

AUGUSTANA COLLEGE

AUG 28 2003

Michael K. Wanous, Ph.D.
Radiation Safety Officer

August 25, 2003

Rick Munoz
Health Physicist
U.S. Nuclear Regulatory Commission, Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX
76011

Dear Mr. Munoz:

I am enclosing a supplement to the decommissioning plan for our former 10 CFR 20.304 burial site.

Sincerely,



Michael Wanous, Ph.D.
Radiation Safety Officer

phone: 605-274-4712 email: mike_wanous@augie.edu

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**DECOMMISSIONING PLAN FOR FORMER 10 CFR 20.304
BURIAL SITE**

AUGUSTANA COLLEGE, SIOUX FALLS, SD

SUPPLEMENT 8/25/2003

NRC LICENSE 40-06921-03

**MICHAEL K. WANOUS, PH.D.
RADIATION SAFETY OFFICER**

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I. EXECUTIVE SUMMARY

Name and address of licensee

Augustana College
2001 S. Summit Ave.
Sioux Falls, SD 57197

Location and brief description of the burial site and immediate environs

The burial site is within a grove of crab apple trees adjacent to the Gilbert Science Center on the Augustana College campus, at the corner of 33rd St. and Summit Ave, Sioux Falls, SD.

Summary of the licensed activities that occurred at the site

The burial site contains carbon-14 (C-14) waste generated from experiments involving carbon assimilation by plants during photosynthesis.

Nature and extent of contamination at the site

No more than 12 mCi of C-14 was buried at the site. Records of the amounts of waste buried are not available, but the total amount of C-14 purchased was 12 mCi. Considering that only experimental waste materials were buried, the actual amount buried was probably much less than 12 mCi.

Decommissioning objective proposed by the licensee

We request unrestricted release for the burial site. We request that our license be amended to incorporate this decommissioning plan (DP).

Timeline of this decommissioning plan

The original DP was submitted to Robert J. Evans, NRC Radiation Specialist/Health Physics, dated February 17, 2003. Solutient Technologies of North Canton, OH performed a site visit and assessment of the burial site and ran the RESRAD v. 6.1 program using site-specific data. The RESRAD report was included with the submitted DP. This RESRAD report indicated that the individual nuclide dose summed over all pathways was 0.4514 mrem/yr at year zero (which was 1969). By year thirty (1999) the modeled dose had fallen to zero and was projected to remain at zero. The preliminary completeness review deemed the DP insufficient. Furthermore, Mr. Evans requested that I run RESRAD again using all default values.

On April 25, 2003 I submitted a revised DP to Mr. Evans, containing more details of the burial site and included the RESRAD v. 6.21 report using all default input values. In this RESRAD report, the individual nuclide dose summed over all pathways was 77.8 mrem/yr at year zero (1969), and fell to 0.0000004247 mrem/yr by year ten (1979), and zero mrem/yr by year thirty (1999), and was projected to remain at zero. The dose graph generated by RESRAD showed that the dose actually fell to essentially zero by year seven (1976). Note that the graph is continuous but the dose table shows data for discrete time intervals (0, 1, 3, 10, 30, 100, 300, 1000 years). This revised DP was also deemed insufficient and the case was transferred to Mr. Rick Munoz, NRC Health Physicist.

Following instructions in my phone conversation with Mr. Munoz on July 24, 2003, and the letter from Dr. D. Blair Spitzberg dated August 1, 2003, this DP supplement provides more details regarding the burial site. For modeling data please refer to the RESRAD outputs previously submitted to the NRC.

II. FACILITY OPERATING HISTORY

II.a. LICENSE NUMBER/STATUS/AUTHORIZED ACTIVITIES

See current NRC license, 40-06921-03

II.b. LICENSE HISTORY

N/A

II.c. PREVIOUS DECOMMISSIONING ACTIVITIES

N/A

II.d. SPILLS

N/A

II.e. PRIOR ONSITE BURIALS

Position of burial site

The burial site is within a grove of crab apple trees on the east side of the Gilbert Science Center (GSC) on the Augustana College campus, at the corner of 33rd St. and Summit Ave, Sioux Falls, SD. On the east side of GSC there is a line of six burial pits that contain the radioactive material. The pits were dug from 1967 to 1969 and are 5 feet deep, arranged in a line. The first hole is 62'2" S of the east wing, and 60'10" E of the west wing of GSC. The other five holes are in 6 foot intervals in a line due S of the first hole. Our records do not indicate that the holes were lined.

Types and concentrations of waste and radionuclides in the burial site

The burial site contains carbon-14 (C-14) waste generated from experiments involving carbon assimilation by plants during photosynthesis. No more than 12 mCi of C-14 was buried at the site. We do not have records of the exact contents of each site but we do have records of the exact positions and dates of waste burial. We have determined that the maximum amount of C-14 in the burial site was 12 mCi, totaling all C-14 that was ordered. Considering that only experimental waste materials were buried, the actual amount buried was probably much less than 12 mCi.

III. FACILITY DESCRIPTION

III.a. SITE LOCATION AND DESCRIPTION

The burial site is on the campus of Augustana College, in the central part of the city of Sioux Falls, SD (see above for detailed description of location). The college is in Minnehaha County. The city of Sioux Falls has a municipal water supply from the Big Sioux River, therefore the burial site should not pose a threat to a well or water supply. The burial site is close to the corner of the campus. To the north and west, the burial site is bordered by the Gilbert Science Center. To the south, across Summit Ave., is Our Savior's Lutheran Church. To the east, across 33rd Street is a residential area.

III.b. POPULATION DISTRIBUTION

The population of Sioux Falls, SD is approximately 120,000.

III.c. CURRENT/FUTURE LAND USE

The site is currently included in and surrounded by a crab apple grove. In order to inform future decisions about the use of the burial site, a report from the Radiation Safety Officer has been obtained by Mr. Gene Marko, the Director of Buildings and Grounds for inclusion in the Campus Master Plan.

III.d. METEOROLOGY AND CLIMATOLOGY

Being located in the middle of North America, Sioux Falls experiences a continental climate with cold winters and warm summers. Average annual rainfall is 25 inches.

III.e. GEOLOGY AND SEISMOLOGY

The site has a top layer of silty clay loess soil, which is 20 to 25 feet deep. Under this is a lean clay glacial till layer (Illinoisan age). The glacial till extends to a depth of between 36 and 70 feet. Below the glacial till is a bedrock of Sioux Quartzite (Sioux Falls granite). The ground water table is at a depth of 20 feet. Sioux Falls is not in a region subject to major earthquakes.

III.f. SURFACE WATER HYDROLOGY

The area of the burial site is covered with grass and the trees of the grove, and the surrounding ground to the east and south is covered with grass (GSC is to the north and west). The area is flat with good drainage. Thus, water erosion does not seem to be a problem. There is no visual evidence of significant soil erosion in the area.

III.g. GROUND WATER HYDROLOGY

The ground water table of the area is 20 feet deep. The water permeability of the soil profile is relatively slow due to the high clay content, especially the lean clay glacial till.

III.h. NATURAL RESOURCES

N/A

IV. RADIOLOGICAL STATUS OF FACILITY

N/A

V. DOSE MODELING

V.a. UNRESTRICTED RELEASE USING SCREENING CRITERIA

V.a.1. Unrestricted Release Using Screening Criteria for Building Surface Residual Radioactivity

N/A

V.a.2. Unrestricted Release Using Screening Criteria for Surface Soil Residual Radioactivity

Considering the small amount of radioactive material, and the radionuclide involved, the use of screening criteria seemed to be the most appropriate way to assess the hazard of the burial site. The RESRAD program was used and these RESRAD reports have been previously submitted to the NRC with the previous versions of the DP.

Solutient Technologies of North Canton, OH performed a site visit and assessment of the burial site and ran the RESRAD v. 6.1 program using site-specific data. The RESRAD report was included with the submitted DP dated February 17, 2003. This RESRAD report indicated that the individual nuclide dose summed over all pathways was 0.4514 mrem/yr at year zero (which was 1969). By year thirty (1999) the modeled dose had fallen to zero and was projected to remain at zero.

A second RESRAD report was requested by the NRC using all default input values. This analysis used RESRAD v. 6.21 and was submitted with the DP dated April 25, 2003. In this RESRAD report, the individual nuclide dose summed over all pathways was 77.8 mrem/yr at year zero (1969), and fell to 0.00000004247 mrem/yr by year ten (1979), and

zero mrem/yr by year thirty (1999), and was projected to remain at zero. The dose graph generated by RESRAD showed that the dose actually fell to essentially zero by year seven (1976). Note that the graph is continuous but the dose table shows data for discrete time intervals (0, 1, 3, 10, 30, 100, 300, 1000 years).

These modeling results indicate that the burial site is now at zero dose of radiation. This falls below the unrestricted dose limit of 25 mrem/yr (10 CFR 20.1402).

V.b. UNRESTRICTED RELEASE USING SITE-SPECIFIC INFORMATION

N/A

V.c. RESTRICTED RELEASE USING SITE-SPECIFIC INFORMATION

N/A

V.d. RELEASE INVOLVING ALTERNATE CRITERIA

N/A

VI. ENVIRONMENTAL INFORMATION

N/A

VII. ALARA ANALYSIS

N/A

VIII. PLANNED DECOMMISSIONING ACTIVITIES

N/A

IX. PROJECT MANAGEMENT AND ORGANIZATION

IX.a. DECOMMISSIONING MANAGEMENT ORGANIZATION

N/A

IX.b. DECOMMISSIONING TASK MANAGEMENT

N/A

IX.c. DECOMMISSIONING MANAGEMENT POSITIONS AND QUALIFICATIONS

N/A

IX.d. RADIATION SAFETY OFFICER

The RSO, Michael K. Wanous, attended several workshops on radiation safety during his graduate training and postdoctoral work at the University of Missouri-Columbia. In 1990 he took the course, "Safe Handling of Radioisotopes" (Nuclear Engineering 302, 1 credit) at the University of Missouri-Columbia and received a grade of A. He has a Ph.D. in Genetics and 14 years of experience working with radioactive materials in research and as RSO.

IX.e. TRAINING

N/A

IX.f. CONTRACTOR SUPPORT

Solutient Technologies of North Canton, OH has provided consulting services in helping us assess our decommissioning project. Maxim Technologies, of Sioux Falls, SD assisted with the geological and hydrological description of the site.