Formerly Utilized Sites Remedial
Action Program (FUSRAP)

Maywood Chemical Company Superfund Site

ADMINISTRATIVE RECORD

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Attention: J. F. Wing
Technical Services Division

Subject: Bechtel Job No. 14501, FUSRAP Project
DOE Contract No. DE-AC05-81OR20722
Survey Plan for the Radiological Characterization of the Sears and Scanel Properties Maywood, New Jersey File No. 138, 148

Dear Mr. Wing:

We have received and incorporated your comments on the subject report. Six copies of the final report are enclosed for your use. If you have any additional questions, please contact Tom Dravecky at 6-3043.

Very truly yours,

for G. P. Crotwell
Project Manager

TMD/bjs
Attachment: As Stated

cc: E. L. Keller
J. F. Nemec

CONCURRENCE

Received by
AUG 2 9 1985
FUSR PDCC

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DOE/OR/20722-81

SURVEY PLAN FOR THE RADIOLOGICAL CHARACTERIZATION OF THE SEARS AND SCANEL PROPERTIES MAYWOOD, NEW JERSEY

AUGUST 1985

Prepared for

UNITED STATES DEPARTMENT OF ENERGY

OAK RIDGE OPERATIONS OFFICE

Under Contract No. DE-AC05-81OR20722

By

Bechtel National, Inc.

Advanced Technology Division

Oak Ridge, Tennessee

Bechtel Job No. 14501

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1.0 INTRODUCTION

Two areas near the Stepan Company plant known as the Sears and Scanel properties were shown to be radioactively contaminated by NUS Corporation during radiological surveys conducted in July 1983 (Ref. 1). Further characterization of these properties is necessary to confirm the NUS finding and to better define the boundaries of the contamination. Once the extent of contamination is known, design engineering for the remedial action can begin. This contamination originated from the processing of thorium ores between 1916 and 1956 by the Maywood Chemical Works (later purchased by the Stepan Company) and is known to consist primarily of thorium-232 and its daughters with some elevated concentrations of uranium-238 and its daughters.

The major objective of this survey is to locate both the horizontal and vertical boundaries of radioactive contamination exceeding remedial action guidelines. An important secondary objective is to identify and evaluate any pathways by which contamination might have migrated from these sites.

2.0 DESCRIPTION OF PROPERTIES

The "Sears site" consists of six separate properties located immediately south of the Stepan Company plant as shown in Figure 1. The area is bordered on the other 3 sides by Maywood Avenue, Essex Street, and Highway 17. In all, the properties make up an area of approximately 50 acres. Each of the six individual properties contain a combination of lawns, asphalt or concrete areas, and at least one building. All buildings are occupied. The preliminary estimate of the volume of contaminated soil on the Sears site is 60,000 yd^3.

The Scanel property is a vacant lot of about 1-1/2 acres and is located about 0.5 mile south of the Stepan Company plant. The site is adjacent to the Hackensack and Lodi Railroad and is slightly north of Essex street. The east boundary of the property

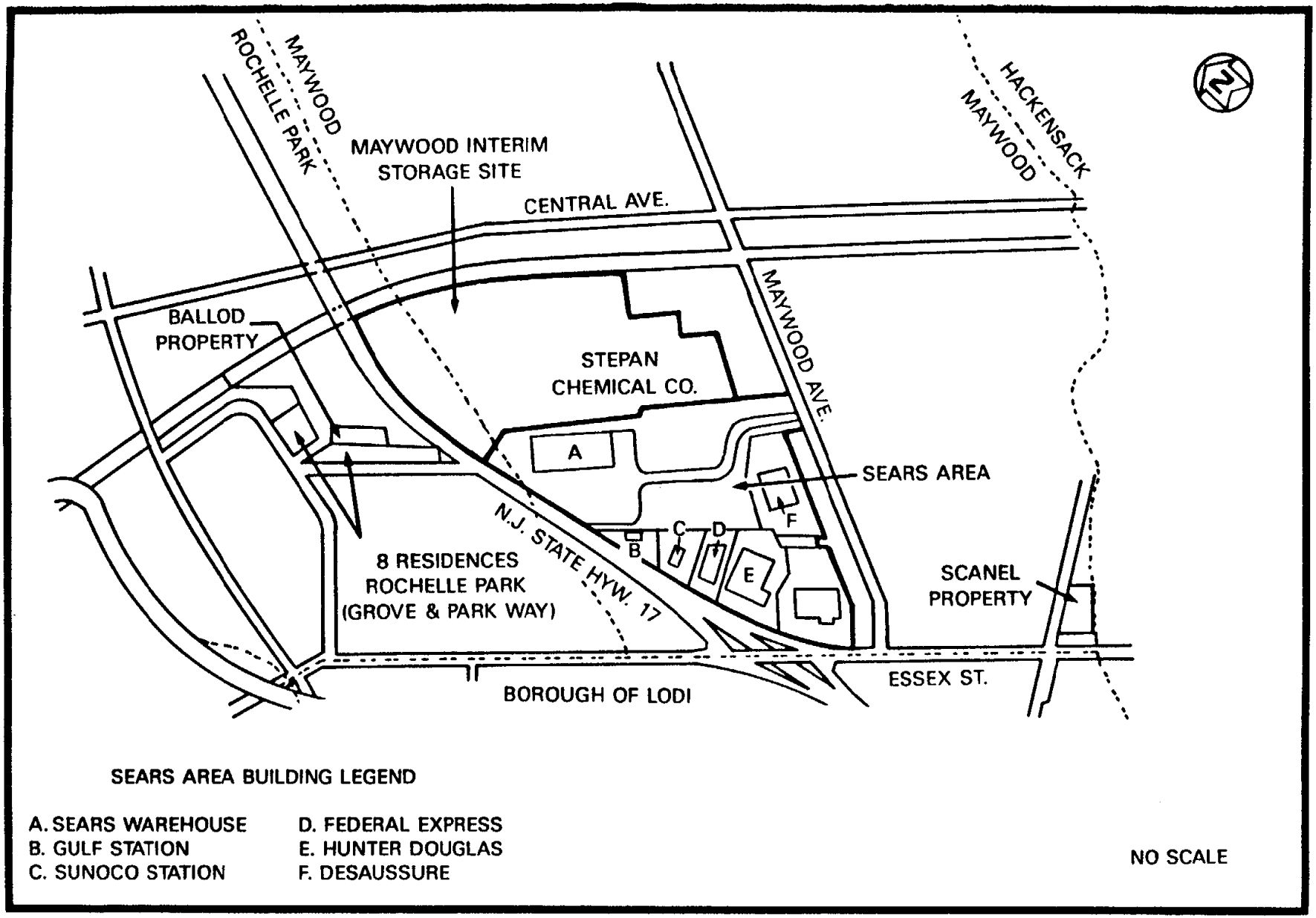

FIGURE 1 SITE PLAN OF SEARS AND SCANEL PROPERTIES

corresponds to the Hackensack-Maywood border. The volume of contaminated soil on the Scanel property is estimated to be 3300 yd^3.

3.0 RADIOLOGICAL SURVEY INSTRUMENTATION

3.1 GAMMA RADIATION EXPOSURE RATE MEASUREMENTS

Gamma radiation exposure rate measurements will be made 3 ft above the surface at selected grid points throughout the site using a pressurized ionization chamber (PIC). These measurements will be used to determine field calibration factors for the 2- x 2-in. NaI (Tl) gamma radiation scintillation detectors used with a portable ratemeter or scaler. The NaI (Tl) detectors will be used for the near-surface and subsurface measurements.

3.2 NEAR-SURFACE GAMMA RADIATION MEASUREMENTS

Near-surface gamma radiation measurements will be made using an NaI (Tl) detector contained in a cone-shaped lead shield (mounted on a wheeled dolly), that positions the detector 12 in. above the ground. Signals from this detector, which is standardized each day with an americium-241 source, are registered on a digital ratemeter/scaler. A portable multi-channel analyzer will be available to identify radionuclides.

3.3 SURFACE BETA-GAMMA DOSE RATES

Surface beta-gamma dose rates will be measured using a Geiger-Mueller (G-M) detector with a thin (7 mg/cm^2) window. The dose rate (mrad/h) will be determined by calibrating the G-M detector against a PIC using uranium-238, thorium-232, and radium-226 sources.

3.4 SUBSURFACE GAMMA RADIATION LOGGING

Gamma radiation profiles of augered holes will be obtained using an NaI (Tl) scintillation detector coupled to a portable scaler. Gamma radiation spectra will be obtained with a portable multi-channel analyzer at points of maximum gross count rate in selected holes where contamination appears to be present. Calibration of the scintillation detector system will be accomplished by correlating the system count rates with soil sample analysis results to obtain a count per minute per picocurie per gram (cpm/pCi/g) calibration factor.

3.5 SURFACE ALPHA MEASUREMENTS

Surfaces will be measured for alpha contamination using an alpha scintillation probe connected to a portable scaler. The alpha detector will be checked daily using a thorium-230 standard.

4.0 RADIOLOGICAL SURVEY MEASUREMENTS

4.1 GRID SYSTEM MEASUREMENTS

A 50-ft grid will be established on the Sears site properties. A 25-ft grid will be established on the Scanel property. Both grid systems will be tied to the New Jersey State Grid. Grid points will be staked with wooden hubs except on asphalt surfaces where nails and flagging will be used. A grid point is defined as the intersection of perpendicular grid lines, or the intersection of grid lines with buildings and/or property boundaries.

The site grid system serves as a basis for planning the location of specific points where radiation measurements will be made and where samples of environmental media will be collected for analysis of radionuclide concentrations.

The following measurements will be made and recorded at 25-ft intervals or as required to adequately characterize the contamination:

- Near-surface gamma radiation measurements using a cone-shielded 2- x 2-in. NaI (Tl) detector with digital readout.
- Gamma radiation exposure rate will be measured 3 ft above the ground at selected locations using a PIC.

4.2 SUBSURFACE GAMMA RADIATION LOGGING

Holes will be augered at selected locations to a depth sufficient to extend through the contamination detected by NUS. These holes will be gamma radiation logged to determine the vertical and lateral contamination boundaries. The NaI (Tl) detector will be lowered into the hole and count rate data will be taken at 1-ft vertical intervals.

Gamma radiation spectra will be taken in selected holes at the point of maximum activity to confirm the identity of the radionuclides present. Calibration of subsurface data will be done by comparing the logging data from each borehole with the results of soil sample analyses from the same hole.

5.0 SOIL SAMPLING AND ANALYSIS

Approximately 1400 soil samples will be taken and submitted for laboratory analysis. They will comprise samples from the categories listed below. The total number of samples will be subject to change based on field conditions.

5.1 SURFACE SAMPLES

Systematic surface soil samples (0 to 6 in. depth) will be collected at selected grid point locations on each property.

Biased surface soil samples will also be collected from any area having near-surface gamma radiation levels or surface beta-gamma exposure rates that exceed typical site background by a factor of three. Samples will be dried, pulverized, homogenized, and stored for radon-222 ingrowth. These samples will be analyzed by high-resolution gamma radiation spectrometry for radium-226 and thorium-232 and daughters. These samples will also be analyzed for total uranium by alpha spectrometry following radiochemical separation and electro-deposition of uranium onto a metal substrate.

5.2 SUBSURFACE SAMPLES

Following an evaluation of borehole gamma logs, several areas will be selected to obtain undisturbed soil samples. These samples will be obtained from the surface to below known deposits of radioactivity if the subsurface contamination is continuous. If it is not, samples will be obtained from just above to just below isolated subsurface contamination following the removal of overburden by auger drilling to near the subsurface deposit. Samples will be processed for analysis in the same manner as surface soil samples. Radionuclide concentrations in these samples will be used to obtain a calibration factor for gamma logs of boreholes.

6.0 WATER AND SEDIMENT SAMPLING AND ANALYSIS

Up to 25 water/sediment samples will be taken for the radionuclides specified below if water is encountered in boreholes, drainage ditches, etc. The number of water/sediment samples will be subject to change based on field conditions.

6.1 BOREHOLE WATER FROM RADIOACTIVELY CONTAMINATED AREAS

Samples of water encountered in holes drilled through radioactively contaminated areas will be collected before insertion of the PVC pipe for gamma logging. Radionuclides for which samples will be analyzed are total uranium, thorium-232, radium-228, and

radium-226. A maximum of 25 samples will be collected and analyzed. Selection of samples will be based on contamination potential and expected migration paths.

6.2 SURFACE WATER

Samples of water will also be collected from standing surface water found in drainage paths from the site and from any on-site sewer or septic tank systems.

6.3 SEDIMENTS

Samples of sediment from on-site streams, sewers, and septic tanks will be obtained using a clamshell, Ekman dredge, or other comparable device. These samples will be analyzed for total uranium, radium-226, and thorium-232 in the same manner as soil samples.

7.0 BUILDING CHARACTERIZATION

Radiological surveys of building interiors will be conducted to determine whether contamination is present. These surveys will consist of surface surveys, radon measurements, and boring through floors if required. Boring through ground level floors will only be done if the other interior measurements and/or subsurface measurements made just outside the building show a potential for contamination to exist under the building's floor. Boreholes will be logged and subsurface soil samples taken as described in Sections 4.2 and 5.2, respectively.

7.1 SURFACE CONTAMINATION SURVEYS

The interiors of the buildings will be surveyed for radioactive contamination using a variety of methods. Gross gamma contamination will be detected using an NaI (TL) scintillation detector. Surface beta-gamma exposure rates will be measured at selected points using a thin-window G-M detector. Surface alpha contamination will be

measured using an alpha scintillation detector. The combination of these three methods will determine whether radioactive contamination is present inside the buildings.

7.2 RADON/THORON MEASUREMENTS

Grab samples will also be taken inside the buildings and analyzed for radon and thoron concentrations. Increased levels of radon or thoron could be indicative of interior contamination or may have originated from contamination under or against the building foundations.

8.0 SCHEDULE

The characterization of these two properties is expected to begin in mid-August. Completion of the survey is anticipated by the end of 1985.

REFERENCE

1. Radiological Study of Maywood Chemical, Maywood, New Jersey, NUS Corporation, Superfund Division, November 7, 1983 (R-584-11-83-1).