning surveys will wear typical work clothing appropriate for the weather.

All field personnel will perform contamination surveys of their hands, shoes, and clothing prior to leaving the site. Contamination surveys will be performed with a Ludlum Model 3 ratemeter connected to a Ludlum Model 44-9 pancake GM detector. This instrument combination will be calibrated using existing written calibration procedures that incorporate the use of a NIST-traceable cesium-137 beta particle standard under NRC Radioactive Materials License 22-00057-07. During the calibration process the instrument response to a cesium-137 check source is documented. Each day the instrument is in the field its response to the check source will be verified and documented. Areas of skin or clothing that read more than 50 cpm greater than background will be decontaminated to levels as low as reasonably achievable prior to release. Background readings on the instrument will be determined outside of the survey area.

Reporting

Following the characterization survey a report will be generated and submitted to NRC. The format of the report will be consistent with that described in NUREG/CR-5849.

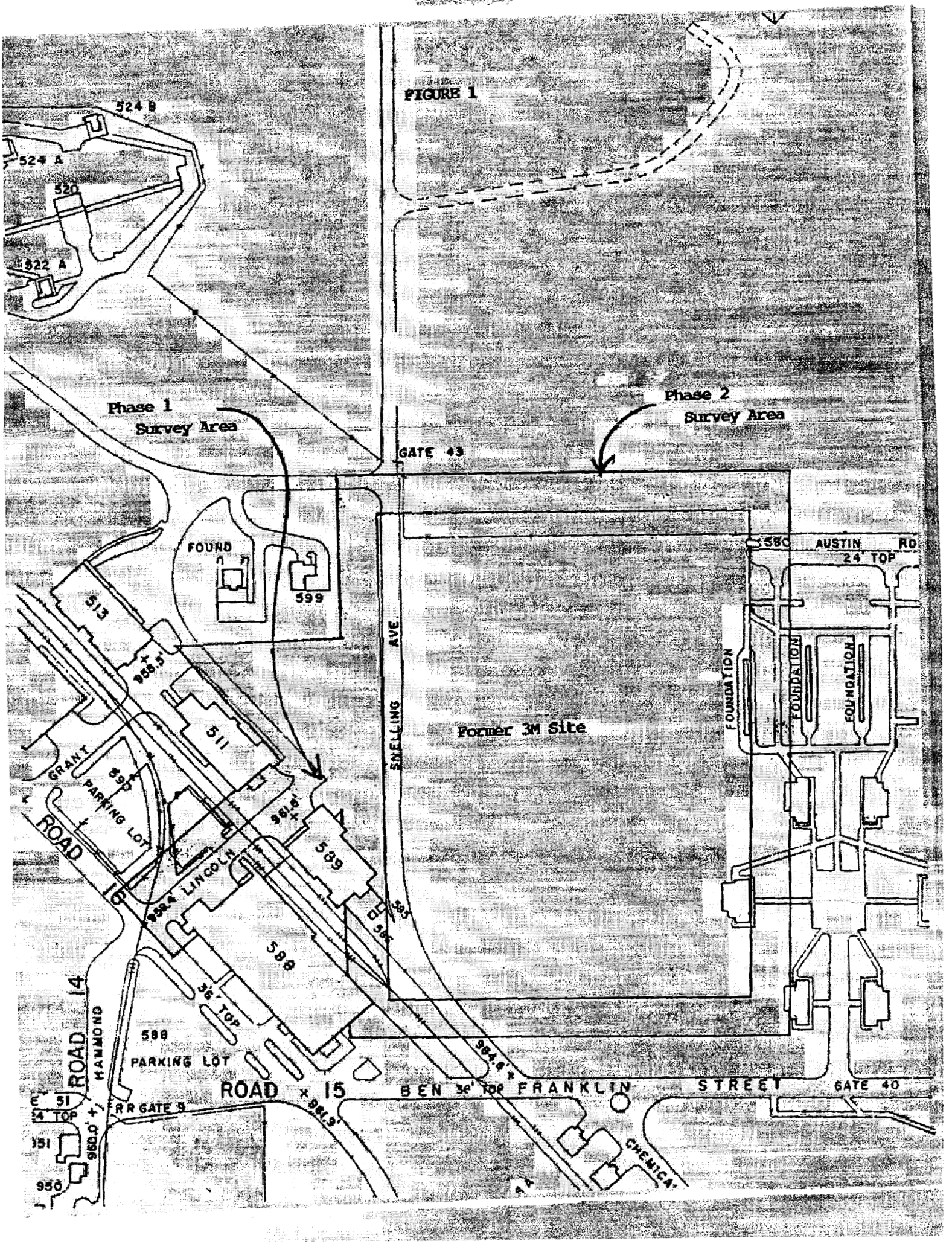
FIGURE 1
524 B
524 A
520
522 A
Phase 1
Survey Area
Phase 2
Survey Area
GATE 43
FOUND
599
513
958.5'+
511
GRANT
590
PARKING LOT
961.6'+
589
LINGCOLN
958.4'+
585
586
588
36" TOP
588
PARKING LOT
ROAD 16
ROAD 14
HAMMOND
ROAD 15
964.8'+
BEN 36" TOP FRANKLIN STREET
GATE 40
FRR GATE 3
961.9'+
960.0'+
951
950
CHEMICAL
SNELLING AVE.
Former 3M Site
FOUNDATION
FOUNDATION
FOUNDATION
580
AUSTIN RD
24" TOP