YANKEE ATOMIC ELECTRIC COMPANY

Telephone (413) 424-5261

49 Yankee Road, Rowe, Massachusetts 01367

October 23, 2013
BYR 2013-032
10 CFR 50.71(e)(4) and 10 CFR 50.4

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555 - 0001

Yankee Atomic Electric Company
Yankee Nuclear Power Station Independent Spent Fuel Storage Installation
NRC License No. DPR-3 (NRC Docket Nos. 50-029 and 72-31)

Subject: Biennial Update to the Yankee Nuclear Power Station License Termination Plan

Pursuant to the requirements of 10 CFR 50.71(e)(4) and 10 CFR 50.4, Yankee Atomic Electric Company provides Revision 4 to the Yankee Nuclear Power Station (YNPS) License Termination Plan (LTP) (Enclosure 1). This revision addresses the changes made to the YNPS LTP, since the submittal of the last biennial update on October 3, 2011 (Reference a). Attachment 1 provides a summary and rationale for the changes. Attachment 2 provides instructions for removal and insertion of affected pages for Revision 4 of the YNPS LTP.

This letter contains no commitments.

If you have any questions regarding this submittal, please do not hesitate to contact Bob Mitchell at (413) 424-5261 ext. 303.

I state under penalty of perjury that the foregoing is true and correct. Executed on October 23, 2013.

Respectfully,

Wayne Norton
YAEC President and Chief Executive Officer

NMSS01
NMSS26
NMSS

Attachments and Enclosures

Attachment 1 – Summary of Proposed Changes to the Yankee Nuclear Power Station License Termination Plan

Attachment 2 – Instructions for Removal and Insertion , Yankee Nuclear Power Station License Termination Plan, Revision 4

Enclosure 1 – Revision 4 to the Yankee Nuclear Power Station License Termination Plan

References

a. Letter from W. Norton (YAEC) to Document Control Desk (NRC), Biennial Update of the License Termination Plan, dated October 3, 2011 (BYR 2011-023) (Accession No. ML11286A225).

cc: W. M. Dean, NRC Region I Administrator
M. S. Ferdas, Chief, Decommissioning Branch, NRC, Region 1
J. Goshen, NRC Project Manager
J. Giarrusso, Planning, Preparedness & Nuclear Section Chief, MEMA
J. Cope-Flanagan, Assistant General Counsel, MDPU
J. Reyes, State of Massachusetts Office of the Attorney General

ATTACHMENT 1 TO BYR 2013-032

SUMMARY OF CHANGES TO THE YANKEE NUCLEAR POWER STATION LICENSE TERMINATION PLAN

ATTACHMENT 1 TO BYR 2013-032
SUMMARY OF CHANGES TO THE YANKEE NUCLEAR POWER STATION LICENSE TERMINATION PLAN

Document	Section #	Proposed Change	Reason for Change
LTP	1.2.1, 1.3, 1.4.3, 1.4.7, 1.7, 2, 2.1.2, 2.1.4, 2.2.1, 2.2.2, 2.2.3, 2.2.4.1, 2.2.4.2, 2.3.1, 2.4, 2.4.1, 2.4.2, 2.5, 2.5.1, 2.5.5, 2.6, 2.7.1, 2.7.2, 2.8, Tables 2-1, 2-2, 2-3, 2-4, 2-5, Appendices 2A, 2B and 2C, 3.2, 3.2.2, 3.2.2.1, 3.2.2.2, 3.2.3, Tables 3-1, 3-2, 8.1.2, 8.1.3.1, 8.1.3.3 (All), 8.2.1.2, 8.2.6.2, 8.2.9, 8.3	Updated to reflect that the decommissioning of the YNPS is complete, with the exception of the ISFSI and the applicable land areas.	On November 21, 2005 and August 10, 2007, the NRC approved the release of land from the 10 CFR 50 License to only those areas associated with the ISFSI. Letter from J. Hickman (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Non-Impacted Site Area from Part 50 License," dated November 21, 2005 (Accession Number ML052420608). Letter from K. McConnell (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Land from Part 50 License," dated August 10, 2007 (Accession Number ML071830515).
LTP	1.2.1, 2.1.2	In the LTP, the discussions regarding the property boundary, site boundary (i.e., boundary of area controlled in accordance with the 10 CFR 50 License), controlled area, and exclusion area were updated.	The discussions regarding the various boundaries and areas are consistent with the applicable regulations and the YNPS Emergency Plan and the NRC Safety Evaluation Report issued on August 10, 2007. Letter from K. McConnell (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Land from Part 50 License," dated August 10, 2007 (Accession Number ML071830515).
LTP	1.2.1, 2.1.2, 2.1.4, 2.2.2, 2.2.3, 2.2.4.1, 2.2.4.2, 2.3.1, 2.5.1, 3.4, 3.5	Updated to reflect the current activities of the YNPS ISFSI.	Changes were made to reflect the current practices at the ISFSI. These changes are consistent with approved procedures or other license basis documents.
LTP	3.1	Eliminated the list of specific low-level waste disposal sites.	The general statement regarding the need for access to low-level waste sites is sufficient at this time. The decommissioning of the ISFSI is not expected to occur for numerous years, thus, the names, owners, and locations of the sites that will be available at that time is not known.

ATTACHMENT 1 TO BYR 2013-032
SUMMARY OF CHANGES TO THE YANKEE NUCLEAR POWER STATION LICENSE TERMINATION PLAN

Document	Section #	Proposed Change	Reason for Change
LTP	3.3, Figure 3-1, 7.1, 7.2, 7.3, 7.4, Table 7-1, Table 7-2, 8.1.3.4	Updated to reflect the new cost estimates regarding decommissioning and storage of spent nuclear fuel and Greater than Class C (GTCC) waste approved by FERC in July 2013. The cost estimate assumes that the storage period will be extended from 2022 to 2031 with license termination in 2033. In addition, the decommissioning cost estimate assumes that all of the concrete and steel from the VCCs and ISFSI storage will be shipped offsite as low-level radioactive waste.	The decommissioning cost estimate was submitted to the NRC in December 2012 as part of the Decommissioning Funding Plan. In addition, the Federal Energy Regulatory Commission approved the new decommissioning cost estimate and a new cost estimate for the management of spent nuclear fuel and GTCC Waste in July 2013. Letter from C. Pizzella (YAEC) to the Document Control Desk (USNRC), Independent Spent Fuel Storage Installation Decommissioning Funding Plan, dated December 17, 2012 (BYR 2012-043) (Accession Number ML12363A106).
LTP	3.4.2, 8.1.3.5	Updated to reflect the environmental impacts associated with the change in schedule for storage of spent nuclear fuel and GTCC waste and change in methodology regarding disposal of the materials comprising the Vertical Concrete Casks and the ISFSI Storage Pad as low-level radioactive waste.	The changes update the environmental impact associated with decommissioning the ISFSI and the longer time period that the spent nuclear fuel and GTCC waste will be stored onsite. The environmental impact remains bounded by the previous assessment.
LTP	Table of Contents, 2.9, Appendix 6.F	Editorial or administrative changes were made. Revision number on Pages 6F-4 through 6F-8 was corrected to Revision 1.	These changes are non-substantive changes that do not modify the intent of the document.
LTP	3.4.1	Updated to address the impacts of decommissioning the ISFSI on occupational health and safety.	The ISFSI structures, systems, and components are not expected to be significantly contaminated at the time of decommissioning. During decommissioning of the ISFSI, the material comprising the Vertical Concrete Casks and the ISFSI storage pad will be shipped off-site as low-level radioactive waste. This activity will be managed, so that doses to workers and the public are minimized and federal regulations regarding doses and dose rates are met.

ATTACHMENT 1 TO BYR 2013-032
SUMMARY OF CHANGES TO THE YANKEE NUCLEAR POWER STATION LICENSE TERMINATION PLAN

Document	Section #	Proposed Change	Reason for Change
LTP	1, 2, 2.5.5, Table 2-3, Appendix 2A, 3, Table 3-3, 4, 5, 6, 7, and 8	Updated to reflect that some historical information regarding the decommissioning of the YNPS has been maintained in the LTP.	In August 2007, the NRC issued a Safety Evaluation Report that reduced the land areas that remained within the control of the 10 CFR 50 License to only those areas associated with the ISFSI. The LTP is only applicable to those land areas. However, some of the historical information regarding the YNPS decommissioning may provide value during the decommissioning of the YNPS ISFSI; thus, the information was retained. Letter from K. McConnell (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Land from Part 50 License," dated August 10, 2007 (Accession Number ML071830515).
LTP	2.7.3, 2.7.5, Table 2-7, Figures 2-9a, 2-9b, 2-9c, 2-9d, 2-10a, 2-10b, 2-10c, 2-10d, 2-10e, 2-11, 2-12, 2-13, 2-14, 2-15, 2-16	The status of the Groundwater Monitoring Program is updated to reflect the discussion in the NRC's Safety Evaluation Report dated August 10, 2007.	This information was updated to reflect the discussion in the NRC's Safety Evaluation Report dated August 10, 2007. Letter from K. McConnell (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Land from Part 50 License," dated August 10, 2007 (Accession Number ML071830515).
LTP	8.2.9, 8.3	Updated to include references to an exemption to 10 CFR 50.47 and 10 CFR 50, Appendix E granted by the NRC I May 2013, and re-issued in August 2013.	Letter from M. D. Lombard (NRC) to R. Mitchell (YAEC), Response to Exemption Request for Portions of Title 10 of the Code of Federal Regulations Part 50 Appendix E, and Section 50.47 of Title 10 of the Code of Federal Regulations for the Yankee Rowe Plant (TAC No. L24662), dated May 7, 2013 (Accession Number ML13121A560). Letter from J. M. Goshen (NRC) to R. Mitchell (YAEC), Revised Response to Exemption Request for Portions of Title 10 of the Code of Federal Regulations Part 50 Appendix E, and Section 50.47 of Title 10 of the Code of Federal Regulations for the Yankee Rowe Plant (TAC No. L24662), dated August 15, 2013 (Accession Number ML13228A241).

ATTACHMENT 2 TO BYR 2013-032

INSTRUCTIONS FOR REMOVAL AND INSERTION

YANKEE NUCLEAR POWER STATION LICENSE TERMINATION PLAN

REVISION 4

ATTACHMENT 2 TO BYR 2013-032
INSTRUCTIONS FOR REMOVAL AND INSERTION
YANKEE NUCLEAR POWER STATION LICENSE TERMINATION PLAN
REVISION 4

DELETE	INSERT
Pages i through xiv	Pages i through xiii
Pages 1-1 through 1-16	Pages 1-1 through 1-16
Pages 2-1 through 2-36	Pages 2-1 through 2-31
Pages 2A-1 through 2A-6	Pages 2A-1 through 2A-6
Pages 2B-1 through 2B-26	Pages 2B-1 through 2B-3
Pages 2C-1 through 2C-22	Pages 2C-1 and 2C-2
Figures 2-9a through 2-9d	
Figures 2-10a through 2-10e	
Figures 2-11 through 2-16	
Pages 3-1 through 3-26	Pages 3-1 through 3-12
Page 4-1	Page 4-1
Page 5-1	Page 5-1
Page 6-1	Page 6-1
Pages 6F-4 through 6F-8	Pages 6F-4 through 6F-8
Pages 7-1 through 7-10	Pages 7-1 and 7-2
Pages 8-1 through 8-25	Pages 8-1 through 8-25

ENCLOSURE 1 TO BYR 2013-032

REVISION 4 TO THE YANKEE NUCLEAR POWER STATION

LICENSE TERMINATION PLAN

Table of Contents

Table of Tables

List of Figures

List of Effective Pages

Page	Revision	Date
FRONT MATTER		
i through xii	4	October 2013
1 GENERAL INFORMATION		
1-1 through 1-16	4	October 2013
2 SITE CLASSIFICATION		
2-1 through 2-31	4	October 2013
APPENDIX 2A		
2A-1 through 2A-6	4	October 2013
APPENDIX 2B		
2B-1 through 2B-3	4	October 2013
APPENDIX 2C		
2C-1 through 2C-2	4	October 2013
3 IDENTIFICATION OF REMAINING SITE DISMANTLEMENT ACTIVITIES		
3-1 through 3-12	4	October 2013
4 SITE REMEDIATION PLANS		
4-1	4	October 2013
4-2 through 4-8	3	October 2007
APPENDIX 4A		
4A-1 through 4A-6	1	November 2004

Page	Revision	Date
5 FINAL STATUS SURVEY (FSS) PLAN		
5-1	4	October 2013
5-2 through 5-62	3	October 2007
6 COMPLIANCE WITH THE RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION		
6-1	4	October 2013
6-2 through 6-21	3	October 2007
APPENDIX 6A		
6A-1 through 6A-8	1	November 2004
6A-9	2	November 2006
6A-10 through 6A-16	1	November 2004
APPENDIX 6B through 6D		
6B-1 through 6B-24	1	November 2004
6C-1 through 6C-4		
6D-1 through 6D-24		
APPENDIX 6E		
6E-1 through 6E-2	2	November 2006
APPENDIX 6F through 6I		
6F-1 through 6F-8	1	November 2004
6G-1 through 6G-8		
6H-1 through 6H-2		
6I-1 through 6I-16		

APPENDIX 6J		
6J-1 through 6J-2	2	November 2006
APPENDIX 6K through Appendix 6S		
Page	Revision	Date
All **except** 6O-2	1	November 2004
6O-2	2	November 2006
7 UPDATES OF THE SITE-SPECIFIC DECOMMISSIONING COSTS		
7-1 and 7-2	4	October 2013
8 SUPPLEMENT TO THE ENVIRONMENTAL REPORT		
8-1 through 8-25	4	October 2013

List of Acronyms

ALARA	As Low As Reasonably Achievable
AMDA	Alternate Method of Disposal Authorization
AOR	Abnormal Operating Report
ASWS	Auxiliary Service Water System
CFR	Code of Federal Regulations
cpm	Counts per minute
CR	Condition Report
DCGL	Derived Concentration Guideline Level
$DCGL_w$	DCGL for average concentration over a wide area, used with statistical tests
$DCGL_{EMC}$	DCLGS for small areas of elevated activity
DEP	[Massachusetts] Department of Environmental Protection
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DPH	[Massachusetts] Department of Public Health
dpm	Disintegrations per minute
DQO	Data quality objective
EMC	Elevated Measurement Comparison
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FGEIS	Final Generic Environmental Impact Statement
FSS	Final Status Survey
FSAR	Final Safety Analysis Report
GPS	Global positioning system
GTCC	Greater than Class C [Waste]
HEPA	High Efficiency Particulate Air
HSA	Historical Site Assessment
ISFSI	Independent Spent Fuel Storage Installation
LBGR	Lower Bound Grey Region
LER	License Event Report
LLW	Low Level Waste
LTP	Licence Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentration
MDCR	Minimum Detectable Count Rate
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
PAB	Plant Auxiliary Building
PIR	Plant Investigation Report
PSDAR	Post-Shutdown Decommissioning Activities Report
QA	Quality Assurance
QAP	Quality Assurance Program
QAPP	Quality Assurance Program Plan
QC	Quality Control
RCA	Radiologically Controlled Area
RESRAD	RESidual RADioactivity [Computer Code]
REMP	Radiological Environmental Monitoring Program

List of Acronyms

RETS	Radiological Environmental Technical Specifications
RIR	Radiological Incident Report
SSCs	Structures, Systems, and Components
SFP	Spent Fuel Pit
TEDE	Total Effective Dose Equivalent
TRU	Trans-Uranics
WRS	Wilcoxon Rank Sum [test]
YAEC	Yankee Atomic Electric Company
YNPS	Yankee Nuclear Power Station

1 GENERAL INFORMATION

Decommissioning activities for and final status survey of the YNPS site, with the exception of the ISFSI and associated land areas (NOL-07, OOL-10-02, and NSY-10), were completed as of January 2007. By letter dated November 21, 2005 (Reference 1-15), the NRC approved removal of the non-impacted land areas from the Part 50 License. Subsequently, the NRC approved the removal of the impacted areas of the site with the exception of the areas associated with the ISFSI (FSS Survey Areas NOL-07, NSY-10, and OOL-10-02) from the Part 50 license via letter, NYR 2007-046 (Reference 1-16). The information included in this section of the License Termination Plan (LTP) includes historical information regarding the decommissioning of the YNPS that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the YNPS site.

1.1 Executive Summary

The objective for decommissioning the Yankee Nuclear Power Station (YNPS) site is to reduce residual radioactivity to levels that permit release of the site for unrestricted use and for termination of the 10CFR50 license, in accordance with the Nuclear Regulatory Commission's (NRC's) site release criteria set forth in 10CFR20, Subpart E. The purpose of this YNPS License Termination Plan (LTP) is to satisfy the requirements of 10CFR50.82, "Termination of License" (Reference 1-1) using the guidance provided in Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Reference 1-2). NRC staff review guidance, in the form of NUREG-1700 (Reference 1-3) and NUREG-1757 (Reference 1-4), has also been considered.

This LTP describes the decommissioning activities that will be performed, the process for performing the Final Status Surveys, and the method for demonstrating that the site meets the criteria for release for unrestricted use. The LTP contains specific information on:

- historical site assessment;
- site characterization;
- remaining decommissioning activities;
- site remediation plans;
- final status survey design and implementation;
- dose modeling scenarios;
- update to the site-specific decommissioning cost estimate; and
- supplement to the environmental report.

Each section of the LTP is summarized in Section 1.4.

1.2 Description of the YNPS Site and Surrounding Areas

1.2.1 YNPS Site

The Yankee Nuclear Power Station (YNPS) was located at 49 Yankee Road, Rowe, in Franklin County, Massachusetts. Yankee Atomic Electric Company (YAEC) is the license holder for YNPS and the YNPS Independent Spent Fuel Storage Installation (ISFSI). The plant site originally contained in the licensed area approximately 1,800 acres, and approximately 10 acres were developed for plant use. As of August 10, 2007 (Reference 1-16), the licensed area was reduced to those areas associated with the YNPS ISFSI, Survey Area/Units OOL-10-02, NOL-07, and NSY-10 (approximately 2 acres). The site is at the bottom of a deep valley along the Deerfield River (elevation 1022') at the southeast corner of Sherman Reservoir (also referred to as Sherman Pond). The area surrounding the site is mostly wooded with very steep slopes on both sides of the Deerfield River. The hills on either side of the site rise about 1000 feet above the river and extend from 12 miles north to 8 miles southeast of the site. Sherman Reservoir served as the source of cooling water for the plant.

YAEC, or TransCanada, owns all of the land located within the property boundary (see Figure 1-1), and all of the property within the controlled area is under the control of YAEC. The TransCanada property is generally located along the Deerfield River and Sherman Reservoir. Portions of the TransCanada are considered impacted by licensed activities and are generally located at the northeastern end of the YAEC industrial area, the southern reaches of Sherman Reservoir, and the property outside of the industrial area fence located between Yankee Road and the Deerfield River. These impacted areas are included in license termination activities. Notable plant structures that were located on TransCanada property were the circulating water discharge seal pit, the Screenwell Pump House, and the meteorological tower located on a peninsula at the northeast corner of the site. The current nearest resident is located approximately 0.8 miles from the former plant site (Reference 1-5).

Significant features of the site are shown in Figure 1-2.

1.2.2 Surrounding Areas

The following paragraphs describe the features and uses of land within 5 miles of the plant. Included is a summary of the population centers within 10 miles of the YNPS site.

Major Bodies of Water: In addition to Sherman Reservoir and the Deerfield River (including tributaries and brooks feeding it), there are other major bodies of water located within 5 miles of the YNPS site. These include: Sadawga Pond (184 acres), Shippee Pond (25 acres), North Pond (17 acres), and Clara Lake (12 acres) in Whittingham, Vermont; Howe Pond (42 acres) in Readsboro, Vermont; and Bear Swamp Upper Reservoir (128 acres) and Pelham Lake (89 acres) in Rowe, Massachusetts.

Industry: There are no exclusively commercial areas within 5 miles of the plant. The only industry within the area is the YNPS and the TransCanada hydroelectric stations. TransCanada has five powerhouses within 5 miles of YNPS. There are three stations that are part of the

Deerfield River Project. They are the Harriman, Sherman, and No. 5 Stations. In addition the Bear Swamp and Fife Brook stations are a part of the Bear Swamp Pumped storage facility.

Public Lands and Conservation Areas: There are several public lands/conservation areas within 5 miles of the YNPS site. These areas offer a variety of recreational opportunities including fishing, hunting, boating, swimming, picnicking, and hiking.

Schools: There are two schools within 5 miles of the plant: Rowe Elementary located about 2.5 miles southeast of the site on Pond Road in Rowe, Massachusetts and Readsboro Central School, located off Route 100 near the center of Readsboro, Vermont.

Farms: Information was collected by YAEC to document the current nearest garden and milk animal locations. These locations may include farms or simply private gardens or dairying locations. Table 1-1 identifies these locations by sector.

Water Supplies: Water supplies within the Deerfield River Drainage Basin, including the entire area within 5 miles of the plant, generally consist of private wells. The only communal source of water within 5 miles of the plant site is Phelps Brook, which services some of the residents of Monroe, Massachusetts. Beyond 5 miles, downstream there are two small water supply wells servicing local private developments: the Deerfield River Club and Heath Stage Apartments in Charlemont, Massachusetts. Still further downstream, the closest public water supply wells, Stillwater Springs, are in the town of Deerfield, 20 to 25 miles south of the YNPS. Stillwater Springs has a safe yield of about 120,000 gallons per day. This well field is immediately adjacent to the Deerfield River. Another supply well, the Deerfield Well Field, off Route 116, has been closed due to contamination from nearby agricultural uses. The Quabbin Reservoir, serving the greater Boston area, is 35 to 40 miles southeast of the YNPS.

Population: The population within 10 miles of the site is estimated to be 39,300 and includes 17 municipalities in two states. Table 1-2 shows the total population in each town with borders within 10 miles of the plant. In general, the area is rural, with North Adams being the most populous municipality.

1.3 Historical Information

YNPS (Docket No. 50-029) achieved initial criticality in 1960 and began commercial operations in 1961. The nuclear steam supply system was a four-loop pressurized water reactor designed by Westinghouse Electric Corporation. The original thermal power design limit of 485 MWt was upgraded to 600 MWt in 1963. The turbine generator, also designed by Westinghouse, was rated to produce 185 MWe.

On February 26, 1992, the Yankee Atomic Electric Company (YAEC) Board of Directors decided to cease power operations permanently at YNPS. This decision was based upon the following two factors:

1. Economic analyses indicated that shutdown of the plant before expiration of the NRC operating license in July 2000 could produce a substantial savings to the electricity producers.

2. Significant regulatory uncertainty existed concerning the timing and cost of completion of the NRC's review of the integrity of the YNPS Reactor Pressure Vessel.

On August 5, 1992, the NRC amended the YNPS Facility Operating License to a possession only status.

The YNPS Decommissioning Plan (Reference 1-6) was submitted March 29, 1994, and received final approval on October 28, 1996 (References 1-7 and 1-8). In May 1997, Yankee submitted to the NRC for approval a License Termination Plan (LTP) for YNPS, pursuant to 10CFR50.82(a)(9). The initial YNPS LTP employed a survey methodology based upon the "Manual for Conducting Radiological Surveys in Support of License Termination, (Reference 1-9)," also referred to as the Draft NUREG/CR-5849 methodology. Subsequently the NRC, jointly with the DOD, DOE, and EPA, approved an alternate survey methodology documented in MARSSIM ("Multi-Agency Radiation Survey and Site Investigation Manual" or NUREG-1575, Reference 1-10). In May 1999, Yankee advised the NRC that it intended to shift from the survey methodology in NUREG/CR-5849 to the MARSSIM methodology and, therefore, withdrew its previously submitted LTP application. The current LTP is written to reflect the MARSSIM methodology, as well as appropriate regulatory guidance made available since the previous LTP submittal.

In 2000, Yankee created a Post-Shutdown Decommissioning Activities Report (PSDAR) within the Final Safety Analysis Report (FSAR). NRC Draft Regulatory Guide DG-1071 recommends that licensees with approved Decommissioning Plans (D Plans) "extract pertinent detail from the decommissioning plan and submit a PSDAR update in the format and content specified by [DG-1071]." Based on the NRC draft guidance, Yankee segregated, updated and condensed certain information concerning post-shutdown decommissioning activities in a manner that conforms to the standard format and content of a PSDAR.

On November 21, 2005 and August 10, 2007 (References 1-15 and 1-16), the NRC approved the release of the majority of the site from the 10 CFR 50 License. As a result, the only areas of the site that remain within the control of the 10 CFR 50 License are those areas associated with the YNPS ISFSI, Survey Areas/Units OOL-10-02, NOL-07, and NSY-10.

With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site.

1.4 Plan Summary

1.4.1 General Information

This LTP has been prepared by YAEC in accordance with the requirements of 10CFR50.82(a)(9). The LTP is being maintained as a supplement to the YNPS FSAR to support

the application for a license amendment to meet 10CFR50.82(a)(9) and 10CFR50.90. Each of the sections required by 10CFR50.82(a)(9) are outlined in the subsections below.

1.4.2 HSA and Site Classification

The objectives of the site classification are:

1. To divide the site into survey areas for classification purposes;

2. To identify the potential and known sources of radioactive contamination in systems, on structures, in surface or subsurface soils, and in groundwater;

3. To determine the initial classification of each survey area; and

4. To develop the information to support Final Status Survey design including instrument performance standards and quality requirements.

The site classification is based upon the Historical Site Assessment (HSA). The HSA consisted of a review and compilation of the following types of information: historical records, plant and radiological incident files, operational survey records, and annual environmental reports to the NRC. Personnel interviews were conducted with present and former plant employees and contractors to obtain additional information regarding operational events that caused contamination in areas or systems not designed to contain radioactive or hazardous materials.

Information from previous surveys, including those in support of the previous Final Status Survey campaign, was reviewed for radiological conditions throughout the site. The radiological data collected during this process provide a basis for developing plans for remediation and Final Status Surveys.

Operational radiation surveys and additional measurements and samples obtained during decommissioning activities will be used to confirm the area classification and effectiveness of the cleanup activities before completing the Final Status Survey.

As a result of the HSA, and site classification, approximately 2170 acres of the 2200-acre plant site have been identified as "non impacted" as defined in MARSSIM. Tables 2-1 and 2-2 provide the area classifications for the various survey areas of the YNPS site.

1.4.3 Identification of Remaining Site Dismantlement Activities (As of October 2013)

In previous phases of decommissioning, major plant systems and components were removed from site buildings. These included the steam generators, reactor vessel, and reactor coolant piping, as well as the turbines, generator and other plant systems not serving spent fuel pit support functions. After component removal, some buildings and land areas were remediated in preparation for the Final Status Survey and some underground and embedded piping were removed. As previously discussed, LTP-related and Final Status Survey activities were halted in

September 1999, based upon the availability of new survey guidance in MARSSIM. The focus then shifted from decommissioning activities to spent fuel storage activities. All fuel and greater-than-class-C (GTCC) waste was removed from the spent fuel pit and placed in storage casks on the pad at the onsite independent spent fuel storage installation (ISFSI). Removal of spent fuel and GTCC waste from the pool and placement on the ISFSI pad were completed in June 2003.

YAEC, with the assistance of a demolition contractor, demolished most site structures to grade. Structural demolition debris were surveyed using site procedures that invoke the "no detectable radioactivity" criterion (consistent with the guidance in NRC Circular IEC 81-07, "Control of Radioactively Contaminated Material") or were subjected to a final status survey using the DCGLs, discussed in Section 6 of this LTP. Materials meeting this criterion were either used as backfill, subject to regulations on the use of such materials by the Commonwealth of Massachusetts, or removed offsite for disposal. The Vapor Container was dismantled, decontaminated, and removed from the plant site. The Reactor Support Structure was dismantled, decontaminated and removed from the plant site.

With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site.

1.4.4 Site Remediation Plans

Section 4 of the LTP describes various methods that can be used during YNPS decommissioning to reduce radioactivity to levels meeting the NRC radiological release criteria. This means that levels of radioactivity will not exceed 25 mrem/yr total effective dose equivalent (TEDE) and will be as low as reasonably achievable (ALARA). This section describes the methodology that will be used to demonstrate that the residual radioactivity has been reduced to levels in compliance with the NRC requirements.

1.4.5 Final Status Survey Plan

The primary objectives of the Final Status Survey are to:

- verify proper survey unit classification (or reclassify survey unit),
- demonstrate that the level of residual radioactivity for each survey unit is below the release criterion, and
- demonstrate that the potential doses from small areas of elevated activity are below the release criterion for each survey unit.

The purpose of the Final Status Survey Plan is to describe the methods that will be used in planning, designing, conducting, and evaluating Final Status Surveys at the YNPS site to demonstrate that the site meets the NRC's radiological criteria for unrestricted use. Section 5 of the LTP describes the Final Status Survey Plan, which is consistent with the guidelines of MARSSIM. The plan also describes methods and techniques used to implement isolation controls that prevent re-contaminating previously remediated areas.

1.4.6 Compliance with the Radiological Criteria for License Termination

Section 6 together with Section 5, Final Status Survey Plan, describes the process that will be used to demonstrate that the YNPS site complies with the radiological criteria of 10CFR20.1402 for unrestricted use. YAEC has selected the RESRAD computer code (Version 6.21) to model the dose from soils and volumetric concrete and its counterpart, RESRAD-BUILD (Version 3.21), to model the dose from structural surfaces.

Two scenarios have been selected for use with the RESRAD family of codes for calculating the radionuclide-specific derived concentration guideline levels (DCGLs). These scenarios are the resident farmer scenario for site soils and volumetric concrete. The building occupancy scenario is being used for surficial contamination in structures. DCGLs are the concentration and surface radioactivity limits that will be the basis for performing the Final Status Survey.

1.4.7 Update of the Site-Specific Decommissioning Costs

In accordance with 10CFR50.82 (a)(9)(ii)(F), Section 7 provides an updated, site-specific estimate of the remaining decommissioning costs. With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site. Section 7 also compares these estimated costs to the amount of funds presently set aside for decommissioning and describes the methods that will ensure sufficient funds for completing decommissioning.

1.4.8 Supplement to the Environmental Report

In accordance with 10CFR50.82 (a)(9)(ii)(G), Section 8 demonstrates that decommissioning activities will be accomplished with no significant adverse environmental impacts. Supplement 1 to NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (FGEIS)" (Reference 1-11) provides an assessment of

the aspects of decommissioning with the potential to impact the environment. This assessment includes an evaluation of the significance of the impact of the activity (SMALL, MODERATE, or LARGE), as well as its applicability (generic to all or to a group of plants or site-specific). Section 8 is focused on the evaluation of those aspects of decommissioning whose impacts could not be generically addressed (i.e., those determined to have site-specific impacts) and on whether remaining license termination activities and end use of the site are bounded by prior assessments.

1.5 Partial Site Release Process

YAEC may choose to remove specific areas from the license in a phased manner before license termination. The approach for phased release and removal from the license, after approval of the License Termination Plan, is as follows:

1. Following completion of decommissioning activities, YAEC will compile a report with the following information for NRC review:

   - a description and location of the survey unit or area being surveyed;
   - certification that dismantlement/decommissioning activities, as described in the LTP, have been completed for the subject building or area;
   - an evaluation of the potential for possible recontamination of the area and a description of controls in place to prevent such recontamination;
   - Final Status Survey results for the survey unit or area, as demonstration of compliance with the LTP release criteria (not applicable to areas designated as "non-impacted");
   - Expected date of removal of the area from the 10CFR50 license.

2. YAEC will review and assess the impacts on the following programs and documents in preparation for removal of a survey unit or area from the license:

   - Final Safety Analysis Report and Technical Specifications;
   - Radiological Environmental Monitoring Program;
   - Offsite Dose Calculation Manual;
   - Defueled Emergency Plan;
   - Security Plan;
   - License Termination Plan;
   - Ground Water Monitoring Program;
   - 10CFR100 Siting Criteria; and
   - Decommissioning Environmental Report.

   The reviews will include an assessment to ensure that the land area(s), and any associated building(s), to be released will have no adverse impact on the site's ability to meet the Part 20, Subpart E, criteria for unrestricted release. The reviews will also include the

impacts on the discharge of effluents and the limits of 10CFR 20, as they pertain to the public.

3. A letter of intent to remove a portion of the property from the Part 50 license will be sent to the NRC, no later than sixty (60) days before the anticipated date for release of the subject survey area(s). This letter will contain a summary of the assessments performed, as described above, and, for areas designated as "impacted" will include the FSS report for the subject survey units(s) or area(s).

4. Once the land area(s), and any associated building(s), have been verified ready for release, no additional surveys or decontamination of the subject building or area will be required (beyond those outlined in Section 5.4.5 intended for isolation and controls) unless administrative controls to prevent recontamination are known or suspected to have been compromised. Following completion of the Final Status Survey and submittal of the associated report, the NRC will review the report and conduct, as appropriate, the applicable NRC confirmatory inspections.

5. Upon completion of the YNPS Decommissioning Project, a final report will be prepared, to summarize the release of areas of the YNPS site from the 10CFR50 license.

1.6 Change Criteria for the License Termination Plan

YAEC is submitting this License Termination Plan as a supplement to the FSAR. Accordingly, the License Termination Plan will be updated in accordance with 10CFR50.71(e). Once the LTP has been approved, the following change criteria will be used, in addition to those criteria specified in 10CFR50.59 and 10CFR50.82(a)(6). A change to the LTP requires NRC approval prior to being implemented, if the change:

(a) Increases the probability of making a Type I decision error above the level stated in the LTP;

(b) Increases the radionuclide-specific derived concentration guideline levels (DCGLs) and related minimum detectable concentrations;

(c) Increases the radioactivity level, relative to the applicable DCGL, at which investigation occurs;

(d) Changes the statistical test applied to one other than the Sign Test or Wilcoxon Rank Sum Test.

(e) Results in use of a null hypothesis other than that stated in Section 5.4.1; that is, "The survey unit exceeds the release criteria."

Re-classification of survey areas from a less to a more restrictive classification (e.g., from a Class 3 to a Class 2 area) may be assigned without prior NRC notification; however, re-

classification to a less restrictive classification (e.g., Class 1 to a Class 2 area) and/or subdivision of a survey area will require NRC notification at least 14 days prior to implementation.

1.7 References

1-1 Title 10 to the Code of Federal Regulations, Part 50.82, "Termination of license."

1-2 Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Power Reactors," dated January 1999.

1-3 NUREG-1700, Revision 1, "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans," dated April 2003.

1-4 NUREG-1757, Volume 2, "Consolidated NMSS Decommissioning Guidance," dated September 2003.

1-5 Yankee Rowe Station 2002 Annual Radiological Environmental Operating Report, dated April 28, 2003.

1-6 Yankee Nuclear Power Station Decommissioning Plan, Revision 0.0.

1-7 Letter, M.B. Fairtile (USNRC) to J.A. Kay (YAEC), "Order Approving the Decommissioning of the Yankee Nuclear Power Station, February 14, 1995.

1-8 Letter, M.B Fairtile (USNRC) to J.A. Kay (YAEC), "Completion of Hearing Process Regarding Approval of Decommissioning Plan for the Yankee Nuclear Power Station, October 28, 1996.

1-9 NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination," dated June 1992.

1-10 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual," Revision 1, dated August 2000.

1-11 Supplement 1 to NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," dated November 2002.

1-12 YNPS Decommissioning Environmental Report, dated December 1993.

1-13 "Massachusetts: 2000, Summary Population and Housing Characteristics," U.S. Department of Commerce, issued September 2002.

1-14 "Vermont: 2000, Summary Population and Housing Characteristics," U.S. Department of Commerce, issued October 2002.

1-15 Letter from J. Hickman (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Non-Impacted Site Area from Part 50 License," dated November 21, 2005.

1-16 Letter from K. McConnell (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Land from Part 50 License," dated August 10, 2007.

Table 1-1

Current Nearest Resident, Garden, and Milk Animal Locations within 5 Miles of YNPS (Reference 1-5)

Sector	Nearest Resident (mi)	Nearest Garden (mi)	Nearest Milk Animal (mi)
N	3.2	3.7	*
NNE	2.7	3.0	*
NE	2.1	2.1	*
ENE	2.3	3.6	*
E	1.8	2.3	*
ESE	2.1	2.1	*
SE	1.3	2.1	*
SSE	1.2	1.2	*
S	1.3	1.8	*
SSW	*	*	2.0**
SW	0.8	4.5	*
WSW	0.8	1.2	*
W	1.3	1.8	*
WNW	1.3	1.3	*
NW	1.5	2.0	*
NNW	1.8	2.3	*

* No location was identified within 5 miles of the plant.
**Limited number of goats. Not able to supply enough milk for sampling.

Table 1-2

Permanent Population Estimates for Municipalities within 10 Miles of the Yankee Nuclear Power Station

	1980 Census (Ref 1-12)	1990 Census (Ref 1-12)	2000 Census (Ref 1-13 and 1-14)
Massachusetts			
Adams	10,381	9,445	8,809
Clarksburg	1,871	1,745	1,686
Florida	730	732	676
North Adams	18,063	16,797	14,681
Savoy	644	634	705
Buckland	1,864	1,928	1,996
Charlemont	1,149	1,249	1,358
Colrain	1,552	1,757	1,813
Hawley	280	317	336
Heath	482	716	805
Monroe	179	115	93
Rowe	336	387	351
Vermont			
Halifax	488	782	782
Whitingham	1,043	1,298	1,298
Wilmington	1,808	1,968	2,225
Readsboro	638	762	809
Stamford	773	773	813

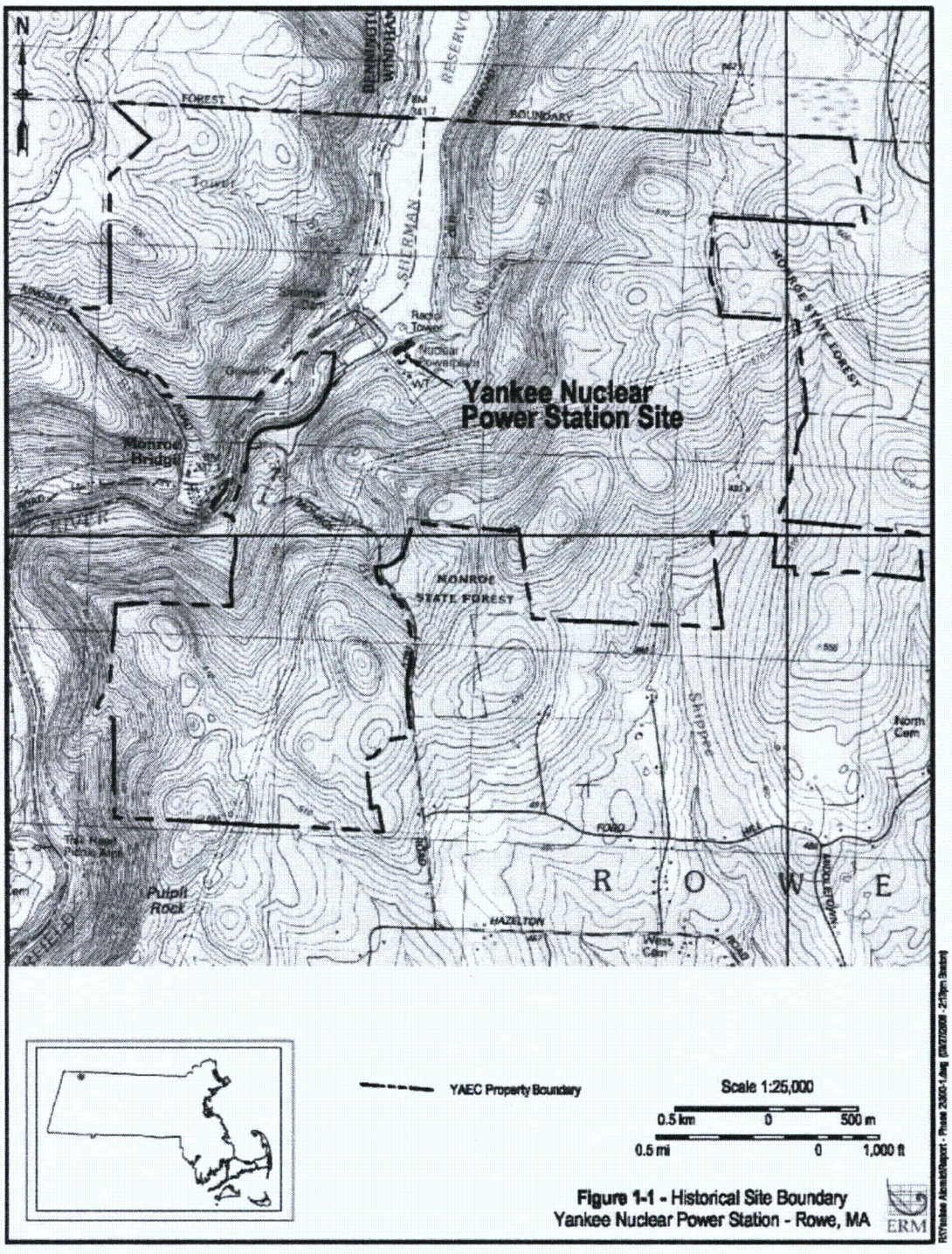
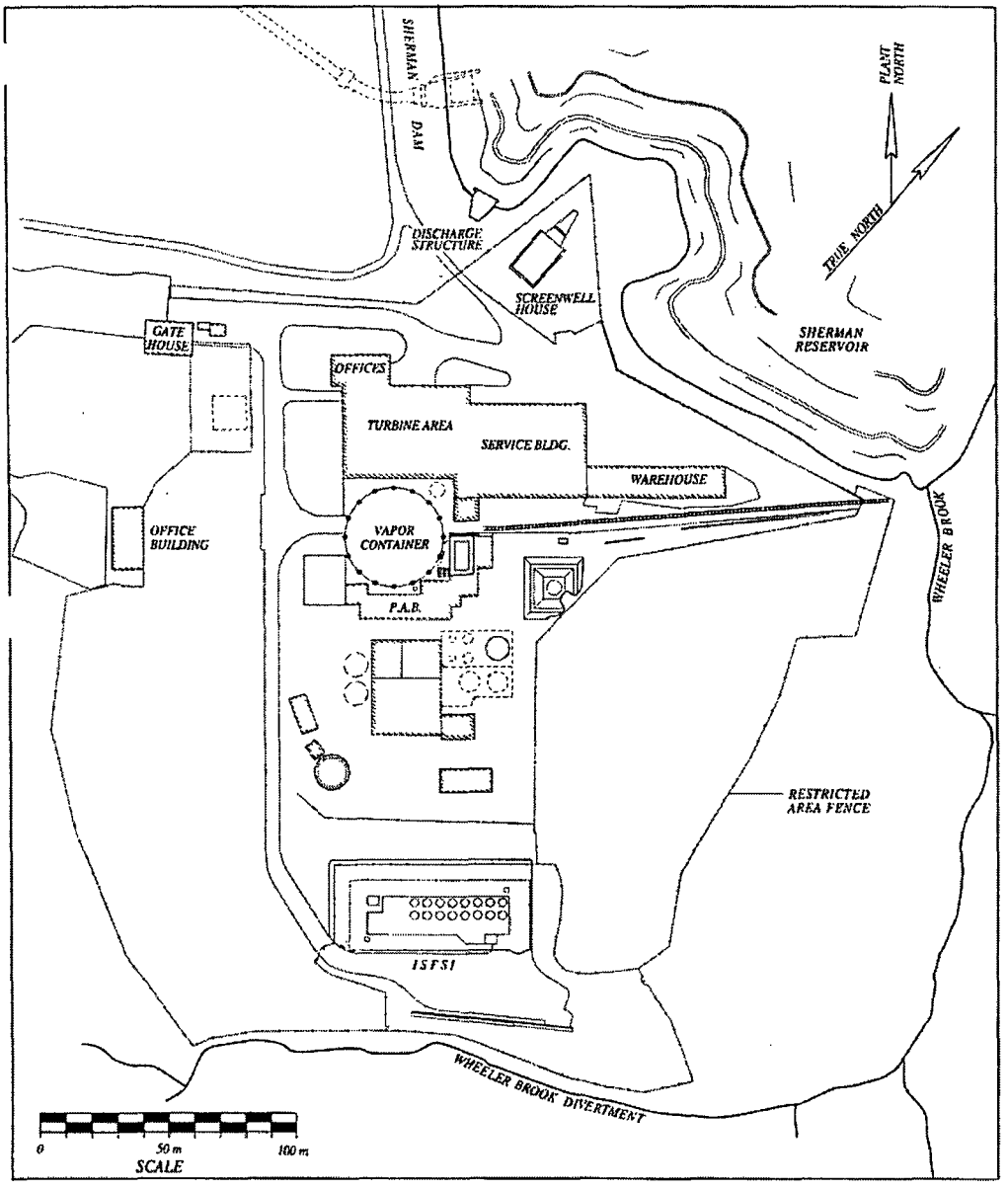
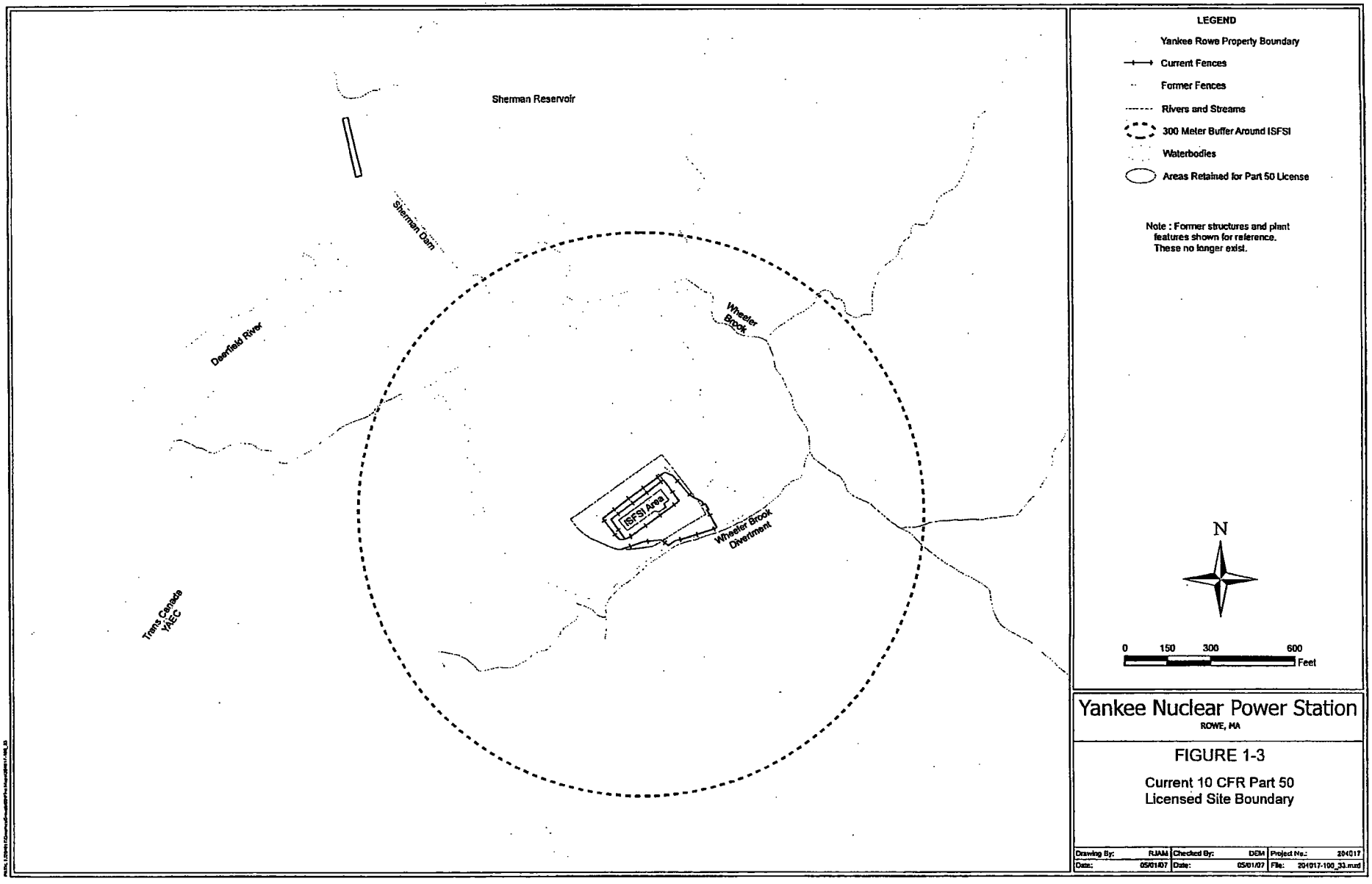


Figure 1-1 - Historical Site Boundary
Yankee Nuclear Power Station - Rowe, MA

Figure 1-2

Historical Site Design




Sherman Reservoir
Sherman Dam
Deerfield River
Wheeler Brook
ISFSI Area
Wheeler Brook Divertment
Trans Canada YAEC
LEGEND
Yankee Rowe Property Boundary
Current Fences
Former Fences
Rivers and Streams
300 Meter Buffer Around ISFSI
Waterbodies
Areas Retained for Part 50 License
Note : Former structures and plant features shown for reference. These no longer exist.
N
0 150 300 600
Feet
Yankee Nuclear Power Station
ROWE, MA
FIGURE 1-3
Current 10 CFR Part 50
Licensed Site Boundary
Drawing By: RJAM Checked By: DEM Project No.: 204017
Date: 05/01/07 Date: 05/01/07 File: 204017-100_33.mxd

2 SITE CLASSIFICATION

Decommissioning activities for and final status survey of the YNPS site, with the exception of the ISFSI and associated land areas (NOL-07, OOL-10-02, and NSY-10), were completed as of January 2007. By letter dated November 21, 2005 (Reference 2-27), the NRC approved removal of the non-impacted land areas from the Part 50 License. Subsequently, the NRC approved the removal of the impacted areas of the site with the exception of the areas associated with the ISFSI (FSS Survey Areas NOL-07, NSY-10, and OOL-10-02) from the Part 50 license via letter NYR 2007-046 (Reference 2-26). The information included in this section of the License Termination Plan (LTP) includes historical information regarding the decommissioning of the YNPS that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the YNPS site.

2.1 Historical Site Assessment and Survey Area Delineation

2.1.1 Approach and Rationale

The Historical Site Assessment (HSA) (Reference 2-1) for the Yankee Nuclear Power Station (YNPS) documents those events and circumstances occurring during the history of the facility that contributed to the contamination of the site environs above background levels. Information relevant to changes in the radiological status of the site following publication of the HSA will be considered a part of the continuing characterization evaluations (see Section 2.6). The continuing evaluations include ongoing decommissioning activities, the expansion of the site groundwater investigation and evaluations of subsurface contamination. The results of the ongoing investigations into the extent of subsurface contamination will drive continuing remediation and/or mitigation efforts as appropriate.

The HSA approach collected, organized and evaluated information that described the YNPS site in terms of physical configuration and the extent to which the site was radioactively contaminated as a result of plant operations and decommissioning activities. The HSA information was used to bound and classify survey areas. The boundaries of the identified survey areas as depicted in Figures 2-1a, 2-1b and 2-2 were selected based on operational history including recorded significant events, common radiological profiles and where appropriate, parcel ownership boundaries. The preliminary survey area classifications and sizes are shown in Table 2-1 for structures and Table 2-2 for open land areas. Survey areas for structures will be broken into multiple survey units where appropriate in order to meet the survey unit size limitations recommended by NUREG-1575 (Reference 2-2). All open land survey area boundaries have been sized to meet the NUREG-1575 size limitation constraints.

The general criteria used to classify the identified survey areas was drawn from the regulatory guidance of NUREG-1575 (MARSSIM) as follows:

Non-impacted Area: Area where there is no reasonable possibility (extremely low probability) of residual contamination. Non-impacted areas are typically off-site and may be used as background reference areas.

Impacted Area: Any area that is not classified as non-impacted. Areas with a possibility of containing residual radioactivity in excess of natural background or fallout levels. All impacted areas must be classified as Class 1, 2 or 3 as described in NUREG-1575.

Class 1 Area: An area that is projected to require a Class 1 final status survey. Impacted areas that have, or had prior to remediation, a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiological surveys) above the DCGL. Size limitations are ≤100 sq. m. for structures and ≤2000 sq. m. open land areas.

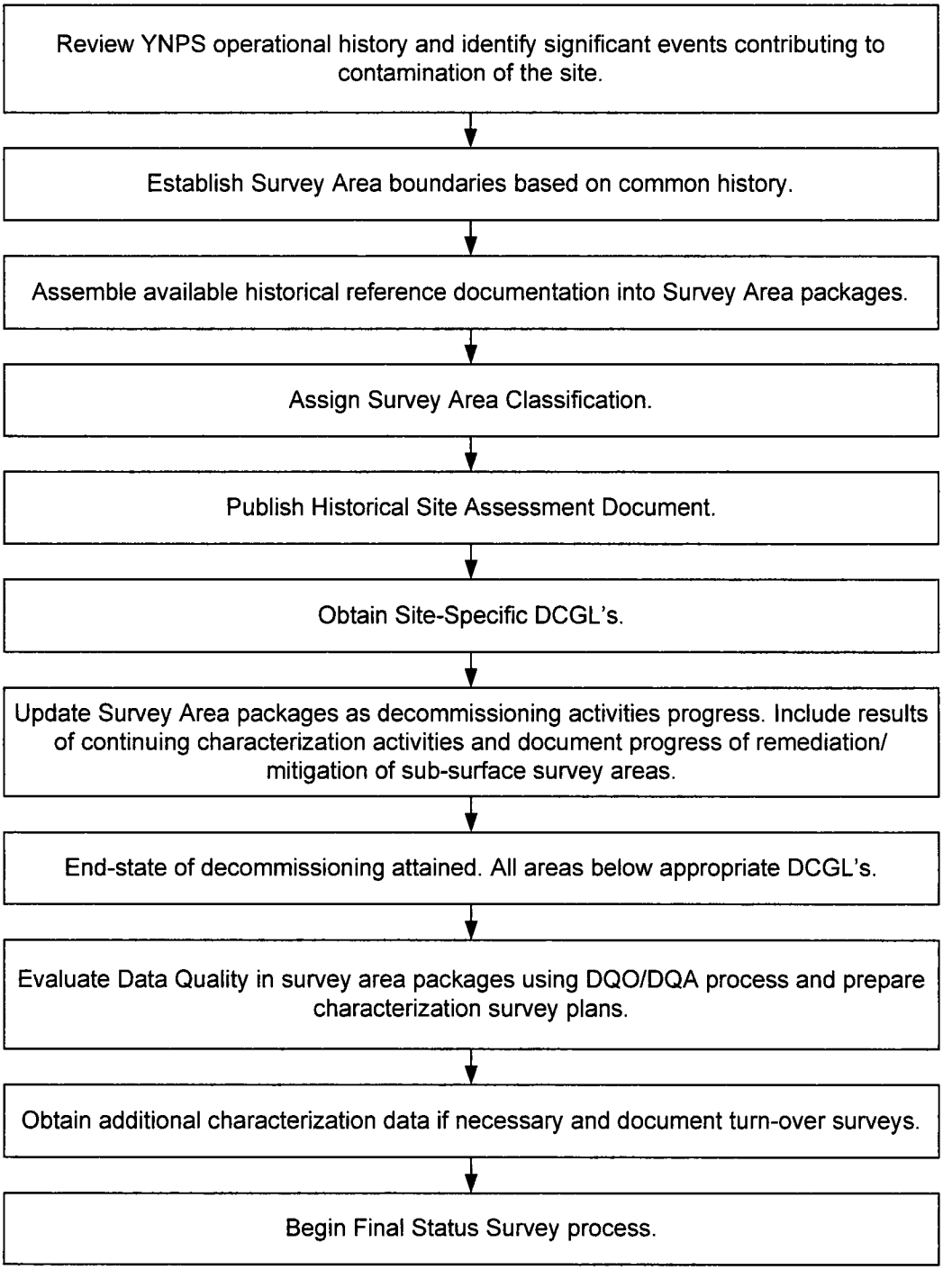
Class 2 Area: Impacted areas that have, or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the DCGL. Size limitations are >100 sq. m. and ≤1000 sq. m. for structures and > 2000 sq. m. and ≤ 10,000 sq. m. for open land areas.

Class 3 Area: Impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the DCGL, based on site operating history and previous radiological surveys. There are no size limitations for Class 3 areas.

The collection and evaluation of site radiological information is conducted under approved site procedures. The output of this process is in the form of information generated for each survey area that will be used in the preparation of survey plans. Information generated for each survey area contains a detailed operational history, the current radiological status, an evaluation of radionuclide past and current translocation pathways that have been or continue to be operable and a description and status of decommissioning work performed. The decommissioning work description includes the results or status of any subsurface characterization or remediation efforts.

The general process for integration of the HSA with continuing characterization and Final Status Survey is shown in the following flowchart.

Process for Integrating HSA with Characterization and FSS



Over the operational history of the YNPS site, the term "remediation" was often used to refer to any process involving the removal of radioactive media. For the purpose of license termination activities, "remediation" is narrowly defined as efforts specifically conducted to reduce the quantity or concentration of radioactivity to a level below the appropriate Derived Concentration Guideline Level (DCGL). Other processes may be referred to as "mitigation" or routine decommissioning activities.

2.1.2 Historical Boundaries of the Site

The YNPS site consisted of about 2,200 acres on both sides of the Deerfield River in the towns of Rowe and Monroe, in Franklin County, Commonwealth of Massachusetts. Figure 1-1 shows the historical boundary of the site and historical plant exclusion area.

The "YAEC Deed Study Project Rowe and Monroe, Massachusetts," dated December 18,1998, (Reference 2-3) provides information concerning properties that make up the YAEC site and current abutments.

YAEC or TransCanada own all of the land located within the property boundary. All of the property within the controlled area boundary is under the control of YAEC. The TransCanada property is generally located along the Deerfield River and Sherman Reservoir. Portions of the TransCanada property are considered impacted by licensed activities and are generally located at the northeastern end of the YAEC industrial area, the southern reaches of Sherman Reservoir and the property outside of the industrial area fence located between Yankee Road and the Deerfield River. These impacted areas are included in license termination activities. Notable impacted plant structures on the TransCanada property within the former site industrial area included the circulating water discharge seal pit, the Screenwell Pump House, and the meteorological tower located on peninsula at the northeast corner of the site.

No public secondary roads traverse the controlled area.

During the early site history, a public rail line ran through the industrial area. This rail line and the associated spur facilitated early construction and spent fuel shipments. Currently, there are no rail lines that traverse or are adjacent to the YNPS site.

Most of the site area is wooded with very steep grades on both sides of the Deerfield River. Features of the site include the the YNPS Independent Spent Fuel Storage Installation (ISFSI), the TransCanada Sherman Station hydroelectric plant, Sherman Reservoir and Dam, the transmission lines running through the site, and the Yankee Administration Building.

2.1.3 Documents Reviewed

In performing the YNPS Historical Site Assessment (HSA) the following documents were reviewed:

- License and Technical Specifications
  - Technical Specification Changes
  - License amendments
- Original Plant Design
  - Function and purpose of systems and structures
  - Plant operating parameters
  - Plant operating procedures
- Original Plant Construction Drawings and Photographs
  - Specifications for systems and structures
  - Field Changes/as built drawings
  - Site Conditions
- Plant Operating History
  - Abnormal Operating Reports (AOR)
  - Licensee Event Reports (LER)
  - Plant Information Reports (PIR)
  - Radiological Occurrence Reports (ROR)
  - Radiological Incident Reports (RIR)
  - Condition Reports (CR)
  - Plant Operating Procedures Regarding Spills and Unplanned Releases
  - Plant Operations Logbooks
  - Radiological Environmental Monitoring Program and Radiological Environmental Technical Specification Reports (REMP & RETS)
  - Monthly Plant Operations Reports
  - Semi-Annual Plant Operations Reports
- Work Control Documents and Site Modifications
  - Job Orders
  - Plant Alterations
  - Engineering Design Change Requests (EDCR)
  - Plant Modifications
  - Maintenance Requests
- Radiological Surveys and Assessments
  - Radiological surveys performed in support of normal plant operations and maintenance
  - Radiological surveys performed in support of special plant operations and maintenance
  - Radiological assessments performed in response to radioactive spills or events

  - Scoping and characterization surveys performed as part of Decommissioning Plan development
  - Remediation support surveys conducted during decommissioning activities
  - Surveys conducted under the guidance of NUREG/CR-5849 (Reference 2-4)
- The historical evaluations performed for the previously submitted LTP.
- The YAEC Decommissioning Plan
  - Decommissioning Work Plans
  - Secondary Side Work Plans
  - Engineering Change Notifications
  - Field Change Notifications
  - Temporary Change Requests
- The documented radiological end point of decommissioning activities
- Documentation of remediation area stabilization and restoration activities.

2.1.4 Property Inspections

The YNPS site is at an advanced stage of decommissioning with only those plant systems necessary to support the ISFSI and portions of the site remaining in service (e.g., potable water, sanitary sewers, construction electrical power, fire protection and storm sewers). Plant operations, maintenance and security personnel continue to occupy portions of the site in support of the YNPS ISFSI operations and maintenance. Due to the advanced state of decommissioning, these activities have a minimal risk of spreading radioactive contamination.

Historically, decontamination processes were performed on certain site structures and systems of the former YNPS as part of site decommissioning activities under the site Decommissioning Plan. These processes included application of chemical paint strippers, dry ice (carbon dioxide) blasting, steel shot blasting and mechanical removal techniques (including rota-peen tools, needle guns, reciprocating chipping hammers and jackhammers). In addition, both the east and west storm drain system catch basins have routinely been cleaned of accumulated sediment. Sediment socks were installed at each catch basin to curtail the build up of sediment in the storm drain system.

Surveys were performed in those areas where decommissioning activities had been completed in accordance with the protocols established under the previously submitted and withdrawn License Termination Plan (Reference 2-5). Controls were instituted and maintained to preserve the radiological condition of most of these areas, and routine surveys are performed in all of these areas to verify that the radiological condition of these areas was not adversely impacted by ongoing plant operation, maintenance, or fuel transfer activities.

Decommissioning activities have resulted in the disturbance and/or excavation of soils in certain survey areas. Extensive soil evaluations were performed in support of soil excavation. The soil excavations were associated with removal of sub-grade components/systems and site modifications necessary for the construction of the ISFSI and the upgrade of security measures around the spent fuel pool. Piles of excavated soil were located in several areas of the site.

Controls were in place to track the location of these soils from the point of origin (excavation) through temporary onsite storage to final disposition. Disturbed/excavated soils, evaluated and verified by sampling and analysis protocols to be non-detectable for radiological constituents (below environmental Lower Limit of Detection [LLD] level for soils) were used as backfill in some excavated areas. Excavated soils contaminated above a Guide Line Value (GLV) protocol were packaged and disposed of as radioactive waste. This protocol allowed some soils contaminated above background to be used as backfill in some locations. Retrospectively, the criterion is lower than the proposed DCGL. As these areas were evaluated for survey planning, the backfilled soil results were evaluated against the soil DCGL for mitigation action.

During the evaluation of survey areas, walk-downs of each area were performed to document the types of survey media remaining or expected to remain at end-state. The walk-downs also documented the current decommissioning status of the area and identified any potential radionuclide translocation pathways that impacted that area or contiguous survey areas. Such pathways include ongoing decommissioning activities or environmental transport pathways, such as sub-surface migration of radioactivity by surface water infiltration, wind, surface water run-off or wildlife.

2.1.5 Personnel Interviews

At the time of plant shutdown in 1992, personnel interviews were conducted as a part of an exit interview process. Since that time personnel have provided additional information on plant operations and practices when additional data was needed.

2.2 History and Current Status

2.2.1 Licensing History

Yankee Atomic Electric Company is the holder of Yankee Nuclear Power Station Facility Operating License DPR-3 issued under the authority of the Atomic Energy Commission (AEC). Yankee Nuclear Power Station achieved initial criticality in 1960 and began commercial operations in 1961. The original thermal power design limit of 485Mwt was upgraded to 600Mwt in 1963.

On February 26, 1992, the YAEC Board of Directors decided to cease power operations permanently at YNPS. On August 5, 1992 the NRC amended the YNPS Facility Operating License to a possession only status.

The YNPS Decommissioning Plan (Reference 2-6) was submitted March 29, 1994 and received final approval in October 28, 1996. In May 1997, Yankee submitted to the NRC for approval a License Termination Plan (LTP) for YNPS, pursuant to 10CFR50.82(a)(9). The initial YNPS LTP employed a survey methodology based upon NUREG/CR-5849. Subsequently the NRC, jointly with the DOD, DOE, and EPA, approved an alternate survey methodology documented in NUREG-1575 (Reference 2-2). In May 1999, Yankee advised the NRC that it intended to shift from the survey methodology in NUREG/CR-5849 to the NUREG-1575 methodology, and withdrew its previously submitted LTP application.

In 2000, Yankee created a Post-Shutdown Decommissioning Activities Report (PSDAR) within the Final Safety Analysis Report (FSAR). NRC Draft Regulatory Guide DG-1071 recommends that licensees with approved Decommissioning Plans (D Plans) "extract pertinent detail from the decommissioning plan and submit a PSDAR update in the format and content specified by [DG-1071]." Based on the NRC draft guidance, Yankee segregated, updated and condensed certain information concerning post-shutdown decommissioning activities in a manner that conforms to the standard format and content of a PSDAR. The current LTP is written to reflect the NUREG-1575 (MARSSIM) methodology, as well as regulatory guidance made available since the previous LTP submittal.

Decommissioning activities completed as of May 1997 had removed the majority of systems and components not required to support the storage of spent fuel in the spent fuel pool. Detailed planning for the transfer of spent fuel from the Spent Fuel Pit began in February 2000. In June 2003 the transfer of all fuel and Greater Than Class "C" waste from the Spent Fuel Pit to the ISFSI was completed.

On November 21, 2005 and August 10, 2007 (References 2-27 and 2-26), the NRC approved the release of the majority of the site from the 10 CFR 50 License. As a result, the only areas of the site that remain within the control of the 10 CFR 50 License are those areas associated with the YNPS ISFSI, Survey Areas/Units OOL-10-02, NOL-07, and NSY-10.

With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site.

2.2.2 Regulatory Involvement

The NRC monitors YNPS site activities using inspectors from Region I offices to perform onsite inspections. Periodic calls are also held with NRC headquarters and Region I staff to monitor plant status and decommissioning progress. The NRC is notified of any incidents on site per the existing protocol established with NRC Region I and NRC reporting regulations.

The decommissioning of the YNPS site is also being performed under various Federal, State and local requirements in addition to the NRC regulations. For example, YNPS is subject to 29 CFR 1910 and 1926 (Reference 2-7) for worker health and safety protection under OSHA regulations. Asbestos and lead-based paint handling and removal are subject to OSHA regulations cited above, and EPA regulations 40 CFR Part 61, Subpart M (Reference 2-8). State and EPA requirements will be met for PCB paint removal activities. YNPS will also be required to meet the state standards for surface water and groundwater.

The Commonwealth of Massachusetts Department of Public Health also has state radiological remediation standards. Compliance with the state standards is not addressed in this document. This issue will be addressed in separate correspondence with the Commonwealth.

Permits and approvals from, or notifications to, several State (Commonwealth) and local agencies are required for safety and environmental protection purposes. Some of these are for specific decommissioning activities, and others are for existing YNPS site facilities and ongoing activities that are necessary to support decommissioning. The following is a partial listing of permits and approvals that were required for decommissioning activities. A smaller subset of these permits and approvals will be required to decommission the ISFSI and the remaining land areas.

- Air emissions from the burning of diesel fuel are regulated by the Commonwealth of Massachusetts Department of Environmental Protection, Air Quality Control Division.
- Non-radioactive liquid effluents are administered by the Commonwealth of Massachusetts Department of Environmental Protection, Division of Water Pollution Control.
- Liquid effluents are controlled under the National Pollutant Discharge Elimination System (NPDES permit) under the EPA and State (Commonwealth) approvals.
- Building permits may be required by the Town of Rowe, Massachusetts, for temporary field office facilities constructed on the plant site to support decommissioning activities. The Town of Rowe uses the Uniform Building Code for evaluating building permit applications.
- The site make-up water wells are operated under permits from the Commonwealth of Massachusetts Department of Environmental Protection, Division of Water Supply.
- Hazardous waste generation is regulated by the Commonwealth of Massachusetts Department of Environmental Protection, Division of Hazardous Waste. Notification of the generator status and annual reporting are conducted in accordance with Massachusetts regulations.
- The Commonwealth of Massachusetts, Department of Labor and Industries, Division of Industrial Safety, regulates the installation, removal and encapsulation of friable asbestos-containing materials and lead-based paint. All non-radiological solid waste will be handled and disposed of in accordance with State and local rules and regulations.
- The Commonwealth of Massachusetts, Department of Public Health, Radiological Control Program, and the Vermont State Health Department, Division of Occupational and Radiological Health, are notified in advance of all placarded shipments of radioactive waste. In addition, the Governors of all affected States receive advance notifications in accordance with 10 CFR 71.97, "Advance notification of shipment of nuclear waste."
- Licenses are required for radio communications by the Federal Communications Commission.
- PCB paints will be removed from all exposed concrete surfaces as required by the Alternate Method of Disposal Authorization (AMDA) requirements prior to demolition of the structures as authorized by the EPA on October 8, 2002 and subsequent changes thereto.

2.2.3 Description of Operations Impacting Site Radiological Status

Normal plant operations were expected to result in contamination of certain areas of the site and these areas were designed to contain such material; however, early in the plant life, certain events and conditions resulted in radioactive material being deposited in other locations. As a result, the plant design and operational procedures evolved to accommodate or eliminate these circumstances. Review of the early operational history of the site drew heavily on the Plant Superintendent's "Monthly Operating Reports".

The following principal events and circumstances, listed in chronological order, contributed to the residual contamination that needs to be address during decommissioning.

- Release of elemental silver and nickel into the reactor coolant due to mechanical wear and corrosion from the initial set of control rods resulted in distribution of radioactive silver in plant systems and on equipment used during the first refueling. [circa 1960's]

- Storage of the refueling equipment and prepared radioactive waste outdoors resulted in distribution of contamination, including radioactive silver, within the RCA yard area.

- Snow removal activities performed in the RCA caused a redistribution of accumulated surface contamination to the areas outside the RCA where snow was relocated.

- Rain falling on the surface of yard areas in the RCA caused redistribution of the contamination into low areas of the RCA and into the storm drain system.

- Leaks in the radioactive systems in the Ion Exchange (IX) Pit resulted in contamination of the water in the IX Pit. A defect in the construction of the IX Pit concrete allowed the contaminated water to leak, resulting in contamination of the subsurface soils, asphalt and concrete around the IX Pit and adjoining structures.

- Wear on internal valve components made of stellite resulted in the introduction of wear particles into the reactor primary system. These particles were activated to gamma emitting Co-60 during plant power operations. Some particles associated with fuel fragments were also generated during plant operations. Maintenance on primary system components resulted in the distribution of these activated particles onto tools and equipment. Although not a frequent occurrence, Co-60 particles have been identified and removed during surveys of the yard area. The particles associated with fuel fragments have not been identified in open yard areas but were mostly confined to controlled contamination areas.

- A failure of a check valve allowed a backflow of shutdown cooling water to enter the seal water system resulting in contamination of the normally clean seal water system up to and including the vent port on the PAB roof.

- Out of doors decontamination facilities (North and South decontamination pads) resulted in contamination of the soils around the pads.

- The repair of a damaged reactor cooling pump motor on the normally clean turbine deck resulted in contamination of the turbine building generally and on the turbine deck and control room specifically.

- In the mid 1970s YNPS converted from stainless steel to zirconium clad fuel pins. Some of the zirconium fuel pins failed in the reactor due to vibrational stress from water jetting. The pin failure resulted in a release of fuel pellets directly into the reactor coolant system. This event changed the isotopic mix within the Reactor Coolant System. In particular, detectable quantities of fission products such as Cs-137 and Cs-134 were dispersed throughout the primary side plant systems and the fuel handling facility for the first time in the plant operating history.

- During a refueling outage in 1981, while relocating the reactor head to its outside storage location, the reactor head made contact with the wall above the equipment hatch in the Vapor Container. The impact dislodged particulate radioactivity adhered to the under side of the reactor head. This resulted in contamination of the RCA yard area under and around the equipment hatch.

- Construction of the original PCA storage facility included a PVC drainpipe that connected the PCA storage building to the Waste Disposal Building. The PVC pipe joints failed allowing liquid to flow from the drainpipe into the surrounding soil.

- The use of an underwater plasma torch to section the reactor internals resulted in the release of highly radioactive cutting debris into the shield tank cavity shield water. This changed the radionuclide mix of the residual contamination in the shield tank cavity and, to a certain extent, in the Spent Fuel Pit.

The storage of spent nuclear fuel and GTCC waste at the ISFSI until the material is removed from site is not expected to result in any releases of radioactive material and minimal contamination of the ISFSI Vertical Concrete Casks and ISFSI Storage Pad due to activation. Currently, the spent nuclear fuel and GTCC waste are sealed in welded canisters.

2.2.4 History of Unplanned Events

As part of the HSA, a comprehensive review of all recorded events documented as having occurred outside the normal operational condition was performed to capture those events which contributed to the contamination of the site. These events were typically documented in the format suitable for reporting to regulatory authorities such as Abnormal Occurrence Reports (AOR's), submitted during the early site history, and Plant Incident Reports (PIR's) or Licensee Event Reports (LER's), submitted through the remainder of plant life. Where available, the information in these reports was supplemented by supporting documentation concerning the events in the form of plant memos and radiological survey data.

2.2.4.1 Unplanned Gaseous Releases

Over the lifetime of the plant, a number of unplanned gaseous release events occurred. Short descriptions of these gaseous events as described in AOR/PIR/LER's are documented in the HSA. A careful review of these unplanned discharges did not reveal any unmonitored particulate component that could have significantly contributed to the long-term contamination of the site or its environs.

A detailed study of planned particulate releases during the operating history of YNPS is presented in Section 2.5 as partial justification for the non-impacted status of a majority of the YAEC owned property. This study considered the impact of the particulate emissions from the primary vent stack. In this study (Ref. 2-13) it was presumed that the radioactive waste incinerator operated until 1964. The four years of batch incinerator emissions were considered to be of negligible impact when compared to the particulate releases from the primary vent stack over the life of the plant. Follow-up investigation of the history of the radioactive waste incinerator revealed that the incinerator actually operated until 1975. The particulate emissions from the radioactive waste incinerator were re-evaluated, and this re-evaluation also concluded that operation of the incinerator has had an insignificant impact on site environs (Ref. 2-18).

During the interim storage period, the potential for an unplanned gaseous release of radioactive material does not exist.

2.2.4.2 Unplanned Liquid Releases

Several AOR's and PIR's reviewed documented unplanned liquid releases that resulted in contamination of the site grounds, buildings and subsurface locations. When subsurface contamination investigations were not performed due to inaccessibility or were not completed to the level suitable for license termination, these locations are targeted for continuing characterization investigation. Table 2-3 provides a listing of the events identified by the HSA that have resulted in contamination of the site. Appendix 2A provides a brief summary of each event based on documentation prepared at the time of the incidents and an assessment of which survey areas were impacted by the events.

During the interim storage period, the potential for an unplanned liquid release of radioactive material does not exist.

2.3 Findings

2.3.1 Overview

As described in Section 2.1.1 above, the preliminary boundaries of the survey areas depicted on Figures 2-1a, 2-1b and 2-2 were selected based upon operational radiological history. An in-depth assessment of the operational history performed during compilation of the HSA was used to bound and classify the survey areas in accordance with the guidance of NUREG-1575. Survey area classifications are shown in Figures 2-3 and 2-4 in a color-coded site map format. Table 2-1 and Table 2-2 list the survey area dimensions and their classifications in a tabular format.

Generally, of the approximately 2200 acres of land that comprise the YNPS site, fewer than 30 acres was impacted by plant operations. The majority of these 30 acres is minimally impacted and, as such, is classified as a group of Class 3 open land survey areas. The Class 3 open land survey areas identified at a distance from the site industrial area are areas that received material, primarily soil, from locations within the plant that are impacted areas. The survey areas that form the perimeter of the impacted areas of the site proper were classified as Class 3 open land survey areas and account for the potential translocation pathways of site-related radioactivity into the surrounding environment by winds, surface water, groundwater, and wildlife intrusion.

The Class 2 open land survey areas that abut the Class 1 open land survey areas are potentially contaminated or known to be contaminated, but are not expected to exceed the DCGL. This creates a buffer zone that will receive a higher level of assessment based upon its likelihood to contain radioactivity at some fraction of DCGL.

Class 1 open land survey areas are identified based upon historical information indicating the potential presence of radioactivity at levels greater than DCGL. Table 2-5 summarizes the radiological conditions of open land areas, the associated MARSSIM classifications, and the total land area by survey area. The radiological condition of each area is expressed as the minimum, maximum and mean of the sum of fractions of a DCGL for soils.

Subsurface soils and subsurface structures/systems located within or that traverse an open land survey area will be evaluated separately as part of the continuing characterization process described in Section 2.6 of this document.

All YNPS structures associated with the site were considered impacted to some extent by plant operations and are located within an impacted land survey area. The majority of the structures were demolished to grade with the debris being removed from site or used as back fill. The remaining portions of the structures will consist of reinforced concrete floor slabs, foundations and sub-grade structures. The floor slabs, adjoining interior walls and above grade exterior walls may all be included within a given survey unit dependent on surface area size limitations. The sub-grade reinforced concrete walls and undersides of floor slabs will be investigated separately. Table 2-1 summarizes the structure survey area classifications and the total interior area to be surveyed. A summary of the current radiological conditions of structures and buildings tabulated by survey area is presented in Table 2-4. This information was further evaluated in consideration of the decommissioning activities previously performed, the potential impact of future decommissioning activities, and the projected end-state of the site at conclusion of all decommissioning activities in order to select the preliminary classification status.

With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site

2.3.2 Radionuclides of Concern at YNPS

An analysis has been performed to determine the radionuclides that have potential dose significance at License Termination (Reference 2-9). This analysis has used three sources of radionuclide data to assure that all significant nuclides associated with plant operations are identified. The sources are selected Part 61 analyses representing several media types spanning a time period from pre-shutdown to the present, radionuclide distributions identified in the YNPS Decommissioning Plan (Reference 2-6) and source term information from NRC published reports. The significant radionuclides identified from the Part 61 analyses encompassed those identified from the latter two sources. The final listing of potentially significant radionuclides is shown on Table 2-6.

2.4 Impacted Area Assessments

The summary assessments provided in Appendices 2B and 2C of this section include a description, key elements of the history, contaminated media and an evaluation of the principle radionuclides expected to be present in the areas that remain within the control of the 10 CFR 50 license. The summary also includes a current decommissioning status and a description of the work remaining to be done to attain the anticipated end-state. A survey area classification statement is provided at the end of each assessment. None of the impacted areas were classified based on the results of scoping or preliminary characterization data. The classifications assigned, based on historical activities performed in these survey areas alone, are substantiated by the large quantity of scoping data available in the form of soil sample analyses and survey data. Summaries of the sampling data as shown on Tables 2-4 and 2-5 are compiled from information detailed in the YNPS HSA. More detailed descriptions, histories and the radiological status of each of these survey areas are also contained within the YNPS HSA.

2.4.1 Buildings, Structures and Open Land Areas Inside the RCA

On November 21, 2005 and August 10, 2007 (References 2-27 and 2-26), the NRC approved the release of the majority of the site from the 10 CFR 50 License. As a result, the only areas of the site that remain within the control of the 10 CFR 50 License are those areas associated with the YNPS ISFSI, Survey Areas/Units OOL-10-02, NOL-07, and NSY-10.

The following designations are used in identifying survey areas inside of the RCA (Figures 2-3 and 2-4):

NOL	Open Land Areas Inside the RCA
NSY	Yard Structures Inside the RCA

Summary individual survey area assessments for those areas that remain within the 10 CFR 50 License are described in Appendix 2B. NSY-10 and NOL-07 are the ISFSI Pad and the open land area immediately surrounding this structure. The area was excavated to prepare a suitable surface for the new concrete pad structure. The soils removed from this excavation were evaluated by composite sampling and found to contain only naturally occurring radionuclides.

The pad and surrounding land have been assigned a Class 3 status pending further evaluations following the final disposition of the spent fuel containers.

2.4.2 Buildings, Structures and Open Land Areas Outside of the RCA

On November 21, 2005 and August 10, 2007 (References 2-27 and 2-26), the NRC approved the release of the majority of the site from the 10 CFR 50 License. As a result, the only areas of the site that remain within the control of the 10 CFR 50 License are those areas associated with the YNPS ISFSI, Survey Areas/Units OOL-10-02, NOL-07, and NSY-10.

The following designation is used in identifying the remaining survey area outside of the RCA (Figures 2-3 and 2-4):

OOL Open Land Areas Outside the RCA

The Summary individual Survey Area assessment for the area that remains within the 10 CFR 50 License is described in Appendix 2C. In general, the impacted areas immediately outside the confines of the historical RCA have been assigned a NUREG-1575 Class 2 status. These buffer zones are areas where radionuclides may have migrated beyond the RCA boundary due to environmental or other translocation vectors.

The remaining impacted area is assigned a Class 3 status. This area is not expected to contain radioactivity in excess of a small fraction of the appropriate DCGL.

2.5 Non-Impacted Area Justification

On November 21, 2005 and August 10, 2007 (References 2-27 and 2-26), the NRC approved the release of the majority of the site from the 10 CFR 50 License. As a result, the only areas of the site that remain within the control of the 10 CFR 50 License are those areas associated with the YNPS ISFSI, Survey Areas/Units OOL-10-02, NOL-07, and NSY-10.

2.5.1 Non-Impacted Area Description

The majority of the land surrounding the industrial area of the site was classified as non-impacted according to MARSSIM criteria. This portion of the site is open land consisting of approximately 2170 acres. The non-impacted land surrounds the industrial area and all other routinely utilized areas. The non-impacted area is bounded on the east and south by Monroe State Forest, on the southeast by TransCanada property, on the west by Readsboro Road (with the exception of an 89 acre plot on Kingsley Hill Road), and on the north by the Massachusetts/Vermont state line. The non-impacted area was not involved in plant operations and consists mostly of rugged terrain which is forested and undisturbed. Power lines traverse the

area in a northeast by east direction (see Figure 2-5). The general site is shown on USGS map Rowe, Massachusetts-Vermont (Reference 2-10).

2.5.2 Decommissioning Activities

There were no decommissioning or remediation activities performed in the non-impacted area. Most of the area is forested. The power line right-of-way is cleared of trees.

2.5.3 Basis of Area Classification

The survey unit is classified as "non-impacted" because there is no reasonable possibility of residual contamination based upon the following (References 2-11, 2-12 and 2-13):

- Samples collected as part of the Radiological Environmental Monitoring Program (REMP) throughout the plant's operational and post-operational history show no evidence of any significant radiological impact due to plant operations;

- Aerial photographs from 1966, 1970, 1974, 1980, 1981, 1982, 1989, and 1990 show no evidence of soil disturbance;

- A conservative evaluation of the impact of particulate effluents to soils outside of the industrial area using a Gaussian dispersion/deposition model substantiates the conclusion that this source of plant-derived radioactive material would be expected to contribute (at a maximum) a very small fraction of the DCGL. Beyond the impacted area boundary, concentrations of this plant-derived radioactive material would be non-detectable and indistinguishable from background;

- A statistical comparison of soil sample analytical data from the non-impacted area and an environmentally equivalent reference area (unaffected by plant releases) was performed.

2.5.4 Occurrence of Anthropogenic Radionuclides in the Environmental Background

According to the National Council on Radiation Protection and Measurements (References 2-14, 2-15 and 2-16), radionuclides present in environmental background are both naturally occurring and man-made. Carbon-14 is introduced cosmogenically and by the atmospheric detonation of nuclear weapons. Tritium is also introduced cosmogenically and through atmospheric detonation of nuclear weapons. Cesium-137 and Strontium-90 are fission products that occur in the environment as a result of atmospheric nuclear weapon detonations.

The range of concentrations of Cs-137 in environmental background due to fall-out from atmospheric atomic device testing is easily detectable in soil. Both Cs-137 and Sr-90 are fission products with similar half-lives. Accordingly, it is expected that Sr-90 due to fall-out from

atmospheric testing would also occur in the environment where weapons derived Cs-137 is present.

2.5.5 Evaluation of the Impact of Elevated Releases of Particulate Radioactive Material

Covering the operating history of YNPS, YRC-1178 (Reference 2-11) provides a conservative evaluation of the deposition of particulate activity in gaseous effluents on soils in the impacted area downwind of the Primary Vent Stack (OOL-08, a historical survey area that has been released from the 10 CFR 50 License). The study examined Semi-Annual Effluent Reports and Monthly Operating Reports that contain the total activity, by radionuclide, released from the plant in particulate form of gaseous effluents. The particulate fraction released from the Primary Vent Stack is determined from analyses of the waste gas discharge. The gaseous fraction of the effluent was disregarded when considering the impact to soils since there is no expectation that this fraction would be deposited. The individual radionuclide activity annual data were decay-corrected to the time of YRC-1178 (1998). A conservative atmospheric deposition factor was developed and applied to the decay-corrected particulate fraction of released activity to determine the maximum residual deposition on an area extending 100-200 meters beyond the industrial area boundary. The long-term average deposition factor was derived from plant specific meteorological and structural data and was determined to be 8.79E-08m^{-2}. Soil radioactivity concentrations based on a penetration depth of 15 cm and a density of 1.6 gm/cc were calculated to be:

- Sr-90: 2.56E-4 pCi/g
- Cs-134: 4.91E-7 pCi/g
- Cs-137: 1.01E-4 pCi/g
- Co-60: 1.31E-4 pCi/g

These values are below the expected site-specific DCGLs and minimum detectable activities (MDAs). These projections demonstrate that the concentration of gaseous effluent-derived radioactive material in area OOL-08 (an impacted area) is expected to be much less than the soil DCGLs. Since the non-impacted area is further from the source, plant-derived radioactive material concentrations would be even lower than those typical of survey area OOL-08 (a historical survey area that has been released from the 10 CFR 50 License).

2.5.6 Statistical Evaluations

2.5.6.1 Description of Reference Areas

Cesium-137 derived from atmospheric nuclear weapon detonations occurs in all land areas, regardless of their proximity to YNPS. In order to assess properly the impact of plant operations alone on the non-impacted area of the site, the contribution from this source of Cs-137 must be quantified. To that end, reference areas that were not reasonably expected to contain plant-derived Cs-137 were identified. Reference 2-17 describes the selection criteria, sampling

protocol, and summary results for these reference background areas. The areas selected were in the vicinity surrounding Pelham Lake. This area was selected for the following reasons:

- It is the direction of least prevalent winds, and therefore has the least likelihood of having been impacted by YNPS air effluents.
- It is in a separate valley and there is no known surface or groundwater communication between the two valleys. Therefore it most likely has not been impacted by liquid effluents.
- It has soil and flora typical of the non-impacted survey area surrounding the YNPS site.

2.5.6.2 Approach and Methodology for Evaluation of the Non-Impacted Area

Thirty (30) surface soil samples were collected from the non-impacted area in August 1998. The locations of each sample point and the general location of the plant site relative to the survey area are presented in Figure 2-5. Sixty surface soil samples were also obtained (in 1996) from a selected reference area beyond the boundaries of the YNPS-owned property as described in Section 2.5.6.1. The means and maximum values of the reference background area and the non-impacted areas compare favorably with the global concentrations of Cs-137 found from atmospheric deposition in topsoil.

Two types of statistical tests were performed to evaluate whether the soils from the non-impacted area contain excess Cs-137 relative to the soil samples from the reference area. These analyses are presented in Reference 2-11. The Student t-test was used to compare the mean values of the two data sets. The second test was a single-tailed Fisher's "F-Test" of the variances of the Cs-137 concentrations in the reference area and the non-impacted area. This comparison is also known as the Analysis of Variance or the Variance Ratio. The test compares the variances of both data sets.

Additional statistical analyses were performed on the shapes of the sample distribution to provide additional evidence that these two distributions may have the same source. These were tests for skewness and normality. These tests indicated that the parameters for the data sets are alike.

2.5.7 Summary

The classification of the area as non-impacted is based upon historical photographs, results of Radiological Environmental Monitoring Program surveys, particulate gaseous effluent deposition modeling and a statistical analysis of Cs-137 soil concentrations relative to a set of background reference areas.

2.6 Investigation of Subsurface Contamination

Subsurface radioactivity is residual radioactivity that is underneath structures such as building floors/foundations or that is covered with soil or some other material. The reasons for this vary. Survey area information, as presented in the YNPS HSA, is the primary resource for identifying areas that may require subsurface investigation.

Appropriate samples will be obtained to identify the depth at which contamination, if any, above DCGL limits occurs. The evaluation of soil under concrete and asphalt will also be addressed. Survey plans will be developed for sampling of soil under contaminated slabs, especially at the location of expansion joints, cracks, and other potential contamination pathways from the concrete surface to the sub-slab soil.

Subsurface investigations will include collection of soil cores. Evaluation of these cores may include segregating them into smaller increments, based upon measurements from field screening techniques. Figure 2-6 illustrates the locations where targeted subsurface investigations will be performed. Finding activity in subsurface soil above the DCGL will prompt further investigation in order to determine the horizontal and vertical extent of the contamination. The investigation will continue until the area of contamination is well defined. This is generally accomplished when the activity in soil from peripheral cores is less than the DCGL. The conclusion in that case is that the investigation has bounded the extent of contamination. All subsurface areas known to be impacted will be investigated and soil radioactivity levels will be reduced to less than the soil DCGL.

Following the remediation/mitigation of all targeted subsurface locations and as part of the final status survey program, a series of systematic subsurface borings will be conducted in the area delineated in Figure 2-6. Radiological evaluations of volumetric material in the vertical column at each subsurface survey location will be performed to substantiate the evaluation that all subsurface locations have been identified and are below the clean-up criteria.

2.7 Investigation of Groundwater Contamination

2.7.1 History

The basic site geology has been well documented in licensing studies and documents. Figure 2-7 illustrates the locations of groundwater monitoring wells. The first site monitoring wells, B-1 and B-3, were installed within the Radiologically Controlled Area (RCA) in December 1977 and October 1979, respectively. Well B-3 was used to monitor groundwater level, and no samples were analyzed for radionuclides. Well B-3 was closed in January 1997.

Following the decision to terminate plant operation, monitoring wells CB-1, -2, -3, and -4, and CW-1, -2, -3, -4, -5, and -6 were installed just down gradient of locations where spills or leaks are known to have occurred. The location, extent and impact of leaks resulting in the contamination of the site are discussed in the Historical Site Assessment and have been summarized in previous subsections of this LTP.

The YNPS Radiological Environmental Monitoring Program (REMP) has identified tritium in Sherman Spring. Tritium was also identified in samples routinely drawn for REMP from monitoring well B-1. The identification of H-3 in the groundwater as a substance of concern was documented in the YNPS Decommissioning Plan; however, recent samples have not detected tritium in Sherman Spring.

The additional wells installed after 1993 further defined the extent of H-3 migration beneath the plant industrial area and toward the Deerfield River and Sherman Dam. Analyses for H-3 from wells, along with REMP results for Sherman Spring, provided a working model for groundwater flow in the shallow outwash aquifer beneath the site. They also served as a basis to help locate additional monitoring wells (CB-6, -8, -9, CW-7, and -8) installed in 1994 to further define general groundwater flow and the H-3 plume at the site. The shape of the H-3 plume, based on analyses from the above wells, is shown in Figure 2-8.

Additional core borings that serve as draw points for groundwater samples (CB-5, -7, -8, -10, and -12, and CW-10) were installed up gradient or cross-gradient of the PAB/SFP/IX Pit complex, in impacted locations beneath building slabs. While these are not actual monitoring wells with installed screens, they do provide scoping type groundwater data when water is present within the bore holes.

A series of deep-bedrock wells were installed during the summer of 2003 in order to investigate the possible existence of a deep plume of contamination. The wells currently in existence, that were installed prior to 2003, are at the level of the glacial outwash or in unfractured till. These wells monitor the concentration of the radionuclides in the groundwater to depths of about 30-70 feet. The new wells investigated depths to bedrock which ranged from 43 to 280 feet.

Figure 2-7 shows the location of bedrock monitoring wells (MW100-107). The designation 'A', 'B', or 'C' for these wells signifies outwash, bedrock, or intermediate depth wells, respectively. Intermediate wells were installed at depths where aquifers were encountered that yielded positive tritium results.

2.7.2 Evaluation of Historical Data

Figure 2-8 shows data for H-3 in samples taken from wells near the plant structures.

CB-11A was installed in the PAB following detection of H-3 in the standing water that was exposed during removal of the concrete floor in that building in 1997. Subsequent samples from that well revealed elevated H-3 concentrations in a highly localized zone. Several new monitoring wells were placed in the vicinity of that well to allow sampling of that area.

A document had been prepared to address the set of groundwater data existing as of 2001 (Reference 2-19). This document was reviewed, and the review and resulting recommendations were documented in Reference 2-20. These recommendations led to revisions to the groundwater monitoring program.

2.7.3 Groundwater Monitoring Program

The NRC provided the following conclusions regarding the Groundwater Compliance Plan in the Safety Evaluation Report issued on August 10, 2007 (Reference 2-26).

> "As documented in Final Groundwater Condition Report dated February 15, 2007, YAEC has calculated the maximum concentration in the resident farmer's well as of April 2007 to be 8150 pCi/L, well below the 20,000 pCi/L limit.
>
> "The staff reviewed YAEC's confirmation of groundwater compliance dated April 24, 2007, for the YNPS. In that document, YAEC demonstrated license termination compliance for the groundwater at the YNPS site as specified in its Groundwater Compliance Plan dated August 31, 2006.
>
> "This demonstration included the following items:
>
> - A summary of the five quarters of radiological sampling data for 53 monitoring wells and Sherman Spring,
> - Confirmation that no radionuclides other than tritium have been detected in the groundwater exceeding License Amendment No. 158 action levels, and
> - Confirmation that tritium concentrations in a resident farmer's well near monitoring well MW-107C is less than the EPA's MCL (20,000 pCi/L).
>
> "In addition, YAEC committed in its Groundwater Compliance Plan to provide a statistical trend analysis of tritium at each monitoring site for the five quarters. All the monitoring sites except monitoring well MW-110C had a stable or downward trend for tritium during this time period. The tritium in well MW-110C has increased slightly over this time period from 1,160 to 2,040 pCi/L, which is approximately 10 percent of the tritium MCL. The staff did not consider this upward trend significant.
>
> "The NRC has reviewed the licensee's groundwater sampling documents and analysis and agrees that the acceptance level, as documented in the LTP, has been met and therefore, groundwater compliance with the release criteria has been achieved."

2.8 Continuing Characterization Activities (as of October 2013)

With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site.

2.8.1 Introduction

Surveys of impacted site structures and open land areas will be performed to support final status surveys for surfaces, materials, and soils that will remain at the time of license termination. This includes concrete building floors at ground level, concrete building foundation walls and footings below ground level, asphalt covering the soil in open areas, and soil. Some of the soils to be characterized are located beneath the concrete floors and asphalt. Materials from structures will be dispositioned either under the free release criteria (consistent with the guidance of NRC Circular IEC-81-07, "Control of Radioactively Contaminated Material") or FSS and may be used as backfill. Sub-grade structures that are not part of a designated structural survey area (e.g., concrete support structures) will be evaluated within the overlying open land survey area or subsurface survey area when they are potentially impacted by the migration of sub-surface contamination. Confirmatory spot checks on other such sub-surface structures or objects will validate a non-impacted status where appropriate.

The remaining investigation activities are of two general types:

- Survey used to determine the presence of radioactivity (impacted or non-impacted), or
- Survey performed with final status survey quality requirements that may be used as a final status survey if the release criteria are met.

In the case of the first type of survey, the quality requirements invoked will be specific to the purpose of the investigation. If the survey will be used in support of FSS design elements, then the data quality objective (DQO) process typically applied to the FSS plan design will be applied to this survey.

2.8.2 Characterization Survey Plans Prepared Under a Quality Assurance Project Plan (QAPP)

Characterization Survey planning includes review of the Historical Site Assessment (HSA), scoping survey data, DCGLs, and other relevant information supporting the initial classification of the survey area or unit.

The DQO process described in MARSSIM is implemented by generation of a survey plan. The DQO process is a series of planning steps for establishing criteria for data quality and developing survey designs. The goals of this process are to provide a more effective survey design and a basis for judging the usability of the data prior to collection. DQOs are statements intended to clarify the survey objectives, define the types of data to be collected, and specify the limits on the decision errors used as a basis for establishing data requirements. The impetus of this DQO planning process is a Quality Assurance Project Plan (QAPP). This QAPP integrates all technical and quality aspects of the project and details how these elements will be implemented.

The survey design includes the selection of instruments and techniques needed to provide scans, static measurements, and samples of the proper quality and quantity to allow decisions to be made regarding the suitability of the current MARSSIM area classification. Technical basis

documents will be developed as needed to justify the use of the measurement methods and to assess instrument detection limits.

Approved site procedures for field and laboratory instrument calibration and operation, survey techniques and reporting, data entry and management, and training and qualification of personnel will ensure that the plan is implemented consistently and according to applicable standards.

2.8.3 Characterization Survey Plans

The purpose of a Characterization Survey Plan is to describe the methods to be used in the planning, design, execution, and evaluation of characterization surveys. The "as found" condition of a given survey area is documented in the survey area classification packages. These packages contain sufficiently detailed information on the operational history and current decommissioning status to allow generation of a Characterization Survey Plan or to use the existing data provided it is qualified to be adequate as characterization data. If the completed classification package indicates that additional characterization is required to investigate potential presence of plant-derived radionuclides on the exterior of sub-grade surfaces or beneath the concrete floor of the end state structure, the results of such investigations will be included in the survey area classification information.

2.9 References

2-1. YAEC Historical Site Assessment.

2-2 NUREG-1575: Multi-Agency Radiation Survey and Site Investigation Manual, Revision 1, dated August 2000.

2-3 YAEC Deed Study Project Rowe and Monroe, Massachusetts, dated December 18, 1998.

2-4 DRAFT NUREG/CR-5849 (ORAU 92/C57): "Manual for Conducting Radiological Surveys in Support of License Termination," by J.D. Berger, dated June 1992.

2-5 YAEC License Termination Plan, dated December 1997.

2-6 YNPS Decommissioning Plan, dated March 29, 1994

2-7 Title 29 Code of Federal Regulations, "Labor."

2-8 Title 40 Code of Federal Regulations, "Protection of Environment."

2-9 Technical Basis Document YA-REPT-00-001-03, Radionuclide Selection for DCGL Determination, dated November 5, 2003.

2-10 USGS topographic quadrangle Rowe, Massachusetts – Vermont, 42072-F7-TM-025, dated 1990.

2-11 Technical Basis Document YA-REPT-00-006-03, "Statistical Evaluation of Non-Impacted Area, Evaluation of 137Cs Concentration in Soils of Non-impacted and Reference Areas in the Vicinity of YNPS."

2-12 EG&G 10617-1233, UC-702, "An Aerial Radiological Survey of the Yankee Rowe Nuclear Power Station and Surrounding Area," EG&G Energy Measurements, dated September 1993.

2-13 YRC-1178, Radionuclide Soil Concentrations Surrounding YNPS Resulting from Gaseous Release During Plant Operation, dated March,1998.

2-14 NCRP Report 47 "Tritium Measurement Techniques," dated May 28, 1976.

2-15 NCRP Report 50 "Environmental Radiation Measurements," dated December 27, 1976.

2-16 NCRP Report 81 "Carbon-14 in the Environment," dated May 15, 1985.

2-17 RP 98-20, "Technical Basis Document for Background Concentrations of Cesium-137 in Soil and Sediment," RP 98-20, dated March 3, 1998.

2-18 YA-REPT-00-002-04, "Evaluation of Effluent Releases from Onsite Incineration of Waste," dated May 24, 2004.

2-19 DESD-TD-YR-02-001, "Site Ground Water Data Collection for YNPS Decommissioning," dated February 2002.

2-20 Letter L02-91, from Eric L. Darois (RSCS) to Greg Babineau (YAEC), dated December 12, 2002.

2-21 YA-REPT-01-005-03, "Yankee Nuclear Power Station Report of Radionuclides in Groundwater, Rev. 1 (Third Quarter 2003, Interim)," dated January 2004.

2-22 YA-REPT-00-004-04, "Hydrogeological Report of 2003 Supplemental Investigation," dated March 15, 2004.

2-23 BYR 2006-074, "Submittal of Groundwater compliance Plan for License Termination at YNPS," dated August 31, 2006.

2-24 BYR 2007-016, "Final Groundwater Condition Report," dated February 15, 2007.

2-25 BYR 2007-034, "Confirmation of Groundwater Compliance," dated April 25, 2007.

2-26 NYR 2007-046, Letter from K. McConnell (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Land from Part 50 License," dated August 10, 2007.

2-27 Letter from J. Hickman (USNRC) to W. Norton (YAEC), "Yankee Nuclear Power Station - Release of Non-Impacted Site Area from Part 50 License," dated November 21, 2005.

Table 2-1

Floor and Total Area of Buildings* and Features

SURVEY AREA	DESCRIPTION	MARSSIM CLASS	FLOOR AREA (m^2)	TOTAL AREA (m^2)	RATIO (total : floor)
NSY-10	ISFSI	3	985	1078	1.09

* Survey area designations apply to structures that will remain intact.

TABLE 2-2

Area of Open Land Survey Areas

SURVEY AREA	DESCRIPTION	MARSSIM CLASS	AREA (m^2)
OOL-10	ISFSI/ACCESS, EXCLUSION ZONE, BUFFER ZONE	2	8408
NOL-07	ISFSI RCA YARD	3	1717

Table 2-3

AOR / PIR List of Unplanned Liquid Releases

This list addresses unplanned liquid releases that impacted survey areas that have been released from the 10 CFR 50 License. This information is being retained to establish that there were no unplanned releases that impacted the survey areas that remain within the license (i.e., OOL-10-2, NSY-10, and NOL-7).

Impacted Survey Area	AOR/ PIR #	Description
NOL-2/NOL-5	61-15	Radioactive Spill – 9/20/61
NOL-1/NOL-2 and NSY-2	63-12	Shield Tank Cavity Fill Water Spill – 9/18/63
OOL-5/OOL-6	63-17	De-watering Pump Packing Leakage – 10/8/63
AUX-1	64-08	Seal Water Tank Spill – 9/3/64
NOL-1/NSY-2 and OOL-5/OOL-6	64-13	IX Pit High Level – Leakage Coming Up through Pavement[1] – 10/3/64
SFP-1/NOL-1/ OOL-1	66-07	Spent Fuel Pit Water Spill – 9/27/66
OOL-5/OOL-6	66-08	Abnormal Activity in Storm Drain – 9/27/66
NOL-1/OOL-1	66-09	Hose Failure – 11/1/66
NSY-7	68-01	Waste Hold-up Tank Moat Spill – 1/16/68
NOL-1 thru 6	75-07	Yard Area Contamination – 7/16/75
NOL-2	77-16	Service Building Radioactive Sump Transfer Line Puncture – 12/21/77
NOL-2/NSY-2	80-09	Resin Spill – 8/6/80
NOL-1/NOL-6 OOL-12/OOL-13 and OOL-1	81-09	Contamination of Yard Area During Rx Head Removal – 5/15/81
WST-1/WST-2 and WST-3	84-16	Drain Pipe Failure[2] – 9/10/84
NOL-1	94-03	Leakage from Frozen Fuel Chute Dewatering Line 2/17&18/94
NOL-1	94-09	NST Tell-Tales/Fuel Chute Dewatering Line 2/23/94

[1] Routine leakage points, paths for subsurface contamination.

TABLE 2-4

Current Radiological Conditions of Buildings in the Industrial Area by Survey Area

Survey area	Description	Nominal exposure rate (μr/hr)	Nominal loose surface contamination (dpm/100cm^2)
NSY-10	**ISFSI**	**2000-5000**	**<1000**

Note: The entry in **BOLD** in the table is currently in use.

Table 2-5
Summary of Radiological Conditions of Open Land Areas
(SOF = Sum of Fractions of Proposed Soil DCGLs as submitted) *

SURVEY AREA	DESCRIPTION	MARSSIM CLASS	MEDIUM	SOF (min)	SOF (max)	SOF (mean)
OOL-10	ISFSI/Access, Exclusion Zone, Buffer Zone	2	Soil	0.010	1.202	0.089
NOL-07	ISFSI RCA Yard	3	Soil	0.012	0.054	0.023

* Statistics (min, max and mean) are based upon 10 mrem/yr DCGLs and are biased high since sample results are not decay corrected and only samples with results greater than 2 sigma are included in the evaluated population.

Table 2-6

Radionuclides of Concern At YNPS

Radionuclide	Half-Life (in years)
H-3	1.228E01
C-14	5.730E03
Fe-55	2.700E00
Co-60	5.271E00
Ni-63	1.001E02
Sr-90	2.860E01
Nb-94	2.030E04
Tc-99	2.130E05
Ag-108m	1.270E02
Sb-125	2.770E00
Cs-134	2.062E00
Cs-137	3.017E01
Eu-152	1.360E01
Eu-154	8.800E00
Eu-155	4.960E00
Pu-238	8.775E01
Pu-239,240	2.413E04
Pu-241	1.440E01
Am-241	4.322E02
Cm-243,244	2.850E01

Appendix 2A

Summaries of the Significant Events Leading to Long-Term Contamination of the YNPS Site (Presented in LTP Table 2-3)

This list addresses events that impacted the site, including survey areas that have been released from control in accordance with 10 CFR 50 License. This information is being retained to establish that the impact on the survey areas that remain within the license (i.e., OOL-10-2, NSY-10, and NOL-7).

AOR 61-15: Radioactive Spill – 9/20/61
A half-liter container of reactor coolant water was dropped on the asphalt in the Potentially Contaminated Area between the Primary Auxiliary Building and the Waste Disposal Building. The sample contained approximately 35 μCi (specific radionuclide data not available). The spill was absorbed using absorbent paper and the area decontaminated by mopping. The fixed contamination remaining was approximately 0.05 mr/hr at 1 inch from the pavement.
Impacted Areas **NOL-02/ NOL-05**

AOR 63-12: Shield Tank Cavity Fill Water Spill – 9/18/63
A one-half inch sampling valve located over the IX Pit was inadvertently left open while filling the shield tank cavity. This resulted in a spill of approximately 10 gallons of water from the Safety Injection Tank. A portion of the spill ran off the deck of the pit and onto a section of the blacktop surface to the west of the pit. The radiation level in the immediate area was 70-100 mr/hr measured at one inch. Contamination levels were 10^6 to 10^7 dpm (specific radionuclide data not available) over areas of several square inches. Run off water resulted in contamination levels of 20-60,000 dpm/ft^2 (Sic).
Impacted Areas **NOL-01/NOL-02**
Impacted Structures **NSY-02**

AOR 63-17: De-watering Pump Packing Leakage – 10/8/63
A water leak from the fuel chute de-watering pump was routed, via a small utility hose, to a 30 gallon collection drum placed in a storm drain catch basin (ECB-005) located between the railroad tracks and the NE corner of the spent fuel pit. It was determined that the bottom rim of the barrel was corroded, and water was leaking from the bottom of the barrel. At the time the leak was identified, six to eight inches of water had accumulated in the barrel with activity of 6 x 10^{-5} μCi/ml (specific radionuclide data not available). It was believed only a small amount of water was leaked to the storm system.
Impacted Areas **OOL-05/OOL-06/NOL-01**
Impacted Sub-surface Areas/Structures **- East Storm Drain System**

AOR 64-08: Seal Water Tank Spill – 9/3/64
Shutdown cooling pump seals leaked reactor coolant water and back-flowed into the seal water tank. This caused the tank to overflow through the vent connection, into the common relief valve discharge line and onto the Primary Auxiliary Building roof. An estimated 35 gallons of water containing a total activity of 270 μCi (specific radionuclide data not available) was released. The Roof Drain System drained into the Storm Drain System via a sub-surface piping connection. A sample of the storm drain (WCB-009) was determined to contain 1 x 10^{-6} μCi/ml. The predominant isotopes were Co-58, Co-60 and Mn-54 (distribution of the radionuclides in the sample not available). Service Water was diverted to the storm drain to flush the system.
Impacted Areas **- AUX-02 Roof and Roof Drain System**
Impacted Sub-surface Areas/Structures **- West Storm Drain System**

AOR 64-13: Leakage from Ion Exchange Pit - 10/3/64
After filling the Ion Exchange Pit to its normal operating level, the operator failed to close the fill valve. Water continued to flow into the pit from the Primary Water Storage Tank by gravity feed. Later, the operator noticed water seeping through the blacktop on the west side of the pit, diagnosed the cause and closed the valve. The water on the blacktop was sampled and was found to contain radioactivity. The radionuclides and concentrations identified were: Ag-110m at 5 x 10^{-7} μCi/ml and Co-60 at 1 x 10^{-6} μCi/ml. The blacktop was rinsed down with Service Water to the storm drain (ECB-005).
Impacted Areas **NSY-02/NOL-01/OOL-05/OOL-06**
Impacted Sub-surface Areas/Structures **- East Storm Drain System internal and external to piping (backfill) / SFP-02 sub-floor / NSY-09 / AUX-01 North external perimeter (backfill) /**

SFP-01 West external perimeter (backfill) / BRT-01 Eastern external perimeter

AOR 66-7: Spent Fuel Pit Water Spill – 9/27/66
A two-inch priming valve for the Spent Fuel Pit (SFP) cooling and purification pump was left open; however an upstream valve isolating make up water to the Low Pressure Surge Tank (LPST) was correctly closed. The LPST make up pump was started to provide make up water to a hose connection located between the two valves to wash down a shipping cask as it was removed from the pit. Water flowed through the open priming valve to the SFP in sufficient quantity to result in actuation of the high level alarm. The reason for the high level alarm was not immediately determined and by the time the reason was identified water had overflowed from the SFP. Approximately 33 gallons of water flowed down the SFP exterior wall, over a small section of asphalt paving and into an immediately adjacent storm drain, ECB-005. A continuous service water flush of the east side culvert system (ECB-005) was initiated and continued for a 24 hour period. This occurrence resulted in a total release of 4 μCi gross β-γ and 670 μCi of tritium (more specific radionuclide data not available).
Impacted Areas **SFP-01 North external wall /NOL-01/OOL-01**
Impacted Sub-surface Areas/Structures **East Storm Drain System internal and external to piping (backfill between SFP-01 and ECB-005)**

AOR 66-8: Abnormal Activity in Storm Drain – 9/27/66
Water from the west storm drain culvert was sampled (the SFP water released discussed above discharged to the east side only). An average of two samples from the west side showed gross activity of 6.7 x 10^{-7} μCi/ml (specific radionuclide data not available). Investigation found a relief valve on the safety injection tank heating system to be slowly leaking into a floor drain in the PAB. The floor drains in that section of the building were traced to discharge to a storm drain located on the outside of the building (WCB-009). Further investigation indicated that the relief valve leak could not have existed for more than one day and that the maximum volume did not exceed eight gallons during that period. A sample of culvert water collected 24 hours after the occurrence indicated a gross activity of 1.2 x 10^{-8} μCi/ml and tritium activity of 5.1 x 10^{-5} μCi/ml. This occurrence resulted in a total release of 0.8 μCi gross β-γ and 3.32 mCi tritium.
Impacted Area **- OOL-05/OOL-06**
Impacted Sub-surface Areas/Structures **- West Storm Drain system**

AOR 66-9: Hose Failure – 11/1/66
The hose used for a routine draining of the fuel chute pump discharge line burst. Less than 10 gallons of contaminated water flowed into a storm drain served by the east culvert (ECB-005). Approximately 10 gallons of water with an activity of 3.0×10^{-3} μCi/ml (for a total of 113 μCi) was released. The spill area was flushed with service water. The east culvert was sampled after the spill.
Impacted Areas **- NOL-01/OOL-01**
Impacted Sub-surface Areas/Structures **- East Storm Drain system**

AOR 68-1: Waste Holdup Tank Moat Spill – 1/16/68
The suction line from the waste hold-up tank was found to be frozen. Approximately 200 gallons of water spilled from a valve bonnet failure caused by the freezing of the suction line. A total of 520 μCi β-γ and 698 mCi tritium were spilled into the moat. The spill was contained within the moat structure.
Impacted Structures **- NSY-07**

PIR 75-7: Yard Area Contamination 7/16/75
An area of land near the Ion Exchange Pit was identified with a contamination level of approximately 500,000 dpm. Over the next few days, the entire restricted area was surveyed. Fourteen areas, ten of which were in areas previously identified as a "clean area," were found to be contaminated at levels greater than 1000 dpm/100 cm^2. Most of the contamination was removed, and the remaining contamination was sealed in place using asphalt sealer and covered with clean soil.
Impacted Areas **- NOL-01 through NOL-06 and SVC-03**
Impacted Sub-surface Areas/Structures **- SVC-03 beneath slab in old RCA access alley**

PIR 77-16: Service Building Radioactive Sump Transfer Line Puncture – 12/21/77
A boring bit inadvertently punctured the 2.5 inch stainless steel line leading from the Service Building Sump Tanks to the PAB while conducting core borings inside the Radiation Control Area. The sump line ran at a depth of 15 feet underground, where the damage occurred, and the boring depth was 61.5 feet. The damage was not detected until the next day when the sump pump started and water issued from the borehole. The sump pump ran through two cycles resulting in 20 gallons of water discharged from the rupture. The water contained the following:

Radionuclide	Total Activity, μCi	Concentration, μCi/ml	Fraction of MPC
I-131	16.50	2.18×10^{-4}	3.63
I-133	2.76	3.65×10^{-5}	0.18
Cs-134	0.34	4.46×10^{-6}	0.01
Cs-137	0.50	6.67×10^{-6}	0.02
Co-60	0.58	7.69×10^{-6}	0.01

No measurable levels of activity were released offsite or to the storm drain. The line was repaired, and a sand and concrete casing was poured around it.
Impacted Areas **- NOL-02**
Impacted Sub-surface Areas/Structures **- Soils surrounding perforation and transfer line backfill/Soils to a depth of 61.5 feet and below along the bore hole.**

PIR 80-9: Resin Spill - 8/6/80
A hose developed a pinhole leak, while pumping resin to a cask. The failure of the hose allowed the release of several gallons of water and one quart of resin. A 15 foot by 20 foot area of the RCA yard was contaminated. Radiation readings on contact with the resin were 1 mrad/hr and the spilled liquid reading were up to several hundred thousand dpm/100 cm^2 (sic) (specific radionuclide data not available). Decontamination included removal and disposal of some of the blacktop.
Impacted Areas - **NOL-02/NSY-02**
Impacted Sub-surface Areas/Structures - **South and East exterior walls of NSY-02. The sub-slab area of NSY-02 (IX-pit) was also impacted due to transfer of contamination by surface water (i.e., water used in decontamination and rainwater) into cracks between asphalt and IX Pit walls.**

PIR 81-9: Contamination of Yard Area During Reactor Head Removal – 5/15/81
While positioning the reactor vessel head over the equipment hatch in preparation to lower the head through the equipment hatch, the reactor head made contact with the shield wall. This resulted in the spread of removable radioactivity outside of the Vapor Container (VC). Removable radioactivity immediately below the equipment hatch was 200 mrad/hr beta. The total activity released to the ground was approximately 250 μCi, with approximately 10μCi (specific radionuclide data not available) discharged to Sherman Pond. The area was cleaned, but due to rainfall trace radioactive material levels were detected in the east storm drains.
Impacted Areas - **NOL-01/NOL-06/OOL-12/OOL-13**
Impacted Sub-surface Areas/Structures - **BRT-01/in cracks and crevices under VC Equipment Hatch and along rails/ties in OOL-12 and OOL-13 and the East Storm Drain System due to surface water run-off.**

PIR 84-16: Drain Pipe Failure – 9/10/84
An excavated drainpipe from the Potentially Contaminated Area (PCA) storage building to the Waste Disposal building was found to be leaking. Soil samples from around the pipe identified the presence of Co-60 and Cs-137 and the excavation of the pipe continued. The area of maximum contamination was measured at 25-35 mR/hr (specific radionuclide data not available), with a hot spot of 29,300 pCi/gm Co-60 in this same area. The pipe from the edge of the old PCA (Potentially Contaminated Area) building to the edge of the waste disposal building and approximately 420 ft^3 of dirt and rock were removed as radioactive waste. The soil remaining at the bottom of the excavation contained Co-60 at an average concentration of 30 pCi/gm.
Impacted Areas – **WST-01/WST-02/WST-03**
Impacted Sub-surface Areas/Structures – **WST-02 at a depth in excess of 9 feet below grade, activity remains potentially in excess of the soil DCGL. WST-03 at ash dewatering sump in drumming pit. Decommissioning standards had not yet been developed at the time this partial remediation was performed. Radiological decay since 1984 may have reduced the radionuclide concentration below the soil DCGL. Further scoping data will be collected below the 9 foot clean backfill to confirm this evaluated condition.**

PIR 94-03 & 94-09.

Leakage from Frozen Fuel Chute Dewatering Line and NST Tell-tales

On February 17 and 18, 1994, a fuel chute dewatering line and a neutron shield tank telltale drain line ruptured due to freezing. A 3.5 liter sample from the fuel chute line indicated 1000 net cpm, and a sample from the NST telltale line indicated the presence of Co-60 and Cs-137. The ground below the rupture, as well as the area adjacent to the railroad tracks and pumpback house, showed no contamination. However, the snow pile along the south side of the rails by the new fuel vault indicated the presence of Co-60, Cs-137 and Mn-54. All snow piles with positive radiation measurements were sent to the rad drains and the areas de-posted.

Impacted Area **– NOL-01**

Appendix 2B

Impacted Area Assessments
Structures and Open Land Areas Inside of the RCA of the YNPS
(including Initial Classification)

Buildings and Structures

ISFSI Pad (NSY-10)

Description: NSY-10 is the ISFSI Pad, constructed in 1999 on the former location of the Pole Barn. NSY-10 is bounded entirely by NOL-07. The design and function of the VCC is such that no contamination of the ISFSI should result from their presence on the ISFSI.

History: Prior to 1999, this location was used for storage of materials and equipment some of which were radioactive materials. During construction of the ISFSI pad, a radiological assessment of some areas north of the pad (notably the NOL-03 and NOL-04 yard areas and the above grade exterior walls of structures within them) was performed using a technologically advanced method. The assessment was performed in anticipation that area background would be impacted by transfer of the fuel to the ISFSI pad. The ISFSI pad is now occupied by loaded VCC. The transportation of the loaded VCC was performed under strict controls to ensure that the transport process would not contaminate the ISFSI. The ISFSI is surveyed on a routine basis and it is anticipated to remain non-contaminated as a result of the presence of the VCC. Should future surveys identify the presence of contamination on the ISFSI pad then the survey area may be re-classified.

Contamination

1. Radionuclides Potentially Present: The primary radionuclides of concern for survey area NSY-10 are Co-60, Cs-137, Sr-90.
2. Media: Reinforced concrete, surface soil, sub-surface soil
3. Continued Investigation: Reinforced concrete, surface soil, sub-surface soil subsurface systems.

Decommissioning/Decontamination Activities

1. Performed: Decommissioning work performed under DWPs included removal of the Pole Barn and re-grading of the surface to facilitate ISFSI pad and road construction. Soils removed from the area were deposited primarily in Survey Areas OOL-07 and OOL-09. Soils from the roadway approach area were deposited in Survey Areas OOL-02 and OOL-10. .
2. Planned: Planned decommissioning activities will depend on the results of the investigation conducted when the ISFSI is taken out of service.
3. Anticipated End State Configuration: The end state configuration of NSY-10 anticipated to include:
   - Reinforced concrete structures
   - Subsurface concrete structures
   - Subsurface soil.

Classification Statement: Based upon the radiological condition of this survey area identified in the operating history and as a result of the decommissioning activities performed to date, survey area NSY-10 is identified as a Class 3 Area.

Open Land Areas

ISFSI RCA Yard (NOL-07)

Description: NOL-07 is the land area that bounds the ISFSI pad and bounded entirely by OOL-10

History: NOL-07 was constructed at the same time as the ISFSI. A comprehensive radiological assessment of this area was performed prior to construction of the ISFSI. Previously this area was used as a material storage area. Some of this material was later identified as radioactive material. A survey of this area under the guidelines of NUREG/CR-5849 was conducted prior to grading. Samples have been taken of each load of soils removed from the area. These samples showed no detectable activity. All soils removed from the area were deposited in survey areas OOL-07 (Class 2) and OOL-09 (Class 3).

Contamination:

1. Radionuclides Potentially Present: The primary radionuclides of concern for survey area NOL-07 are Co-60, Cs-137, and Sr-90.
2. Media: Surface and subsurface soil.
3. Continued Investigation: Continued investigation will not be performed until the spent fuel and waste stored on the ISFSI has been removed.

Decommissioning/Decontamination Activities

1. Performed: Dismantlement of a pole barn structure and non-rad material storage area. The area was then graded in preparation for construction of the ISFSI pad. New concrete was used in the structure. Fuel Storage Casks have been placed on the pad and are in their final configuration.
2. Planned: Future decommissioning activities are dependent upon the results of continued investigations
3. Anticipated End State Configuration: A soil surface configuration suitable for survey. Subsurface structures requiring survey will be sufficiently exposed to allow survey.

Classification Statement: Based upon the current/best information indicating the radiological conditions and on conditions and events identified in the operating history, survey area NOL-07 is identified as a Class 3 Area. It is not expected that any radioactive material will leave the confines of the fuel casks and residual contamination after removal of the fuel casks is anticipated to be a small fraction of the DCGLs.

Appendix 2C
Impacted Area Assessments
Buildings, Structures and Open Land Areas Outside of the RCA of the YNPS
(including Initial Classification)

Buildings and Structures

None

Open Land Areas Outside of the RCA (OOL)

ISFSI Pad Access Zone (OOL-10)

Description: OOL-10 consists of the land area owned by YAEC.

History: Survey Area OOL-10 is the buffer zone around the RCA and, as such, has the potential to have become contaminated.

Contamination:

1. Radionuclides Potentially Present: The primary radionuclides of concern for survey area OOL-10 are Co-60, Cs-137, Sr-90, Ag-108m and H-3.
2. Media: Surface and subsurface soil, surface water and groundwater.
3. Continued Investigation: Continued investigation will be necessary to assess surface and subsurface soil surface water and groundwater.

Decommissioning/Decontamination Activities

1. Performed: Decommissioning activities performed in OOL-10 consist of soil removal to adjust the grade of the ISFSI fuel transfer haul road.
2. Planned: Future-decommissioning activities may include removal of certain soils and materials depending upon the results of the continuing investigation.
3. Anticipated End State Configuration: A soil surface configuration suitable for survey and access to surface water and groundwater.

Classification Statement: Based upon the current/best information indicating the radiological conditions and on conditions and events identified in the operating history, survey area OOL-10 is identified as a Class 2 Area.

3 IDENTIFICATION OF REMAINING SITE DISMANTLEMENT ACTIVITIES

Decommissioning activities for and final status survey of the YNPS site, with the exception of the ISFSI and associated land areas (NOL-07, OOL-10-02, and NSY-10), were completed as of January 2007. By letter dated November 21, 2005 (Reference 2-27), the NRC approved removal of the non-impacted land areas from the Part 50 License. Subsequently, the NRC approved the removal of the impacted areas of the site with the exception of the areas associated with the ISFSI (FSS Survey Areas NOL-07, NSY-10, and OOL-10-02) from the Part 50 license via letter NYR 2007-046 (Reference 2-26). The information included in this section of the License Termination Plan (LTP) includes historical information regarding the decommissioning of the YNPS that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the YNPS site.

3.1 Introduction and General Considerations

In accordance with 10CFR50.82(a)(9)(ii)(B), Reference 3-1, the License Termination Plan (LTP) must identify the major dismantlement activities that remain. Included in this information are estimates of occupational radiation dose associated with those activities and estimates of projected volumes of radioactive waste. These activities are undertaken pursuant to the current 10CFR50 license, are consistent with the PSDAR (Reference 3-2), and do not depend upon approval of the LTP to proceed.

YAEC intends to release the YNPS site for unrestricted use, and its primary goals are to decommission the YNPS safely and to maintain continued safe storage of spent fuel, until it is removed from the site. YAEC will decontaminate and dismantle YNPS in accordance with the DECON alternative, as described in the NRC's Final Generic Environmental Impact Statement (NUREG-0586 and its supplements, Reference 3-3). Completion of the DECON option is contingent upon continued access to one or more low-level waste disposal sites.

Decommissioning activities at YNPS are being conducted in accordance with the YNPS PSDAR, YDQAP, FSAR, Technical Specifications, Part 50 license, and the requirements of 10CFR50.82(a)(6) and (a)(7). As such, the conduct of the decommissioning activities described herein is not dependent upon approval of the LTP. In addition, YAEC does not foresee any of the specific decommissioning activities described herein as resulting in the need for prior NRC approval upon evaluation under 10CFR50.59. These activities are being conducted in accordance with existing program and procedures which have been reviewed by the NRC, including: YNPS Radiation Protection Program, Occupational Safety Program, Radioactive and Non-Radioactive Waste Management Programs and the Decommissioning Quality Assurance Plan. Activities conducted during decommissioning do not pose any greater radiological or safety risk than those conducted during plant operation and refueling. Nonetheless, if any activity requires prior NRC approval under 10CFR50.59(c)(2) or a change to the YNPS Technical Specifications or license, a submittal will be made to the NRC for review and approval before implementing the activity in question.

3.2 Decommissioning Approach (as of October 2013)

Decommissioning activities are being completed in three phases:

Phase 1: Mechanically/electrically isolate the Spent Fuel Pool, remove SSCs not supporting fuel storage, and remove fuel and GTCC waste from the SFP,

Phase 2: Dismantlement and disposition of remaining systems, structures, and components (SSCs), and

Phase 3: Termination of the Part 50 license.

As discussed herein, Phase 1 has been completed. Phase 2 activities are ongoing and their status is described in this section. Phase 3 is intended to occur following completion of all radiological decommissioning activities associated with the site including the YNPS ISFSI.

The following are general decontamination and dismantlement considerations that are being incorporated, as appropriate, into the activities for decommissioning the systems, components and structures at YNPS. With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site.

- Radiological characterization survey data has been used to identify the systems, structures, and components to be decontaminated and dismantled. The extent of contamination associated with the remaining SSCs associated with the ISFSI is presented in Table 3-1.

- Detailed decommissioning work documents for decommissioning the ISFSI will be developed, reviewed, and approved in accordance with project and plant programs and procedures.

- Plant tag-out procedures will be used to de-energize electrical and control equipment. Radiation Protection procedures will be used to ensure compliance with radiological requirements for contamination control and worker protection and ALARA programs. Occupation safety standards will be observed.

- Components will be identified prior to removal. The components are then removed using the techniques and methods as specified in the decommissioning work packages. Components are either decontaminated or shipped to a low-level radioactive waste disposal facility or, if appropriate, shipped to an approved landfill.

- Contaminated structural steel components, on which a volume reduction process is being applied, may be moved to a processing area and packaged into containers for shipment to an off-site waste processing facility.

- Remaining portions of basements and slabs will be perforated to allow for groundwater and/or surface water infiltration.

- Remaining buried contaminated components (e.g., piping, drains, and conduit) are being excavated. After excavation, the components will be examined to ensure that they are physically sound prior to cutting and removal. Most buried contaminated piping is located in steel conduits (i.e., pipes enclosed in pipes). Contamination controls will be modified as necessary if the components are significantly degraded.

- After completion of decommissioning and/or remediation activities and prior to final status survey, isolation and controls will be implemented as described in Section 5.4.5.

- A final status survey will be performed to verify removal of contamination to below release levels.

- Coatings will be removed, as required by local, state, and federal regulations. PCB paints will be removed from exposed concrete surfaces as required by the Alternate Method of Disposal Authorization (AMDA) requirements prior to demolition of the structure, as authorized by the EPA on October 8, 2002 (Reference 3-4) and subsequent changes thereto.

3.2.1 Phase 1 Activities

Since 1993 Yankee has removed and disposed of the steam generators, pressurizer, and the reactor vessel. The reactor vessel internals, which are greater-than-Class-C (GTCC) waste, remain onsite and are stored at the site's independent spent fuel storage installation (ISFSI).

The Spent Fuel Pit (SFP) and other systems associated with fuel storage were electrically and mechanically isolated to create a Spent Fuel "Island" that would not be adversely impacted by other decommissioning activities. The majority of systems and components not required to support the storage of spent fuel have been dismantled and disposed of in accordance with the YNPS Decommissioning Plan and Final Safety Analysis Report. The status of plant SSCs, as of July 2003 is provided in Table 3-2.

Once a Spent Fuel "Island" was established, the focus of site activities shifted to the removal of spent fuel and GTCC waste from the SFP, to the ISFSI. Movement of the fuel and the non-fuel GTCC waste from the SFP to the ISFSI was completed in June 2003.

3.2.2 Phase 2 Activities

After removing the spent fuel and GTCC waste from the SFP, the remaining components of the systems listed below were dismantled and decontaminated.

- Temporary Waste Water Processing System,
- Radiation Monitoring System,
- Ventilation Systems (Including Vapor Container Ventilation and Purge System),

- Fuel Handling Equipment System,
- SFP Cooling and Purification System,
- Auxiliary Service Water System,
- Demineralized Water System,
- Compressed Air System,
- Electrical System,
- Heating System, and
- Fire Protection and Detection System

After removing systems and components from an area or building, contaminated concrete, steel, and other building materials are being decontaminated or removed. The structures listed below were decontaminated and/or dismantled during the decommissioning of the SFP Island.

- Yard Area Crane and Support Structure,
- Vapor Container (VC),
- Reactor Support Structure,
- VC Polar Crane,
- Radiation Shielding,
- Pipe Chases,
- Fuel Transfer Chute,
- Ion Exchange Pit,
- Primary Vent Stack,
- Spent Fuel Pit and SFP Building,
- New Fuel Vault,
- Primary Auxiliary Building,
- Waste Disposal Building,
- Safe Shutdown System Building,
- Potentially Contaminated Area (PCA) Storage Buildings and Warehouse,
- Compactor Building
- Service Building and Fuel Transfer Enclosure,
- Miscellaneous Storage Tanks and
- Meteorological Tower.

Upon the completion of Phase 2 activities, all systems and components will have been removed from plant buildings and yard areas (including those supporting spent fuel and GTCC storage in the ISFSI) and disposed of at the appropriate facility. In general, above grade portions of site buildings and the ISFSI Storage Pad will be remediated, if necessary, and demolished. Below-grade portions of site structures (elevation 1022'-8" and below) were remediated to meet the site release criteria or are being removed. Building demolition debris that has been determined to contain "no detectable radioactivity" or has passed a final status survey may be used as backfill on site. Details concerning dismantlement and remediation efforts are provided in the subsections to follow.

Following submittal of the License Termination Plan, Final Status Surveys will be conducted to verify that structures and open land areas meet the release criteria. Independent verification of

the results by the NRC will allow for the release of the individual surveyed structures and open land areas. In order to facilitate remediation, the facility superstructures may be demolished before remediating substructure and soils beneath the structures. Measures, as described in LTP Section 5.4.5, will be implemented to prevent recontamination of surveyed areas prior to final status survey.

General decontamination and dismantlement considerations are given in Section 3.2; however, specific decontamination and dismantlement considerations for applicable remaining ISFSI systems, structures, and components are given in the following sections. The contamination status for the remaining systems is provided in Table 3-1. Also, the description and status of remaining SSCs are presented in Sections 3.2.2.1 (Systems and Components) and 3.2.2.2 (Structures).

3.2.2.1 Systems and Components

3.2.2.1.1 Electrical System

The on-site electrical system is powered by a Massachusetts Electric Line. The system consists of a transformer, auto throw-over switch, distribution panels and the necessary associated equipment to support ISFSI operations. Backup power for portions of the plant electrical system is provided automatically during a loss of offsite power via a 175 kW Security Diesel Generator.

Electrical System components associated with the Gatehouse and ISFSI will remain to support storage and monitoring of spent fuel at the ISFSI. There are currently no decommissioning or dismantlement considerations specific to the Electrical System.

3.2.2.1.2 Heating System

Temporary heating may be required during area and building dismantlement activities. Heating System components associated with the Gatehouse will remain to support storage and monitoring of spent fuel at the ISFSI.

There are currently no decommissioning or dismantlement considerations specific to the Heating System.

3.2.2.2 Structures

Decommissioning of the ISFSI consists primarily of the disposal of the concrete canister overpacks, provided they are not shipped with the spent fuel casks and disposal of the ISFSI storage pad. The overpack design minimizes neutron activation, thereby generating minimal radioactive waste. This waste should qualify for disposal at a low-level radioactive waste disposal site. Currently, the decommissioning cost estimate assumes that the material comprising the Vertical Concrete Casks and the ISFSI storage pad are demolished and shipped offsite to a low-level radioactive waste disposal site.

3.2.3 Phase 3 Activities

The final phase of decommissioning will take place after all spent fuel and GTCC waste is removed from the site and the dismantlement and decontamination of the ISFSI is complete. In the interim, spent fuel and GTCC will be stored in the ISFSI.

Decommissioning of the ISFSI consists primarily of the disposal of the concrete canister overpacks, provided they are not shipped with the spent fuel casks. The overpack design minimizes neutron activation, thereby generating minimal radioactive waste. This waste should qualify for disposal at a low-level radioactive waste disposal site.

As indicated in Section 1 of the LTP, YAEC may decide to remove some portions of the site from the license before license termination. For those areas the process outlined in Section 1.5 will be followed. Termination of the license will occur after the last stage of final status survey and independent NRC verification (i.e., on the grounds and SSCs associated with the ISFSI).

3.3 Decommissioning Schedule (as of October 2013)

YAEC completed the second phase of dismantlement and decontamination and final status surveys and License reduction in August 2007. The design and construction of a dry cask storage facility was completed in 2001. Fuel transfer activities commenced in 2002 and were completed in 2003. Following the transfer of spent fuel and GTCC waste from the SFP, decommissioning of the SFP island was completed over a period of approximately three years, including final status surveys. The dry cask storage facility is expected to be operated from 2002 to 2031, when the last fuel assembly is assumed to be taken off-site. Using this assumption, the YNPS license will be terminated after the dry cask storage facility is decommissioned (scheduled to occur in 2033). Updates will be provided to the NRC through current interactions with the NRC Region I personnel.

3.4 Radiological Impacts of Decommissioning (as of October 2013)

The decommissioning activities are being conducted under the provisions of the YNPS Radiation Protection Program and Radioactive Waste Management Program. These programs continue to be implemented as described in the YNPS FSAR. The Radiation Protection Program implements the regulatory requirements of 10CFR20 through approved plant procedures established to maintain radiation exposures ALARA. The Radioactive Waste Management Program controls generation, characterization, processing, handling, shipping and disposal of radioactive wastes per the approved YNPS Radiation Protection Program, Process Control Program, and plant procedures. During the storage period, there will be little, if any, radioactive waste removed or shipped from the site.

The current Radiation Protection Program (described in FSAR Section 507), Waste Management Program (FSAR Section 508) and Offsite Dose Calculation Manual will be used to protect workers and the public during the various decontamination and decommissioning activities. These well-established programs are routinely inspected by the NRC to ensure that workers, the public, and the environment are protected during facility decommissioning activities. It is also important to note that most decommissioning activities involve very similar radiation protection

and waste management considerations as those encountered during plant operations. As described in the PSDAR, the YNPS decommissioning will be accomplished with no significant adverse environmental impacts in that:

- The postulated impacts associated with the method chosen, DECON, have already been considered in the Final Generic Environmental Impact Statement (FGEIS).
- There are no unique aspects of the plant or decommissioning techniques to be utilized that would invalidate the conclusions reached in the FGEIS.
- The methods to be employed to dismantle and decontaminate the site are standard construction based techniques fully considered in the FGEIS.
- The site-specific person-rem estimate for all decommissioning activities has been conservatively calculated using methods similar to and consistent with those in the FGEIS.

3.4.1 Occupational Exposure

The total radiation exposure impact for decommissioning was estimated in the Decommissioning Plan, Reference 3-5, to be approximately 744 person-rem (see breakdown in Table 3-3). This estimate was re-evaluated in 1996, resulting in a lower value of 580 person-rem (see also Table 3-3). The final radiation exposure for decommissioning of the YNPS was 594 person-rem. The radiation exposure associated with the decommissioning of the ISFSI will be managed, so that doses to workers and the public are minimized and federal regulations regarding doses and dose rates are met.

Radiation exposure to off-site individuals for expected conditions, or from postulated accidents is bounded by the EPA's Protective Action Guidelines and NRC regulation. The public exposure due to radiological effluents will continue to remain well below the 10CFR20 limits and the ALARA dose objectives of 10CFR50, Appendix I. This conclusion is supported by the YNPS Annual Effluent Release Reports in which individual doses to members of the public are calculated for station liquid and gaseous effluents.

3.4.2 Radioactive Waste Projections

No significant impacts are expected from the disposal of low-level radioactive waste (LLW). The total volume of the YNPS low-level radioactive waste for disposal was estimated in the Decommissioning Plan to be approximately 132,000 ft^3. A total volume of approximately 1,670,000 ft^3 of LLW was shipped from the YNPS site for off-site disposal. A significant portion of this waste contained very low levels of radioactivity (DOT exempt) and was created as a result of remediation activities to satisfy EPA clean-up requirements for PCBs, to satisfy the Massachusetts Department of Public Health (DPH) radiological release criteria of 10 mrem/year and to meet the Massachusetts Contingency Plan regulations for non-radiological release criteria under the Department of Environmental Protection (DEP) requirements. The volume of LLW that would have been required to be disposed of to satisfy the NRC 25 mrem/year release criteria would have been a significantly lower volume, in the 300,000 ft^3 range, significantly below the

FGEIS estimate of 647,670 ft^3 for a reference PWR. The current decommissioning cost estimate assumes that the material (concrete and steel) associated with the Vertical Concrete Casks and the ISFSI Storage Pad will be shipped off-site as low-level radioactive waste. The volume of this material was not included in the original estimate. However, this material is not expected to be required to be removed to meet the NRC 25 mrem/year release criteria.

3.5 References

3-1 Title 10 to the Code of Federal Regulations, Part 50.82, "Termination of license."

3-2 YNPS Post-Shutdown Decommissioning Activities Report, dated October 2013.

3-3 Supplement 1 to NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," dated November 2002.

3-4 Letter from R.W. Varney, Region Administrator, EPA Region I, to J. Kay, Regulatory Affairs, Yankee, Extension of Amended (as of January 6, 1999) Alternative Method of Disposal Authorization for PCB Paint Removal, dated October 8, 2002.

3-5 YNPS Decommissioning Environmental Report, dated December 1993.

3-6 USNRC Atomic Safety and Licensing Board Docket No. 50-029-DCOM, Supplemental Affidavit of Russell A. Mellor, September 3, 1996.

3-7 Memorandum RP-03-045 from Greg Babineau to Jim Kay, dated November 19, 2003.

Table 3-1

Remaining Contaminated Plant Systems

(as of October 2013)

The Vertical Concrete Casks and ISFSI Storage Pad are expected to be contaminated due to neutron activation. The decommissioning cost estimate assumes that the material comprising the Vertical Concrete Casks and the ISFSI Storage Pad are dismantled and disposed of as low level radioactive waste.

Table 3-2

Status of Plant SSCs as of October 2013

SSC	Status
Reactor Vessel	Removed.[1]
Steam Generators	Removed.
Main Coolant System	Removed.
Pressure Control and Relief System	Removed.
Charging and Volume Control System	Removed.
Chemical Shutdown System	Removed.
Purification System	Removed.
Component Cooling System	Removed.
Primary Plant Corrosion Control System	Removed.
Primary Plant Sample System	Removed.
Waste Disposal System	Removed.
Shutdown Cooling System	Removed.
Primary Plant Vent and Drain System	Removed.
Emergency Core Cooling System	Removed.
Radiation Monitoring System	Removed.
VC Ventilation and Purge System	Removed.
VC Heating and Cooling System	Removed.
Post-Accident Hydrogen Control System	Removed.
Containment Isolation System	Removed.
Fuel Handling Equipment System	Removed
SFP Cooling and Purification System	Removed.
Main Steam System	Removed.
Feedwater System	Removed.
Steam Generator Blowdown System	Removed.
Emergency Feedwater System	Removed.
Service Water System	Removed.
Demineralized Water System	Removed.
Compressed Air System	Removed.
Electrical System	Partially removed, portions in service.
Heating System	Partially removed, portions in service.
Ventilation System	Removed.
Fire Protection and Detection System	Removed
Primary Pump Seal Water System	Removed.

[1] "Removed" SSCs have been physically removed from the site and disposed of in appropriate disposal facilities.

Table 3-2

Status of Plant SSCs as of October 2013

SSC	Status
Safe Shutdown System	Removed.
Water Cleanup System	Removed.
Vapor Container	Removed.
Reactor Support	Removed.
Vapor Container Polar Crane	Removed.
Radiation Shielding	Removed.
Neutron Shield Tank	Removed.
Pipe Chases	Removed.
Fuel Transfer Chute	Removed.
Yard Area Crane and Support Structure	Removed.
Ion Exchange Pit	Removed.
Primary Vent Stack	Removed.
Spent Fuel Pit and Spent Fuel Pit Building	Removed.
New Fuel Vault	Removed.
Primary Auxiliary Building	Removed.
Diesel Generator Building	Removed.
Waste Disposal Building	Removed.
Safe Shutdown System Building	Removed.
Potentially Contaminated Area (PCA) Storage Buildings 1 and 2 and Warehouse	Removed.
Compactor Building	Removed.
Service Building	Removed.
Miscellaneous Tanks	Removed.
Meteorological Tower	Abandoned in place.
ISFSI Vertical Concrete Casks and Storage Pad	In service

Table 3-3

Historical Radiation Exposure Projections Associated with the Former YNPS

Activity	Exposure (Person-rem)	
	Original Estimate, Reference 3-5	**Revised Estimate, Reference 3-6**
Component Removal Project		
• Asbestos Abatement	73	76
• Steam Generators and Pressurizer	62	59
• Reactor Vessel Internals	25	92
Subtotal	**160**	**227**
Fuel Transfer	41	41
Dismantlement		
• Reactor Vessel	48	33
• Main Coolant System	50	36
• Other Systems in Vapor Container	84	48
• Balance of Plant Systems	98	48
• Asbestos Abatement	90	55
• Structures	50	28
• Miscellaneous	82	56
Subtotal	**502**	**304**
Transportation	41	7
Plant Effluents	<1	<1
Total	**744**	**579**

4 SITE REMEDIATION PLANS

Decommissioning activities for and final status survey of the YNPS site, with the exception of the ISFSI and associated land areas (NOL-07, OOL-10-02, and NSY-10), were completed as of January 2007. By letter dated November 21, 2005 (Reference 2-27), the NRC approved removal of the non-impacted land areas from the Part 50 License. Subsequently, the NRC approved the removal of the impacted areas of the site with the exception of the areas associated with the ISFSI (FSS Survey Areas NOL-07, NSY-10, and OOL-10-02) from the Part 50 license via letter NYR 2007-046 (Reference 2-26). The information included in this section of the License Termination Plan (LTP) includes historical information regarding the decommissioning of the YNPS that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the YNPS site.

4.1 Introduction

In accordance with 10CFR50.82 (a)(9)(ii)(C) (Reference 4-1), the LTP must provide the "plans for site remediation." These plans must include the provisions to meet the criteria from Subpart E of 10CFR20 (Reference 4-2) before the site may be released for unrestricted use:

- Annual total effective dose equivalent to the average member of the critical group not to exceed 25 mrem, and
- The dose to the public must be "as low as reasonably achievable," or ALARA.

Decontamination and dismantlement (D&D) activities are being conducted in accordance with the YNPS Radiation Protection, Safety and Waste Management Programs, which are well established and frequently inspected. Changes made to the programs for D&D activities are documented and processed in accordance with existing plant administrative procedures and 10CFR50.59, as appropriate.

This section describes the methodologies and criteria that will be used to perform activities to remove residual radioactivity and to demonstrate compliance with the ALARA criterion, required by 10CFR20. More specific detail regarding remediation activities may be found in Section 3.

4.2 Remediation Actions

Remediation actions may be required to reduce the radioactivity levels below the applicable cleanup criteria as provided in Sections 5 and 6. The specific remedial actions depend on the type of area under consideration. These area types are categorized as one of the following:

- Soils/sediment

5 FINAL STATUS SURVEY PLAN

Decommissioning activities for and final status survey of the YNPS site, with the exception of the ISFSI and associated land areas (NOL-07, OOL-10-02, and NSY-10), were completed as of January 2007. By letter dated November 21, 2005 (Reference 2-27), the NRC approved removal of the non-impacted land areas from the Part 50 License. Subsequently, the NRC approved the removal of the impacted areas of the site with the exception of the areas associated with the ISFSI (FSS Survey Areas NOL-07, NSY-10, and OOL-10-02) from the Part 50 license via letter NYR 2007-046 (Reference 2-26). The information included in this section of the License Termination Plan (LTP) includes historical information regarding the decommissioning of the YNPS that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the YNPS site.

5.1 Introduction

The FSS (FSS) Plan describes the methods for planning, designing, conducting, and evaluating FSS at the YNPS site. These surveys serve as key elements to demonstrate that the dose from residual radioactivity is less than the maximum annual dose criterion for license termination for unrestricted use specified in 10CFR20.1402 (Reference 5-1). The additional requirement of 10CFR20.1402, that residual radioactivity at the site be reduced to levels that are as low as reasonably achievable (ALARA), is addressed in Section 4. The FSS Plan was developed using the guidance of NUREG-1575, "The Multi-Agency Radiological Site Survey and Investigation Manual (MARSSIM)" (Reference 5-2); Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Reference 5-3); NUREG-1727, "NMSS Decommissioning Standard Review Plan," (Reference 5-4); and NUREG-1757, Volume 2, "Consolidated NMSS Decommissioning Guidance," (Reference 5-5).

The FSS process described in the survey plan adheres to the guidance of MARSSIM. However, advanced survey technologies may be used to conduct radiological surveys that can scan the surface and record the results. This survey plan allows for the use of these advanced technologies, where survey quality and efficiency can be increased, as long as the survey results are at least equivalent, in terms of their statistical significance, to those that would have been obtained using the non-parametric sampling methods of MARSSIM. In cases where advanced survey technologies are to be used, a technical evaluation will be developed to describe the technology to be used and to demonstrate how the technology meets the objectives of the survey. These technical evaluations will be referenced, as appropriate, in FSS Reports and will be available for NRC review. Notification will be made to the NRC prior to the use of advanced instruments or technologies.

6 COMPLIANCE WITH THE RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION

Decommissioning activities for and final status survey of the YNPS site, with the exception of the ISFSI and associated land areas (NOL-07, OOL-10-02, and NSY-10), were completed as of January 2007. By letter dated November 21, 2005 (Reference 2-27), the NRC approved removal of the non-impacted land areas from the Part 50 License. Subsequently, the NRC approved the removal of the impacted areas of the site with the exception of the areas associated with the ISFSI (FSS Survey Areas NOL-07, NSY-10, and OOL-10-02) from the Part 50 license via letter NYR 2007-046 (Reference 2-26). The information included in this section of the License Termination Plan (LTP) includes historical information regarding the decommissioning of the YNPS that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the YNPS site.

6.1 Site Release Criteria

6.1.1 Radiological Criteria for Unrestricted Use

The site release criteria for the Yankee Nuclear Power Station (YNPS) site are the NRC's radiological criteria for unrestricted use given in 10 CFR 20.1402 (Reference 6-1):

- Dose Criterion: The residual radioactivity that is distinguishable from background radiation results in a Total Effective Dose Equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem/year, including that from groundwater sources; and

- ALARA Criterion: The residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA).

6.1.2 Conditions Satisfying the Site Release Criteria

Levels of residual radioactivity that correspond to the allowable radiation dose and ALARA levels described above are calculated by analysis of various scenarios and pathways (e.g., direct radiation, inhalation, ingestion) through which exposures could be reasonably expected to occur. LTP Section 2.3.2 discusses the radionuclides for which derived concentration guideline levels (DCGLs) must be calculated. These DCGLs form the basis for the following conditions which, when met, satisfy the site release criteria as prescribed in 10 CFR 20.1402:

- The average residual radioactivity above background is less than or equal to the DCGL.

- Individual measurements representing small areas of residual radioactivity that exceed the DCGL, do not exceed the elevated measurement comparison DCGL. The elevated measurement comparison DCGL ($DCGL_{EMC}$) is described in Section 5.4.6.3.

Tab;e 1- 1
Remaining Room/Walls Dimensions

Building	Area	Width		Length		Height	
		Ft/in	Meters	Ft/in	Meters	Ft/in	Meters
PAB	TK-30 in (PAB Basement) **Room**	12'-6"	3.81E+00	15'-6"	4.72E+00	18'-6"	5.64E+00
PAB	TK-27 (PAB Basement) **Room**	10'-2"	3.10E+00	15'-6"	4.72E+00	18'-6"	5.64E+00
PAB	South **Wall** (G-Line)			133'-0"*	4.05E+01	13'-0"	3.96E+00
PAB	East **Wall** (2-Line to Fa)			17'-0"	5.18E+00	13'-0"	3.96E+00
I-X PIT	Southernmost **Wall**			33'-0"	1.01E+01	14'-8"	4.47E+00
I-X PIT	Easternmost **Wall** (Total Length)			31'-10"	9.70E+00	14'-8"	4.47E+00
SFP	Spent Fuel **Pool**	16'-6"	5.03E+00	33'-8"	1.03E+01	14'-8"	4.47E+00
New Fuel Vault	New Fuel Storage (South **Wall**)			15'-0"	4.57E+00	13'-6"	4.11E+00
Safe Shutdown	Pipe Chase **Cubicle**	4'-0"	1.22E+00	4'-0"	1.22E+00	8'-0"	2.44E+00
Waste Vault	Waste Transfer Pit **Cubicle**	9'-0"	2.74E+00	14'-0"	4.27E+00	9'-10"	3.00E+00
Elevator Pit	Elevator Pit **Cubicle**	7'-10"	2.39E+00	9'-0"	2.74E+00	6'-6"	1.98E+00
Waste Disposal	Pipe Chase **Cubicle**	5'-0"	1.52E+00	11'-10"	3.61E+00	10'-1"	3.07E+00
Waste Disposal	Distillate Heat Exchanger **Cubicle**	9'-0"	2.74E+00	16'-0"	4.88E+00	7'-0"	2.13E+00
Waste Disposal	Evaporator **Cubicle**	10'-6"	3.20E+00	16'-0"	4.88E+00	7'-0"	2.13E+00
Waste Disposal	Drumming Pit **Cubicle**	10'-4"	3.15E+00	27'-0"	8.23E+00	7'-0"	2.13E+00
PAB	PAB Back Stairwell Pit **Cubicle**	11'-4"	3.45E+00	13'-0"	3.96E+00	8'-2"	2.49E+00
Average Wall Length (meters) = 4.44E+00							
Average Wall Height (meters) = 3.51E+00							

* As previously noted, the south (G-Line) wall of the PAB is excluded from the calculation of average wall length.

Table 1-2

Remaining Structures and Drawing Reference

Building	Room/Wall/Pit	Room/Wall Width	Drawing Reference	Wall Length	Drawing Reference	Wall Height (Note 1)	Drawing Reference
PAB	Drain Collecting Tank Room (TK-30)	12' 6"	PAB 9699-FC-40D	15' 6"	PAB 9699-RC-40A	1022' 8"-1004' 2"=18' 6"	PAB 9699-FM-57A
PAB	Gravity Drain Tank Room (TK-27)	10' 2"	PAB 9699-FC-40D	15' 6"	PAB 9699-RC-40A	1022' 8"-1004' 2"=18' 6"	PAB 9699-FM-57A
PAB	South Wall (G-Line)			133' 0"	PAB 9699-FR-16A	1035' 8" - 1022' 8" =13' 0"	PAB 9699-FM-57A
PAB	East Wall (2-Line to Fa)			17' 0"	PAB 9699-FR-16A	1035' 8" - 1022' 8" =13' 0"	PAB 9699-FM-57A
I-X PIT	Southernmost Wall			33' 0"	I-X Pit 9699-FM-35B	1035' 8" - 1021' 0" =14' 8"	I-X Pit 9699-FM-35B
I-X PIT	Easternmost Wall F to E			25' 6"	PAB 9699-FM-57A	1035' 8" - 1021' 0" =14' 8"	I-X Pit 9699-FM-35B
I-X PIT	Easternmost Wall E to Wall End			6'4"	I-X Pit 9699-FM-35B		
I-X PIT	Easternmost Wall (Total Length)			31' 10"			
SFP	Spent Fuel Pool	16' 6"	Fuel Pit 9699-FM-21A	33' 8"	Fuel Pit 9699-FM-21A	1022' 8" - 1008' 0" =14' 8"	Fuel Pit 9699-FC-45B
New Fuel Vault	New Fuel Storage (South Wall)			15' 0"	PAB 9699-FM-57A	1035' 0" - 1021' 6" =13' 6"	Fuel Pit 9699-FM-21A
Safe Shutdown	Pipe Chase (555)	4' 0"	CES Rev.1 85005-F-1001	4' 0"	CES Rev.1 85005-F-1001	1034' 0" - 1026' 0" = 8' 0"	CES Rev.1 85005-F-1001
Waste Vault	Waste Transfer Pump Pit (underground)	9' 0"	9699-FC-50C	14' 0"	9699-FC-50C	1020' 6" - 1010' 8" =9' 10"	9699-FC-50C
Elevator Pit	Elevator Pit	7' 10"	PAB 9699-FC-43A	9' 0"	PAB 9699-FC-43A	1022' 8' - 1016' 2" =6' 6"	PAB 9699-FC-43A
Waste Disposal	Pipe Chase Cubicle	5' 0"	Waste Disp.9699-FA-17A	11' 10"	Waste Disp.9699-FA-17A	1035' 8" - 1025' 7" = 10' 1"	Waste Disp.9699-FA-17A
Waste Disposal	Distillate Heat Exchanger Cubicle	9' 0"	Waste Disp.9699-FA-17A	16' 0"	Waste Disp.9699-FA-17A	1035' 8" - 1028' 8" = 7' 0"	Waste Disp.9699-FA-17A
Waste Disposal	Evaporator Cubicle	10' 6"	Waste Disp.9699-FA-17A	16' 0'	Waste Disp.9699-FA-17A	1035' 8" - 1028' 8" = 7' 0"	Waste Disp.9699-FA-17A
Waste Disposal	Drumming Pit Cubicle	10' 4"	Waste Disp.9699-FA-17A	27' 0"	Waste Disp.9699-FA-17A	1035' 8" - 1028' 8" = 7' 0"	Waste Disp.9699-FA-17A
PAB	Back of PAB Stairwell Pit Cubicle	11' 4"	PAB 9699 RC-40B	13' 0"	PAB 9699 RC-40B	1035' 8" - 1027' 6' = 8' 2"	PAB 9699-FM-57B

Note 1: Top/ceiling height elevation is from DEMCO work scope Ref. 1

2. Source Configuration

NUREG/CR-6755 (Ref. 2), Section 4.1, describes three principal assumptions inherent in the Building Occupancy scenario: a fixed room area, uniform surface contamination, and the receptor location at the center of the floor at a height of 1 m. The configuration of the receptor and sources is illustrated in Figure 2-1. The RESRAD- BUILD input parameters, receptor location and center of source coordinates, are provided in Table 2-1.

Figure 2-1
Configuration of Source and Receptor Locations
for RESRAD-BUILD Model

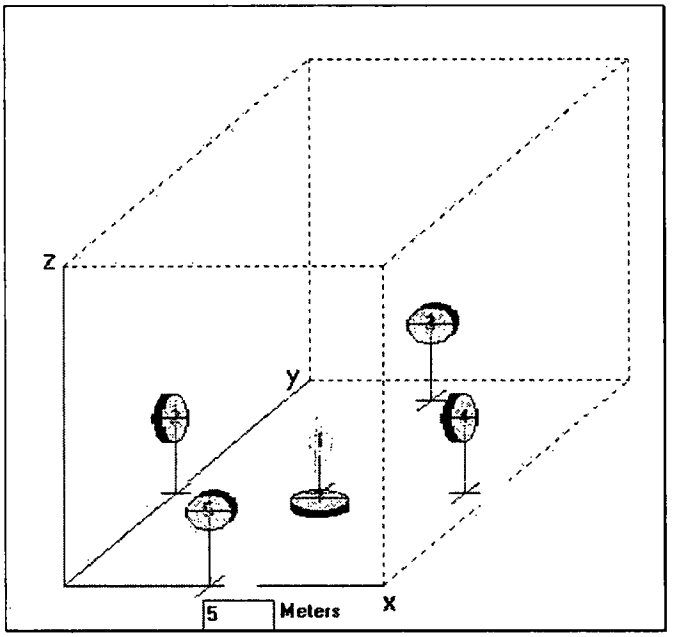


Table 2-1
Receptor and Center of Source Locations, meters

Source #	Source Description	Axis		
		X	Y	Z
1	Floor	2.22	2.22	0
2	West Wall	0	2.22	1.76
3	North Wall	2.22	4.44	1.76
4	East Wall	4.44	2.22	1.76
5	South Wall	2.22	0	1.76
	Receptor Location	2.22	2.22	1

3. Direct Ingestion Rate

The source specific input parameter, Direct Ingestion Rate, is described in RESRAD-BUILD as the direct ingestion rate of the source by any receptor in the room. Direct ingestion is possible only if the receptor and the source are in the same room and represents the fraction of the source ingested per hour.

NUREG/CR-5512, Volume 3, (Ref. 3) defines the average ingestion rate of 1.1E-4 m^2/hr as representative for the average individual in an industrial setting. The Direct Ingestion Rate for use in the Building Occupancy Scenario is calculated based upon the total room surface area (source area). The surface area is equal to sum of the surface area of four walls (15.58 m^2 per wall, as discussed in Section 1) plus the surface area of the floor (19.71 m^2, as discussed in Section 1).

Direct Ingestion Rate = Average Ingestion Rate / Source Area
= (1.1E-04 m^2/hr) / ((4 x 15.58 m^2) + 19.71 m^2)
= (1.1E-04 m^2/hr) / (82.03 m^2)
= 1.34E-06 hr^{-1}

The direct ingestion defined in this manner used in conjunction with an indirect ingestion rate set to zero, adequately models the Building Occupancy Ingestion pathway.

References:

1 Attachment E to the "Contract for the Performance of Demolition and Disposal and Related Services, By and Between DEMCO, Inc. and Yankee Atomic Electric Company," dated February 28, 2003.

2. NUREG/CR-6755, "Technical Basis for Calculating Radiation Doses for the Building Occupancy Scenario Using the Probabilistic RESRAD-BUILD 3.0 Code," February. 2002 (ANL/EAD/TM/02-1).

3. NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning," Volume 3: "Parameter Analysis, Draft Report for Comment," October 1999 (SAND99-2148).

This page intentionally left blank.

7 UPDATE OF SITE-SPECIFIC DECOMMISSIONING COSTS

Decommissioning activities for and final status survey of the YNPS site, with the exception of the ISFSI and associated land areas (NOL-07, OOL-10-02, and NSY-10), were completed as of January 2007. By letter dated November 21, 2005 (Reference 2-27), the NRC approved removal of the non-impacted land areas from the Part 50 License. Subsequently, the NRC approved the removal of the impacted areas of the site with the exception of the areas associated with the ISFSI (FSS Survey Areas NOL-07, NSY-10, and OOL-10-02) from the Part 50 license via letter NYR 2007-046 (Reference 2-26). The information included in this section of the License Termination Plan (LTP) includes historical information regarding the decommissioning of the YNPS that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the YNPS site.

7.1 Summary of Decommissioning Cost Estimate

The current Federal Energy Regulatory Commission (FERC) approved decommissioning cost estimate (December 2012) and cost estimate for management of spent fuel and GTCC waste is based on the Stipulation and Settlement Agreement between YAEC and the Connecticut Public Utilities Regulatory Authority, the Connecticut Office of Consumer Counsel, the Maine Public Utilities Commission, the Maine Office of Public Advocate, the Massachusetts Department of Public Utilities, and the Attorney General of Massachusetts dated April 30, 2013.

This cost estimate includes the cost associated with the projected ISFSI decommissioning costs and a funding assumption of 15 years of operations costs to manage spent fuel and GTCC waste. A funding mechanism provides that damage awards and settlement proceeds that YAEC receives in future phases of its litigation with the Department of Energy (DOE) will be applied to maintain the adequacy of the Nuclear Decommissioning Trust (NDT) to cover 15 years of ISFSI operations (as well as all other projected decommissioning costs). In addition, YAEC has the right to resume collection of decommissioning charges from its customers subject to the submittal of a proposal under section 205 of the Federal Power Act, if needed.

YAEC has an account within its NDT entitled, "ISFSI Radiological Decom," that segregates the funds for radiological decommissioning of the ISFSI from the larger balance of funds for ongoing management of spent fuel and GTCC waste held in the NDT.

The assumptions of the current decommissioning cost estimate are discussed in the Decommissioning Funding Plan submitted to the NRC on December 17, 2012 in accordance with 10 CFR 72.30(b)(2). The decommissioning cost estimate incorporates the most recent assumptions with respect to the remaining decommissioning activities and related costs (i.e., those associated with the Yankee Nuclear Power Plant ISFSI). The total un-escalated cost estimate for decommissioning the ISFSI, including contingency is $9.8 million, which includes $8.5 million for radiological removal and $1.3 million for non-radiological removal. The decommissioning cost estimate is in 2013 dollars.

YAEC will continue to inform the NRC regarding the status of this funding by complying with the obligations defined in: 1) 10 CFR 50.75(f)(1) and (2) to submit an annual Decommissioning Funding Status Report; 2) 10 CFR 50.82(a)(8)(v) to submit an annual financial assurance status report regarding decommissioning funding; 3) 10 CFR 72.30(c) to resubmit the decommissioning funding plan at intervals not to exceed three years; and 4) The schedule provided in the PSDAR will be maintained in accordance with 10 CFR 50.82(a)(7).

7.2 References

7-1 Letter from C. Pizzella (YAEC) to U.S. Nuclear Regulatory Commission, BYR 2012-043, "Independent Spent Fuel Storage Installation Decommissioning Funding Plan," dated December 17, 2012.

7-2 Letter from Alston & Bird LLP to Federal Energy Regulatory Commission, "Yankee Atomic Electric Company Docket No. ER13-___-000," dated May 1, 2013.

8 SUPPLEMENT TO THE ENVIRONMENTAL REPORT

Decommissioning activities for and final status survey of the YNPS site, with the exception of the ISFSI and associated land areas (NOL-07, OOL-10-02, and NSY-10), were completed as of January 2007. By letter dated November 21, 2005 (Reference 2-27), the NRC approved removal of the non-impacted land areas from the Part 50 License. Subsequently, the NRC approved the removal of the impacted areas of the site with the exception of the areas associated with the ISFSI (FSS Survey Areas NOL-07, NSY-10, and OOL-10-02) from the Part 50 license via letter NYR 2007-046 (Reference 2-26). The information included in this section of the License Termination Plan (LTP) includes historical information regarding the decommissioning of the YNPS that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the YNPS site.

8.1 Introduction

8.1.1 Overview

A decommissioning environmental report (Reference 8-1), dated December 1993, was prepared for the YNPS site, in conjunction with the plant's Decommissioning Plan. This report concluded that the environmental impacts of decommissioning activities are small and bounded by the previously issued Final Generic Environmental Impact Statement (FGEIS) issued by the Nuclear Regulatory Commission as NUREG-0586 (Reference 8-2) and by the YNPS environmental assessment, associated with construction period recapture. In 1997, a License Termination Plan (LTP) was prepared and submitted to the NRC but was later withdrawn, following the release of MARSSIM guidance (Reference 8-3). In 2002, activities associated with the LTP restarted using MARSSIM and other updated guidance.

The purpose of this section of the LTP is to describe any new information on significant environmental impacts associated with site-specific license termination activities and to determine if these impacts are within the scope of the environmental impacts previously evaluated either generically or on a site-specific basis by:

1. the environmental impact statement developed in support of the original facility,
2. the environmental impacts described in conjunction with the Decommissioning Plan (and PSDAR) related to decommissioning activities, or
3. the Final Generic Environmental Impact Statement addressing decommissioning (NUREG-0586).

The NRC has issued guidance associated with the impacts of decommissioning, including Supplement 1 to NUREG-0586 (Reference 8-4). Supplement 1 to NUREG-0586 focuses on the impacts of decommissioning nuclear power reactors licensed by the NRC, unlike the 1988 FGEIS, which took a broad look at decommissioning of a variety of sites and activities.

Supplement 1 to NUREG-0586 is intended to consider, in a comprehensive manner, all aspects related to the radiological decommissioning of nuclear reactor facilities. Supplement 1 uses an

approach that defines a measure of significance and severity of potential environmental impacts and an applicability of these impacts to a variety of facilities. The significance of an impact is described as being SMALL, MODERATE, or LARGE. The applicability of impacts is described as being generic or site-specific. These terms are clearly defined in Section 4 of Supplement 1 to NUREG-0586.

Table H-1, located in Appendix H to Supplement 1 of NUREG-0586, provides a listing of activities for which the NRC has generically determined that no environmental impacts exist. Because these activities have already been determined not to result in environmental impacts, no further review is required in connection with the LTP.

Table H-2 provides a summary of the decommissioning activities and associated environmental issues that have been determined to have *potential* impacts. As stated in Section 4.3 of Supplement 1 to the FGEIS, if these plant-specific impacts fall within the scope of the environmental impacts previously identified and evaluated by the NRC staff, these activities can be performed without further evaluation. The issues identified in Table H-2 to be evaluated for plant-specific impacts are:

- Onsite/offsite land use
- Water use
- Water quality
- Air quality
- Aquatic ecology
- Terrestrial ecology
- Threatened and endangered species
- Radiological
- Radiological accidents
- Occupational
- Socioeconomics
- Environmental justice
- Cultural impacts
- Aesthetics
- Noise
- Transportation
- Irretrievable resources.

According to Supplement 1 to NUREG-0586, the NRC assessed the impacts of each of these issues using data from previous studies and environmental reviews in addition to information obtained during site visits and provided by plants undergoing decommissioning. The NRC then examined the cumulative impacts of decommissioning activities and other past, present, and reasonably foreseeable future activities at the sites. After analyzing the issues, the NRC determined the impact of each and assigned a significance level (SMALL, MODERATE, or LARGE).

The NRC also determined whether the analysis of the environmental issues could be applied to all plants. Each environmental issue identified was assigned one of the following two categories: generic or site-specific.

Generic issues met the following three criteria:

1. The environmental impacts associated with the issue have been determined to apply to all plants, or, for some issues, to a group of plants of a specific size, specific locations, or having a specific type of cooling system or site characteristic.

2. A single significance criterion (SMALL, MODERATE, or LARGE) has been assigned to describe the impacts.

3. Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

If one or more of the above criteria cannot be met, the issue is considered to be "site-specific" and a site-specific evaluation of the issue is required. Table 8-1 summarizes the NRC's findings with respect to applicability and impact of the identified environmental issues pertinent to decommissioning.

Decommissioning and license termination activities at YNPS fall within the range of activities evaluated for the FGEIS and NUREG-0586, Supplement 1. For those issues identified as "generic" in Table 8-1, the NRC's prior conclusions bound environmental impacts at YNPS from decommissioning and license termination.

The LTP addresses the issues identified in Table 8-1 as "site-specific." In addition, consistent with RG 1.179, the review focuses on any new information or significant environmental change associated with site-specific termination issues. Impacts associated with site-specific termination activities have been compared to previously analyzed decommissioning and termination activities, in this LTP and its references. The proposed termination activities related to the end use of the site do not result in significant environmental changes that are not bounded by the site-specific decommissioning activities described in the Decommissioning Plan, PSDAR, the FGEIS, or NUREG-0586.

Note that the review and conclusion in this Section relate only to activities and impacts associated with termination of the NRC license. YNPS is conducting other site characterization for non-radiological remediation and site restoration, which are not part of the license termination activities and are outside of the scope of NRC regulation. The non-radiological activities are addressed in an environmental closure plan that was submitted to the Massachusetts Department of Environmental Protection acting as the lead agency. Other agencies, such as the EPA, are also routinely involved in aspects of non-radiological site remediation.

8.1.2 Proposed Site Conditions at the Time of License Termination

The YNPS site is intended to be released for unrestricted use, under the radiological release criteria of 10CFR20.1402 (Reference 8-5) upon termination of its NRC license. Sections 3 and 4 of this LTP discuss in greater detail the activities that have been completed, those ongoing and remaining, and the proposed final state of the site.

At the time of license termination, the site will be a backfilled and graded land area, with the potential for selected above grade structures to remain. In general, structures were demolished to site elevation 1022'-8" with the demolition debris passing final status survey or meeting the "no detectable" criteria able to be used as backfill onsite. Any remaining slabs will be perforated, to allow groundwater to flow through.

In general buried piping and utilities were removed. Any buried piping or utilities that remain were evaluated and surveyed in place, as appropriate, in accordance with plant procedures to ensure that no detectable radioactivity exists.

8.1.3 Remaining Dismantlement and Decommissioning Activities

YAEC originally submitted a Decommissioning Plan (Reference 8-7), which was approved in February of 1995. In accordance with Regulatory Guide 1.185 (Reference 8-8), licensees with approved decommissioning plans were permitted to "replace their decommissioning plans with a Post-Shutdown Decommissioning Activities Report (PSDAR) update that uses the format and content specified in this document." YAEC later elected to relocate pertinent information to a PSDAR (Reference 8-9) conforming to the guidance of Regulatory Guide 1.185.

YAEC continues to implement the DECON alternative as the most appropriate alternative for decommissioning the YNPS site. Evaluation of the environmental effects of the DECON alternative is contained in NUREG-0586 and its supplement.

8.1.3.1 General Description of Decommissioning Activities

Since 1993 YAEC has removed and disposed of the steam generators, pressurizer, reactor vessel and reactor vessel internals. Portions of the reactor vessel internals are considered to be greater-than-Class-C (GTCC) waste and are stored in the ISFSI.

As indicated in the PSDAR, the decommissioning activities are being completed in three phases:

- The first phase of decommissioning consisted of mechanically and electrically isolating the Spent Fuel Pit, removing of any systems and components that did not support fuel storage in the SFP or subsequent decommissioning, and moving spent fuel and GTCC to the ISFSI. The first phase of decommissioning was completed when the spent fuel and all GTCC waste was removed from the SFP in June of 2003.

- The second phase of decommissioning involves the dismantlement and de-contamination of remaining systems, structures, and components (SSCs. This phase of

decommissioning is ongoing. With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site.

- The final phase of decommissioning is the termination of the possession only license.

A more detailed discussion of the activities to be performed in each of the phases is provided in Section 3 of this LTP

8.1.3.2 Other Decommissioning Considerations

The PSDAR discusses other decommissioning considerations, including decontamination and dismantlement methods, storage and removal of spent fuel and GTCC waste, and site restoration.

8.1.3.3 General Decommissioning Activities Related to Removal of Radiological Components and Structures

Site structures and components were removed using techniques and methods appropriate for the particular circumstances and were consistent with Decommissioning Work Packages. Openings in structures were typically covered or sealed to minimize the spread of contamination. Components were moved to an area for processing or volume reduction and/or packaging into containers, so that they can then be shipped to a processing facility for decontamination or to a low-level radioactive waste disposal facility. Buried contaminated components were decontaminated to meet the free release criteria or were excavated and removed for disposal.

8.1.3.3.1 Decontamination Methods

Contaminated systems and components were removed and sent to an offsite processing facility or to a low-level radioactive waste disposal facility. Onsite decontamination of systems and components was generally limited to those activities needed to maintain personnel exposure ALARA, to expedite equipment removal, and to minimize the spread of contamination.

Application of coating and hand wiping were the preferred methods for stabilizing or removing loose surface contamination. If other methods were employed (e.g., grit blasting, high-pressure washing), airborne contamination control and waste processing systems are used, as necessary, to control and monitor any release of contamination.

Contaminated and activated concrete, as well as other contaminated materials, were removed and sent to a low-level radioactive waste disposal facility. Concrete removal methods, such as scabbling and scarifying, controlled concrete removal depth in order to minimize the waste volume produced. Vacuuming the dust and debris effluent with HEPA filtration minimized the need for additional respiratory protection control measures. YAEC considered new decommissioning techniques and technologies, as appropriate.

8.1.3.3.2 Dismantlement Methods

YAEC used two basic dismantlement methods:

- Mechanical methods: Mechanical methods machine the surface of the material that is being cut. Typically, these methods are capable of cutting remotely without generating significant amounts of airborne contamination. This attribute makes mechanical methods attractive for removing most of the contaminated piping, components, and equipment.

- Thermal methods: Thermal methods melt or vaporize the surface of the material being cut. The cutting debris is transported from the cut region with a gas jet or water spray. Although thermal methods are more expedient than mechanical methods, they have large power requirements and generate airborne contamination when applied to contaminated systems in an air environment. However, thermal methods can be used with a cutting station and air filtration. For these reasons, application of thermal cutting methods on contaminated systems, structures or equipment is being restricted to areas that can be easily sealed, filtered, or maintained under water. Appropriate lead paint removal controls must also be implemented when using thermal cutting methods.

8.1.3.3.3 Special Programs

There were no special or unusual programs related to the decommissioning of YNPS. All procedures and processes used at YNPS were consistent with those considered in the FGEIS and its supplement.

8.1.3.3.4 Removal of LLW and Compaction or Incineration

LLW was being processed in accordance with plant procedures and sent to LLW disposal facilities. While no incineration occurred onsite, YAEC used an offsite licensed facility.

8.1.3.3.5 Soil Remediation

Soils and pavement were being surveyed and characterized in accordance with the site radiological characterization program. As necessary, soils, and pavement were remediated (i.e., removed, processed and disposed of at a licensed facility) if determined to contain contamination levels above the site release criteria.

8.1.3.3.6 Processing and Disposal Site Locations

Currently, there are several facilities available for (1) processing of waste materials to achieve volume reduction prior to disposal or (2) disposal of low-level radioactive waste.

8.1.3.3.7 Removal of Mixed Wastes

Mixed wastes were managed according to all applicable federal and state regulations, including NRC handling, storage, and transportation regulations. Mixed wastes from YNPS were transported only by authorized and licensed transporters and shipped only to authorized and licensed facilities. YAEC used an appropriate approved process to render the mixed waste non-hazardous.

8.1.3.3.8 Storage/Removal of Spent Fuel and GTCC Waste and Decommissioning of the ISFSI

YAEC will store spent fuel and GTCC waste in the ISFSI, until the DOE takes title to such wastes. Movement of fuel to the ISFSI began in June of 2002 and was completed in June of 2003. GTCC wastes were moved to the ISFSI in June of 2003.

YAEC cannot make a precise determination of when spent fuel and GTCC wastes will be removed from the YNPS site. Currently, YAEC expects that turnover to the DOE of spent fuel and GTCC wastes will be completed in 2031.

Following the removal of the spent fuel and GTCC waste from the YNPS site, the Vertical Concrete Casks and ISFSI Storage Pad will be removed as low-level radioactive waste.

8.1.3.3.9 LTP, Final Status Survey, and Site Release Criteria

The ultimate goal of decommissioning the YNPS site is to release it for unrestricted use. This requires assurance that future uses of the site, after license termination, will not expose members of the general public to unacceptable levels of radiation.

Section 1 provides a history of previous LTP and final status survey (also referred to as the final radiological survey) activities. Consistent with a commitment made in the PSDAR, this LTP uses the guidance of NUREG-1700 to address the 10CFR20 criteria for license termination. Final status surveys will then be conducted to verify that structures and open land areas meet the release criteria. An independent NRC contractor will then conduct a verification survey, thereby allowing unrestricted release of the site. After final status survey and NRC verification, some of the remaining surveyed structures and open land areas may be removed from the license. YAEC will then maintain control over the site until license termination.

With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site.

8.1.3.3.10 Site Restoration

Following termination of the YNPS possession-only license by the NRC, YAEC will complete the final site restoration activities. The remaining site areas will be graded and landscaped as necessary.

8.1.3.4 Schedule of Decommissioning Activities

The current schedule for decommissioning activities is provided in Section 3 of this LTP. Planning sequences and dates are based upon current knowledge and could change in the future. Yankee will continue to inform the NRC of all major changes to the planned decommissioning activities in accordance with 10CFR50.82(a)(7).

8.1.3.5 Conclusions Regarding Environmental Impact Included in the PSDAR

The PSDAR included a discussion of environmental impacts from decommissioning the YNPS. These conclusions were based largely upon the information provided in the YNPS Decommissioning Environmental Report (DER). The DER was based upon NUREG-0586, "Final Generic Environmental Impact Statement (FGEIS) on Decommissioning of Nuclear Facilities" and the site-specific environmental assessment from the re-capture of the construction time period.

The PSDAR concluded that the impacts due to decommissioning would be bounded by the previously issued environmental impacts statements. This was principally due to the following reasons:

- The postulated impacts associated with the method chosen, DECON, have already been considered in the FGEIS.
- There are no unique aspects of the plant or decommissioning techniques to be utilized that would invalidate the conclusions reached in the FGEIS.
- The methods to be employed to dismantle and decontaminate the site are standard construction-based techniques fully considered in the FGEIS.
- The site-specific person-rem estimate for all decommissioning activities has been conservatively calculated using methods similar to those used in the FGEIS.

Specifically, the review concluded that the YAEC decommissioning will result in generally positive environmental effects, in that:

- Radiological sources that create the potential for radiation exposure to site workers and the public will be eliminated.
- The site will be returned to a condition that will be acceptable for unrestricted use.
- The thermal impact on the Deerfield River from facility operations will be eliminated.
- Noise levels in the vicinity of the facility will be reduced.
- Hazardous material and chemicals will be removed.

- Local traffic will be reduced (fewer employees, contractors and materials shipments than required to support an operating nuclear power plant).

Furthermore, the YNPS decommissioning will be accomplished with no significant adverse environmental impacts in that:

- No site-specific factors pertaining to YNPS will alter the conclusions of the FGEIS.
- Radiation dose to the public will be minimal.
- Radiation dose to decommissioning workers will be a fraction of the operating exposure.
- Decommissioning is not an imminent health or safety problem and will generally have a positive environmental impact.

The Decommissioning Plan estimated the total radiation exposure impact for decommissioning to be 744 person-rem. This estimate was re-evaluated in 1996, resulting in a lower value of 580 person-rem (Reference 8-9). The actual exposure, through December 31, 2002, for decommissioning activities is 555 person-rem (Reference 8-10).

Radiation exposure due to transportation of radioactive waste has been conservatively estimated to be approximately 7 person-rem. This value is bounded by the FGEIS value of 100 person-rem of occupational exposure for transport of radioactive material. In Supplement 1 to NUREG 0586, the very low activity waste dose rates were considered to be so low that they did not have to be considered in the transportation dose estimate. All of the material associated with the VCCs and the ISFSI storage pad that will be shipped to a low-level radioactive waste site is considered to be very low activity waste.

Radiation exposure to offsite individuals for expected conditions, or from postulated accidents is bounded by the Environmental Protection Agency's Protective Action Guidelines and NRC regulations. The public exposure due to radiological effluents will continue to remain well below the 10CFRPart 20 limits and the ALARA dose objectives of 10CFR50, Appendix I. This conclusion is supported by the YNPS Annual Effluent Release Reports in which individual doses to members of the public are calculated for station liquid and gaseous effluents.

No significant impacts are expected from the disposal of low-level radioactive waste (LLW). The total volume of YNPS LLW for disposal was estimated in the Decommissioning Plan to be approximately 132,000 cubic feet. A total volume of approximately 1,670,000 ft^3 of LLW was shipped from the YNPS site for off-site disposal during decommissiong of the plant. A significant portion of this waste contained very low levels of radioactivity (DOT exempt) and was created as a result of remediation activities to satisfy EPA cleanup requirements for PCBs, to satisfy the Massachusetts Department of Public Health (DPH) radiological release criteria of 10 mRem/year and to meet the Massachusetts Contingency Plan regulations for non-radiological release criteria under the Department of Environmental Protection (DEP) requirements. The volume of LLW that would have been required to be disposed of to satisfy the NRC's 25 mRem/year

release criteria would have been a significantly lower volume in the 300,000 ft3 range, significantly below the FGEIS estimate of 647,670 ft^3 for a reference PWR.

The decommissioning cost estimate assumes that all of the material associated with the VCCs and the ISFSI storage pad will be shipped offsite as low-level radioactive waste. This assumption was made to maximize the cost of disposal of radioactive materials in the decommissioning cost estimate. YAEC does not anticipate that this material would be required to be disposed of to satisfy the NRC's 25 mRem/year release criteria.

Since the approval of the Decommissioning Plan and the issuance of the Decommissioning Environmental Report, YNPS has identified the presence of polychlorinated biphenyls (PCBs) from some paint coatings in soil. As in the case of radiologically contaminated lead paint, asbestos, and other hazardous materials, contaminated paint that contains PCBs will be managed according to all applicable federal and state regulations.

No significant environmental impacts are anticipated in the event that LLW is required to be temporarily stored onsite because adequate storage space exists and LLW storage will be in accordance with all applicable federal and state regulations. Extending the storage period from 2022 through 2031 does not have a significant impact, because all applicable federal and state regulations will be met.

The non-radiological environmental impacts from decommissioning are temporary and are not significant. The largest occupational risk associated with decommissioning YNPS is related to the risk of industrial accidents. The primary environmental effects are short term: small increases in noise levels and fugitive dust in the immediate vicinity of the site, as well as truck traffic to and from the site for hauling equipment and waste. No socioeconomic impacts, other than those associated with the cessation of operations (loss of jobs and taxes) have been identified. Also, no significant impacts to local culture, terrestrial or aquatic resources, such as the Sherman Reservoir and Deerfield River have been identified.

8.2 Analysis of Site-Specific Issues

8.2.1 Onsite-Offsite Land Uses

8.2.1.1 Onsite Land Uses

The environmental impacts associated with onsite land uses have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of onsite land uses is documented in Section 4.3.1 of Supplement 1 to NUREG-0586.

YNPS is located on a 2200 acre site, of which approximately 10 acres have been developed for plant use. Decommissioning activities involve the same areas used during initial construction and during operations. The use of a small fraction of the total site area land impacted by decommissioning and the re-use of areas used during initial construction are consistent with the NRC's assumptions in Supplement 1 to NUREG-0586, and thus there are no significant environmental impacts associated with YNPS decommissioning.

YAEC has identified no new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

8.2.1.2 Offsite Land Uses

Only areas within the existing site boundary (i.e., the area that remains within the control of the 10 CFR 50 License) will be used to support decommissioning and license termination activities (such as temporary storage areas and staging areas). As discussed previously in this section, and in detail in Section 5, isolation and control measures will be instituted to prevent the spread of contamination. These measures will also be monitored to ensure their effectiveness. Thus, no environmental impacts associated with the use of offsite lands are anticipated from YNPS decommissioning and license termination activities.

8.2.2 Water Use

The environmental impacts associated with water use, during decommissioning, have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of water use is documented in Section 4.3.2 of Supplement 1 to NUREG-0586.

During plant operation, an average of 0.4 million gallons of water per day from the Sherman Reservoir was used to cool plants systems. Water use was discussed in the "Environmental Assessment by the U.S. Nuclear Regulatory Commission, Related to the Request to Authorize Facility Decommissioning," dated December 14, 1994 (Reference 8-12). At that point in the decommissioning project, water usage was estimated to be less than 1% of the average water usage during operations.

Since 1994, a number of systems that contributed to water usage have been removed from operation. Section 3 of this LTP describes those water-containing systems that have been removed from service or drained and identifies the systems remaining in operation. Only a few systems remain, and as described in Supplement 1 to NUREG-0586, the operational demands for cooling and make-up water have been eliminated with the removal of spent fuel and GTCC waste from the spent fuel pit.

Use of water for decontamination of systems such as the Reactor Coolant System and the Spent Fuel Pit are addressed in the FGEIS. Other water usage, such as for dust abatement, are similar to those that occurred during construction of the plant. In addition, potable water for decommissioning contractor staff is being provided via bottled water, and sanitary services are provided by portable toilet facilities, thus minimizing the impacts on the on-site water supply.

In summary, the conditions for YNPS decommissioning are consistent with the assumptions of Supplement 1 to the FGEIS, and thus there are no significant environmental impacts associated with water use during the decommissioning of the YNPS. YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

8.2.3 Water Quality

The environmental impacts associated with surface water quality have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the

environmental impacts of surface water quality is documented in Section 4.3.3 of Supplement 1 to NUREG-0586.

All discharges are controlled under the National Pollutant Discharge Elimination System (NPDES) permit (Reference 8-13). This permit is issued jointly by the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MDEP). The Offsite Dose Calculation Manual (Reference 8-14) also addresses limitations on doses to members of the public from liquid effluent and requires that they be maintained below the limits in:

- 10CFR50, Appendix I;
- 10CFR20, Appendix B, Table 2, Column 1; and
- 40CFR190.

Radiological impacts are being assessed and monitored by use of on- and offsite groundwater monitoring wells for aquifers that discharge to Sherman Reservoir, including monitoring Sherman Spring. Currently the levels of radionuclides in these well samples, with the exception of tritium, are below the EPA's drinking water MCLs. A detailed discussion about the groundwater assessments (completed and planned) and available data are provided in Section 2 of this LTP.

As previously discussed, site buildings are being removed to ground level at 1022'-8", and basements are being cleaned to meet the appropriate DCGLs. These basements are also being perforated to allow equilibrium with the water table, and soils are being used to backfill the holes. Concrete debris from demolition of the buildings may be used as backfill onsite if it passes a final status survey or meet the "no detectable" criteria. A "beneficial use determination" (BUD) to use this concrete as backfill is being filled with the State of Massachusetts Department of Environmental Protection. As a part of the BUD approval, the DEP must make the conclusion that the reuse will not cause significant risk or impact or create a nuisance condition.

The conditions for YNPS decommissioning are consistent with the assumptions of Supplement 1 to the FGEIS, and thus there are no significant environmental impacts associated with surface water quality during the decommissioning of YNPS. YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

8.2.4 Air Quality

The environmental impacts of decommissioning associated with air quality have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of air quality is documented in Section 4.3.4 of Supplement 1 to the FGEIS.

Supplement 1 to the FGEIS identifies the following decommissioning activities as having the potential for non-radiological impacts on air quality:

- Worker transportation to and from the site,
- Dismantling of systems and removal of equipment,
- Movement and open storage of materials onsite,
- Demolition of buildings and structures, and
- Shipment of material and debris to offsite locations.

Worker transportation: Consistent with the assumptions in the FGEIS, the work force at YNPS has decreased from the time the plant ceased operation. The work force will further decrease as decommissioning nears completion. There will and have been occasional increases during specific decontamination and decommissioning activities. The work force during decommissioning is smaller than that associated with plant construction and refueling at YNPS. Accordingly, the adverse changes in air quality, associated with changes in worker transportation, will not be detectable and are not destabilizing.

Dismantling systems and removal of equipment: Generation of particulate matter associated with the physical activities of dismantlement and by the release of gases from systems during removal are potential sources that could impact air quality. Methods and provisions are available to minimize fugitive dust (e.g., wet suppression and chemical stabilization agents) and to minimize airborne contamination in buildings (e.g., isolation of areas and HEPA filtration). Local filtration systems can also be used when activities are located in areas that are not ventilated to the plant stack, and are likely to generate airborne radioactivity. Thus, it is highly unlikely that particulate matter generated during decommissioning and released to the environment will be detectable offsite. Any refrigerants will be disposed of in accordance with the applicable state and federal regulations.

Movement and open storage of materials onsite: Movement of equipment and open storage of materials during decommissioning may result in fugitive dust. Provisions as discussed in Section 3 and identified above can mitigate these effects. Thus, it is highly unlikely that particulate matter generated as a result of movement or storage of material onsite will be detectable offsite.

Demolition of buildings or structures: As discussed in the FGEIS, demolition of structures and buildings on the YNPS site may result in a temporary increase in fugitive dust. The controlled dismantlement and packaging of site components and structures will minimize the potential for fugitive dust from becoming an ambient air quality concern during decommissioning. Fugitive dust from demolition of buildings and structures generally involves large particles that settle quickly. Dust and smaller particles will be controlled using mitigation methods such as wet suppression. Thus, it is highly unlikely that particulate matter generated as a result of building or structure demolition will be detectable offsite.

Shipments of material to an offsite location: Material, debris, and equipment will be removed from the site during decommissioning. Although the remaining number of shipments to be sent during decommissioning is relatively large, these shipments are taking place over a couple of years, and thus the average number of shipments per day is relatively small. As stated in the

FGEIS, it is unlikely that the emissions associated with the small number of daily shipments would be detectable offsite.

Air effluent released from the site is monitored in accordance with the Offsite Dose Calculation Manual (ODCM) which sets limits on doses caused by effluents, based upon the ALARA (as low as reasonably achievable) objectives of 10CFR50.34a, 10CFR50.36a, and Section IV.B.1 of Appendix I to 10CFR50. Effluents are reported annually to the NRC.

Based upon the above considerations, it has been determined that the conclusions of the FGEIS are applicable to YNPS, and decommissioning of YNPS will not noticeably affect offsite air quality. YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

8.2.5 Aquatic Ecology

8.2.5.1 Activities Within the Operational Area

The environmental impacts associated with aquatic ecology for decommissioning activities within the operational area have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of aquatic ecology for activities within the operational area is documented in Section 4.3.5 of Supplement 1 to NUREG-0586. Any new wetland areas created as a result of the ISFSI construction will remain during decommissioning.

8.2.5.2 Activities Outside of the Operational Area

The FGEIS identifies generation of runoff due to ground disturbances and surface erosion as having the potential to impact aquatic resources. Provisions will be made to reduce surface erosion and runoff.

It is understood that decommissioning of shoreline and in-water structures has the potential to impact aquatic habitats and biota. YAEC will consult with regulatory and resource agencies to obtain permits and plan activities to minimize the duration and extent of these impacts. Regardless, impacts would be limited to those areas previously disturbed during construction and operation, and these areas would be expected to re-colonize as they did following initial construction. Thus, even considering the removal of shoreline and in-water structures, the impacts of decommissioning on aquatic ecology are minimal.

YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

8.2.6 Terrestrial Ecology

8.2.6.1 Activities Within the Operational Area

The environmental impacts of decommissioning associated with terrestrial ecology for activities within the operational area have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of terrestrial ecology for

activities within the operational area is documented in Section 4.3.6 of Supplement 1 to the FGEIS.

8.2.6.2 Activities Outside the Operational Area

Only areas within the existing site boundary (i.e., the area that remains within the control of the 10 CFR 50 Licensing) will be used to support decommissioning and license termination activities (such as temporary storage areas and staging areas). These areas are within those areas that were disturbed during initial construction. The FGEIS states that terrestrial habitats disturbed during the construction of the site often continue to be of low habitat quality during operation and decommissioning.

As discussed previously in this section, and in detail in Section 5, isolation and control measures will be instituted to prevent the spread of contamination, and these measures will be monitored to ensure their effectiveness. Because the YNPS site has been in active decommissioning since the decision to permanently close the facility was made, it is reasonable to conclude that areas disturbed during the construction and operation of the plant have not become new sensitive areas with respect to terrestrial biota. Thus, no environmental impacts associated with the use of offsite lands are anticipated from YNPS decommissioning and license termination activities related to the end use of the site.

8.2.7 Threatened and Endangered Species

While the YNPS site consists of over 2000 acres of land, only a small fraction consisting of approximately 10 acres has been developed for plant use. During planning and construction of the independent spent fuel storage facility (which is adjacent to the areas being decommissioned), the Natural Heritage and Endangered Species Program (NHESP), an agency of the Department of Fisheries, Wildlife, and Environmental Law Enforcement, was contacted to review impacts. This review included activities associated with the installation of the ISFSI pad, road improvements, and improvements to the present storm water system. The NHESP had determined that the activities do not occur within the actual habitat of a state-protected rare wildlife species (Reference 8-15).

However, during recent field surveys to complete the mapping and to characterize natural communities, a late-larval spring salamander (*Gyrinophilus porphyriticus*) was identified on the YAEC property. It was found at the northeast end of the property, in one of the headwater channels of Wheeler Brook and very near the property line (which is also the Massachusetts/Vermont State Line) in a forestry management area.

The spring salamander is a species of Special Concern in Massachusetts. This status means that it is a species that has either been documented as suffering a decline that could threaten the species if allowed to continue or which occurs in small numbers or with a very restricted distribution in the state.

The implications of this species occurring on the site are fairly minimal since (1) this species occurs in a habitat that is already provided a high level of protection under the Massachusetts Wetlands Protection Act and (2) spring salamanders hardly ever stray far from their home streams. Standard best forestry practices include limiting stream crossings, retain tree cover

adjacent to streams, and prohibit activities (such as skidding or brush piling) in streams. No evidence of any past forest management activities affecting habitat in this stream was observed during the survey and future forest management activities are not expected to require alteration of the stream.

Only a very small section of Wheeler Brook comes close to the industrial portion of the property, less than 200 feet. In that area, Wheeler Brook is generally of lower gradient than preferred by the spring salamander. Therefore, decommissioning and license termination activities at the YNPS site are not expected to affect the spring salamander.

Thus, decommissioning and license termination activities at the YNPS site does not adversely impact threatened or endangered species.

8.2.8 Radiological

8.2.8.1 Activities Resulting in Occupational Doses to Workers

The environmental impacts associated with radiological activities resulting in occupational doses to worker have been determined by the NRC to be generically applicable with a SMALL impact, because of the existence of guidance regulating doses to workers (10CFR20) which remain applicable to the YNPS. The NRC's analysis of the environmental impacts of radiological activities resulting in occupational doses to workers is documented in Section 4.3.8 of Supplement 1 to NUREG-0586.

8.2.8.2 Activities Resulting in Doses to the Public

The environmental impacts associated with radiological activities resulting in doses to the public have been determined by the NRC to be generically applicable with a SMALL impact, because of the existence of guidance regulating and documenting doses to members of the public (10CFR20). The NRC's analysis of the environmental impacts of radiological activities resulting in doses to the public is documented in Section 4.3.8 of Supplement 1 to NUREG-0586. YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

Potential doses to the public following license termination are not covered by the Supplement to the FGEIS but were evaluated during promulgation of rulemaking for the radiological criteria for license termination (10CFR20.1402). The basis for public health and safety considerations associated with the license termination rule is discussed in NUREG-1496.

8.2.9 Radiological Accidents

The environmental impacts associated with radiological accidents have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of radiological accidents is documented in Section 4.3.9 of Supplement 1 to NUREG-0586. YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

The NRC concluded that radiological impacts, due to accidents, are considered to be undetectable and non-destabilizing, in the National Environmental Policy Act (NEPA) sense, if the doses remain within regulatory limits. The YNPS FSAR provides a summary of the

evaluation of plant transients that have a potential impact on both occupational and public safety and health. The risk of accidents resulting in a significant radiological release during decommissioning activities is considerably less than during plant operations.

The analysis of decommissioning events includes all phases of decommissioning activities: decontamination, dismantlement, packaging, storage, radioactive materials handling, and license termination activities (including final status surveys). The following radiological events were identified as having the potential to affect public health and safety:

- Decommissioning activity events.
- Loss of support system events, including loss of offsite power, cooling water and compressed air.
- Fire and explosion events.
- External events.
- Spent fuel storage events.

YAEC requested and received an exemption from the emergency preparedness requirements of 10CFR50.47 (Reference 8-16); however, approval of the exemption request was predicated on the absence of any accidents where the offsite dose consequences could exceed the EPA protective action guidelines (PAGs). Releases resulting from accidents postulated in the decommissioning accident analysis were evaluated using the EPA PAGs as an upper limit and found to be bounded by this criterion. Use of the EPA PAGs as an administrative limit also ensure that postulated accident offsite doses are significantly less than the 10CFR100 reference values. This exemption was confirmed by the NRC in an exemption issued on May 7, 2013 (Reference 8-25) and re-issued on August 15, 2013 (Reference 8-26).

On August 10, 2007 (Reference 2-26), the NRC approved the release of the majority of land from the 10 CFR 50 License. In the August 10, 2007 Safety Evaluation Report, the NRC stated: "10 CFR Part 100 addresses design and environmental aspects to be considered in siting a power reactor. Decommissioning of the YNPS power reactor portion of the site has been completed. Only the ISFSI and a 300 m boundary will remain after this proposed partial site release. Therefore, the criteria of 10 CFR Part 100 no longer apply to this site and need not be addressed."

Thus, the associated impacts on the environment are minimal.

8.2.10 Occupational Issues

The environmental impacts of occupational issues have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of occupational issues is documented in Section 4.3.10 of Supplement 1 to NUREG-0586. YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

As Supplement 1 to the FGEIS indicates, the Occupational Safety and Health Act of 1970 was enacted to protect the health of workers, and applicable regulations are administered by the Occupational Safety and Heath Administration (OSHA). YNPS is subject to 29 CFR 1910 and 1926 for worker health and safety protection under OSHA regulations. These requirements are implemented under existing plant programs and procedures.

8.2.11 Socioeconomic Impacts

The environmental impacts of socioeconomic impacts have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of socioeconomic impacts is documented in Section 4.3.12 of Supplement 1 to NUREG-0586.

The impacts that are observed by the community are primarily those resulting from plant closure rather than from decommissioning, although some decommissioning activities began very shortly after closure. These impacts occur either through changes in employment levels and local demands for housing and infrastructure, or through decline of the local tax base and the ability of local government entities to provide public services. Supplement 1 to NUREG-0586 states that decommissioning, itself, has no impact on the tax base and no detectable impact on the demand for public services.

Additionally Supplement 1 to NUREG-0586 concludes that the effects of employment changes on population growth are:

1. not detectable if population changes (reductions or increases) are less than 3% per year,
2. detectable but not destabilizing if the population change is between 3% and 5%, and
3. de-stabilizing if the population change is greater than 5% per year.

Table 8-2 shows the change in population over the last two decades. For the decade 1990 to 2000, which includes the period of shutdown and partial decommissioning, the overall change in population in the vicinity of the site was a 5% decrease over this ten-year period. The average annual population change, based upon the data from 1990 and 2000, does not exceed the NRC's threshold of 3%, and thus signifies that the changes are neither detectable nor destabilizing. Thus no significant socioeconomic impacts are associated with YNPS decommissioning and license termination activities related to the end use of the site.

8.2.12 Environmental Justice

Radioactive waste shipments, from the site to an interstate highway, traverse a six-county area including the following counties: Berkshire, Franklin, and Hampshire in Massachusetts; Bennington in Vermont; and Columbia and Rensselear in New York. The total population of this area is approximately 611,400 people. The number of minority (non-white) persons is about 7% of the total population, and the percentage of people below the poverty level is about 9% of the total population. The area is generally rural along the shipping routes. These data were derived from the Bureau of the Census 2000 Reports (References 8-17, 8-18, and 8-19).

Environmental Justice was addressed by the NRC during the review and approval of the YNPS Decommissioning Plan (Reference 8-20). The NRC concluded that there are no significant environmental impacts associated with the proposed decommissioning activity that would have a

significant effect on the quality of the human environment. The NRC included consideration of the transportation of radioactive wastes from the YNPS site to the interstate transportation corridor (both rail and highway) and concluded that such transportation will not have a disproportionate effect on minority or low income populations.

These conclusions remain valid. The types of decommissioning and license termination activities, conducted or planned at YNPS, are not significantly different than those described in the Decommissioning Plan and the assumptions related to affected populations remain valid, considering the information from the 2000 Census, presented above. Thus, there are no environmental justice impacts introduced by decommissioning or license termination.

8.2.13 Cultural and Historic Resource Impacts

8.2.13.1 Activities Within the Operational Area

The environmental impacts associated with cultural and historic resource impacts from activities within the operational area have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of cultural and historic resource impacts from activities within the operational area is documented in Section 4.3.14 of Supplement 1 to NUREG-0586. YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

8.2.13.2 Activities Outside the Operational Area

An independent review of files from the Massachusetts Historic Commission, the Massachusetts State Archives, and the State House Library was performed to determine the significance of buildings and areas in the vicinity of the YNPS site. There are no historic or cultural resources which are listed in the National Register of Historic Places within five miles of the plant (References 8-21, 8-22, 8-23 and 8-24). The Hoosac Tunnel, just beyond five miles of the site to the southwest, is designated as a National Register Property. The closest locale considered to have local historic significance is the Brigham Young birthplace monument located in Whitingham, Vermont, approximately five miles northeast of YNPS. The Sherman Dam Development District (including individual structures) and the Monroe Bridge Development/ Glassine Paper Company/Deerfield Dam District (including individual structures) have been deemed eligible to be on the State Register of Historic Places. The YNPS structures have not been identified as a historic site or asset, and decommissioning and license termination activities will not involve or impact any site or structure listed in the State Register of Historic Places.

8.2.14 Aesthetics

The environmental impacts associated with aesthetics have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of aesthetics is documented in Section 4.3.15 of Supplement 1 to NUREG-0586.

Aesthetic resources include natural and man-made landscapes and the way the two are integrated. As a part of construction and operation of the facility, the landscape was previously altered. Decommissioning activities will be conducted onsite, both inside and outside of existing buildings (in the case of dismantlement or shipping activities). The NRC has concluded that any visual intrusion resulting from decommissioning will be temporary and would serve to

reduce the aesthetic impacts of the facility. YAEC will use best management practices to control many of the potentially adverse impacts of decommissioning on aesthetics (such as dust and noise), as discussed in other sections.

YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

8.2.15 Noise

The environmental impacts associated with noise have been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of noise is documented in Section 4.3.16 of Supplement 1 to NUREG-0586.

As stated in the "Environmental Assessment by the U.S. Nuclear Regulatory Commission, Related to the Request to Authorize Facility Decommissioning," dated December 14, 1994, decommissioning activities at YNPS will add minimally to the ambient noise of the surrounding environment, beyond the security fence.

Decommissioning activities will, in general, be intermittent and temporary, and limited to a relatively small portion of the entire YNPS site. Noise is attenuated by the mature forests surrounding the plant. During fall and winter, absence of foliage will allow some additional transmission of noise, and, to the areas north and west of the plant, the presence of Sherman Reservoir will allow some transmission of noise over the water before attenuation by forest. However, a review of wildlife species existing in the vicinity of the plant indicates an assemblage consistent with that found within similar regional habitats. This indicates that the noise levels generated at YNPS during decommissioning have added only minimally to the ambient noise levels and have had a negligible effect on the vicinity and the environment. YAEC has not identified any new information or significant environmental change associated with the site-specific termination activities related to the end use of the site.

8.2.16 Transportation

The environmental issue of transportation has been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of transportation is documented in Section 4.3.17 of Supplement 1 to NUREG-0586.

The number of shipments and the volume of waste shipped are greater during decommissioning than during operations. In Supplement 1 to the FGEIS, the public health and safety impacts of transportation of radioactive wastes are evaluated on the basis of compliance with regulation. The NRC has concluded that compliance with regulation is adequate to protect the public against unreasonable risk from the transportation of radioactive materials. The supplement to the FGEIS notes that the evaluation leading to that conclusion was based, in part, on information in NUREG-0170 and that recent re-evaluation of transportation risks, using updated information and assessment tools, found that risks are lower than those estimated in NUREG-0170. Because YNPS will comply with all applicable regulations when shipping radioactive wastes from decommissioning, the effects of transportation of that radioactive waste on public health and safety are considered to be neither detectable nor destabilizing.

Non-radiological impacts of transportation include increased traffic and wear and tear on roadways. Because the average number of shipments from the site will be relatively small, there will be no significant effect on traffic flow or road wear. Additionally, because of the industry's emphasis on training and adherence to established procedures, truck accident rates for activities at nuclear facilities has been lower than the national average for similar activities. The NRC has concluded that impacts of transportation accidents would neither be detectable nor destabilizing.

Thus, transportation of wastes associated with the YNPS decommissioning and license termination activities do not present significant adverse impacts.

8.2.17 Irretrievable Resources

The environmental issue of irretrievable resources has been determined by the NRC to be generically applicable with a SMALL impact. The NRC's analysis of the environmental impacts of irretrievable resources is documented in Section 4.3.18 of Supplement 1 to NUREG-0586.

Supplement 1 to the FGEIS indicates that land associated with a site released for unrestricted use is available for other uses, regardless of whether or not the decommissioning process returned the land to an open space or to an industrial complex. Thus the land resource would not be considered "irretrievable." The Supplement to the FGEIS evaluated other irretrievable resources such as the materials/equipment used to decontaminate the facilities and the fuel used for construction machinery and for transporting wastes and concluded these resources are minor.

Thus, the impact of decommissioning and license termination on irretrievable resources is neither detectable nor destabilizing.

8.3 References

8-1 YNPS Decommissioning Environmental Report., dated December 1993.

8-2 NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," dated August 1988.

8-3 NUREG-1575, NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual," Revision 1, dated August 2000.

8-4 Supplement 1 to NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," dated November 2002.

8-5 Title 10 to the Code of Federal Regulations, Subpart E to Part 20.

8-6 Attachment E to the "Contract for the Performance of Demolition and Disposal and Related Services, By and Between DEMCO, Inc. and Yankee Atomic Electric Company," dated February 28, 2003

8-7 Yankee Nuclear Power Station Decommissioning Plan, Revision 0.0.

8-8 Regulatory Guide 1.185, "Standard Format and Content for Post-shutdown Decommissioning Activities Report," dated July 2000.

8-9 YNPS Post-Shutdown Decommissioning Activities Report, dated June 2003.

8-10 USNRC Atomic Safety and Licensing Board Docket No. 50-029-DCOM, Supplemental Affidavit of Russell A. Mellor, September 3, 1996.

8-11 Memorandum RP-03-045 from Greg Babineau to Jim Kay, dated November 19, 2003.

8-12 "Environmental Assessment by the U.S. Nuclear Regulatory Commission, Related to the Request to Authorize Facility Decommissioning," dated December 14, 1994.

8-13 R. Janson (EPA) to J. A. Kay (YNPS), dated July 29, 2003, "Issuance of NPDES Permit No. MA0004367.

8-14 Offsite Dose Calculation Manual, Revision 15.

8-15 NHESP 99-5798, "Installation of an on-site storage pad, road improvements, and improvements to present storm water system," dated November 30, 1999, from Patricia Huckery, NHESP Wetlands Environmental Review to the Rowe Conservation Commission.

8-16 NYR 92-144, Exemption From 10CFR Part 50 - Appendix E - Emergency Preparedness Training Exercises at the Yankee Nuclear Power Station (TAC No. M83415), M. B. Fairtile (USNRC) to J. M. Grant, July 24, 1992.

8-17 "Massachusetts: 2000, Summary Population and Housing Characteristics," U.S. Department of Commerce, issued September 2002

8-18 "Vermont: 2000, Summary Population and Housing Characteristics," U.S. Department of Commerce, issued October 2002.

8-19 "New York: 2000, Summary Population and Housing Characteristics," U.S. Department of Commerce, issued July 2002.

8-20 NRC Letter, "Order Approving the Decommissioning Plan and Authorizing Decommissioning of the Yankee Nuclear Power Station," dated February 14, 1995.

8-21 State Register of Historic Places/1988, Massachusetts Historical Commission.

8-22 BYR 2003-063 "Project Notification Form, Request for Determination of No Adverse Effect," from Gregg Demers and John McTigue, ERM, to Brona Simon, Massachusetts Historical Commission, dated July 11, 2003.

8-23 National Register Survey Books, Bennington County and Windham County Listings, Vermont Division of Historic Preservation.

8-24 Deerfield River Project, Deerfield River, Vermont and Massachusetts—Information for the Initial Stage of Consultation FERC Project No. 2323, Volumes I and II, New England Power Company, March 1988.

8-25 Letter from M. D. Lombard (USNRC) to R. Mitchell (YAEC), "Response to Exemption Request for Portions of Title 10 of the Code of Federal Regulations Part 50 Appendix E, and Section 50.47 of Title 10 of the Code of Federal Regulations for the Yankee Rowe Plant (TAC No. L24662)," dated May 7, 2013.

8-26 Letter from J. M. Goshen (USNRC) to R. Mitchell (YAEC), "Revised Response to Exemption Request for Portions of Title 10 of the Code of Federal Regulations Part 50 Appendix E, and Section 50.47 of Title 10 of the Code of Federal Regulations for the Yankee Rowe Plant (TAC No. L24662)," dated August 15, 2013.

Table 8-1

Summary of Environmental Impacts from Decommissioning

Issue	Generic	Impact	LTP Section
Onsite-Offsite Land Uses			8.2.1
• Onsite Land Uses	Yes	Small	8.2.1.1
• Offsite Land Uses	No	Site-Specific	8.2.1.2
Water Use	Yes	Small	8.2.2
Water Quality	Yes	Small	8.2.3
Air Quality	Yes	Small	8.2.4
Aquatic Ecology			8.2.5
• Activities within the operational area*	Yes	Small	8.2.5.1
• Activities outside the operational area	No	Site-Specific	8.2.5.2
Terrestrial Ecology			8.2.6
• Within the operational area	Yes	Small	8.2.6.1
• Outside the operational area	No	Site-Specific	8.2.6.2
Threatened and Endangered Species	No	Site-Specific	8.2.7
Radiological			8.2.8
• Activities resulting in occupational doses to workers	Yes	Small	8.2.8.1
• Activities resulting in doses to the public	Yes	Small	8.2.8.2
Radiological accidents	Yes	Small	8.2.9
Occupational issues	Yes	Small	8.2.10
Cost	N/A	N/A†	7
Socioeconomic	Yes	Small	8.2.11
Environmental Justice	No	Site-Specific	8.2.12
Cultural and Historic Resource Impacts			8.2.13
• Activities within the operational area	Yes	Small	8.2.13.1
• Activities outside the operational area	No	Site-Specific	8.2.13.2
Aesthetics	Yes	Small	8.2.14
Noise	Yes	Small	8.2.15
Transportation	Yes	Small	8.2.16
Irretrievable Resources	Yes	Small	8.2.17

* The operational area is defined as the portion of the plant site where most or all of the site activities occur, such as reactor operation, materials and equipment storage, parking, substation operation, facility service, and maintenance. This includes areas within the protected area fences, the intake, discharge, cooling, and associated structures as well as surrounding paved, graveled, maintained landscape, or other maintained areas.

† A decommissioning cost assessment is not a specific National Environmental Policy Act (NEPA) requirement.

Table 8-2

Population Changes in the Vicinity of YNPS

Location	1980 (Ref 8-1)	1990 (Ref 8-1)	2000 (Ref 8-17 & 8-18)	% change in decade before shutdown	% change in decade including shutdown
Massachusetts					
Adams	10,381	9,445	8,809	-9%	-7%
Clarksburg	1,871	1,745	1,686	-7%	-3%
Florida	730	732	676	0%	-8%
North Adams	18,063	16,797	14,681	-7%	-13%
Savoy	644	634	705	-2%	11%
Buckland	1,864	1,928	1,996	3%	4%
Charlemont	1,149	1,249	1,358	9%	9%
Colrain	1,552	1,757	1,813	13%	3%
Hawley	280	317	336	13%	6%
Heath	482	716	805	49%	12%
Monroe	179	115	93	-36%	-19%
Rowe	336	387	351	15%	-9%
Vermont					
Halifax	488	782	782	60%	0%
Whitingham	1,043	1,298	1,298	24%	0%
Wilmington	1,808	1,968	2,225	9%	13%
Readsboro	638	762	809	19%	6%
Stamford	773	773	813	0%	5%
Overall	42,281	41,405	39,236	-2%	-5%