November 16, 2005

Br. 2

52-01986-04

03001183

Ms. Elizabeth Ulrich
U.S. Nuclear Regulatory Commission
Commercial and R & D Branch
División of Nuclear Materials Safety, Region I
King of Prussia, PA 19406

2005 NOV 21 PM 1:52

Dear Ms. Ulrich:

The University of Puerto Rico (UPR) requests an amendment to the Materials License 52-01986-04, dated November 9, 2004. The amendment would remove cesium-137 (CS-137) (contained in a living tree) located at Study Area 4, at the UPR El Verde Research Station, by deleting items 6.h (CS-137), 9.H (the use is incorrectly indicated as storage in two trees), and conditions 10.B UPR submits that the Cs-137 in the tree in Study Area 4 satisfies the requirements set forth in 10 CFR 20 for license termination without restrictions for decommissioned facilities.

License Item 6.H was previously addressed under Materials License 52-19434-02 and subsequently incorporated into the current license. The source material is residual Cs-137 that was injected into a tree as part of U.S. Atomic Energy Commission- (AEC) sponsored research conducted in the 1960s. When the U.S. Department of Energy (DOE), the successor agency to AEC, decommissioned the facility and transferred research station responsibilities to UPR in the early 1980s, UPR obtained a Materials License for the residual Cs-137 to conduct field studies. No further studies were undertaken at the El Verde Research Station, and the license was amended for storage only of the residual Cs-137.

DOE decommissioned the El Verde Research Station in the 1980s and conducted soil removal and additional radiological assessments at Study Area 4 through 1997. In accordance with License Conditions 10.B and 22.B, the DOE Office of Environmental Management (EM) has maintained a fence and warning signs at Study Area 4.

The DOE Office of Legacy Management (LM) is responsible for required long-term surveillance and maintenance (LTS&M) at remediate sites and facilities where DOE used or stored radioactive materials. DOE is transferring responsibility for the radioactive materials in the tree at the El Verde Research Station from DOE-EM to DOE-LM. The DOE conducted an evaluation of LTS&M requirements at Study Area 4 in conjunction with the transfer to DOE-LM. To determine its LTS&M requirements, DOE reviewed results of environmental surveys, risk assessments, and dose assessments previously completed for the site. Based on this review, DOE concludes, and UPR concurs, that Study Area 4 does not pose unacceptable health risks; Study Area 4 meets DOE and NRC criteria for unrestricted use, and access controls for that area no longer required. The DOE-LM will continue to maintain records for the site and respond to public inquiries regarding past activities at the site, consistent with LTS&M practices employed by DOE-LM at other sites that have been released for unrestricted use.

University of Puerto Rico
Río Piedras Campus
Chancellor's Office

PO Box 23300
San Juan PR 00931-3300
Tel. 787-763-3877
787-764-0000, Exts. 2424, 3240
Fax 787-764-8799

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NMSS/RGNI MATERIALS-002

Because UPR has no plans to conduct future radioisotope research in this area, UPR requests that Materials License 52-01986-04 be amended to remove material 6.H, use 9.H, and conditions 10.B and 22.B This will remove requirements for restricting access to the area and fencing and signs will no longer be required. The U.S. Forest Service (USF) administers the land containing the El Verde Research Station and Study Area 4. UPR intends to maintain the El Verde Research Station on USFS land, so public recreation facilities and associated traffic is not anticipated near Study Area 4 for the foreseeable future. UPR Will provide unfettered Study Area 4 access to DOE and NRC.

Attached to this request is supporting information copiled by DOE during its evaluation of LTS&M requirements for the site. Enclosures include:

1. A summary of site activities and radiological conditions
2. A 1994 evaluation of the site that includes a human health risk assessment
3. A 1996 Phase I Environmental Assessment
4. A 1997 independent verification of radiological conditions authored by Jim Burger (the primary author of NUREG 5849, *Manual for Conducting Radiological Surveys in Support of License Termination).*

If you have any questions or if you would like any further information, call me at (787) 764-0000, extensión 2037.

Sincerely,

Gladys Escalona de Motta, PH.D.
Chancellor

yn

Enclosure

c: P. Cruz, Superintendent, Caribbean Nation Forest, USFS
R. Staubly, Site Manager, DOE-LM
Dr. Fernando Renaud
Ms. Mildred Ferré
Ms. Brenda L. Tolley

Supporting Information for Application to Amend NRC License 52-01986-04 for the El Verde Research Station, Luquillo, Puerto Rico

Purpose

This document provides information to support removal of cesium-137 (Cs-137) in a tree at the El Verde Research Station from Nuclear Regulatory Commission (NRC) Materials License 52-01986-04 (Attachment 1), granted to the University of Puerto Rico (UPR). The tree was injected with 0.46 millicuries of Cs-137 in 1968. This information will document that the facility was decommissioned and demonstrate that the Total Effective Dose Equivalent (TEDE) is less than 25 millirem per year. The tree poses no unacceptable risk to human health or the environment.

Introduction

The U.S. Department of Energy (DOE) and its predecessor agency, the U.S. Atomic Energy Commission (AEC), previously funded research involving radioactive materials at the El Verde Research Station in Luquillo, Puerto Rico. DOE, therefore, has responsibility for any long-term surveillance and maintenance (LTS&M) activities required as a result of that research. Previous surveys have indicated that the only radioactivity remaining above background levels at this facility is associated with a tree at Study Area 4.

The El Verde Research Station does not contain public recreation facilities so access is generally limited to researchers. Presently, direct access to the tree is restricted by means of a fence and locked gate; warning signs are also posted. These restrictions are required by the current radioactive materials license held by UPR. However, by reviewing information compiled for the site to determine its LTS&M responsibilities, DOE has concluded that Study Area 4 qualifies for unrestricted use and that the Cs-injected tree can be removed from the current NRC license. The results of DOE's review are presented here to support removal of materials and restrictions at Study Area 4 from the license and to establish LTS&M requirements.

Background—Contamination and Decommissioning

Radiological studies conducted at the El Verde site were funded by DOE and its predecessor agencies and conducted by different organizations associated with UPR. Most radiological constituents have decayed to background levels or were cleaned up during site decommissioning, which DOE conducted between 1980 and 1983. The only residual radioactive material that remained at the site after decommissioning was in a tree that had been injected with 0.46 millicuries of Cs-137 in 1968. Although Cs-contaminated soil associated with this tree was subsequently removed and shipped off site in 1982, the tree itself was left in place because of research opportunities presented by the tree, because of difficulties of removal and transport, and because the Cs-137 in the tree posed no risk.

More recent sampling of the tree and associated soils (see ORAU 1994, Attachment 2) indicates that Cs-137 is present in concentrations ranging from 5.5 to 252 picocuries per gram (pCi/g). However, gamma exposure rates drop to background within 3 meters of the tree. Results of surveys conducted at the site from the late 1970's to the mid 1990's are consistent and indicate

that elevated concentrations are confined to the area immediately at the root zone of the tree; no evidence of contaminant migration has been noted. [Note that the current NRC license for the site and some other documentation refer to two Cs-injected trees. However, some of the best-documented inventory reports for the site (e.g., CEER 1983) indicated that only one tree at Study Area 4 was injected with Cs-137; another tree in that area was injected with several short-lived radionuclides that have subsequently decayed to background.]

To support removal of radiological controls at the site, a dose assessment was completed in 1994 (ORAU 1994; Attachment 2). The assessment assumed that the entire injected inventory of Cs 137 remained in the tree (even though some obviously was transferred to the soil around the tree and was later removed) and had decayed by one half-life since injection occurred. Doses were calculated based on the assumption that the remaining inventory of Cs-137 was uniformly distributed in the top 15 centimeters over a 100 square meter (m^2) area of soil (the maximum area for evaluating residual radioactivity in soils per DOE Order 5400.5). Calculated doses (TEDE) for both residential farming and recreational exposure scenarios indicate a maximum potential dose of 17 millirems per year (mrem/yr), using very conservative exposure assumptions. Based on these calculations, the site meets current NRC criteria for unrestricted use (TEDE of 25 mrem/yr or less; 10 CFR Part 20, Subpart E; Attachment 4). However, because of the conditions of the current NRC license (condition 22.B), access controls are required and are being maintained (Attachment 1).

Background—Licensing

When DOE completed decommissioning of the site in the early 1980's, arrangements were made to transfer the site to UPR. During this time, UPR applied to NRC for a license for the site. In the original license application (52-19434-02), UPR indicated that the radioactive materials at Study Area 4 were to be "for use in field experiments," referring to the residual Cs-137 contamination present in the tree. Later the license was revised to indicate the radioactive materials were "for storage only." The Radiation Protection Program included as part of the license application indicated that stored radioactive materials needed to be labeled and access to them controlled; thus the fencing and signage for the tree. The DOE radiation survey report (CEER 1983) was completed to certify site decommissioning and was finalized after the UPR license was approved. The report certified that the site did not represent a radiation hazard and could be used safely under the conditions of the NRC license (52-19434-02).

An application to renew license 52-19434-02 was submitted by UPR to NRC in 1992. As a result of that application, NRC requested additional information regarding control of exposure to radioactive materials at Study Area 4. UPR responded in a letter (dated November 18, 1992), stating that the tree contained the only radioactive material at the site and that it was inaccessible to the public because of the fence and signage. That letter became a condition of the approved license (condition 22.B of the current license). Correspondence associated with the license renewal indicated that UPR wanted to maintain the license in the event they wanted to do tracer or similar studies in the future, though license termination was mentioned as an option at that point.

UPR subsequently (1994) obtained an additional license for storage of radioactive materials at a laboratory facility on the Rio Piedras campus. This license was unrelated to Study Area 4 and was set to expire in February 2000.

Currently, UPR holds NRC license 52-01986-04 (Attachment 1), which appears to have combined materials from the previous two licenses, including the Cs-137 contained in the tree at Study Area 4 (the license incorrectly states that the cesium is in two trees). The letter stating that the tree would be inaccessible to the public continues to be a condition of the current license. The current license was approved on November 9, 2004 and has an expiration date of June 30, 2011.

Long-Term Monitoring and Control Requirements

The land withdrawn by DOE for use at the El Verde Research Station, along with facilities constructed at the site, were decommissioned and transferred to the U.S. Forest Service (USFS) in 1996. Several environmental studies were completed at that time and compiled into a Phase I Environmental Site Assessment (ORISE 1996; Attachment 5). Also at that time, it was recommended that the NRC license (52-19434-02) be transferred from UPR to the USFS. Apparently this did not happen as UPR's current license still regulates the Study Area 4 tree. The signed supplemental memorandum of understanding (MOU, DOE 1996) between DOE and the USFS commits DOE to obtain a permit from the USFS to "cover use of one quarter of an acre of land on which one tree irradiated with Cesium137 is located." The MOU does not specify monitoring or surveillance requirements.

A radiological study and modeling of the site using the DOE RESRAD code was completed in January 1997 (Auxier & Associates, Inc., 1997; Attachment 4) and concluded that Study Area 4 of the El Verde site met the current DOE average and "hot-spot" criteria for unrestricted use specified in DOE Order 5400.5. This study further supported the conclusions reached earlier by ORAU (1994) that site conditions did not present an unacceptable risk to site workers and the public. As noted above, calculations in the 1994 assessment indicate a maximum TEDE of 17 mrem/yr for the most conservative exposure scenario (i.e., residential use). The draft surveillance and maintenance permit between DOE and USFS (as yet unsigned; DOE 1997) does provide for monitoring and maintenance of the fence at the site. This permit was drafted in August 1997; these requirements presumably stemmed from the NRC license that was still in place at the time. An NRC inspection took place at the El Verde Research Station in June 2000 and resulted in a notice of violation of license 52-19434-02 because of damage to the fence at the site, rendering it accessible to the public. (This implies that the license was still in effect at the time.) DOE subsequently repaired the fence.

Of potential note is that transfer of the site from DOE to the USFS took place during a time in which NRC had published a proposed rule for license termination identifying 15 mrem/yr as the criterion for unrestricted use. It is possible that application of this criterion led to the assumption that use restrictions were required. Subsequently, the final NRC rule for license termination has established a 25 mrem/yr criterion for unrestricted use (see 10 CFR 20, Subpart E, Attachment 4). Based on this current criterion and on conservative exposure assumptions used for dose assessment for the site, it appears that Study Area 4 at the El Verde Research Station is suitable for unrestricted use.

If decommissioning of Study Area 4 were to take place under the current regulatory framework, it would likely be conducted in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM, DOE 2000). Much of the MARSSIM process focuses on providing a statistically defensible methodology for site characterization and verification.

Surveys conducted at El Verde Research Station Study Area 4 were not based on a statistical design, but were instead biased toward maximum concentrations and gamma exposure rates. However, as noted in MARSSIM, for land areas less than 100 m^2, data "... should be obtained based on judgment, rather than on systematic or random design..." Therefore, the approach used to characterize El Verde Research Station Study Area 4 is consistent with the approach recommended in MARSSIM. The analyses included in Attachments 2 and 3 also are consistent with the MARSSIM approach for comparing site data with regulatory release criteria. These evaluations indicate that the site is appropriate for unrestricted use.

Rationale for Removal of the Tree from the Current License Amendment

Materials at Study Area 4 of the El Verde Research Station site were originally licensed separately from other materials covered by the current license and are unrelated to those other materials. NRC regulations for license termination (10 CFR 20 Subpart E) provide for decommissioning and license termination of "separate buildings or outdoor areas" of a site. Study Area 4 was decommissioned in the early 1980's and met the As Low As Reasonably Achievable (ALARA) criteria required by the NRC regulations. Instead of license termination at that time, UPR elected to renew the license with its existing conditions. These requirements were eventually incorporated into the current license held by UPR (License 52-01986-04). Based on the 1994 dose calculations for the El Verde site that indicate a maximum TEDE of 17 mrem/yr for residential exposure, the site meets the current NRC regulations for license termination with unrestricted use (25 mrem/yr). UPR is requesting that material 6.H, use 9.H, and conditions 10.B, 22.A, and 22.B be removed from the current license. The evaluation provided here, including previous dose and radiation evaluations, demonstrates that the NRC free release criteria are satisfied and that no further monitoring requirements are necessary at the site based on technical or regulatory concerns.

Post-License Amendment Care

Removing the tree in Study Area 4 from the NRC license will terminate NRC regulatory authority over the residual Cs-137 in the tree. No physical control of the Cs-137-injected tree is necessary because the dose assessments indicate that the most conservative exposure assumptions, burning the tree and long-term residential exposure to the Cs-contaminated soil and ash, will not result in an unacceptable dose.

The DOE Office of Legacy Management (LM) will retain responsibility for preserving information about the tree in Study Area 4. Upon license amendment, the DOE long-term surveillance and maintenance program for the Cs-137 in the tree will consist of the following:

1. DOE–LM will maintain records of use, decommissioning, characterization, and license amendment.

2. DOE will propose to UPR that a permanent tag be affixed to the tree informing researchers that DOE holds records of the research involving radionuclides injected into the tree. DOE will ask UPR to confirm the presence of the tag every 5 years.

3. Fencing and postings will no longer be required. UPR will remove the signs and the gate will be unlocked. DOE will not maintain the fence, but the fence should endure for at least one

additional half-life and will serve as a reminder that the tree had been used for investigations involving radionuclides.

4. DOE will not obtain an access agreement with USFS. However, DOE can inspect the tree if necessary through access granted by UPR research station staff. DOE will obatian an access agreement from UPR.

References

Title 10 *Code of Federal Regulations* Part 20, Subpart E, "Radiological Criteria for Decommissioning." [Attachment 4]

Auxier & Associates 1997. "Regarding Residual Cs-137 at Study Area 4, El Verde Research Station, Luquillo, Puerto Rico," memorandum from J.D. Berger, CHP, to M. Ferre, DOE Oak Ridge Office, Oak Ridge, Tennessee, January 10. [Attachment 3]

Center for Energy and Environment Research (CEER) 1983. *Radiological Survey Report for El Verde Research Station,* CEER-X-115, May.

DOE Order 5400.5. "Radiation Protection of the Public and the Environment."

DOE 1996. Supplemental Agreement No. 1 to Memorandum of Understanding between United States Department of Energy and the Forest Service, United States Department of Agriculture, signed September 23, 1996 by Cindy B. Hunter and Pablo Cruz.

DOE 1997. Letter from Cindy B. Hunter, DOE Oak Ridge Operation Office, to Demi Vigil, U.S. Department of Agriculture, re: Permit for Surveillance, Maintenance, and Radiological Control of Cesium Contaminated Tree, El Verde, Puerto Rico; Real Estate Permit No. REORDER-8-96-0202.

DOE 2000. *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM), NUREG-1575, Rev. 1; EPA 402-R-97-016, Rev. 1; DOE/EH-0624, Rev. 1; August.

NRC 2004. University of Puerto Rico, Materials License 52-01986-04, approved November 9, 2004. [Attachment 1]

Oak Ridge Associated Universities (ORAU) 1994. *Radiological Evaluation , Study Area 4, El Verde Research Station, Luquillo Forest, Luquillo, Puerto Rico,* Energy/Environment Systems Division, February. [Attachment 2]

Oak Ridge Institute for Science and Education (ORISE) 1996. *Phase I Environmental Site Assessment of the El Verde Research Station, Luquillo, Puerto Rico*, September. [Attachment 5]

End of current text

Attachment 1

Current NRC License Held by the University of Puerto Rico

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Amendment No. 16

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	In accordance with the letter dated October 25, 2004,
1. University of Puerto Rico College of Natural Sciences	3. License number 52-01986-04 is amended in its entirety to read as follows.
2. Rio Piedras Campus P. O. Box 23360 San Juan, Puerto Rico 00931-3360	4. Expiration date June 30, 2011
	5. Docket No. 030-01183 Reference No. 52-19434-02

6. Byproduct, source, and/or special nuclear material	Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Hydrogen 3	A. Any	A. 30 millicuries
B. Carbon 14	B. Any	B. 10 millicuries
C. Phosphorus 32	C. Any	C. 30 millicuries
D. Phosphorus 33	D. Any	D. 20 millicuries
E. Sulfur 35	E. Any	E. 25 millicuries
F. Calcium 45	F. Any	F. 8.5 millicuries
G. Iodine 125	G. Any	G. 5 millicuries
H. Cesium 137	H. Any	H. 1 millicuries
I. Krypton 85	I. Sealed Source (Isotopes Product Labs NER-8295, -8285, or -8275, or 3M Model 3B4G)	I. No single source to exceed the maximum activity specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission or an Agreement State

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SUPPLEMENTARY SHEET

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52-01986-04

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030-01183
52-19434-02

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6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
J. Strontium 90	Sealed Source (Amersham Corporation Model SIF.P1 [formerly Models SIF.31 - SIF.33])	J. No single source to exceed the maximum activity specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission or an Agreement State

9. Authorized use:

A. through G. Research and development as defined in 10 CFR 30.4; animal studies; teaching and training of students.

H. Possession only, as residue in tree trees incident to experimental use as described in the application dated December 20, 1981, License No. 52-19434-02.

I. In TSI Incorporated Model No. 3012 Static Charge Neutralizer devices for research and development as defined in 10 CFR 30.4.

J. In Amersham Corporation Model No. SIF.P1 Industrial Gauge Source for research and development as defined in 10 CFR 30.4.

CONDITIONS

10. A. Licensed material in Subitems 6.A through 6.G., 6.I. and 6.J. may be used or stored only at the licensee's facilities located at the University of Puerto Rico, Departments of Biology and chemistry, Rio Piedras, Puerto Rico.

B. Licensed material in Subitem 6.H. may only be retained, without harvest or removal, at the licensee's facilities located at the Caribbean National Forest, Luquillo Forest, El Verde Research Station, Puerto Rico.

C. Licensed material in Subitems 6.I. and 6.J. may be used at temporary job sites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material, including areas of exclusive Federal jurisdiction within Agreement States.

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If the jurisdiction status of a Federal facility within an Agreement State is unknown, the licensee should contact the Federal agency controlling the job site in question to determine whether the proposed job site is an area of exclusive Federal jurisdiction. Authorization for use of radioactive materials at job sites in Agreement States not under exclusive Federal jurisdiction shall be obtained from the appropriate state regulatory agency.

11. Licensed material in Subitems 6.A. through 6.G. shall be used by, or under the supervision of, Paul Bayman, Ph.D.; Graciela Candelas, Ph.D.; José E. García-Arrarás, Ph.D.; Carlos González, Ph.D.; Fernando González, Ph.D.; Tugrul Giray, Ph.D.; José Lasalda, Ph.D.; W. Owen McMillan, Ph.D.; Reginald Morales, Ph.D.; Sandra Peña, Ph.D.; Fernando Renaud, Ph.D.; or Gary A. Toranzos, Ph.D. Licensed material in Subitem 6.H shall be stored or retained by Fernando Renaud, Ph.D. or Robert Waide, Ph.D. Licensed material in Subitems 6.I. and 6.J. shall be used by, or under the supervision of, Fernando Renaud, Ph.D.

12. The Radiation Safety Officer for this license is Fernando Renaud, Ph.D.

13. The licensee shall not use licensed material in or on human beings.

14. The licensee shall not use licensed material in field applications where it is released except as provided otherwise by specific condition of the license.

15. Experimental animals, or the products from experimental animals, that have been administered licensed materials shall not be used for human consumption.

16. A. Sealed sources shall be tested for leakage and/or contamination at intervals not to exceed the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or under equivalent regulations of an Agreement State.

    B. Notwithstanding Paragraph A of this Condition, sealed sources designed to primarily emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed 3 months.

    C. In the absence of a certificate from a transferor indicating that a leak test has been made within the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or under equivalent regulations of an Agreement State, prior to the transfer, a sealed source received from another person shall not be put into use until tested and the test results received.

    D. Sealed sources need not be tested if they contain only hydrogen-3; or they contain only a radioactive gas; or the half-life of the isotope is 30 days or less; or they contain not more than 100 microcuries of beta- and/or gamma-emitting material or not more than 10 microcuries of alpha-emitting material.

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E. Sealed sources need not be tested if they are in storage and are not being used; however, when they are removed from storage for use or transferred to another person and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

F. The leak test shall be capable of detecting the presence of 0.005 microcurie (185 becquerels) of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie (185 becquerels) or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission in accordance with 10 CFR 30.50(c)(2), and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations.

G. Tests for leakage and/or contamination, including leak test sample collection and analysis, shall be performed by the licensee or by other persons specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.

H. Records of leak test results shall be kept in units of microcuries and shall be maintained for 5 years.

17. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.

18. The licensee shall conduct a physical inventory every six months, or at other intervals approved by the U.S. Nuclear Regulatory Commission, to account for all sources and/or devices received and possessed under the license. Records of inventories shall be maintained for 5 years from the date of each inventory and shall include the radionuclides, quantities, manufacturer's name and model numbers, and the date of the inventory.

19. Maintenance, repair, cleaning, replacement, and disposal of foils contained in detector cells shall be performed only by the device manufacturer or other persons specifically authorized by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.

20. The licensee is authorized to hold radioactive material with a physical half-life of less than or equal to 120 days for decay-in-storage before disposal in ordinary trash, provided:

A. Waste to be disposed of in this manner shall be held for decay a minimum of 10 half-lives.

B. Before disposal as ordinary trash, the waste shall be surveyed at the container surface with the appropriate survey instrument set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated.

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C. A record of each such disposal permitted under this license condition shall be retained for 3 years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.

21. The licensee is authorized to transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

22. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Application dated December 20, 1991 (License No. 52-19434-02)
B. Letter dated November 18, 1992 (Licence No. 52-19434-02)
C. Application dated April 17, 2001
D. Letter dated October 25, 2004

For the U.S. Nuclear Regulatory Commission

Date November 9, 2004

By

Elizabeth Ullrich
Commercial and R&D Branch
Division of Nuclear Materials Safety
Region I
King of Prussia, Pennsylvania 19406

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Attachment 2

1994 Radiological Evaluation of El Verde Study Area 4

RADIOLOGICAL EVALUATION
STUDY AREA 4
EL VERDE RESEARCH STATION
LUQUILLO FOREST
LUQUILLO, PUERTO RICO

INTRODUCTION

Between 1964 and 1976, the U.S. Atomic Energy Commission (AEC), under an agreement with the U.S. Department of Agriculture Forest Service, supported a terrestrial ecology program in a section of the Luquillo Forest, known as the El Verde Research Station. This program was conducted through the Puerto Rico Nuclear Center (later renamed CEER, Center for Energy and Environment Research), at the University of Puerto Rico (UPR). In 1976, control of activities at the El Verde site was transferred from the AEC successor, ERDA (presently the Department of Energy (DOE)), to the University of Puerto Rico; the agreement with USFS was also transferred to UPR.

The program included the use of radioactive materials, for direct exposure of vegetation and for tracing biopathways. Most radionuclides used in the projects were of short half-life or were in the form of sealed sources. Sealed radioactive sources have been removed; materials used for labeling (tagging) vegetation have mostly decayed or dispersed to the extent that residual activity levels are at or near ambient background.

One area which still retains activity in excess of background levels is Study Area 4, east of the Research Station. In September 1968, a tree of the species Matayba dominguensis was injected with 460 microcuries (μCi) of Cs-137; at about the same time, a nearby tree of the species Dacryodes excelsa in this Study Area was injected with a mixture of Rb-86 (17.69 mCi), Sr-85 (0.19 mCi), and Mn-54 (0.34 mCi).[1,2] The purpose of these injections was to study mineral cycling and metabolism. The Rb-86, Sr-85, and Mn-54 have relatively short radiological

Prepared by the Energy/Environment Systems Division of Oak Ridge Associated Universities, Oak Ridge, Tennessee, under Contract DE-AC05-76OR00033 with the U.S. Department of Energy.

half-lives (maximum of about 300 days for Mn-54); residual activities are, therefore, negligible after almost 25 years of decay. The half-life of Cs-137 is approximately 30 years, and, thus, at this writing, as much as 58% (270 μCi) could theoretically remain. In the late 1970's and early 1980's, about 43 kg of contaminated soil was removed from around the roots of the Matayba dominguensis tree by UPR and disposed of in Oak Ridge, TN; the total activity removed was not determined and, therefore, the balance of Cs-137 at the Study Area 4 cannot be determined, without extensive subsurface investigations.

The residual Cs-137 activity in Study Area 4 is licensed to the University of Puerto Rico by the Nuclear Regulatory Commission (License 52-19434-02). The University has indicated a desire to divest itself of the responsibility for this site; it has been suggested that this responsibility be transferred to the U.S. Department of Agriculture (USDA) by adding the site to their existing radioactive materials license with the NRC. The USDA has requested an evaluation of the radiological conditions and associated potential environmental and public health impacts, prior to further consideration of such a transfer.[3] This report addresses these issues.

SITE DESCRIPTION

The Luquillo Forest, also known as the Caribbean National Forest, is located in the northeast portion of Puerto Rico, approximately 15 km from the town of Luquillo and about 35 km from San Juan (Figure 1). The Forest, occupying approximately 11,300 hectares, receives up to 600 cm of rainfall, annually. It is a dense evergreen forest, containing a wide variety of native flora; it is also a wildlife refuge for about 50 bird species and numerous amphibians and reptiles. Major uses of the forest are hiking, camping, and sight-seeing. With exception of several principle roads and a few improved trails, the Luquillo Forest is relatively inaccessible. Interior trails are typically narrow, rugged, and steep.

The El Verde Research Station is in the northwest corner of the Luqillo Forest and is reached via Highway 186 (Figures 1 and 2). Study Area 4 is about 500 m east of the Research Station Field Office. The study area is accessed via a winding, occasionally steep trail from the Field Office. The access trail is about 650 m in length and includes a cable suspension bridge, over

CER53

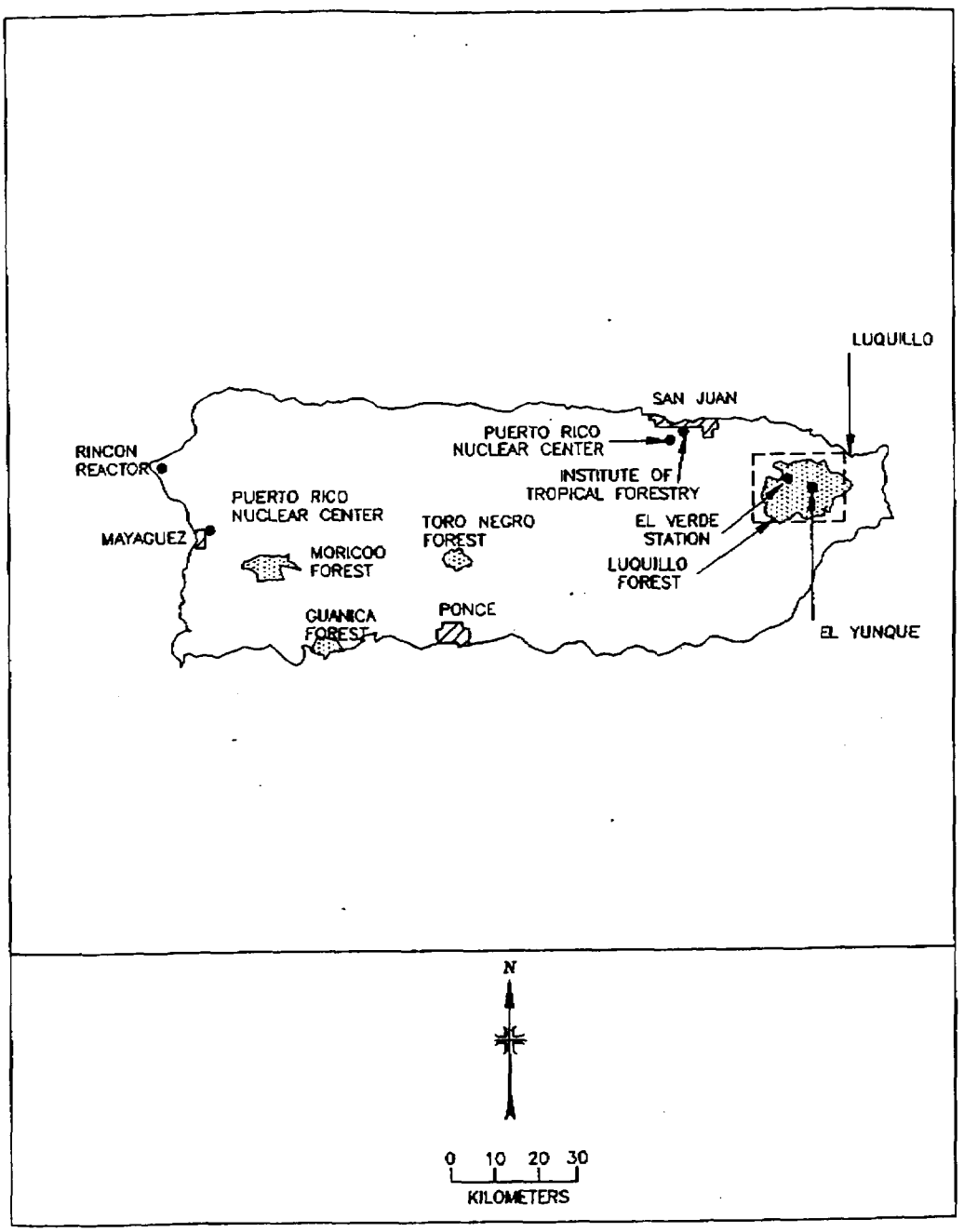

FIGURE 1: Map of Puerto Rico – Location of Luquillo Forest and El Verde Research Area (From "Radiological Survey Report for El Verde Research Station," CEER-X-115, Health and Safety Division, CEER, May 1983 (Revised)

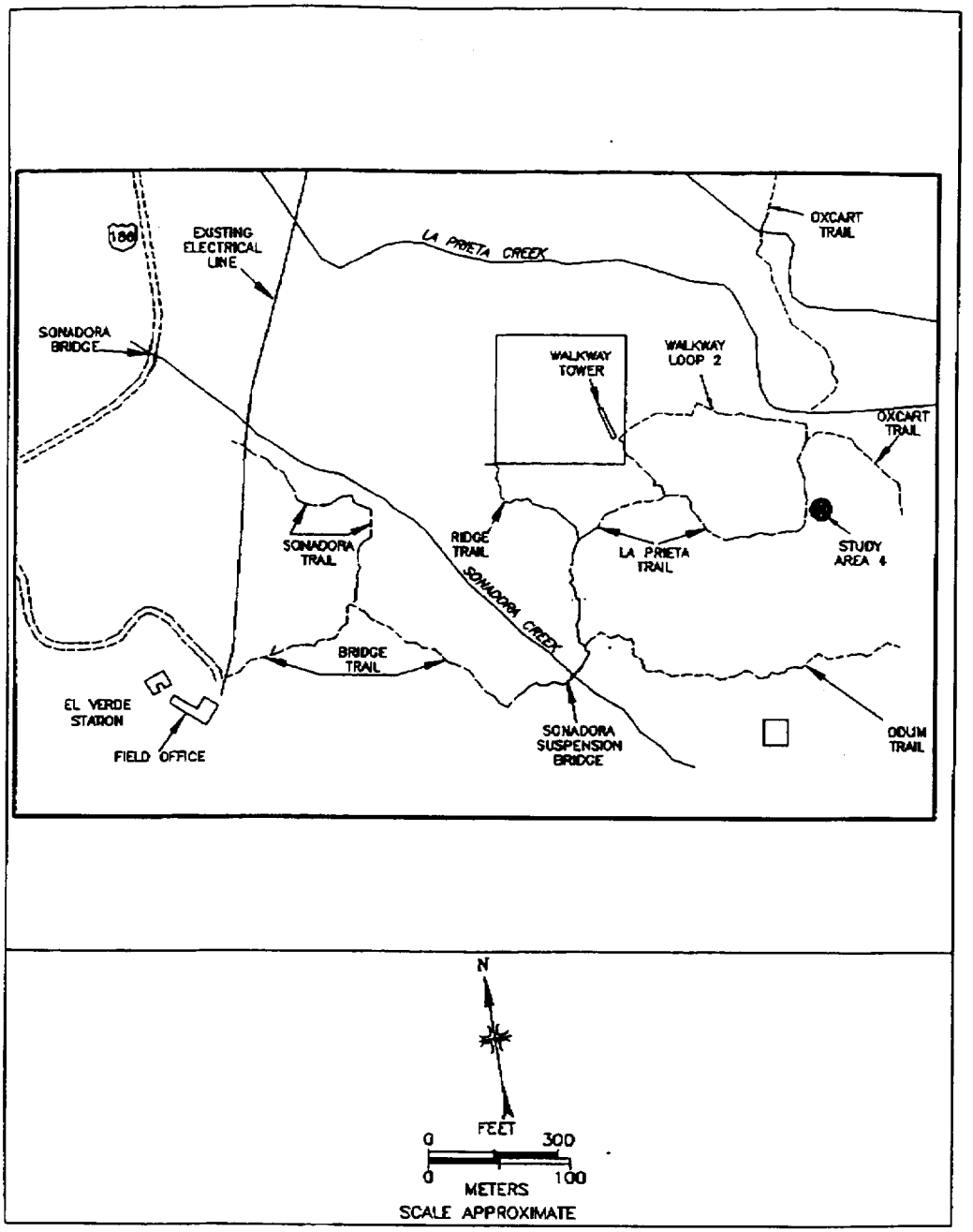

FIGURE 2: El Verde Research Station – Location of Cesium-137-Labeled Tree in Study Area 4

the Sonadora Creek. Study Area 4 is located on a small knoll, slightly above this trail; the closest point on the trail to the region of contaminated soil is approximately 8 m. The trunk of the Matayba dominguensis tree is presently approximately 1.8 m in circumference at 1 m above the ground surface. Fencing, with postings indicating the presence of the Cs-137, previously surrounded the Study Area. This fence is not presently standing and warnings are therefore not readily visible. A plot plan of Study Area 4 is shown in Figure 3.

Several previous radiological surveys have been performed in the Study Area during the past 10 years.[2,4,5] These surveys, by UPR, Oak Ridge National Laboratory, and the Environmental Survey and Site Assessment Program of Oak Ridge Institute for Science and Education provide similar results and do not identify significant changes in the levels and distribution of the Cs-137 contaminations. These surveys indicate that the residual activity is concentrated at the base of the trunk and in the small root system of the previously injected tree. The maximum Cs-137 concentration is 370 pCi/g, in the soil around the root system, directly beneath the tree. Within several meters of the tree the Cs-137 concentration in surface soil ranged from about 10 to 250 pCi/g. Beyond this distance, the concentration decreases and ranged from 1 pCi/g (background) to 2.5 pCi/g at 5 m from the tree.

Maximum direct gamma radiation levels are at contact with the root system, directly beneath the tree. The highest level noted is about 200 μR/h, in contact with the exposed roots and soil. On contact with the tree itself, at 1 m above ground level, the direct radiation level is a maximum of 15 μR/h. At approximately 3 m from the tree the direct radiation level decreases to ambient background levels (2-3 μR/h) at both surface contact and at 1 m above the surface. No evidence of "hot-spots", that would suggest migration of activity, have been noted out to 5 to 10 m beyond the Study Area perimeter.

A core of wood from the Cs-137 injection site contained 77.4 pCi/g, and small roots contained 109 pCi/g. These particular locations are considered as representing maximum Cs-137 concentrations in the tree itself. Leaves, collected from the surface near the tree contained 5.5 pCi/g.

CER55

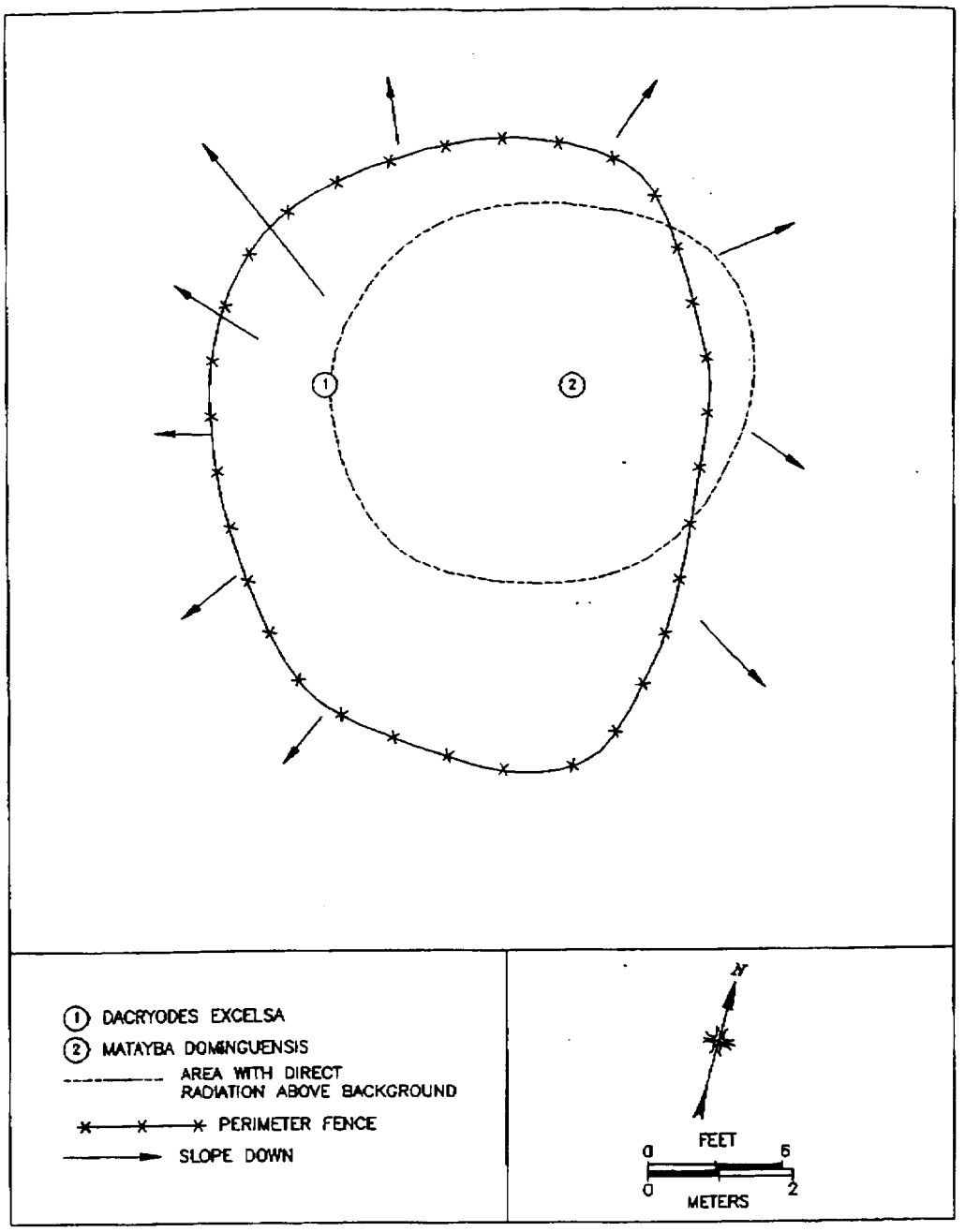

FIGURE 3: Study Area 4 – Location of Experimental Trees and Results of Surface Gamma Scan

RADIATION EXPOSURE EVALUATION

In evaluating the potential future impact of the radioactivity at Study Area 4 on workers and the public, several basic conditions were considered. The first of these conditions assumes no changes in site use, i.e. the site will continue as a research area within a National Forest. The second condition assumes that the area will be released for development, in which case timber will be cut and burned and the land surface graded to enable construction of access roads, structures, and other improvements. Because of uncertainties in the total activity Cs-137 currently remaining, it is assumed for the purpose of these estimates that the quantity originally injected has undergone radioactive decay, but not other actions have occurred to significantly reduce the amount; the total activity used for these estimates is thus assumed to be 270 μCi, although the actual quantity may be considerably less. Also, because of uncertainties in the distribution of the activity between the tree and soil, for calculations applied to only one of these media it has been conservatively assumed that the entire quantity of Cs-137 (270 μCi) is contained in the media of interest.

I. Condition 1 - Site Use Unchanged

According to the El Verde Research Station staff, other study areas in this portion of the Luquillo Forest will require surveillance for at least an additional 30-40 years.[6] They consider it unlikely that there will be development, which would increase the amount of worker or public traffic near Study Area 4 or which would result in disturbance of the contaminated soil or tree. Under such circumstances, direct gamma radiation would be the most probable exposure pathway from Cs-137 in the soil and tree.[7,8] Site staff members spend less than 1 hour per year within 10 m of the tree; public traffic is uncommon in this area of the Forest and annual exposure time of a member of the public is estimated as less than that of the staff.[6] If an individual were exposed to the maximum level of direct gamma radiation measured at 1 m above the ground surface (15 uR/h in contact with the tree) for 1 hour annually, the accumulated exposure would be 15 uR. This is approximately a dose equivalent rate of 0.01 mrem/y, above background.

Surveys have not identified evidence of surface migration of Cs-137 from the Study Area; potential impact on surface waters are thus considered negligible.[2,4,5]

Based on NUREG/CR-5512, total soil contamination of 1 pCi of Cs-137 would result in an annual total dose equivalent of 6.55×10^{-12} mrem, via a drinking water pathway.[7] A total site Cs-137 inventory of 270 uCi would therefore have an associated dose equivalent of about 0.001 mrem/y. This calculated value is based on conservative and "default" assumptions and contains a high level of uncertainty, because of the likely overestimate of total activity and the unknown effects of more abundant rainfall and the mobility of Cs-137 in soil for this locale. However, due to the absence of wells in the vicinity of the Study Area and the low dose equivalent rate estimated, this drinking water pathway is also considered negligible.

II. Condition 2 - Site Development

By clearing and grading the area, it is assumed that the total estimated quantity of activity (270 uCi) is distributed in the upper 15 cm soil layer of a 100 m^2 area. If the density of the soil is assumed to be 1.5 g/cm^3, the resulting average concentration of Cs-137 in this soil layer would be 12 pCi/g. The exposure scenario with the greatest potential radiation dose to a site occupant from Cs-137 is surface soil is the residential scenario.[7,8] The residential scenario, developed in NUREG/CR-5512, equates 0.71 pCi/g in soil with an annual dose equivalent of 1 mrem.[7] Using this relationship, a soil concentration of 12 pCi/g would yield a dose equivalent rate of 17 mrem/y to a site resident. It is acknowledge that uniform mixing would not likely occur and the distribution would be non-homogeneous, with small volumes of soil having higher concentrations of Cs-137. However, due to overestimates of input parameters and averaging of the exposure over a year, the resulting dose equivalent is considered to be a conservative overestimate.

The Matayba domeniguensis tree is not a species used for construction. It could be burned for cooking or heating; however, considering the size of the tree and the inaccessibility of its location, it is unlikely that it would be removed from its present location for such a use. The likely fate of this tree, if the area were cleared for development, is that it would be burned in

place, along with most of the other vegetation. Because of uncertainties as to the volatility of the Cs-137, two possibilities representing the extreme cases, are considered, one is that all of the Cs-137 remains in the ash; the other is that all of the Cs-137 is volatilized, creating an inhalation exposure potential.

Assume that all of the Cs-137 remains in the ash and is combined with the soil during grading. The resulting concentration and associated does equivalent from this mixture would be the same as described above, for the residential scenario, i.e. 12 pCi/g and 17 mrem/y, respectively.

The procedure presented in NCRP Commentary #3 may be used to estimate the consequences of a radioactive initial release to the atmosphere.[9] For this situation the procedure recommended for Screening Level II is followed. Input parameters assumed are:

total activity in tree	270 uCi
portion of activity voltalized	100%
time for combustion	24 h
wind in direction of exposures	25%*
distance to exposed individual	100 m*
exposure time	8 h
wind speed	2 m/s*
release height above ground surface	0
diffusion parameter (0 height, 100 m)	$3.5 \times 10^{-3} m^{-2}$

*recommended default values for Screening Level II application

The release rate for combustion of the tree in 1 day is:

$$\frac{270\ \mu Ci}{86400\ s} = 3.13 \times 10^{-3}\ \mu Ci/s$$

At 100 m from the burn site, the resulting air concentration would be:

$$\frac{3.13 \times 10^{-3}\ \mu Ci/s \times 0.25 \times 3.5 \times 10^{-3}\ m^{-2}}{2\ m/s} = 1.37 \times 10^{-6}\ \mu Ci/m^3$$

At an inhalation rate of 0.04 m^3/min (ICRP-30 for heavy physical labor), the total inhaled activity, during an 8 hour exposure would be:

$$1.37 \times 10^{-6}\ \mu Ci/m^3 \times 0.04\ m^3/\text{min} \times \frac{60\ \text{min}}{h} \times 8\ h = 2.63 \times 10^{-5}\ \mu Ci$$

From Table C-3 of NCRP Commentary No. 3, the committed total effective dose equivalent from inhalation of Cs-137 is 3.1×10^7 mrem/Ci. Inhalation of 2.63×10^{-5} uCi would thus deliver an estimated committed dose equivalent of:

$$2.63 \times 10^{-5}\ \mu Ci \times 3.1 \times 10^7\ \text{mrem/Ci} \times 10^{-6}\ Ci/\mu Ci = 8.15 \times 10^{-4}\ \text{mrem}$$

This value is considered an overestimate, because plume rise and diffusion, due to temperature of the combustion gases, is ignored and the extreme cases of total activity in the wood and fraction of the Cs-137 volatilized, are assumed.

The following table summarizes the results of these evaluations:

Condition	Exposure Pathway	Estimated Dose Equivalent
Site Use Unchanged	direct gamma radiation	0.01 mrem/g
Site Use Unchanged	surface water	negligible (not calculated)
Site Use Unchange	drinking water	0.001 mrem/y
Site Development	combined residential scenario	17 mrem/y
Site Development	Cs-137 remains in ash/soil	17 mrem/y
Site Development	Cs-137 volatilized-inhalation	8.2×10^{-4} mrem*

*Committed dose equivalent

Of the various scenarios considered, the maximum estimated dose equivalent to an individual, is the result of residential use of the land, following clearing and grading of the surface. The

estimated dose equivalent for this scenario is 17 mrem/y, above background. The other scenarios all had estimated dose equivalent levels of less than 1 mrem/y, above background. For comparison, the NRC and DOE recommended limits for a member of the public are an average of 50 mrem/y and 100 mrem/y, respectively.[10,11] All potential exposure scenarios were well below that recommended limit, and considering that conservative assumptions were used for most of those estimates, the actual doses would likely be even less.

SUMMARY

As much as 270 μCi of Cs-137, from a vegetation tagging experiment, conducted approximately 30 years ago, is present in soil and a Matayba dominguensis tree in a small secluded area near the El Verde Research Station of the Luquillo Forest. This radioactive material is currently regulated under a Nuclear Regulatory Commission license with the University of Puerto Rico. An evaluation of the potential radiological impact of this Cs-137 on Forest workers and the public was performed. This evaluation indicates that radiation doses would be expected to remain well within regulatory limits of the NRC and DOE, even assuming conservative site conditions, which likely overestimate the doses. On the basis of these results, it can be assumed that leaving the tree soil at the current location, either with continued licensing restrictions and surveillance of without future regulatory control, will assure an adequate level of radiological protection. The alternative would be to remove and properly dispose of the contaminated tree and soil. This would be difficult to perform under present site conditions which restrict accessibility. Such an action would require destruction of the mature tree and would also likely result in damage to additional portions of the Forest in the immediate area and along the transport routes.

REFERENCES

1. "The Rain Forest Project Annual Report," PRNC-129, Puerto Rico Nuclear Center, June 1969.

2. Radiological Survey Report for El Verde Research Station," CEER-X-115, Health and Safety Division, Center for Energy and Environmental Research, University of Puerto Rico, May 1983 (Revised).

3. Letter from Armando G. Caban (USDA, Forest Service) to Andrew Szilagyi (USDOE, EM 62), "Transition of El Verde Research Station from DOE to the Forest Service," October 7, 1993.

4. Preliminary Site Survey Report of the El Verde Research Station, Center for Energy and Environment Research, in the Luquillo Forest, Luquillo, Puerto Rico," Draft, ORNL/RASA-90/1, Oak Ridge National Laboratory, March 1990.

5. "Radiological Measurements, Study Area 4, Ed Verde Research Station, Luquillo Forest, Luquillo, Puerto Rico," Oak Ridge Institute of Science and Education, May 1993.

6. Personal communication with R. Waidle, U.S. Forest Service, December 1993.

7. W. E. Kennedy, Jr. and D. L. Strenge, Residual Radioactive Contamination from Decommissioning, PNL - 7994, Vol 1. (NUREG/CR-5512), Pacific Northwest Laboratory, October 1992.

8. T. L. Gilbert, et al. A Manual for Implementing Residual Radioactive Material Guidelines, ANL/ES-160, DOE/CH/8901, Argonne National Laboratory, June 1989.

9. "Screening Techniques for Determining Compliance with Environmental Standards," NCRP Commentary No. 3, National Council on Radiation Protection and Measurements, January 1989.

10. Title 10, Code of Federal Regulations, Part 20.1302, "Compliance With Dose Limits for Individual Members of The Public," Office of the Federal Register National Archives and Records Administration, January 1993.

11. "Radiation Protection of the Public and the Environment," DOE Order 5400.5, U.S. Department of Energy, February 8, 1990.

Attachment 3

1997 Evaluation of Residual Cs-137 at El Verde Study Area 4

REGARDING RESIDUAL CS-137 AT STUDY AREA 4
EL VERDE RESEARCH STATION
LUQUILLO, PUERTO RICO

The maximum activity of Cs-137 that could be present at Study Area 4 is about 270 μCi, based on radiological decay of the 460 μCi originally injected into a Matayba tree and assuming negligible reduction in the source term by migration or remedial activities. A survey of the Study Area, performed by ORISE in May 1993, identified a small area of contaminated soil, primarily within the root structure of the injected tree. The maximum Cs-137 concentration in soil was 370 pCi/g at one isolated location, less than 0.1 m^2 in area. Direct measurements indicated that the contamination decreased with distance from this location, with radiation levels reaching background within 3 m or less from the tree. The extent of the more highly contaminated soil appeared to occupy only about 1 m^2 around the root system.

DOE criteria, used for unrestricted release of land areas, are determined on a site specific basis using the RESRAD code. Typically, the guideline concentrations for Cs-137 in soil have been on the order of 15 to 30 pCi/g, based on 100 mrem/y dose limits and restrictive future site use scenarios and exposure parameters, such as "resident-farmer" use. (For comparison, the NRC has been using a concentration of 15 pCi/g for unrestricted release.) The actual current use of this site is such that the resident-farmer scenario overestimates the potential for exposure to the residual activity. Also, site personnel indicate that there are no plans to modify the use of this area and that present conditions are not expected to change over the next 30 to 40 years - at least one additional half-life of Cs-137, further reducing the activity by a factor of 2 or more. Consequently, a 15 pCi/g guideline is considered a conservatively restrictive level and a site-specific guideline, would certainly be significantly higher than 15 pCi/g. With respect to areas of elevated concentrations, DOE regulations (Order 5400.5) allow averaging of concentrations over the upper 15 cm soil layer of a 100 m^2 area. Smaller areas, between 100 m^2 and 1 m^2, of elevated concentrations are acceptable, if the average concentration in an area of A m^2 does not exceed a level of $(100/A)^{1/2}$ times the average guideline value. In addition, every reasonable effort is to be made to remove material having a concentration in excess of 30 times the guideline value, also know as a "hot-spot", regardless of the average concentration within the 100 m^2 area.

If the maximum possible quantity of Cs-137 were distributed in the top 15 cm of soil in a 100 m^2 area, the average concentration would be approximately 12 pCi/g, which is below the guideline levels typically used by DOE and NRC. The maximum concentration measured (370 pCi/g) is less than 30 times the more conservative guideline concentration of 15 pCi/g, i.e., 450 pCi/g. Finally, the average concentration acceptable for a 1 m^2 area of elevated activity is 10 times the average guideline level or, again using the 15 pCi/g value, 150 pCi/g. Although a few additional samples would be necessary to demonstrate that this particular condition is satisfied, the direct monitoring data indicate that the activity levels outside the isolated "hot-spot" are much lower

than the "hot-spot" itself, and it would appear unlikely that the average concentration in the surrounding 1 m^2 area could exceed 150 pCi/g.

On the basis of the available data, it is my opinion that the residual Cs-137 in Study Area 4 of the El Verde Research Station satisfies the current DOE average and "hot-spot" criteria for unrestricted release. This assessment is based on comparisons with a conservative guideline value and use of a realistic site-specific guideline would result in an even greater level of confidence that DOE dose criteria are being met.

J. D. Berger, CHP
Auxier & Associates, Inc.
January 10, 1997

Emily Newell

ACTION ITEM FROM THE 1996 YEAR END REVIEW

Responsible Party: Clayton Gist

Action:

Response: On the basis of the available data, the residual Cs-137 in Study Area 4 of the El Verde Research Station satisfies the current DOE average and "hot-spot" criteria for unrestricted release.

Background: See attached document.

El Verde

End of current text

Attachment 4

10 CFR Part 20, Subpart E

4.A new Subpart E entitled "Radiological Criteria for Decommissioning," is added to 10 CFR Part 20 to read as follows:

Subpart E--Radiological Criteria for Decommissioning

Sec.

§ 20.1401 General provisions and scope.

(a) The criteria in this subpart apply to the decommissioning of facilities licensed under Parts 30, 40, 50, 60, 61, 70, and 72 of this chapter, as well as other facilities subject to the Commission's jurisdiction under the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended. For high-level and low-level waste disposal facilities (10 CFR Parts 60 and 61), the criteria apply only to ancillary surface facilities that support radioactive waste disposal activities. For uranium and thorium recovery facilities already subject to Appendix A to 10 CFR Part 40 and uranium solution extraction facilities, cleanup of radionuclides other than radium from buildings and soils must result in a dose no greater than the dose resulting from cleanup of radium contaminated soil to the standard specified in Criterion 6(6), Appendix A of 10 CFR Part 40. Groundwater protection and decontamination at uranium and thorium recovery facilities subject to Appendix A to 10 CFR Part 40 shall be governed solely by the applicable requirements of Appendix A to 10 CFR Part 40.

(b) The criteria in this subpart do not apply to sites which:

(1) have been decommissioned prior to the effective date of the rule in accordance with criteria identified in the Site Decommissioning Management Plan (SDMP) Action Plan of April 16, 1992 (57 FR 13389);

(2) have previously submitted and received Commission approval on a license termination plan (LTP) or decommissioning plan that is compatible with the SDMP Action Plan criteria; or

(3) submit a sufficient LTP or decommissioning plan before [insert a date 12 months after effective date of the rule] and such LTP or decommissioning plan is approved by the Commission before [insert date 24 months after effective date of the rule] and in accordance with the criteria identified in the SDMP Action Plan, except that if an EIS is required in the submittal, there will be a provision for day-for-day extension.

(c) After a site has been decommissioned and the license terminated in accordance with the criteria in this subpart, the Commission will require additional cleanup only if, based on new information, it determines that the criteria of this subpart were not met and residual radioactivity remaining at the site could result in significant threat to public health and safety.

(d) When calculating TEDE to the average member of the critical group the licensee shall base estimates on the greatest annual TEDE dose expected within the first 1000 years after decommissioning. Estimates must be substantiated using actual measurements to the maximum extent practical.

§ 20.1402 Radiological criteria for unrestricted use.

A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels which are ALARA shall take into account consideration of any detriments, such as deaths from

transportation accidents, expected to potentially result from decontamination and waste disposal.

§ 20.1403 Criteria for license termination under restricted conditions.

A site will be considered acceptable for license termination under restricted conditions if--

(a) The licensee can demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of § 20.1402 would result in net public or environmental harm or were not being made because the residual levels associated with restricted conditions are as low as reasonably achievable (ALARA). Determination of the levels which are ALARA must take into account consideration of any detriments, such as traffic accidents, expected to potentially result from decontamination and waste disposal; and

(b) The licensee has made provisions for legally enforceable institutional controls that provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) per year; and

(c) The licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site. Acceptable financial assurance mechanisms are--

(1) Funds placed into an account segregated from the licensee's assets and outside the licensee's administrative control as described in § 30.35(f)(1) of this chapter;

(2) Surety method, insurance, or other guarantee method as described in § 30.35(f)(2) of this chapter;

(3) A statement of intent in the case of Federal, State, or local Government licensees, as described in § 30.35 (f)(4) of this chapter, or;

(4) When a governmental entity is assuming custody and ownership of a site, an arrangement that is deemed acceptable by such governmental entity; and

(d) The licensee has submitted a decommissioning plan or License Termination Plan (LTP) to the Commission indicating the licensee's intent to decommission in accordance with §§ 30.36(d), 40.42(d), 50.82(a) and (b), 70.38(d), or 72.54 of this chapter, and specifying that the licensee intends to decommission by restricting use of the site. The licensee shall document in the LTP or decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated, as appropriate, following analysis of that advice. Licensees proposing to decommission by restricting use of the site shall seek advice from such affected parties regarding the following matters concerning the proposed decommissioning--

(1) Whether provisions for institutional controls proposed by the licensee;

(i) Will provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) TEDE per year;

(ii) Will be enforceable; and

(iii) Will not impose undue burdens on the local community or other affected parties.

(2) Whether the licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site; and

(e) Residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is as low as reasonably achievable and would not exceed either--

(1) 100 mrem (1 mSv) per year; or

(2) 500 mrem (5 mSv) per year provided the licensee--

(i) Demonstrates that further reductions in residual radioactivity necessary to comply with the 100 mrem/y (1 mSv/y) value of paragraph (e)(1) of this section are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm;

(ii) Makes provisions for durable institutional controls;

(iii) Provides sufficient financial assurance to enable a responsible government entity or independent third party, including a governmental custodian of a site, both to carry out periodic rechecks of the site no less frequently than every 5 years to assure that the institutional controls remain in place as necessary to meet the criteria of § 20.1403(b) and to assume and carry out responsibilities for any necessary control and maintenance of those controls. Acceptable financial assurance mechanisms are those in paragraph (c) of this section.

§ 20.1404 Alternate criteria for license termination.

The Commission may terminate a license using alternate criteria greater than the dose criterion of § 20.1402 and § 20.1403(b) and § 20.1403(d)(1), if the licensee--

(a) Provides assurance that public health and safety would continue to be protected, and that a total dose from all sources of more than the 1 mSv/y (100 mrem/y) limit of Subpart D would be unlikely, by submitting an analysis of possible sources of exposure;

(b) Has employed to the extent practical restrictions on site use according to the provisions of § 20.1403 in minimizing exposures at the site; and

(c) Reduced doses to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal.

§ 20.1405 Public notification and public participation.

Upon the receipt of an LTP or decommissioning plan from the licensee, or a proposal by the licensee for release of a site pursuant to §§ 20.1403 or 20.1404, or whenever the Commission deems such notice to be in the public interest, the Commission shall:

(a) Notify and solicit comments from local and State governments in the vicinity of the site and any Indian Nation or other indigenous people that have treaty or statutory rights that could be affected by the decommissioning; and

(b) Publish a notice in the *Federal Register* and in a forum, such as local newspapers, letters to State or local organizations, or other appropriate forum, that is readily accessible to individuals in the vicinity of the site, and solicit comments from affected parties.

§ 20.1406 Minimization of contamination.

Applicants for licenses, other than renewals, after [insert effective date of rule], shall describe in the application how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

5.In §20.2402, paragraph (b) is revised to read as follows:

(b) The regulations in §§20.1001 through 20.2402 that are not issued under Sections 161b, 161i, or 161o for the purposes of Section 223 are as follows: §§20.1001, 20.1002, 20.1003, 20.1004, 20.1005, 20.1006,

End of current text

Attachment 5

Phase I Environmental Site Assessment of the El Verde Research Station, Luquillo, Puerto Rico

ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

September 6, 1996

Ms. Mildred Ferre
Environmental Restoration Division
U. S. Department of Energy
105 Broadway
Oak Ridge, TN 37830

SUBJECT: PHASE I ENVIRONMENTAL SITE ASSESSMENT OF THE EL VERDE RESEARCH STATION, LUQUILLO, PUERTO RICO

Dear Ms. Ferre:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) has completed the environmental site assessment for the subject project.

Enclosed are six copies of the final report describing the procedures and results of the assessment. Six copies of major reference documents which were included in the background documentation have also been provided, per your request. Please contact me at (423) 576-9252 or Tim Vitkus at (423) 576-5073 should you have any questions.

Sincerely,

Ann T Payne

Ann T. Payne
Project Coordinator
Environmental Survey and
Site Assessment Program

ATP:tsf

Enclosure

cc: C. Gist, DOE/ORO
W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
T. Vitkus, ORISE/ESSAP
File/532

P. O. BOX 117, OAK RIDGE, TENNESSEE 37831-0117

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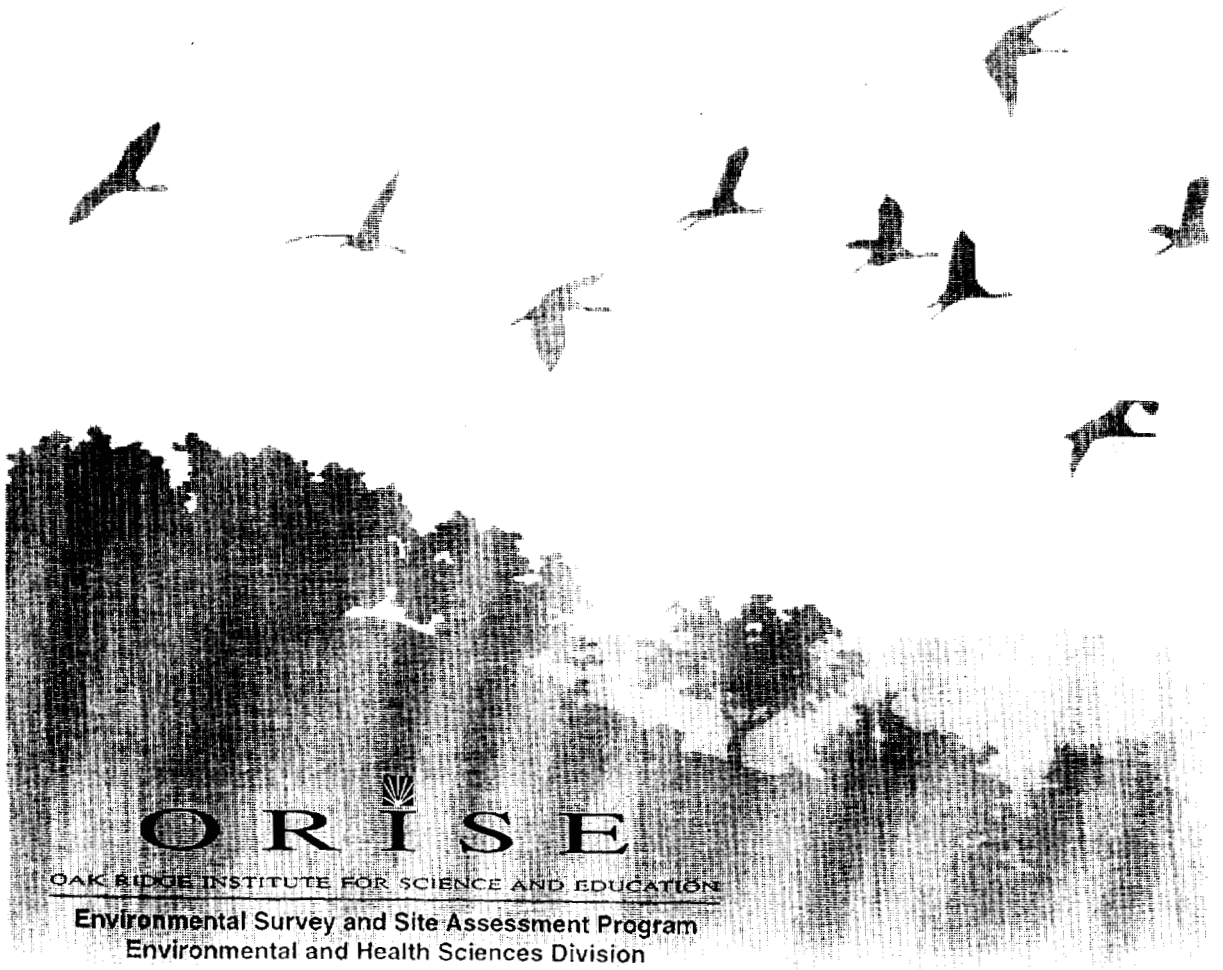
PHASE I ENVIRONMENTAL SITE ASSESSMENT OF THE EL VERDE RESEARCH STATION LUQUILLO, PUERTO RICO

A. T. PAYNE

Prepared for the Office of Environmental Restoration
U.S. Department of Energy



PHASE I ENVIRONMENTAL SITE ASSESSMENT OF THE EL VERDE RESEARCH STATION LUQUILLO, PUERTO RICO

Prepared by

A. T. Payne

Environmental Survey and Site Assessment Program
Environmental and Health Sciences Division
Oak Ridge Institute for Science and Education
Oak Ridge, TN 37831-0117

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FINAL REPORT

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OF THE
EL VERDE RESEARCH STATION
LUQUILLO, PUERTO RICO

Prepared by: Ann T Payne Date: 9/4/96
A. T. Payne, Project Coordinator
Environmental Survey and Site Assessment Program

Reviewed by: Tom Wantland Date 9/5/96
T. D. Wantland, Industrial Hygienist
Safety & Environmental Protection Department

Reviewed by: Date: 9/5/96
R. J. Kapolka, CIH, CSP, CHMM, Program Director
Safety & Environmental Protection Department

Reviewed by: Date: 9/4/96
T. J. Vitkus, Survey Projects Manager
Environmental Survey and Site Assessment Program

Reviewed by: Eric W. Abelquist Date: 9/5/96
E. W. Abelquist, Assistant Program Director
Environmental Survey and Site Assessment Program

Reviewed by: Date: 9/5/96
W. L. Beck, CHP, Program Director
Environmental Survey and Site Assessment Program

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PROJECT STAFF

E. G. Bullington

CLERICAL STAFF

D. K. Ash
T. S. Fox
K. E. Waters

ILLUSTRATOR

T. L. Bright
T. D. Herrera

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ABBREVIATIONS AND ACRONYMS

µR/h	microroentgen per hour
ACBM	asbestos containing building materials
AEC	Atomic Energy Commission
ASTM	American Society for Testing and Materials
cc	cubic centimeter
CEER	Center for Energy & Environmental Research
CFR	Code of Federal Regulations
Ci	curie
DOE	U.S. Department of Energy
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
ESSAP	Environmental Survey and Site Assessment Program
FUSRAP	Formerly Utilized Sites Remedial Action Program
ha	hectares
kg	kilogram
km	kilometer
m	meter
NFPA	National Fire Protection Agency
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
PCB	polychlorinated biphenyl
PREPA	Puerto Rico Electric Power Authority
UPR	University of Puerto Rico
USDA	U.S. Department of Agriculture
USFS	U.S. Department of Agriculture Forest Service

PHASE I ENVIRONMENTAL SITE ASSESSMENT
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EL VERDE RESEARCH STATION

INTRODUCTION AND SITE HISTORY

Between 1964 and 1976, the U.S. Atomic Energy Commission (AEC), under an agreement with the U.S. Department of Agriculture Forest Service (USFS), supported a terrestrial ecology program in a section of the Luquillo Forest known as the El Verde Research Station (Figure 1). This program was conducted through the Puerto Rico Nuclear Center, later renamed Center for Energy and Environmental Research (CEER) at the University of Puerto Rico (UPR). A memorandum of agreement was signed in 1964 between the USFS and the AEC separating 156 acres (62.4 hectares) of the Luquillo Forest into an experimental area in order to conduct detailed ecological studies of the effects of Cs-137 gamma radiation on tropical rainforests. Beginning in 1963 when the Research Station was established, a variety of research projects were conducted. Vegetation was identified and quantified, pollen was analyzed, climate and soil studies were performed, and other aspects of the rainforest were studied. Radiotracers were used during one of the studies of mineral cycling and forest metabolism. In 1976, control of activities at the El Verde site was transferred from the AEC successor, Energy Research and Development Administration (ERDA), presently the U.S. Department of Energy (DOE), to the UPR; the agreement with USFS also was transferred to UPR. DOE activities at the El Verde Research Station are now completed and plans are to return the property to the United States Department of Agriculture (USDA). DOE has requested that the Oak Ridge Institute of Science and Education (ORISE) Environmental Survey and Site Assessment Program (ESSAP) perform a Phase I Environmental Site Assessment of the El Verde Research Station. The purpose of this report is to summarize the findings of this assessment, including an evaluation of available historical records, and an evaluation of the results from a site inspection performed by DOE.

Records of previous inspection and clean-up activities were provided by the DOE. Government ownership of the property is historically well documented and, therefore, not considered to be questionable. Thus, ORISE was not requested to perform a verification of property ownership records. This assessment is limited by the completeness and accuracy of documentation provided by DOE.

This assessment is not intended to be an exhaustive reinvestigation of the activities performed in regard to this site, rather it is meant to provide an independent overview of work already completed to ensure that acceptable methodology was used during remediation/clean-up, and that the final status of the site is completely and accurately represented in the records. An assessment of other potentially adverse conditions or areas of concern not previously identified was also performed. Methodology for this assessment was in accordance with the American Society for Testing and Materials (ASTM) Standard Guidance for Site Assessments, E 1527-94 (ASTM 1994).

SITE DESCRIPTION

The Luquillo Forest, also know as the Caribbean National Forest, is located in the northeast portion of Puerto Rico, approximately 15 km from the town of Luquillo and about 35 km from San Juan (Figure 1). The forest, occupying approximately 11,300 ha, receives up to 600 cm of rainfall annually. It is a dense evergreen forest, containing a wide variety of native flora, and is also a wildlife refuge for about 50 bird species and numerous amphibians and reptiles. The major use of the forest is ecological research; to a lesser extent, the area is also used for hiking, camping, and sight-seeing. With the exception of several principle roads and a few improved trails, the Luquillo Forest is relatively inaccessible. Interior trails are typically narrow, rugged, and steep. The El Verde Research Station was built on the site of a former coffee plantation (Figure 2), and consists of 62.4 ha located within the forest. The station is in the northwest corner of the forest and is reached via a winding, occasionally steep trail from the Field Office. The access trail is about 650 m in length and includes a cable suspension bridge over the Sonadora Creek. The main study areas were located on the northwestern slope of the mountain; other study areas were developed just up the mountain and to the east across the Sonadora River.

Four structures exist on the site. The main laboratory/office building and annex, the dormitory and dining hall, generator building, and a small storage shed. (Figure 3).

The buildings are currently used for ecological research. Researchers stay in the dormitory at the research station during the study period. The property is surrounded by rain forest, which is already under the responsibility of the USFS.

RECORDS REVIEW

DOE provided all available records regarding activities at the El Verde site for evaluation. All available direct and supporting records, reports, correspondence, and miscellaneous notes were reviewed and evaluated in order to compile a comprehensive summary of events at the site, as well as to determine the current recorded status of previously identified adverse environmental conditions. Specific environmental conditions identified and addressed to date at the El Verde site are summarized as follows.

RADIOLOGICAL

The NRC granted license # 52-19434-02 to the UPR in March 1982. The UPR performed a survey and evaluation of the facility during the years 1980 through 1983. The report indicates that the terrestrial ecology program activities at the El Verde Research Station included the use of radioactive materials for direct exposure of vegetation and for tracing biopathways. Most radionuclides used in projects were of short half-life (physical and/or biological half-life) or were in the form of sealed sources. Radionuclides reported to have been used in the study areas are H-3, P-32, Cs-134 and 137, Sr-85, Mn-54, Rb-86, and Zn-65. One 10,000 Ci sealed Cs-137 source used for an irradiation study was shipped to the U.S. in July 1966 for disposal. Radioactive materials used for labeling (tagging) vegetation have mostly decayed or dispersed to the extent that residual activity levels are at or near ambient background. Tritium was reported by UPR to be the radioisotope of concern due to the potential for incorporation into the human body. The report provided a detailed explanation regarding dissipation of tritium into the atmosphere as water vapor. Surveys were performed on interior areas, however, since the laboratory building was included in the NRC license, and plans were to use radioisotopes such as tritium, the drains, hood exhaust, and sink traps, were not included in the surveys (UPR 1983). The area surrounding the buildings was scanned and a scoping survey of the forest was also performed. Gamma surface scans and exposure rate measurements in the area surrounding the buildings indicated background levels of radionuclides. Soil sampling in the area around the buildings was not reported to have been performed. The trails from the laboratory area to the location where a sealed Cs-137 source was positioned for an irradiation experiment were surface scanned for gamma; gamma scans were also performed at 3, 6, and 12 meters from the trail. Six areas were found fenced and marked with radioactivity warnings. The six areas were mapped and surveyed, including collection of soil and vegetation samples. Contamination was identified in

Areas 4, 5, and 8. Clean-up was completed in Areas 5 and 8. The contamination in Area 4 (Figure 4) was determined to be due to residual activity remaining from an experiment involving the injection of a tree with Cs-137. Study Area 4 is located on a small knoll, slightly above the trail from the Field Office. Fencing, with postings indicating the presence of the Cs-137, previously surrounded the study area. Approximately 43 kg of contaminated soil was removed from beneath the tree leaving an estimated radiation level of 200 μR/h. Contaminated soil removed during decontamination activities was shipped to a low-level waste disposal site in Oak Ridge, Tennessee in September 1982 (UPR 1983).

Oak Ridge National Laboratory performed survey activities and reported the results as a draft report in March 1990 (ORNL 1990). These activities were conducted in an attempt to verify the previous UPR survey findings. Gamma scans of the six study areas were performed, and soil and vegetation samples were collected. All results were reported to be below the U.S. DOE guidelines for FUSRAP sites (DOE 1987) except for the contaminated tree in Area 4. The data for this Area supported the findings of the UPR survey. Further study was recommended to evaluate the areal spread and depth of the contamination, and to collect vegetation samples from the contaminated trees and the other trees in the vicinity in order to determine the potential for migration, dispersion, or secondary uptake of the contaminants. No documentation was found in the records indicating whether follow-up to this recommendation has occurred. The report gives no indication that verification scans or sampling were performed in the area immediately surrounding the buildings. Survey activities were not performed in the new laboratory section, Storage Room A in Area B, or in Shop II in Area C due to lack of records indicating historical knowledge of radioisotope usage. This report was not finalized due to budget constraints.

In February 1993, NRC renewed license #52-19434-02, amending it to allow only for storage of the Cs-137 in the tree incident to the injection experiment. In May of 1993, ORISE issued a report summarizing a review of information and results of measurements and sampling regarding the Cs-137- tagged tree in Area 4. This report indicated that potential for exposure to the public appears to be minimal and recommended either continuing the NRC license agreement, until the quantity of radioactive material could be demonstrated through survey or decay calculation to fall below the licensing level, or to perform a risk assessment and possibly terminate radiological controls.

USDA has agreed to issue a new permit to DOE limited to the one quarter acre of land on which the contaminated Cs-137 tree is located. The permit is intended to include permission to build and maintain a fence and warnings required for the site.

ASBESTOS INSPECTION

A limited asbestos investigation was performed by the Jacobs Environmental Restoration Team in May 1994, following a baseline investigation by The Oak Ridge National Laboratory Industrial Hygiene Section, in 1989 (Jacobs 1994). The Jacobs investigation followed relevant guidelines of AHERA, 40 Code of Federal Regulations (CFR) 763. Existing data was reviewed, a walk-through of each building was conducted, and bulk sampling was performed. Samples were analyzed by Schneider Laboratories, Inc. No friable asbestos-containing building materials (ACBMs) were identified on the site, and the ACBMs found were in good condition. No immediate removal recommendations were made. The ACBMs found at the site included interior and exterior transite wallboard on the Laboratory Annex. The report stated that if an effective management plan for the material was not the preferred option, portions of the facility would require significant removal of building material. Because the asbestos material is not friable, there are no current requirements for removal. DOE and USDA have agreed to manage the material in place in accordance with applicable regulations (USDA 1996).

LEAD-BASED PAINT

The final report indicated that lead-based paint was identified at three locations on door and window frames in the Dormitory Building. DOE does not plan to remove this material, however, an operating and management plan will be developed to facilitate the long term management of the material.

PCB TRANSFORMER

A letter from A. G. Caban and P. Cruz, of USDA to A. Szilagyi of DOE indicates the presence of one PCB transformer on the site. The Puerto Rico Electric Power Authority (PREPA) reviewed records regarding this transformer and found that it does not contain PCBs (PREPA 1993).

SITE RECONNAISSANCE

A site visit was performed by a DOE industrial hygienist in July, 1996. This inspection included a walk-through inspection of all buildings on the site. Results of this inspection are summarized as follows:

GENERATOR BUILDING

- Unlabeled used oil is stored in all-season coolant containers.
- No secondary containment is in place for a 550-gallon diesel fuel storage tank.
- No overfill prevention device is present on the diesel fuel storage tank. Evidence of overfill exists in the form of fuel residue on tank sides.
- The building sides are constructed of transite.
- Broken transite board was found outside of the building by the fuel tank.
- An electrical transformer was observed. It was uncertain at the time of the site visit whether the transformer contained PCBs. Subsequent information indicated that the transformer was evaluated by the Puerto Rico Electric Power Authority and found to be a non-PCB type.
- A light fixture outside of the building is not guarded.
- Electrical outlets are not protected by ground-fault-circuit-interrupters.
- A large electric breaker box on the side of the Laboratory Building adjacent to the Generator Building requires new electrical warning signage and box should be secured to control access.
- The building is not posted for noise level.

LABORATORY BUILDING AND ANNEX

- Chemical containers in several lab rooms lacked labels.
- One approximately 50 cc container was hand labeled, "contains arsenic".
- An approximately 1 liter container was marked "waste solvent".
- Flammables are not stored in a National Fire Protection Agency (NFPA) approved storage cabinet

- Laboratory electrical outlets were at "wet locations" that are not protected by ground-fault-circuit-interrupters.
- Ceiling tiles have a plastic coating on fiberglass, which may not meet NFPA requirements.
- Doors to individual labs are not equipped with door closers.
- Labs are not equipped with emergency showers or eye wash stations.

A laboratory chemical exhaust cabinet was located in one lab only. This hood was not operable due to the outlet not being served during power outages by the emergency generator, even though there were many chemicals stored in the hood. This is a tabletop hood and it is doubtful it would meet minimum flow requirements.

Utility sinks at several locations are not equipped with anti-syphoned devices. A hose was observed connected to a faucet and terminating in one of the utility sinks.

The water supply is dependent on the reservoir and is not treated. Bottled water is available, but on the day of inspection all bottled water locations were empty. All water tap locations should be posted as non-potable water.

The dehumidifier in the lecture room of the laboratory appeared to have fungal growth in the reservoir.

Exposed electrical wiring was observed in the ceiling of a room located in the laboratory annex.

STORAGE BUILDING

The Storage Building is used for storing gardening equipment. No concerns were identified in this building.

DORMITORY AND DINING HALL

Sleeping quarters have one access door for eight people with windows not accessible for escape. This may not meet NFPA 101.

The facility discharges sanitary waste to a septic tank located behind the women's sleeping quarters. No inspection or analysis of the tank or drain field was made.

FINDINGS AND CONCLUSIONS

ENVIRONMENTAL CONDITIONS

ESSAP has performed a Phase I Environmental Site Assessment of the El Verde Research Station in conformance with the scope and limitations of ASTM Practice E 1527-94. Any exceptions to, or deletions from, this practice are described in earlier sections of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the property except for the following:

Radiological

NRC license #52-19434-02, held by UPR, included Cs-137 and H-3. This license application indicates that H-3 would be handled/or stored in Laboratory II. The license was amended in February 1993 authorizing storage only of up to 1 millicurie of Cs-137 in the injected tree. Removal of the H-3 from the license would naturally deem evaluation of survey results to ensure any residual radioactivity related to these activities was satisfactorily addressed. Areas of particular interest would be sinks, drains, and hood exhausts in Laboratory II, and depending on results from these areas, possibly the septic tank and drain field. DOE indicates that no activities involving radioactive materials were conducted in or around the laboratories. Radioactive materials are reported to have been received in the quantities necessary for the studies and then applied directly to the study area, without the need for preparation activities. It is recommended that a more complete history of activities related to radioactive materials use in the laboratory be obtained from personnel who performed work on the site. Soil sampling was not recorded to have been performed in the area surrounding the buildings during either the UPR survey or the ORNL survey activities. When an NRC license is terminated, confirmatory sampling is routinely performed to ensure the final status of a site is acceptable for release for unrestricted use. DOE plans to restore the security fencing and warning signs around the contaminated tree.

Asbestos

The asbestos identified during the Jacobs inspection will not be removed. DOE indicates plans to develop an operating and management plan for this material.

Lead-Based Paint

The lead-based paint identified from sample analysis will not be removed. DOE indicates plans to develop an operating and management plan for this material.

Other Hazardous Materials

If no future activities will require use of hazardous materials, these materials, such as used oil, waste solvent, and chemicals should be removed from the site. If future use is anticipated, the facility would be considered "conditionally exempt" and would require an Environmental Protection Agency (EPA) generator number.

Diesel Fuel Tank

Evidence of overfill of the diesel fuel tank was observed. Sampling would be required in order to evaluate the potential for contamination in the surrounding area. If the tank is to be reactivated, an overfill protection device should be installed.

SAFETY AND HEALTH CONDITIONS

The following concerns are not considered "environmental conditions" per the guidance document, however, they are considered to be significant safety and/or health issues which should be addressed:

Electrical Concerns

Electrical fixtures and outlets are not up to current standards. A complete electrical evaluation would be required to determine the extent of upgrade to the electrical system that would be necessary to meet all current electrical codes.

Potential Noise Hazard

Measurement of the noise level in the Generator Building is recommended prior to work taking place in the area.

Fire Code Concerns

Flammables are not stored properly. All such materials should be stored in NFPA-approved storage cabinets.

Ceiling tiles with plastic coating on fiberglass should be evaluated for compliance with NFPA requirements.

Access to sleeping quarters which meets NFPA 101 requirements must be established prior to use.

Concerns for Future Operation of Laboratories

Should laboratories become operational, the lab doors should be equipped with door closers, emergency showers, and eye wash stations.

Hoods containing chemicals must have a source of power which is maintained during power outages. Hoods must also be checked to ensure minimum flow requirements are met.

Sinks in laboratories must be equipped with anti-syphoning devices to ensure that liquids cannot be drawn into the clean water supply. Sinks must also be marked as having a non-potable water supply.

The septic system should be evaluated.

General Concerns for Individuals Working in the Buildings

A supply of potable water must be available at all times.

The dehumidifier must be cleaned and maintained if it is to be used.

SUMMARY

The Environmental Survey and Site Assessment Program of ORISE performed a Phase I Environmental Site Assessment of the El Verde Research Station in the Luquillo Forest, Luquillo, Puerto Rico. Assessment activities included historical record reviews and an evaluation of the results from a site inspection performed by DOE.

The assessment identified three environmental conditions and several general safety and health conditions.

Environmental conditions included incomplete documentation in the historical records to determine whether radioactive materials were used in the laboratories, presence of hazardous materials on the site without record of an EPA conditionally exempt generator number, and evidence of overfill in the area surrounding the diesel fuel tank.

Safety and health conditions identified at the site included the existence of a potential noise hazard in the Generator Building, fire code concerns, and multiple concerns related to any future operation of the laboratories and conditions for laboratory workers.

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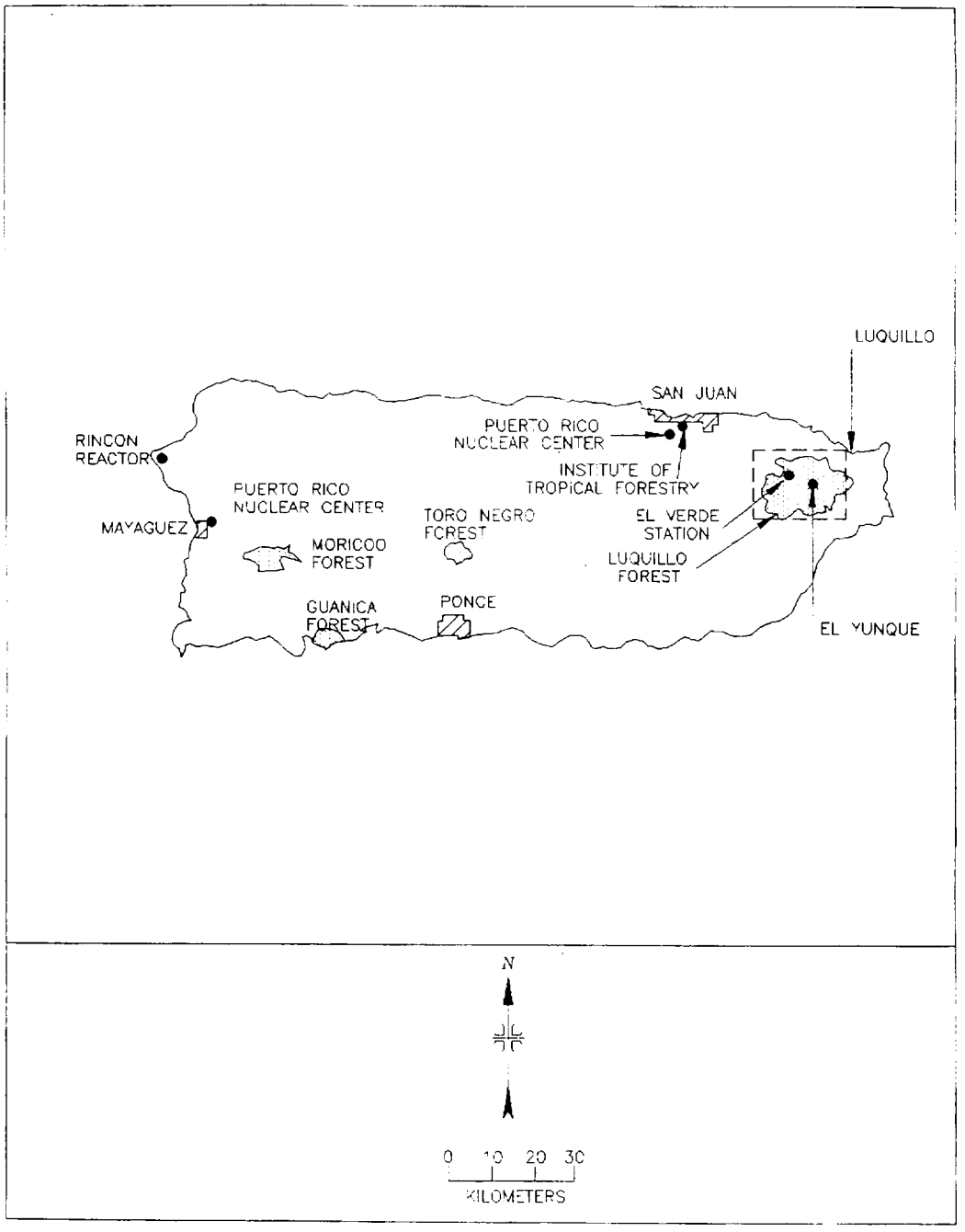

FIGURE 1: Map of Puerto Rico -- Location of Luquillo Forest and El Verde Research Area
(From "Radiological Survey Report for El Verde Research Station,"
CEER-X-115, Health and Safety Division, CEER, May 1983, Revised)

532-002 (1)

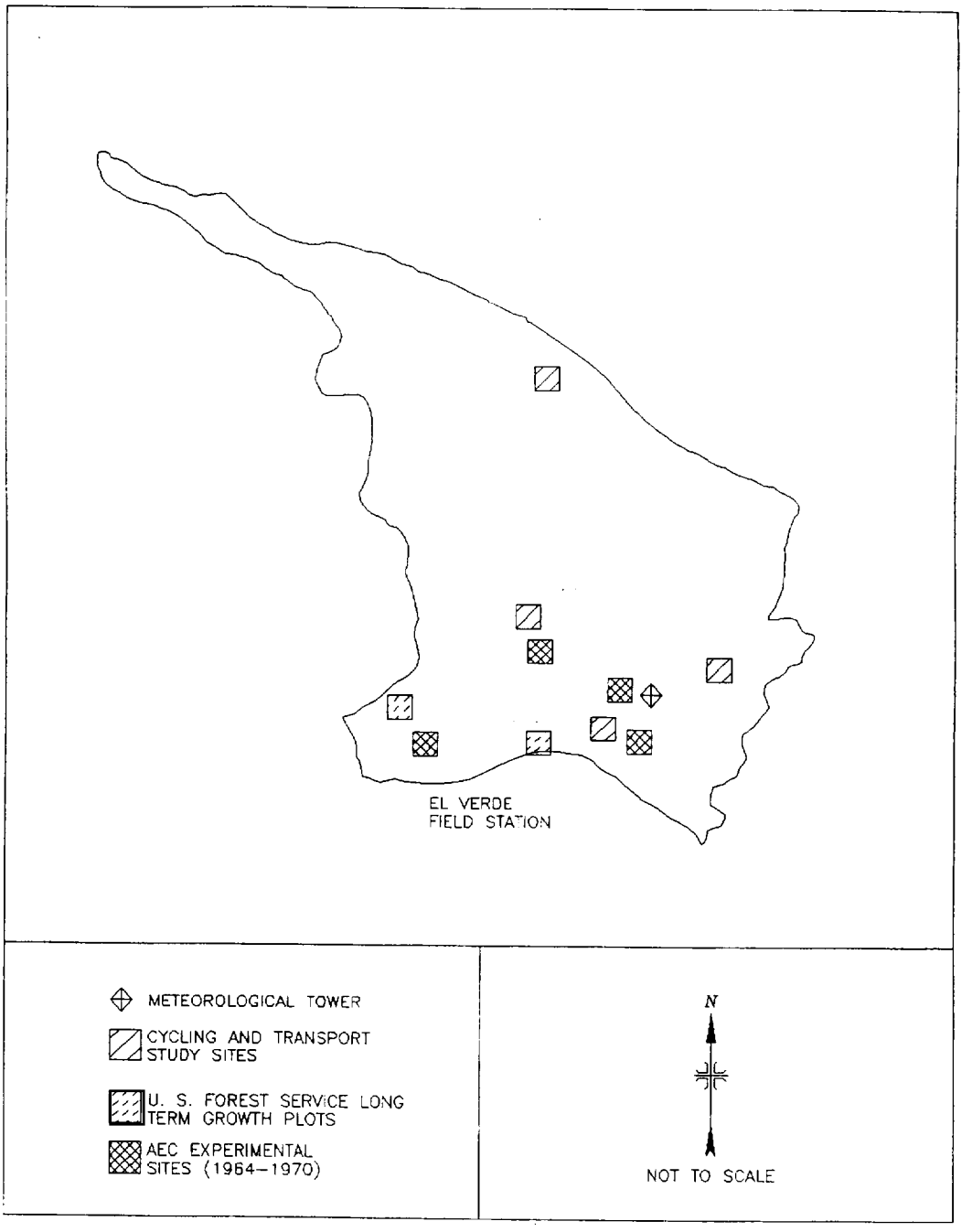

FIGURE 2: Approximate Boundary of the 156 Acres Under DOE–Forest Service Agreement

532-003 (x)

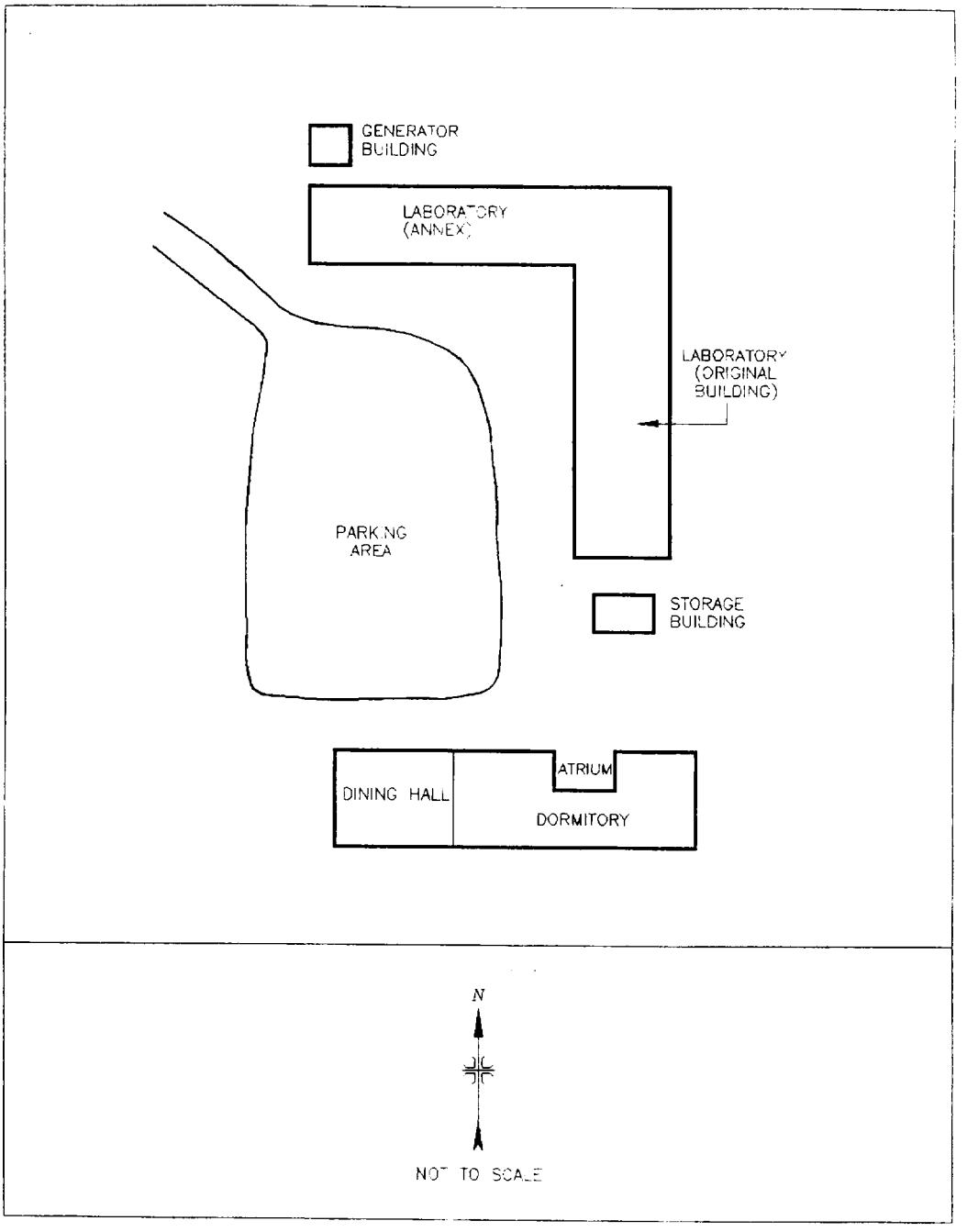

FIGURE 3: El Verde CEER Facility – El Verde, Puerto Rico

532-004 (x)

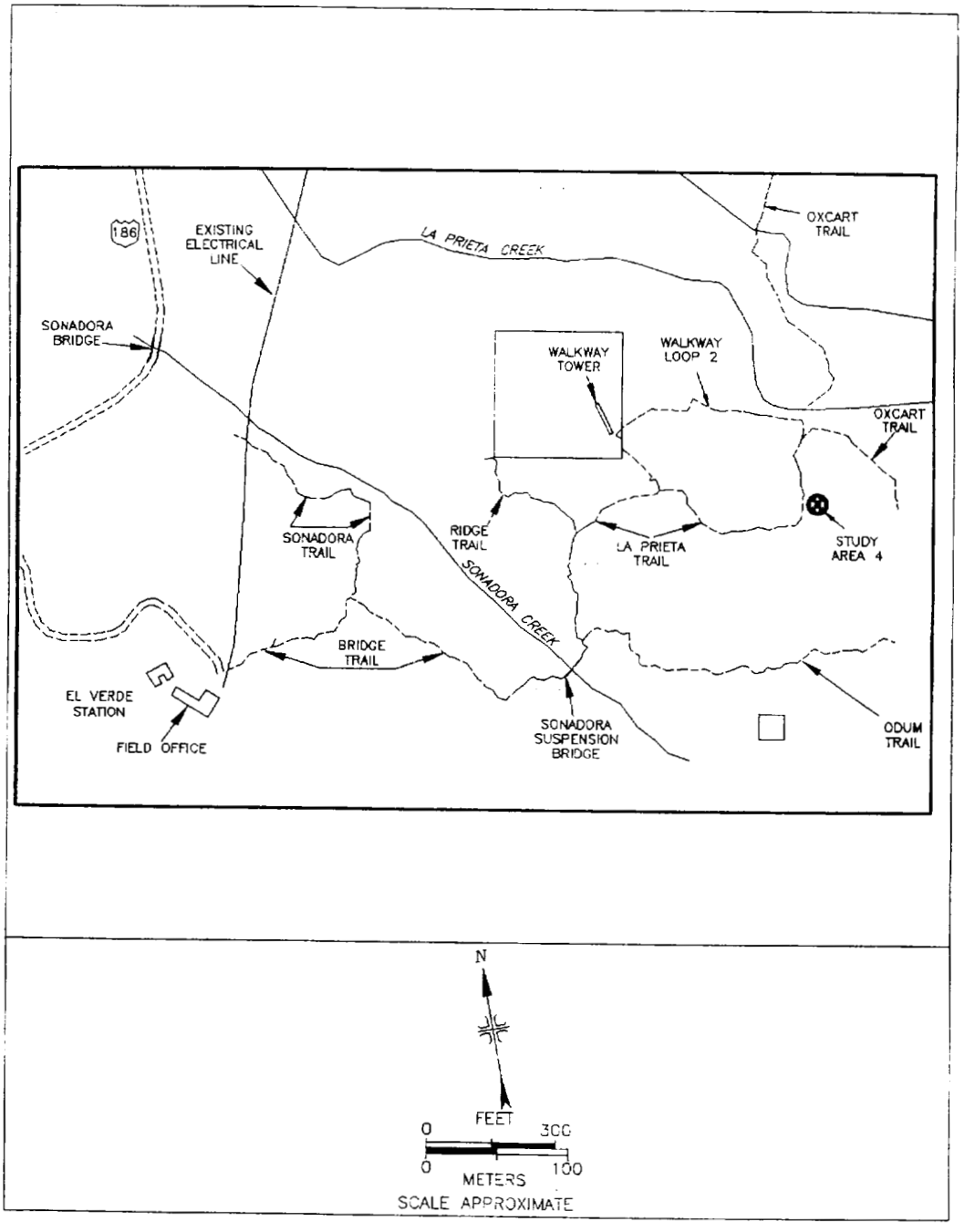

FIGURE 4: El Verde Research Station – Location of Cesium-137-Labeled Tree in Study Area 4

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ENVIRONMENTAL SITE ASSESSMENT

C-1 Project Propose.

The purpose of this project is to:

(a) conduct a comprehensive Environmental Site Assessment in accordance with the most recent version of the American Society for Testing and Materials (ASTM) Standard Guidance for Site Assessments (E 1527), Section 101 (35), 107, and 120 (h) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and Federal Property Management Regulations 41 CFR 101-47.202-2 (b) (9) and (10);

(b) document the findings in a professional report; and

(c) determine if there is a need and/or priority for further action under any regulatory authority.

C-2 Applicable Guidance and Criteria.

This project is being undertaken to meet the requirements of Section 101 (35), 107, and 120 (h) of the Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA), and Federal Property Management Regulations 41 CFR 101-47.202-2 (b) (9) and (10). Applicable guidance may include the American Society for Testing and Materials (ASTM) Standard Guidance for Site Assessments (E 1527), the National Contingency Plan (NCP, 40 CFR 300), EPA Directive 9345.0-01 or superseding guidance issued by EPA's Office of Solid Waste and Emergency/Response (OSWER), the most recent versions of the Compendium of Superfund Field Methods and Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods and Test Methods (SW-846), other codes, and/or applicable State regulations, procedures, or authority for conducting environmental site assessments and/or evaluating sites where actual or potential releases of hazardous substances/wastes from a site/facility may have occurred.

The environmental site assessment shall be conducted in strict compliance with Federal, State, and/or local requirements for this type of work and the work plan.

C-3 Site History.

C-4 Project Summary and Specifications.

The contractor should approach the project in two phases. Phase I is to include a record search and physical inspection of the property. Phase II is to include a program of sampling and analysis. This second phase is only to be completed if the results from phase I warrant sampling. Included as a requirement of sampling is the development of a site safety plan. The findings of the ESA (both Phase I and Phase II if required) will be included in a comprehensive ESA report.

The contractor shall identify and furnish all personnel, materials, equipment, safety gear, and services necessary to achieve the project purpose and schedule. The contractor must be certified and/or bonded in evaluating property records and property for actual and potential hazards and liabilities associated with current or past operations involving hazardous substances or hazardous wastes.

C-4.1 Phase I Records Search and Physical Inspection.

At a minimum the ESA must include a detailed record search and thorough physical inspection of the property, facilities, and structures; compliance history, aerial survey photographs, site and topographic maps, engineering environmental studies, and other relevant information about the property and immediate vicinity. Where indicated (i.e., Superfund sites, Federal enforcement actions or ownership, etc.) a review of Federal records should also be conducted. To the extent possible, the investigation should cover at least the past 50 years. Nearby drinking water supply wells (i.e., within a 1 mile radius) should be identified.

Identify past owners and operators, historical and current land uses, facilities that are and were present, regulatory actions and other information that might indicate the presence, storage, use, spilling, discharge, or disposal of hazardous wastes, hazardous substances, petroleum, petroleum products, pesticides, asbestos, radioisotopes, or other compounds, formulations, or biological or chemical agents capable of adverse environmental or human-health effects.

Possible sources of information include but are not limited to:

- Office of Management and Budget A-106 plans;
- chemical, biological, and radiological inventories;
- material safety data sheets;
- hazardous waste manifests;
- RCRA 3016 reporting;
- EPCRA reporting;
- ARS storage tank inventory;
- asbestos containing material surveys;
- Federal, state, and local permits (e.g. underground storage tanks, waste water treatment or disposal systems, incinerators, landfills, water supply wells, storm water discharges, operating permits, etc.); and
- Interviews with key location personnel both past and present.

During the physical inspection, all buildings and other surface and subsurface structures should be accessed and fully inspected whenever possible. The level of effort and focus of the physical inspection should be guided and informed by current and previous property uses. However, at a minimum, it should include identification and evaluation of the following:

- operating, non-operating, and abandoned facilities, structures, and units present on the property, or the site where they previously existed;
- interior and exterior sources of actual or potential contamination, such as underground storage tanks (USTs), interior floor drains, dry wells, asbestos, PCB transformers, roof drains, dumps, landfills, and disposal areas;
- sources of air or water pollution and any pollution control devices;
- operating procedures, including types of equipment used, materials handled, and procedures;
- sensitive environmental receptors, such as wetlands, water supply wells, food supplies, and surface waters; and
- adjacent land uses.

At a minimum the presence of the following conditions should be noted:

- discolored ground or other surfaces;
- areas of stressed or dead vegetation;

- drums/barrels stacked or buried on the property;
- unusual odors, particularly in the vicinity of septic tanks or other underground conditions;
- abnormal conditions of surface waters and impoundments, including any sheens, dead fish or birds, or discoloration;
- inconsistencies in the general topography of the site, such as unusually low or high areas, depressions, etc.;
- unevenness in parking and other developed areas; and
- underground storage tanks.

Information obtained from the record search and physical inspection will be evaluated to judge whether or not sampling is required.

Phase II will be conducted upon request by USA.

C-4.2 Phase II. Sampling/analysis (if needed)

If it is determined that Phase II is needed, the Government will request that the Contractor submit a cost proposal for the additional work. The cost proposal submitted in response to this Request for Proposal should only include pricing for completing Phase I only. A Phase II proposal is not to be submitted unless specifically requested by the Government.

C-4.2.1 Sampling Plan.

If sampling is required, the Contractor must submit a sampling plan for review and acceptance by the Government. Acceptance by the Government will include a review and approval by the lead regulatory agency. The plan should outline at a minimum, the following:

- statistical basis, rationale, and methodology for selecting the types, numbers, and locations of samples to be collected and analyzed;
- list of pollutants to be analyzed and analytical methods;
- provisions to ensure that all analyses are completed within allowable holding times;
- detailed step-by-step procedures for collecting samples;
- procedures to be used to decontaminate sampling equipment between samples;
- type(s) of sampling containers and samples;
- the order in which samples are to be collected at a given sampling point;
- the method by which quality and representativeness of samples will be assured;
- methods for labeling, handling, preserving, packing, shipping, and documenting samples;
- chain of custody procedures to be used to handle the samples;
- calibration of any field instruments;
- analytical procedures/methods to be employed in determining the concentration of constituents of interest; and
- precision, accuracy, detection limits, quantification limits, and percent recovery for each constituent, pollutant, or variable.

Investigation methods may include, but not be limited to, surface geophysical methods such as ground-penetrating radar, soil gas surveys, soil borings, suction lysimeters, and water samples from existing monitoring or water-supply wells.

End of current text

This is to acknowledge the receipt of your letter/application dated

11/16/2005, and to inform you that the initial processing which includes an administrative review has been performed.

Amendment 52-01986-01

[X] There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

[ ] Please provide to this office within 30 days of your receipt of this card

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A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 138100.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader