

Phase 5 – Southern Abutting Property Soil Sampling Results

Sigma-Aldrich Manufacturing LLC Fort Mims Site
Maryland Heights, Missouri

U.S. Nuclear Regulatory Commission
Radioactive Materials License No. 16-16273-01

Sigma-Aldrich Manufacturing LLC
PO Box 14508
St. Louis, MO 63178

Prepared by:

DDES LLC
345 North Avenue, 2nd Floor
Wakefield, MA 01880

January 10, 2017



EXECUTIVE SUMMARY

Decontamination Decommissioning and Environmental Services, LLC was retained by Sigma-Aldrich Manufacturing LLC to obtain soil samples from the southern abutting Property of the Sigma Aldrich Fort Mims Site at 11542 Fort Mims Drive in Maryland Heights, Missouri. This work was performed as part of the approved *Phase 4 Soil Sampling Plan* dated February 26, 2015. The southern abutting Property sampling was performed on May 7, 2015. Based on the results of this sampling event, four (4) additional sampling locations were sampled on October 25, 2016 to delineate surface concentrations of carbon-14 (^{14}C) and tritium (^3H).

A total of eight (8) discrete soil samples were obtained from four (4) designated locations. Soil samples were obtained from the surface and one meter depth as designated by the plan at the four (4) sampling locations. These soil samples were submitted for carbon-14 (^{14}C) and tritium (^3H) analysis by Test America Laboratories in Earth City, Missouri. The results indicate that ^{14}C and ^3H were detectable in all eight (8) soil samples. The ^{14}C concentrations ranged from 12.0 to 41.4 picocuries per gram (pCi/g) and ^3H concentrations ranging from 9.18 to 11.4 pCi/g.



1.0 SOIL SAMPLING METHODOLOGY

Sampling methods were performed in accordance with the approved *Phase 4 – Soil Sampling and Analysis Plan Sigma-Aldrich Fort Mims Site Maryland Heights, Missouri* report (dated February 26, 2015) (Sampling Plan). Soils samples were collected using hand augers. The sampling equipment was decontaminated after each use to prevent cross-contamination of samples. A minimum of 500 grams of soils were collected from each location and depth interval. The sample was transferred into a stainless-steel bowl and thoroughly homogenized. After homogenizing, the sample was transferred to the appropriate labeled container for off-site radiological analysis.

SAMPLE ID

Each sample point was designated by a Sample ID, and identified as follows:

WWW: 2-character designation of survey unit (for example, “030”)

XXX: 2-character designation of sample location (for example, “107”)

YY: 2-character designation of sample type (for example, “01” = ^{14}C and “02” = ^3H)

For example, in the sample identification number, 30-107-01, “30” represents the survey unit, “107” represents the location and “01” represents the sample type of ^{14}C . The sample ID number was recorded on the containers and chain-of-custody record at the time of sample collection.

SAMPLE SHIPMENT AND ANALYSIS

All samples were packaged and controlled in accordance with the Plan. The samples were controlled using chain-of custody procedures custody seals and the use of field logbooks during collection.

The soil samples were driven to Test America Laboratories in Earth City, Missouri. Total ^{14}C and total ^3H concentrations were determined by oxidation analysis. Test America is accredited by the National Environmental Laboratory Accreditation Program (NELAP) and is licensed to receive and analyze radioactive material.



SAMPLING QUALITY ASSURANCE

Quality assurance samples were collected for statistical analysis. For precision, one (1) field duplicate was obtained for every ten (10) samples collected. A field duplicate is a duplicate sample collected from the same sample point which has been thoroughly homogenized.



2.0 SAMPLING RESULTS

Table 1 identifies the soil samples and analytical results for the soil samples for Survey Unit 30 on the southern abutting Property. The southern abutting Soil Sample Map has been included as Attachment A and the analytical results are included in Attachment B.

Southern Abutting Property Soil Sample Results			
Soil Sample Location	Interval Depth (meter)	¹⁴C (pCi/g)	³H (pCi/g)
030-106	0-0.15	41.4	10.6
030-107	0-0.15	19.1	9.97
030-108	0-0.15	12.0	9.18
030-109	0-0.15	13.0	11.4
Average		21.4	10.3
Maximum		41.4	11.4



3.0 CONCLUSIONS AND RECOMMENDATIONS

Screening values for ^{14}C and ^3H soil impacts were selected from *Consolidated Decommissioning Guidance of NUREG-1757*, Vol.1, Rev. 2, Appendix B, Table B.2. These conservative values are not site specific and are not cleanup levels, but were selected to identify areas where further evaluation was warranted. The screening values selected were 12 pCi/g for ^{14}C and 110 pCi/g for ^3H . However, as presented in Section 1.4.1 of the Sampling Plan, site-specific site screening levels (SSLs) for this project have been set at 50 pCi/g for ^{14}C and 220 pCi/g for ^3H . These SSLs were used as a decision point to determine when additional data should be obtained to evaluate the horizontal and vertical extent of contamination.

The soil sample results for ^3H indicate average value of 10.3 pCi/g with a maximum value of 11.4 pCi/g. All values were well below the screening value of 110 pCi/g. Further it is not uncommon to find detectible background concentrations of ^3H in soils. The isotope occurs naturally in the upper atmosphere through the interaction of gases with cosmic radiation. It is then transported to the surface soils by precipitation. Based on the sampling results being well below the screening value, we believe ^3H has been adequately defined and do not recommend additional sampling for this isotope.

The soil sample results for ^{14}C indicate that ^{14}C results are below the site-specific SSL (50 pCi/g). The average was 24.1 pCi/g for all samples. The maximum value for ^{14}C was 41.4 pCi/g. Sampling maps for this scope of work have been included as Attachment A.



Attachment A

Site Sampling Map



Attachment B

Analytical Results