YANKEE ATOMIC ELECTRIC COMPANY Telephone (413) 424-5261

49 Yankee Road, Rowe, Massachusetts 01367

June 19, 2003
BYR 2003-050

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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Reference: (a) License No. DPR-3 (Docket No. 50-29)
(b) Letter, J. W. McTigue & G. Demers (ERM) to D. Howland (MA DEP), dated June 9, 2003, BYR 2003-044

Subject: Summary of Site Investigation Work for YNPS Decommissioning

In response to the request for additional information made during the site meeting with NRC on 6 May 2003, this letter provides a summary of site investigation work (Reference b) to be conducted in support of the decommissioning of the Yankee Nuclear Power Station (YNPS).

Specific activities include the installation of up to12 groundwater monitoring wells to expand the coverage of the existing shallow well network in monitoring groundwater quality at depth and in overburden deposits and the underlying bedrock. This work is being initiated in support of requirements for monitoring of radiological constituents in groundwater consistent with the site License Termination Plan (LTP) being developed for submittal to the Nuclear Regulatory Commission (NRC) in November 2003. This work will also support assessment of site groundwater quality for potential impacts from non-radiological constituents, if present, and reviews by multiple regulatory and public stakeholders. Therefore, the work was designed to accommodate the needs of multiple uses, as feasible. At this time we expect that this phase of investigation will be followed by additional work as necessary to fully characterize site groundwater quality in support of plant closure.

NMSS01

If you have any questions, please contact us.

Sincerely,

YANKEE ATOMIC ELECTRIC COMPANY

J. A. Kay

James A. Kay
Principal Licensing Engineer

cc: J. Hickman, NRC, Senior Project Manager, NMSS (2 copies)
T. O'Connell, MA DPH

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9 June 2003
Reference: 0002107
BYR 2003-044

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

Re: Notice of Site Investigation Activities
Expansion of Site Groundwater Monitoring Well Network
Facility Decommissioning Project
Yankee Nuclear Power Station
Rowe, MA

Dear Dave:

On behalf of Yankee Atomic Electric Company (YAEC), Environmental Resources Management (ERM) is pleased to provide this summary of site investigation work to be conducted in support of the decommissioning of the Yankee Nuclear Power Station (YNPS). This summary responds to your request for additional information made during the site-decommissioning meeting on 6 May 2003. We appreciate the Department's continued interest and involvement in this important project.

Specific activities include the installation of up to 12 groundwater monitoring wells to expand the coverage of the existing shallow well network in monitoring groundwater quality at depth and in overburden deposits and the underlying bedrock. This work is being initiated in support of requirements for monitoring of radiological constituents in groundwater consistent with the site License Termination Plan (LTP) being developed for submittal to the Nuclear Regulatory Commission (NRC) in the Fall 2003. This work will also support assessment of site groundwater quality for potential impacts from non-radiological constituents, if present, and reviews by multiple regulatory and public stakeholders. Therefore, the work is designed to accommodate the needs of multiple uses, as feasible. At this time we expect that this phase of investigation will satisfy the radiological characterization and be followed by additional radiological and non-radiological work as necessary to fully characterize site groundwater quality in support of plant closure.

BACKGROUND

The former YNPS is located on approximately 2,200-acre parcel at 49 Yankee Road in Rowe, Massachusetts (Figure 1). The plant began operation in 1961, ceased operation in February 1992 and has since been undergoing decommissioning. The reactor vessel has been removed from the site and spent nuclear fuel transferred to an on site Interim Spent Fuel Storage Installation (ISFSI). Remaining activities include the demolition of structures, characterization and remediation of materials, transportation and management of wastes off-site and site restoration. Completion of the physical decommissioning and closure activities of the site is currently targeted in 2005. The ISFSI and security measures will remain on site until the Department of Energy has a facility ready to receive the spent fuel.

YAEC initiated a site-wide groundwater monitoring program in 1997. The portion of the monitoring network on, and down-gradient of, the former operating plant consists of the series of wells displayed in Figure 2. These are generally shallow wells installed so that the well screen intersects the water table, encountered at depths ranging from four to 18 feet below ground surface and enable the monitoring of shallow groundwater quality. Historic monitoring results for the shallow aquifer beneath the site indicate a release of tritium from the ion exchange pit to groundwater. Additional information regarding groundwater quality in the deep overburden and bedrock aquifers will be necessary to support site closure.

SITE CONCEPTUAL MODEL

To assist in the design and installation of a deep well network, the project team developed a conceptual model of the subsurface geology and hydrogeology beneath the site using historical site and regional data. The conceptual model acts as a working hypothesis of site subsurface conditions, their influence on the flow of groundwater and pathways for migration of potential releases of radiological or non-radiological constituents in groundwater. The model supports the design of the investigation program, is tested as information is generated and the findings are used to support modifications necessary to meet the objectives of the program.

The site is located within a deeply incised north-south trending glacial bedrock valley bordered by steeply sided slopes along the east and west flanks (Figure 1). The Sherman Dam creates Sherman Reservoir extending north along the valley axis and controls the rate of release to the headwaters of the Deerfield River flowing south. Surface water drainage and groundwater flow is expected to be generally west to northwest across the site toward the Sherman Reservoir and the Deerfield River, but may vary locally with site topography, drainage features and subsurface geology.

Geologic deposits beneath the site are generalized to include:

1. 0 to 20 feet of glacial outwash, a loose to dense, silty sand and gravel characteristic of relatively moderate to high permeability and moderate to high rates of groundwater flow, overlying;

2. 0 to 70 feet or more of lodgment till, a dense, compact matrix of clay, silt, sand and gravel of relatively low permeability and low rates of groundwater flow, overlying;

3. a gneissic bedrock of the Hoosic Formation, a dense crystalline rock with groundwater restricted to within bedding planes, joints or fractures, thus the rate and direction of flow within bedrock may be variable and structurally controlled.

Based on the general sequence of geologic units beneath the site, the majority of seasonal groundwater flow beneath the site is expected to occur at shallow depths within the more permeable, upper glacial outwash deposits, ultimately discharging to Sherman Reservoir or the Deerfield River. The higher density and lower permeability of the underlying lodgment till is expected to reduce the relative rates of groundwater flow, resulting in much longer flow paths before discharge to the reservoir or river. The till may prevent shallow groundwater beneath the plant from migrating deeper into the till or bedrock prior to discharge.

Review of available site geologic logs for deep borings developed by Weston Geophysical Corporation indicate that the lodgment till beneath the site was observed to contain inter-bedded sands, silts, clays and, in some instances, nested boulders overlying bedrock. Variations within the compositional layering and permeability of till could influence the migration of radiological and non-radiological constituents in groundwater beneath the site. In addition, bedrock is observed to outcrop on the eastern side of the plant building complex. The presence of shallow bedrock could also influence groundwater flow and the migration pathway of potential releases to groundwater beneath the site.

Using the above information, the project team developed a site conceptual model to reflect general subsurface conditions and potential migration pathways that may exist beneath the site (Figure 3). This figure displays three distinct groundwater flow paths representing possible migration pathways for a release to groundwater. In each case, the release would ultimately discharge to surface water in the Sherman Reservoir or the Deerfield River. However, the migration pathway(s) may be single or multiple as characterized by the following three general cases:

- The most probable flow path is designated F1. In this case, groundwater flow and migration of a release is largely limited to the upper glacial outwash deposits. Downward migration is impeded by the underlying, lower permeability till.
- A second possible flow path, F2, is within or along a bedding plane(s) of relatively higher permeability deposits located within the lodgment till.
- A third possible flow path is within the bedrock, F3, where the release would largely bypass the overburden deposits and the majority of impact would exist in bedrock.

SCOPE OF WORK

Objectives

Based on the site conceptual model, the project team developed a subsurface investigation approach to meet the following primary objectives:

- Determine if the deeper overburden aquifer (i.e., till) has been adversely impacted by a release(s) of radiological or non-radiological constituents to groundwater beneath the "footprint" of the plant and down-gradient toward the reservoir and river. The approach must address the presence or absence of layers within the till that could act as preferential migration pathways.

- Determine if the shallow bedrock aquifer has been adversely impacted by a release(s) of radiological or non-radiological constituents to groundwater beneath the "footprint" of the plant and down-gradient toward the reservoir and river.
- Establish the direction and rate of groundwater flow within and between subsurface geologic units, both laterally and vertically, beneath the plant and down-gradient.

This Scope of Work (SOW) is not intended to evaluate potential impact to deep bedrock at this time. Additional investigation may be required to further assess the extent of site groundwater impact.

Selection of Monitoring Well Locations & Target Depths

The proposed monitoring well network includes up to 12 new wells, including seven shallow bedrock wells, three deep overburden wells and two shallow overburden wells. Target well locations are displayed in Figure 2. The proposed well network may be expanded or contracted based on observations made during boring advancement and/or the results of field screening for radiological and/or non-radiological constituents. It is also important to recognize that installation of additional wells may be necessary during subsequent phases of site investigation to support plant closure.

Well locations were selected primarily based on the detected release of tritium to shallow groundwater originating from the former Ion Exchange Pit that appears to be migrating westerly with advective flow of groundwater (Figure 2). Bedrock wells will be installed in the upper 15 feet of the bedrock. These wells are numbered MW-100B, MW-101B, MW-102B, MW-103B, MW-104B, MW-105B and MW-106B and target the source area and locations down-gradient along the suspected trend and boundaries of the tritium plume. Three of the overburden wells near the source area will target a nested boulder layer, if the layer or possibly additional deposits within the till are encountered that are likely to be of higher hydraulic conductivity than the surrounding till or the underlying bedrock. These wells are MW-100A, MW-101A and MW-102A. Two additional overburden wells target depths of 25 to 50 feet, one (MW-106A) near the Deerfield River within a suspected zone of groundwater discharge, and one (MW-103A) to define the southwestern down-gradient extent of the shallow groundwater impact, if present.

A more detailed description of the rationale for selection of each proposed well location is described below:

MW-100

This proposed well location is down-gradient and in proximity to the former Ion Exchange Pit (IEP), where a release of radioactive constituents to shallow groundwater has been identified. MW-100 is located close to an existing monitoring well CB-1, where relatively high concentrations of tritium have been measured in groundwater. The anticipated depth to bedrock at MW-100 is estimated at 70 feet below ground surface based on available site boring logs. One bedrock monitoring well, MW-100B, will be installed at this location. Should a nested boulder layer or unit of higher hydraulic conductivity be encountered during drilling, an additional overburden well, MW-100A, will also be installed at this location.

MW-101

This proposed well location is under the south perimeter of the vapor containment structure, directly down-gradient from the Primary Auxiliary Building (PAB). The proposed well location is near the existing shallow monitoring well MW-2, where moderate levels of tritium have been measured in groundwater. The anticipated depth to bedrock at MW-101 is approximately 110 feet below ground surface (Weston, 1979).

One bedrock monitoring well, MW-101B, will be installed at this location. Should a nested boulder layer or unit of higher hydraulic conductivity be encountered during drilling, an additional overburden well, MW-101A, will also be installed at this location.

MW-102

This proposed well location is under the north perimeter of the Vapor Containment (VC) structure and down-gradient of the Ion Exchange Pit. The proposed well location is within the core of the Radiation Control Area (RCA) and in an area where elevated radioactivity has been found in surface soil. Tritium and other radionuclides have been measured in groundwater in the existing nearby shallow well CB-9. The anticipated depth to bedrock at MW-102 is approximately 110 feet below ground surface (Weston, 1979).

One bedrock monitoring well, MW-102B, will be installed at this location. Should a nested boulder layer or unit of higher hydraulic conductivity be encountered during drilling, an additional overburden well, MW-102A, will also be installed at this location.

MW-103

This proposed well location is near the gatehouse, approximately 230 feet west of existing shallow well CW-6. This well location is expected to be southwest of the tritium groundwater plume. The anticipated depth to bedrock at MW-103 is approximately 100 feet below ground surface (Weston, 1979).

One bedrock-monitoring well, MW-103B, will be installed at this location to provide water quality data in the bedrock aquifer down-gradient from the RCA. One overburden-monitoring well, MW-103A, will be installed to provide definitive mapping of the down-gradient extent of the radionuclide plume in the shallow overburden aquifer. The depth of the MW-103A will be determined based upon the stratigraphy identified during drilling; the intent is to complete a relatively shallow well at a depth of about 25 feet below ground surface.

MW-104

This proposed monitoring well location is in the access road near existing shallow well CB-2 and about 150 feet up-gradient from existing shallow well CB-6. Subsurface information in the area of MW-104 is not well documented. For planning purposes, a depth to bedrock of approximately 70 feet below grade has been assumed.

One bedrock-monitoring well, MW-104B, will be installed at this location. MW-104B will be used to evaluate whether radionuclides have been transported through the bedrock aquifer down-gradient of the RCA.

MW-105

This proposed monitoring well location is in an area inferred to be north of the tritium plume, near shallow well CW-7. The anticipated depth to bedrock at MW-105 is estimated at 70 feet below ground surface.

One bedrock-monitoring well, MW-105B, will be installed at this location. MW-105B will be used to evaluate whether radionuclides have been transported through the bedrock aquifer down-gradient from the RCA.

MW-106

This proposed monitoring well location is west of the Sherman Dam hydroelectric powerhouse. The area has been inferred to be west of the down-gradient terminus of the tritium groundwater plume. Subsurface information in the area of MW-106 is not well documented. For planning purposes, a depth to bedrock of 50 feet below grade has been assumed.

One bedrock monitoring well, MW-106B, will be installed at this location. MW-106B will be used to evaluate water quality in the bedrock aquifer down-gradient of the tritium plume. One shallow overburden monitoring well, MW-106A, will also be installed if the depth to bedrock at this location is greater than roughly 50 feet. MW-106A will be used to evaluate water quality in the overburden aquifer down-gradient of the tritium plume, where shallow ground water is likely discharges to the Deerfield River. A depth of 45 feet below ground surface for MW-106A has been assumed for planning purposes.

Advance Borings, Screen Soil & Groundwater and Install Monitoring Wells

Advancement of soil borings, screening of soil and/or groundwater and installation of monitoring wells will be conducted in accordance with standard industry procedures and available guidance developed by the Massachusetts Department of Environmental Protection (MA DEP, Standard References), the NRC, US Environmental Protection Agency (US EPA) and YNPS Standard Procedures. ERM has reviewed available YPNS Standard Procedures for investigation and well installation and found these procedures to be consistent with available standards and guidance. Oversight of the monitoring well installation program will be conducted by both an ERM geologist and a geologist from the YNPS radiological site decommissioning team. Boring advancement and well construction will be conducted by D.L. Maher, a contractor experienced in subsurface investigation programs for both radiological and non-radiological constituents.

A roto-sonic drilling method will be used to advance borings at each of the proposed locations. The roto-sonic drilling system employs simultaneous high-frequency vibrational and low speed rotational motion coupled with down-pressure to advance the cutting edge of a circular drill string. This method was selected for the following reasons:

- This method is ideal for advancing a borehole through dense, difficult deposits such as the underlying till and bedrock existing beneath the site, reducing the time required for installation.
- This method will eliminate the need for introduction of large volumes of water or air required by other methods, minimizing the:
    - potential for contaminants to be spread and disturbance to the surrounding aquifer during borehole advancement;
    - amount of waste generated during the investigation process; and
    - potential for adverse exposure by workers during boring advancement.
- This method enables collection of continuous core samples of both overburden and bedrock along the entire length of the borehole to support screening of both radiological and non-radiological constituents, detailed characterization of subsurface stratigraphy and identification of units characteristic of relatively higher permeability that could represent preferred flow and migration pathways.
- The entire length of the borehole is cased continuously during advancement minimizing the potential for cross-contamination of units from drilling.

A 4.5-inch diameter core barrel will be advanced in ten-foot increments, collecting a continuous core sample. A 5.5-inch diameter outer casing will be advanced over the core barrel. The core barrel is then retrieved and the core sample is extruded from the core barrel into 6-inch diameter plastic sleeves. The 5.5-inch diameter outer casing is advanced over the core barrel to maintain borehole integrity. High pressure, low volume water may be added to maintain the annular space between the core barrel and the outer casing. This process is continued to the desired depth of the borehole. The sonic core barrel will be advanced into the bedrock. The rock core collected from the bedrock wells will be retrieved for inspection and description, and stored in wooden core boxes.

Continuous soil samples of the overburden will be collected for visual inspection and classification, and screening for radiological and non-radiological constituents. Screening for non-radiological constituents will be conducted for selected samples in the field for total volatile organic compounds (VOCs) using a flame ionization detector (FID) and the Department's jar headspace screening method. Screening for radiological constituents will be conducted for selected samples at Yankee's on site laboratory. Selected samples may be submitted for more comprehensive laboratory analysis of radiological or non-radiological constituents based on screening results.

Groundwater samples will also be collected at selected intervals for screening. Samples will be collected using either a stainless steel bailer or a submersible groundwater pump and screened for radiological constituents at Yankee's on site laboratory. Groundwater samples may also be collected for field screening of VOCs using a FID or laboratory screening of non-radiological constituents.

Once total depth is reached, the core barrel and drill rods are retrieved from the inside of the sonic casing. Monitoring well(s) will be constructed within the sonic casing using two-inch ID PVC, 0.010-inch machine slotted, 10-foot well screen, and PVC riser pipe. The annular space will be filled with a sand filter pack, bentonite seal, and Portland cement and a five percent bentonite/grout mixture. As the annular space material is added in five-foot increments, the sonic casing is withdrawn in five-foot lifts to assure positive displacement to the well materials. Monitoring wells will be finished with flush-mounted road boxes and developed following installation.

Well installation activities are scheduled to commence on 9 June 2003 and expected to extend into early July until completion. If you have any questions or comments, please contact either of the undersigned at (617) 267-8377.

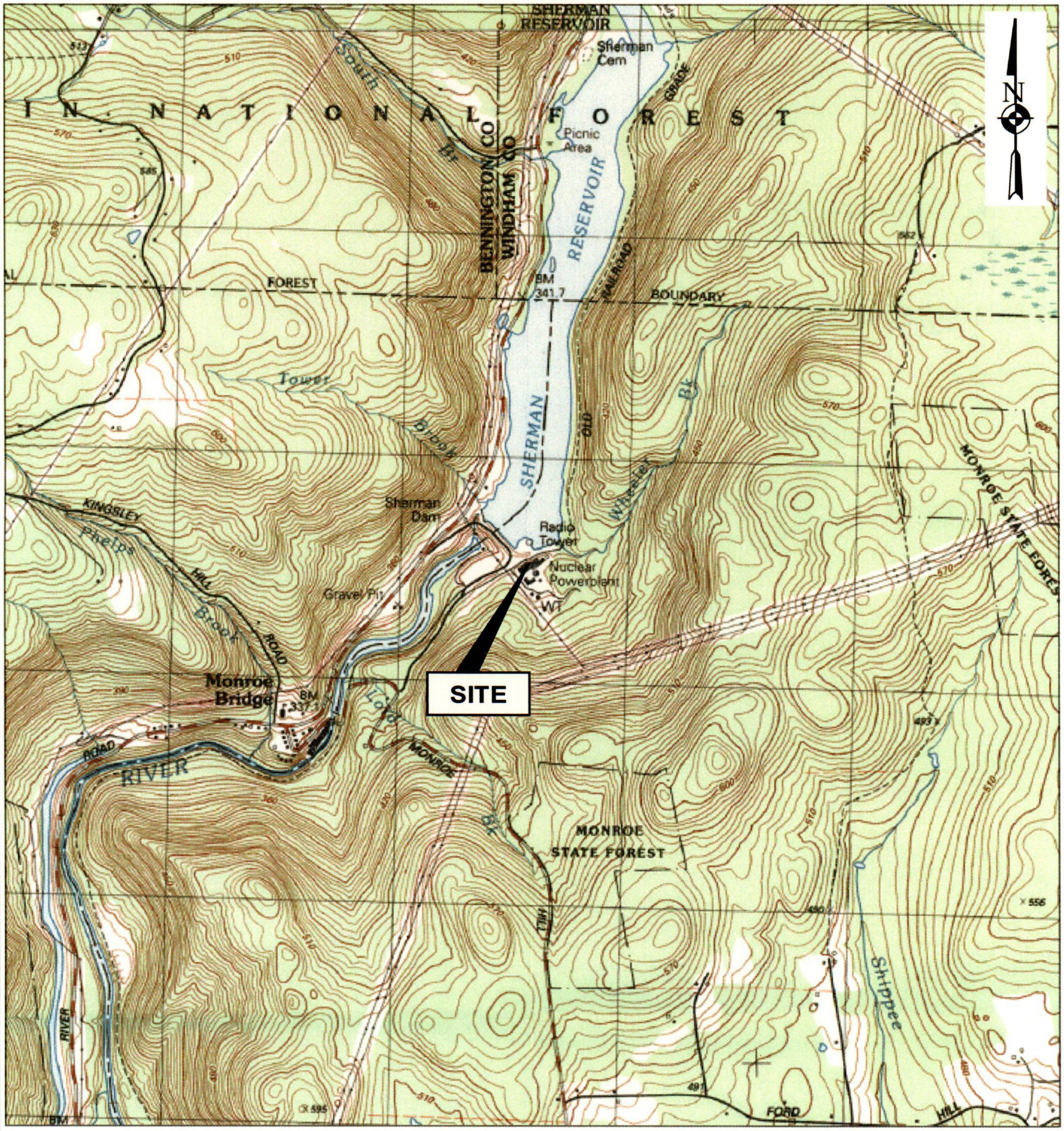
Sincerely,

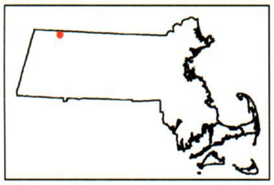
John R D'Ugo
for John W. McTigue, P.G., LSP
Principal-in-Charge

Gregg Demers
Gregg Demers, P.E., LSP
Project Manager

Enc: Figure 1: Site Locus
Figure 2: Existing & Proposed Well Locations
Figure 3: Site Conceptual Model

cc: L. Hanson- Project Hydrogeologist MA DEP
T. O'Connell- MA DPH
J. Peckinpaugh- U.S. NRC
K. Dow, YAEC
M. Atkins, YAEC
J. Kay, Framatome
E. Heath, Framtome
D. Scott, Bechtel
File 0002107





Reference: Topo! Interactive Maps. 1999, Wildflower Production, San Francisco, CA.

ENVIRONMENTAL RESOURCES MANAGEMENT

ERM

399 Boylston Street, Boston, Massachusetts 02116 (617) 267-8377

CLIENT NAME:	YAEC	DRAWN BY:	JE	DATE:	6/3/03
FILE NAME:	Locus Map.fh11	SCALE:	1:25,000	PROJ:	2107

Yankee Nuclear Power Station
Rowe, Massachusetts

Site Location

FIGURE NO.: 1

PRINCIPAL-IN-CHARGE:	JMcT	PROJECT MANAGER:	GD

C01

Legend

- Property Line
- 2 Foot Contour
- 10 Foot Contour
- Treeline
- Edge of Water/Stream
- Existing Overburden Monitoring Well Location
- Proposed Overburden Monitoring Well Location
- Proposed Bedrock Monitoring Well Location
- Area of Continuing Investigation
- Estimated Tritium 300 to 3,000 pCi/L
- Estimated Tritium 3,000 to 6,000 pCi/L

SCALE

50 0 25 50 100 200

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ERM

Revisions			
Symbol	File Path	Date	Approved
	11x17		
	R:\Yankee Atomic\Yankee Rowe.dwg		

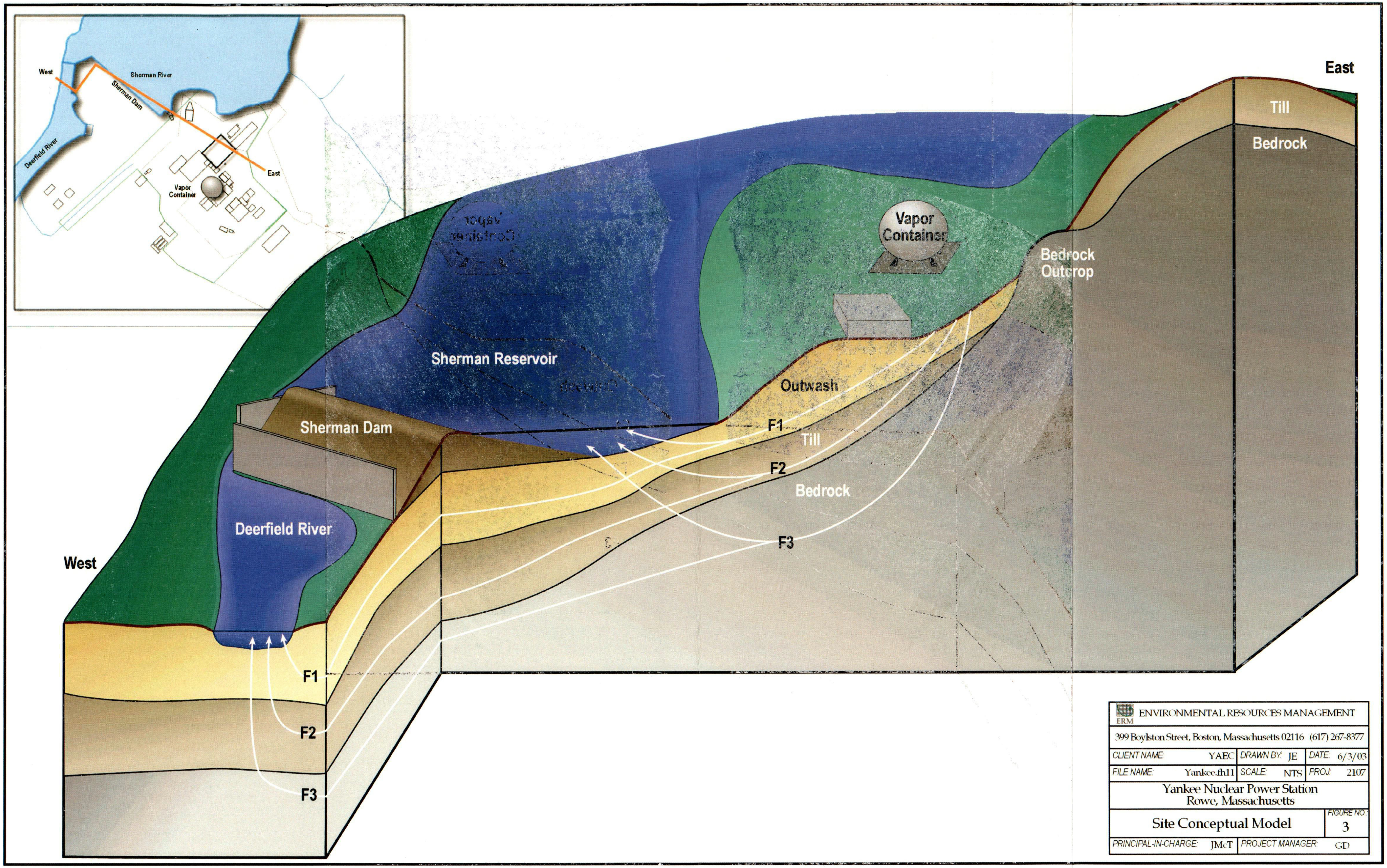
Designed by:	
Drawn by: JE	
Checked by: MD	
Reviewed by: GD	
Submitted by:	

Yankee Rowe Power Plant
Rowe, Massachusetts

Proposed Well Locations

Scale: 1"=100'	Date: 6/3/03
Drawing No.	Figure No. 2
Contract No. 2107	

C02



ENVIRONMENTAL RESOURCES MANAGEMENT					
399 Boylston Street, Boston, Massachusetts 02116 (617) 267-8377					
CLIENT NAME:	YAEC	DRAWN BY:	JE	DATE:	6/3/03
FILE NAME:	Yankee.fh11	SCALE:	NTS	PROJ:	2107
Yankee Nuclear Power Station Rowe, Massachusetts					
Site Conceptual Model				FIGURE NO:	3
PRINCIPAL-IN-CHARGE:	JMcT	PROJECT MANAGER:	GD		

C03