Environmental Resources Management

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ERM

6 November 2006
Reference: BYR-2006-103

Mr. David Howland
Massachusetts Department of Environmental Protection
Western Regional Office
436 Dwight Street
Springfield, MA 01103

RE: Beneficial Use Determination for Structures-Major Revision
Yankee Nuclear Power Station, Rowe, MA
Rowe-DSWM-05-253-009
Transmittal: W050861

Dear Mr. Howland:

Environmental Resources Management (ERM), on behalf of Yankee Atomic Electric Company (YAEC), is pleased to submit this major revision to the Beneficial Use Determination (BUD) for Structures at the Yankee Nuclear Power Station (YNPS) in Rowe, Massachusetts. This submittal revises the information contained in the BUD for Structures application dated on 22 March 2005. The revised BUD is intended to allow concrete slabs and foundations to remain in-place, to allow concrete and asphalt to be processed and used for site grading, and to allow certain inactive subsurface utilities to remain in-place. The purpose of this revision is to update the Department on the current substructure configuration, quantities of materials left-in-place and document the details of discussions held relative to disposition of specific commodities. As discussed with the Department, this submittal is being made under the same transmittal and application forms as the original submittal.

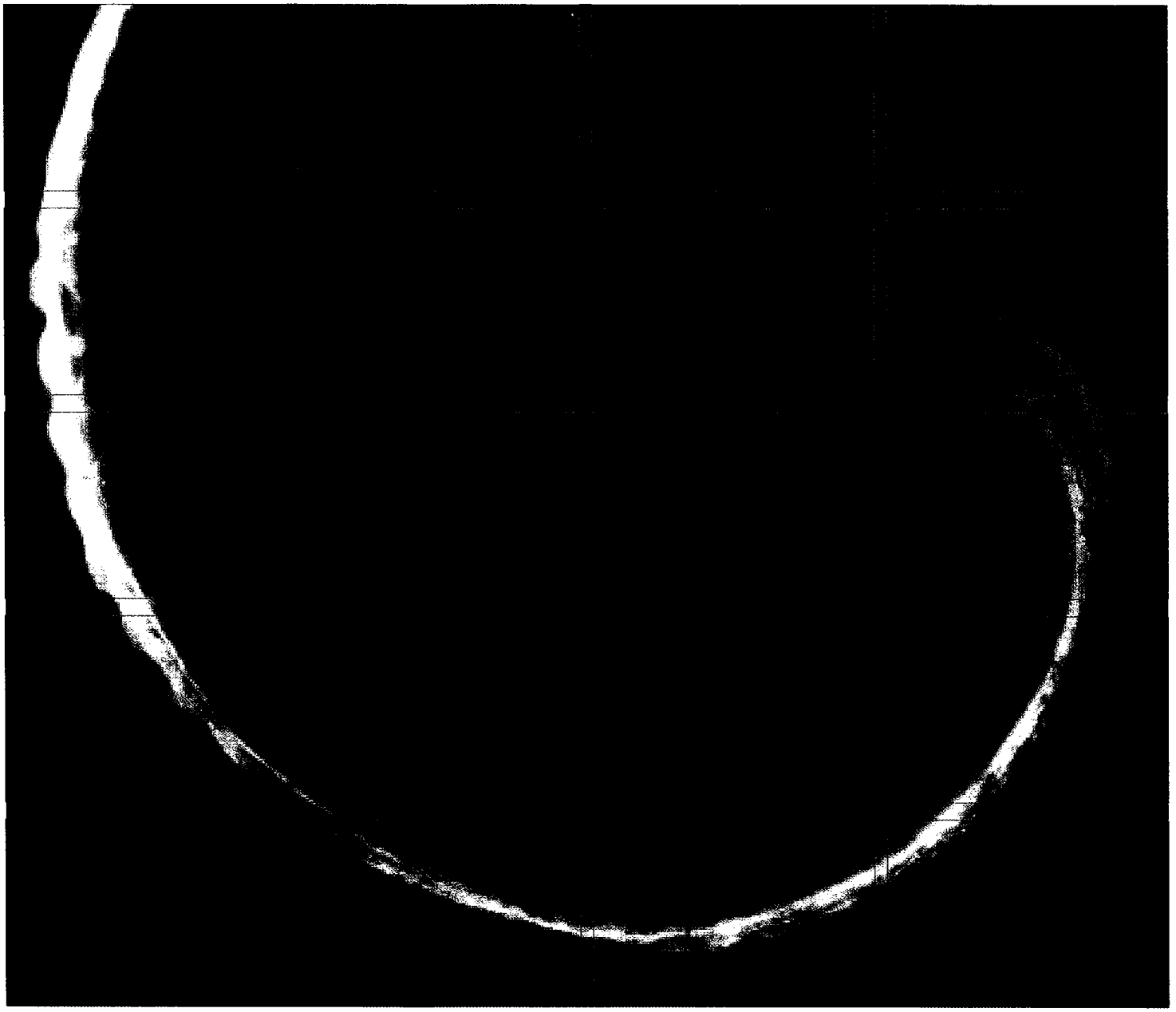
We appreciate your support of this project. Should you have questions or require additional information, please contact Mr. Kenneth W. Dow, Environmental Manager, at (413) 424-2245.

Sincerely,

for John W. McTigue, P.G., LSP
Principal-in-Charge

Joseph R. Lynch
Senior Consultant

Enclosures: Revised Beneficial Use Determination (2 copies)



Revised Beneficial Use Determination (BUD) for Structures

Yankee Nuclear Power Station
Rowe, Mass

ERM Reference 0043964.02
6 November 2006

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TABLES

FIGURES

1.0 INTRODUCTION

1.1 BACKGROUND

Yankee Atomic Electric Company (YAEC) is in the final stages of decommissioning and closing the Yankee Nuclear Power Station (YNPS) located in Rowe, Massachusetts (see Figure 1). YNPS began operations in 1960 and operated safely and successfully for 31 years. In February 1992, the YAEC Board of Directors decided it was in the best economic interest of electric customers to cease operations permanently at YNPS and decommission the plant. YAEC intends to complete the majority of decommissioning and physical site closure activities at the site in 2006 and to restore the site to environmental quality standards that will enable future unrestricted use of the site, where feasible.

The site is located at 49 Yankee Road in the northwestern Massachusetts Town of Rowe, adjacent to the Vermont border (Figure 1). The site consists of an approximately 1,800-acre property owned by YAEC (see Figure 1) and portions of an adjacent property to the west owned by TransCanada. The site abuts the eastern shore of the Deerfield River and Sherman Reservoir, adjacent to Sherman Dam, one of several dams along the Deerfield River used for hydroelectric power generation.

This revision to the Beneficial Use Determination (BUD) – Major was developed by YAEC, with the assistance of Environmental Resources Management (ERM) and Gradient Corporation (Gradient), to support the site closure project. Copies were originally provided to the Massachusetts Department of Environmental Protection (DEP or Department) in September 2004 and subsequently revised in March 2005. This revision updates the March 2005 version based on Yankee's discussions with the Department regarding the final configuration of the site and changes in demolition activities.

1.2 PURPOSE AND SCOPE

The purpose of this BUD revision is to provide the Department, with updated information necessary to review and approve the reuse of processed concrete and asphalt and to leave select building slabs, foundations and utility lines in-place. This revision was prepared consistent with available Department guidance for a BUD application and

includes a description of the solid waste material to be beneficially used, estimated quantities, physical and chemical properties and handling methods to ensure that beneficial reuse of materials on site poses no significant adverse effects to public health, safety, or the environment (MA DEP, 2004). This application also relies on the restoration of site topography by re-grading with at least 36 inches of soil over any non-native materials that are left on site under the BUD consistent with the Department's Approval of July 2005.

This BUD application does not address the management of soil in the Southeast Construction Fill Area (SCFA). A separate BUD application, along with a Corrective Action Design, both dated 4 November 2004, were submitted to address the removal of the SCFA and the reuse of soils from the SCFA for site regrading. A BUD approval for the SCFA was issued by the Department on 23 December 2004.

2.0 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION

2.1.1 *Re-Use of Structures*

Unless otherwise noted below, all building structures at the site were demolished and the debris removed from the site, including floor slabs and foundations. A summary of those structures remaining at the site is provided in Table 1. Figure 2 shows what structures remain in-place. A building-by-building summary is provided below (note that underground utilities are addressed in Section 2.1.2):

- Administrative Office Building – This building has been removed in its entirety and is not subject to the BUD.
- Gatehouse – These buildings will remain intact and are not subject to the BUD.
- Interim Spent Fuel Storage Installation (ISFSI) – This nuclear fuel storage pad will remain intact and is not subject to the BUD.
- Meteorological Tower – This tower and associated control shed, located on TransCanada property, will remain intact and is not subject to the BUD.
- Turbine Building and Auxiliary Building - The majority of the Turbine Building slab remains in place with the exception of portions that were removed to facilitate final site grading, to remove selected underground utilities, and to accommodate the extension of the Sherman Dam. The Auxiliary Building slab was removed in its entirety. Portions of the foundations remain in place. The removed concrete was processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 700 cubic yards.
- Office attached to Turbine Building - This slab and foundation was removed to facilitate final site grading. The removed concrete was processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: included with Turbine Building estimate.

- Service Building - The Service Building slab was removed in its entirety to access subsurface piping, to facilitate Final Status Surveys (FSS) and to facilitate final site grading. Portions of the foundations remain in-place. The removed concrete was processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 200 cubic yards.
- Service Building Annex - The Service Building Annex slab was removed in its entirety to access subsurface radiological piping, facilitate FSS of the area and to facilitate final site grading. Portions of the foundations remain in-place. The removed concrete was processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: included with Service Building estimate.
- North Decon Room - All remaining portions of the slab were removed and shipped offsite for disposal.
- Stores Warehouse - The Stores Warehouse slab was removed in its entirety to facilitate FSS activities and final site grading. Portions of the foundations remain in-place. The removed concrete was processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 150 cubic yards.
- Tank Farm Moat & Gas Drum Decay Area – The majority of the structures were removed with a portion of the foundations remaining in place. The removed concrete was processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 200 cubic yards.
- Ion Exchange Pit (IX Pit) – The Ion Exchange Pit was removed in its entirety. All removed concrete was shipped off site for disposal.
- Safety Injection/Diesel Generator (SI/DG) Building - All of the slab has been removed and portions of the foundations remain in place. The removed concrete was processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 60 cubic yards.
- New Fuel Vault – The New Fuel Vault was removed in its entirety. All removed concrete was shipped off site for disposal.
- Spent Fuel Pit – The Spent Fuel Pit was removed in its entirety. All removed concrete was shipped off site for disposal.

- New and Old Safety Injection (SI) Tank Bases - All remaining portions of the slabs and foundations were removed in their entirety. The New SI Tank was processed and reused as a beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. The Old SI Tank was shipped for offsite disposal. Material to remain on-site: 60 cubic yards.
- Tank 39 Base Primary Water Tank - All remaining portions of the slabs and foundations were removed in their entirety. The removed concrete was processed and reused as a beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 50 cubic yards.
- Demineralized Water Tank Slab - Was removed in its entirety. All removed concrete was shipped off site for disposal.
- Fuel Transfer Enclosure (South Decon Room) - Was removed in its entirety. All removed concrete was shipped off site for disposal.
- Vapor Container/Reactor Support Structure (VC/RSS) - The RSS was a massive concrete structure that housed the nuclear reactor. All of the original above grade structure was removed and shipped off site for disposal. Portions of the structural foundations were processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Other portions remain in place. Material to remain on-site: 1,700 cubic yards.
- Compactor Building - All remaining portions of the slabs were removed in their entirety while portions of foundations remain in place. Portions of the structural foundations were processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 35 cubic yards.
- Waste Disposal Building - All remaining portions of the slabs were removed in their entirety . All remaining concrete was shipped offsite for disposal.
- Potentially Contaminated Area (PCA) Warehouse - All remaining portions of the slab were removed in their entirety while portions of the foundations were processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. and a portion of the foundation remains in place. Material to remain on-site: 10 cubic yards.

- PCA #1 (Old PCA) - All remaining portions of the slab were removed in their entirety while portions of the foundation were processed and monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Other portions remain in place. Material to remain on-site: 10 cubic yards
- PCA #2 (New PCA) - All remaining portions of the slab and foundation were removed in their entirety. The removed concrete was processed and monitored for reuse as a beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 40 cubic yards
- Fire Water Tank Slab - All remaining portions of the structure's slab and foundation were removed with the exception of southern most section of the foundation wall which remains in place for roadway stability. Material to remain on-site: 20 cubic yards.
- Fire Water Pump House - All remaining portions of the slab and foundation were removed in their entirety. All material was shipped offsite for disposal.
- Safe Shutdown Building - All remaining portions of the slab and foundation were removed in their entirety. All material was shipped offsite for disposal.
- Circulating Water Discharge Structure (Seal Pit) - Following demolition activities in accordance with current local, state and federal wetland permits for the Seal Pit. Portions of the slabs and foundations were either shipped offsite for disposal, processed and monitored for reuse as a beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. or remain in place. Material to remain on-site: 300 cubic yards. This includes flow fill used to fill the Circulating Water System discharge piping.
- Circulating Water Intake (Screenwell House) - Following demolition activities to meet current local, state and federal permits for the Screenwell House, portions of the lower floor slabs and foundations were processed and reused as a beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 1,350 cubic yards. This includes flow fill used to fill the Circulating Water System intake piping.
- Primary Auxiliary Building (PAB) – A portion of the lower slab and foundations remain in place with the exception of those areas that were removed to access subsurface radiological piping and those portions removed to facilitate final site grading. A portion of the lower level south foundation wall remains in place to assist in final site

grading. In addition, following extensive characterization and abatement, much of the original above grade structure was monitored for reuse as beneficial fill in accordance with the Materials Reuse Protocol described in Section 3.1.2. Material to remain on-site: 1900 cubic yards.

- Rad Lab Sump Pit - Was removed in its entirety. All removed concrete was shipped off site for disposal.
- Fuel Oil Transfer Pump House – Was removed in its entirety. All removed concrete was shipped off site for disposal.
- Fuel Transfer Chute – Was removed in its entirety. All removed concrete was shipped off site for disposal.
- Elevator Shaft - Was removed in its entirety. All removed concrete was shipped off site for disposal.
- Yard Crane Supports – Was removed in its entirety. All removed concrete was shipped off site for disposal.

The building foundations to remain on-site consist primarily of concrete reinforced with steel and concrete masonry units (i.e., cinder blocks). Subsurface concrete structures to remain (e.g., slabs and sumps) were perforated as necessary to allow infiltration of storm water and/or flow of groundwater through the foundations/structures.

Building surfaces were characterized for paint containing polychlorinated biphenyls (PCBs) and other hazardous constituents prior to demolition. The abatement of PCB-containing paint at concentrations of 50 mg/kg or greater of PCBs has been conducted under specific United States Environmental Protection Agency (US EPA) approved work plans developed in accordance with the Alternative Method of Disposal Authorization (AMDA), issued by the US EPA under Section 6(e)(1) under the Toxic Substance Control Act (TSCA) and the PCB regulations (40 CFR 761).

The concrete foundations remaining in the subsurface underwent visual inspection, where accessible, to determine if any coatings are present. Any paint remaining on subsurface materials proposed to be left in-place (except spray paint incidental to demolition) was be tested to confirm that PCBs were not present in the paint. Any paint found to contain PCBs was removed from the surface of the concrete prior to reuse under the BUD. Any non-PCB paint to remain on concrete was also be tested for RCRA 8 metals. Any non-PCB paint containing RCRA-8 metals at concentrations exceeding applicable BUD re-use criteria was removed prior to reuse.

Mastic coatings are present on some subsurface foundations that remain in-place. Where accessible, the mastic coatings have been tested for asbestos. Based on discussions with the Department regarding the feasibility of removal of mastic from these structures, mastic coatings on foundations will remain in-place for the following reasons:

- Mastic coatings containing asbestos are non-friable. These coatings were designed to be used in the subsurface, and as such, pose a low potential for adverse impact to human health and/or the environment if they remain on the structures, are not disturbed or rendered friable.

- Removal of mastic coatings would require extensive excavation and removal of the upper surface of the concrete containing the coating. Disturbance of these materials during removal could pose a significant short-term risk to worker health and safety and the environment due to the potential for asbestos fibers to become friable and be released to the environment. Containment and monitoring would minimize the potential risks associated with asbestos removal, but not eliminate short-term risks associated with waste generation, management, off-site transportation and disposal.

- Leaving mastic coatings on subsurface structures would eliminate the short-term risk to human health and the environment posed by removal and waste management. Placement of restrictions on the deed to the property that prohibit subsurface excavation or disturbance of subsurface structures containing mastic coatings and/or require appropriate oversight of excavations and management of wastes encountered, as necessary, would eliminate the potential for future adverse exposure to human health and the environment posed by mastic coatings.

Therefore, mastic coatings on subsurface structures (primarily building foundation components), will remain and a deed restriction will be filed prohibiting future work that could result in the disturbance of these materials, unless the work is conducted by a qualified professional. This approach will eliminate the short-term risks to human health and the environment posed by mastic removal and ensure continued protection of human health and the environment into the foreseeable future.

2.1.2 *Utility Lines to Remain In-Place*

An extensive evaluation has been performed of all subsurface utilities and associated structures based on site drawings. Prior to the initiation of demolition activities, a utility matrix was developed to aid in evaluating whether a utility component should be removed or decommissioned in-place. This evaluation was based on discussions with the Department, including a meeting held at the Yankee site on February 2, 2005.

YAEC is leaving selected inactive utility lines in-place that are problematic to remove due to obstacles such as their location beneath building slabs, their encasement in concrete ducts, the presence of asbestos-containing material (ACM) as a pipe component or around the pipes and difficulties associated with ACM abatement or the location/depth of the utility line. Reasonable measures were taken to remove the contents of the utility lines (i.e., water, wires, etc) as part of the decommissioning process; however, wires/cables may remain in-place in inaccessible locations (including some wires that could be coated with ACM). Lines proposed to remain in-place were permanently capped at each end with grout where accessible.

Site underground utilities have been separated into the following categories to facilitate the Department's review and to document the rationale for the leaving proposed utilities in-place. These include the following:

- Under Building Slab (pipes) – Pipes located beneath or immediately adjacent to the foundation of a building slab are to be left in-place. Removal of these lines would require a significant effort that is not justified for the few slabs that are to remain in-place. If the pipe is greater than eight inches in diameter, it was filled with flow-fill. Pipes less than eight inches in diameter were not filled, but contents removed and ends capped with grout, as feasible.

- Concrete Encased Duct Bank – Many of the site electric conduits were installed within concrete structures (duct banks) and encased within concrete within the structure to protect them from the elements. Much of this pipe is identified as 'fiber' pipe and limited testing has revealed it not to be ACM. Asbestos wrap around cables within utility manholes entering these pipes has been identified as ACM. This asbestos material was removed within the manhole prior to pulling cables, however, the cable may not have been fully removed, and in those cases the ACM may remain. Once cables had been pulled, YAEC filled the ends of accessible conduits

with grout, leaving the duct banks and filled manholes in-place following demolition. Most all concrete encased duct banks, however, have been removed. Removal of these structures would require abatement of ACM that is currently isolated and encased in concrete. The ACM as either wrap, a component of the cable, or conduit does not pose a significant adverse risk to human health or the environment under current or proposed future conditions. Therefore, YAEC proposes to leave these subsurface structures and will incorporate them through the filing of a deed restriction. This will prohibit future work that could result in the disturbance of these materials, unless the work is conducted by a qualified professional. This approach will eliminate the short-term risks to human health and the environment posed by ACM removal and ensure continued protection of human health and the environment into the foreseeable future.

- Creosote Timbers over Concrete Duct Bank – Site drawings identified the presence of 2-inch thick creosote wooden timbers placed as markers to prevent excavation and accidentally penetrating electrical lines within the duct banks. Upon excavation, very few of these timbers were identified on the exposed duct banks. For those areas not exposed, YAEC has left these timbers in-place so that they can continue to serve as markers to prevent accidental damage of the conduits within the duct banks. The presence of these timbers as markers will be noted in the deed restriction to be placed on that portion of the property subject to the BUD to facilitate their future use as markers in the event that future activities require controlled subsurface excavation and/or management of subsurface ACM.

- Railroad Lines - A railroad siding system was installed off the original Hoosac Tunnel & Wilmington Railroad ("Hoot, Toot & Whistle") during the initial construction of the site to facilitate the movement and installation of heavy equipment (including the reactor vessel, steam generators, turbine and main generator). The railroad tracks entered on the eastern end of the site along the Deerfield River with branches leading under the Vapor Containment and into the Turbine Building (west side). The steel rails, creosote timbers, and stone ballast associated with rail lines were removed when encountered during the course of decommissioning to a depth of approximately 3 feet below grade elevation. Those sections of the tracks that were not encountered during the subsurface excavation program, will remain in-place due to the potential environmental impacts excavating adjacent to

the resource area. The tracks and ties are inert and pose no risk. Areas adjacent to the railroad tracks have been characterized by soil testing and will be addressed within a site wide risk assessment.

- Concrete and Steel Pipes – Numerous pipes were identified from site drawings that are predominantly made of concrete or steel, which are similar to the concrete duct banks and inert materials. Many of the pipes are located in close proximity to the Sherman Dam and removal would have a potentially adverse effect on the structural integrity of the dam. YAEC has removed pipes where the majority of the line is located at a depth of less than five feet. YAEC has left pipes in-place where the majority of the line is located at a depth of greater than five feet and filled the pipes with flow-fill if greater than eight inches in diameter. Pipes with a diameter of eight inches or less were not be filled, but the contents (wires, etc.) were removed to the extent practical and the ends of the pipe capped with grout. Pipes encountered during site excavation activities were removed if encountered. As an example, the Circulating and Service Water Lines that provided cooling water from Sherman Reservoir through the Screenwell House to the Turbine Building and then back through the Discharge Structure to Sherman Reservoir were left in-place including:
  - One 100-foot long, 10-foot diameter buried corrugated steel intake pipe between Sherman Reservoir and Screenwell House
  - One 7-foot diameter concrete intake pipe between Screenwell House and Turbine Building
  - Two 1-foot diameter steel water service lines between Screenwell House and Turbine Building
  - Four 5-foot diameter steel pipes below Turbine Building
  - One 3-foot diameter corrugated steel pipe between Screenwell House and Discharge Structure
  - One 7-foot diameter discharge pipe between Turbine Building and Discharge Structure (a portion of the pipe is concrete lined with steel and a portion of the pipe is all steel)
  - Three 4-foot diameter steel capped pipes near Discharge Structure branching off from the 7-foot diameter steel pipe

  Yankee has left each of the above lines in-place and filled them with a flow-fill.

- Storm Water Distribution System – An evaluation was performed of the East and West storm water collection systems to determine whether site radiological release criteria was met. The systems are comprised of storm water catch basins and lateral lines that direct storm water through two outfalls managed under a National Discharge and Elimination System (NPDES) permit issued jointly by EPA and the Department. Based on these reviews, YAEC removed the majority of the storm water distribution. This includes removal of the entire East system and the eastern portion of the West system. The exception includes the portion of the West storm drainage system that runs along the western edge of the roadway to the ISFSI which will continue to function as an active flow path.

- Individual Electrical Conduits / Utility Lines – Subsurface site electrical conduits, other small utility lines and pipes are made of inert materials that do not pose an adverse risk of harm to human health and/or the environment. YAEC has removed conduits and utility lines where the majority of the line is shallower than five feet below existing grades or where other excavations encountered deeper system components. YAEC evaluated the feasibility of removal of utility lines where the majority of the line is at a depth of greater than five feet below existing grade. Where removal was feasible based on depth and/or other planned site excavation activities, those lines were removed. Where removal was judged to be infeasible due to the location, depth and/or structure of the line (e.g., found to contain ACM), these lines remain in-place.

- Electrical Grounding Grid – Due to the former use of the site as a power station, an extensive grounding grid was established during plant construction (1950s) that tied into each structure and subsurface amenity to ensure all aspects of operation were properly protected. Composed of bare copper cable, YAEC removed those portions of the grid that were encountered during ongoing excavation and/or demolition activities. YAEC will leave the remainder of the grounding grid in-place.

- Fire Water Protection System – A fire water protection system consists of a looped header that connected to numerous hydrant stations throughout the site. The depth of this system is at least seven feet below existing grades. YAEC has left that portion of this system that is decommissioned in-place unless encountered through other excavation. Hydrants were removed to a depth of five feet below grade.

- Sanitary System- Sanitary sewer lines are considered outside the scope of this BUD application since the closure of septic systems will be addressed under the requirements of the State Environmental Code Title 5 regulations (310 CMR 15.000). Due to radiological considerations, much of the sanitary system that serviced the Industrial Area has been removed. Portions of the system that serviced an Administrative complex adjacent to the Industrial Area remains in place and was closed in accordance with Title 5 requirements.

2.1.3 *Processed Concrete and Asphalt*

As approved by the Department, YAEC proposes to beneficially reuse processed concrete block, reinforced concrete and asphalt from paved areas at the site. The locations where processed concrete and asphalt will be reused to grade the site are shown in Figure 3. All processed concrete has met the Materials Reuse Protocol that is under development between YAEC, the Department, and DPH with regards to a potential radiological constituents (Section 3.1.2). All paint containing PCBs were removed from the concrete prior to reuse. Non-PCB paints that remain on concrete were evaluated to ensure the metals concentrations comply with BUD risk criteria. Processed concrete and asphalt used on site were placed in horizontal lifts and compacted to reduce void space and create a stable fill material.

2.1.4 *End-State*

With the completion of demolition activities, aboveground structures that remain at the site include the ISFSI, the Gatehouse, a planned office building adjacent to the Gatehouse (December 2006), a new septic system adjacent to the Administration Building, and the potable water well and associated structures and components. The revised post-decommissioning grading and planting plans (Kleinschmidt, September 2006) have been reviewed by the Rowe Conservation Commission and by the Department. YAEC intends to extend the east embankment of the Sherman Dam to permanently replace the temporary flood control measures that had been part of YNPS. The site has been regraded and planted following the completion of demolition activities and only minor grading activities remain adjacent to the Sherman Dam extension project. The regrading plan has provided a minimum of 36 inches of soil cover above any foundations or utility lines that are left in-place.

A deed restriction will be placed on that portion of the YAEC property where material will remain in the subsurface that was approved for beneficial reuse under the BUD. The deed restriction will meet the Department's requirements and conditions imposed under BUD approval and will be separate and distinct from any Notice of Activity and Use Limitation (AUL) that may be placed on the property to prevent adverse exposure to residual levels of radioactivity, oil and/or hazardous materials that may remain in the subsurface on site.

2.2 *SOURCE*

The Yankee Nuclear Power Station in Rowe, Massachusetts is the source of the solid waste that will remain on-site. The name and address of the generator are:

Yankee Atomic Electric Company
49 Yankee Road
Rowe, MA 01367

2.3 *INDUSTRIAL PROCESSES*

The solid waste that will remain in-place is derived from the decommissioning of YNPS. The items were constructed using traditional construction methods and include concrete, steel reinforced concrete, asphalt, steel pipes, fiber pipes, concrete pipes, and copper wire.

2.4 *QUANTITY*

The volumes of concrete materials used on site are described by structure in Section 2.1.1, and total 6,785 cubic yards plus approximately 1,000 cubic yards of flow fill. In addition, approximately 1,500 cubic yards of asphalt have also been re-used. Concrete, flow fill, and asphalt combine to approximately 9,285 cubic yards of material.

The volume estimates of materials that have been reused on-site under the BUD are based on the current site closure plans and reasonable knowledge of the dimensions/construction of features to remain on-site. Based on the ability of processed concrete to meet the Materials Reuse Protocol, this quantity may vary. The actual volumes used and these final site conditions will be documented on as-built drawings showing fill areas and buried features. In the event that additional structures/foundations

3.0 CHEMICAL, PHYSICAL, AND BIOLOGICAL PROPERTIES

3.1 CHEMICAL PROPERTIES

3.1.1 Overview

The solid waste beneficially reused primarily consists of concrete blocks, reinforced concrete and asphalt. Concrete is produced by mixing cement and water with inert materials such as sand and gravel. A chemical reaction known as hydration occurs between the cement and water that creates a hard, rock-like product. Steel reinforcing bar (rebar) is imbedded in poured concrete. Asphalt pavement typically contains approximately 95 percent aggregate, consisting of stone, sand, or gravel and five percent asphalt cement as a binder.

Due to the inert nature of the concrete and asphalt, reactivity, leachability, metals content and volatile organic compound concentrations are not a potential concern. The pH of groundwater at the site, which currently ranges from 5 to 8, is not expected to be impacted by leaving the reinforced concrete in-place.

3.1.2 Radiological Characterization

The following Materials Reuse Protocols were developed by YAEC in coordination with the Massachusetts DPH and subsequently approved by the Department in September 2005. The Materials Reuse Protocols are being utilized for determination of above and below grade processed concrete debris that would qualify for purposes of reuse as backfill (including grading material). Note that these protocols apply only to above and below grade processed concrete debris for use as fill and do not apply to existing subsurface slabs/structures and asphalt. The Materials Reuse Protocols demonstrate compliance with the BUD criterion of "no distinguishable plant-related radioactivity above background levels" for radionuclides in substructures and materials suitable for backfill in the BUD fill area and include:

1. For gamma emitting radionuclides, the analysis system sensitivity was established to ensure the environmental lower limit of detection (LLD) of 0.18 picoCuries/gram (pCi/g) for Cs-137 are met. Given this level of system sensitivity, any gamma emitting radionuclides that have positive radioactivity identified above their

respective minimum detectable activity (MDA) were considered to be distinguishable above background and therefore would not be considered acceptable for re-use as backfill.

2. The minimum detection limits (MDLs) for Hard-to-Detect (HTD) radionuclides tritium (H-3), Carbon 14 (C-14), and Strontium 90 (Sr-90) are 5 pCi/g, 2 p/Ci/g, and 2 pCi/g, respectively.

3. Averaging of Tritium, C-14 and Sr-90 levels within individual subsurface concrete structures (or rubble piles) for comparison to the individual MDLs outlined above.

4. The establishment of maximum, Upper Limit (UL) values for Tritium, C-14 and Sr-90 at three times the MDLs, or 15 pCi/g (Tritium), 6 pCi/g (C-14) and 6 pCi/g (Sr-90) for any concrete "hotspots" in subsurface structures or rubble piles.

Existing subsurface structures reused under the BUD, including below grade concrete structures, concrete slabs (fractured and/or perforated) and asphalt will meet release criteria described above. In addition, excavated soils to be used as backfill within the BUD area will also meet the 10 mrem/yr DCGL criteria. The YNPS License Termination Plan (LTP) includes the applicable Derived Concentration Guideline Limits (DCGLs) that are being applied to the site. It should be noted that the DPH site release criteria (10 mrem/yr) is more conservative than the NRC criteria (25 mrem/yr) and as such, the DCGLs found in the LTP will be adjusted to reflect the Massachusetts Department of Public Health (DPH) criteria.

3.1.3 *Non-Radiological Characterization*

As described in Section 2.1, paint containing PCBs were removed from concrete and asphalt to be used for site grading. YAEC has collected core samples of the concrete to verify that PCB concentrations are less than two (2) milligrams per kilogram (mg/kg) following the removal of paint. In the event that non-PCB paint remains on concrete, core samples will be collected to verify that that metals concentrations do not pose a risk (see Section 4.2 for risk criteria).

A mastic coating will remain on some foundation walls at the site. The mastic coating is inert. As described in Section 2.1, some of the mastic may contain non-friable asbestos.

3.2 *PHYSICAL PROPERTIES*

3.2.1 *Size*

The concrete foundations and walls are generally up to 1 foot thick, except where two walls abut. Concrete used for site grading and asphalt from paved areas was processed as necessary to provide a suitable base for the three feet of soil that will be placed over the non-native materials.

3.2.2 *Density*

The concrete may contain rebar and typically has a density of 150 pounds per cubic foot. Certain structures, such as the Fuel Transfer Chute (shipped off-site), were constructed with concrete that had a density of at least 225 pounds per cubic foot. The density of asphalt is estimated to be approximately 140 pounds per cubic foot.

3.2.3 *Percent Solids*

The solid waste to be beneficially used is reinforced concrete and asphalt that is 100 percent solid.

3.2.4 *Liquid Content*

The concrete is free of liquids. Water that may be present in some subsurface utility lines (e.g., water and sewer lines) was removed prior to decommissioning the lines.

3.3 *BIOLOGICAL PROPERTIES*

Due to the nature of the concrete and asphalt, there is no biological activity or pathogens associated with the foundations or utility lines.

4.0 HANDLING METHODS AND UTILIZATION

4.1 HANDLING

The foundations, concrete and asphalt and utility lines remaining at the site were managed on site. Voids within utility lines greater than eight inches in diameter were filled. Utility lines less than eight inches in diameter were abandoned in-place. Three feet of soil covers any non-native materials left in-place.

The concrete structures (buildings, slabs and support columns) were demolished using standard construction practices and heavy machinery. Large structures such were minimized by mechanical means. Smaller structures were demolished with various hydraulic claws and shears, as appropriate. Once the buildings are brought to grade elevation, structural steel beams and metal were segregated into piles for sorting, packaging and disposal. Rebar that was exposed was cut off as close as possible for disposal and rebar that is contained within concrete remains on-site. Concrete was crushed using heavy equipment to accommodate stockpiling, prior to being loaded into containers for radiation surveying on-site in accordance with the Materials Reuse Protocol. Material surveyed for re-use on site was either placed directly into building voids or stockpiled until used for site grading.

4.2 UTILIZATION

4.2.1 *General Description*

The remaining foundations and buried utility lines will be incorporated in the final site re-grading.

4.2.2 *Locations Where Material is to be Used*

Figure 2 shows the locations of foundations that remain. Figure 3 shows where processed concrete and asphalt was used.

4.2.3 *Health and Environmental Impacts*

The material reused under the BUD primarily consists of inert construction materials comprised of concrete and asphalt. Potential

residual impacts on the concrete include paint, as well as radiological constituents (below DCGLs) for remaining structures (with the exception of the ISFSI facility) including foundations, slabs, subsurface asphalt and soil.

The BUD guidance document states that the applicant must demonstrate that Critical Contaminants of Concern (CCCs), such as PCBs as defined in the guidance document, are consistent with background. Based on discussions with DEP at a pre-application meeting held on 1 July 2004, it is our understanding that this requirement of the BUD guidance may not be applicable for a Category 3 BUD.

Confirmation sampling of the concrete was performed to ensure that the maximum residual PCB concentration was no more than 2 mg/kg in the concrete debris. This maximum threshold is essentially equivalent to the proposed default BUD S-2 and S-3 standard of 1.6 mg/kg for PCBs. The S-2 and S-3 BUD values represent an average concentration (this is inherent to the risk assessment process). Although concrete will be confirmed to contain no more than 2 mg/kg as a sample-specific maximum concentration, the actual average PCB concentration in concrete will be well below the S-2 and S-3 BUD standards for PCBs. Because PCBs in concrete will meet the BUD S-2 and S-3 standards, no further assessment for PCBs is required.

In the event that non-PCB paint was left on concrete surfaces, the coated concrete will be tested for RCRA 8 metals. The sampling results were evaluated to ensure that the average concentrations are below the S-2 and S-3 BUD values.

No standards exist in the draft BUD guidance for radionuclides. However, due to the operation of the power plant, the concrete may contain "no distinguishable plant-related radioactivity above background levels," as defined earlier in this document. The use of the Materials Reuse Protocol is consistent with a Category 3 Beneficial Use of Secondary Materials in Restricted Applications because the management of the concrete beneath 3-foot of soil overburden meets the DEP BUD guidance risk management criteria (overall cancer risk less than or equal to 5 in 10,000; or 0.5×10^{-5}). A Human Health Risk Assessment was prepared by Gradient Corporation (Appendix B) to evaluate potential risks associated with the on-site reuse of concrete.

The risk assessment guidelines for the BUD, which adopt those defined under the MCP with a more conservative risk threshold, define health protection on the basis of cancer risk, rather than radiation dose. MADEP

does not have guidelines for the evaluation of cancer risk for radionuclides. Consequently, the U.S. EPA guidelines, published in the *Soil Screening Guidance for Radionuclides* (USEPA, 2000a,b) were used for the Human Health Risk Assessment.

The final site grading and re-vegetation plan will ensure that the concrete will reside beneath 3-feet of soil. A deed restriction will require a Health & Safety Plan and Soil Management Plan for subsurface excavation activities. Thus, the deed restriction will prevent "direct contact" pathways such as incidental ingestion and dermal contact with subsurface materials. Thus, the primary pathway of possible concern for exposure to radionuclides in the subsurface concrete is from external radiation (*e.g.*, ionizing radiation emitted as the result of radioactive decay).

The health assessment presented here indicates that soil grading plan and use of concrete debris as fill, satisfies the interim draft BUD guidance for Category 3 use of Secondary Materials in Restricted Applications. As such, compliance with the Materials Reuse Protocol under development with the Massachusetts DPH would provide an even greater level of protection to human health and the environment.

5.0 REFERENCES

U.S. Environmental Protection Agency (USEPA). 2000a. Soil Screening Guidance for Radionuclides: Technical Background Document. EPA/540-R-00-006. Office of Radiation and Indoor Air; Office of Solid Waste and Emergency Response. Washington, DC.

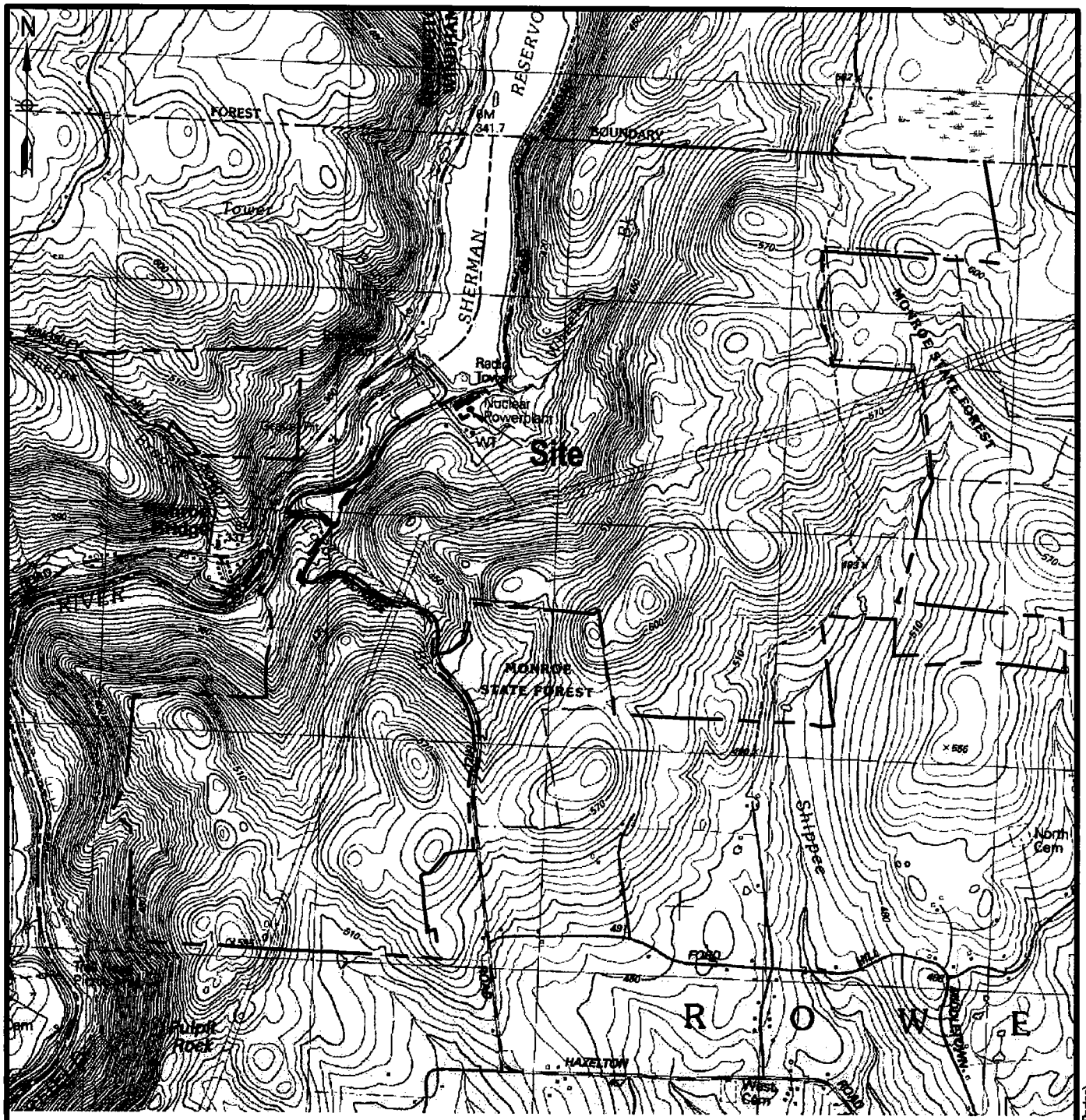
U.S. Environmental Protection Agency (USEPA). 2000b. Soil Screening Guidance for Radionuclides: User's Guide. EPA/540-R-00-007. Office of Radiation and Indoor Air; Office of Solid Waste and Emergency Response. Washington, DC.

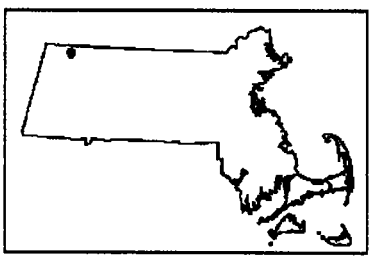
Massachusetts Department of Environmental Protection, Bureau of Waste Prevention, "Draft Interim Guidance Document for Beneficial Use Determination Regulations 310 CMR 19.060", March 18, 2004.

Table 1
Summary of Structures Reused
Yankee Nuclear Power Station, Rowe, MA

Structure Name	Approximate Volume of Concrete to Remain In-Place (cubic yards)	Approximate Volume of Processed Concrete Remaining (cubic yards)
Turbine Building / Office Complex	400	300
Service Building	40	160
Stores Warehouse	25	125
Tank Farm Moat & Gas Drum Decay Area	75	125
Safety Injection/Diesel Generator Building	5	55
New/Old SI Tank Base	0	60
Tank 39 Base Primary Water Tank	0	50
Vapor Container/Reactor Support Structure	1,500	200
Compactor Building	5	30
PCA Warehouse	10	0
PCA #1	5	5
PCA #2	0	40
Fire Water Tank Slab	10	10
Circulating Water Discharge Structure	250	50
Circulating Water Intake Structure	1,300	50
Primary Auxiliary Building	150	1,750
Subtotal	**3,775**	**3,010**
Total	**6,785**	

Note: Table does not include a summary of utilities or asphalt to be reused under the BUD.





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

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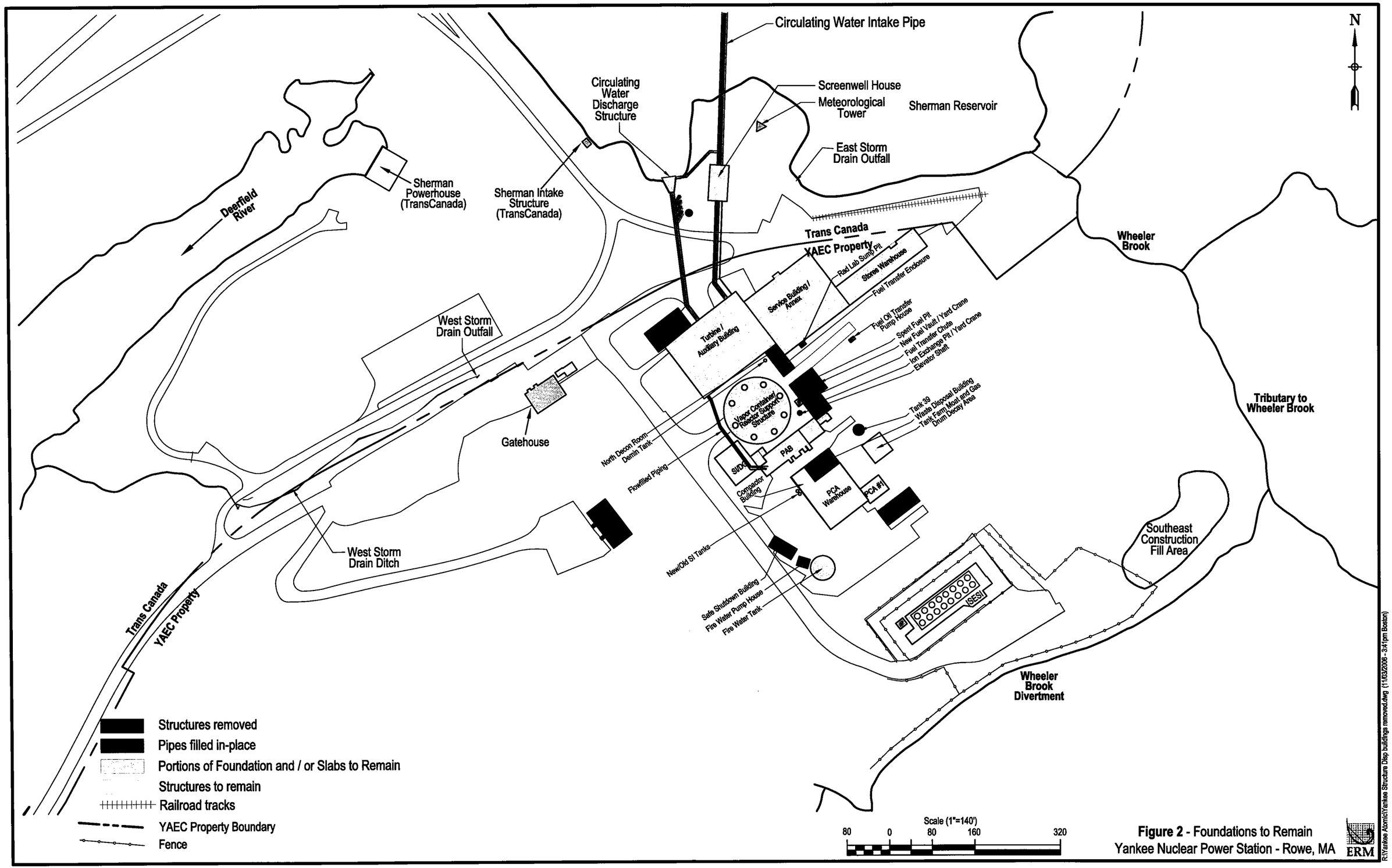

Figure 2 - Foundations to Remain
Yankee Nuclear Power Station - Rowe, MA

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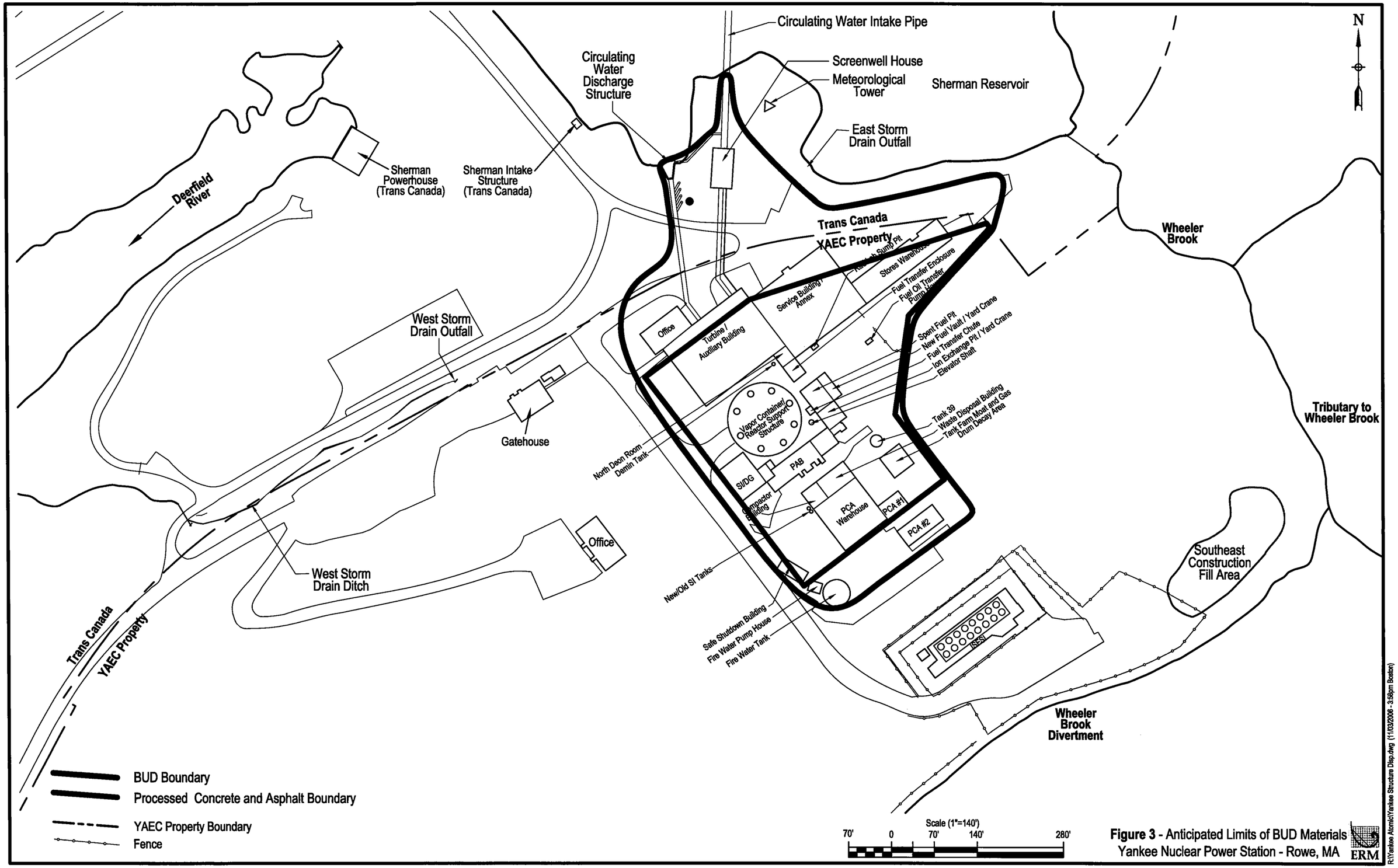

Figure 3 - Anticipated Limits of BUD Materials
Yankee Nuclear Power Station - Rowe, MA

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