ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

April 21, 2006

Mr. Theodore Smith
Mail Stop: T-7F27
Division of Waste Management
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: PROPOSED CONFIRMATORY SURVEY PLAN FOR THE REMAINING STRUCTURAL SURFACES, EMBEDDED PIPING, STANDING WATER AND OPEN LAND AREA SURVEY UNITS, CONNECTICUT YANKEE DECOMMISSIONING PROJECT, HADDAM, CONNECTICUT (DOCKET NO. 50-0213, RFTA NO. 06-006)

Dear Mr. Smith:

Enclosed is the confirmatory survey plan for the subject areas at the Connecticut Yankee Decommissioning Project at the Haddam Neck Plant in Haddam, Connecticut. Confirmatory survey activities are scheduled to begin April 25, 2006. This survey plan will be used for the remaining structural surfaces, embedded piping, standing water and open land area survey activities for this project. The survey units that will be available for confirmatory survey activities on this survey trip include: 9527-0001; 9527-0002; 9527-0003; and 9527-0004.

If you have any questions, please direct them to me at 865.576.3356 or Scott Kirk at 865.574.0685.

Sincerely,

Wade C. Adams

Wade C. Adams
Health Physicist/Project Leader
Survey Projects

WCA:db

Enclosure

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PROPOSED
CONFIRMATORY SURVEY PLAN
FOR THE REMAINING STRUCTURAL SURFACES, EMBEDDED PIPING, STANDING WATER AND OPEN LAND AREA SURVEY UNITS
CONNECTICUT YANKEE DECOMMISSIONING PROJECT
HADDAM, CONNECTICUT

INTRODUCTION AND SITE HISTORY

The Connecticut Yankee Haddam Neck Plant (HNP), owned by the Connecticut Yankee Atomic Power Company (CYAPCO), began commercial operation in January 1968 under Atomic Energy Commission Docket Number 50-213, License Number DPR-61. The plant incorporated a 4-loop closed-cycle pressurized water type nuclear steam supply system (NSSS); a turbine generator and electrical systems; engineered safety features; radioactive waste systems; fuel handling systems; instrumentation and control systems; the necessary auxiliaries; and structures to house plant systems and other onsite facilities. HNP was designed to produce 1,825 megawatt (MW) of thermal power and 590 MW of gross electrical power.

On December 4, 1996, the HNP permanently shut down after approximately 28 years of operation. On December 5, 1996, CYAPCO notified the U.S. Nuclear Regulatory Commission (NRC) of the permanent cessation of operations at the HNP and the permanent removal of all fuel assemblies from the Reactor Pressure Vessel and their placement in the Spent Fuel Pool. The CYAPCO board of directors voted to permanently cease further operation and decommission the plant and submitted the Post Shutdown Decommissioning Activities Report (PSDAR), in accordance with 10CFR50.82 (a)(4), on August 22, 1997. The PSDAR was accepted by the NRC. On January 26, 1998, CYAPCO transmitted an Updated Final Safety Analysis Report to reflect the plant's permanent shutdown status, and on June 30, 1998, the NRC amended the HNP Facility Operating License to reflect this plant condition (CYAPCO 2005).

CYAPCO currently is conducting decontamination efforts and performing final status surveys (FSS) in the remaining structural surfaces and open land areas and will provide FSS data for each initiated

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completed survey unit (SU) to the NRC as the data become available. CYAPCO has also initiated the FSS program for embedded piping and surface water survey units.

The NRC's Headquarters and Region I Offices have requested that the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory surveys of the remaining structural surfaces, embedded piping, standing water and open land areas at CYAPCO in Haddam Neck, Connecticut after completion of FSS reports for the survey units that are to be released.

SITE DESCRIPTION

The HNP is located at 362 Injun Hollow Road in the Town of Haddam, Middlesex County, Connecticut on the east bank of the Connecticut River at a point 21 miles south-southeast of Hartford, Connecticut, and 25 miles northeast of New Haven, Connecticut.

The HNP was a 525 acre site on a level, 600-foot (ft)-wide terrace at an elevation of 21 ft above mean sea level (msl). Since the beginning of the decommissioning project, there have been two phased land releases; therefore, 120 acres remain as part of the HNP. A parking lot occupies the area to the north of the industrial area. Adjacent to the parking lot is a small man-made pond. A 5,500 foot-long cooling water discharge canal return was constructed and used during plant operation to return heated circulating water from the secondary plant back to the Connecticut River and to process and discharge liquids containing radioactivity. The discharge canal is separated from the Connecticut River by a 200 to 1,000 ft wide peninsula flood plain that ranges in elevation from about 5 to 15 ft above msl. A steep wooded hill slope rises immediately east of the industrial area to elevations over 300 ft above msl. The lowermost 30 to 40 ft of the hillside adjacent to the plant consists of nearly vertical rock cut.

The topography of the site originally consisted of a north-south trending promontory approximately 400 ft-wide that connected the steep hillside north of this area to a floodplain terrace along the river's edge. The steep hill slope extended southward to the northeastern most third of the Containment Building. The southern part of the promontory consisted of large bedrock outcroppings in the area of the Turbine Building. Wetlands extended for 1,000 ft or more to the northwest and southeast of the promontory. During construction of the HNP, the steep hill slope to the north and the higher portions of the promontory were cut and the adjacent wetlands were filled. The discharge canal was excavated through the wetland, terrace, and floodplain to the

southeast. The subsurface portions of the Containment Building, Primary Auxiliary Building (PAB), Turbine Building, Discharge Tunnel, and Spent Fuel Pool were excavated down to, or below, the original bedrock surface.

The HNP design included several structures engineered and constructed to contain radioactive material. These structures included the Containment Building, the Primary Auxiliary Building, the Service Building, the Waste Storage Building, Ion Exchange Structure, Spent Resin Facility, and structures containing tanks for storage of radioactive liquids. These structures and facilities were located within the Radiologically Controlled Area (RCA) boundaries. The site also included ancillary facilities that were used to support normal plant operations. These facilities consisted of warehouses, administrative office buildings, an information center and Emergency Operations Facility. Most buildings and facilities were centrally located on a 15 acre plot adjacent to the Connecticut River.

The remaining site area is largely undeveloped and undisturbed land tracts. The topography ranges from rocky, open spaces to steep, rocky hillsides that are heavily wooded and overgrown with brush in many locations.

OBJECTIVES

The objectives of the confirmatory survey are to provide independent contractor field data reviews and to generate independent radiological data for use by the NRC in evaluating the adequacy and accuracy of the licensee's procedures and FSS results. A site-specific inspection plan was previously submitted to the NRC on April 8, 2005 (ORISE 2005a). As addressed in the inspection plan, ORISE will also review/evaluate final status survey plans (FSSP) and reports (FSSR). The purpose of this review is to ensure that the licensee adequately designed the FSS and fulfilled commitments contained in the license termination plan (LTP).

RESPONSIBILITY

Work described in this survey plan will be performed under the direction of Eric Abelquist, Program Director, Scott Kirk, Survey Projects Manager, and Wade C. Adams, Project Leader, with ORISE. The cognizant site supervisor has the authority to make appropriate changes to the survey procedures as deemed necessary. After consultation with the NRC site representative, the scope of

the survey may be altered based on findings as the survey progresses, and additional information provided by the NRC.

DOCUMENT REVIEW

ORISE will review the licensee's survey classification supporting documentation and the final radiological survey data for adequacy and appropriateness, taking into account LTP and MARSSIM considerations (CYAPCO 2005 and NRC 2000). ORISE will also review and evaluate FSSPs and FSSRs in accordance with the referenced site-specific inspection plan to ensure that FSS procedures and results adequately meet site LTP commitments and Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) considerations (CYAPCO 2005 and NRC 2000).

PROCEDURES

Survey activities will be conducted in accordance with the ORISE Survey Procedures and Quality Assurance Manuals (ORISE 2004 and 2005b, respectively). Deviations to the survey plan or procedures will be documented in the site logbook.

HEALTH AND SAFETY

A walkdown of the project area SU's will be performed in order to evaluate the area for potential health and safety issues. Additionally, the proposed survey and sampling procedures are evaluated to ensure that any hazards inherent to the procedures themselves are addressed in current job hazard analyses (JHAs). The procedures entail minimal potential hazards that are addressed in current ORISE JHAs. Personnel will also adhere to the CYAPCO health and safety requirements. Confirmatory activities are expected to be conducted in areas that do not require radiation work permits or special dosimetric considerations.

REFERENCE SYSTEM

Measurements and sampling locations will be referenced to the existing CYAPCO grid system or area landmarks. In addition, ORISE may use a global positioning system (GPS) and associated maps to reference measurement and sampling locations.

SURVEY UNIT CLASSIFICATION

The MARSSIM FSS process depends upon the use of characterization surveys and site history to divide the site into properly classified survey units of appropriate physical area. Modifications to the SU classification can be made based on new survey findings or information. SUs are limited in size based on their classification, exposure pathway modeling assumptions and site-specific conditions. CYAPCO has assigned each remaining structural surface and open land area SU with an initial classification based on past surveys and the historical site assessment (CYAPCO 2005).

Under MARSSIM, the level of survey effort required for a given SU is determined by the potential for residual contamination as indicated by the classification. SUs with a higher classification will receive a higher degree of survey effort. CYAPCO is using the following MARSSIM classifications for the remaining structural surface and open land area survey units:

- Non-impacted: Areas that have no radiological impact from site operations.
- Impacted Areas: Areas that have some potential for containing residual contamination. Impacted areas include Class 1, 2, and 3 Areas.
    - Class 1: Areas that have, or had prior to remediation, a potential for radioactive contamination (based on site history) or known contamination (based on previous surveys). Areas containing contamination in excess of the $DCGL_w$ prior to remediation should be classified as Class 1 areas.
    - Class 2: Areas that have, or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the $DCGL_w$.
    - Class 3: Any impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual activity at a small fraction of the $DCGL_w$.

ORISE confirmatory survey activities coverage within the CYAPCO SUs will be as follows:

- Non-impacted: Scanning will be done on a judgmental basis.
- Class 1: 50% to 100% of the surface area will be scanned.

- Class 2: 10% to 50% of the surface area will be scanned.
- Class 3: Scanning will be done on a judgmental basis.

SURFACE SCANS

Structural Surfaces

Surface scans for beta and gamma radiation will be performed on 25 to 50 percent of the remaining structural surfaces that can be safely accessed. Scan coverage percentage may increase or decrease depending on findings as the survey progresses and project time constraints. Scans for gamma and beta radiation will be performed using sodium iodide (NaI) scintillation, gas proportional, and/or GM detectors. Particular attention will be given to cracks and joints in the surfaces, exposed concrete surfaces, and other locations where material may have accumulated. Locations of elevated direct radiation will be marked for further investigation. All detectors will be coupled to ratemeters or ratemeter-scalers with audible indicators.

Embedded Piping

Beta surface scans will be performed using a GM and/or gas proportional detector array pipe monitor coupled to ratemeter-scalers with audible indicators. Scans should be performed over 50% of accessible surfaces in selected embedded piping runs. Areas of elevated radiation will be marked for further investigation.

Open Land Areas

Surface scans for gamma radiation will be performed systematically in Class 1 and 2 areas as well as judgmentally selected locations in all selected open land area SUs where radioactivity may have concentrated during operations (e.g., transport routes, drainage areas, streambeds, areas of known radiological releases, etc.).

Additional area scans may be performed, depending on findings as the survey progresses and project time constraints. Particular attention will be given to cracks and fissures in the surfaces, areas of known radiological releases from the HNP, and other locations where material may have accumulated. Scans for gamma radiation will be performed using sodium iodide (NaI) scintillation

detectors coupled to ratemeters with audible indicators. Locations of elevated direct radiation will be marked for further investigation.

SURFACE ACTIVITY MEASUREMENTS

Construction material-specific background measurements, collected from a non-impacted area of the site during a previous ORISE survey, will be used for correcting gross activity measurements performed on the structural surfaces. Direct measurements for total beta activity will be performed at any locations where residual contamination has been identified by surface scans that exhibit radiation levels potentially above acceptable unrestricted release limits established for the site. The number of measurements performed will depend on findings as the survey progresses.

Additionally, up to ten measurement locations will be selected to correspond to licensee locations (e.g., side-by-side measurements) for direct data comparison. A set of two smears will be collected from each direct measurement location—a dry for smear for determining removable gross alpha and beta activity and a wet smear sample for the determination of removable H-3 activity. The majority of the direct measurements will be performed using gas proportional detectors—GM detectors will be used in areas that are inaccessible to the gas proportional detectors. Detectors will be coupled to portable ratemeter-scalers.

Direct measurements will be performed in each piping run selected for independent confirmatory surveys—the number performed will be dependent on the surface scan results. Direct measurements may also be performed at locations corresponding to licensee measurements for direct data comparison.

SOIL SAMPLING

ORISE will judgmentally collect surface (0 to 15 cm) soil samples from various locations within each SU that is selected for confirmatory survey activities. Selected sample locations will focus on known areas of radiological releases from the HNP and major transport, shoreline, and trafficked areas. Additionally, locations exhibiting gamma radiation distinguishable from background also will be selected for sampling.

Samples would also be collected from these areas below the initial 15 cm depth should field investigations indicate the potential for subsurface contamination. The number of soil samples

collected will depend upon survey findings and will be based on the results of surface scans. At a minimum, soil samples will be collected from five locations within each selected SU.

ORISE will monitor the collected samples to determine if the activity is homogeneously mixed contamination throughout the soil matrix or a discrete particle. If ORISE determines that the soil sample contains a discrete particle, at the discretion of the NRC site representative, the sample will either be provided to the licensee or submitted to the ORISE laboratory for further evaluation.

WATER AND SEDIMENT SAMPLING

ORISE will collect water and sediment samples from specific locations identified by the NRC on-site representative. It is expected that one or two of each sample type will be collected.

MISCELLANEOUS MATERIAL SAMPLING

At the discretion of the NRC site representative, samples of miscellaneous material such as concrete, sediment, and other residues may be collected from judgmental locations that are not accessible for direct survey or from locations of elevated direct gamma radiation detected by surface scans.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and data will be returned to the ORISE laboratory in Oak Ridge, Tennessee for analysis and interpretation. Samples will be analyzed in accordance with the ORISE Laboratory Procedures Manual (ORISE 2005c). Smears will be analyzed for gross alpha and gross beta activity using a low-background proportional counter and for H-3 by liquid scintillation analysis. Smear results and direct measurement data will be converted to units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Soil, sediment, concrete, and water samples will be analyzed by gamma spectroscopy and results reported in picocuries per gram (pCi/g) or picocuries per liter (pCi/L). The radionuclides of interest are Co-60 and Cs-137; however, spectra also will be reviewed for other gamma-emitting fission and activation products associated with the HNP and other identifiable total absorption peaks (TAPs). After reviewing the gamma spectroscopy results for these samples, analyses for additional radionuclides, such as H-3, Ni-63, Sr-90, Ag-108m and transuranics, may be performed at the direction of the NRC. Water and sediment samples may also be analyzed for tritium, with distillates counted using a liquid scintillation analyzer and results reported in units of pCi/L or pCi/g.

The data generated will be compared with the applicable site-specific guidelines established for the HNP site (CYAPCO 2005). Results will be presented in a draft report and provided to the NRC for review and comment. Data and samples collected, as part of this survey, will be archived by ORISE.

GUIDELINES

The primary contaminants of concern for the HNP are beta-gamma emitters—fission and activation products—resulting from reactor operation. Cesium-137 and Co-60 have been identified during characterization as the predominant radionuclides present on surfaces and in the soils. CYAPCO has developed site-specific derived concentration guideline levels (DCGLs) based on dose modeling not to exceed 10 mrem/year total effective dose equivalent (TEDE) as presented in Section 6 of the LTP (CYAPCO 2005). The DCGL's for soils, water and embedded piping will be modified to reflect the ratio of radionuclide concentrations in the specific survey units; therefore, ORISE will use the appropriate release guidelines for each specific SU. The licensee does not assess surface activity levels on structural surfaces. Instead, the licensee uses a beta scan investigation level of twice the ambient background to assess volumetric contamination. Therefore, core samples are collected from the identified areas for further investigation and sample analyses; the results are then compared to the volumetric guideline to determine if the identified location met the volumetric release criteria.

TENTATIVE SCHEDULE

The following activities are planned to be conducted in accordance with the following schedule:

- Field Measurements — Six trips from April 2006 to April 2007
- Sample Analysis — May 2006 to May 2007
- Interim Letter Report — Within 45 days after each survey

The final letter report will be issued within 15 days of the receipt of the NRC comments on the draft report.

REFERENCES

Connecticut Yankee Atomic Power Company (CYAPCO). License Termination Plan, Connecticut Yankee Decommissioning Project, Haddam Neck Plant, Revision 3. Haddam, Connecticut; August 2005.

Oak Ridge Institute for Science and Education (ORISE). Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; September 2, 2004.

Oak Ridge Institute for Science and Education. Revision 1—Site-Specific Inspection Plan for the Connecticut Yankee Decommissioning Project, Haddam, Connecticut (Docket No. 50-0213, RFTA No. 03-008). Oak Ridge, Tennessee; April 8, 2005a.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; July 28, 2005b.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; June 20, 2005c.

U.S. Nuclear Regulatory Commission (NRC). Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). NUREG-1575; Revision 1. Washington, DC; August 2000.