Formerly Utilized Sites Remedial
Action Program (FUSRAP)

Maywood Chemical Company Superfund Site

ADMINISTRATIVE RECORD

Document Number

MISS- 015.

US Army Corps
of Engineers®

037363

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JUN 2 1986

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Attention: J. F. Wing
Technical Services Division

Subject: Bechtel Job No. 14501, FUSRAP Project
DOE Contract No. DE-AC05-81OR20722
Publication of the Characterization Plan
for the Maywood Interim Storage Site
File No. 148, 138

Dear Mr. Wing:

Enclosed are 10 copies of the subject report for publication. We have deleted the signature page as you directed, and will no longer include one in future characterization plans. If you have any questions, contact Tom Dravecky at 6-3043.

Very truly yours,

J. R. Kannard
Project Manager - FUSRAP

ms
Enclosure: As Stated

cc: S. W. Ahrends
J. F. Nemec

CONCURRENCE

Received by
JUN 2 1986

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CHARACTERIZATION PLAN FOR THE MAYWOOD INTERIM STORAGE SITE MAYWOOD, NEW JERSEY

MAY 1986

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

A characterization survey of the Maywood Interim Storage Site (MISS) is necessary to determine the location, depth, and significance of radioisotopes. This survey will also serve to determine the magnitude and nature of the chemical factors that could reflect the possibility of co-contamination. The intent of this report is to document the scope of the characterization effort and the procedures to be used.

1.1 HISTORICAL OVERVIEW

The MISS, located near the Stepan Company plant, was shown to be radioactively contaminated during radiological surveys conducted by Nuclear Safety Associates, Inc. in the summer of 1981 (Ref. 1). Further characterization of the MISS is necessary to confirm the Reference 1 findings 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 radium-226, uranium-238, and their daughters.

1.2 REVIEW OF EXISTING INFORMATION

Before field activities for the characterization commence, available information on the site will be reviewed. These reviews will include, but will not be limited to, all known previous characterization reports, documents describing operations at the Stepan Company, topographic surveys, aerial photographs, and eyewitness accounts.

As a result of this effort, a reasonable knowledge of expected site conditions and suspect areas will be obtained. This review will be completed in time for findings to be made available to the field characterization team for use in performing the survey.

1.3 SCHEDULE

Radiological and chemical characterizations will be accomplished simultaneously. The projected start date is April 21, 1986, with completion scheduled for late May.

1.4 SUPPORTING SERVICES

Accomplishing this characterization will necessitate two supporting subcontracts:

- Surveying services will be required to establish a 50-ft grid system at the site and to survey the boreholes drilled during the survey.
- A subcontract will be required for borehole drilling.

2.0 RADIOLOGICAL CHARACTERIZATION

2.1 SCOPE/PURPOSE

Radiological characterization of the Maywood Interim Storage Site, including the New York Susquehanna and Western Railroad right of way north of the site, will be conducted to determine the horizontal and vertical limits of contamination, to determine ranges of radionuclide concentrations, and to estimate the volume of contaminated material buried on-site. Additionally, the characterization will identify and evaluate any pathways by which contamination might have migrated from the site.

Individual activities designed to cost-effectively accomplish these goals are delineated in a checklist presented in Appendix A. The following subsections provide more detail associated with the checklist. The planned level of effort for Eberline Analytical Corporation (EAC) is documented in Appendix B.

2.2 CHARACTERIZATION ACTIVITIES

2.2.1 Site Grid System

A civil surveyor will establish a 50-ft grid over the entire MISS by staking the intersections of a series of mutually perpendicular lines. The grid origin will be located at the northern boundary of the site as shown in Figure 2-1. Each stake will be marked with grid coordinates. In addition, a 2-in. square wooden hub stake will be installed at 100-ft intervals along each line. The grid will be tied to the New Jersey state grid system with sufficient detail to allow reestablishment of the grid at some future date. All property boundaries will be located and set. A drawing showing the property boundaries, fences, roads, gravel, asphalt, surface obstructions, landmarks, grid intersections, and other features will be provided by the surveyor.

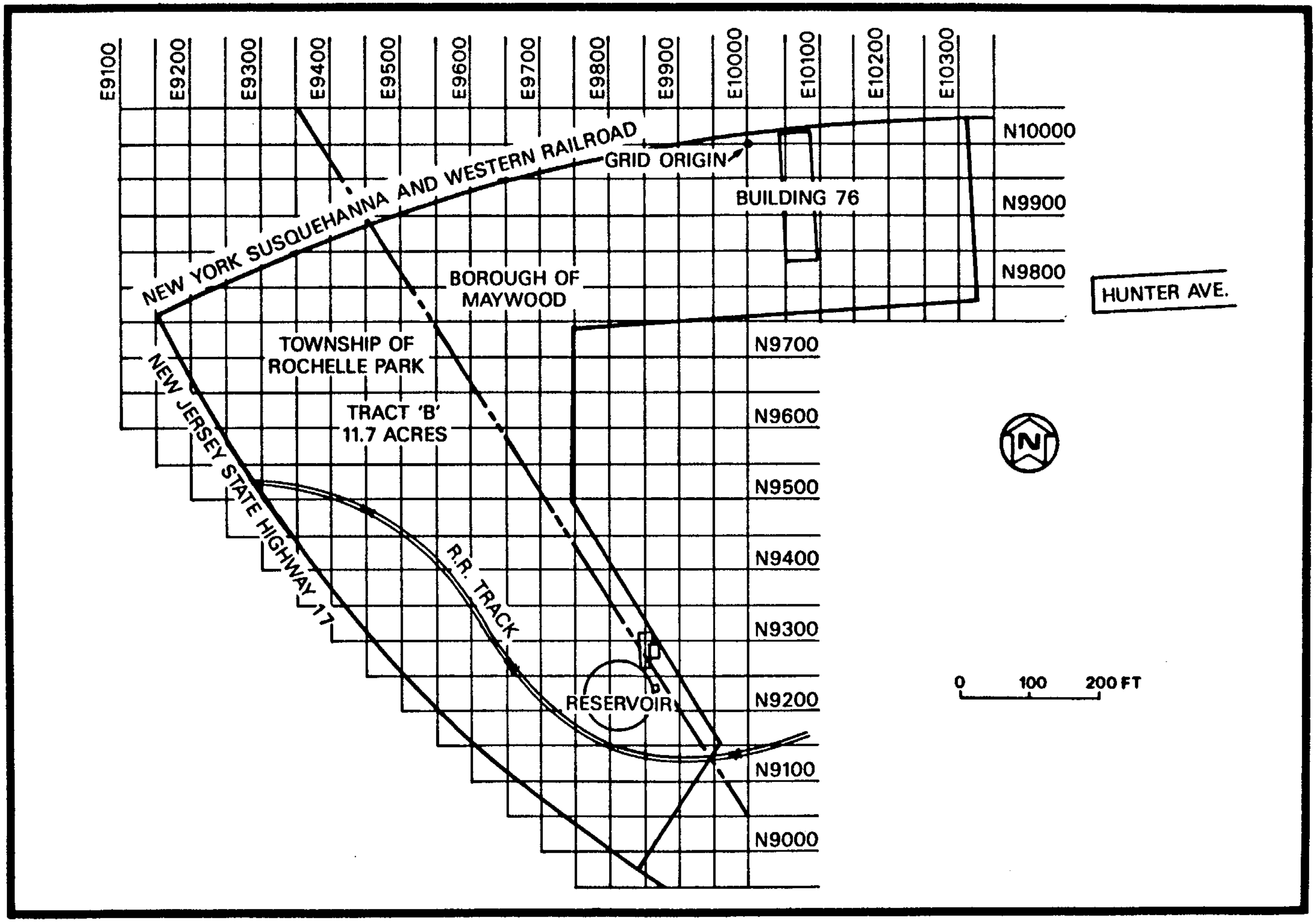

FIGURE 2-1 SITE PLAN FOR THE MAYWOOD INTERIM STORAGE SITE

2.2.2 Surface Characterization

Surface characterization will precede subsurface investigations and include:

- A site tour by Henry Morton and interviews with him.
- Walkover surveys between grid points. Isopleths will be drawn showing selected gamma intensities.
- Cone-shielded gamma scintillator measurements will be made to verify isopleths generated during the walkover survey. This will eliminate any discrepancy in the size of these areas that might have been influenced by lateral gamma flux (shine) from other contaminated areas.
- Surface soil samples (0 to 6 in.) will be collected from selected locations on both systematic and biased spacing. Surface soil sample locations will be selected after review of the gamma scanning data. Soil samples will be analyzed for uranium-238, thorium-232, and radium-226.
- Sediment samples will be taken from all drainage pathways including ditches, swales, berms, culverts, and creeks. These samples will be analyzed for uranium-238, thorium-232, and radium-226.

2.2.3 Subsurface Investigation

A systematic subsurface investigation will be conducted by drilling 6-in.-diameter boreholes at most 100-ft grid intersections. Biased locations will also be chosen to obtain information from areas of suspected contamination. A sufficient number of boreholes will be drilled in each area where elevated surface radioactive contamination is found to determine the depth of the contamination. The depth of each borehole will be determined in the field based on guidance from the geological and radiological support representatives. In all cases, boreholes will at least reach natural soil and will extend completely through all layers of contamination.

Subsurface soil samples will be collected from selected boreholes by a split-spoon sampler driven in advance of the auger. Once drilled, each characterization hole will be temporarily lined with a 4-in.-diameter PVC casing while it is gamma logged. All boreholes drilled for the chemical sampling investigation will also be gamma logged. Gamma logging will be conducted by lowering a gamma scintillator into the borehole. This detector will be calibrated to allow correlation from counts per minute to picocuries per gram (pCi/g). Gamma radiation measurements will be made typically at 1-ft vertical intervals; however, the interval may be smaller near the boundaries of contamination.

After each borehole is systematically logged, the depth of contamination in it will be compared with depths of contamination in other boreholes in the area. If a significant difference is noted, additional boreholes will be drilled at a closer spacing to better define the areas of contamination. These boreholes will be logged and sampled in the manner described above. Once sampled, boreholes in contaminated areas will be sealed using bentonite and/or cement/bentonite grout.

2.2.4 Data Review

Meetings of the field characterization team will be held after successive stages of the characterization to review and discuss findings to date. At these meetings, problem areas and inconsistencies will be identified, and a strategy for continued investigation will be developed. The meetings will serve to structure the characterization sequentially so that information collected is built upon and clarified throughout the course of the survey.

2.3 DOCUMENTATION

All data collected during the survey will be transmitted to the BNI Oak Ridge office via the EAC Oak Ridge office in an approved format. Before the start of on-site activities, the field team will be provided with blank grid drawings on which to plot field measurements. The field team will assign a scale to the grid blocks, which will permit later interpretation of the drawings. These drawings will show:

- All surface walkover isopleths and cone-shield readings verifying the size and shape of these isopleths
- Locations of all surface soil and sediment samples, identified in such a way that the results of laboratory analyses for each location can be clearly associated with the corresponding point on the drawing
- Locations of all boreholes with identification number corresponding to gamma logs and soil samples
- Sketches of surface obstructions, irregularities, drainage pathways, culverts, fences, roads, landmarks, (to rough scale)

2.4 REPORTING

A radiological characterization report will be prepared to present the data collected and an interpretation of the results. The objectives of the report will be to present the current radiological conditions.

3.0 CHEMICAL CHARACTERIZATION

3.1 SCOPE/PURPOSE

Chemical characterization of selected boreholes will be undertaken to determine the condition of the site with respect to regulations established by the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and to provide input to develop the environmental hygiene program that will be implemented during remedial action. Chemical characterization will be conducted in accordance with guidelines presented in SW-846, Test Methods for Evaluating Solid Waste, second edition, published by the Environmental Protection Agency (EPA) (Ref. 2).

3.2 CHARACTERIZATION ACTIVITIES

3.2.1 Approach

The nature and extent of chemical contamination of this site due to former activities is largely unknown. In order to maximize the efficiency of the overall program, most of the chemical analyses will be performed on soil samples which are to be archived during the radiological characterization. The one exception is volatile organic analysis which requires special sample handling during sample collection.

3.2.2 Number of Samples

A methodology is presented in SW-846 for calculating the number of samples required to characterize a site. This technique assumes that previous sampling has resulted in some familiarity with the variance of the concentrations to be measured. No applicable measurements have been performed at Maywood. The number of individual samples to be taken on this characterization has been limited to 30 samples for volatile organic analyses and 20 samples for all other parameters. When the results of the chemical analyses on these samples are received, the SW-846 calculations will be performed to ensure that enough samples have indeed been taken.

3.2.3 Sampling Locations

A stratified sampling strategy will be employed to select sampling locations based on the grid system discussed in Section 2.2.1. Samples will be collected during the radiological drilling program outlined in Section 2.2.3.

Volatile Organic Analysis (VOA)

Twenty randomly selected locations will be sampled and analyzed for volatile organics. Additionally, funds are budgeted for 10 VOA analyses for boreholes which were not randomly selected for VOA, but which exhibit volatile organics, i.e., detection with environmental hygiene monitoring equipment.

Other Parameters

The 10 samples that exhibit the highest radioactivity during this investigation will be analyzed for the parameters listed in Subsection 3.2.5. An additional 10 analyses will be performed. The choice of additional samples will be based upon unique features identified in the drill logs or simple random sampling (excluding the first 10). If there is a drill log feature, such as a distinct color change, which occurs across several holes, these samples may be composited to determine the average chemical characteristics of the feature. All compositing will be conducted by the laboratory.

3.2.4 Sampling Procedure

Sampling containers will be supplied by the Environmental Analysis Laboratory (EAL). Samples will be collected continuously from the surface to a depth agreed upon by the geologist as representing undisturbed natural material. Sampling will be performed using split-spoon samplers. The sample will be split with one fraction being retained for radiological analysis by EAC and the other for chemical analysis by EAL. Sample splitting will be conducted in the EAL laboratory. All samples taken from a single borehole will be maintained as discrete sample intervals.

3.2.5 Required Analyses

The samples taken for VOA will be discrete samples. Twenty samples will be used for analyzing for the remaining parameters.

	Number of Samples
Volatile Organic Analysis (Method 8240)	30
All Other Parameters	20
Base Neutral/Acid Extractable Organics (Method 8270)	
Metals, Full Scan ICP	
RCRA Characteristics, with Pesticides	
Pesticides and PCBs (40 CFR 261)	
Mercury (AA, Cold Vapor)	

Nonpriority pollutant GC/MS (gas chromatography/mass spectroscopy) peaks in excess of 10 parts per billion will be reported by the laboratory.

3.2.6 Shipping Requirements

Samples will be packaged and shipped in conformance with Department of Transportation, EPA, and applicable state and local regulations pertaining to hazardous and radioactive materials.

3.3 DOCUMENTATION

Chain-of-custody records will be maintained for each sample from the time it is collected until it is received by the laboratory. EAL will supply chain-of-custody forms.

All quality assurance/quality control (QA/QC) data will be reported with the analytical results for the samples. The QA/QC report will include blind splits, process blanks, standard reference materials, spikes, and control charts. The report is due 30 days after the laboratory receives the last sample. The report will also include a signed chain-of-custody record for all samples. This record will indicate the data on which samples were received, and the name of the receiving individual. Chain-of-custody records for individual laboratory analyses will not be required. Analytical methods used will be documented.

3.4 REPORTING

After the characterization, the data and an interpretation of the results will be compiled and incorporated into the radiological characterization report for the site.

REFERENCES

1. Morton, Henry W. Natural Thorium in Maywood, New Jersey, Nuclear Safety Associates, Inc., Maryland, September 29, 1982.

2. U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste, SW-846, Second Edition, Washington, D.C., July 1982.

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APPENDIX A

RADIOLOGICAL CHARACTERIZATION CHECKLIST FOR THE MAYWOOD INTERIM STORAGE SITE

APPENDIX A

RADIOLOGICAL CHARACTERIZATION CHECKLIST FOR THE MAYWOOD INTERIM STORAGE SITE

Action	Completed: Initials	Completed: Date
1. Review of Historical Information		
a. previous radiation surveys		
b. operations descriptions		
c. photos		
d. interviews		
1) operations personnel (hire as consultants?)		
2) neighbors		
3) others		
e. Aero Space Research resources		
f. others		
2. Property Surveys		
a. obtain blank grid drawings		
b. obtain old and new topographical drawings		
c. confirm that the property is staked at 50-ft intervals		
3. Walkover Tour of Properties (note on drawings)		
a. rubble		
b. surface obstructions		
c. buried utility lines		
d. utility poles		
e. culverts		
f. stockpiles		
g. grates, drains		
h. others (wells, etc.)		

4. Characterization Team Review of Preliminary Information

   a. compare old and new topographic maps for changes ______ ______

   b. develop sketches of properties from historical information ______ ______

5. Surface Gamma Surveys

   a. walkover with unshielded gamma scintillator ______ ______

   b. cone-shielded gamma survey at elevated areas ______ ______

6. Team Meeting to Review Gamma Scans

   a. map areas exceeding preselected limits with unshielded scan ______ ______

   b. map areas exceeding preselected limits with cone-shield results ______ ______

   c. check consistency of surface scans with historical information ______ ______

   d. plan locations for systematic and biased surface soil samples ______ ______

   e. plan locations for systematic and biased boreholes ______ ______

   f. plan locations for sampling around Item 3 problem areas ______ ______

   g. plan sediment sampling locations

      1) culverts ______ ______

      2) drainage ways ______ ______

      3) inside storm sewers ______ ______

      4) outfalls ______ ______

      5) others ______ ______

7. Surface Soil Sampling (as planned in 6d) ______ ______

8. Sediment Sampling (as planned in 6g) ______ ______

9. Subsurface Investigations (as planned in 6e)

   a. drill systematic boreholes to depth of undisturbed soil at 100 ft. increments ______ ______

b. drill systematic core hole/boreholes inside habitable structures if warranted ______ ______

c. obtain surface elevation of boreholes ______ ______

d. gamma log boreholes ______ ______

e. sample as required from boreholes ______ ______

f. review gamma logs for uniformity of contamination layers ______ ______

g. plan biased borehole locations to resolve inconsistencies between systematic holes ______ ______

h. repeat steps a. through d. for biased boreholes ______ ______

10. Team Meeting to Review Sampling

a. were all planned samples collected? ______ ______

b. were sufficient samples collected to

1) establish background? ______ ______

2) calibrate cone shield? ______ ______

3) calibrate unshielded gamma walkover survey? ______ ______

4) calibrate borehole gamma logs? ______ ______

c. problem areas from Item 3 characterized?

1) sides? ______ ______

2) bottoms? ______ ______

3) top? ______ ______

d. was a borehole drilled in each area of surface contamination? If not proceed to set up a second drill package ______ ______

e. identify all areas that are unmeasurable ______ ______

f. graphically review data to ensure that all areas have been characterized ______ ______

11. Second drill package is necessary. See action 15 ______ ______

12. Review of Data for Consistency with Historical Information ______ ______

13. Field Sample Collection Forms
    a. do coordinates on samples match those on forms? ______ ______
    b. are all samples on collection forms? ______ ______
    c. were all logged samples shipped? ______ ______
    d. was copy of field sample collection sent to EAC Oak Ridge office? ______ ______

14. Transmit all Field Notes, Data, and Drawings to EAC Oak Ridge Office ______ ______

15. After close review determine bias drilling plan to identify proper depth of contaminated area ______ ______

16. BNI/EH&S Interpretation of Characterization Data
    a. Surface
        1) Develop surface contamination isopleths ______ ______
        2) Compare BNI and characterization team isopleths ______ ______
    b. Subsurface
        1) correlate soil samples and borehole gamma logs to determine cpm/pCi/g ______ ______
        2) develop contamination isopleths at various depths ______ ______
            a) map all borehole logs that exceed criteria ______ ______
            b) map all borehole logs with increasing trends regardless of magnitude ______ ______

17. Comparison of Contamination Limits and Historical Information for Consistency ______ ______

18. Transmittal of Data for Review to BNI Engineering Department with Copies to Construction and the Characterization Team ______ ______

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19. Site Tour to Review Characterization Findings with

    a. lead health physicist ________ ________
    b. lead engineer ________ ________
    c. lead construction representative ________ ________
    d. lead member of characterization team ________ ________

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APPENDIX B

STAFFING/BUDGET FOR BECHTEL NATIONAL, INC. AND EBERLINE ANALYTICAL CORPORATION SUPPORT FOR THE MAYWOOD INTERIM STORAGE SITE CHARACTERIZATION

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APPENDIX B

STAFFING/BUDGET FOR EBERLINE ANALYTICAL CORPORATION SUPPORT FOR CHARACTERIZATION OF THE MAYWOOD INTERIM STORAGE SITE

The following budgetary constraints are applicable to the Eberline Analytical Corporation support for the Maywood Interim Storage Site:

- o Manpower in the Oak Ridge office will be limited to no more than 160 hours for the technical director for characterizations and 20 hours for the project manager.
- o The field characterization team will not expend more than 1,450 man-hours.
- o Budgetary support is currently limited to analysis of:
  - 150 soil samples (radiological)
  - 30 soil samples for VOA
  - 20 soil samples (chemical)
  - 15 urine samples
- o Budgetary support is currently limited to drilling 150 boreholes.

All samples shall be analyzed for thorium-232, radium-226, and total uranium.