YANKEE ATOMIC ELECTRIC COMPANY
49 Yankee Road, Rowe, Massachusetts 01367

February 25, 2008
BYR 2008-004

Mr. David Howland
Massachusetts Department of Environmental Protection
DEP Western Region
436 Dwight Street
Suite 402
Springfield, MA 01103

Subject: Yankee Nuclear Power Station, Rowe, MA
Response Action Outcome Statements
RTN 1-13411

Dear Mr. Howland:

Yankee Atomic Electric Company (YAEC) has completed the decommissioning of the Yankee Nuclear Power Station in Rowe, MA. Concurrent with plant decommissioning, YAEC completed numerous environmental sampling campaigns for both radiological and non-radiological parameters to support the management of contaminated materials and environmental media and restoration of the site. The investigation and remedial activities were conducted in consultation with the Department of Environmental Protection, in accordance with the requirements of the Massachusetts Contingency Plan (310 CMR 40.0000). Based on the cleanup objectives achieved in various areas, the site was divided into three areas for the purposes of three Partial Response Action Outcome (RAOP) filings, as defined below:

- Class A-2 – Applies to the Outlying Areas where a Permanent Solution has been achieved and where there are not restrictions on future uses or activities.
- Class A-3 – Applies to the Combined Study Area where a Permanent Solution has been achieved and where deed restrictions are in-place to prevent residential use of the property.
- Class C-1 – Applies to the Central Area where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

The documentation for the RAOP filings has been submitted to the Department via the eDEP website. Hard copies of the submittals are provided for your convenience.

Should you require additional information please contact me at 413-424-5261 Extension 303 or Joseph Bourassa at 413-424-5261 Extension 302.

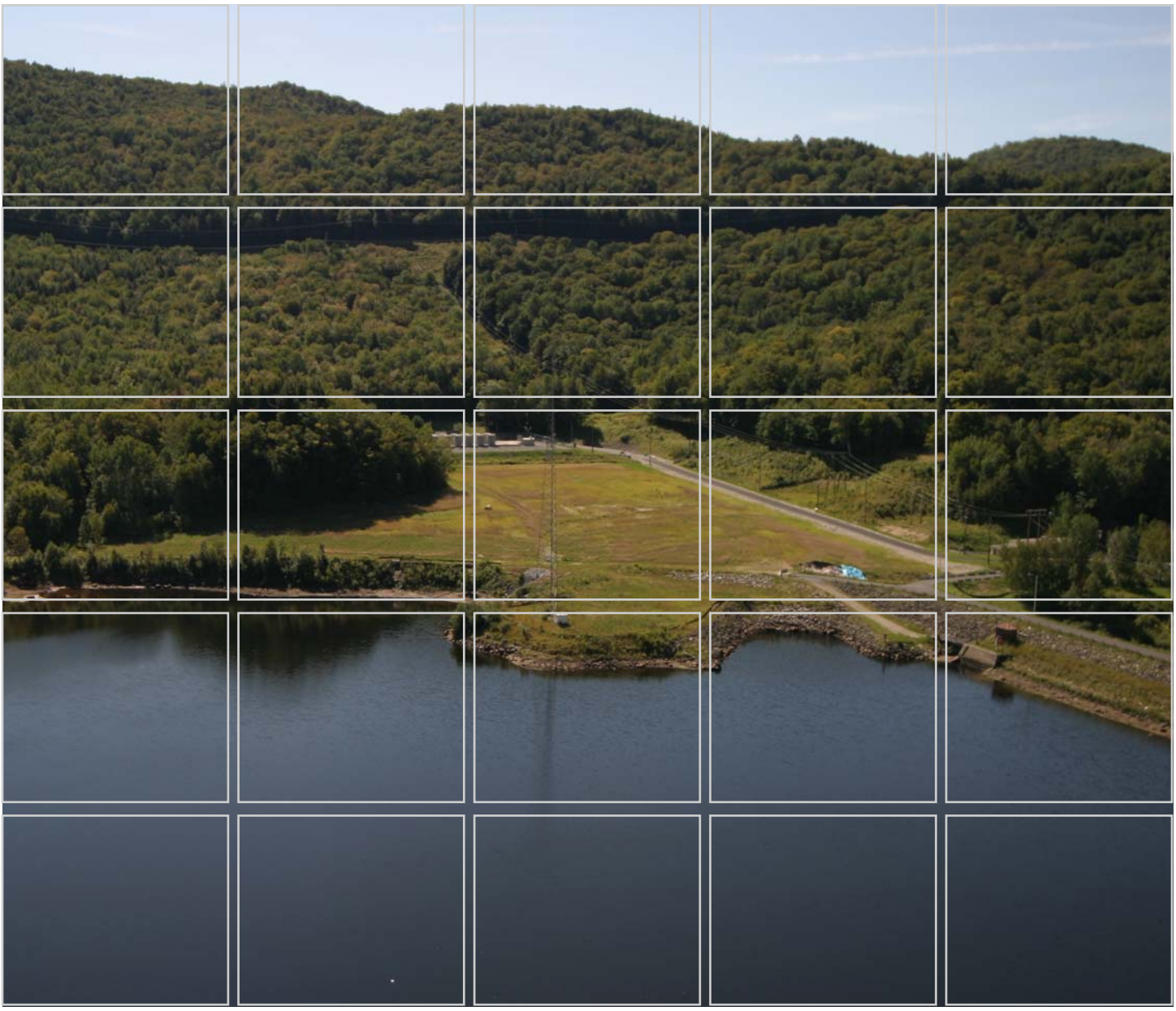
Sincerely,

YANKEE ATOMIC ELECTRIC CO

Robert Mitchell
ISFSI Manager

Enclosures: Class A-2 RAOP
Class A-3 RAOP
Class C-1 RAOP

cc: L. Hansen, MA DEP (WRO)
Public Repository at Greenfield Community College



Class A-2 Response Action Outcome Partial Statement

Outlying Areas

Yankee Nuclear Power Station
Rowe, Massachusetts
RTN 1-13411

25 February 2008

ERM
399 Boylston Street
Boston, MA 02116
(617) 646-7800
www.erm.com

Delivering sustainable solutions in a more competitive world

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 BACKGROUND

On behalf of Yankee Atomic Electric Company (YAEC), Environmental Resources Management (ERM) prepared this Partial Class A-2 Response Action Outcome (RAOP) Statement for a portion of the former Yankee Nuclear Power Station (YNPS), the "site", located at 49 Yankee Road, Rowe, Massachusetts (Figure 1). This Class A-2 RAOP represents a Permanent Solution for that portion of the site where a condition of no significant risk has been achieved.

This document was prepared in accordance with the requirements of the Massachusetts Contingency Plan (MCP) Section 310 of the Code of Massachusetts Regulations (CMR 40.1000), regulating release(s) of oil and/or hazardous materials (OHM) to the environment. The RAOP Statement Transmittal Form (BWSC 104) was submitted electronically and a copy is provided in Appendix A.

The Massachusetts Department of Environmental Protection (MA DEP) classified the site as a Tier IB Disposal Site due to releases of OHM to the environment associated with operation of the former YNPS, now fully decommissioned and the majority of the property was released from its operating license by the United States Nuclear Regulatory Commission (US NRC) in August 2007. Assessment and remedial response actions were completed under Tier IB Permit No. 54016. The MA DEP Release Tracking Number (RTN) for the site is 1-13411. This Class A-2 RAOP is being filed specific to that portion of the site where response actions were conducted to mitigate OHM impacts to levels that do not pose a significant risk of harm to human health, safety, public welfare, or the environment. This portion of the site is located outside of the former industrial area and is designated as the "Outlying Areas" (see Figure 2).

1.2 PURPOSE AND SCOPE

The purpose of this report is to document compliance with MCP requirements for achievement of a Permanent Solution as a Class A-2 RAOP for the portion of the site designated as the Outlying Area. This RAOP excludes the other remaining areas of the site subject to MCP compliance, specifically two other portions of the site designated as the

Central Area and the Combined Study Area, for which separate RAOP Statements (Class C-1 and Class A-3, respectively) will be filed.

The remainder of this report is organized as follows:

- **Section 2.0 – Site Description and Summary of Site Response Actions –** Includes a description of the site and a summary of past assessment and remedial response actions including soil excavation and disposal.

- **Section 3.0 – Achievement of Response Action Performance Standards** - This section summarizes key MCP performance standards specific to a Class A-2 Permanent Solution and documents how site conditions satisfy these criteria, including: elimination and control of sources; a summary of the Method 1 Risk Characterization; and an Evaluation of the Feasibility of Achieving Background.

- **Section 4.0 – Public Notification and Licensed Site Professional Opinion –** Describes documentation prepared to satisfy public notification requirements for achievement of a Class A-2 RAOP and provides the Licensed Site Professional's Opinion and reference to certification.

2.0 SITE DESCRIPTION AND SUMMARY OF RESPONSE ACTIONS

2.1 SITE DESCRIPTION

The former YNPS was located on an approximately 1,800-acre property at 49 Yankee Road in Rowe, Massachusetts (Figure 1). YAEC, owner and operator of YNPS, began construction of the power station in 1958. Operations as a 145-megawatt to 185-megawatt electric generating plant began in 1961. Commercial power generation activities ceased in 1992. Decommissioning activities were substantially completed in 2006 and License Reduction was approved by the NRC in 2007.

The site is located along the eastern shore of the Deerfield River adjacent to Sherman Dam, one of the several dams along the Deerfield River used for hydroelectric power generation. The YAEC property is divided into two parcels, separated by the Deerfield River (see Figure 1):

- Rowe Parcel – Approximately 1,800 acres located in the northwest corner of Rowe, Massachusetts, to the east of the Deerfield River. The former nuclear plant itself occupied approximately 12 of the 1,800 acres of the Rowe Parcel.

- Monroe Parcel – Approximately 89 acres located in Monroe, Massachusetts to the west of the Deerfield River.

The site property is owned by YAEC and portions of an adjacent property to the west are owned by TransCanada (see Figure 2).

All structures at the site, except for the guardhouse and Independent Spent Fuel Storage Installation (ISFSI), have been demolished. A new two-story office building was constructed next to the guardhouse in 2007. The ISFSI will continue to be guarded and monitored until the fuel is removed for permanent storage in accordance with applicable laws.

Concurrent with plant decommissioning, YAEC completed numerous environmental sampling campaigns for both radiological and non-radiological parameters to support the management of contaminated materials and environmental media and restoration of the site. These included the sampling of building surfaces and materials such as asphalt and concrete, in addition to environmental media including soil, soil gas, groundwater, surface water, sediments and fish. The management of

radioactive materials and media was completed in accordance with the requirements of the NRC and the MA DPH. The management of materials and/or media impacted by OHM was completed in accordance with applicable regulatory programs of the MA DEP and/or the US EPA.

Contaminated structures and media at the site have been remediated in accordance with applicable regulatory programs and the site was restored by re-grading and planting.

2.2 *SITE AND RAO BOUNDARIES*

The "disposal site," as defined in the MCP, is the area where OHM has come to be located. As such, three areas of the site where OHM was discovered and/or remediated are shown in Figure 2, including the:

- Central Area – Located in the center of the former industrial portion of the site, this area is defined by the location where the concentrations in groundwater exceeded the Massachusetts Drinking Water Quality Standards (DWQSs). Tritium and arsenic were the only compounds that remained above DWQSs following the completion of remedial actions. The locations where tritium and arsenic concentrations exceeded the DWQS is eligible for a Class C-1 RAOP, which applies to locations where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

- Combined Study Area – This area encompasses the remainder of the industrial portion of the site surrounding the Central Area (see Figure 2). Under a deed restriction preventing residential use of the property in the Combined Study Area, a condition of No Significant Risk to human health, the environment, public welfare and safety has been achieved as detailed in the Method 3 Risk Characterization (described in Section 3.4). Therefore, this area of the site is eligible for a Class A-2 RAOP.

- Outlying Areas – Outlying Areas are located to the south and southwest of the Combined Study Area as shown in Figure 2. Investigations completed during decommissioning activities identified impacts in these outlying areas. Response actions were conducted in some of the Outlying Areas to mitigate the impacts. A condition of No Significant Risk to human health, the environment, public welfare and safety has been achieved in the Outlying Areas

without the need for any restrictions in future use. Therefore, the Outlying Areas are eligible for a Class A-2 RAOP.

The subject of this Class A-2 RAOP is the Outlying Areas. The boundary of the Outlying Areas is consistent with the area where OHM were detected above MCP Reportable Concentrations during site investigation activities, including areas designated as the Furlon House, Relic Dump, Hair Pin Turn, ABC Parking Lot, and Drum in Woods (see Figure 2).

The boundary of the Outlying Areas does not include locations where sampling results were non-detect or were consistent with background, such as samples below the power lines and at the New Shooting Range (north of the Combined Study Area). Concentrations of some semi-volatile organic compounds were detected in one sample that was collected in the northeastern corner of the YAEC Property (Relic Log 001), approximately one mile northeast of the Combined Study Area (see Supplemental Phase II Comprehensive Site Assessment, dated 21 September 2006) However, since the sample results were below Reportable Concentrations and the sample was collected in an isolated area, the sample location was not considered to be part of the site and the results do not require separate reporting under the MCP.

2.3 SUMMARY OF RESPONSE ACTIONS

Since the initiation of plant decommissioning activities in 1992, YAEC has conducted numerous environmental sampling programs to support site decommissioning and proper management of materials and media contaminated by radiological and non-radiological constituents. Based on the results of site investigations for OHM, response actions including excavation of soil were planned and completed under the MCP Phase IV and Amended Phase III/IV Plans.

Excavated soils were either treated on-site or transported and disposed of at designated off-site facilities. A portion of the treated material was reused on-site as fill material. The remainder of the treated material was transported off-site to a non-hazardous waste facility. The untreated soils were transported off-site for disposal as remediation waste without on-site treatment.

The assessment and remediation of environmental media contaminated by OHM at the site under the MCP was documented in the following reports:

- IRA Completion Report, February 2001
- Release Abatement Measure (RAM) Completion Report, July 2005
- Phase I Initial Site Investigation Report, April 2001
- Phase II Comprehensive Site Assessment Report, April 2003
- Phase II Comprehensive Site Assessment Report, January 2005 (update of April 2003 Phase II)
- Supplemental Phase II Comprehensive Site Assessment Report, September 2006
- Addendum to Phase II Comprehensive Site Assessment, February 2007
- Phase III Remedial Action Plan Report, April 2003
- Phase IV Remedy Implementation Plan (Phase IV Plan), April 2004
- Amended Phase III Remedial Action Plan/Phase IV Remedy Implementation Plan (Amended Phase IIII/IV Plan), June 2005
- Phase IV Final Inspection Report, March 2007

In addition, the management of soil and sediment contaminated with PCBs within the Combined Study Area was regulated by the EPA under the requirements of the Toxic Substances Control Act (TSCA) and was documented in the following reports:

- TSCA Sediment Final Report, July 2006
- TSCA Soil Final Report, 1 March 2007

Radiological investigations and response actions were completed under the NRC requirements and compliance plans in support of the License Termination Plan (LTP). Final Status Survey reports documenting response actions completed to manage materials and media impacted by radiological constituents and certifying residual levels of radioactivity following completion of response actions were submitted to the NRC for final approval of license termination. Radiological surveys were completed between 2003 and 2007 and reports were submitted to the NRC between March 2006 and January 2007. NRC approval of the Final Status Surveys and License Reduction were issued in August 2007. NRC reports are available within the NRC website's document database.

3.0 ACHIEVEMENT OF RESPONSE ACTION PERFORMANCE STANDARDS

3.1 CLASS A-2 RESPONSE ACTION PERFORMANCE STANDARDS

This Class A-2 RAOP represents a Permanent Solution for the Outlying Areas of the site. An RAO A-2 is the appropriate category of RAO for the site because remedial response actions meet the following performance standards:

- In accordance with 310 CMR 40.1003, General Provisions for Response Action Outcomes, (3): a Response Action Outcome may be achieved and a Response Action Outcome Statement may be submitted for an entire site, disposal site, or a portion of a disposal site.

- In accordance with 310 CMR 40.1003, General Provisions For Response Action Outcomes, (5)(a): a Class A Response Action Outcome may be achieved for each source of OHM that has been eliminated or controlled.

- In accordance with 310 CMR 40.1036, Class A Response Action Outcomes (2)(a): a Permanent Solution has been achieved.

- In accordance with 310 CMR 40.1036, Class A Response Action Outcomes (2)(b): the levels of OHM in the environment have not been reduced to background.

- In accordance with 310 CMR 40.1036, Class A Response Action Outcomes (2)(c): one or more Activity and Use Limitations are not required to maintain a level of No Significant Risk.

- In accordance with 310 CMR 40.1036, Class A Response Action Outcomes(6)(b): a Class A RAO may be achieved following completion of Phase IV Comprehensive Response Action pursuant to 310 CMR 40.0870 and a Phase IV Comprehensive Response Action has been completed.

- In accordance with 310 CMR 40.1003(4): the boundary of the portion of the site to which this RAOP applies is shown in Figure 2.

3.2 *ELIMINATION AND CONTROL OF SOURCES OF OIL AND/OR HAZARDOUS MATERIALS*

3.2.1 *Overview*

As required by 310 CMR 40.1003(5)(a), a Class A RAOP cannot be achieved until each source of OHM, which is resulting or is likely to result in an increase in concentrations of OHM in an environmental medium, has been eliminated or controlled.

The following section describes the sources of the contamination, both radiological and non-radiological, that were mitigated with the remedial measures described in the Response Action Summary (Section 2.3) above.

3.2.2 *Site Non-Radiological Sources*

Non-radiological contamination at the site can be attributed to facility operation and maintenance during operations from 1961 to closure in 1992. Identified sources of release of OHM to the environment at the YNPS were eliminated either by removal of impacted materials (e.g., concrete, tanks, etc.) during site decommissioning activities or via abatement of impacted media via dredging, excavation, on-site treatment and reuse or off-site transportation and disposal. Potential sources in the Outlying Areas are described below.

PCBs

A portion of the Outlying Areas designated as the ABC Parking Lot (Figure 2) was investigated for PCB-containing paint impacts to soil. Painted concrete blocks, which were the source of the PCBs, were removed from the area. Therefore, the source has been eliminated.

Petroleum

Petroleum was detected in the Outlying Areas designated as the Drum in the Woods and the Furlon House (Figure 2). The source of impact at the Drum in the Woods was associated with a drum that had been discovered at that location. The drum was removed and soil removal activities were conducted in 2004 and 2005.

The source of petroleum at the Furlon House was associated with a former aboveground fuel oil tank that was located in building's basement. The tank and Furlon House have been removed. Therefore, there is no longer a source of petroleum at the Furlon House area.

Other

OHM were detected above MCP Reportable Concentrations in other areas, such as the Hair Pin Turn and Relic Dump, but no specific sources of impact were identified at the site.

3.2.3 Site Radiological Sources

The YNPS Historical Site Assessment, dated January 2004, noted that soils from the Industrial Area had been used to level the parking area at the Furlon House and that asphalt and concrete from the Industrial Area had been deposited at the ABC Parking Lot. Subsequent radiological surveys of those areas conducted as part of the Final Status Survey, documented that both areas were suitable for unrestricted use and that no sources exist in those areas.

3.3 DATA ASSESSMENT

Pursuant to 310 CMR 40.1056(2)(k), Gradient evaluated the usability and representativeness of the site soil and groundwater data used to support the risk characterization. The data usability assessments focused on the precision and accuracy of the data, while the representativeness focused on the spatial and temporal adequacy of the data set. The findings of the evaluations were documented in a series of Data Usability Reports, prepared by Gradient between 2004 and 2005.

3.4 RISK CHARACTERIZATION

Potential risks from the site as a whole were evaluated by Gradient Corporation in a Method 3 Risk Characterization report, dated November 2007. Since the Method 3 Risk Characterization relied on a number of land use restrictions, it did not include an evaluation of an unrestricted/residential use scenario. Therefore, in accordance with 310 CMR 40.0980, Gradient prepared a Method 2 Risk Characterization to evaluate potential risks in the Outlying Areas (i.e., Non Restricted Use Areas). A copy of the Method 2 Risk Characterization is provided in Appendix B.

The Method 2 Risk Characterization concluded that a condition of No Significant Risk of Harm to Human Health, the Environment, Public Welfare, and Safety was achieved in the Outlying Areas.

3.5 FEASIBILITY OF ACHIEVING BACKGROUND

The feasibility evaluation was conducted to satisfy the requirements of 310 CMR 40.1056(2)(e) and in accordance with the MA DEP Policy *Conducting Feasibility Evaluations under the MCP*, Policy #WSC-04-160.

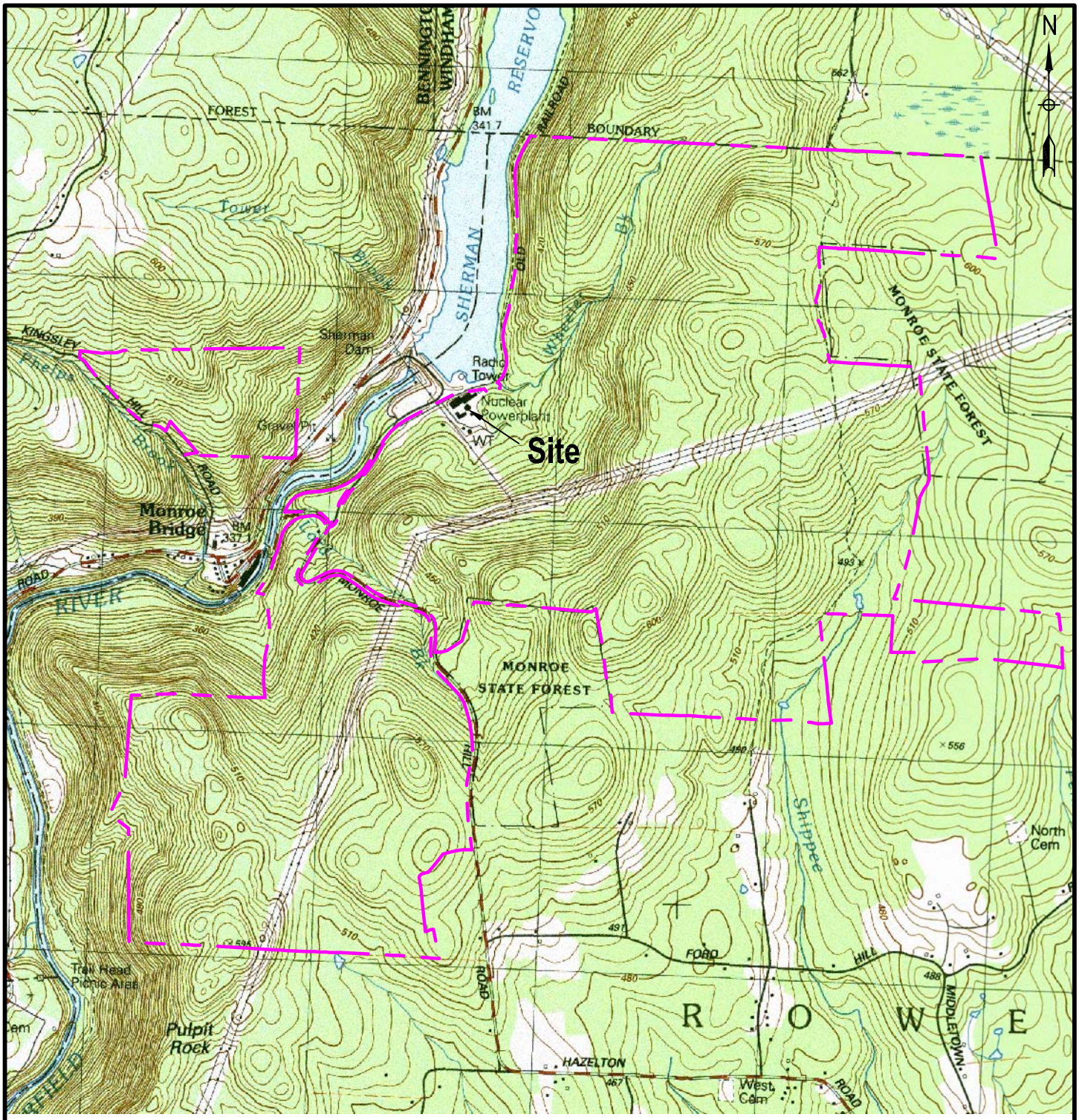
The only areas were remediation was conducted in the Outlying Areas was at the Furlon House and Drum in the Woods areas. In both cases, the remedial activities were conducted to address petroleum impacts in soil. As outlined in MA DEP's policy, achieving or approaching background is deemed infeasible for degradable (nonpersistent) compounds, such as petroleum. Therefore, no further evaluation is warranted.

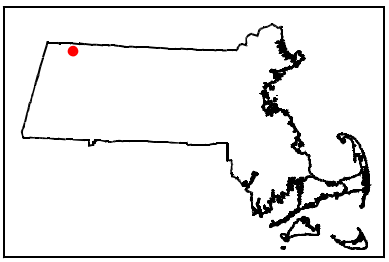
4.0 PUBLIC NOTIFICATION AND LICENSED SITE PROFESSIONAL OPINION

The public notification requirements of 310 CMR 40.1403(3)(f) have been met by providing notice of the filing and availability of this RAOP to the Chief Municipal Officer and Board of Health in the Town of Rowe, Massachusetts. A copy of the notification is provided in Appendix C.

The LSP opinion and certification are provided in Section G of BWSC-104. The original form was submitted using the MA DEP electronic submittal website with an additional hard copy sent to the MA DEP. A copy of the BWSC form is included in Appendix A.

Figures





YAEC Property Boundary

Scale 1:25,000

0.5 km 0 500 m

0.5 mi 0 1,000 ft

Figure 1 - Locus Map
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - TSCA Scil\Yankee TSCA Soil.dwg (07/20/04 Boston)

Legend
- Class A-2 RAO/Outlying Areas
- Class A-3 RAO/Combined Study Area
- Class C-1 RAO/Central Area
- Property Line

N

Sherman Reservoir
East Storm Drain Outfall
Deerfield River
Sherman Station
Trans Canada YAEC Property
Wheeler Brook
West Storm Drain Outfall
MW-111A/B/C
MW-107A/B/C/D/E/F
MW-101A/B/C
Tributary to Wheeler Brook
Guard House
West Storm Drain Ditch
Trans Canada YAEC Property
ISFSI
Wheeler Brook Divertment
ABC Parking Lot
Drum in Woods
Furlon House
Relic Dump
Hair Pin Turn

Scale (1"=400')
200' 0 200' 400' 800'

Figure 2 - RAO Boundaries
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - RAO 2008\Figure 2 & 3.dwg (02/22/2008 - 12:21pm Boston)

Appendix A – Copy of RAOP Statement Transmittal Form, BWSC-104

Print Cancel

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT
Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

For sites with multiple RTNs, enter the Primary RTN above.

A. SITE LOCATION:

1. Site Name/Location Aid: YANKEE ROWE ATOMIC PLANT

2. Street Address: 49 YANKEE RD

3. City/Town: ROWE 4. ZIP Code: 013670000

☑ 5. Check here if a Tier Classification Submittal has been provided to DEP for this disposal site. 4732699

☐ a. Tier IA ☑ b. Tier IB ☐ c. Tier IC ☐ d. Tier II 669611

6. If a Tier I Permit has been issued, provide Permit Number: 54016

B. THIS FORM IS BEING USED TO: (check all that apply)

1. List Submittal Date of RAO Statement (if previously submitted): _____ mm/dd/yyyy

☐ 2. Submit a **Response Action Outcome (RAO) Statement**

☐ a. Check here if this RAO Statement covers additional Release Tracking Numbers (RTNs). RTNs that have been previously linked to a Tier Classified Primary RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. ☐ - _____ ☐ - _____

☐ 3. Submit a **Revised Response Action Outcome Statement**

☐ a. Check here if this Revised RAO Statement covers additional Release Tracking Numbers (RTNs), not listed on the RAO Statement or previously submitted Revised RAO Statements. RTNs that have been previously linked to a Tier Classified Primary RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. ☐ - _____ ☐ - _____

☑ 4. Submit a **Response Action Outcome Partial (RAO-P) Statement**

Check above box, if any Response Actions remain to be taken to address conditions associated with this disposal site having the Primary RTN listed in the header section of this transmittal form. This RAO Statement will record only an RAO-Partial Statement for that RTN. A final RAO Statement will need to be submitted that references all RAO-Partial Statements and, if applicable, covers any remaining conditions not covered by the RAO-Partial Statements.

Also, specify if you are an Eligible Person or Tenant pursuant to M.G.L. c. 21E s.2, and have no further obligation to conduct response actions on the remaining portion(s) of the disposal site:

☐ a. Eligible Person ☐ b. Eligible Tenant

☐ 5. Submit an optional **Phase I Completion Statement** supporting an RAO Statement

☐ 6. Submit a **Periodic Review Opinion evaluating the status of a Temporary Solution** for a Class C-1 RAO Statement, as specified in 310 CMR 40.1051 (Section F is optional)

☐ 7. Submit a **Retraction** of a previously submitted **Response Action Outcome Statement** (Sections E & F are not required)

(All sections of this transmittal form must be filled out unless otherwise noted above)

C. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply; for volumes, list cumulative amounts)

- [ ] 1. Assessment and/or Monitoring Only
- [ ] 2. Temporary Covers or Caps
- [ ] 3. Deployment of Absorbent or Containment Materials
- [ ] 4. Treatment of Water Supplies
- [ ] 5. Structure Venting System
- [ ] 6. Engineered Barrier
- [ ] 7. Product or NAPL Recovery
- [ ] 8. Fencing and Sign Posting
- [ ] 9. Groundwater Treatment Systems
- [ ] 10. Soil Vapor Extraction
- [ ] 11. Bioremediation
- [ ] 12. Air Sparging
- [ ] 13. Monitored Natural Attenuation
- [ ] 14. In-situ Chemical Oxidation

- [x] 15. Removal of Contaminated Soils
  - [x] a. Re-use, Recycling or Treatment
    - [x] i. On Site — Estimated volume in cubic yards: **2,962**
    - [ ] ii. Off Site — Estimated volume in cubic yards:
      - iia. Facility Name: _____ Town: _____ State: _____
      - iib. Facility Name: _____ Town: _____ State: _____
      - iii. Describe: _____
  - [x] b. Landfill
    - [ ] i. Cover — Estimated volume in cubic yards: _____
      - Facility Name: _____ Town: _____ State: _____
    - [x] ii. Disposal — Estimated volume in cubic yards: **13,520**
      - Facility Name: **ENVIROCARE** Town: **CLIVE** State: **UT**

- [ ] 16. Removal of Drums, Tanks or Containers:
  - a. Describe Quantity and Amount: _____
  - b. Facility Name: _____ Town: _____ State: _____
  - c. Facility Name: _____ Town : _____ State: _____

- [ ] 17. Removal of Other Contaminated Media:
  - a. Specify Type and Volume: _____
  - b. Facility Name: _____ Town: _____ State: _____
  - c. Facility Name: _____ Town: _____ State: _____

C. DESCRIPTION OF RESPONSE ACTIONS (cont.): (check all that apply; for volumes, list cumulative amounts)

☑ 18. Other Response Actions:

Describe: **OTHER SOIL/SEDIMENT DISPOSAL SHIPPED TO: WASTE MANAGEMENT OF NEW HAMPSHIRE, ROCHESTER, NH (8,760 CUBIC YARDS), WASTE MANAGEMENT, MODEL CITY, NY (490 CUBIC YARDS)**

☐ 19. Use of Innovative Technologies:

Describe:

D. SITE USE:

1. Are the response actions that are the subject of this submittal associated with the *redevelopment, reuse* or the *major expansion of the current use* of property(ies) impacted by the presence of oil and/or hazardous materials?

☐ a. Yes ☑ b. No ☐ c. Don't know

2. Is the property a *vacant or under-utilized commercial or industrial* property ("a brownfield property")?

☐ a. Yes ☑ b. No ☐ c. Don't know

3. Will funds from a state or federal brownfield incentive program be used on one or more of the property(ies) within the disposal site?

☐ a. Yes ☑ b. No ☐ c. Don't know If Yes, identify program(s):

4. Has a Covenant Not to Sue been obtained or sought?

☐ a. Yes ☑ b. No ☐ c. Don't know

5. Check all applicable categories that apply to the person making this submittal: ☐ a. Redevelopment Agency or Authority

☐ b. Community Development Corporation ☐ c. Economic Development and Industrial Corporation

☐ d. Private Developer ☐ e. Fiduciary ☐ f. Secured Lender ☐ g. Municipality

☐ h. Potential Buyer (non-owner) ☐ i. Other, describe:

This data will be used by MassDEP for information purposes only, and does not represent or create any legal commitment, obligation or liability on the part of the party or person providing this data to MassDEP.

E. RESPONSE ACTION OUTCOME CLASS:

Specify the Class of Response Action Outcome that applies to the disposal site, or site of the Threat of Release.
Select **ONLY** one Class.

☐ **1. Class A-1 RAO**: Specify one of the following:

☐ a. Contamination has been reduced to background levels. ☐ b. A Threat of Release has been eliminated.

☑ **2. Class A-2 RAO:** You **MUST** provide justification that reducing contamination to or approaching background levels is infeasible.

☐ **3. Class A-3 RAO**: You **MUST** provide an implemented Activity and Use Limitation (AUL) and justification that reducing contamination to or approaching background levels is infeasible.

☐ **4. Class A-4 RAO**: You **MUST** provide an implemented AUL, justification that reducing contamination to or approaching background levels is infeasible, and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface or below an Engineered Barrier is infeasible. If the Permanent Solution relies upon an Engineered Barrier, you must provide or have previously provided a Phase III Remedial Action Plan that justifies the selection of the Engineered Barrier.

E. RESPONSE ACTION OUTCOME CLASS (cont.):

☐ **5. Class B-1 RAO: Specify one of the following:**

☐ a. Contamination is consistent with background levels ☐ b. Contamination is **NOT** consistent with background levels.

☐ **6. Class B-2 RAO**: You **MUST** provide an implemented AUL.

☐ **7. Class B-3 RAO**: You **MUST** provide an implemented AUL and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface is infeasible.

☐ **8. Class C-1 RAO**: You must submit a plan as specified at 310 CMR 40.0861(2)(h). Indicate type of ongoing response actions.

☐ a. Active Remedial System ☐ b. Active Remedial Monitoring Program ☐ c. None

☐ d. Other Specify:

☐ **9. Class C-2 RAO**: You must hold a valid Tier I Permit or Tier II Classification to continue response actions toward a Permanent Solution.

F. RESPONSE ACTION OUTCOME INFORMATION:

1. Specify the Risk Characterization Method(s) used to achieve the RAO described above:

☐ a. Method 1 ☑ b. Method 2 ☐ c. Method 3

☐ d. Method Not Applicable-Contamination reduced to or consistent with background, or Threat of Release abated

2. Specify all Soil Category(ies) applicable. More than one Soil Category may apply at a Site. Be sure to check off all **APPLICABLE** categories:

☑ a. S-1/GW-1 ☑ d. S-2/GW-1 ☑ g. S-3/GW-1

☐ b. S-1/GW-2 ☐ e. S-2/GW-2 ☐ h. S-3/GW-2

☑ c. S-1/GW-3 ☑ f. S-2/GW-3 ☑ i. S-3/GW-3

3. Specify all Groundwater Category(ies) impacted. A site may impact more than one Groundwater Category. Be sure to check off all **IMPACTED** categories:

☑ a. GW-1 ☐ b. GW-2 ☑ c. GW-3 ☐ d. No Groundwater Impacted

4. Specify remediation conducted:

☑ a. Check here if soil remediation was conducted.

☐ b. Check here if groundwater remediation was conducted.

5. Specify whether the analytical data used to support the Response Action Outcome was generated pursuant to the Department's Compendium of Analytical Methods (CAM) and 310 CMR 40.1056:

☐ a. CAM used to support all analytical data. ☑ b. CAM used to support some of the analytical data.

☐ c. CAM not used.

☑ 6. Check here to certify that the Class A, B or C Response Action Outcome includes a Data Usability Assessment and Data Representativeness Evaluation pursuant to 310 CMR 40.1056.

7. Estimate the number of acres this RAO Statement applies to: 18

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

G. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that either an **RAO Statement, Phase I Completion Statement and/or Periodic Review Opinion** is being provided,* the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 6423

2. First Name: JOHN W 3. Last Name: MCTIGUE

4. Telephone: (617) 267-8377 5. Ext.: 6. FAX:

7. Signature: JOHN W MCTIGUE

8. Date: 02/27/2008
mm/dd/yyyy

9. LSP Stamp:

H. PERSON MAKING SUBMITTAL:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☑ c. change in the person undertaking response actions

2. Name of Organization: YANKEE ATOMIC ELECTRIC COMPANY

3. Contact First Name: ROBERT 4. Last Name: MITCHELL

5. Street: 49 YANKEE ROAD 6. Title: ISFSI MANAGER

7. City/Town: ROWE 8. State: MA 9. ZIP Code: 01367-0000

10. Telephone: (413) 424-5261 11. Ext.: 303 12. FAX:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

I. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON MAKING SUBMITTAL:

☑ 1. RP or PRP ☑ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☐ e. Other RP or PRP Specify:

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Making Submittal Specify Relationship:

J. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☐ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of an RAO Statement that relies on the public way/rail right-of-way exemption from the requirements of an AUL.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of a RAO Statement with instructions on how to obtain a full copy of the report.

☑ 4. Check here to certify that documentation is attached specifying the location of the Site, or the location and boundaries of the Disposal Site subject to this RAO Statement. If submitting an RAO Statement for a PORTION of a Disposal Site, you must document the location and boundaries for both the portion subject to this submittal and, to the extent defined, the entire Disposal Site.

☐ 5. Check here to certify that, pursuant to 310 CMR 40.1406, notice was provided to the owner(s) of each property within the disposal site boundaries, or notice was not required because the disposal site boundaries are limited to property owned by the party conducting response actions. (check all that apply)

- ☐ a. Notice was provided prior to, or concurrent with the submittal of a Phase II Completion Statement to the Department.
- ☐ b. Notice was provided prior to, or concurrent with the submittal of this RAO Statement to the Department.
- ☐ c. Notice not required. d. Total number of property owners notified, if applicable:

☐ 6. Check here if required to submit one or more AULs. You must submit an AUL Transmittal Form (BWSC113) and a copy of each implemented AUL related to this RAO Statement. Specify the type of AUL(s) below: (required for Class A-3, A-4, B-2, B-3 RAO Statements)

- ☐ a. Notice of Activity and Use Limitation b. Number of Notices submitted:
- ☐ c. Grant of Environmental Restriction d. Number of Grants submitted:

☐ 7. If an RAO Compliance Fee is required for any of the RTNs listed on this transmittal form, check here to certify that an RAO Compliance Fee was submitted to DEP, P. O. Box 4062, Boston, MA 02211.

☐ 8. Check here if any non-updatable information provided on this form is incorrect, e.g. Site Address/Location Aid. Send corrections to the DEP Regional Office.

☑ 9. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

K. CERTIFICATION OF PERSON MAKING SUBMITTAL:

1. I, **ROBERT MITCHELL**, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: **ROBERT MITCHELL** (Signature)

3. Title: **ISFSI MANAGER**

4. For: **YANKEE ATOMIC ELECTRIC COMPANY** (Name of person or entity recorded in Section H)

5. Date: **02/26/2008** mm/dd/yyyy

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section H.

7. Street:

8. City/Town:

9. State:

10. ZIP Code:

11. Telephone:

12. Ext.:

13. FAX:

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

Received by DEP on

2/27/2008 8:44:30 AM

Appendix B – Method 1 Risk Characterization

Memorandum

To: John McTigue, Gregg Demers, Joe Bourassa **Date:** February 19, 2008

From: David Merrill

Subject: Method 2 Risk Characterization – Non Restricted Use Areas (Non RUA)
Yankee Nuclear Power Station

Gradient has prepared the following analysis as an addendum to the Method 3 Risk Characterization, Yankee Nuclear Power Station, submitted in November, 2007 to the Massachusetts Department of Environmental Protection (MADEP).

As described in the Risk Characterization, Restricted Use Areas (RUA) are in place over certain portions of the YAEC property. The restrictions preclude future residential development in the RUA. Because the RUAs preclude residential development, the Method 3 Risk Characterization did not evaluate hypothetical future residential scenarios at the YNPS site for the areas covered by the RUAs.

This addendum presents available data for areas where no land use restrictions are in-place. In the Method 3 Risk Characterization, these areas outside the RUA on the YAEC property were not evaluated for a possible "residential use" scenario. The risk analysis in this addendum, together with the methods and site characteristics documented in the Method 3 Risk Characterization, satisfies the requirements for a Method 2 Risk Characterization pursuant to the Massachusetts Contingency Plan (MCP). Specifically, this Method 2 Risk Characterization includes:

- Screening of data and identification of chemicals of potential concern (COPCs) above background;
- Estimation of EPCs for COPCs (average and maxima);
- Screening of EPCs for oil and hazardous material (OHM) against Method 1 Standards;
- Adoption of available screening criteria as Method 2 standards for COPCs for which Method 1 standards do not exist (i.e. radionuclides); and
- A conclusion that residual concentrations of OHM and radionuclides (COPCs) in soil in the non-RUA do not pose a condition of significant risk for unrestricted land use.

20 University Road, Cambridge, MA 02138 • (617) 395-5000 • Facsimile (617) 395-5001 • www.gradientcorp.com

Documentation satisfying the remaining MCP requirements for a Method 2 Risk Characterization pursuant to 310 CMR 40.0980 (*e.g.*, definition of site soil and groundwater classifications) are included in the Method 3 Risk Characterization.

Figure 1 (attached) shows the soil sample locations from the non-RUA areas for oil and hazardous materials (OHM) constituents, including the ABC Rubble Area, Hairpin Turn Area, Old Shooting range, Visitor Center/Furlon House Area, samples from a relic drum, and several samples in road drainage swales. In addition to OHM samples, radionuclide samples were collected during the Final Status Survey (FSS) in OOL-16, OOL-17, and OOL-18 as shown on Figure 1.

Gradient compiled and reviewed the above-described soil sample results for OHM and radionuclides and compared them to MCP S-1 values (OHM) and US EPA (2000) Soil Screening Levels (SSLs) for Radionuclides.[1] As summarized in Table 1-1, with the exception of two chromium results, and one lead result, all of the OHM results from the non-RUA areas are below the MCP S-1 concentrations. As summarized in Table 1-2, of the detected radionuclides in the non-RUA area, Cs-137 is within the range of local background, and the maximum detected Cs-134, Eu-155, and Sb-125 are below their respective US EPA SSLs (the comparison to US EPA SSLs is based on the minimum SSL for direct radiation, inhalation of fugitive dust, ingestion of soil, and vegetable intake).

A single lead result from SB116 (360 mg/kg) collected in 2003 at a depth of 2-3 ft bgs exceeds its MCP S-1 value of 300 mg/kg. Re-sampling of the SB116 area in 2006 (6 samples from the 2 – 3 ft bgs interval), revealed all samples were below the S-1 criteria for lead (ranging from 98.5 mg/kg up to 171 mg/kg). Not only is the 2003 sample considered anomalous, the average lead concentration for non-RUA samples (46.7 mg/kg) is well below the S-1 value of 300 mg/kg, as is the 95% Upper Confidence Limit on the Arithmetic Mean (95% UCLM) value of 55.5 mg/kg.[2]

Two soil samples designated "Relic-Drum" samples collected in 2006 had chromium results above its S-1 value of 30 mg/kg (39 mg/kg and 43.9 mg/kg). These isolated samples are not considered to pose a health risk for several reasons. The average chromium concentration in non-RUA soil samples is 14.8 mg/kg, which is below the S-1 value for chromium. In addition, the median chromium

[1] US EPA, Office of Radiation and Indoor Air, October 2000. "Soil screening guidance for radionuclides: Technical background document." NTIS PB2000-963306; EPA-540/R-00/006

[2] According to the MCP Section 40.0926 in a Method 1 Risk Characterization, the exposure point concentrations for comparison to the S-1 values are based on a conservative estimate of the arithmetic mean (*e.g.*, Method 1 does not require comparison of the maximum concentration to the S-1 values).

concentration in non-RUA soil samples (12.9 mg/kg) is comparable to the median local background chromium concentration (14.6 mg/kg). Finally, the 95% UCLM is 15.9 mg/kg for the 30 chromium samples in the non-RUA areas, which again is lower than the MCP S-1 value of 30 mg/kg. These two chromium results reflect slightly elevated concentrations of chromium in soil. They do not represent a "hot spot" or pose any greater likelihood of exposure than anywhere else at the site. The EPC comparison to the MCP S-1 on the basis of the 95% UCLM is appropriate pursuant to the MCP.

On the basis of this analysis following MCP Method 2 Risk Characterization guidelines, the non-RUA areas of the Yankee Nuclear Power Station site satisfies a condition of No Significant Risk of Harm to Human Health and the Environment, and no risk management restrictions are required for the non-RUA areas of the site.

PATH: T:\204017\GraphicsGroup\100\FinalMaps\204017-100_46

SB157
SB157 0 : 6
SB157 24 : 36
SB157 48 : 60
SB157 60 : 72
SB156
SB156 0 : 6
SB156 72 : 84
SB-156-R 24 : 36
SB-156-R 60 : 72
SB-156-R 120 : 132
SB155 0 : 6
SB155 24 : 36
SB158
SB158 0 : 6
SB158 24 : 36
SB158 60 : 72
SB-157-R 24 : 36
SB-157-R 84 : 96
SB-158-R 24 : 36
SB-158-R 60 : 72
FLH-06 0 : 3
FLH-06 12 : 24
FLH-05 0 : 3
FLH-05 12 : 24
FLH-03 0 : 3
FLH-03 12 : 24
SB159 0 : 6
SB159 24 : 36
FLH-04 0 : 3
FLH-04 12 : 24
FLH-02 0 : 3
FLH-02 12 : 24
FLH-01 0 : 3
FLH-01 12 : 24
FLH-07 0 : 3
FLH-07 12 : 24
SB-517 60 : 72
SB-517 72 : 84

Inset A

Sherman Reservoir
Sherman Dam
Wheeler Brook
ISFSI Area
Wheeler Brook Divertment
Deerfield River
Trans Canada YAEC
Restricted Use Area (RUA)

SB133 0 : 6
SB133 12 : 24
SB132 0 : 6
SB132 24 : 36
SB153 0 : 6
SB153 24 : 36
SB154 0 : 6
SB154 12 : 24
EX-ABC-002
EX-ABC-004
EX-ABC-001
EX-ABC-003
EX-ABC-006
EX-ABC-005
SB148 0 : 6
SB148 24 : 36
SB149 0 : 6
SB149 24 : 36
SB150 0 : 6
SB150 24 : 36

See Inset A

TP4
TP4 0 : 24
RELIC3-Drum1-003I 0 : 3
RELIC3-Drum2-003I 0 : 3
SB116 0 : 6
SB116 24 : 36
SB117 0 : 6
SB117 12 : 24
SB118 0 : 6
SB118 12 : 24
SB116N 24 : 36
SB116S 24 : 36
SB116C 24 : 36
SB116CD 24 : 36
SB116E 24 : 36
SB116W 24 : 36

FSS Study Areas

Deerfield River
OOL-17
OOL-16
OMB-05
OOL-18 Unit 1

Relic Log Samples

Relic-log-001
Relic-log-002

LEGEND

- Non AUL Soil Sample Locations

SB116
0 : 6

Sample ID
Upper depth : Lower depth

All depths in inches.

Note : Former structures and plant features shown for reference. These no longer exist.

N

0 400 800 Feet

Gradient CORPORATION
20 UNIVERSITY ROAD • CAMBRIDGE, MA 02138 • (617)395-5000

FIGURE 1

Non RUA Soil Sample Locations

Yankee Nuclear Power Station,
Rowe, MA

Drawing By:	RJAM	Checked By:	DEM	Project No.:	204017
Date:	02/07/08	Date:	02/07/08	File:	204017-100_46

Table 1-1
YAEC Soil Samples -- Outside Restricted Use Area / Outlying Miscellaneous Samples
Yankee Nuclear Power Station, Rowe, MA

Oil or Hazardous Materials	YAEC Non-RUA Samples						Background		DEP criteria [2]	Maximum Exceeds DEP criteria?	Comment
	Number Detected	Number Sampled	Percent Detected	Average	Median	Maximum [1]	Median	Maximum [1]			
Inorganics (mg/Kg)											
Arsenic	28	30	93%	3.06	2.05	18.90	1.85	5.61	20	No	
Barium	3	3	100%	44.30	35.90	67.70			1000	No	
Cadmium	3	30	10%	0.47	0.39	1.39	0.50	0.79	2	No	
Chromium	30	30	100%	14.81	13.50	43.90	14.65	34.00	30	Yes	2 Relic Drum samples > S-1
Copper	27	27	100%	23.81	12.00	330.00	6.15	18.70	1000	No	
Lead	34	34	100%	46.70	12.95	360.00	3.80	101.00	300	Yes	1 sample > S-1
Mercury	3	30	10%	0.27	0.29	0.14	0.36	0.32	20	No	
Nickel	27	27	100%	12.06	11.00	16.00	8.73	29.00	20	No	
Selenium	10	30	33%	3.36	1.30	11.00	1.55	2.45	400	No	
Zinc	27	27	100%	58.30	40.00	460.00	53.90	75.80	2500	No	
Polychlorinated Biphenyls (µg/Kg)											
Aroclor-1254	13	28	46%	77.50	21.50	580.00			2000	No	
Aroclor-1260	14	28	50%	25.50	19.30	70.70			2000	No	
Semivolatile Organic Compounds (µg/Kg)											
Acenaphthylene	3	11	27%	231.82	180.00	190.00	205.00	96.50	100000	No	
Anthracene	3	11	27%	223.55	180.00	130.00	205.00	48.00	1000000	No	
Benzo(a)anthracene	7	11	64%	235.18	200.00	420.00	214.50	232.00	7000	No	
Benzo(a)pyrene	7	11	64%	248.27	200.00	490.00	205.00	219.00	2000	No	
Benzo(b)fluoranthene	5	11	45%	238.64	200.00	370.00	215.00	533.00	7000	No	
Benzo(g,h,i)perylene	5	11	45%	252.64	200.00	340.00	200.00	105.00	1000000	No	
Benzo(k)fluoranthene	4	11	36%	265.91	200.00	340.00	205.00	217.00	70000	No	
Chrysene	7	11	64%	255.91	200.00	550.00	200.00	337.00	7000	No	
Di-n-butyl phthalate	3	11	27%	222.00	200.00	84.00	ND	ND	50000	No	
Fluoranthene	8	11	73%	390.73	200.00	770.00	215.00	552.00	1000000	No	
Indeno(1,2,3-cd)pyrene	2	11	18%	247.73	200.00	260.00	205.00	119.00	7000	No	
Naphthalene	0	11	0%	249.09	200.00		ND	ND	500000	No	
Phenanthrene	4	11	36%	318.64	200.00	600.00	215.00	357.00	1000000	No	
Pyrene	7	11	64%	414.09	200.00	930.00	215.00	773.00	1000000	No	
Volatile Organic Compounds (µg/Kg)											
2-Butanone	3	5	60%	363.68	59.00	130.00			500000	No	
Acetone	3	5	60%	1042.40	730.00	869.00			500000	No	
Benzene	1	5	20%	34.74	5.90	6.30			30000	No	
Bromomethane	1	5	20%	69.08	10.40	5.00			50000	No	
Naphthalene - VOC	1	5	20%	34.24	4.00	3.80			500000	No	
Toluene	3	5	60%	35.88	5.90	14.00			500000	No	
Total Petroleum Hydrocarbons (mg/Kg)											
TPH-DRO	21	23	91%	41.22	13.00	320.00			800	No	
Extractable Petroleum Hydrocarbons (mg/Kg)											
Adjusted C11-C22 Aromatics	1	18	6%	17.84	15.48	29.90	ND	ND	800	No	
Adjusted TPH	3	18	17%	23.79	15.88	90.40	ND	ND	800	No	
Unadjusted C11-C22 Aromatic	3	27	11%	15.08	15.30	29.90	ND	ND	800	No	
Unadjusted C19-C36 Aliphatics	1	27	4%	14.02	15.20	25.50	ND	ND	3000	No	
Unadjusted C9-C18 Aliphatics	3	27	11%	14.75	15.20	37.40	ND	ND	1000	No	
Unadjusted TPH	3	18	17%	23.79	15.88	90.40	ND	ND	800	No	
Volatile Petroleum Hydrocarbons (mg/Kg)											
Adjusted C9-C10 Aromatics	3	16	19%	0.95	0.14	8.60	4.71	89.00	100	No	
Adjusted C9-C12 Aliphatics	13	16	81%	0.85	0.12	7.36	2.99	35.30	1000	No	
Unadjusted C5-C8 Aliphatics	16	25	64%	2.21	1.15	2.17	2.71	4.95	100	No	
Unadjusted C9-C12 Aliphatics	16	25	64%	2.74	0.95	16.00	7.65	124.00	1000	No	

Notes

Includes all samples from Non-RUA and Outlying Miscellaneous Study Areas.

1 - In cases where the maximum is higher than the average and/or median concentrations, it is due to high detection limits

2 - MADEP S-1 Criteria. For analytes with no reported S-1 value, the MADEP Reportable S-1 Value was used.

Averages and medians calculated using those detected and 1/2 the detection limit of those not detected

ND - Not Detected

Blank - Not analyzed

Table 1-2
Radionuclide COPCs in Soil -- YAEC Non-RUA Samples
Yankee Nuclear Power Station, Rowe, MA

Radionuclide	YAEC Non-RUA Samples						Detected > 5%	Background[1]	Detected > Background?	Min EPA SSL[2] (pCi/g)	Comment
	Number Detected	Number Sampled	Percent Detected	Average (pCi/g)	Standard Deviation (pCi/g)	Maximum (pCi/g)		Maximum (pCi/g)			
Ag-108m	0	79	0%				No	ND	No	No	Not detected
Am-241	0	79	0%				No	ND	No	No	Not detected
Co-60	0	79	0%				Yes	ND	No	Yes	Not detected
Cs-134	3	76	4%	0.020	0.010	0.024	No	ND	Yes	0.159	Less than EPA SSL
Cs-137	13	79	16%	0.040	0.050	0.300	Yes	2.16	No	No	Background
Eu-152	0	79	0%				No	ND	No	No	Not detected
Eu-154	0	79	0%				No	ND	No	No	Not detected
Eu-155	1	79	1%	0.100	0.030	0.147	No	ND	No	3.83	Less than EPA SSL
Mn-54	0	79	0%				No	ND	No	No	Not detected
Nb-94	0	79	0%				No	ND	No	No	Not detected
Sb-125	4	74	5.4%	0.060	0.020	0.169	Yes	ND	Yes	0.463	Less than EPA SSL
C-14	0	6	0%				Yes		No	No	Not detected
Cm-243	0	6	0%				No		No	No	Not detected
Fe-55	0	6	0%				No		No	No	Not detected
H-3	0	6	0%				Yes		No	No	Not detected
Ni-63	0	6	0%				No		No	No	Not detected
Pu-238	0	6	0%				No		No	No	Not detected
Pu-239	0	6	0%				No		No	No	Not detected
Pu-241	0	6	0%				No		No	No	Not detected
Sr-90	0	6	0%				No	1.142	No	No	Not detected
Tc-99	0	6	0%				No		No	No	Not detected

Notes: *ND - Not detected (only Sr-90 had background samples for HTD radionuclides)*

Mean and standard deviation use ½ detection limit (MDC) for non-detects (not calculated if not detected)

Negative activities as reported by the lab are an artifact of adjusting for instrument background interferences.

1) Soil background samples collected from REF-01, Non-Impacted Area, and Pelham Lake.

2) Minimum value of decay-corrected US EPA SSL (minimum of direct radiation, homegrown produce ingestion, soil ingestion, inhalation of fugitive dust)

Table 1-3
Inorganic Results for Soil Samples from Non-RUA Areas (mg/kg)
YNPS Rowe, MA

Station		**SB116**	**SB116**	**SB116C**	**SB116CD**	**SB116E**	**SB116N**	**SB116S**	**SB116W**	**SB117**	**SB117**	**SB118**
Sample ID		**SB1160006I**	**SB1160203F**	**SB116C-0203F**	**SB116CD-0203F**	**SB116E-0203F**	**SB116N-0203F**	**SB116S-0203F**	**SB116W-0203F**	**SB1170006I**	**SB1170102F**	**SB1180006I**
Upper Depth		**0**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**0**	**12**	**0**
Lower Depth		**6**	**36**	**36**	**36**	**36**	**36**	**36**	**36**	**6**	**24**	**6**
Date Sampled		**10/15/2003**	**10/15/2003**	**6/5/2006**	**6/5/2006**	**6/5/2006**	**6/5/2006**	**6/5/2006**	**6/5/2006**	**10/15/2003**	**10/15/2003**	**10/15/2003**
Split Sample												
Sample Type	**MCP S-1**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**
Antimony	20	R	R							R	R	R
Arsenic	20	3.7	2.5							2.8	3.1	4.9
Barium	1000											
Beryllium	0.7	0.81 U	0.88 U							0.92 U	0.97 U	0.81 U
Cadmium	2	0.77 U	0.84 U							0.87 U	0.92 U	0.77 U
Chromium	30	12	17							16	15	17
Copper*		11 J	330 J							14 J	13 J	9.3 J
Lead	300	57 J	360 J	162	171	110	120	98.5	110	8.9 J	4.2 J	17 J
Mercury	20	0.61 U	0.68 U							0.65 U	0.72 U	0.6 U
Nickel	20	11 J	13 J							14 J	11 J	14 J
Selenium	400	2.4 U	2.6 U							2.7 U	2.9 U	2.4 U
Silver	100	0.24 U	0.26 U							0.28 U	0.29 U	0.24 U
Thallium	8	0.57 U	0.57 U							0.64 U	0.68 U	0.57 U
Zinc	2500	58 J	460 J							55 J	41 J	40 J

*Reportable S-1 value.

J-estimated value; U-not detected (value is the detection limit); UJ-nondetect (estimated detection limit); R-rejected
Blank results indicate chemical not analyzed

Table 1-3
Inorganic Results for Soil Samples from Non-RUA Areas (mg/kg)
YNPS Rowe, MA

Station		**SB118**	**SB132**	**SB132**	**SB133**	**SB133**	**SB153**	**SB153**	**SB154**	**SB154**	**SB155**	**SB155**	**SB156**
Sample ID		**SB1180102F**	**SB1320006I**	**SB1320203F**	**SB1330006I**	**SB1330102F**	**SB1530006I**	**SB1530203F**	**SB1540006I**	**SB1540102F**	**SB1550006I**	**SB1550203F**	**SB1560006I**
Upper Depth		**12**	**0**	**24**	**0**	**12**	**0**	**24**	**0**	**12**	**0**	**24**	**0**
Lower Depth		**24**	**6**	**36**	**6**	**24**	**6**	**36**	**6**	**24**	**6**	**36**	**6**
Date Sampled		**10/15/2003**	**10/21/2003**	**10/21/2003**	**10/21/2003**	**10/21/2003**	**10/15/2003**	**10/15/2003**	**10/15/2003**	**10/15/2003**	**10/15/2003**	**10/15/2003**	**10/28/2003**
Split Sample													
Sample Type	**MCP S-1**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**
Antimony	20	R	R	R	R	R	R	R	R	R	R	R	R
Arsenic	20	2.3	1.6 J	1.3 J	2.1 J	1 J	2.5	0.88	2.1	1.7	3	2.3	1.3 J
Barium	1000												
Beryllium	0.7	0.93 U	0.76 U	0.74 U	0.87 U	0.79 U	0.83 U	0.74 U	0.83 U	0.81 U	0.79 U	0.81 U	0.79 UJ
Cadmium	2	0.88 U	0.73 U	0.7 U	0.83 U	0.75 U	0.79 U	0.7 U	0.79 U	0.77 U	0.75 U	0.77 U	0.75 UJ
Chromium	30	11	7.4	10	12	14	13	9.8	14	11	12	11	15 J
Copper*		9.8 J	11	14	13	17	10 J	18 J	12 J	11 J	9.5 J	10 J	18 J
Lead	300	81 J	0.79 J	1.1 J	1.7 J	0.97 J	4.2 J	0.51 J	46 J	40 J	26 J	17 J	1.8 J
Mercury	20	0.62 U	0.51 U	0.4 U	0.56 U	0.53 U	0.58 U	0.43 U	0.62 U	0.65 U	0.67 U	0.64 U	0.4 UJ
Nickel	20	10 J	8.8	9.8	15	16	13 J	11 J	14 J	11 J	12 J	10 J	15 J
Selenium	400	2.7 U	2.3 U	2.2 U	2.6 U	2.3 U	2.5 U	2.2 U	2.5 U	2.4 U	2.3 U	2.4 U	11 J
Silver	100	0.28 U	0.23 U	0.22 U	0.26 U	0.24 U	0.25 U	0.22 U	0.25 U	0.24 U	0.24 U	0.24 U	0.24 UJ
Thallium	8	0.65 U	0.53 U	0.52 U	0.61 U	0.55 U	0.58 U	0.51 U	0.58 U	0.57 U	0.55 U	0.57 U	0.55 UJ
Zinc	2500	40 J	29	40	58	49	38 J	37 J	39 J	33 J	34 J	38 J	55 J

*Reportable S-1 value.

J-estimated value; U-not detected (value is the detection limit); UJ-nondetect (estimated detection limit); R-rejected
Blank results indicate chemical not analyzed

Table 1-3
Inorganic Results for Soil Samples from Non-RUA Areas (mg/kg)
YNPS Rowe, MA

Station		**SB156**	**SB157**	**SB157**	**SB157**	**SB158**	**SB158**	**SB158**	**SB158**	**SB158**	**SB159**	**SB159**
Sample ID		**SB1560607F**	**SB1570006I**	**SB1570405F**	**SB1570506F**	**FD207-102803**	**MSSB0506F102803**	**SB1580006I**	**SB1580203F**	**SB1580506F**	**SB1590006I**	**SB1590203F**
Upper Depth		**72**	**0**	**48**	**60**	**24**		**0**	**24**	**60**	**0**	**24**
Lower Depth		**84**	**6**	**60**	**72**	**36**		**6**	**36**	**72**	**6**	**36**
Date Sampled		**10/28/2003**	**10/28/2003**	**10/28/2003**	**10/28/2003**	**10/28/2003**	**10/28/2003**	**10/28/2003**	**10/28/2003**	**10/28/2003**	**10/28/2003**	**10/28/2003**
Split Sample						**SB1580203F**						
Sample Type	**MCP S-1**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Duplicate**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**	**Field Sample**
Antimony	20	R	R	R	R	R	R	R	R	R	R	R
Arsenic	20	0.16 UJ	2.2 J	1.2 J	0.89 J	1.5 J	1.6 J	0.17 UJ	0.93 J	1.4 J	1.9 J	2 J
Barium	1000											
Beryllium	0.7	0.77 UJ	0.78 UJ	0.78 UJ	0.76 UJ	0.81 UJ	0.82 UJ	0.77 UJ	0.83 UJ	0.76 UJ	0.81 UJ	0.86 UJ
Cadmium	2	0.74 UJ	0.74 UJ	0.74 UJ	0.72 UJ	0.77 UJ	0.78 UJ	0.73 UJ	0.79 UJ	0.73 UJ	0.77 UJ	0.82 UJ
Chromium	30	17 J	15 J	14 J	17 J	15 J	11 J	10 J	10 J	16 J	11 J	16 J
Copper*		3.8 J	14 J	16 J	13 J	21 J	14 J	14 J	8.3 J	9.6 J	12 J	7.5 J
Lead	300	R	2.5 J	1.6 J	0.6 J	1.4 J	1.3 J	R	0.5 J	1.4 J	2 J	0.83 J
Mercury	20	0.54 UJ	0.52 UJ	0.53 UJ	0.54 UJ	0.59 UJ	0.64 UJ	0.59 UJ	0.55 UJ	0.6 UJ	0.58 UJ	0.56 UJ
Nickel	20	9.7 J	16 J	14 J	13 J	13 J	11 J	10 J	8.5 J	14 J	11 J	9.9 J
Selenium	400	7 J	8.2 J	6.9 J	6.9 J	9.2 J	6.6 J	5.9 J	2.4 UJ	9.2 J	6.3 J	8.3 J
Silver	100	0.23 UJ	0.23 UJ	0.23 UJ	0.23 UJ	0.24 UJ	0.25 UJ	0.23 UJ	0.25 UJ	0.23 UJ	0.24 UJ	0.26 UJ
Thallium	8	0.51 UJ	0.54 UJ	0.54 UJ	0.53 UJ	0.57 UJ	0.57 UJ	0.54 UJ	0.58 UJ	0.53 UJ	0.57 UJ	0.6 UJ
Zinc	2500	29 J	39 J	41 J	35 J	40 J	40 J	33 J	27 J	44 J	100 J	42 J

*Reportable S-1 value.

J-estimated value; U-not detected (value is the detection limit); UJ-nondetect (estimated detection limit); R-rejected
Blank results indicate chemical not analyzed

Table 1-3
Inorganic Results for Soil Samples from Non-RUA Areas (mg/kg)
YNPS Rowe, MA

Station		**RELIC3-Drum1-003I**	**RELIC3-Drum2-003I**	**Relic-log-001**
Sample ID		**RELIC3-Drum1-003I**	**RELIC3-Drum2-003I**	**Relic-log-001**
Upper Depth		**0**	**0**	
Lower Depth		**3**	**3**	
Date Sampled		**7/6/2006**	**7/6/2006**	**7/19/2006**
Split Sample				
Sample Type	**MCP S-1**	**Field Sample**	**Field Sample**	**Field Sample**
Antimony	20			
Arsenic	20	18.9 J	18.4 J	3.27
Barium	1000	29.3	35.9	67.7
Beryllium	0.7			
Cadmium	2	1.17	1.39	0.938
Chromium	30	43.9 J	39 J	7.27
Copper*				
Lead	300	55.1 J	57.7 J	24.6
Mercury	20	0.1	0.137	0.13
Nickel	20			
Selenium	400	2.13 U	1.99 U	3.03 U
Silver	100	1.42 UJ	1.33 UJ	2.02 UJ
Thallium	8			
Zinc	2500			

*Reportable S-1 value.

J-estimated value; U-not detected (value is the detection limit); UJ-nondetect (estimated detection limit); R-rejected
Blank results indicate chemical not analyzed

Appendix C – Public Notification Correspondence

Environmental
Resources
Management

399 Boylston Street
6th Floor
Boston, MA 02116
(617) 646-7800
(617) 267-6447 (fax)

20 February 2008
Ref: 63019.2

Mr. Richard Alix
Chairman, Board of Health
Rowe Town Hall
321 Zoar Road
Rowe, Massachusetts 01367

RE: Notice of Availability
Class A-2 Response Action Outcome Partial (RAOP) Statement
Class A-3 RAOP Statement
Class C-1 RAOP Statement
Yankee Nuclear Power Station
Rowe, Massachusetts
RTN # 1-13411

Dear Mr. Alix:

On behalf of Yankee Atomic Electric Company (Yankee), Environmental Resources Management (ERM) has submitted three Response Action Outcome Partial (RAOP) Statements for the above referenced site to the Massachusetts Department of Environmental Protection (DEP) Western Regional Office. These statements encompass the total disposal site boundary defined in the Massachusetts Contingency Plan as the area(s) where Oil and/or Hazardous Material has come to be locations.

The site was divided into three areas for the purposes of the RAOP filings, as defined below (see attached figure):

- Class A-2 – Applies to the Outlying Areas where a Permanent Solution has been achieved and where there are not restrictions on future uses or activities.

- Class A-3 RAOP – Applies to the Combined Study Area where a Permanent Solution has been achieved and where deed restrictions are in-place to prevent residential use of the property.

- Class C-1 RAOP – Applies to the Central Area where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

In accordance with 310 CMR 40.1403(3)(e), the Chief Municipal Officer and the Board of Health are being notified of the availability of these submittals.

Information regarding the submittals can be reviewed at:

Massachusetts Department of Environmental Protection
Western Regional Office
436 Dwight Street, 5th Floor
Springfield, MA 01103
Phone: (413) 784-1100 Fax: (413) 784-1149

Sincerely,

John W. McTigue, P.G., LSP
LSP of Record

Enclosure: Figure of RAO Boundaries

Environmental
Resources
Management

399 Boylston Street
6th Floor
Boston, MA 02116
(617) 646-7800
(617) 267-6447 (fax)

25 February 2008
Ref: 63019.2

Ms. Myra Carlow
Chairman, Board of Selectmen
Rowe Town Hall
321 Zoar Road
Rowe, Massachusetts 01367

RE: Notice of Availability
Class A-2 Response Action Outcome Partial (RAOP) Statement
Class A-3 RAOP Statement
Class C-1 RAOP Statement
Yankee Nuclear Power Station
Rowe, Massachusetts
RTN # 1-13411

Dear Ms. Carlow:

On behalf of Yankee Atomic Electric Company (Yankee), Environmental Resources Management (ERM) has submitted three Response Action Outcome Partial (RAOP) Statements for the above referenced site to the Massachusetts Department of Environmental Protection (DEP) Western Regional Office.

The site was divided into three areas for the purposes of the RAOP filings, as defined below (see attached figure):

- Class A-2 RAOP – Applies to the Outlying Areas where a Permanent Solution has been achieved and where there are not restrictions on future uses or activities.

- Class A-3 RAOP – Applies to the Combined Study Area where a Permanent Solution has been achieved and where deed restrictions are in-place to prevent residential use of the property.

- Class C-1 RAOP – Applies to the Central Area where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

In accordance with 310 CMR 40.1403(3)(e), the Chief Municipal Officer and the Board of Health are being notified of the availability of these submittals.

Information regarding the submittals can be reviewed at:

Massachusetts Department of Environmental Protection
Western Regional Office
436 Dwight Street, 5th Floor
Springfield, MA 01103
Phone: (413) 784-1100 Fax: (413) 784-1149

Sincerely,

John W. McTigue, P.G., LSP
LSP of Record

Enclosure: Figure of RAO Boundaries

Legend
- Class A-2 RAO/Outlying Areas
- Class A-3 RAO/Combined Study Area
- Class C-1 RAO/Central Area
- Property Line

N

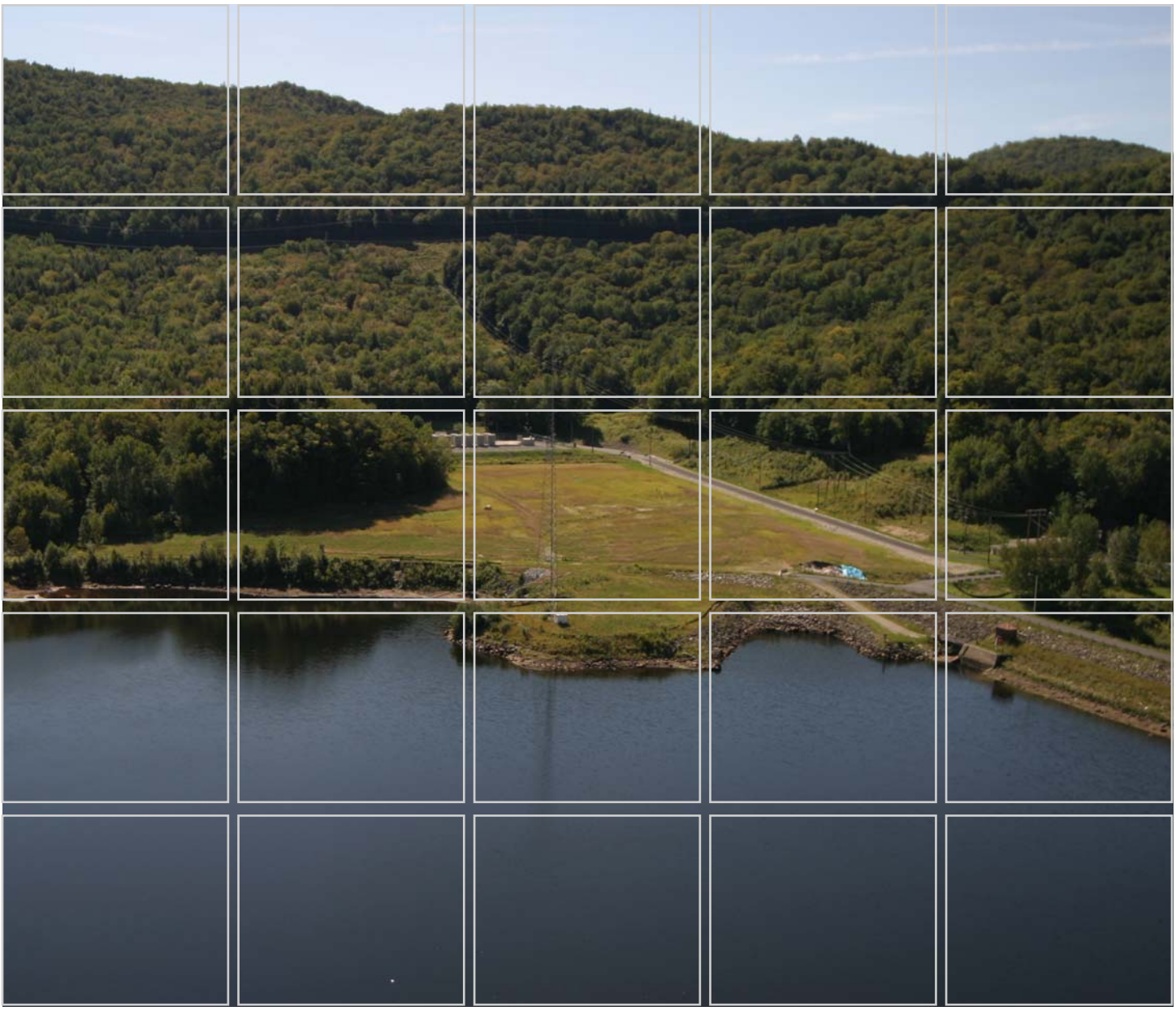
Sherman Reservoir
East Storm Drain Outfall
Deerfield River
Sherman Station
Trans Canada YAEC Property
Wheeler Brook
West Storm Drain Outfall
MW-111A/B/C
MW-107A/B/C/D/E/F
MW-101A/B/C
Tributary to Wheeler Brook
Guard House
West Storm Drain Ditch
Trans Canada YAEC Property
ISFSI
Wheeler Brook Divertment
ABC Parking Lot
Drum in Woods
Furlon House
Relic Dump
Hair Pin Turn

Scale (1"=400')
200' 0 200' 400' 800'

RAO Boundaries
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - RAO 2008\Figure 2 & 3.dwg (02/26/2008 - 10:10am Boston)



Class A-3 Response Action Outcome Partial Statement

Combined Study Area

Yankee Nuclear Power Station
Rowe, Massachusetts
RTN 1-13411

25 February 2008

ERM
399 Boylston Street
Boston, MA 02116
(617) 646-7800
www.erm.com

Delivering sustainable solutions in a more competitive world

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 BACKGROUND

On behalf of Yankee Atomic Electric Company (YAEC), Environmental Resources Management (ERM) prepared this Partial Class A-3 Response Action Outcome (RAOP) Statement for a portion of the former Yankee Nuclear Power Station (YNPS), the "site", located at 49 Yankee Road, Rowe, Massachusetts (Figure 1). This Class A-3 RAOP represents a Permanent Solution for that portion of the former industrial area where a condition of No Significant Risk has been achieved, based on the presence of land-use restrictions that prohibit future residential use.

This document was prepared in accordance with the requirements of the Massachusetts Contingency Plan (MCP) Section 310 of the Code of Massachusetts Regulations (CMR 40.1000), regulating release(s) of oil and/or hazardous materials (OHM) to the environment. The RAOP Statement Transmittal Form (BWSC 104) was submitted electronically and a copy is provided in Appendix A.

The Massachusetts Department of Environmental Protection (MA DEP) classified the site as a Tier IB Disposal Site due to releases of OHM to the environment associated with operation of the former YNPS, now fully decommissioned and the majority of the property was released from its operating license by the United States Nuclear Regulatory Commission (US NRC) in August 2007. Assessment and remedial response actions were completed under Tier IB Permit No. 54016. The MA DEP Release Tracking Number (RTN) for the site is 1-13411. This Class A-3 RAOP is being filed specific to that portion of the site where residual OHM and radiological impacts remain in soil and sediment following the completion of remedial activities at levels that do not pose a significant risk of harm to human health, safety, public welfare, or the environment. This portion of the former industrial area is designated as the "Combined Study Area" (see Figure 2).

A Method 3 Risk Characterization, dated November 2007, was prepared by Gradient Corporation, following the completion of remedial activities at the site. The risk characterization assessed the combined risk associated with residual radiological and OHM constituents remaining at the site. The scope of work for the risk characterization and the risk characterization itself were completed under the oversight and direction

of the MA DEP, US Environmental Protection Agency (EPA) and MA Department of Public Health (DPH).

1.2 PURPOSE AND SCOPE

The purpose of this report is to document compliance with MCP requirements for achievement of a Permanent Solution as a Class A-3 RAOP for the portion of the Site designated as the Combined Study Area. This RAOP excludes the other remaining areas of the site subject to MCP compliance, specifically two other portions of the site designated as the Central Area and the Outlying Areas, for which separate RAOP Statements (Class C-1 and Class A-2, respectively) will be filed.

The remainder of this report is organized as follows:

- **Section 2.0 – Site Description and Summary of Site Response Actions –** Includes a description of the site and a summary of past assessment and remedial response actions including soil excavation and disposal.

- **Section 3.0 – Achievement of Response Action Performance Standards** - This section summarizes key MCP performance standards specific to a Class A-3 Permanent Solution and documents how site conditions satisfy these criteria, including: elimination and control of sources; a summary of the Method 3 Risk Characterization; and an Evaluation of the Feasibility of Achieving Background.

- **Section 4.0 – Public Notification and Licensed Site Professional Opinion –** Describes documentation prepared to satisfy public notification requirements for achievement of a Class A-3 RAOP and provides the Licensed Site Professional's Opinion and reference to certification.

2.0 SITE DESCRIPTION AND SUMMARY OF RESPONSE ACTIONS

2.1 SITE DESCRIPTION

The former YNPS was located on an approximately 1,800-acre property at 49 Yankee Road in Rowe, Massachusetts (Figure 1). YAEC, owner and operator of YNPS, began construction of the power station in 1958. Operations as a 145-megawatt to 185-megawatt electric generating plant began in 1961. Commercial power generation activities ceased in 1992. Decommissioning activities were substantially completed in 2006 and License Reduction was approved by the NRC in 2007.

The site is located along the eastern shore of the Deerfield River adjacent to Sherman Dam, one of the several dams along the Deerfield River used for hydroelectric power generation. The YAEC property is divided into two parcels, separated by the Deerfield River (see Figure 1):

- Rowe Parcel – Approximately 1,800 acres located in the northwest corner of Rowe, Massachusetts, to the east of the Deerfield River. The former nuclear plant itself occupied approximately 12 of the 1,800 acres of the Rowe Parcel.

- Monroe Parcel – Approximately 89 acres located in Monroe, Massachusetts to the west of the Deerfield River.

The site property is owned by YAEC and portions of an adjacent property to the west are owned by TransCanada (see Figure 2).

All structures at the site, except for the guardhouse and Independent Spent Fuel Storage Installation (ISFSI), have been demolished. A new two-story office building was constructed next to the guardhouse in 2007. The ISFSI will continue to be guarded and monitored until the fuel is removed for permanent storage in accordance with applicable laws.

Concurrent with plant decommissioning, YAEC completed numerous environmental sampling campaigns for both radiological and non-radiological parameters to support the management of contaminated materials and environmental media and restoration of the site. These included the sampling of building surfaces and materials such as asphalt and concrete, in addition to environmental media including soil, soil gas, groundwater, surface water, sediments and fish. The management of

radioactive materials and media was completed in accordance with the requirements of the NRC and the MA DPH. The management of materials and/or media impacted by OHM was completed in accordance with applicable regulatory programs of the MA DEP and/or the US EPA.

Contaminated structures and media at the site have been remediated in accordance with applicable regulatory programs and the site was restored by re-grading and planting.

2.2 *SITE AND RAO BOUNDARIES*

The "disposal site," as defined in the MCP, is the area where OHM has come to be located. As such, three areas of the site where OHM was discovered and/or remediated are shown in Figure 2, including the:

- Central Area – Located in the center of the former industrial portion of the site, this area is defined by the location where the concentrations in groundwater exceeded the Massachusetts Drinking Water Quality Standards (DWQSs). Tritium and arsenic were the only compounds that remained above DWQSs following the completion of remedial actions. The locations where tritium and arsenic concentrations exceeded the DWQS is eligible for a Class C-1 RAOP, which applies to locations where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

- Combined Study Area – This area encompasses the remainder of the industrial portion of the site surrounding the Central Area (see Figure 2). Under a deed restriction preventing residential use of the property in the Combined Study Area, a condition of No Significant Risk to human health, the environment, public welfare and safety has been achieved as detailed in the Method 3 Risk Characterization (described in Section 3.4). Therefore, this area of the site is eligible for a Class A-3 RAOP.

- Outlying Areas – Outlying Areas are located to the south and southwest of the Combined Study Area as shown in Figure 2. Investigations completed during decommissioning activities identified impacts in these outlying areas. Response actions were conducted in some of the Outlying Areas to mitigate the impacts. A condition of No Significant Risk to human health, the environment, public welfare and safety has been achieved in the Outlying Areas

without the need for any restrictions in future use. Therefore, the Outlying Areas are eligible for a Class A-2 RAOP.

The subject of this Class A-3 RAOP is the Combined Study Area. The boundary of the Combined Study Area is consistent with the area that was defined as the Restricted Use Area in the Method 3 Risk Characterization, excluding the Central Area. The Combined Study Area represents the portion of the site where deed restrictions will be used to prevent residential use of the site.

2.3 SUMMARY OF RESPONSE ACTIONS

Since the initiation of plant decommissioning activities in 1992, YAEC has conducted numerous environmental sampling programs to support site decommissioning and proper management of materials and media contaminated by radiological and non-radiological constituents. Based on the results of site investigations for OHM, response actions including dredging of sediment and excavation of soil and sediment were planned and completed under the MCP Phase IV and Amended Phase III/IV Plans.

Dredged sediment and excavated soils were either treated on-site or transported and disposed of at designated off-site facilities. A portion of the treated material was reused on-site as fill material. The remainder of the treated material was transported off-site to a non-hazardous waste facility. The untreated soils and sediments were transported off-site for disposal as remediation waste without on-site treatment.

The assessment and remediation of environmental media contaminated by OHM at the site under the MCP was documented in the following reports:

- IRA Completion Report, February 2001
- Release Abatement Measure (RAM) Completion Report, July 2005
- Phase I Initial Site Investigation Report, April 2001
- Phase II Comprehensive Site Assessment Report, April 2003
- Phase II Comprehensive Site Assessment Report, January 2005 (update of April 2003 Phase II)
- Supplemental Phase II Comprehensive Site Assessment Report, September 2006
- Addendum to Phase II Comprehensive Site Assessment, February 2007

- Phase III Remedial Action Plan Report, April 2003
- Phase IV Remedy Implementation Plan (Phase IV Plan), April 2004
- Amended Phase III Remedial Action Plan/Phase IV Remedy Implementation Plan (Amended Phase IIII/IV Plan), June 2005
- Phase IV Final Inspection Report, March 2007

In addition, the management of soil and sediment contaminated with PCBs was regulated by the EPA under the requirements of the Toxic Substances Control Act (TSCA) and was documented in the following reports:

- TSCA Sediment Final Report, July 2006
- TSCA Soil Final Report, 1 March 2007

Radiological investigations and response actions were completed under the NRC requirements and compliance plans in support of the License Termination Plan (LTP). Final Status Survey reports documenting response actions completed to manage materials and media impacted by radiological constituents and certifying residual levels of radioactivity following completion of response actions were submitted to the NRC for final approval of license termination. Radiological surveys were completed between 2003 and 2007 and reports were submitted to the NRC between March 2006 and January 2007. NRC approval of the Final Status Surveys and License Reduction were issued in August 2007. NRC reports are available within the NRC website's document database.

3.0 ACHIEVEMENT OF RESPONSE ACTION PERFORMANCE STANDARDS

3.1 CLASS A-3 RESPONSE ACTION PERFORMANCE STANDARDS

This Class A-3 RAOP represents a Permanent Solution for the Combined Study Area portion of the site. An RAO A-3 is the appropriate category of RAO for the site because remedial response actions meet the following performance standards:

- In accordance with 310 CMR 40.1003, General Provisions for Response Action Outcomes, (3): a Response Action Outcome may be achieved and a Response Action Outcome Statement may be submitted for an entire site, disposal site, or a portion of a disposal site.

- In accordance with 310 CMR 40.1003, General Provisions For Response Action Outcomes, (5)(a): a Class A Response Action Outcome may be achieved for each source of OHM that has been eliminated or controlled.

- In accordance with 310 CMR 40.1036, Class A Response Action Outcomes (3)(d): the concentrations of OHM do not exceed an applicable Upper Concentration Limit listed in 310 CMR 40.0996(7).

- In accordance with 310 CMR 40.1036, Class A Response Action Outcomes(6)(b): a Class A RAO may be achieved following completion of Phase IV Comprehensive Response Action pursuant to 310 CMR 40.0870 and a Phase IV Comprehensive Response Action (soil excavation and disposal) has been completed.

- In accordance with 310 CMR 40.1056(2)(c): the site is eligible for a Class A-3 RAO since a condition of No Significant Risk has been achieved.

- In accordance with 310 CMR 40.1003(4): the boundary of the portion of the site to which this RAOP applies is shown in Figure 2. The RAOP boundary for the Combined Study Area is defined as the Restricted Use Area in the Method 3 Risk Characterization, excluding the Central Area. The Combined Study Area represents the portion of the site where deed restrictions will be used to prevent residential use of the site.

Class A-3 RAOs rely on deed restrictions, typically in the form of an Activity and Use Limitation (310 CMR 40.1036(3)(c)), to preclude certain land use scenarios, such as residential use, from the risk characterization. However, as discussed further in Section 3.4, MA DEP agreed that YAEC could rely on alternative types of deed restrictions to satisfy the requirement for a Notice of Activity and Use Limitation. Therefore, this Class A-3 RAOP does not include a Notice of Activity and Use Limitation, or the associated transmittal forms. However, the deed restrictions that are being relied upon to support the filing are provided in Appendices B and C.

3.2 ELIMINATION, CONTROL AND MITIGATION OF SOURCES OF OIL AND/OR HAZARDOUS MATERIALS

3.2.1 Overview

As required by 310 CMR 40.1003(5)(a), a Class A RAOP cannot be achieved until each source of OHM, which is resulting or is likely to result in an increase in concentrations of OHM in an environmental medium, has been eliminated or controlled.

The following section describes the sources of the contamination, both radiological and non-radiological, that were mitigated with the remedial measures described in the Response Action Summary (Section 2.3) above.

3.2.2 Site Non-Radiological Sources

Non-radiological contamination at the site can be attributed to facility operation and maintenance during operations from 1961 to closure in 1992. Identified sources of release of OHM to the environment at the YNPS were eliminated either by removal of impacted materials (e.g., concrete, tanks, etc.) during site decommissioning activities or via abatement of impacted media via dredging, excavation, on-site treatment and reuse or off-site transportation and disposal.

PCBs

Within the Combined Study Area, PCB-containing paint was the primary source of OHM impacts, with the highest concentrations found on the former Vapor Container. As the paint weathered, PCB-containing paint chips were released onto pavement and soil and migrated to soil and sediment via discharge two storm water catch basins; the East Storm Drain Outfall and West Storm Drain Ditch (Figure 2). During plant

decommissioning activities, the identified sources were eliminated as the buildings were demolished and the debris was shipped off-site.

Dioxins

The source of dioxins was the use of the incinerators during plant operation. This source was eliminated when the plant was shutdown in 1992. Structures related to the incinerators were removed during decommissioning activities and the resulting dioxin soil contamination was mitigated with excavation and disposal.

Petroleum

Sources of petroleum were present across the site. The sources included above ground storage tanks, fuel lines, drums and fuel spills. Sources were eliminated during site decommissioning activities when tanks, lines and drums were removed from the site. Historic fuel oil releases were remediated by excavation and removal of impacted soil.

Lead

Sources of lead contamination were identified at a former shooting range and two areas where sand blast grit was deposited. These source areas were eliminated during remediation activities when soil was excavated.

3.2.3 Site Radiological Sources

Normal plant operations resulted in certain areas of the site being subject to releases of radioactivity. During the history of plant operations, certain events and conditions resulted in radioactive material being deposited in other locations within the plant areas. As a result, the plant design and operational procedures evolved to accommodate or eliminate these circumstances. Many of these events were categorized as "Planned" release events, because they were associated with normal plant operations and were expected to result in impacts to plant structures.

The principal events and circumstances, listed in chronological order in Table 1, contributed to the residual contamination addressed during decommissioning. It should be noted that these events relate to the plant operational history and affected general plant radiological conditions and not specific plant locations.

A comprehensive review of recorded events documented as having occurred outside the normal operational condition of the plant was also

performed to capture those events that contributed to radiological contamination of the site. These events are summarized in Table 2.

The former Spent Fuel Pool/Ion Exchange Pit (SFP/IXP) was believed to be the primary source area for tritium in groundwater at YNPS. Tritium migrated from the SFP/IXP into the glaciofluvial aquifer and downward into the till in the period 1963 to 1965. Around 1965, Yankee identified that the leak was in the IXP at the junction of the IXP and SFP walls. The IXP was subsequently drained and repaired, eliminating the source. YAEC believes the SFP may have had minor leakage before a steel liner was installed in between 1978 and 1981, based on the observation of cracks in the concrete pool walls. The amount of SFP leakage in the 1970s was small and not discernable based on water-level changes and make-up rates.

The 1963 to 1965 tritium release resulted in concentrations of tritium in excess of 2,000,000 pCi/L at Sherman Spring in 1965. Since the release in the 1960s, tritium concentrations in the glaciofluvial aquifer have decreased to less than 5,000 pCi/L in the downgradient portion of the glaciofluvial aquifer. In addition to the impact to the glaciofluvial aquifer, tritium released from the former SFP/IXP migrated downward into the till and sand layers within the till. This is a function of the downward hydraulic gradient that occurs between the glaciofluvial and glacial till aquifers. This process resulted in concentrations of tritium being above DWQSs at MW-107C under current conditions.

Since plant shutdown in 1992, identified radiological sources have been eliminated and removed from the site, as the operations and previously contaminated soils of the facility were the source of this contamination.

3.3 DATA ASSESSMENT

Pursuant to 310 CMR 40.1056(2)(k), Gradient evaluated the usability and representativeness of the site soil and groundwater data used to support the risk characterization. The data usability assessments focused on the precision and accuracy of the data, while the representativeness focused on the spatial and temporal adequacy of the data set. The findings of the evaluations were documented in a series of Data Usability Reports, prepared by Gradient between 2004 and 2005.

3.4 RISK CHARACTERIZATION

In accordance with 310 CMR 40.0990, a Method 3 Risk Characterization was used to characterize the potential risks to human health, the environment, public welfare and safety posed by residual chemical and radiological constituents remaining in site soil, groundwater, surface water, sediment ad fish following plant decommissioning.

The methodology and results of the Method 3 Risk Characterization, were summarized in a Method 3 Risk Characterization report, prepared by Gradient Corporation, and dated November 2007. As a result of a change in the DWQS standard for acetone, Gradient prepared an addendum to update the findings of the risk characterization. The risk characterization was prepared following completion of remedial response actions. The scope of work for the risk characterization and the risk characterization itself were completed under the oversight and direction of the MA DEP, US EPA and MA DPH.

The risk characterization reflected the fact that land use restrictions are in-place on both the YAEC and TransCanada properties. MADEP has agreed that YAEC can rely on the existing deed restrictions to satisfy the requirement for an Notice of Activity and Use Limitation (310 CMR 40.1012). A summary of the land use restrictions that were relied on for the purposes of this RAO filing are summarized below:

- YAEC – YAEC filed a Declaration of Restriction Against Residential Use for the Combined Study Area (see Appendix B). The Declaration was recorded at the Franklin County Registry of Deeds on 1 February 2008 (Book 5455, Page 347). The section of the Grant, titled Restricted Uses of Protected Property, states:

  > "No portion of the Restricted Premises shall be used for single or multi-family residential purposes or as a day care center at any time."

- TransCanada – UsGen New England, Inc., a predecessor to TransCanada, filed a Grant of Conservation Restrictions for the Deerfield River Hydroelectric Project, which extends through several towns located to along the banks of the Deerfield River, including the portion of the Combined Study Area located on TransCanada's property (see Appendix C). The Grant was recorded at the Franklin County Registry of Deeds on 18 July 2001 (Book 3812, Page 090). The section of the Grant, titled Restricted Uses of Protected Property, states:

"No residential, commercial, industrial, or mining activities shall be permitted and not building, structure or appurtenant facility or improvement shall be constructed, created, installed, erected, or moved onto the Protected Property, except in furtherance of Grantor's business."

In addition to the deed restrictions described above, YAEC has filed the following additional restrictions on portions of the Combined Study Area:

- Declaration of Land Use Restrictive Covenant – Prohibits residential use of the portions of the YAEC property where PCBs remaining soil above 1 part per million (ppm) (required by TSCA)

- Record Notice of Beneficial Use Determination – Prohibits disturbance of the soil cover located over buried crushed concrete and asphalt in the central portion of the Combined Study Area, prohibits excavation and invasive activities without prior MA DEP approval, and requires the soil cover to be maintained and monitored (required by Massachusetts Solid Waste Regulations)

- Record Notice of Landfill Operation – Requires maintenance and monitoring activities to be conducted at the former construction and demolition debris landfill (referred to as the Southeast Construction Fill Area) and does not allow any use, other than as a landfill without prior MA DEP approval (required by Massachusetts Solid Waste Regulations)

The risk characterization relied on the fact that land use restrictions are in-place on both the YAEC and TransCanada properties. Considering the use restrictions, the risk characterization evaluated the following exposure scenarios:

- Current Use Recreator

- Future Use Recreator

- Hypothetical Future Commercial/Industrial User

Gradient adopted MA DEP default exposure assumptions in the risk characterization for OHM. In the absence of MA DEP guidance, US EPA default exposure factors were adopted for the risk characterization for radionuclides. As agreed with MA DEP, the evaluation of risks from radionuclides assumed a 16 year delay in the possible earliest date for

future unrestricted recreational or commercial exposures, based on the presence of the ISFSI.

The risk characterization determined that the combined human health risk for the foreseeable future uses were less than the MA DEP acceptable risk benchmark of 1 in 100,000 (10^{-5}) increased lifetime cancer risk and the non-cancer Hazard Indices were less than the MA DEP acceptable benchmark of one. However, the detection of tritium and arsenic in the Central Area at concentrations above their respective DWQS poses, by definition under the MCP, a potential future risk of harm to human health.

The Method 3 Risk Characterization concluded that the site poses No Significant Risk of harm to the environment, public welfare, or safety.

MA DEP has reviewed and approved both the methods and conclusions of the Method 3 Risk Characterization that was prepared for the site.

3.5 FEASIBILITY OF ACHIEVING BACKGROUND

The feasibility evaluation was conducted to satisfy the requirements of 310 CMR 40.1056(2)(e) and in accordance with the MA DEP Policy *Conducting Feasibility Evaluations under the MCP*, Policy #WSC-04-160.

Based on the results of site investigations, the Phase IV, Amended Phase III/IV Plans and Phase IV Completion Statement identified the following areas that required remediation:

- PCBs in sediment from the East Storm Drain and West Storm Drain Ditch

- PCBs in soil from a variety of areas in the Industrial Area (Study Areas 1 to 4), Southeast Construction Fill Area (SCFA Areas A to C), Study Area 5 (the Amended Phase III/IV Plan referred to the SCFA as Area 5, however, for the purposes of this report, Study Area 5 refers to the wooded area located to the west of the Industrial Area), SCFA Area D, the Mid-Lot Debris Pile Area, and Painted Blocks along the Deerfield River

- Dioxin in soil west of the Rad Waste Warehouse Complex (Dioxin Area)

- Petroleum in soil in Bulldozer Spill Area, near the Fuel Oil Tank Area, Drum in Woods, Firewater Pumphouse Drywell, Firewater Tank (Tank

55), Fuel Spill 164 Area, Furlon House Basement, Rad Waste Area, Railroad Ties Areas, and Turbine Building Office Area

- Lead in soil in the Peninsula Sand Blast Grit Area, the South Yard Sand Blast Grit Area and at the Old Shooting Range

- Radiological impacts around the SFP/IXP

The goal of remediation activities was the reduction in the concentration of OHM in affected media to levels that do not pose a condition of Significant Risk of harm to human health, safety, public welfare, and the environment (per 310 CMR 40.1003). Response actions were conducted to achieve background levels, to the extent feasible. Descriptions of removal activities conducted in each area and compliance with cleanup objectives were summarized in the Phase IV Completion Report.

In accordance with MA DEP Policy #WSC-04-160 Section 9.3.3.4, if the cost to remediate beyond regulatory criteria to background levels is greater than 20 percent of the original remedial cost then the additional remedial effort is considered unfeasible.

PCBs, lead, dioxin and petroleum in soil at the Site have been remediated to levels below regulatory standards, but will not feasibly attain background concentrations. An approximate five acre area was remediated to remove PCBs in soil via excavation. An estimated 20 acres would need to be remediated to achieve background levels at a cost of approximately 400 percent of the original remedial cost. Achieving background levels at the Site would be impractical and cost prohibitive. In addition, further excavation would likely necessitate the removal of extensive trees and vegetation creating a significant short-term damage.

A similar argument applies to PCBs in sediment. A total of approximately 305 cubic yards of sediment were dredged from an approximate ½ acre area in Sherman Reservoir to reduce PCB concentrations below regulatory criteria (TSCA Cleanup Objective of 1 part per million). An additional 365 cubic yards of sediment were excavated from the West Strom Drain Ditch in 2004 and 2005. Additional dredging to achieve background concentrations of PCBs would be several times that of the original remedial effort. Therefore, achieving background is considered to be infeasible because the associated costs would be much more than 20 percent of the original remedial cost.

Beyond the monetary costs of achieving background levels, the costs of conducting further remedial action would not be justified by the benefits.

The persistent contaminants in soil and sediments located in areas of lower exposure potential pose No Significant Risk to human health and the environment as detailed in the Method 3 Risk Characterization.

4.0 PUBLIC NOTIFICATION AND LICENSED SITE PROFESSIONAL OPINION

The public notification requirements of 310 CMR 40.1403(3)(f) have been met by providing notice of the filing and availability of this RAOP to the Chief Municipal Officer and Board of Health in the Town of Rowe, Massachusetts. A copy of the notification is provided in Appendix D.

The LSP opinion and certification are provided in Section G of BWSC-104. The original form was submitted using the MA DEP electronic submittal website with an additional hard copy sent to the MA DEP. A copy of the BWSC form is included in Appendix A.

Tables

Table 1
Sources of Radioactive Release
Plant Operations & Maintenance
Yankee Nuclear Power Station
Rowe, MA

Date	Mechanism or Structure	Radionuclides of Concern	Release Impact
Circa 1960's	Due to mechanical wear and corrosion from the initial set of control rods.	Radioactive silver and nickel - Ag-108m and Ni-63.	Into the reactor coolant.
	Storage of the refueling equipment and prepared radioactive waste outdoors.	Radioactive silver.	Within the Radiologically Controlled Area (RCA) yard area.
	Snow removal activities performed in the RCA caused a redistribution of accumulated surface contamination.		Area outside the RCA where snow was relocated. The areas affected were inside the industrial area fence on property governed by the YNPS NRC license, areas outside the fenced industrial area, along the rail road bed outside the east gate, and along existing roadways.
	Rain falling on the surface of yard areas in the RCA.	Small amounts of radioactive material have been observed in the catch basins over the years.	Redistribution of radiological contamination into low areas of the RCA and into the storm drain system.
	A defect in the construction of the IX Pit concrete.	Believed to be the source of the tritium contamination observed in the ground water at the site.	Leaks in the radioactive systems in the Ion Exchange (IX) Pit resulted in contamination of the water in the IX Pit.
	These leaks as well as possible leaks from the Spent Fuel Pool (SFP) that abuts the IX Pit.		
	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.	Although not a frequent occurrence, Co-60 particles have been identified and removed during surveys of the RCA. The environmental impact of these particles has been observed to be very minor as they are microscopic in size and are insoluble as they are essentially metal chips.
	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. All radioactive contamination was contained within the turbine building structure.
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.	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.	Resulted in a release of fuel pellet fragments into the reactor coolant system.
1981	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 underside of the reactor head.	This resulted in contamination of the RCA yard area under and around the equipment hatch.
1984	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 line ran diagonally from the old PCA to the Waste Disposal Building through the NE quadrant of the warehouse. The line was excavated and repaired and the affected soil disposed off-site as radioactive waste.
Circa 1994	Use of an underwater plasma torch to section of 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 Pool.	This cutting debris was contained within the plant system and was essentially insoluble due to its metallic nature. No evidence of environmental release was observed.

All events listed in chronological order

Table 2
Sources of Radioactive Release
Unplanned Releases
Yankee Nuclear Power Station
Rowe, MA

Date	Name of Release	Radionuclides of Concern	Description
9/20/1961	Radioactive Spill	The sample contained approximately 35 mCi (specific radionuclide data not available).	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 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.
9/18/1963	Shield Tank Cavity Fill Water Spill	Contamination levels were 10^6 to 10^7 dpm (specific radionuclide data not available) over areas of several square inches.	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. Run off water resulted in contamination levels of 20-60,000 dpm/ft^2 (Sic).
10/8/1963	De-watering Pump Packing Leakage	At the time the leak was identified, 6 to 8 inches of water had accumulated in the barrel with activity of 6×10^{-5} mCi/ml (specific radionuclide data not available).	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. It was believed only a small amount of water was leaked to the storm system.
9/3/1964	Seal Water Tank Spill	An estimated 35 gallons of water containing a total activity of 270 mCi (specific radionuclide data not available) was released.	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. The Roof Drain System drained into the Storm Drain System via a subsurface piping connection. A sample of the storm drain (WCB-009) was determined to contain 1×10^{-6} mCi/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.
10/3/1964	IX Pit High Level – Leakage Coming Up through Pavement	The radionuclides and concentrations identified were: Ag-110m at 5×10^{-7} mCi/ml and Co-60 at 1×10^{-6} mCi/ml.	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 blacktop was rinsed down with Service Water to the storm drain.
9/27/1966	Spent Fuel Pit Water Spill	This occurrence resulted in a total release of 4 mCi gross b-g and 670 mCi of tritium (more specific radionuclide data not available).	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. A continuous service water flush of the east side culvert system was initiated and continued for a 24-hour period.

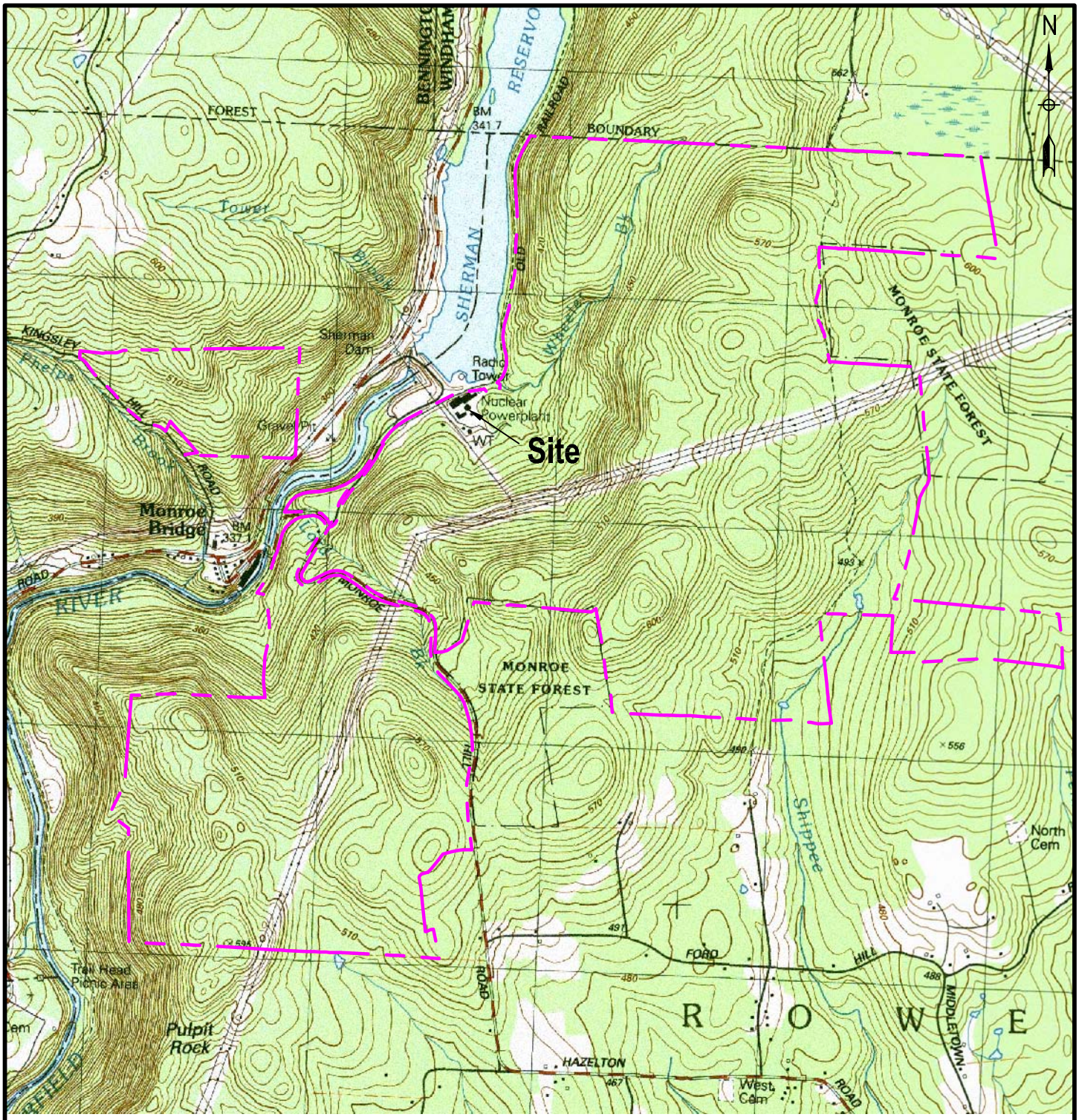
Table 2
Sources of Radioactive Release
Unplanned Releases
Yankee Nuclear Power Station
Rowe, MA

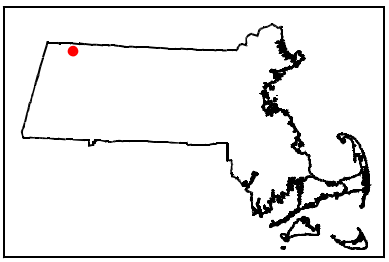
<table>
<tr><th>Date</th><th>Name of Release</th><th>Radionuclides of Concern</th><th>Description</th></tr>
<tr><td>9/27/1966</td><td>Abnormal Activity in Storm Drain</td><td>This occurrence resulted in a total release of 0.8 mCi gross b-g and 3.32 mCi tritium.</td><td>Water from the west storm drain 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} mCi/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. 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} mCi/ml and tritium activity of 5.1 x 10^{-5} mCi/ml.</td></tr>
<tr><td>11/1/1966</td><td>Hose Failure</td><td>Approximately 10 gallons of water with an activity of 3.0 x 10^{-3} mCi/ml (for a total of 113 mCi) was released.</td><td>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. The spill area was flushed with service water. The east culvert was sampled after the spill.</td></tr>
<tr><td>1/16/1968</td><td>Waste Hold-up Tank Moat Spill</td><td>A total of 520 mCi b-g and 698 mCi tritium were spilled into the moat.</td><td>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. The spill was contained within the moat structure.</td></tr>
<tr><td>7/16/1975</td><td>Yard Area Contamination</td><td>An area of land near the Ion Exchange Pit was identified with a contamination level of approximately 500,000 dpm.</td><td>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.</td></tr>
<tr><td>12/21/1977</td><td>Service Building Radioactive Sump Transfer Line Puncture</td><td></td><td>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:
<table>
<tr><th>Radionuclide</th><th>Total Activity, mCi</th><th>Concentration, mCi/ml</th><th>Fraction of MPC</th></tr>
<tr><td>I-131</td><td>16.5</td><td>2.18 x 10^{-4}</td><td>3.63</td></tr>
<tr><td>I-133</td><td>2.76</td><td>3.65 x 10^{-5}</td><td>0.18</td></tr>
<tr><td>Cs-134</td><td>0.34</td><td>4.46 x 10^{-6}</td><td>0.01</td></tr>
<tr><td>Cs-137</td><td>0.5</td><td>6.67 x 10^{-6}</td><td>0.02</td></tr>
<tr><td>Co-60</td><td>0.58</td><td>7.69 x 10^{-6}</td><td>0.01</td></tr>
</table>
No measurable levels of activity were released off-site or to the storm drain. The line was repaired, and a sand and concrete casing was poured around it.</td></tr>
<tr><td>8/6/1980</td><td>Resin Spill</td><td>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).</td><td>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- by 20-foot area of the RCA yard was contaminated. Decontamination included removal and disposal of some of the blacktop.</td></tr>
</table>

Table 2
Sources of Radioactive Release
Unplanned Releases
Yankee Nuclear Power Station
Rowe, MA

Date	Name of Release	Radionuclides of Concern	Description
5/15/1981	Contamination of Yard Area During Rx Head Removal	Removable radioactivity immediately below the equipment hatch was 200 mrad/hr beta. The total activity released to the ground was approximately 250 mCi, with approximately 10mCi (specific radionuclide data not available) discharged to Sherman Pond.	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). The area was cleaned, but due to rainfall trace radioactive material levels were detected in the east storm drains.
9/10/1984	Drain Pipe Failure	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.	An excavated drainpipe from the Potentially Contaminated Area (PCA) storage building to the Waste Disposal building was found to be leaking. The pipe from the edge of the old PCA 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.
2/17&18/94	Leakage from Frozen Fuel Chute Dewatering Line	A 3.5-liter sample from the fuel chute line indicated 1,000 net cpm, and a sample from the NST telltale line indicated the presence of Co-60 and Cs-137.	On February 17 and 18, 1994, a fuel chute dewatering line and a neutron shield tank telltale drain line ruptured due to freezing. 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.
2/23/1994	NST Tell-Tales/Fuel Chute Dewatering Line	A 3.5-liter sample from the fuel chute line indicated 1,000 net cpm, and a sample from the NST telltale line indicated the presence of Co-60 and Cs-137.	On February 17 and 18, 1994, a fuel chute dewatering line and a neutron shield tank telltale drain line ruptured due to freezing. 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.

Figures





YAEC Property Boundary

Scale 1:25,000

0.5 km 0 500 m

0.5 mi 0 1,000 ft

Figure 1 - Locus Map
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - TSCA Scil\Yankee TSCA Soil.dwg (07/20/04 Boston)

Legend
- Class A-2 RAO/Outlying Areas
- Class A-3 RAO/Combined Study Area
- Class C-1 RAO/Central Area
- Property Line

N

Sherman Reservoir
East Storm Drain Outfall
Deerfield River
Sherman Station
Trans Canada YAEC Property
Wheeler Brook
West Storm Drain Outfall
MW-111A/B/C
MW-107A/B/C/D/E/F
MW-101A/B/C
Tributary to Wheeler Brook
Guard House
West Storm Drain Ditch
Trans Canada YAEC Property
ISFSI
Wheeler Brook Divertment
ABC Parking Lot
Drum in Woods
Furlon House
Relic Dump
Hair Pin Turn

Scale (1"=400')
200' 0 200' 400' 800'

Figure 2 - RAO Boundaries
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - RAO 2008\Figure 2 & 3.dwg (02/22/2008 - 12:21pm Boston)

Appendix A – Copy of RAOP Statement Transmittal Form, BWSC-104

Print Cancel

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT
Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

For sites with multiple RTNs, enter the Primary RTN above.

A. SITE LOCATION:

1. Site Name/Location Aid: YANKEE ROWE ATOMIC PLANT

2. Street Address: 49 YANKEE RD

3. City/Town: ROWE 4. ZIP Code: 013670000

☑ 5. Check here if a Tier Classification Submittal has been provided to DEP for this disposal site. 4732699

☐ a. Tier IA ☑ b. Tier IB ☐ c. Tier IC ☐ d. Tier II 669611

6. If a Tier I Permit has been issued, provide Permit Number: 54016

B. THIS FORM IS BEING USED TO: (check all that apply)

1. List Submittal Date of RAO Statement (if previously submitted): _____ mm/dd/yyyy

☐ 2. Submit a **Response Action Outcome (RAO) Statement**

☐ a. Check here if this RAO Statement covers additional Release Tracking Numbers (RTNs). RTNs that have been previously linked to a Tier Classified Primary RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. ☐ - _____ ☐ - _____

☐ 3. Submit a **Revised Response Action Outcome Statement**

☐ a. Check here if this Revised RAO Statement covers additional Release Tracking Numbers (RTNs), not listed on the RAO Statement or previously submitted Revised RAO Statements. RTNs that have been previously linked to a Tier Classified Primary RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. ☐ - _____ ☐ - _____

☑ 4. Submit a **Response Action Outcome Partial (RAO-P) Statement**

Check above box, if any Response Actions remain to be taken to address conditions associated with this disposal site having the Primary RTN listed in the header section of this transmittal form. This RAO Statement will record only an RAO-Partial Statement for that RTN. A final RAO Statement will need to be submitted that references all RAO-Partial Statements and, if applicable, covers any remaining conditions not covered by the RAO-Partial Statements.

Also, specify if you are an Eligible Person or Tenant pursuant to M.G.L. c. 21E s.2, and have no further obligation to conduct response actions on the remaining portion(s) of the disposal site:

☐ a. Eligible Person ☐ b. Eligible Tenant

☐ 5. Submit an optional **Phase I Completion Statement** supporting an RAO Statement

☐ 6. Submit a **Periodic Review Opinion evaluating the status of a Temporary Solution** for a Class C-1 RAO Statement, as specified in 310 CMR 40.1051 (Section F is optional)

☐ 7. Submit a **Retraction** of a previously submitted **Response Action Outcome Statement** (Sections E & F are not required)

(All sections of this transmittal form must be filled out unless otherwise noted above)

C. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply; for volumes, list cumulative amounts)

- ☐ 1. Assessment and/or Monitoring Only
- ☐ 2. Temporary Covers or Caps
- ☐ 3. Deployment of Absorbent or Containment Materials
- ☐ 4. Treatment of Water Supplies
- ☐ 5. Structure Venting System
- ☐ 6. Engineered Barrier
- ☐ 7. Product or NAPL Recovery
- ☐ 8. Fencing and Sign Posting
- ☐ 9. Groundwater Treatment Systems
- ☐ 10. Soil Vapor Extraction
- ☐ 11. Bioremediation
- ☐ 12. Air Sparging
- ☐ 13. Monitored Natural Attenuation
- ☐ 14. In-situ Chemical Oxidation

- ☑ 15. Removal of Contaminated Soils
  - ☑ a. Re-use, Recycling or Treatment
    - ☑ i. On Site — Estimated volume in cubic yards: 2,962
    - ☐ ii. Off Site — Estimated volume in cubic yards:
      - iia. Facility Name: _____ Town: _____ State: _____
      - iib. Facility Name: _____ Town: _____ State: _____
      - iii. Describe: _____
  - ☑ b. Landfill
    - ☐ i. Cover — Estimated volume in cubic yards: _____
      - Facility Name: _____ Town: _____ State: _____
    - ☑ ii. Disposal — Estimated volume in cubic yards: 13,520
      - Facility Name: ENVIROCARE Town: CLIVE State: UT

- ☐ 16. Removal of Drums, Tanks or Containers:
  - a. Describe Quantity and Amount: _____
  - b. Facility Name: _____ Town: _____ State: _____
  - c. Facility Name: _____ Town : _____ State: _____

- ☐ 17. Removal of Other Contaminated Media:
  - a. Specify Type and Volume: _____
  - b. Facility Name: _____ Town: _____ State: _____
  - c. Facility Name: _____ Town: _____ State: _____

C. DESCRIPTION OF RESPONSE ACTIONS (cont.): (check all that apply; for volumes, list cumulative amounts)

☑ 18. Other Response Actions:

Describe: **OTHER SOIL/SEDIMENT DISPOSAL SHIPPED TO: WASTE MANAGEMENT OF NEW HAMPSHIRE, ROCHESTER, NH (8,760 CUBIC YARDS), WASTE MANAGEMENT, MODEL CITY, NY (490 CUBIC YARDS)**

☐ 19. Use of Innovative Technologies:

Describe:

D. SITE USE:

1. Are the response actions that are the subject of this submittal associated with the *redevelopment, reuse* or the *major expansion of the current use* of property(ies) impacted by the presence of oil and/or hazardous materials?

☐ a. Yes ☑ b. No ☐ c. Don't know

2. Is the property a *vacant or under-utilized commercial or industrial* property ("a brownfield property")?

☐ a. Yes ☑ b. No ☐ c. Don't know

3. Will funds from a state or federal brownfield incentive program be used on one or more of the property(ies) within the disposal site?

☐ a. Yes ☑ b. No ☐ c. Don't know If Yes, identify program(s):

4. Has a Covenant Not to Sue been obtained or sought?

☐ a. Yes ☑ b. No ☐ c. Don't know

5. Check all applicable categories that apply to the person making this submittal: ☐ a. Redevelopment Agency or Authority

☐ b. Community Development Corporation ☐ c. Economic Development and Industrial Corporation

☐ d. Private Developer ☐ e. Fiduciary ☐ f. Secured Lender ☐ g. Municipality

☐ h. Potential Buyer (non-owner) ☐ i. Other, describe:

This data will be used by MassDEP for information purposes only, and does not represent or create any legal commitment, obligation or liability on the part of the party or person providing this data to MassDEP.

E. RESPONSE ACTION OUTCOME CLASS:

Specify the Class of Response Action Outcome that applies to the disposal site, or site of the Threat of Release.
Select **ONLY** one Class.

☐ **1. Class A-1 RAO**: Specify one of the following:

☐ a. Contamination has been reduced to background levels. ☐ b. A Threat of Release has been eliminated.

☑ **2. Class A-2 RAO:** You **MUST** provide justification that reducing contamination to or approaching background levels is infeasible.

☐ **3. Class A-3 RAO**: You **MUST** provide an implemented Activity and Use Limitation (AUL) and justification that reducing contamination to or approaching background levels is infeasible.

☐ **4. Class A-4 RAO**: You **MUST** provide an implemented AUL, justification that reducing contamination to or approaching background levels is infeasible, and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface or below an Engineered Barrier is infeasible. If the Permanent Solution relies upon an Engineered Barrier, you must provide or have previously provided a Phase III Remedial Action Plan that justifies the selection of the Engineered Barrier.

E. RESPONSE ACTION OUTCOME CLASS (cont.):

☐ **5. Class B-1 RAO: Specify one of the following:**

☐ a. Contamination is consistent with background levels ☐ b. Contamination is **NOT** consistent with background levels.

☐ **6. Class B-2 RAO**: You **MUST** provide an implemented AUL.

☐ **7. Class B-3 RAO**: You **MUST** provide an implemented AUL and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface is infeasible.

☐ **8. Class C-1 RAO**: You must submit a plan as specified at 310 CMR 40.0861(2)(h). Indicate type of ongoing response actions.

☐ a. Active Remedial System ☐ b. Active Remedial Monitoring Program ☐ c. None

☐ d. Other Specify:

☐ **9. Class C-2 RAO**: You must hold a valid Tier I Permit or Tier II Classification to continue response actions toward a Permanent Solution.

F. RESPONSE ACTION OUTCOME INFORMATION:

1. Specify the Risk Characterization Method(s) used to achieve the RAO described above:

☐ a. Method 1 ☑ b. Method 2 ☐ c. Method 3

☐ d. Method Not Applicable-Contamination reduced to or consistent with background, or Threat of Release abated

2. Specify all Soil Category(ies) applicable. More than one Soil Category may apply at a Site. Be sure to check off all **APPLICABLE** categories:

☑ a. S-1/GW-1 ☑ d. S-2/GW-1 ☑ g. S-3/GW-1

☐ b. S-1/GW-2 ☐ e. S-2/GW-2 ☐ h. S-3/GW-2

☑ c. S-1/GW-3 ☑ f. S-2/GW-3 ☑ i. S-3/GW-3

3. Specify all Groundwater Category(ies) impacted. A site may impact more than one Groundwater Category. Be sure to check off all **IMPACTED** categories:

☑ a. GW-1 ☐ b. GW-2 ☑ c. GW-3 ☐ d. No Groundwater Impacted

4. Specify remediation conducted:

☑ a. Check here if soil remediation was conducted.

☐ b. Check here if groundwater remediation was conducted.

5. Specify whether the analytical data used to support the Response Action Outcome was generated pursuant to the Department's Compendium of Analytical Methods (CAM) and 310 CMR 40.1056:

☐ a. CAM used to support all analytical data. ☑ b. CAM used to support some of the analytical data.

☐ c. CAM not used.

☑ 6. Check here to certify that the Class A, B or C Response Action Outcome includes a Data Usability Assessment and Data Representativeness Evaluation pursuant to 310 CMR 40.1056.

7. Estimate the number of acres this RAO Statement applies to: 18

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

G. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that either an **RAO Statement, Phase I Completion Statement and/or Periodic Review Opinion** is being provided,* the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 6423

2. First Name: JOHN W 3. Last Name: MCTIGUE

4. Telephone: (617) 267-8377 5. Ext.: 6. FAX:

7. Signature: JOHN W MCTIGUE

8. Date: 02/27/2008
mm/dd/yyyy

9. LSP Stamp:

H. PERSON MAKING SUBMITTAL:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☑ c. change in the person undertaking response actions

2. Name of Organization: YANKEE ATOMIC ELECTRIC COMPANY

3. Contact First Name: ROBERT 4. Last Name: MITCHELL

5. Street: 49 YANKEE ROAD 6. Title: ISFSI MANAGER

7. City/Town: ROWE 8. State: MA 9. ZIP Code: 01367-0000

10. Telephone: (413) 424-5261 11. Ext.: 303 12. FAX:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

I. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON MAKING SUBMITTAL:

☑ 1. RP or PRP ☑ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☐ e. Other RP or PRP Specify:

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Making Submittal Specify Relationship:

J. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☐ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of an RAO Statement that relies on the public way/rail right-of-way exemption from the requirements of an AUL.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of a RAO Statement with instructions on how to obtain a full copy of the report.

☑ 4. Check here to certify that documentation is attached specifying the location of the Site, or the location and boundaries of the Disposal Site subject to this RAO Statement. If submitting an RAO Statement for a PORTION of a Disposal Site, you must document the location and boundaries for both the portion subject to this submittal and, to the extent defined, the entire Disposal Site.

☐ 5. Check here to certify that, pursuant to 310 CMR 40.1406, notice was provided to the owner(s) of each property within the disposal site boundaries, or notice was not required because the disposal site boundaries are limited to property owned by the party conducting response actions. (check all that apply)

- ☐ a. Notice was provided prior to, or concurrent with the submittal of a Phase II Completion Statement to the Department.
- ☐ b. Notice was provided prior to, or concurrent with the submittal of this RAO Statement to the Department.
- ☐ c. Notice not required. d. Total number of property owners notified, if applicable:

☐ 6. Check here if required to submit one or more AULs. You must submit an AUL Transmittal Form (BWSC113) and a copy of each implemented AUL related to this RAO Statement. Specify the type of AUL(s) below: (required for Class A-3, A-4, B-2, B-3 RAO Statements)

- ☐ a. Notice of Activity and Use Limitation b. Number of Notices submitted:
- ☐ c. Grant of Environmental Restriction d. Number of Grants submitted:

☐ 7. If an RAO Compliance Fee is required for any of the RTNs listed on this transmittal form, check here to certify that an RAO Compliance Fee was submitted to DEP, P. O. Box 4062, Boston, MA 02211.

☐ 8. Check here if any non-updatable information provided on this form is incorrect, e.g. Site Address/Location Aid. Send corrections to the DEP Regional Office.

☑ 9. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

K. CERTIFICATION OF PERSON MAKING SUBMITTAL:

1. I, **ROBERT MITCHELL**, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: **ROBERT MITCHELL** (Signature)

3. Title: **ISFSI MANAGER**

4. For: **YANKEE ATOMIC ELECTRIC COMPANY** (Name of person or entity recorded in Section H)

5. Date: **02/26/2008** mm/dd/yyyy

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section H.

7. Street:

8. City/Town:

9. State:

10. ZIP Code:

11. Telephone:

12. Ext.:

13. FAX:

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

Received by DEP on

2/27/2008 8:44:30 AM

Appendix B – YAEC Deed Restriction

2008 00001046
Bk: 5455 Pg: 347 Doc: REST FC
Page: 1 of 4 02/01/2008 11:46 AM

DECLARATION OF RESTRICTION AGAINST RESIDENTIAL USE

This Declaration of Restrictive Covenants ("Declaration") is made as of this 1st day of February, 2008, by Yankee Atomic Electric Company, a Massachusetts corporation ("YAEC"), together with its successors and assigns (collectively "Owner").

W I T N E S S E T H:

WHEREAS, YAEC is the owner in fee simple of those certain parcels of land located in Rowe, Franklin County, Massachusetts, pursuant to a deed recorded with the Franklin County Registry of Deeds in Book 1035, Page 416 ("Property"). The Property is shown on a plan recorded in the Franklin County Registry of Deeds in Plan Book 21, Pages 1 and 2;

WHEREAS, certain portions of the Property ("the Restricted Premises") are the subject of this Declaration. The Restricted Premises are certain portions of the Property generally located less than 1,600 feet from the southeastern end of Sherman Dam and more particularly shown as the Restricted Use Area and shaded on Exhibit A attached hereto.

NOW, THEREFORE, YAEC does hereby make and declare the Restricted Premises to be subject to the following restrictive covenant and provisions:

1. Restriction. No portion of the Restricted Premises shall be used for single or multi-family residential purposes or as a day care center at any time.

2. Benefit. The entire Property shall be the Benefited Land ("Benefited Land") for purposes of this Declaration of Restrictions, and all successor owners to YAEC with respect to any portion of the Property shall be deemed an owner of Benefited Land for purposes of enforcement of this Declaration of Restrictions.

3. Bind and Inure. This Declaration of Restriction shall run with the Restricted Premises and the Benefited Land, respectively, and will bind the owners of the Restricted Land and their respective successors and assigns for the benefit of the owners from time to time of the Benefited Land.

4. Enforcement. Any owner of any portion of the Benefited Land may prosecute proceedings at law or in equity against any owner of the Restricted Premises violating or attempting to violate the provisions hereof.

5. Non-Waiver. The failure of any owner of any Benefited Land to enforce this Declaration of Restriction at any time shall not be deemed to be a waiver of the right to do so thereafter, whether as to the same breach or to one occurring prior or subsequent thereto.

6. Severability. If any provision of this Declaration of Restriction or the application of such provision to any person or circumstance shall be held invalid in any respect, the remainder of this Declaration or the application of such provision to such persons or circumstances other than those as to which it is held invalid, shall not be effected thereby.

WITNESS the execution hereof under seal this 1st day of February, 2008.

Joseph Bourassa
Environmental Compliance Officer
Yankee Atomic Electric Company

COMMONWEALTH OF MASSACHUSETTS

Franklin, ss February 1, 2008

On this 1 day of February, 2008, before me, the undersigned notary public, personally appeared Joseph Bourassa (name of document signer), proved to me through satisfactory evidence of identification, which were CT Drivers License to be the person whose name is signed on the preceding or attached document, and acknowledged to me that (he) (she) signed it voluntarily for its stated purpose.

(as partner for _____, a partnership)
(as a Representative for YAEC, a corporation)
(as attorney in fact for _____, the principal)
(as _____ for _____, (a) (the) _____)

Dennis R. MacLaughlin (Official signature and seal of notary)

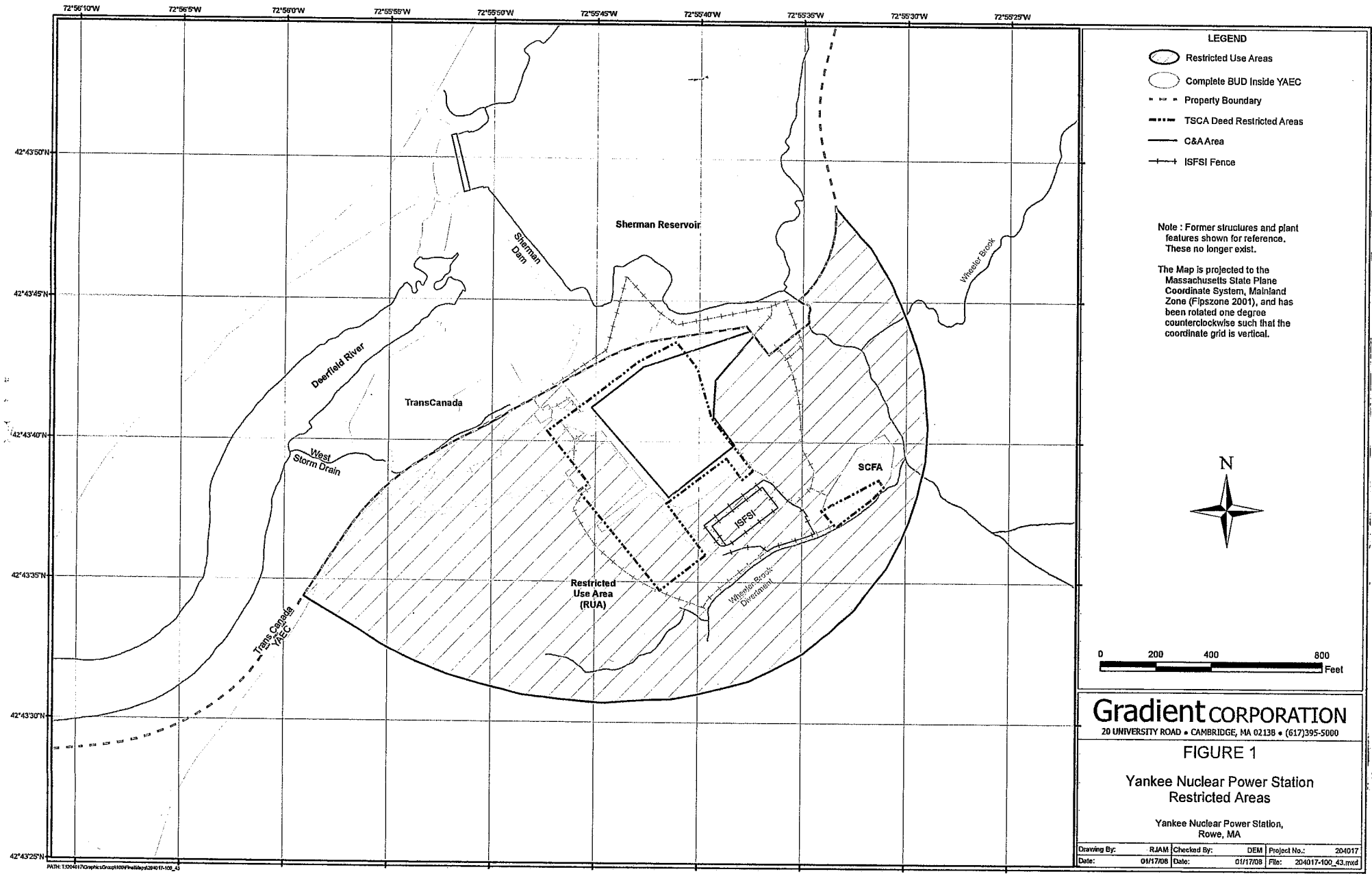
Upon recording, return to:

Yankee Atomic Electric Company
49 Yankee Road
Rowe, MA 01367

DENNIS R. MACLAUGHLIN
NOTARY PUBLIC, MASSACHUSETTS
MY COMMISSION EXPIRES APRIL 9, 2010

Exhibit A

Restricted Premises



Gradient CORPORATION
20 UNIVERSITY ROAD • CAMBRIDGE, MA 02138 • (617)395-5000

FIGURE 1

Yankee Nuclear Power Station
Restricted Areas

Yankee Nuclear Power Station,
Rowe, MA

Drawing By:	RJAM	Checked By:	DEM	Project No.:	204017
Date:	01/17/08	Date:	01/17/08	File:	204017-100_43.mxd

PATH: T:\204017\Graphics\Cross\100\Final\Maps\204017-100_43

ATTEST: FRANKLIN COUNTY, MASS. Joseph A. Gochinski Register

Appendix C – TransCanada Deed Restriction

2001 00009231
Bk: 3812 Pg: 090 Doc:RESTR
Page 1 of 25 07/18/2001 04:05PM

3812

90

BK 1031 PG 819
07/18/01 01:51 DOC. 4078

GRANT OF CONSERVATION RESTRICTIONS

Property Location: Deerfield River - Rowe, Monroe, Charlemont, Buckland, Conway, Shelburne and Deerfield, Franklin County Florida, Berkshire County

2001 JUL 18 PM 4:05

WHEREAS, USGen New England, Inc., a Delaware corporation with its principal place of business in Bethesda, Maryland, (hereinafter "Grantor"), is the owner in fee of certain real property and of other real estate interests in Franklin and Berkshire Counties, Massachusetts, which has aesthetic, recreational, and natural resource values in its present state; and

WHEREAS, Grantor is the owner and licensed operator of the Deerfield River Hydroelectric Project as authorized under the Federal Energy Regulatory Commission License No. 2323 (hereinafter the "Deerfield River Hydroelectric Project") which makes certain property of the Grantor, being part of the Deerfield River Hydroelectric Project ("Project Lands"), subject to all terms and conditions of Federal License No. 2323 and to all other rules and regulations of the Federal Energy Regulatory Commission ("hereinafter FERC"); and

WHEREAS, this property contains approximately 1362 acres of primarily undeveloped land (provided, however, Grantor makes no representations herein regarding actual acreage), some of which is in agricultural and forestry use, which provides wildlife habitat, natural resource protection, as well as recreational and scenic opportunities; and

WHEREAS, the Massachusetts Department of Environmental Management is a state agency whose purposes include the preservation of undeveloped and open space land in order to protect the aesthetic, recreational, cultural, educational, scientific and natural resources of the state through non-regulatory means, thereby reducing the burdens on state and local governments; and

WHEREAS, the economic and environmental health of Massachusetts is closely linked to its agricultural and forest lands, which not only produce food products, fuel, timber and other products, but also provide much of Massachusetts' scenic beauty, upon which the state's tourist and recreation industries depend; and

WHEREAS, the Grantor's predecessor in title to the aforesaid real estate, New England Power Company, entered into a Settlement Agreement dated October 5, 1994 (hereafter "Settlement"), providing for the re-licensing of the Deerfield River and the Bear Swamp Hydroelectric Projects, which by its terms is binding upon the Grantor as successor in title; and

WHEREAS, the Settlement calls for the protection of the Project Lands and certain riverine non-Project lands both as defined therein;

NOW, THEREFORE, Grantor, in consideration of Ten Dollars and other valuable consideration paid, GRANTS to the Massachusetts Department of Environmental Management whose principal offices are at 251 Causeway Street, Boston, Massachusetts 02114, and its successors and assigns (hereinafter "Grantee") forever, perpetual conservation restrictions (as more particularly set forth below), as defined in G. L. c. 184, §§ 31-33, and for the purposes set forth in Article 97 of the Massachusetts Constitution, on certain tracts of land consisting of the Project Lands and the riverine non-Project lands, situated in the Towns of Rowe, Monroe,

Charlemont, Buckland, Conway, Shelburne and Deerfield, in Franklin County, and Florida in Berkshire County, Massachusetts (hereinafter "Protected Property"), said Protected Property being more particularly described by the documents set forth in Schedule A, attached hereto and incorporated herein, and shown on maps on file with FERC.

The conservation restrictions hereby conveyed to Grantee consist of covenants on the part of Grantor to do or refrain from doing, severally and collectively, the various acts set forth below, subject to rights specifically reserved by Grantor herein. It is hereby acknowledged that these covenants shall constitute a servitude upon the land and run with the land. Grantee accepts such covenants in order to achieve the Purposes set forth in Section I, below.

I. Purposes of this Grant

Grantor and Grantee acknowledge that the Purposes of this Grant are as follows (hereinafter "Purposes of this Grant"):

1. This Grant serves to implement the agreement to preserve in their natural state the Protected Property associated with the Deerfield River Hydroelectric Project, while allowing for the continued operation of the Electricity Business as described in Paragraph I of Section III, below, that was negotiated as part of the Deerfield River Re-licensing Settlement entered into on October 5, 1994. The intent of this Grant is to implement the conservation protections agreed to, consistent with the Settlement, with the exception that the protections granted herein will be of perpetual duration.

2. To contribute to the implementation of the policies of the Commonwealth of Massachusetts designed to foster the conservation of the state's scenic, agricultural, forestry and other natural resources.

3. To conserve wood lands and open lands, and public access thereto, conserve wildlife and riverine habitat and other natural resource values of the Protected Property for the scenic, recreational and educational benefit of the public.

Grantor and Grantee recognize these scenic, forestry, recreational, agricultural, and natural values of the Protected Property, and share the common purpose of conserving these values by the conveyance of the conservation restrictions, to prevent the use or development of the property for any purpose or in any manner which would conflict with the maintenance of these scenic, forestry, recreational, agricultural, and natural resource values, except as herein set forth. Grantee accepts such conservation restrictions in order to conserve these values for present and future generations.

II. Restricted Uses of Protected Property

The restrictions hereby imposed upon the Protected Property, and the acts which Grantor shall do or refrain from doing, are as follows:

1. The Protected Property shall not be used for purposes other than agricultural, forestry, educational, non-commercial recreation, open space and electric transmission and hydroelectric generation purposes as set forth herein. No residential, commercial, industrial, or mining activities shall

be permitted, and no building, structure or appurtenant facility or improvement shall be constructed, created, installed, erected or moved onto the Protected Property, except in furtherance of the Grantor's business described in Paragraph 1 of Section III or as specifically permitted under this Grant.

2. Except in furtherance of the Grantor's business described in Paragraph 1 of Section III or as otherwise specifically permitted under this Grant, no rights-of-way, easements of ingress or egress, driveways, roads, or utility lines or easements shall be conveyed, constructed, developed or maintained into, on, over, under, or across the Protected Property, without the prior written permission of Grantee. Grantee may grant such permission if it determines, in its sole reasonable discretion, that any such improvement would be consistent with the Purposes of this Grant, and not adversely affect the agricultural and forestry potential, wildlife habitat value, or the scenic beauty of the Protected Property.

3. Except when incidental to the furtherance of the Grantor's business described in Paragraph 1 of Section III, there shall be no signs, billboards, or outdoor advertising of any kind erected or displayed on the Protected Property; provided, however, that Grantor may erect and maintain signs indicating the name of the Protected Property, boundary markers, directional signs, signs restricting hunting or trespassing on the Protected Property, memorial plaques, temporary signs indicating that the Protected Property is for sale or lease, signs informing the public that any agricultural or timber products are for sale or are being grown on the premises and temporary political or religious signs. Grantee, with the permission of Grantor, may erect and maintain signs designating the Protected Property as land under the protection of Grantee.

4. The placement, collection or storage of trash, human waste, or any other unsightly or offensive material on the Protected Property shall not be permitted except in connection with the Grantor's business described in Paragraph 1 of Section III and otherwise at such locations, if any, and in such a manner as shall be approved in advance in writing by Grantee. The storage and spreading of manure, lime or other fertilizer for agricultural practices and purposes and the temporary storage of trash in receptacles for periodic off-site disposal shall be permitted without such prior written approval.

5. There shall be no disturbance of the surface, including but not limited to filling, excavation, removal of topsoil, sand, gravel, rocks or minerals, or change of the topography of the land in any manner, except as incidental to the business operation of Grantor described in Paragraph 1 of Section III hereof and except as may be reasonably necessary to carry out the uses permitted on the Protected Property under the terms of this Grant. In no case shall mining of subsurface oil, gas, or other minerals be permitted.

6. The Protected Property shall not be subdivided or conveyed in separate parcels except (a) when necessary in furtherance of the uses permitted in Paragraph 1 of Section III, or (b) to carry out one of the other permitted uses in Section III. Any subdivision pursuant to subparagraph (b) will be subject to the Grantee's approval, such approval not to be unreasonably withheld. Any subdivision must be consistent with maintaining forestry management units that maintain the potential and current productivity of the lands for commercial forestry and preventing the fragmentation of wildlife habitat.

7. No use shall be made of the Protected Property, and no activity thereon shall be permitted which is inconsistent with the Purposes of this Grant.

III. Permitted Uses of the Protected Property

Notwithstanding the foregoing, Grantor shall have the right to make the following uses of the Protected Property:

1. The right to use the Protected Property for all uses and activities associated with the present and future operation of the business of the generation of hydroelectric energy and the transmission and distribution of high and low voltage electricity and the transmission of intelligence by electrical energy or other means ("the Electricity Business"). Existing hydroelectric developments may be operated, maintained and replaced as necessary, but wholly new hydroelectric developments (*e.g.*, dams and associated facilities) shall not be constructed, operated or maintained. New facilities may be added involving the transmission of intelligence in connection with the generation, transmission, and distribution of electricity, in which case, Grantor will use best efforts, to the extent practicable, to cause such facilities to be located on, or in proximity to, areas already used by facilities associated with the Electricity Business and to avoid or minimize negative impacts to the scenic, forestry, recreational, agricultural and natural values of the Protected Property.

The Grantor shall also have the right to make the following uses of the Protected Property, while using best efforts to avoid major negative impacts to the scenic, forestry, recreational, agricultural, and natural resource values of the Protected Property, or at a minimum, using best efforts to minimize, to the extent practicable, such impacts where they cannot be avoided:

2. The right to establish, reestablish, maintain, and use cultivated fields, orchards, and pastures in accordance with generally accepted agricultural practices and sound husbandry principles, together with the right to construct, maintain and repair access roads for these purposes; provided, however, that Grantor shall secure the written approval of Grantee prior to any clearing of forest land to establish new fields, orchards or pastures. Grantee's approval shall not be unreasonably withheld or conditioned, provided that such clearing is consistent with the Purposes of this Grant and the Forestry Management Plan prepared pursuant to Section IV.

3. The right to perform forest management activities in accordance with Section IV. Grantor will provide fifteen (15) days prior written notice to the Grantee of any commercial timber harvesting activity, unless such activities or notice for such activities are already specified in the plan prepared pursuant to Section IV.

4. The right to utilize, maintain, establish, construct, and improve water sources, courses, and bodies within the Protected Property for uses otherwise permitted hereunder, provided that Grantor does not unnecessarily disturb the natural course of the surface water drainage and runoff flowing over the Protected Property. The construction of ponds or reservoirs shall be permitted only upon the prior written approval of Grantee, which approval shall not be unreasonably withheld or conditioned provided that such pond or reservoir is located in a manner which is consistent with the Purposes of this Grant. The conditions, restrictions and prohibitions set forth in this paragraph shall not apply to the Electricity Business. Any rights retained by the Grantor in this paragraph are in addition to and subject to the rights and obligations set out in Paragraph 1 of Section III.

5. The right to clear, construct, and maintain public campgrounds, boat launches, trail shelters, parking areas, visitor and information facilities and trails for walking, horseback riding, skiing, and other non-motorized, recreational activities within and across the Protected Property. Snowmobiling may be permitted at the discretion of Grantor. The Grantor will provide free public access with no charge or fees to the water and undeveloped lands. Grantor may charge reasonable user fees to recover the actual cost of providing and operating developed public recreation facilities. Any rights retained by the Grantor in this paragraph are in addition to the reserved right to continue the Electricity Business.

IV. Forest Management

In connection with Grantor's operation of the Deerfield River Hydroelectric Project, and as an activity secondary thereto, Grantor shall perform forest management activities but only in accordance with a Forest Management Plan ("Forestry Plan"), to be approved by the Grantee prior to implementation. Said plan shall be consistent with the Deerfield River Project L.P. 2323 Forest Management Plan ("Management Plan") dated June 9, 1998, as approved and modified by FERC by Order issued November 24, 1999, and the Massachusetts Forestry Cutting Practices Act, G. L. c. 132, §§ 40-46 ("Mass. Cutting Practices Act") as applicable. All updates, amendments or other changes to the Forestry Plan shall be submitted to Grantee for its approval prior to any harvesting. The Forestry Plan as updated, amended or changed from time-to-time is hereinafter referred to as the "Amended Forestry Plan." Grantee's approval of the Forestry Plan and any Amended Forestry Plan shall not be unreasonably withheld or conditioned if the Forestry Plan and Amended Forestry Plan has been prepared by a professional forester and if the Forestry Plan and the Amended Forestry Plan are consistent with the Purposes of this Grant and the Mass. Cutting Practices Act. The Forestry Plan and any Amended Forestry Plan shall be consistent with the Purposes of this Grant and the Management Plan, and shall include at least the following elements (except that, those elements of the Forestry Plan or Amended Forestry Plan which do not change need not be re-submitted in updates, amendments or changes to the Forestry Plan):

a) Grantor's forest management objectives;

b) An appropriately scaled, accurate map indicating such items as forest stands, streams and wetlands, and major access routes (truck roads, landings and major skid trails);

c) Forest stand ("treatment unit") descriptions (forest types, stocking levels before and after harvesting, soils, topography, stand quality, site class, insect and disease occurrence, previous management history, and prescribed silvicultural treatment);

d) Plant and wildlife considerations (identification of known significant habitats and management recommendations);

e) Aesthetic and recreational considerations (impact on viewsheds from public roads, trails and places); and

f) Historic and cultural resource considerations (identification of known resources and associated management recommendations).

The Forestry Plan shall be updated at least once every ten (10) years if Grantor intends to harvest timber or other wood products. Amendments to the Forestry Plan shall be required in the event the Grantor proposes a treatment not included in the Forestry Plan, but no such amendment shall be required for any change in timing or sequence of treatments if such change does not vary more than five (5) years from the prescription schedule set forth in the Forestry Plan as approved by Grantee. In the event that any treatment unit is substantially damaged by natural causes such as insect infestation, disease, fire or wind, Grantor may elect to conduct an alternative treatment in which event Grantor shall submit an amendment to the Forestry Plan for Grantee's approval prior to conducting any alternative treatment.

Disapproval by Grantee of a Forestry Plan or an Amended Forestry Plan proposing a heavy cut (as defined below) shall not be deemed unreasonable. Grantee, however, may approve a Forestry Plan or an Amended Forestry Plan in its discretion if consistent with the Purposes of this Grant, such as to permit the planting of different species of trees or the establishment or re-establishment of a field, orchard or pasture. Grantee may rely upon the advice and recommendations of such foresters, wildlife experts, conservation biologists or other experts as Grantee may select to determine whether the Forestry Plan or Amended Forestry Plan would be detrimental to the values identified in Section I. "Heavy cut" shall mean the harvesting of wood products below the "C-Line" or minimum stocking level on the Protected Property as determined by applying the protocol set forth in the current U.S. Department of Agriculture, Forest Service Silvicultural Guidelines for the Northeast, or by applying a similar, successor standard approved by Grantee, or the harvesting of wood products that does not conform with the standards provided in the Mass. Cutting Practices Act.

V. Enforcement of the Restrictions

Grantee shall make reasonable efforts from time to time to assure compliance by Grantor with all of the restrictions herein. In connection with such efforts, Grantee, or its designee, may, at its own risk, make periodic inspection of all or any portion of the Protected Property, and for such inspection and enforcement purposes Grantee, or its designee, shall have the right of reasonable access to the Protected Property upon such terms and conditions and following such prior notice to Grantor as Grantor may from time to time reasonably impose and require. In the event that Grantee becomes aware of an event or circumstance of non-compliance with the terms and conditions herein set forth, Grantee shall give notice to Grantor of such event or circumstance of non-compliance via certified mail, return receipt requested, and demand corrective action sufficient to abate such event or circumstance of non-compliance and restore the Protected Property to its previous condition.

Failure by Grantor to cause discontinuance, abatement, or such other corrective action as may be demanded by Grantee within a reasonable time after receipt of notice and reasonable opportunity to take corrective action shall entitle Grantee to bring an action in a court of competent jurisdiction to enforce the terms of this Grant and to recover any damages arising from such non-compliance. Such damages when recovered, may be applied by Grantee to corrective action on the Protected Property, if necessary. If such court determines that Grantor has failed to comply with this Grant after receiving notice of noncompliance and reasonable opportunity to correct, Grantor shall reimburse Grantee for any reasonable costs of enforcement, including Grantee's staff time, court costs and reasonable attorneys' fees, in addition to any other payments ordered by such Court. In the event that Grantee initiates litigation and the court determines that Grantor has not failed to comply with the terms of this Grant, and

that Grantee has initiated litigation without reasonable cause or in bad faith, then Grantee shall reimburse Grantor for any reasonable costs of defending such action, including court costs and reasonable attorneys' fees. The parties to this Grant specifically acknowledge that events and circumstances of non-compliance constitute immediate and irreparable injury, loss, and damage to the Protected Property and accordingly entitle Grantee to such equitable relief, including but not limited to injunctive relief, as the Court deems just. The remedies described herein are in addition to, and not in limitation of, any other remedies available to Grantee at law, in equity, or through administrative proceedings.

No delay or omission by Grantee in the exercise of any right or remedy upon any breach by Grantor shall impair Grantee's rights or remedies or be construed as a waiver. Nothing in this enforcement section shall be construed as imposing a liability upon a prior owner of the Protected Property, where the event or circumstance of non-compliance shall have occurred after said prior owner's ownership or control of the Protected Property has terminated.

VI. Integrity of the Hydroelectric Project

1. The Grantee covenants and agrees with the Grantor that at any and all times that Grantee enters upon the Protected Property the Grantee shall take all necessary precautions to protect the scenic, recreational and environmental values of the Protected Property.

2. The Grantee covenants and agrees with the Grantor that Grantee's enforcement of the conservation restrictions set forth herein shall not endanger health, create a nuisance or otherwise be incompatible with the current use and operation of the Deerfield River Hydroelectric Project, or any future change in use as may from time to time be approved by FERC.

3. The Grantee acknowledges and agrees with the Grantor that this Grant of Conservation Restrictions and all terms and conditions contained herein are subject to Grantor's Federal License No. 2323 as issued by FERC and all the terms and conditions thereof and all amendments thereto or other licenses or orders which may be issued by FERC in connection with the Deerfield River Hydroelectric Project as well as any rules and regulations promulgated by FERC in the future.

4. The Grantee acknowledges and agrees with the Grantor that nothing in this Grant of Conservation Restrictions shall defeat, lessen or be in degradation of any interest or right acquired or reserved by the Grantor in connection with the Deerfield River Hydroelectric Project and issued under Federal License No. 2323.

5. The Grantee acknowledges that this grant of Conservation Restrictions by the Grantor is in full satisfaction of the Grantor's obligations under Section V, subsection A, of the Settlement, dated October 5, 1994.

VII. Notices

1. Unless otherwise provided herein or by law Grantor shall provide at least forty-five (45) days written notice prior to commencing any activity requiring Grantee's prior approval under the terms of this Grant. Grantor shall provide Grantee information reasonably necessary to determine whether the proposed activity is consistent with the purposes of this Grant. Grantee shall respond within forty-five

(45) days of receipt of such notice providing its consent, or specifying why the proposed activity is in conflict with this Grant. Grantee's approval shall not be unreasonably withheld. In the event that Grantee does not respond within forty-five (45) days of confirmation of actual receipt of such prior notice, Grantee will be deemed to have approved the activity.

VIII. Miscellaneous Provisions

1. It is hereby agreed that the construction of any buildings, structures or improvements, or any use of the land otherwise permitted under this Grant, shall be in accordance with all applicable law.

2. Grantee may transfer the conservation restrictions conveyed by Grantor herein only to a qualified government or non-government conservation organization that (a) agrees to enforce the conservation Purposes of this Grant, in accordance with the regulations established by the Internal Revenue Service governing such transfers (if applicable) and (b) has first been approved in writing by Grantor, The Conservation Law Foundation (CLF) and The Appalachian Mountain Club (AMC) (to the extent that CLF and AMC continue to exist), each of whom may withhold such approval in its sole discretion.

3. In the event the conservation restrictions conveyed to Grantee herein are extinguished by eminent domain or other legal proceedings, Grantee shall be entitled to any damages which are specifically allocated to the extinguishment of the conservation restrictions created by this Grant. Grantee shall use any such proceeds to preserve undeveloped and open space land in order to protect the aesthetic, cultural, educational, scientific and natural resources of the state through non-regulatory means.

4. This grant is made subject to existing rights of third parties, if any, including but not limited to all existing rights and easements of record of New England Power Company; without any warranties or covenants of title; and subject to all matters now of record in the Registries of Deeds of the Counties in which the Protected Property is located.

5. In any deed conveying an interest in all or part of the Protected Property, Grantor shall make reference to the conservation restrictions described herein and shall indicate that said restrictions are binding upon all successors in interest in the Protected Property in perpetuity.

6. Grantee shall be entitled to record any instruments necessary in the future to continue the validity of this Grant, and Grantor agrees to cooperate and execute any instruments necessary to do so.

7. If circumstances arise under which amendment to or modification of this Restriction would be appropriate, Grantor and Grantee may by mutual written agreement jointly amend this Restriction, provided that no amendment may be made that will be inconsistent with the purposes of this Restriction, affect its perpetual duration, violate the provisions of Article 97 of the Amendments to the Massachusetts Constitution, nor adversely affect any of the significant conservation values of the Protected Property. Any amendment to this restriction shall be duly recorded in the appropriate Registry of Deeds.

8. In the event all or any portion of the Protected Property is no longer required for electrical generation and transmission purposes, then existing, approved or with regulatory approvals pending (the "Surplus Property"), Grantee shall have, upon receipt of notice from the Grantor of the availability of Surplus Property ("Grantor's Notice"), an option to purchase the Surplus Property, subject to all regulatory approvals. Grantee shall exercise such option by giving written notice to Grantor at any time during the period ending six (6) months after Grantee's receipt of Grantor's Notice. The purchase price for the Surplus Property shall be the Fair Market Value of the Surplus Property (determined as hereafter provided).

If Grantor and Grantee shall not agree on the Fair Market Value of the Surplus Property within thirty (30) days after Grantee's notice exercising such option to purchase the Surplus Property, Fair Market Value shall be determined by appraisers (who shall hold the MAI designation), one to be chosen by Grantor, one to be chosen by Grantee, and a third to be selected, if necessary, as below provided. The written decision of a majority of the three appraisers shall be conclusive. Grantor and Grantee shall each notify the other of its chosen appraiser within fifteen (15) days following the call for appraisal. Such two appraisers shall attempt to reach a unanimous decision within thirty (30) days after their designation. If such two appraisers do not reach a unanimous decision within such time, they shall be afforded seven (7) days to choose a third appraiser. If they shall be unable to select a third appraiser, then they shall so notify the then President of the Greater Boston Real Estate Board and request him to select an impartial third appraiser, who shall hold the MAI designation. Such impartial third appraiser and the first two chosen shall hear the parties and their evidence and render their decision. Grantor and Grantee shall bear the expense of the third appraiser (if any) equally.

If Grantee shall exercise the option set forth in this Section, Grantor shall sell, and Grantee shall buy, subject to appropriation and necessary governmental approvals, the Surplus Property upon the terms set forth in this Section, including the following:

(a) Unless otherwise agreed by Grantee, included in the sale as part of the Surplus Property are the buildings, structures and improvements now or hereafter thereon and the fixtures belonging to Grantor and used in connection therewith, including, if any, all furnaces, heaters, heating equipment, oil and gas burners and fixtures appurtenant thereto, hot water heaters, plumbing fixtures, electrical and lighting fixtures, fences, gates, trees, shrubs, plants, and, if built in, air conditioning equipment and ventilators.

(b) The Surplus Property shall be conveyed by a good and sufficient quitclaim deed running to Grantee, or to the nominee designated by Grantee, and such deed shall convey a good and clear record and marketable title thereto, free from all encumbrances, except

(i) provisions of existing building and zoning laws;
(ii) such real estate taxes that are not Grantee's obligation to pay under this Lease;
(iii) any liens for municipal betterments assessed after the date of this Lease; and
(iv) all matters of record in the appropriate Registry of Deeds on the date Grantee exercises its option.

(c) The purchase price for the Surplus Property shall be paid at the time of delivery of the deed by a check of the Commonwealth drawn by the State Treasurer or his designee.

(d) Such deed shall be delivered at 10:00 a.m. on the thirtieth (30th) day (or if such day is not a business day, the first business day thereafter) after the purchase price shall be determined ("Closing Date"), at the offices of Foley, Hoag & Eliot, One Post Office Square, Boston, Massachusetts, unless otherwise agreed in writing. It is agreed that time is of the essence.

(e) Full possession of the Surplus Property, free of all tenants and occupancy shall be delivered at the time of delivery of the deed, the Surplus Property to be in its then "*as-is*" condition.

(f) If Grantor shall be unable to give title or to make conveyance or to deliver possession of the Surplus Property, all as herein stipulated, then, at the option of either party, all obligations of all parties under this Section shall cease and this Section shall be void without recourse to the parties hereto.

(g) Grantee shall have the election to accept such title as Grantor can deliver to the Surplus Property in its then condition and to pay therefor the purchase price without deduction, in which case Grantor shall convey such title, provided that if there exists any title defect which may be cured by the payment of a readily ascertainable sum, such sum shall be deducted from the purchase price and used by Grantee to cure such defect simultaneously with the Closing.

(h) The acceptance of a deed by Grantee or its nominee, as the case may be, shall be deemed to be a full performance and discharge of every agreement and obligation contained or expressed in this Section.

9. The term "Grantor" shall include the successors and assigns of USGen New England, Inc. The term "Grantee" shall include the permitted successors and assigns of the original Grantee, the Massachusetts Department of Environmental Management.

The land and real property interests held by Grantor to which these restrictions apply are described in deeds set out in Schedule A attached hereto, to which deeds reference may be had for Grantor's title.

INVALIDATION of any provision hereof shall not affect any other provision of this Grant.

TO HAVE AND TO HOLD said granted conservation restrictions, with all the privileges and appurtenances thereof, to the said Grantee, the Massachusetts Department of Environmental Management, its permitted successors and assigns, to their own use and behoof forever.

100

BK 1031 PG 829

IN WITNESS WHEREOF, Grantor executes this Grant under seal this 16th day of July, 2001.

Signed and delivered
In The Presence Of:

Witness to GEORGE T. GRUNBECK

GRANTOR
USGen New England, Inc.

By:

COMMONWEALTH OF MASSACHUSETTS

Suffolk County, ss:

At One Bowdoin Square, Boston, this 16th day of July, 2001, personally appeared George Grunbeck, VICE PRESIDENT of US Gen New England, Inc., duly authorized, and acknowledged the foregoing instrument to be his free act and deed and the free act and deed of USGen New England, Inc., before me.

Notary Public:

My commission expires: 3/3/06

3812

BK 1031 PG 830

SCHEDULE A
PROTECTED PROPERTY

All those parcels of land and other real property interests, whether appurtenant or in gross, located in the towns of Rowe, Monroe, Buckland, Conway, Shelburne and Deerfield, Franklin County, Massachusetts, and the town of Florida, Berkshire County, Massachusetts, conveyed by New England Power Company (NEPCO) to Grantor by several instruments on record with the Franklin County Registry of Deeds in Greenfield, Massachusetts, and with the Berkshire Northern District Registry of Deeds in Adams, Massachusetts, being recorded as follows:

Franklin Registry:

1. Deed of NEPCO to Grantor dated August 21, 1998, Book 3393, Page 285 (Sherman).
2. Deed of NEPCO to Grantor dated August 18, 1998, Book 3393, Page 342 (Deerfield 2)[1].
3. Deed of NEPCO to Grantor dated August 18, 1998, Book 3393, Page 333 (Deerfield 3)[2].
4. Deed of NEPCO to Grantor dated August 21, 1998, Book 3393, Page 323 (Deerfield 4).
5. Deed of NEPCO to Grantor dated August 21, 1998, Book 3393, Page 299 (Deerfield 5).

North Berkshire Registry:

1. Deed of NEPCO to Grantor dated August 21, 1998, Book 963, Page 221 (Deerfield 4).
2. Deed of NEPCO to Grantor dated August 21, 1998, Book 963, Page 197 (Deerfield 5).

Also, unrecorded deed of NEPCO to Grantor dated July 10, 2001 (Zoar Gap picnic area).

Said parcels of land are shown on enlarged USGS topographic and other maps on file with the Federal Energy Regulatory Commission, License No. 2323.

Excepting from this conveyance any portion of the land or interests in land located within the bounds of the Bear Swamp Pumped Storage Facility located in the towns of Florida and Rowe, Massachusetts, shown on a plan entitled "Existing Conditions Plan of Bear Swamp - Project No. 2669 Prepared for USGen New England, Inc., Florida & Rowe, Massachusetts" dated November 23, 1998, by Cullinan Engineering Company, Inc., of Auburn and Boston, Massachusetts, a copy of which is on file with the Grantor and the Grantee, the bounds of said Facility being more particularly described in Exhibit A, attached.

Excepting also from this conveyance a parcel of land containing 14 acres, more or less, located in the Shelburne Village area of the town of Buckland, Massachusetts, shown on an unrecorded plan entitled "Plan of F.E.R.C. License Exclusion Buckland (Franklin Co.), MA Surveyed for USGen New England, Inc." dated September 14, 2000, by Ainsworth Associates, Inc., of Greenfield, Massachusetts, a reduced

---

[1] See also Document No. 5665 on Certificate of Title 7, and Certificate of Title 1202, Registration Book 7, Page 107

[2] See also Document No. 5664 on Certificate of Title 8, and Certificate of Title 1201, Registration Book 7, Page 106

copy of which is attached hereto as Exhibit B; another parcel of land located in Buckland on the west side of the Deerfield River on which Grantor's No. 4 Development, so-called, is located, including the powerhouse, penstock, forebay, gates and other facilities associated therewith, as shown on Exhibits C and C-1, attached hereto, being all or a portion of the parcel identified as DRE 180 on said Exhibits, and another parcel of land also located in the Shelburne Village area of Buckland on which Grantor's dam, gateworks, and associated facilities are located, and which is identified as DRE 210 on Exhibit D attached hereto.

3812

EXHIBIT A
BEAR SWAMP DESCRIPTION

DESCRIPTION OF LAND IN THE COMMONWEALTH OF MASSACHUSETTS, LOCATED ON TUNNEL ROAD IN THE TOWN OF ROWE, FRANKLIN COUNTY, AND ALSO ON RIVER ROAD IN THE TOWN OF FLORIDA, BERKSHIRE COUNTY, BEING OWNED BY USGEN NEW ENGLAND, INC., KNOWN AS AND LICENSED BY THE FEDERAL ENERGY REGULATORY COMMISSION AS "BEAR SWAMP - PROJECT 2669" BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT AN IRON ROD FOUND ON THE NORTHERLY SIDELINE OF TUNNEL ROAD AT THE SOUTHWESTERLY CORNER OF LAND NOW OR FORMERLY OF USGEN NEW ENGLAND INC.;

THENCE: N 01° 54' 58" W A DISTANCE OF 338.16 FEET;

THENCE: N 42° 05' 30" E A DISTANCE OF 46 FEET;

THENCE: N 00° 23' 30" E A DISTANCE OF 759 FEET;

THENCE: N 53° 51' 30" W A DISTANCE OF 167 FEET;

THENCE: N 81° 38' 30" W A DISTANCE OF 199 FEET;

THENCE: S 81° 40' 30" W A DISTANCE OF 172 FEET;

THENCE: S 88° 40' 30" W A DISTANCE OF 178 FEET;

THENCE: N 74° 09' 30" W A DISTANCE OF 2323 FEET;

THENCE: S 88° 02' 30" W A DISTANCE OF 448 FEET;

THENCE: N 89° 11' 30" W A DISTANCE OF 200 FEET;

THENCE: N 85° 53' 30" W A DISTANCE OF 852 FEET;

THENCE: N 09° 28' 30" W A DISTANCE OF 396 FEET TO AN IRON PIN FOUND ON THE SOUTHERLY SIDELINE OF THE RIVER ROAD;

THENCE: CROSSING THE RIVER ROAD ON A TIE COURSE OF N 09° 28' 30" W A DISTANCE OF 67.15 FEET TO THE NORTHERLY LINE OF SAID ROAD;

THENCE: N 09° 28' 30" W A DISTANCE OF 415.95 FEET;

THENCE: N 09° 28' 30" W A DISTANCE OF 495 FEET;

THENCE: N 09° 28' 30" W A DISTANCE OF 1180 FEET TO FIFE BROOK;

THENCE: SOUTHEASTERLY ALONG SAID BROOK A DISTANCE OF 114 FEET;

THENCE: N 03° 28' 25" E A DISTANCE OF 1150 FEET ;

THENCE: S 84° 46' 35" E A DISTANCE OF 1399 FEET ;

THENCE: N 13° 46' 05" E A DISTANCE OF 926 FEET ;

THENCE: N 75° 36' 07" W A DISTANCE OF 2024.90 FEET ;

THENCE: S 56° 26' 48" W A DISTANCE OF 833.26 FEET ;

THENCE: S 04° 32' 25" W A DISTANCE OF 84.84 FEET ;

THENCE: N 72° 16' 35" W A DISTANCE OF 1199.80 FEET ;

THENCE: N 27° 08' 25" E A DISTANCE OF 191.92 FEET ;

THENCE: S 84° 32' 35" E A DISTANCE OF 1087.60 FEET ;

THENCE: S 03° 23' 40" W A DISTANCE OF 35.51 FEET ;

THENCE: N 56° 24' 25" E A DISTANCE OF 756.82 FEET ;

THENCE: S 75° 41' 33" E A DISTANCE OF 1852.87 FEET ;

THENCE: N 56° 09' 51" E A DISTANCE OF 968.51 FEET ;

THENCE: S 68° 43' 44" E A DISTANCE OF 1251.80 FEET ;

THENCE: S 84° 23' 17" E A DISTANCE OF 2067.75 FEET ;

THENCE: N 63° 15' 24" E A DISTANCE OF 1484 FEET TO OTHER LAND OF USGEN NEW ENGLAND, INC., KNOWN AS "DEERFIELD NO. 5 - PROJECT 2323" ;

THENCE: S 22° 15' 37" E A DISTANCE OF 381.22 FEET TO RIVER ROAD, SAID POINT LAYING 234 FEET EASTERLY OF A CONCRETE BOUND FOUND;

THENCE: N 67° 12' 19" E ALONG RIVER ROAD A DISTANCE OF 193.00 FEET ;

THENCE: S 05° 55' 41" E CROSSING RIVER ROAD A DISTANCE OF 68.96 FEET ;

THENCE: S 05° 55' 41" E A DISTANCE OF 526 FEET TO THE 880 FOOT CONTOUR ELEVATION ;

THENCE: EASTERLY AND NORTHERLY ALONG THE 880 FOOT CONTOUR BUT EXCEPTING THE DEERFIELD NO. 5 POWERHOUSE A DISTANCE OF 5430 FEET TO SAID "DEERFIELD NO. 5 - PROJECT 2323" ;

THENCE: S 88° 49' 20" E A DISTANCE OF 1360 FEET ;

THENCE: S 13° 08' 40" W A DISTANCE OF 1645 FEET ;

THENCE: S 88° 09' 20" E A DISTANCE OF 165 FEET ;

THENCE: S 08° 08' 40" W A DISTANCE OF 1655 FEET ;

THENCE: S 88° 09' 20" E A DISTANCE OF 231 FEET ;

THENCE: S 11° 12' 34" E A DISTANCE OF 527.74 FEET ;

THENCE: S 25° 19' 40" W A DISTANCE OF 231 FEET ;

THENCE: S 10° 19' 40" W A DISTANCE OF 924 FEET ;

THENCE: S 89° 19' 40" W A DISTANCE OF 231 FEET ;

THENCE: S 38° 40' 05" W A DISTANCE OF 771.72 FEET ;

THENCE: S 07° 48' 55" E A DISTANCE OF 496.13 FEET ;

THENCE: S 08° 15' 10" E A DISTANCE OF 412.91 FEET ;

THENCE: S 13° 53' 39" E A DISTANCE OF 792.18 FEET ;

THENCE: S 87° 39' 54" W A DISTANCE OF 1665.96 FEET ;

THENCE: S 05° 30' 19" E A DISTANCE OF 725.91 FEET ;

THENCE: S 87° 51' 22" W A DISTANCE OF 501 FEET ;

THENCE: S 05° 30' 19" E A DISTANCE OF 1161 FEET TO TUNNEL ROAD ;

THENCE: S 88° 12' 20" W A DISTANCE OF 178.10 FEET ;

THENCE: N 76° 13' 02" W A DISTANCE OF 117.15 FEET ;

THENCE: S 87° 20' 38" W A DISTANCE OF 402.92 FEET ;

THENCE: AN ARC DISTANCE OF 156.62 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 200.00 FEET AND AN INTERIOR ANGLE OF 44° 52' 08" ;

THENCE: N 47° 47' 14" W A DISTANCE OF 99.24 FEET ;

THENCE: N 65° 51' 26" W A DISTANCE OF 326.50 FEET ;

THENCE: AN ARC DISTANCE OF 142.91 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 150.00 FEET AND AN INTERIOR ANGLE OF 54° 35' 13" ;

THENCE: S 59° 33' 21" W A DISTANCE OF 182.30 FEET ;

THENCE: AN ARC DISTANCE OF 134.59 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 300.00 FEET AND AN INTERIOR ANGLE OF 25° 42' 18" ;

THENCE: S 33° 51' 03" W A DISTANCE OF 152.04 FEET ;

THENCE: S 42° 17' 56" W A DISTANCE OF 81.03 FEET ;

THENCE: S 50° 33' 56" W A DISTANCE OF 68.40 FEET ;

THENCE: S 56° 55' 56" W A DISTANCE OF 97.07 FEET ;

THENCE: S 47° 50' 56" W A DISTANCE OF 140.37 FEET ;

THENCE: AN ARC DISTANCE OF 231.29 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 351.75 FEET AND AN INTERIOR ANGLE OF 37° 40' 26" ;

THENCE: S 85° 31' 22" W A DISTANCE OF 89.88 FEET ;

THENCE: AN ARC DISTANCE OF 114.72 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 158.50 FEET AND AN INTERIOR ANGLE OF 41° 28' 05" ;

THENCE: S 44° 03' 17" W A DISTANCE OF 231.85 FEET ;

THENCE: S 42° 38' 29" W A DISTANCE OF 211.03 FEET ;

THENCE: S 39° 11' 00" W A DISTANCE OF 223.95 FEET ;

THENCE: S 62° 50' 19" W A DISTANCE OF 249.64 FEET TO AN IRON PIN AT THE POINT OF BEGINNING.

EXCEPTING RIVER ROAD, DESCRIBED AS FOLLOWS :

BEGINNING AT AN IRON PIN FOUND ON THE WESTERLY SIDELINE OF LAND OF USGEN NEW ENGLAND, INC., AND ON THE SOUTHERLY SIDELINE OF RIVER ROAD

THENCE: S 88° 50' 48" E A DISTANCE OF 528.64 FEET ;

THENCE: S 82° 37' 35" E A DISTANCE OF 200.00 FEET TO A POINT 33 FEET RIGHT OF STATION 0+00 AS SHOWN ON THE DECEMBER 5, 1972 BERKSHIRE COUNTY LAYOUT OF RIVER ROAD IN FLORIDA ;

THENCE: S 82° 37' 35" E A DISTANCE OF 390.00 FEET ;

THENCE: AN ARC DISTANCE OF 673.77 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 383.00 FEET AND AN INTERIOR ANGLE OF 100° 47' 39" ;

THENCE: N 03° 25' 13" W A DISTANCE OF 180.17 FEET ;

THENCE: AN ARC DISTANCE OF 212.69 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 406.20 FEET AND AN INTERIOR ANGLE OF 30° 00' 02" ;

THENCE: N 33° 25' 13" W A DISTANCE OF 728.80 FEET ;

THENCE: AN ARC DISTANCE OF 380.24 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 317.00 FEET AND AN INTERIOR ANGLE OF 68° 43' 34" ;

THENCE: N 35° 18' 20" E A DISTANCE OF 134.75 FEET ;

THENCE: AN ARC DISTANCE OF 283.73 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 383.00 FEET AND AN INTERIOR ANGLE OF 42° 26' 43" ;

THENCE: N 07° 08' 25" W A DISTANCE OF 84.94 FEET ;

THENCE: AN ARC DISTANCE OF 207.38 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 317.00 FEET AND AN INTERIOR ANGLE OF 37° 28' 58" ;

THENCE: N 30° 20' 35" E A DISTANCE OF 166.46 FEET ;

THENCE: AN ARC DISTANCE OF 110.71 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 383.00 FEET AND AN INTERIOR ANGLE OF 16° 33' 43" ;

THENCE: N 13° 46' 52" E A DISTANCE OF 1570.56 FEET ;

THENCE: AN ARC DISTANCE OF 591.41 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 317.00 FEET AND AN INTERIOR ANGLE OF 106° 53' 36" ;

THENCE: S 59° 19' 32" E A DISTANCE OF 453.82 FEET ;

THENCE: AN ARC DISTANCE OF 407.91 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 993.00 FEET AND AN INTERIOR ANGLE OF 23° 32' 11" ;

THENCE: S 82° 51' 44" E A DISTANCE OF 761.09 FEET ;

THENCE: AN ARC DISTANCE OF 401.91 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 6512.67 FEET AND AN INTERIOR ANGLE OF 3° 32' 09" ;

THENCE: S 86° 23' 53" E A DISTANCE OF 1091.37 FEET ;

THENCE: AN ARC DISTANCE OF 335.69 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 480.84 FEET AND AN INTERIOR ANGLE OF 40° 00' 00" ;

THENCE: AN ARC DISTANCE OF 245.05 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 1040.02 FEET AND AN INTERIOR ANGLE OF 13° 30' 00" ;

THENCE: N 67° 06' 07" E A DISTANCE OF 173.00 FEET ;

THENCE: AN ARC DISTANCE OF 287.22 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 1061.70 FEET AND AN INTERIOR ANGLE OF 15° 30' 00" ;

THENCE: AN ARC DISTANCE OF 428.53 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 1573.56 FEET AND AN INTERIOR ANGLE OF 15° 36' 12" ;

THENCE: N 67° 12' 19" E A DISTANCE OF 406.98 FEET TO OTHER LAND OF USGEN NEW ENGLAND INC., KNOWN AS "DEERFIELD NO. 5 - PROJECT 2323" ;

THENCE: CROSSING RIVER ROAD ON A TIE COURSE OF N 05° 55' 41" W A DISTANCE OF 68.96 FEET;

THENCE: S 67° 12' 19" W A DISTANCE OF 427.00 FEET;

THENCE: AN ARC DISTANCE OF 446.50 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 1639.56 FEET AND AN INTERIOR ANGLE OF 15° 36' 12";

THENCE: AN ARC DISTANCE OF 269.36 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 995.70 FEET AND AN INTERIOR ANGLE OF 15° 30' 00";

THENCE: S 67° 06' 07" W A DISTANCE OF 173.00 FEET;
THENCE: AN ARC DISTANCE OF 260.60 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 1106.02 FEET AND AN INTERIOR ANGLE OF 13° 30' 00";

THENCE: AN ARC DISTANCE OF 289.61 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 414.84 FEET AND AN INTERIOR ANGLE OF 40° 00' 00";

THENCE: N 86° 23' 53" W A DISTANCE OF 1091.37 FEET;

THENCE: AN ARC DISTANCE OF 397.84 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 6446.67 FEET AND AN INTERIOR ANGLE OF 3° 32' 09";

THENCE: N 82° 51' 44" W A DISTANCE OF 761.09 FEET;

THENCE: AN ARC DISTANCE OF 380.80 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 927.00 FEET AND AN INTERIOR ANGLE OF 23° 32' 11";

THENCE: N 59° 19' 32" W A DISTANCE OF 453.82 FEET;

THENCE: AN ARC DISTANCE OF 714.54 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 383.00 FEET AND AN INTERIOR ANGLE OF 106° 53' 36";

THENCE: S 13° 46' 52" W A DISTANCE OF 1570.56 FEET;

THENCE: AN ARC DISTANCE OF 91.63 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 317.00 FEET AND AN INTERIOR ANGLE OF 16° 33' 43";

THENCE: S 30° 20' 35" W A DISTANCE OF 166.46 FEET;

THENCE: AN ARC DISTANCE OF 250.56 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 383.00 FEET AND AN INTERIOR ANGLE OF 37° 28' 58";

THENCE: S 07° 08' 25" E A DISTANCE OF 84.94 FEET;

THENCE: AN ARC DISTANCE OF 234.84 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 317.00 FEET AND AN INTERIOR ANGLE OF 42° 26' 43";

THENCE: S 35° 18' 20" W A DISTANCE OF 134.75 FEET;

3812

THENCE: AN ARC DISTANCE OF 459.41 FEET ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 383.00 FEET AND AN INTERIOR ANGLE OF 68° 43' 34" ;

THENCE: S 33° 25' 13" E A DISTANCE OF 728.80 FEET ;

THENCE: AN ARC DISTANCE OF 178.13 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 340.20 FEET AND AN INTERIOR ANGLE OF 30° 00' 02" ;

THENCE: S 03° 25' 13" E A DISTANCE OF 180.17 FEET ;

THENCE: AN ARC DISTANCE OF 557.66 FEET ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 317.00 FEET AND AN INTERIOR ANGLE OF 100° 47' 39" ;

THENCE: N 82° 37' 35" W A DISTANCE OF 390.00 TO STATION 0+00 OF SAID COUNTY LAYOUT ;

THENCE: N 82° 37' 35" W A DISTANCE OF 203.59 FEET ;

THENCE: N 88° 50' 48" W A DISTANCE OF 544.64 TO A POINT ON THE WESTERLY LINE OF LAND OF USGEN NEW ENGLAND INC.;

THENCE: CROSSING THE RIVER ROAD ON A TIE COURSE OF S 09° 30' 06" E A DISTANCE OF 67.16 TO AN IRON PIN FOUND AT THE POINT OF BEGINNING.

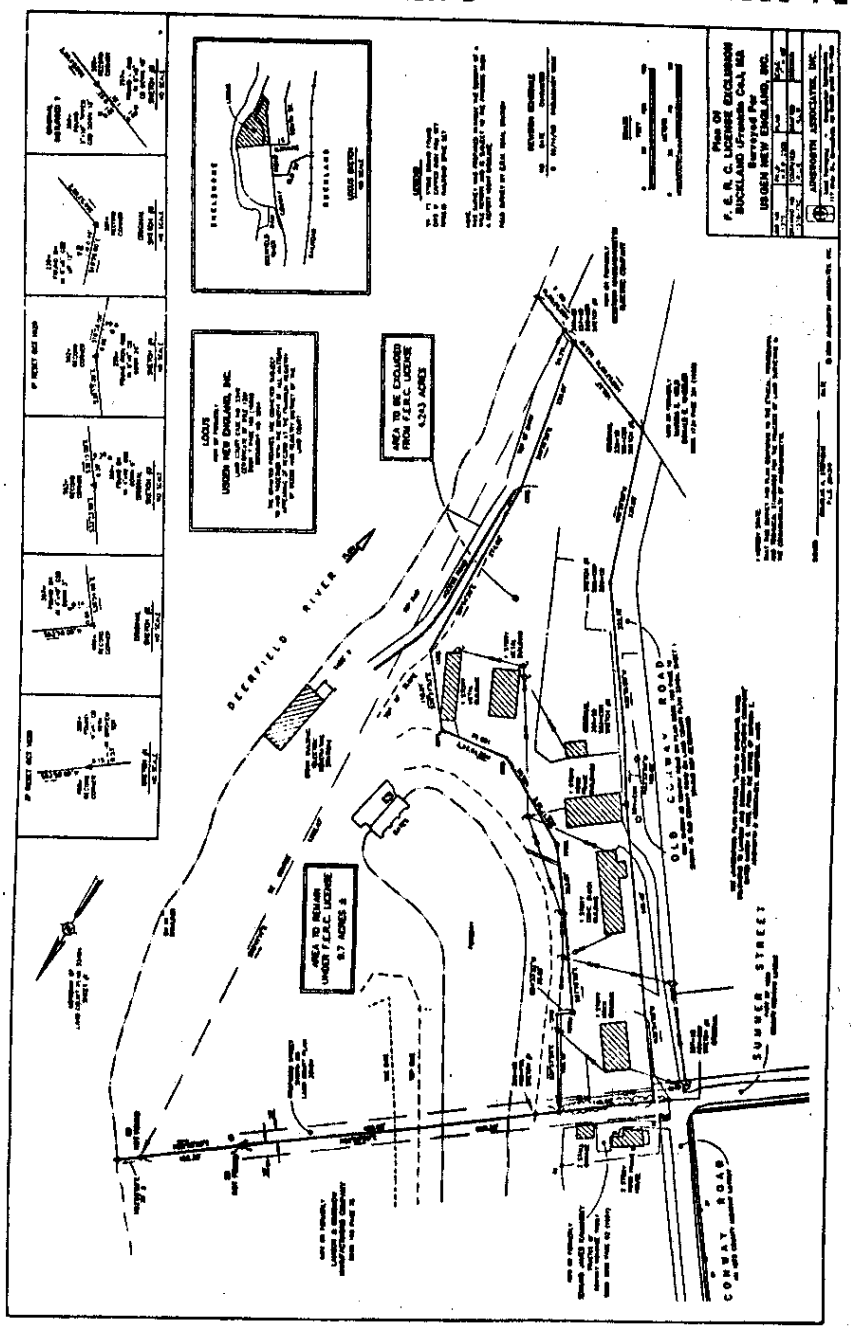
CONTAINING 1256 ACRES, MORE OR LESS

3812

110

EXHIBIT B

BK 1031 PG 839



3812

111

EXHIBIT C

BK 1031 PG 840

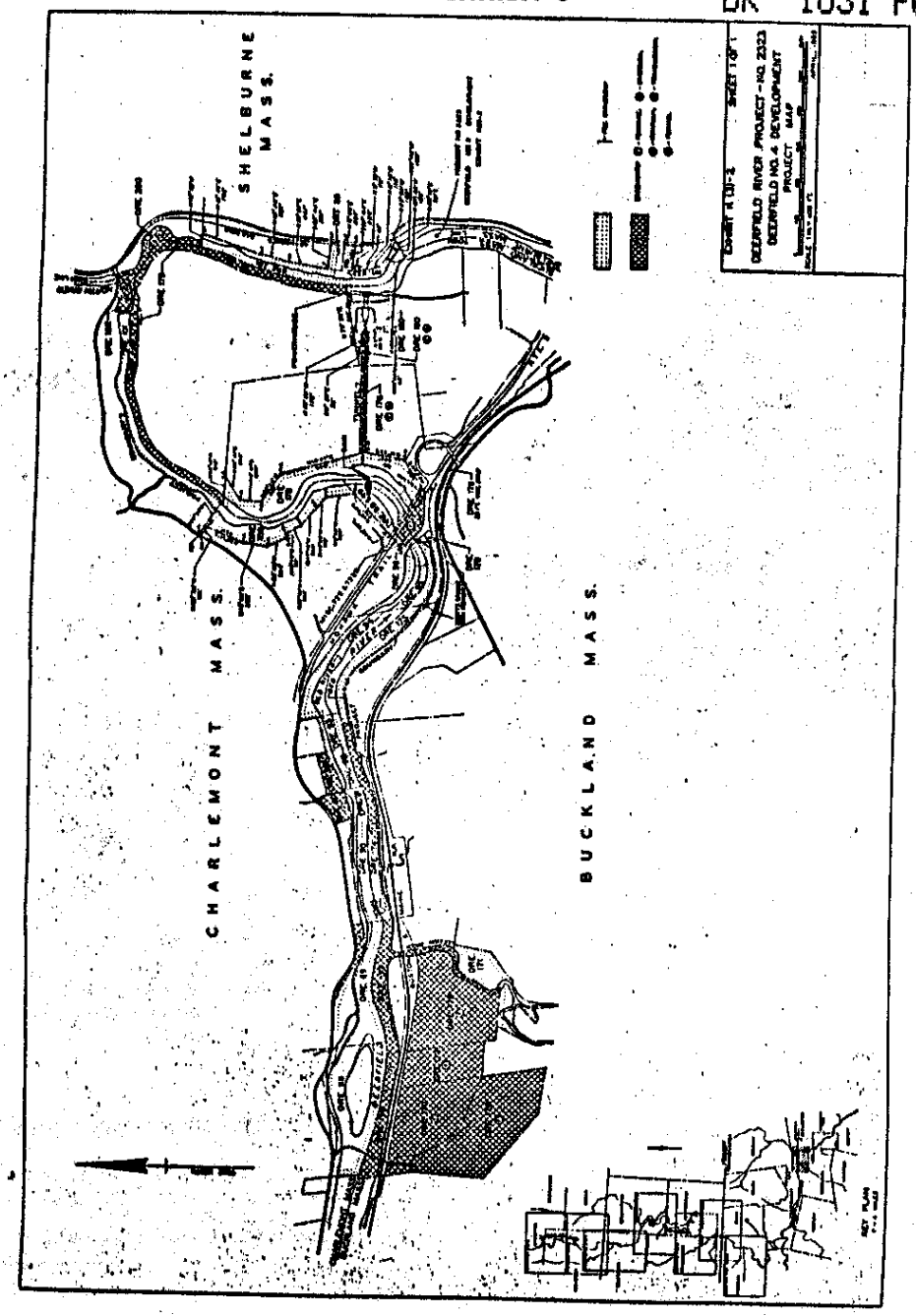


EXHIBIT C-1

BK 1031 PG 841

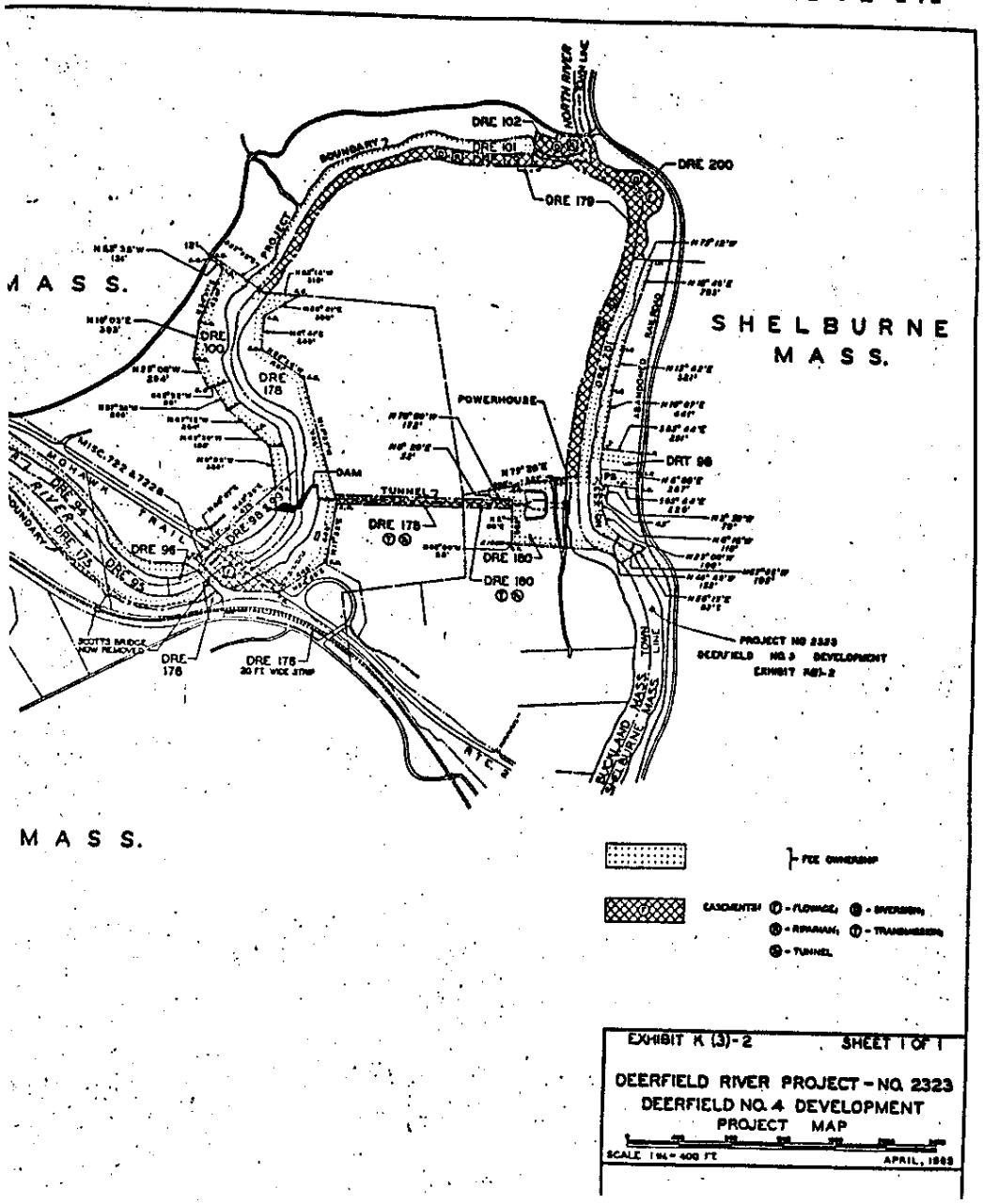


EXHIBIT K (3)-2 SHEET 1 OF 1

DEERFIELD RIVER PROJECT - NO. 2323
DEERFIELD NO. 4 DEVELOPMENT
PROJECT MAP

SCALE 1in = 400 ft APRIL, 1983

3812

EXHIBIT D

BK 1031 PG 842

BK 1031 PG 843

ACCEPTANCE OF GRANT

Grantee joins herein for the purpose of accepting the foregoing grant and agreeing to be bound by the provisions thereof.

IN WITNESS WHEREOF, Grantee executes this Grant under seal this 11th day of July, 2001.

GRANTEE
Commonwealth of Massachusetts
Department of Environmental Management

By: _____
Peter C. Webber, Commissioner

COMMONWEALTH OF MASSACHUSETTS

Suffolk County, ss:

At 11:00 am, this 11th day of July, 2001, personally appeared Peter C. Webber, the Commissioner of the Massachusetts Department of Environmental Management, and acknowledged the foregoing instrument to be his free act and deed and the free act and deed of the Commonwealth of Massachusetts, before me.

_____
Notary Public: John Black
My commission expires: May 27, 2001

Commonwealth of Massachusetts
Berkshire County
A True Copy from Book 1031 Page 819
In the Northern District Registry
of Deeds
Attest: Christopher J. Dolan
REGISTER

END OF DOCUMENT
Northern Berkshire Registry of Deeds:

Appendix D – Public Notification Correspondence

Environmental
Resources
Management

399 Boylston Street
6th Floor
Boston, MA 02116
(617) 646-7800
(617) 267-6447 (fax)

20 February 2008
Ref: 63019.2

Mr. Richard Alix
Chairman, Board of Health
Rowe Town Hall
321 Zoar Road
Rowe, Massachusetts 01367

RE: Notice of Availability
Class A-2 Response Action Outcome Partial (RAOP) Statement
Class A-3 RAOP Statement
Class C-1 RAOP Statement
Yankee Nuclear Power Station
Rowe, Massachusetts
RTN # 1-13411

Dear Mr. Alix:

On behalf of Yankee Atomic Electric Company (Yankee), Environmental Resources Management (ERM) has submitted three Response Action Outcome Partial (RAOP) Statements for the above referenced site to the Massachusetts Department of Environmental Protection (DEP) Western Regional Office. These statements encompass the total disposal site boundary defined in the Massachusetts Contingency Plan as the area(s) where Oil and/or Hazardous Material has come to be locations.

The site was divided into three areas for the purposes of the RAOP filings, as defined below (see attached figure):

- Class A-2 – Applies to the Outlying Areas where a Permanent Solution has been achieved and where there are not restrictions on future uses or activities.

- Class A-3 RAOP – Applies to the Combined Study Area where a Permanent Solution has been achieved and where deed restrictions are in-place to prevent residential use of the property.

- Class C-1 RAOP – Applies to the Central Area where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

In accordance with 310 CMR 40.1403(3)(e), the Chief Municipal Officer and the Board of Health are being notified of the availability of these submittals.

Information regarding the submittals can be reviewed at:

Massachusetts Department of Environmental Protection
Western Regional Office
436 Dwight Street, 5th Floor
Springfield, MA 01103
Phone: (413) 784-1100 Fax: (413) 784-1149

Sincerely,

John W. McTigue, P.G., LSP
LSP of Record

Enclosure: Figure of RAO Boundaries

Environmental
Resources
Management

399 Boylston Street
6th Floor
Boston, MA 02116
(617) 646-7800
(617) 267-6447 (fax)

25 February 2008
Ref: 63019.2

Ms. Myra Carlow
Chairman, Board of Selectmen
Rowe Town Hall
321 Zoar Road
Rowe, Massachusetts 01367

RE: Notice of Availability
Class A-2 Response Action Outcome Partial (RAOP) Statement
Class A-3 RAOP Statement
Class C-1 RAOP Statement
Yankee Nuclear Power Station
Rowe, Massachusetts
RTN # 1-13411

Dear Ms. Carlow:

On behalf of Yankee Atomic Electric Company (Yankee), Environmental Resources Management (ERM) has submitted three Response Action Outcome Partial (RAOP) Statements for the above referenced site to the Massachusetts Department of Environmental Protection (DEP) Western Regional Office.

The site was divided into three areas for the purposes of the RAOP filings, as defined below (see attached figure):

- Class A-2 RAOP – Applies to the Outlying Areas where a Permanent Solution has been achieved and where there are not restrictions on future uses or activities.

- Class A-3 RAOP – Applies to the Combined Study Area where a Permanent Solution has been achieved and where deed restrictions are in-place to prevent residential use of the property.

- Class C-1 RAOP – Applies to the Central Area where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

In accordance with 310 CMR 40.1403(3)(e), the Chief Municipal Officer and the Board of Health are being notified of the availability of these submittals.

Information regarding the submittals can be reviewed at:

Massachusetts Department of Environmental Protection
Western Regional Office
436 Dwight Street, 5th Floor
Springfield, MA 01103
Phone: (413) 784-1100 Fax: (413) 784-1149

Sincerely,

John W. McTigue, P.G., LSP
LSP of Record

Enclosure: Figure of RAO Boundaries

Legend
- Class A-2 RAO/Outlying Areas
- Class A-3 RAO/Combined Study Area
- Class C-1 RAO/Central Area
- Property Line

N

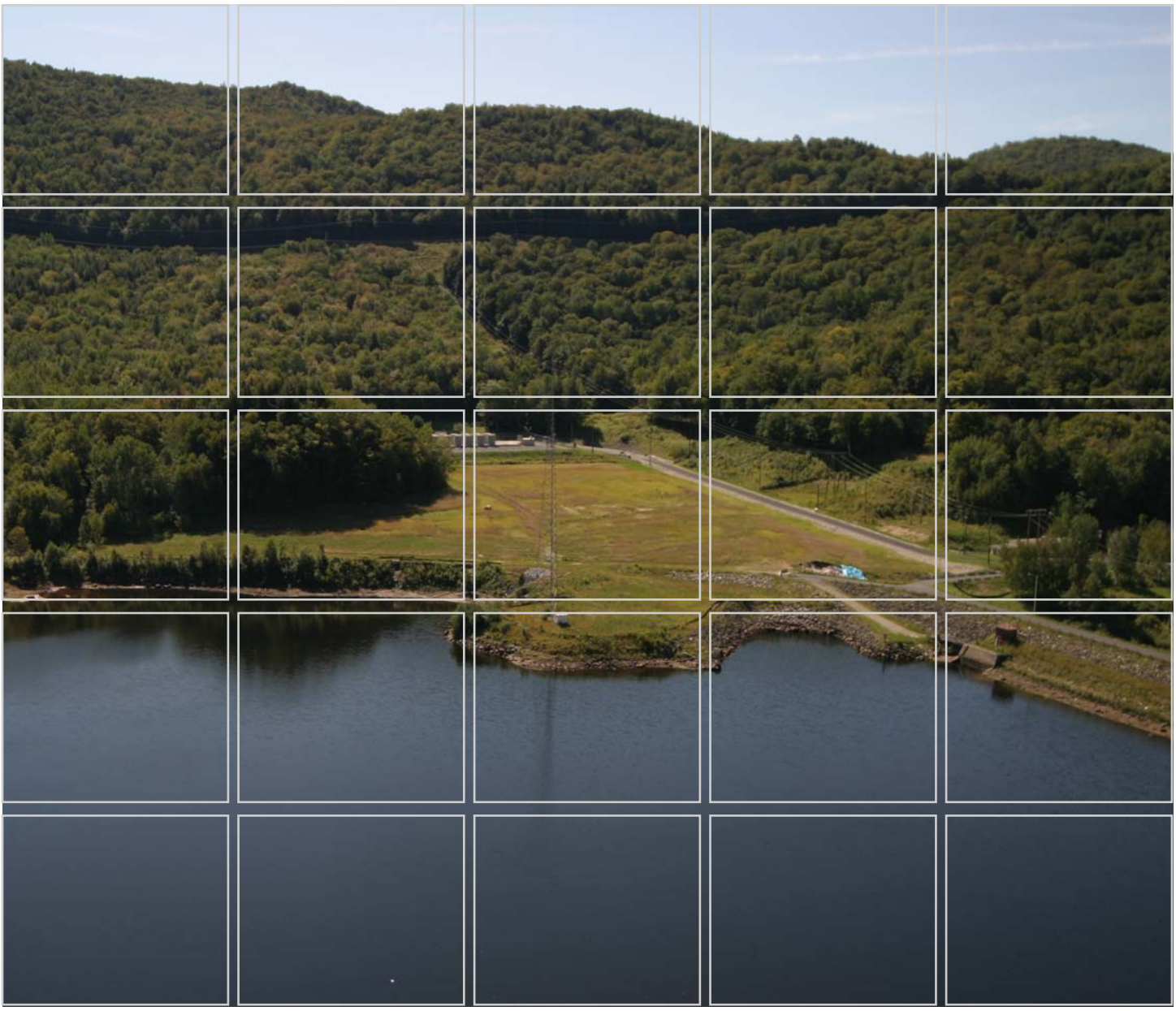
Sherman Reservoir
East Storm Drain Outfall
Deerfield River
Sherman Station
Trans Canada YAEC Property
Wheeler Brook
West Storm Drain Outfall
MW-111A/B/C
MW-107A/B/C/D/E/F
MW-101A/B/C
Tributary to Wheeler Brook
Guard House
West Storm Drain Ditch
Trans Canada YAEC Property
ISFSI
Wheeler Brook Divertment
ABC Parking Lot
Drum in Woods
Furlon House
Relic Dump
Hair Pin Turn

Scale (1"=400')
200' 0 200' 400' 800'

RAO Boundaries
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - RAO 2008\Figure 2 & 3.dwg (02/26/2008 - 10:10am Boston)



Class C-1 Response Action Outcome Partial Statement

Central Area

Yankee Nuclear Power Station
Rowe, Massachusetts
RTN 1-13411

25 February 2008

ERM
399 Boylston Street
Boston, MA 02116
(617) 646-7800
www.erm.com

Delivering sustainable solutions in a more competitive world

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 BACKGROUND

On behalf of Yankee Atomic Electric Company (YAEC), Environmental Resources Management (ERM) prepared this Partial Class C-1 Response Action Outcome (RAOP) Statement for the Central Area, a portion of the former Yankee Nuclear Power Station (YNPS), the "site", located at 49 Yankee Road, Rowe, Massachusetts (Figure 1). This Class C-1 RAOP represents a Temporary Solution for that portion of the former industrial area where tritium and arsenic concentrations in groundwater remain above drinking water standards.

This document was prepared in accordance with the requirements of the Massachusetts Contingency Plan (MCP) Section 310 of the Code of Massachusetts Regulations (CMR 40.1000), regulating release(s) of oil and/or hazardous materials (OHM) to the environment. The RAOP Statement Transmittal Form (BWSC 104) was submitted electronically and a copy is provided in Appendix A.

The Massachusetts Department of Environmental Protection (MA DEP) classified the site as a Tier IB Disposal Site due to releases of OHM to the environment associated with operation of the former YNPS, now fully decommissioned and the majority of the property was released from its operating license by the United States Nuclear Regulatory Commission (US NRC) in August 2007. Assessment and remedial response actions were completed under Tier IB Permit No. 54016. The MA DEP Release Tracking Number (RTN) for the site is 1-13411. This Class C-1 RAOP is being filed specific to that portion of the site where tritium and arsenic remain in groundwater at concentrations above applicable federal maximum contaminant levels for drinking water. This portion of the former industrial area is designated as the "Central Area" (see Figure 2).

A Method 3 Risk Characterization, dated November 2007, was prepared by Gradient Corporation, following the completion of remedial activities at the site. The risk characterization assessed the combined risk associated with residual radiological and OHM constituents remaining at the site. The scope of work for the risk characterization and the risk characterization itself were completed under the oversight and direction of the MA DEP, US Environmental Protection Agency (EPA) and MA Department of Public Health (DPH).

1.2 PURPOSE AND SCOPE

The purpose of this report is to document compliance with MCP requirements for achievement of a Temporary Solution as a Class C-1 RAOP for the portion of the site designated as the Central Area. This RAOP excludes the other remaining areas of the site subject to MCP compliance, specifically two other portions of the site designated as the Combined Study Area and the Outlying Areas, for which separate RAOP Statements (Class A-3 and Class A-2, respectively) will be filed.

The remainder of this report is organized as follows:

- **Section 2.0 – Site Description and Summary of Site Response Actions –** Includes a description of the site and a summary of past assessment and remedial response actions including soil excavation and disposal.

- **Section 3.0 – Achievement of Response Action Performance Standards** - This section summarizes key MCP performance standards specific to a Class C-1 Temporary Solution and documents how site conditions satisfy these criteria, including: elimination, control and mitigation of sources; a summary of the Method 3 Risk Characterization; a Substantial Hazard Evaluation; and an Evaluation of the Feasibility of Achievement of a Permanent Solution.

- **Section 4.0 – Operation/Maintenance and Monitoring/Periodic Evaluation –** This section outlines monitoring and the periodic evaluation to be conducted until achievement of a Permanent Solution.

- **Section 5.0 – Public Notification and Licensed Site Professional Opinion –** Describes documentation prepared to satisfy public notification requirements for achievement of a Class C-1 RAOP and provides the Licensed Site Professional's Opinion and reference to certification.

2.0 SITE DESCRIPTION AND SUMMARY OF RESPONSE ACTIONS

2.1 SITE DESCRIPTION

The former YNPS was located on an approximately 1,800-acre property at 49 Yankee Road in Rowe, Massachusetts (Figure 1). YAEC, owner and operator of YNPS, began construction of the power station in 1958. Operations as a 145-megawatt to 185-megawatt electric generating plant began in 1961. Commercial power generation activities ceased in 1992. Decommissioning activities were substantially completed in 2006 and License Reduction was approved by the NRC in 2007.

The site is located along the eastern shore of the Deerfield River adjacent to Sherman Dam, one of the several dams along the Deerfield River used for hydroelectric power generation. The YAEC property is divided into two parcels, separated by the Deerfield River (see Figure 1):

- Rowe Parcel – Approximately 1,800 acres located in the northwest corner of Rowe, Massachusetts, to the east of the Deerfield River. The former nuclear plant itself occupied approximately 12 of the 1,800 acres of the Rowe Parcel.

- Monroe Parcel – Approximately 89 acres located in Monroe, Massachusetts to the west of the Deerfield River.

The site property is owned by YAEC and portions of an adjacent property to the west are owned by TransCanada (see Figure 2).

All structures at the site, except for the guardhouse and Independent Spent Fuel Storage Installation (ISFSI), have been demolished. A new two-story office building was constructed next to the guardhouse in 2007. The ISFSI will continue to be guarded and monitored until the fuel is removed for permanent storage in accordance with applicable laws.

Concurrent with plant decommissioning, YAEC completed numerous environmental sampling campaigns for both radiological and non-radiological parameters to support the management of contaminated materials and environmental media and restoration of the site. These included the sampling of building surfaces and materials such as asphalt and concrete, in addition to environmental media including soil, soil gas, groundwater, surface water, sediments and fish. The management of

radioactive materials and media was completed in accordance with the requirements of the NRC and the MA DPH. The management of materials and/or media impacted by OHM was completed in accordance with applicable regulatory programs of the MA DEP and/or the US EPA.

Contaminated structures and media at the site have been remediated in accordance with applicable regulatory programs and the site was restored by re-grading and planting.

2.2 *SITE AND RAO BOUNDARIES*

The "disposal site," as defined in the MCP, is the area where OHM has come to be located. As such, three areas of the site where OHM was discovered and/or remediated are shown in Figure 2, including the:

- Central Area – Located in the center of the former industrial portion of the site, this area is defined by the location where the concentrations in groundwater exceeded the Massachusetts Drinking Water Quality Standards (DWQSs). Tritium and arsenic were the only compounds that remained above DWQSs following the completion of remedial actions. The location where tritium and arsenic concentrations exceed the DWQS is eligible for a Class C-1 RAOP, which applies to locations where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

- Combined Study Area (CSA) – This area encompasses the remainder of the industrial portion of the site surrounding the Central Area (see Figure 2). Under a deed restriction preventing residential use of the property in the CSA, a condition of No Significant Risk to human health, the environment, public welfare and safety has been achieved as detailed in the Method 3 Risk Characterization (described in Section 3.4). Therefore, this area of the site is eligible for a Class A-3 RAOP.

- Outlying Areas – Outlying Areas are located to the south and southwest of the CSA as shown in Figure 2. Investigations completed during decommissioning activities identified impacts in these outlying areas. Response actions were conducted in some of the Outlying Areas to mitigate the impacts. A condition of No Significant Risk to human health, the environment, public welfare and safety has been achieved in the Outlying Areas without the

need for any restrictions in future use. Therefore, the Outlying Areas are eligible for a Class A-2 RAOP.

The subject of this Class C-1 RAOP is the Central Area. The boundary of the Central Area was determined using the most recent groundwater monitoring results defined by those locations where groundwater concentrations have not been below DWQSs for more than two consecutive monitoring rounds. The Central Area boundary and the most recent sampling data are shown in Figure 2.

Observed tritium values have declined from September 2003 (48,000 pCi/L, MW-107C) to March 2007 (30,900 pCi/L, MW-107C) and results are expected to continue to decline as a result of the completed site remediation and because tritium naturally decays with a half-life of 12 years, along with natural attenuation. Groundwater results and trends are shown in Figure 4.

Arsenic has been detected above the DWQS (0.01 milligrams per liter (mg/L)) in three wells (MW-101A, MW-107A, and MW-111C) at sporadic intervals. The detected concentrations (up to 0.016 mg/L) seem to be related to natural background levels in Massachusetts and New England. Although there is no known source of arsenic at the site, the concentration of arsenic will continue to be monitored for a period of time in the Central Area as part of the approved Post-Closure Groundwater Monitoring Program.

2.3 SUMMARY OF RESPONSE ACTIONS

Since the initiation of plant decommissioning activities in 1992, YAEC has conducted numerous environmental sampling programs to support site decommissioning and proper management of materials and media contaminated by radiological and non-radiological constituents. Based on the results of site investigations for OHM, response actions including dredging of sediment and excavation of soil and sediment were planned and completed under the MCP Phase IV and Amended Phase III/IV Plans.

The assessment and remediation of environmental media contaminated by OHM at the site under the MCP was documented in the following reports:

- IRA Completion Report, February 2001
- Release Abatement Measure (RAM) Completion Report, July 2005

- Phase I Initial Site Investigation Report, April 2001
- Phase II Comprehensive Site Assessment Report, April 2003
- Phase II Comprehensive Site Assessment Report, January 2005 (update of April 2003 Phase II)
- Supplemental Phase II Comprehensive Site Assessment Report, September 2006
- Addendum to Phase II Comprehensive Site Assessment, February 2007
- Phase III Remedial Action Plan Report, April 2003
- Phase IV Remedy Implementation Plan (Phase IV Plan), April 2004
- Amended Phase III Remedial Action Plan/Phase IV Remedy Implementation Plan (Amended Phase IIII/IV Plan), June 2005
- Phase IV Final Inspection Report, March 2007

In addition, the management of soil and sediment contaminated with PCBs was regulated by the EPA under the requirements of the Toxic Substances Control Act (TSCA) and was documented in the following reports:

- TSCA Sediment Final Report, July 2006
- TSCA Soil Final Report, 1 March 2007

Radiological investigations and response actions were completed under the NRC requirements and compliance plans in support of the License Termination Plan (LTP). Final Status Survey reports documenting response actions completed to manage materials and media impacted by radiological constituents and certifying residual levels of radioactivity following completion of response actions were submitted to the NRC for final approval of license termination. Radiological surveys were completed between 2003 and 2007 and reports were submitted to the NRC between March 2006 and January 2007. NRC approval of the Final Status Surveys and License Reduction were issued in August 2007. NRC reports are available within the NRC website's document database.

The focus of the Class C-1 RAOP is on the groundwater in the Central Area of the site. Groundwater monitoring has been on-going since the early 1990s. The remedial activities at the site have focused on source area removal activities, as well as soil and sediment remediation. The remedial activities for groundwater consisted of monitored natural attenuation.

3.0 ACHIEVEMENT OF RESPONSE ACTION PERFORMANCE STANDARDS

3.1 CLASS C-1 RESPONSE ACTION PERFORMANCE STANDARDS

This Class C-1 RAOP represents a Temporary Solution for the Central Area portion of the site. An RAO C-1 is the appropriate category of RAO for the site because remedial response actions meet the following performance standards:

- In accordance with 310 CMR 40.1003, General Provisions for Response Action Outcomes, (3): a Response Action Outcome may be achieved and a Response Action Outcome Statement may be submitted for an entire site, disposal site, or a portion of a disposal site.

- In accordance with 310 CMR 40.1003, General Provisions For Response Action Outcomes, (5)(b): for a Class C Response Action Outcome each source of OHM has been eliminated, controlled or mitigated to the extent feasible.

- In accordance with 310 CMR 40.1050, Class C Response Action Outcomes, Temporary Solutions, (1)(a): Substantial Hazards have been eliminated.

- In accordance with 310 CMR 40.1050, Class C Response Action Outcomes, Temporary Solutions (2)(b): the concentrations of OHM (tritium and arsenic in groundwater) exceed an applicable or suitably analogous standard identified pursuant to 310 CMR 40.0993(3), (Massachusetts DWQS), but such concentrations do not pose a Substantial Hazard.

- In accordance with 310 CMR 40.1050, Class C Response Action Outcomes, Temporary Solutions, (4)(b): a Class C RAO may be achieved following completion of Phase IV Comprehensive Response Action pursuant to 310 CMR 40.0870; Phase IV Comprehensive Response Actions (soil excavation and disposal) have been completed.

- In accordance with 310 CMR 40.1051(1): the site is eligible for a Class C-1 RAO since a condition of No Substantial Hazard exists and it is concluded that the tritium and arsenic concentrations will naturally decay to a point that it is possible to achieve a Permanent Solution.

- In accordance with 310 CMR 40.1003(4): the boundary of the portion of the site to which this RAOP applies is shown in Figure 2. The RAOP boundary for the Central Area is defined by the area around the MW-101A, MW-107, MW-111C well clusters, where tritium and arsenic have been detected above DWQSs.

3.2 ELIMINATION, CONTROL AND MITIGATION OF SOURCES OF OIL AND/OR HAZARDOUS MATERIALS

3.2.1 Overview

As required by 310 CMR 40.1003(5)(b), a Class C RAOP cannot be achieved until each source of OHM, which is resulting or is likely to result in an increase in concentrations of OHM in an environmental medium, has been, to the extent feasible, eliminated, controlled or mitigated.

The following section describes the sources of the contamination, both radiological and non-radiological, that were mitigated with the remedial measures described in the Response Action Summary (Section 2.3) above.

3.2.2 Site Non-Radiological Sources

Non-radiological contamination at the site can be attributed to facility operation and maintenance during operations from 1961 to closure in 1992. Identified sources of release of OHM to the environment at the YNPS were eliminated either by removal of impacted materials (e.g., concrete, tanks, etc.) during site decommissioning activities or via abatement of impacted media via dredging, excavation, on-site treatment and reuse or off-site transportation and disposal.

Within the Central Area, PCB-containing paint was the primary source of OHM impacts, with the highest concentrations found on the former Vapor Container. As the paint weathered, PCB-containing paint chips were released onto pavement and soil and migrated to soil and sediment via discharge two storm water catch basins; the East Storm Drain Outfall and West Storm Drain Ditch (Figure 2).

During plant decommissioning activities, the identified sources were eliminated as buildings were demolished and debris was shipped off-site. The primary remedial alternative was excavation and/or dredging and on-site treatment via thermal desorption and reuse and/or off-site disposal (Section 2.3).

3.2.3 Site Radiological Sources

Normal plant operations resulted in certain areas of the site being subject to releases of radioactivity. During the history of plant operations, certain events and conditions resulted in radioactive material being deposited in other locations within the plant areas. As a result, the plant design and operational procedures evolved to accommodate or eliminate these circumstances. Many of these events were categorized as "Planned" release events, because they were associated with normal plant operations and were expected to result in impacts to plant structures.

The principal events and circumstances, listed in chronological order in Table 1, contributed to the residual contamination addressed during decommissioning. It should be noted that these events relate to the plant operational history and affected general plant radiological conditions and not specific plant locations.

A comprehensive review of recorded events documented as having occurred outside the normal operational condition of the plant was also performed to capture those events that contributed to radiological contamination of the site. These events are summarized in Table 2.

The former Spent Fuel Pool/Ion Exchange Pit (SFP/IXP) was believed to be the primary source area for tritium in groundwater at YNPS. Tritium migrated from the SFP/IXP into the glaciofluvial aquifer and downward into the till in the period 1963 to 1965. Around 1965, Yankee identified that the leak was in the IXP at the junction of the IXP and SFP walls. The IXP was subsequently drained and repaired, eliminating the source. YAEC believes the SFP may have had minor leakage before a steel liner was installed in between 1978 and 1981, based on the observation of cracks in the concrete pool walls. The amount of SFP leakage in the 1970s was small and not discernable based on water-level changes and make-up rates.

The 1963 to 1965 tritium release resulted in concentrations of tritium in excess of 2,000,000 pCi/L at Sherman Spring in 1965. Since the release in the 1960s, tritium concentrations in the glaciofluvial aquifer have decreased to less than 5,000 pCi/L in the downgradient portion of the glaciofluvial aquifer. In addition to the impact to the glaciofluvial aquifer, tritium released from the former SFP/IXP migrated downward into the till and sand layers within the till. This is a function of the downward hydraulic gradient that occurs between the glaciofluvial and glacial till aquifers. This process resulted in concentrations of tritium being above DWQSs at MW-107C under current conditions.

Since plant shutdown in 1992, identified radiological sources have been eliminated and removed from the site, as the operations and previously contaminated soils at the facility were the source of this contamination.

3.3 DATA ASSESSMENT

Pursuant to 310 CMR 40.1056(2)(k), Gradient evaluated the usability and representativeness of the site soil and groundwater data used to support the risk characterization. The data usability assessments focused on the precision and accuracy of the data, while the representativeness focused on the spatial and temporal adequacy of the data set. The findings of the evaluations were documented in a series of Data Usability Reports, prepared by Gradient between 2004 and 2005.

3.4 RISK CHARACTERIZATION

In accordance with 310 CMR 40.0990, a Method 3 Risk Characterization was used to characterize the potential risks to human health, the environment, public welfare and safety posed by residual chemical and radiological constituents remaining in site soil, groundwater, surface water, sediment ad fish following plant decommissioning.

The methodology and results of the Method 3 Risk Characterization, were summarized in a Method 3 Risk Characterization report, prepared by Gradient Corporation, and dated November 2007. As a result of a change in the DWQS standard for acetone, Gradient prepared an addendum to update the findings of the risk characterization (see Appendix B). The risk characterization was prepared following completion of remedial response actions. The scope of work for the risk characterization and the risk characterization itself were completed under the oversight and direction of the MA DEP, US EPA and MA DPH.

The risk characterization reflected the fact that land use restrictions are in-place on both the YAEC and TransCanada properties. Considering the use restrictions, the risk characterization evaluated the following exposure scenarios:

- Current Use Recreator
- Future Use Recreator
- Hypothetical Future Commercial/Industrial User

Gradient adopted MA DEP default exposure assumptions in the risk characterization for OHM. In the absence of MA DEP guidance, US EPA default exposure factors were adopted for the risk characterization for radionuclides. As agreed with MA DEP, the evaluation of risks from radionuclides assumed a 16 year delay in the possible earliest date for future unrestricted recreational or commercial exposures, based on the presence of the ISFSI.

The risk characterization determined that the combined human health risk for the foreseeable future uses were less than the MA DEP acceptable risk benchmark of 1 in 100,000 (10^{-5}) increased lifetime cancer risk and the non-cancer Hazard Indices were less than the MA DEP acceptable benchmark of one. However, the detection of tritium and arsenic in the Central Area at concentrations above their respective DWQS poses, by definition under the MCP, a potential future risk of harm to human health.

The Method 3 Risk Characterization concluded that the site poses No Significant Risk of harm to the environment, public welfare, or safety.

MA DEP has reviewed and approved both the methods and conclusions of the Method 3 Risk Characterization that was prepared for the site.

3.5 SUBSTANTIAL HAZARD EVALUATION

Pursuant to 310 CMR 40.0956(1), the focus of a Substantial Hazard Evaluation is on the possible exposures to Human and Environmental Receptors, considering the current use of the disposal site and the surrounding environment. A substantial hazard is defined under 310 CMR 40.0006 as a "hazard that would pose a significant risk of harm to health, safety, public welfare or the environment if it continued to be present for several years."

Based on current uses, there is no anticipated exposure to the residual OHM or radioactivity in site soil, sediment and groundwater. The majority of the soil with residual impacts is located at depth, below a 3-foot layer of clean fill. The facility currently has a water supply well that is located upgradient of the residual groundwater impacts. Groundwater monitoring indicates that these impacts are limited to the Central Area of the site, are decaying/attenuating and therefore not anticipated to migrate from this area. Therefore, there are no current exposure pathways to tritium or arsenic groundwater.

The potential risks associated with a "recreator" were evaluated in the Method 3 Risk Characterization, which was the only current use scenario considered. As stated above, the risk characterization concluded that there is no risk to human health or the environment associated with current or future receptors. Pursuant to MCP 310 CMR 40.1056(2)(d) a Condition of No Substantial Hazard exists at the site.

3.6 FEASIBILITY OF ACHIEVING A PERMANENT SOLUTION

The original Phase III and Phase III/IV Addendum focused on impacts to soil and sediment. Therefore, a supplemental Phase III evaluation was performed for tritium and arsenic in groundwater (see Appendix C).

The MCP Phase III and feasibility assessment concluded that reliance on natural attenuation via radioactive decay of tritium will be the most effective remedy to achieve a Permanent Solution for the Central Area. As the half life of tritium is approximately 12 years, it is expected that tritium concentrations will be permanently reduced below the DWQS in approximately 10 years with no affects from natural attenuation. Graphs of the historic tritium and arsenic data are provided in Figure 4. Groundwater sampling will continue in accordance with a MA DEP approved monitoring plan on a periodic basis in monitoring well MW-107C, as well as select surrounding wells. Monitoring reports, including an analysis of the concentration trends, will be submitted to the MA DEP periodically, as defined in the approved Post-Closure Groundwater Monitoring Plan.

A feasibility analysis of other remediation options was performed and is summarized below. Active abatement via groundwater pump and treat does not appear to be a viable option since:

1. Pumping extensive volumes of groundwater from the construction excavations during source removal had no significant effect on the concentrations of tritium in MW-107C. The groundwater was discharged to surface water under a National Pollution Discharge Elimination System permit for construction dewatering. Hydraulic pump testing of MW-107C also resulted in minimal yield and no reduction in tritium concentrations. These results suggest that recovery via pumping is not feasible due to the very low yield of the till in which this well screen is completed.

2. Arsenic is a naturally-occurring inorganic element. The concentrations detected at the site are within the range of

background concentrations reported for drinking water supplies in Massachusetts and New England. Therefore, pumping and treating naturally-occurring arsenic would have no benefit.

3. There is no available treatment technology for tritium in groundwater, either on or off-site. MA DEP has stated that a remedial alternative that involved discharge to surface water without treatment, as was done during the excavation activities, would not be an acceptable remedial alternative for the site.

4. Off-site disposal of large volumes of water would not be feasible from a risk-reduction/cost-benefit standpoint in considering that this would generate a costly waste stream and increase short-term risk.

Other alternatives to monitoring, such as in-situ treatment via biological or oxidative properties and thermal treatment were evaluated, but were not considered to be effective for remediating tritium or arsenic impacts in groundwater.

Therefore, monitoring was considered to be the most appropriate manner for achieving a Permanent Solution at the site.

4.0 OPERATION, MAINTENANCE AND MONITORING/PERIODIC EVALUATION

Pursuant to MCP 310 CMR 40.1051(3) and (3)(b) a Class C-1 RAO is not a Permanent Solution and thus a periodic review of the Temporary Solution will be conducted every five years. Groundwater monitoring will continue periodically, as defined in the approved Post-Closure Groundwater Monitoring Plan.

5.0 PUBLIC NOTIFICATION AND LICENSED SITE PROFESSIONAL OPINION

The public notification requirements of 310 CMR 40.1403(3)(f) have been met by providing notice of the filing and availability of this RAOP to the Chief Municipal Officer and Board of Health in the Town of Rowe, Massachusetts. A copy of the notification is provided in Appendix D.

The LSP opinion and certification are provided in Section G of BWSC-104. The original form was submitted using the MA DEP electronic submittal website with an additional hard copy sent to the MA DEP. A copy of the BWSC form is included in Appendix A.

Tables

Table 1
Sources of Radioactive Release
Plant Operations & Maintenance
Yankee Nuclear Power Station
Rowe, MA

Date	Mechanism or Structure	Radionuclides of Concern	Release Impact
Circa 1960's	Due to mechanical wear and corrosion from the initial set of control rods.	Radioactive silver and nickel - Ag-108m and Ni-63.	Into the reactor coolant.
	Storage of the refueling equipment and prepared radioactive waste outdoors.	Radioactive silver.	Within the Radiologically Controlled Area (RCA) yard area.
	Snow removal activities performed in the RCA caused a redistribution of accumulated surface contamination.		Area outside the RCA where snow was relocated. The areas affected were inside the industrial area fence on property governed by the YNPS NRC license, areas outside the fenced industrial area, along the rail road bed outside the east gate, and along existing roadways.
	Rain falling on the surface of yard areas in the RCA.	Small amounts of radioactive material have been observed in the catch basins over the years.	Redistribution of radiological contamination into low areas of the RCA and into the storm drain system.
	A defect in the construction of the IX Pit concrete.	Believed to be the source of the tritium contamination observed in the ground water at the site.	Leaks in the radioactive systems in the Ion Exchange (IX) Pit resulted in contamination of the water in the IX Pit.
	These leaks as well as possible leaks from the Spent Fuel Pool (SFP) that abuts the IX Pit.		
	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.	Although not a frequent occurrence, Co-60 particles have been identified and removed during surveys of the RCA. The environmental impact of these particles has been observed to be very minor as they are microscopic in size and are insoluble as they are essentially metal chips.
	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. All radioactive contamination was contained within the turbine building structure.
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.	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.	Resulted in a release of fuel pellet fragments into the reactor coolant system.
1981	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 underside of the reactor head.	This resulted in contamination of the RCA yard area under and around the equipment hatch.
1984	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 line ran diagonally from the old PCA to the Waste Disposal Building through the NE quadrant of the warehouse. The line was excavated and repaired and the affected soil disposed off-site as radioactive waste.
Circa 1994	Use of an underwater plasma torch to section of 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 Pool.	This cutting debris was contained within the plant system and was essentially insoluble due to its metallic nature. No evidence of environmental release was observed.

All events listed in chronological order

Table 2
Sources of Radioactive Release
Unplanned Releases
Yankee Nuclear Power Station
Rowe, MA

Date	Name of Release	Radionuclides of Concern	Description
9/20/1961	Radioactive Spill	The sample contained approximately 35 mCi (specific radionuclide data not available).	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 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.
9/18/1963	Shield Tank Cavity Fill Water Spill	Contamination levels were 10^6 to 10^7 dpm (specific radionuclide data not available) over areas of several square inches.	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. Run off water resulted in contamination levels of 20-60,000 dpm/ft^2 (Sic).
10/8/1963	De-watering Pump Packing Leakage	At the time the leak was identified, 6 to 8 inches of water had accumulated in the barrel with activity of 6×10^{-5} mCi/ml (specific radionuclide data not available).	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. It was believed only a small amount of water was leaked to the storm system.
9/3/1964	Seal Water Tank Spill	An estimated 35 gallons of water containing a total activity of 270 mCi (specific radionuclide data not available) was released.	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. The Roof Drain System drained into the Storm Drain System via a subsurface piping connection. A sample of the storm drain (WCB-009) was determined to contain 1×10^{-6} mCi/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.
10/3/1964	IX Pit High Level – Leakage Coming Up through Pavement	The radionuclides and concentrations identified were: Ag-110m at 5×10^{-7} mCi/ml and Co-60 at 1×10^{-6} mCi/ml.	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 blacktop was rinsed down with Service Water to the storm drain.
9/27/1966	Spent Fuel Pit Water Spill	This occurrence resulted in a total release of 4 mCi gross b-g and 670 mCi of tritium (more specific radionuclide data not available).	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. A continuous service water flush of the east side culvert system was initiated and continued for a 24-hour period.

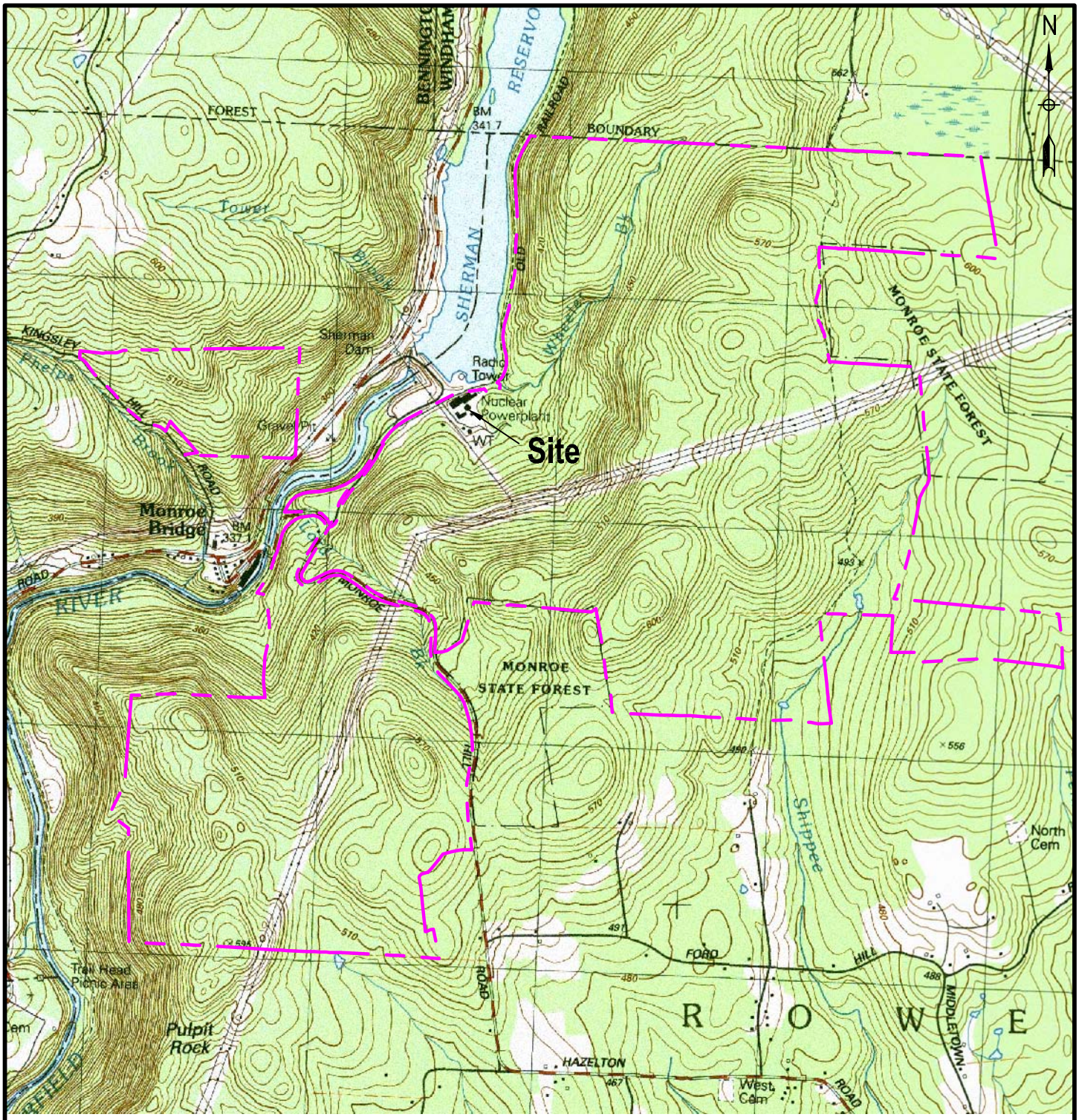
Table 2
Sources of Radioactive Release
Unplanned Releases
Yankee Nuclear Power Station
Rowe, MA

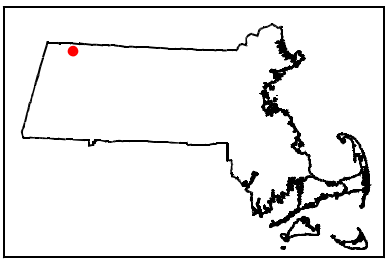
<table>
<tr><th>Date</th><th>Name of Release</th><th>Radionuclides of Concern</th><th>Description</th></tr>
<tr><td>9/27/1966</td><td>Abnormal Activity in Storm Drain</td><td>This occurrence resulted in a total release of 0.8 mCi gross b-g and 3.32 mCi tritium.</td><td>Water from the west storm drain 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} mCi/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. 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} mCi/ml and tritium activity of 5.1 x 10^{-5} mCi/ml.</td></tr>
<tr><td>11/1/1966</td><td>Hose Failure</td><td>Approximately 10 gallons of water with an activity of 3.0 x 10^{-3} mCi/ml (for a total of 113 mCi) was released.</td><td>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. The spill area was flushed with service water. The east culvert was sampled after the spill.</td></tr>
<tr><td>1/16/1968</td><td>Waste Hold-up Tank Moat Spill</td><td>A total of 520 mCi b-g and 698 mCi tritium were spilled into the moat.</td><td>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. The spill was contained within the moat structure.</td></tr>
<tr><td>7/16/1975</td><td>Yard Area Contamination</td><td>An area of land near the Ion Exchange Pit was identified with a contamination level of approximately 500,000 dpm.</td><td>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.</td></tr>
<tr><td>12/21/1977</td><td>Service Building Radioactive Sump Transfer Line Puncture</td><td></td><td>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:
<table>
<tr><th>Radionuclide</th><th>Total Activity, mCi</th><th>Concentration, mCi/ml</th><th>Fraction of MPC</th></tr>
<tr><td>I-131</td><td>16.5</td><td>2.18 x 10^{-4}</td><td>3.63</td></tr>
<tr><td>I-133</td><td>2.76</td><td>3.65 x 10^{-5}</td><td>0.18</td></tr>
<tr><td>Cs-134</td><td>0.34</td><td>4.46 x 10^{-6}</td><td>0.01</td></tr>
<tr><td>Cs-137</td><td>0.5</td><td>6.67 x 10^{-6}</td><td>0.02</td></tr>
<tr><td>Co-60</td><td>0.58</td><td>7.69 x 10^{-6}</td><td>0.01</td></tr>
</table>
No measurable levels of activity were released off-site or to the storm drain. The line was repaired, and a sand and concrete casing was poured around it.</td></tr>
<tr><td>8/6/1980</td><td>Resin Spill</td><td>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).</td><td>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- by 20-foot area of the RCA yard was contaminated. Decontamination included removal and disposal of some of the blacktop.</td></tr>
</table>

Table 2
Sources of Radioactive Release
Unplanned Releases
Yankee Nuclear Power Station
Rowe, MA

Date	Name of Release	Radionuclides of Concern	Description
5/15/1981	Contamination of Yard Area During Rx Head Removal	Removable radioactivity immediately below the equipment hatch was 200 mrad/hr beta. The total activity released to the ground was approximately 250 mCi, with approximately 10mCi (specific radionuclide data not available) discharged to Sherman Pond.	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). The area was cleaned, but due to rainfall trace radioactive material levels were detected in the east storm drains.
9/10/1984	Drain Pipe Failure	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.	An excavated drainpipe from the Potentially Contaminated Area (PCA) storage building to the Waste Disposal building was found to be leaking. The pipe from the edge of the old PCA 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.
2/17&18/94	Leakage from Frozen Fuel Chute Dewatering Line	A 3.5-liter sample from the fuel chute line indicated 1,000 net cpm, and a sample from the NST telltale line indicated the presence of Co-60 and Cs-137.	On February 17 and 18, 1994, a fuel chute dewatering line and a neutron shield tank telltale drain line ruptured due to freezing. 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.
2/23/1994	NST Tell-Tales/Fuel Chute Dewatering Line	A 3.5-liter sample from the fuel chute line indicated 1,000 net cpm, and a sample from the NST telltale line indicated the presence of Co-60 and Cs-137.	On February 17 and 18, 1994, a fuel chute dewatering line and a neutron shield tank telltale drain line ruptured due to freezing. 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.

Figures





YAEC Property Boundary

Scale 1:25,000

0.5 km 0 500 m

0.5 mi 0 1,000 ft

Figure 1 - Locus Map
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - TSCA Scil\Yankee TSCA Soil.dwg (07/20/04 Boston)

Legend
- Class A-2 RAO/Outlying Areas
- Class A-3 RAO/Combined Study Area
- Class C-1 RAO/Central Area
- Property Line

N

Sherman Reservoir
East Storm Drain Outfall
Deerfield River
Sherman Station
Trans Canada YAEC Property
Wheeler Brook
West Storm Drain Outfall
MW-111A/B/C
MW-107A/B/C/D/E/F
MW-101A/B/C
Tributary to Wheeler Brook
Guard House
West Storm Drain Ditch
Trans Canada YAEC Property
ISFSI
Wheeler Brook Divertment
ABC Parking Lot
Drum in Woods
Furlon House
Relic Dump
Hair Pin Turn

Scale (1"=400')
200' 0 200' 400' 800'

Figure 2 - RAO Boundaries
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - RAO 2008\Figure 2 & 3.dwg (02/22/2008 - 12:21pm Boston)

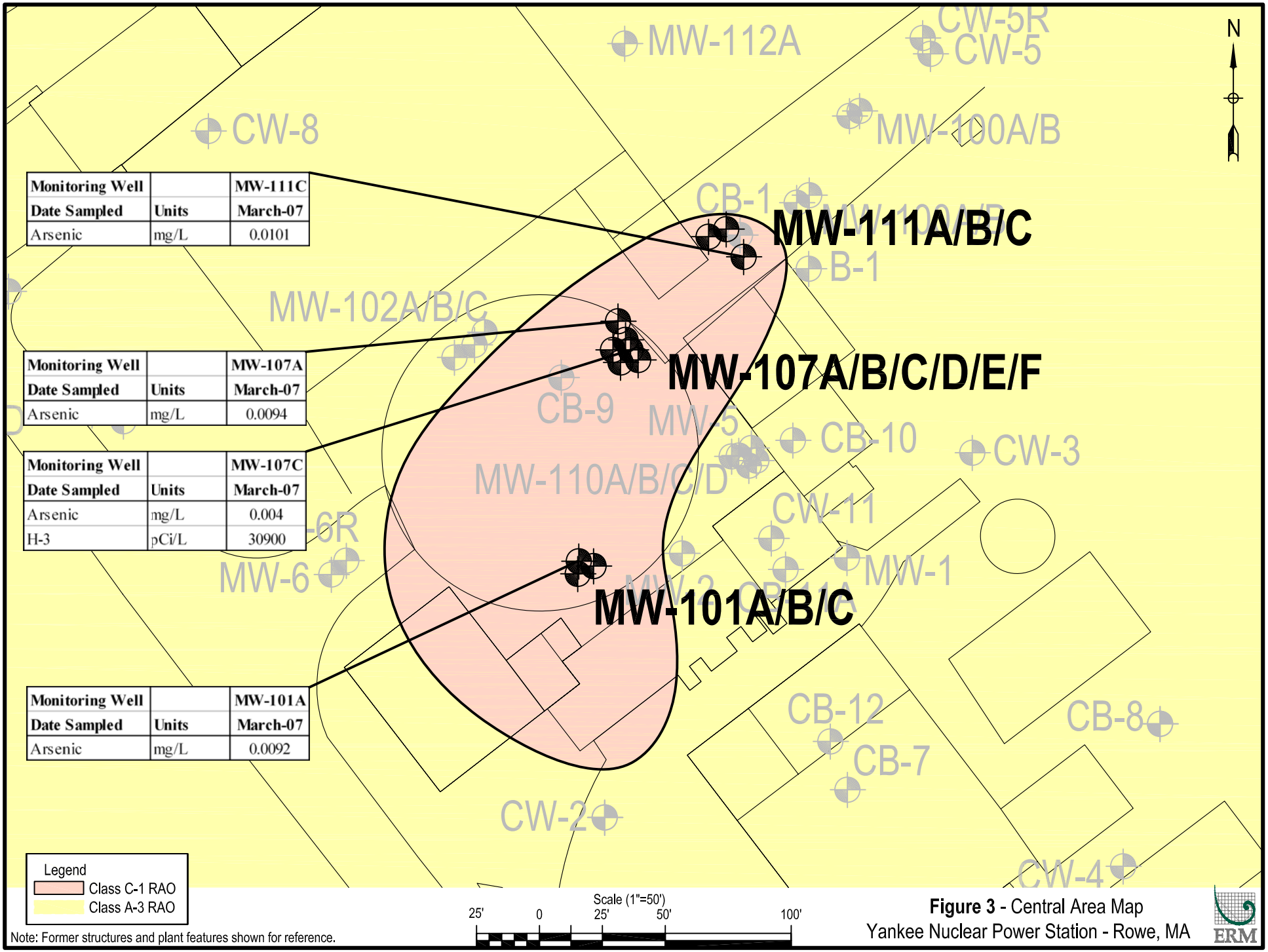
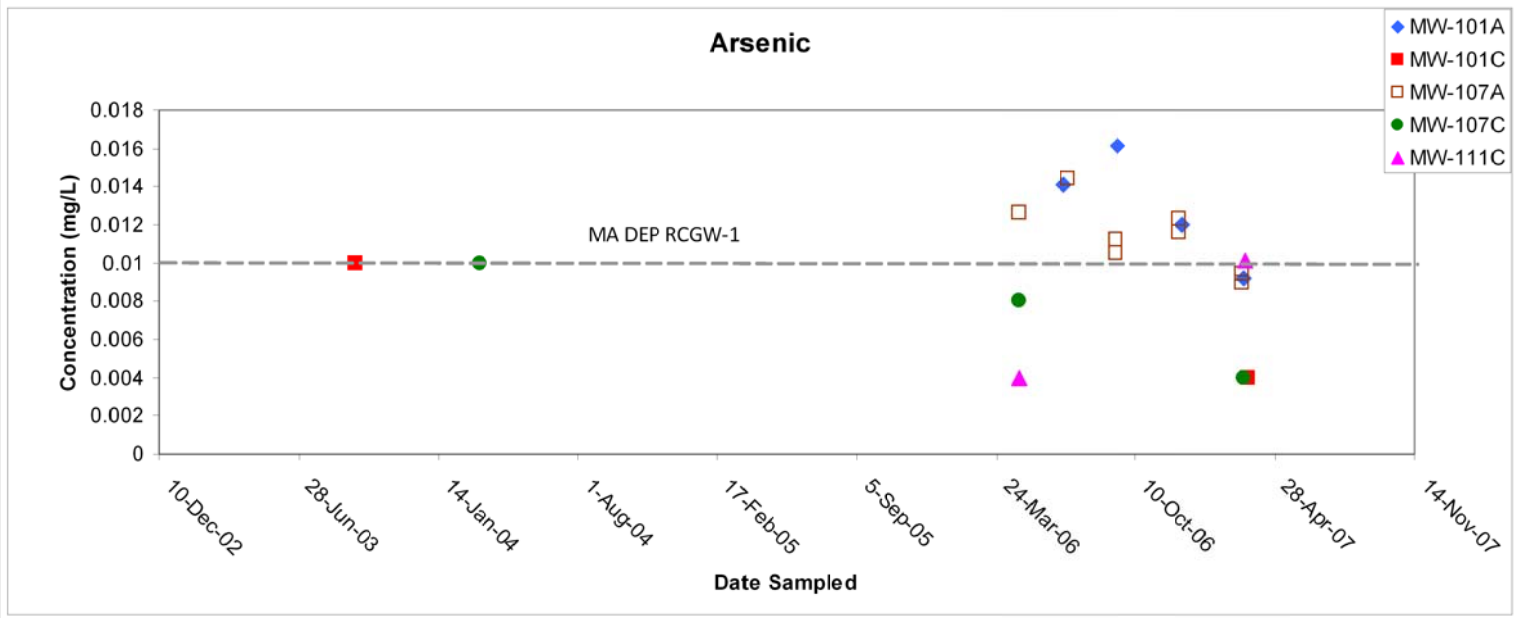


Figure 3 - Central Area Map
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - RAO 2008\Figure 2 & 3.dwg (02/22/2008 - 12:21pm Boston)



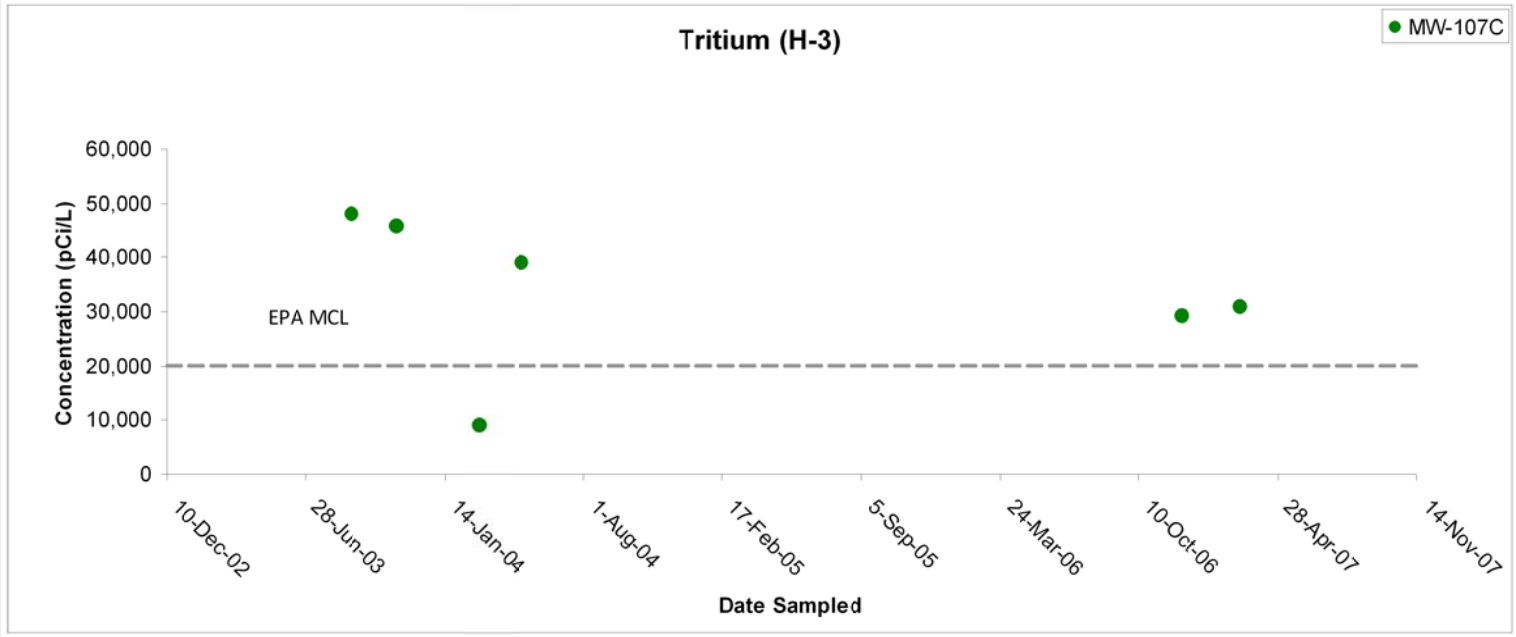


Figure 4 - Historic Arsenic and Tritium Results
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - RAO 2008\YAEC_STUDY AREAS.dwg (02/22/2008 - 12:18pm Boston)

Appendix A – Copy of RAOP Statement Transmittal Form, BWSC-104 (Submitted Electronically)

Print Cancel

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT
Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

For sites with multiple RTNs, enter the Primary RTN above.

A. SITE LOCATION:

1. Site Name/Location Aid: YANKEE ROWE ATOMIC PLANT

2. Street Address: 49 YANKEE RD

3. City/Town: ROWE 4. ZIP Code: 013670000

☑ 5. Check here if a Tier Classification Submittal has been provided to DEP for this disposal site. 4732699

☐ a. Tier IA ☑ b. Tier IB ☐ c. Tier IC ☐ d. Tier II 669611

6. If a Tier I Permit has been issued, provide Permit Number: 54016

B. THIS FORM IS BEING USED TO: (check all that apply)

1. List Submittal Date of RAO Statement (if previously submitted): _____ mm/dd/yyyy

☐ 2. Submit a **Response Action Outcome (RAO) Statement**

☐ a. Check here if this RAO Statement covers additional Release Tracking Numbers (RTNs). RTNs that have been previously linked to a Tier Classified Primary RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. ☐ - _____ ☐ - _____

☐ 3. Submit a **Revised Response Action Outcome Statement**

☐ a. Check here if this Revised RAO Statement covers additional Release Tracking Numbers (RTNs), not listed on the RAO Statement or previously submitted Revised RAO Statements. RTNs that have been previously linked to a Tier Classified Primary RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. ☐ - _____ ☐ - _____

☑ 4. Submit a **Response Action Outcome Partial (RAO-P) Statement**

Check above box, if any Response Actions remain to be taken to address conditions associated with this disposal site having the Primary RTN listed in the header section of this transmittal form. This RAO Statement will record only an RAO-Partial Statement for that RTN. A final RAO Statement will need to be submitted that references all RAO-Partial Statements and, if applicable, covers any remaining conditions not covered by the RAO-Partial Statements.

Also, specify if you are an Eligible Person or Tenant pursuant to M.G.L. c. 21E s.2, and have no further obligation to conduct response actions on the remaining portion(s) of the disposal site:

☐ a. Eligible Person ☐ b. Eligible Tenant

☐ 5. Submit an optional **Phase I Completion Statement** supporting an RAO Statement

☐ 6. Submit a **Periodic Review Opinion evaluating the status of a Temporary Solution** for a Class C-1 RAO Statement, as specified in 310 CMR 40.1051 (Section F is optional)

☐ 7. Submit a **Retraction** of a previously submitted **Response Action Outcome Statement** (Sections E & F are not required)

(All sections of this transmittal form must be filled out unless otherwise noted above)

C. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply; for volumes, list cumulative amounts)

- ☐ 1. Assessment and/or Monitoring Only
- ☐ 2. Temporary Covers or Caps
- ☐ 3. Deployment of Absorbent or Containment Materials
- ☐ 4. Treatment of Water Supplies
- ☐ 5. Structure Venting System
- ☐ 6. Engineered Barrier
- ☐ 7. Product or NAPL Recovery
- ☐ 8. Fencing and Sign Posting
- ☐ 9. Groundwater Treatment Systems
- ☐ 10. Soil Vapor Extraction
- ☐ 11. Bioremediation
- ☐ 12. Air Sparging
- ☐ 13. Monitored Natural Attenuation
- ☐ 14. In-situ Chemical Oxidation

- ☑ 15. Removal of Contaminated Soils
  - ☑ a. Re-use, Recycling or Treatment
    - ☑ i. On Site — Estimated volume in cubic yards: 2,962
    - ☐ ii. Off Site — Estimated volume in cubic yards:
      - iia. Facility Name: _____ Town: _____ State: _____
      - iib. Facility Name: _____ Town: _____ State: _____
      - iii. Describe: _____
  - ☑ b. Landfill
    - ☐ i. Cover — Estimated volume in cubic yards: _____
      - Facility Name: _____ Town: _____ State: _____
    - ☑ ii. Disposal — Estimated volume in cubic yards: 13,520
      - Facility Name: ENVIROCARE Town: CLIVE State: UT

- ☐ 16. Removal of Drums, Tanks or Containers:
  - a. Describe Quantity and Amount: _____
  - b. Facility Name: _____ Town: _____ State: _____
  - c. Facility Name: _____ Town : _____ State: _____

- ☐ 17. Removal of Other Contaminated Media:
  - a. Specify Type and Volume: _____
  - b. Facility Name: _____ Town: _____ State: _____
  - c. Facility Name: _____ Town: _____ State: _____

C. DESCRIPTION OF RESPONSE ACTIONS (cont.): (check all that apply; for volumes, list cumulative amounts)

☑ 18. Other Response Actions:

Describe: **OTHER SOIL/SEDIMENT DISPOSAL SHIPPED TO: WASTE MANAGEMENT OF NEW HAMPSHIRE, ROCHESTER, NH (8,760 CUBIC YARDS), WASTE MANAGEMENT, MODEL CITY, NY (490 CUBIC YARDS)**

☐ 19. Use of Innovative Technologies:

Describe:

D. SITE USE:

1. Are the response actions that are the subject of this submittal associated with the *redevelopment, reuse* or the *major expansion of the current use* of property(ies) impacted by the presence of oil and/or hazardous materials?

☐ a. Yes ☑ b. No ☐ c. Don't know

2. Is the property a *vacant or under-utilized commercial or industrial* property ("a brownfield property")?

☐ a. Yes ☑ b. No ☐ c. Don't know

3. Will funds from a state or federal brownfield incentive program be used on one or more of the property(ies) within the disposal site?

☐ a. Yes ☑ b. No ☐ c. Don't know If Yes, identify program(s):

4. Has a Covenant Not to Sue been obtained or sought?

☐ a. Yes ☑ b. No ☐ c. Don't know

5. Check all applicable categories that apply to the person making this submittal: ☐ a. Redevelopment Agency or Authority

☐ b. Community Development Corporation ☐ c. Economic Development and Industrial Corporation

☐ d. Private Developer ☐ e. Fiduciary ☐ f. Secured Lender ☐ g. Municipality

☐ h. Potential Buyer (non-owner) ☐ i. Other, describe:

This data will be used by MassDEP for information purposes only, and does not represent or create any legal commitment, obligation or liability on the part of the party or person providing this data to MassDEP.

E. RESPONSE ACTION OUTCOME CLASS:

Specify the Class of Response Action Outcome that applies to the disposal site, or site of the Threat of Release.
Select **ONLY** one Class.

☐ **1. Class A-1 RAO**: Specify one of the following:

☐ a. Contamination has been reduced to background levels. ☐ b. A Threat of Release has been eliminated.

☑ **2. Class A-2 RAO:** You **MUST** provide justification that reducing contamination to or approaching background levels is infeasible.

☐ **3. Class A-3 RAO**: You **MUST** provide an implemented Activity and Use Limitation (AUL) and justification that reducing contamination to or approaching background levels is infeasible.

☐ **4. Class A-4 RAO**: You **MUST** provide an implemented AUL, justification that reducing contamination to or approaching background levels is infeasible, and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface or below an Engineered Barrier is infeasible. If the Permanent Solution relies upon an Engineered Barrier, you must provide or have previously provided a Phase III Remedial Action Plan that justifies the selection of the Engineered Barrier.

E. RESPONSE ACTION OUTCOME CLASS (cont.):

☐ **5. Class B-1 RAO: Specify one of the following:**

☐ a. Contamination is consistent with background levels ☐ b. Contamination is **NOT** consistent with background levels.

☐ **6. Class B-2 RAO**: You **MUST** provide an implemented AUL.

☐ **7. Class B-3 RAO**: You **MUST** provide an implemented AUL and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface is infeasible.

☐ **8. Class C-1 RAO**: You must submit a plan as specified at 310 CMR 40.0861(2)(h). Indicate type of ongoing response actions.

☐ a. Active Remedial System ☐ b. Active Remedial Monitoring Program ☐ c. None

☐ d. Other Specify:

☐ **9. Class C-2 RAO**: You must hold a valid Tier I Permit or Tier II Classification to continue response actions toward a Permanent Solution.

F. RESPONSE ACTION OUTCOME INFORMATION:

1. Specify the Risk Characterization Method(s) used to achieve the RAO described above:

☐ a. Method 1 ☑ b. Method 2 ☐ c. Method 3

☐ d. Method Not Applicable-Contamination reduced to or consistent with background, or Threat of Release abated

2. Specify all Soil Category(ies) applicable. More than one Soil Category may apply at a Site. Be sure to check off all **APPLICABLE** categories:

☑ a. S-1/GW-1 ☑ d. S-2/GW-1 ☑ g. S-3/GW-1

☐ b. S-1/GW-2 ☐ e. S-2/GW-2 ☐ h. S-3/GW-2

☑ c. S-1/GW-3 ☑ f. S-2/GW-3 ☑ i. S-3/GW-3

3. Specify all Groundwater Category(ies) impacted. A site may impact more than one Groundwater Category. Be sure to check off all **IMPACTED** categories:

☑ a. GW-1 ☐ b. GW-2 ☑ c. GW-3 ☐ d. No Groundwater Impacted

4. Specify remediation conducted:

☑ a. Check here if soil remediation was conducted.

☐ b. Check here if groundwater remediation was conducted.

5. Specify whether the analytical data used to support the Response Action Outcome was generated pursuant to the Department's Compendium of Analytical Methods (CAM) and 310 CMR 40.1056:

☐ a. CAM used to support all analytical data. ☑ b. CAM used to support some of the analytical data.

☐ c. CAM not used.

☑ 6. Check here to certify that the Class A, B or C Response Action Outcome includes a Data Usability Assessment and Data Representativeness Evaluation pursuant to 310 CMR 40.1056.

7. Estimate the number of acres this RAO Statement applies to: 18

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

G. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that either an **RAO Statement, Phase I Completion Statement and/or Periodic Review Opinion** is being provided,* the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 6423

2. First Name: JOHN W 3. Last Name: MCTIGUE

4. Telephone: (617) 267-8377 5. Ext.: 6. FAX:

7. Signature: JOHN W MCTIGUE

8. Date: 02/27/2008
mm/dd/yyyy

9. LSP Stamp:

H. PERSON MAKING SUBMITTAL:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☑ c. change in the person undertaking response actions

2. Name of Organization: YANKEE ATOMIC ELECTRIC COMPANY

3. Contact First Name: ROBERT 4. Last Name: MITCHELL

5. Street: 49 YANKEE ROAD 6. Title: ISFSI MANAGER

7. City/Town: ROWE 8. State: MA 9. ZIP Code: 01367-0000

10. Telephone: (413) 424-5261 11. Ext.: 303 12. FAX:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

I. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON MAKING SUBMITTAL:

☑ 1. RP or PRP ☑ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☐ e. Other RP or PRP Specify:

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Making Submittal Specify Relationship:

J. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☐ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of an RAO Statement that relies on the public way/rail right-of-way exemption from the requirements of an AUL.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of a RAO Statement with instructions on how to obtain a full copy of the report.

☑ 4. Check here to certify that documentation is attached specifying the location of the Site, or the location and boundaries of the Disposal Site subject to this RAO Statement. If submitting an RAO Statement for a PORTION of a Disposal Site, you must document the location and boundaries for both the portion subject to this submittal and, to the extent defined, the entire Disposal Site.

☐ 5. Check here to certify that, pursuant to 310 CMR 40.1406, notice was provided to the owner(s) of each property within the disposal site boundaries, or notice was not required because the disposal site boundaries are limited to property owned by the party conducting response actions. (check all that apply)

- ☐ a. Notice was provided prior to, or concurrent with the submittal of a Phase II Completion Statement to the Department.
- ☐ b. Notice was provided prior to, or concurrent with the submittal of this RAO Statement to the Department.
- ☐ c. Notice not required. d. Total number of property owners notified, if applicable:

☐ 6. Check here if required to submit one or more AULs. You must submit an AUL Transmittal Form (BWSC113) and a copy of each implemented AUL related to this RAO Statement. Specify the type of AUL(s) below: (required for Class A-3, A-4, B-2, B-3 RAO Statements)

- ☐ a. Notice of Activity and Use Limitation b. Number of Notices submitted:
- ☐ c. Grant of Environmental Restriction d. Number of Grants submitted:

☐ 7. If an RAO Compliance Fee is required for any of the RTNs listed on this transmittal form, check here to certify that an RAO Compliance Fee was submitted to DEP, P. O. Box 4062, Boston, MA 02211.

☐ 8. Check here if any non-updatable information provided on this form is incorrect, e.g. Site Address/Location Aid. Send corrections to the DEP Regional Office.

☑ 9. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.1000 (Subpart J)

Release Tracking Number
1 - 13411

K. CERTIFICATION OF PERSON MAKING SUBMITTAL:

1. I, **ROBERT MITCHELL**, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: **ROBERT MITCHELL** (Signature)

3. Title: **ISFSI MANAGER**

4. For: **YANKEE ATOMIC ELECTRIC COMPANY** (Name of person or entity recorded in Section H)

5. Date: **02/26/2008** mm/dd/yyyy

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section H.

7. Street:

8. City/Town:

9. State:

10. ZIP Code:

11. Telephone:

12. Ext.:

13. FAX:

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

Received by DEP on

2/27/2008 8:44:30 AM

Appendix B – Memorandum on Risk Characterization for Acetone in Groundwater

Memorandum

Gradient
CORPORATION

To: Gregg Demers, John McTigue
ERM

Date: February 6, 2008

From: David Merrill

Subject: Risk Characterization, Former Yankee Nuclear Power Station
Revision to Massachusetts ORSG Acetone Drinking Water Guideline

In our "Method 3 Risk Characterization, Former Yankee Nuclear Power Station," submitted to the Massachusetts Department of Environmental Protection in November 2007, we identified a condition of "Significant Risk to Human Health" according to the Massachusetts Contingency Plan (MCP) because acetone (and tritium) in certain monitoring wells exceeded Massachusetts drinking water standards or guidelines. That conclusion is now revised for the reasons stated below.

Since submitting our Risk Characterization, it has come to our attention that the Massachusetts Office of Research and Standards Drinking Water Guideline (ORSG) for acetone is currently 6,300 µg/L, rather than the 3,000 µg/L former guideline value referenced in the Risk Characterization.[1] Consistent with this ORSG value for acetone, amendments to the MCP issued December 14, 2007 also reflect an updated Massachusetts GW-1 value for acetone, which similarly changed from 3,000 µg/L to the current value of 6,300 µg/L.[2]

Acetone in monitoring wells at the former Yankee Nuclear Power Station site meets the current ORSG drinking water guideline value of 6,300 µg/L. Thus, the condition of "Significant Risk" under the MCP in our November 2007 Risk Characterization no longer applies to acetone in groundwater at the site.

Please let me know if you have any further questions on this matter.

[1] The most current Massachusetts Drinking Water Standards and Guidelines, dated Spring 2007, are published at: http://www.mass.gov/dep/water/dwstand.pdf. Acetone does not have a promulgated MMCL, hence the applicable value to apply is the ORS Guideline (ORSG) value.

[2] The 2007 Amendments to the MCP are available at: http://www.mass.gov/dep/cleanup/laws/clfsos.pdf

20 University Road, Cambridge, MA 02138 • (617) 395-5000 • Facsimile (617) 395-5001 • www.gradientcorp.com

Appendix C – Phase III Remedial Action Plan for Groundwater

FINAL REPORT

Supplemental Phase III Remedial Action Plan

Yankee Nuclear Power Station
Rowe, Massachusetts
RTN 1-13411

25 February 2008

0063109

Environmental Resources Management
399 Boylston Street, 6th Floor
Boston, Massachusetts 02116

LIST OF FIGURES

1.0 INTRODUCTION

1.1 BACKGROUND

On behalf of Yankee Atomic Electric Company (Yankee), Environmental Resources Management (ERM) has prepared this Supplemental Phase III Remedial Action Plan (Phase III) to address arsenic and tritium remaining in groundwater at the Yankee Nuclear Power Station (YNPS) located at 49 Yankee Road in Rowe, Massachusetts (Figure 1). The Department assigned Release Tracking Number (RTN) 1-13411 to the release.

This Supplemental Phase III was prepared to satisfy a specific requirement of the Massachusetts Contingency Plan (MCP), 310 CMR 40.1051(3), which requires that a Phase III evaluation be conducted pursuant to 310 CMR40.850 to support the filing of a Class C Response Action Outcome Statement (RAO) as a Temporary Solution. A Partial Class C-1 Response Action Outcome (RAOP) is being filed for the Central Area of the YNPS site where arsenic and tritium in groundwater preclude the achievement of a Permanent Solution. The evaluation of remedial alternatives for impacts to soil and sediment at the site were documented in the previous reports, listed below:

- Phase III Remedial Action Plan Report, April 2003; and
- Amended Phase III Remedial Action Plan/Phase IV Remedy Implementation Plan (Amended Phase IIII/IV Plan), June 2005.

The previous Phase III evaluations completed for the site precluded consideration of groundwater because, at the time they were completed, the evaluation of the nature and extent of groundwater impacts on the site was on-going and not yet been finished. Concurrent with decommissioning of the YNPS between 2005 and 2007, several rounds of monitoring well installation, extensive groundwater sampling and analysis were completed in support of a site-wide evaluation of the nature and extent of releases of both radiological and non-radiological constituents to the environment (see Phase II Comprehensive Site Assessment Report, January 2005, and Supplemental Phase II Comprehensive Site Assessment Report, September 2006). The site-wide Phase II was completed following completion of remedial response actions to address impacts to site structures, soil, sediment and

groundwater. The Phase II activities were conducted in coordination with the Massachusetts Department of Environmental Protection (MA DEP), US Environmental Protection Agency (US EPA) and MA Department of Public Health (MA DPH) to ensure regulatory agreement with the response actions completed. Therefore, this Phase III is specific to the evaluation of alternatives to address residual impacts to site groundwater following plant decommissioning and was prepared explicitly to support the filing of a Class C-1 RAOP as a Temporary Solution for that portion of the site where impacts to site groundwater remain following plant decommissioning.

1.2 PURPOSE & SCOPE

The purpose of the Phase III is to identify and evaluate remedial action alternatives for arsenic and tritium in groundwater in sufficient detail to support selection of the "preferred" remedial action alternative. In accordance with 310 CMR 40.0850, the Phase III includes three primary components:

- Identification and initial screening of remedial technologies that are reasonably likely to be feasible and achieve a level of No Significant Risk.
- Identification and detailed evaluation of remedial action alternatives to ascertain which alternatives will meet the performance standards and requirements set forth in 310 CMR 40.0850, 40.0900 and 40.1000, and whether these alternatives constitute a Permanent or Temporary Solution.
- Selection of the preferred remedial action alternative(s) most likely to achieve a Permanent Solution, if feasible.

3.0 REMEDIAL ACTION OBJECTIVES

3.1 OVERVIEW

The purpose of this section is to establish objectives for remediation of arsenic and tritium impacts to groundwater that will enable achievement of a Permanent Solution, if feasible. Remedial action objectives are expressed as media-specific target goals for arsenic and tritium in groundwater that if achieved, would restore the site to a condition of No Significant Risk, meet MCP performance standards for the filing of a RAO Statement, and represent a Permanent Solution for the site. Key MCP Response Action Performance Standards (RAPS) that must be met in order to achieve a Permanent Solution include:

- Elimination or control of each source of OHM which is resulting, or is likely to result, in an increase in concentrations of OHM in an environmental medium, either as a consequence of a direct discharge, or through inter-media transfer (per 310 CMR 40.1003).
- Reduction in the concentration of OHM in affected media to levels that do not pose a condition of Significant Risk of harm to human health, safety, public welfare and the environment (per 310 CMR 40.1003).
- Reduction in the concentration of OHM in affected media to levels that would exist in the absence of the site. Such measures shall, to the extent feasible, achieve or approach background levels of OHM in the environment as defined under 310 CMR 40.0006 (per 310 CMR 40.1020).
- Reduction in the overall mass and volume of OHM at the site to the extent feasible, regardless of whether it is feasible to achieve one or more Temporary or Permanent Solutions, or whether it is feasible to achieve background for the entire site (per 310 CMR 40.0191).

In addition to meeting the MCP performance standards, the evaluation of remedial alternatives also needs to consider compliance with United States Nuclear Regulatory Commission (NRC) regulations. Other local, state and federal regulatory requirements applicable to the development of remedial action objectives and achievement of RAPS are discussed where appropriate.

3.2 REMEDIAL ACTION OBJECTIVES

The presence of arsenic and tritium in groundwater at the site does not pose a condition "Significant Risk" under current uses of the site since there is currently no ongoing exposure to arsenic or tritium in groundwater. However, a condition of "Significant Risk" to human health could exist in the foreseeable future if the area of groundwater impact persists and that area is used as a future source of drinking water. Since there are no public water supplies within the vicinity of the site, the MA DEP considers groundwater beneath the site to represent a potential future source of drinking water, and as such the concentrations of arsenic and tritium in groundwater must meet "applicable or suitably analogous standards" for the protection of potential future Drinking Water Source Areas (as defined under the MCP) in order to achieve a Permanent Solution for groundwater. Based on the results of site groundwater monitoring, the concentrations of arsenic in three wells (MW-101A, MW-107A, and MW-111C) and tritium in one well (MW-107C) exceed applicable Massachusetts Drinking Water Quality Standards (DWQS; 0.01 milligram per liter (mg/L) for arsenic and 20,000 picocurie per liter (pCi/L) for tritium). Therefore, remedial objectives for arsenic and tritium are the respective DWQSs, as listed above.

Arsenic is a naturally-occurring inorganic element. The concentrations detected at the site are within the range of background concentrations reported for drinking water supplies in Massachusetts and New England. However, in the absence of site-specific data to demonstrate that the arsenic levels are in fact consistent with background, it was carried forward in the Phase III evaluation. For the purposes of this evaluation, background for tritium is defined as being less than 200 pCi/L.

3.3 SUMMARY OF REMEDIAL AREAS

There are several downgradient wells within 100 feet of MW-101A, MW-107A/C, and MW-111C where arsenic and/or tritium has not been detected in groundwater above DWQS, thereby limiting the horizontal extent of impact to within 100 feet of the wells. In the case of arsenic there are multiple depths of wells at each of the three clusters where arsenic has been detected above the DWQS and it has only been detected in one of the wells in each cluster, thereby limiting the vertical extent of impact. Similarly, there are five other wells in the MW-107C cluster that help to

confirm that the vertical extent of tritium is limited to the immediate vicinity of the screened interval at MW-107C, which is approximately 50 feet below ground.

4.0 IDENTIFICATION AND INITIAL SCREENING OF REMEDIAL TECHNOLOGIES AND TECHNOLOGY SCREENING

4.1 OVERVIEW

This section identifies remedial technologies that were evaluated based on their potential to achieve remedial goals for site groundwater. Technologies were screened using the following criteria:

- Effectiveness – the ability of the technology to support achievement of a Permanent or Temporary Solution; i.e., meeting remedial action objectives.

- Implementability – the availability of personnel to implement the technology.

4.2 IDENTIFICATION OF REMEDIAL TECHNOLOGIES

Remedial treatment technologies to address the presence of arsenic and tritium in groundwater may be grouped into two general categories:

- *In-Situ* (in place) treatment of impacted groundwater to physically and/or chemically stabilize or neutralize the arsenic and/or tritium; and
- Removal and off-site disposal of groundwater in combination.

4.2.1 In-Situ Remediation

In-situ remediation involves processes that do not require removing the groundwater from its original location. Compounds are either destroyed in place or immobilized to prevent releases into the environment. *In-situ* management of impacted groundwater offers the potential advantage of avoiding the risks and costs associated with the removal and relocation of groundwater for treatment or disposal purposes. There are currently no *In-situ t*reatment technologies available to either accelerate the natural radioactive decay of tritium in groundwater. Technologies are available to reduce the dissolution of naturally-occurring arsenic, such as

adjustments in the pH of the groundwater. However, since the arsenic is naturally-occurring, these technologies would not be effective at achieving a Permanent Solution. Therefore, no in-situ technologies were carried forward for detailed evaluation.

4.2.2 Removal and Off-Site Disposal

One of the most common technologies employed to reduce the concentration of contaminants in the subsurface is to physically remove and treat the impacted groundwater. If the tritium impacted groundwater was removed, there is currently no on-site treatment technology available. Discharge of the impacted groundwater to ground or to the Deerfield River would require regulatory review and approval. Alternatively, off-site disposal of tritium impacted groundwater would create radioactive, waste which would need to be transported to a waste disposal facility. On-site treatment of arsenic using activated carbon is theoretically feasible, but would not help achieve a Permanent Solution, since the arsenic is naturally-occurring.

Nonetheless, groundwater pump and treatment was carried forward for detailed evaluation since it is technically feasible.

5.0 DETAILED EVALUATION OF ALTERNATIVES

5.1 OVERVIEW

Pursuant to 310 CMR 40.0857, this section includes a detailed evaluation of remedial alternatives identified in the initial screening of remedial technologies presented in the previous section. Based on the initial screening of remedial technologies, the following remedial alternatives were carried forward for detailed evaluation:

- Alternative #1 - No Action
- Alternative #2 – Pumping and Off-Site Disposal

Pursuant to 310 CMR 40.0858, the detailed evaluation must consider each of the seven criteria defined in Section 5.2 for each alternative. Each remedial alternative for groundwater is evaluated relative to these criteria in Section 5.3.

5.2 SCREENING CRITERIA

A detailed evaluation of the alternatives includes a brief description of the site-specific aspects of each alternative. This is followed by an evaluation of each alternative using the following criteria:

Effectiveness — This criterion identifies whether the alternative will achieve a Permanent or a Temporary Solution. It also addresses how contaminant concentrations will be reduced and the likelihood that residual concentrations will approach or achieve "background."

Reliability — This criterion addresses the likelihood that the alternative will be successful and the effectiveness of any measures required to manage waste streams, if applicable.

Implementability	This criterion addresses the technical complexity of the alternative and its compatibility with site constraints. It also addresses whether the remedial alternative has successfully been used at other sites in similar situations.
Cost	This criterion addresses the short-term and long-term costs associated with implementing the alternative. The costs presented are intended for use in the comparative analysis in Section 6.0.
Risks	This criterion addresses the expected short-term and long-term risk associated with the alternative.
Benefits	This criterion addresses the expected benefits associated with the alternative.
Timeliness	This criterion compares the timeliness of each alternative in terms of achieving a level of No Significant Risk.

5.3 ALTERNATIVES

5.3.1 Alternative #1 – No Action

Effectiveness

Arsenic is naturally-occurring. Monitoring over time will be used to confirm that the arsenic detections are sporadic and do not warrant remedial actions.

Tritium in groundwater will undergo natural radioactive decay with a half-life of approximately 12 years. A graph of the natural decay of tritium expected at MW-107C is provided as Figure 1. Therefore, this alternative will achieve a Permanent Solution and it is expected that residual tritium concentrations would eventually approach or achieve "background."

Reliability

It is likely that this alternative would be successful in achieving the remedial action objective. The natural radioactive decay of tritium is on-going, along with natural attenuation. The data is also expected to demonstrate that arsenic is not consistently present above DWQS.

Implementability

This alternative is easily implemented.

Cost

The only costs associated with this alternative would be periodic monitoring, as defined in the approved Post-Closure Groundwater Monitoring Plan. Those costs are expected to be relatively low.

Risks

This alternative would not create short-term risks and would reduce risks in the long-term.

Benefits

This alternative would not generate any wastes and would effectively eliminate tritium in groundwater and associated risk to receptors. The concentrations of arsenic would not be expected to change significantly. This is the least expensive alternative and most easily implemented.

Timeliness

Two to five years of arsenic monitoring data are expected to demonstrate that the arsenic is naturally-occurring. As shown in Figure 1, the tritium concentrations are expected to be below the DWQS in approximately eight years only considering natural decay, and to be below background levels in approximately 100 years.

5.3.2 Alternative #2- Pumping and Off-Site Disposal

The primary engineering and management components of Alternative #2 include the installation of a pump in the well and the construction of a system for containing the pumped groundwater. The groundwater would either need to be permitted to discharge to ground or the Deerfield River,

or would need to be transported off-site for disposal at an appropriate facility. Treatment with carbon would be used to address the presence of arsenic.

Effectiveness

Arsenic is naturally-occurring and therefore pumping and treatment is not expected to have any long-term impact on arsenic concentrations in groundwater. Pumping performed during site closure activities did not have any significant impact on tritium concentrations at MW-107C. Therefore, it is not expected that pumping would reduce the concentrations to below the DWQS any faster than the No Action Alternative.

Reliability

Pumping and discharge or off-site disposal is a reliable remedial method.

Implementability

The well is accessible and installation of a pump in the well is feasible. In the absence of any treatment of the groundwater, it may be difficult to obtain the approvals necessary to discharge the groundwater to ground or the Deerfield River.

Cost

The cost for this alternative, which would require construction of a pumping system and that could require the off-site disposal of extracted groundwater, would be high.

Risks

This alternative would provide minimal risk reduction above and beyond what will occur with the monitoring of arsenic and the natural decay of tritium. Construction and operation of the remedial system will create short-term risks for the people involved in the remedial activities. Off-site transportation of the extracted groundwater would create additional short-term risks. Long-term risks are not expected to be significantly lower with this alternative than with the No Action Alternative.

Benefits

Pumping of the impacted groundwater may result in a slightly shorter remediation period than with the pumping and off-site disposal of groundwater may be beneficial to the long-term restoration of the site, but would be detrimental to the disposal location and create significant risks to the public due to transportation.

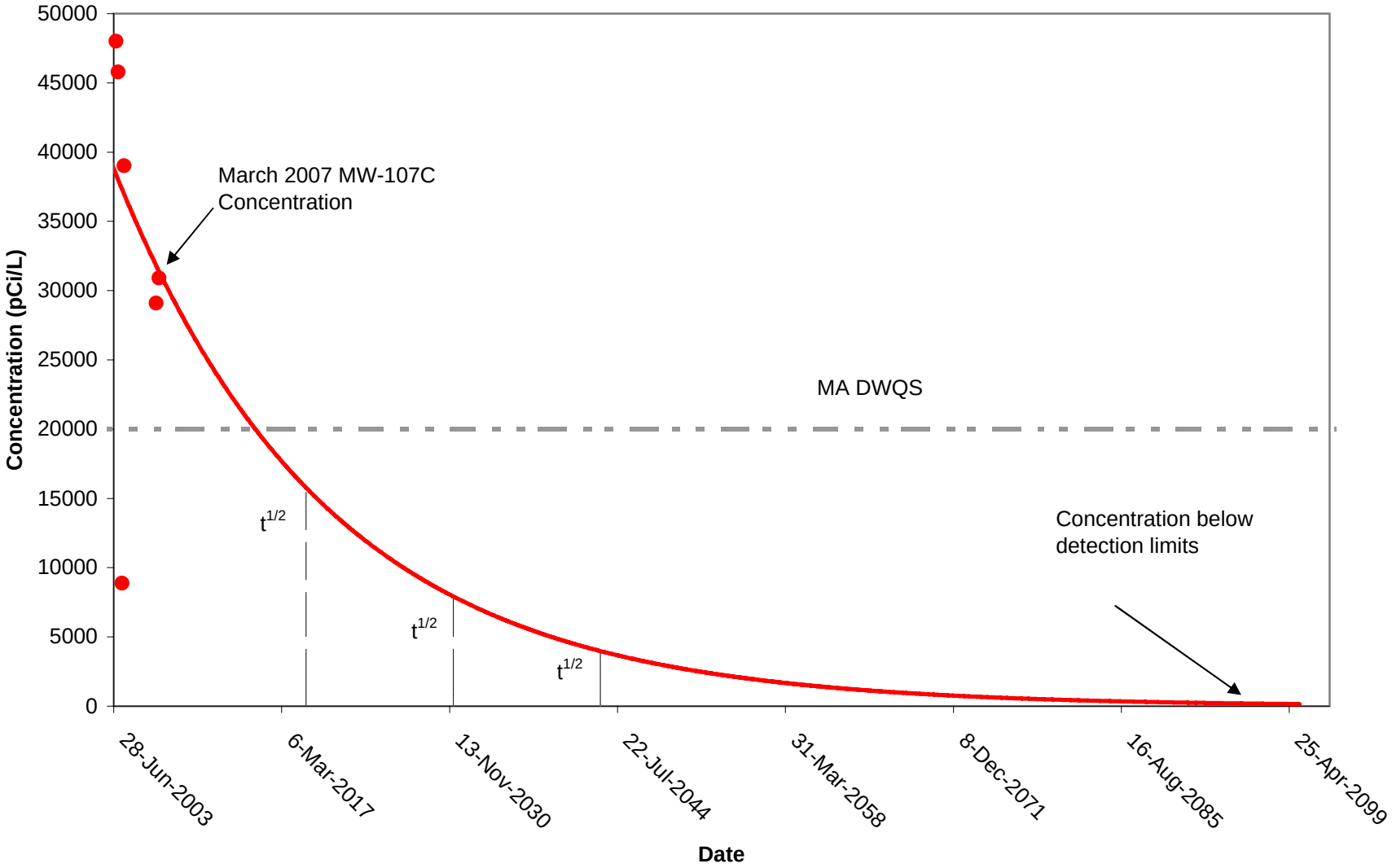
Timeliness

Pumping and off-site disposal may expedite achievement of a condition of No Significant Risk to human health and the environment.

6.0 RECOMMENDED REMEDIAL ALTERNATIVE

Based on the results of the technology screening and a detailed evaluation of remedial alternatives, Alternative #1 – No Action was selected as the preferred remedy for tritium in groundwater. This remedy is proven effective at achieving the remedial objective within a reasonable time frame. Therefore, a Temporary Solution is deemed to be the most appropriate closure option for the arsenic and tritium in groundwater issue.

Figure 1: Natural Tritium Decay Scheme



Appendix D – Public Notification Correspondence

Environmental
Resources
Management

399 Boylston Street
6th Floor
Boston, MA 02116
(617) 646-7800
(617) 267-6447 (fax)

20 February 2008
Ref: 63019.2

Mr. Richard Alix
Chairman, Board of Health
Rowe Town Hall
321 Zoar Road
Rowe, Massachusetts 01367

RE: Notice of Availability
Class A-2 Response Action Outcome Partial (RAOP) Statement
Class A-3 RAOP Statement
Class C-1 RAOP Statement
Yankee Nuclear Power Station
Rowe, Massachusetts
RTN # 1-13411

Dear Mr. Alix:

On behalf of Yankee Atomic Electric Company (Yankee), Environmental Resources Management (ERM) has submitted three Response Action Outcome Partial (RAOP) Statements for the above referenced site to the Massachusetts Department of Environmental Protection (DEP) Western Regional Office. These statements encompass the total disposal site boundary defined in the Massachusetts Contingency Plan as the area(s) where Oil and/or Hazardous Material has come to be locations.

The site was divided into three areas for the purposes of the RAOP filings, as defined below (see attached figure):

- Class A-2 – Applies to the Outlying Areas where a Permanent Solution has been achieved and where there are not restrictions on future uses or activities.

- Class A-3 RAOP – Applies to the Combined Study Area where a Permanent Solution has been achieved and where deed restrictions are in-place to prevent residential use of the property.

- Class C-1 RAOP – Applies to the Central Area where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

In accordance with 310 CMR 40.1403(3)(e), the Chief Municipal Officer and the Board of Health are being notified of the availability of these submittals.

Information regarding the submittals can be reviewed at:

Massachusetts Department of Environmental Protection
Western Regional Office
436 Dwight Street, 5th Floor
Springfield, MA 01103
Phone: (413) 784-1100 Fax: (413) 784-1149

Sincerely,

John W. McTigue, P.G., LSP
LSP of Record

Enclosure: Figure of RAO Boundaries

Environmental
Resources
Management

399 Boylston Street
6th Floor
Boston, MA 02116
(617) 646-7800
(617) 267-6447 (fax)

25 February 2008
Ref: 63019.2

Ms. Myra Carlow
Chairman, Board of Selectmen
Rowe Town Hall
321 Zoar Road
Rowe, Massachusetts 01367

RE: Notice of Availability
Class A-2 Response Action Outcome Partial (RAOP) Statement
Class A-3 RAOP Statement
Class C-1 RAOP Statement
Yankee Nuclear Power Station
Rowe, Massachusetts
RTN # 1-13411

Dear Ms. Carlow:

On behalf of Yankee Atomic Electric Company (Yankee), Environmental Resources Management (ERM) has submitted three Response Action Outcome Partial (RAOP) Statements for the above referenced site to the Massachusetts Department of Environmental Protection (DEP) Western Regional Office.

The site was divided into three areas for the purposes of the RAOP filings, as defined below (see attached figure):

- Class A-2 RAOP – Applies to the Outlying Areas where a Permanent Solution has been achieved and where there are not restrictions on future uses or activities.

- Class A-3 RAOP – Applies to the Combined Study Area where a Permanent Solution has been achieved and where deed restrictions are in-place to prevent residential use of the property.

- Class C-1 RAOP – Applies to the Central Area where a Temporary Solution has been achieved and a condition of No Substantial Hazard exists, but that a condition of No Significant Risk has not yet been achieved.

In accordance with 310 CMR 40.1403(3)(e), the Chief Municipal Officer and the Board of Health are being notified of the availability of these submittals.

Information regarding the submittals can be reviewed at:

Massachusetts Department of Environmental Protection
Western Regional Office
436 Dwight Street, 5th Floor
Springfield, MA 01103
Phone: (413) 784-1100 Fax: (413) 784-1149

Sincerely,

John W. McTigue, P.G., LSP
LSP of Record

Enclosure: Figure of RAO Boundaries

Legend
- Class A-2 RAO/Outlying Areas
- Class A-3 RAO/Combined Study Area
- Class C-1 RAO/Central Area
- Property Line

N

Sherman Reservoir
East Storm Drain Outfall
Deerfield River
Sherman Station
Trans Canada YAEC Property
Wheeler Brook
West Storm Drain Outfall
MW-111A/B/C
MW-107A/B/C/D/E/F
MW-101A/B/C
Tributary to Wheeler Brook
Guard House
West Storm Drain Ditch
Trans Canada YAEC Property
ISFSI
Wheeler Brook Divertment
ABC Parking Lot
Drum in Woods
Furlon House
Relic Dump
Hair Pin Turn

Scale (1"=400')
200' 0 200' 400' 800'

RAO Boundaries
Yankee Nuclear Power Station - Rowe, MA

ERM

R:\Yankee Atomic\Report - RAO 2008\Figure 2 & 3.dwg (02/26/2008 - 10:10am Boston)