



CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT

362 INJUN HOLLOW ROAD • EAST HAMPTON, CT 06424-3099

November 21, 2001  
CY-01-198

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

Haddam Neck Plant  
Offsite Material Recovery Plans

CYAPCO is nearing completion of the implementation of the Off-Site Material Recovery Project. A portion of our closeout process involves a review and evaluation of the programs and procedures used during this project, including the Offsite Material Recovery Program (OMRP) and Material Recovery Plan (MRP). As a result of this review, we identified areas for improvement in the OMRP and MRP. We have incorporated these improvements and revised the two documents. The changes were not considered significant and have no impact on the implementation of OMRP related activities. A summary of the changes and discussion of the OMRP framework is discussed in Attachment 1. A copy of Revision 2 of the Material Recovery Plan is provided in Attachment 2. We are sending you these changes for your information only.

If you should have any questions on the attached documents, please contact Mr. G. P. van Noordennen at (860) 267-3938.

Sincerely,

A handwritten signature in black ink, appearing to read 'Noah W. Fetherston'.

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Noah W. Fetherston  
Site Manager

cc: H. J. Miller, NRC Region I, Administrator  
J. E. Donoghue, NRC Sr. Project Manager, Haddam Neck Plant  
R. Bellamy, Chief, Decommissioning and Laboratory Branch, NRC Region I  
E. L. Wilds, Jr., Director, CT DEP Monitoring and Radiation Division

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**ATTACHMENT 1**

**HADDAM NECK PLANT**

**OFFSITE MATERIAL RECOVERY PROGRAM**

**REVISION SUMMARY AND FRAMEWORK**

**November 2001**

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## 1.0 Background

The Connecticut Yankee (CY) plant, which has ceased operation, is in the process of decommissioning. During the historical site assessment of CY, a plant employee raised a concern about past instances of improper disposal of soil and fill material at the plant. Apparently this material had been placed outside of the radiologically controlled area without appropriate surveys being performed. Radiation Protection personnel were assigned to conduct surveys in the two affected areas mentioned by the employee; the peninsula just west of the discharge canal and a landfill area adjacent to the security guards' shooting range. Small quantities of CY licensed radioactive material were discovered on the landfill site; the peninsula area was determined to have none. Regulatory authorities were notified of the findings.

Subsequently other plant employees came forward and stated that soil and fill material had also been delivered to many of the plant's neighbors over the years. A list of twelve fill sites was created. After obtaining permission from the owners, survey teams, as well as interested regulatory personnel, visited each of these sites to conduct a radiological assessment. Two of these sites were determined to contain small amounts of plant-related radioactivity. Public notifications were made and the ensuing media interest generated more reports from current and past employees, neighbors and concerned citizens of other offsite locations possibly containing CY-licensed material. The most significant report at the time was the removal of approximately 5,100 potentially contaminated solid concrete blocks from the plant site in 1975 with little or no radiological monitoring. These blocks had been used as temporary shielding at a radioactive waste storage area inside the plant's radiologically controlled area. On November 26, 1997 surveys performed at two properties with concrete shield blocks indicated low levels of licensed material.

As a result of these initial discoveries of CY-related radioactivity at off site locations, CY became concerned that other materials could have been inadvertently released without the proper level of radiological monitoring. From the onset of the Program, CY management committed to retrieving all accessible materials that contained CY-related radioactivity. This included initiating actions to identify and recover all of the concrete shield blocks. Current and former employees were requested to identify CY material they had received and to provide any other information that would be of help in this matter. To implement the actions deemed necessary to recover the CY-related radioactivity, CY management established the Offsite Material Recovery Program (OMRP).

The OMRP ultimately consisted of all of the personnel, procedures, processes, and technical bases necessary to assess multiple sites for potential CY-related radioactivity. CY formally submitted the MRP (the original version of this document) in April of 1998. Out of necessity, the OMRP became an ongoing, evolutionary project. Since the quantities of released radioactivity and the potential public health impact were unknowns, the OMRP was practically developed and implemented simultaneously. This need to

quickly begin field assessment work resulted in procedures and technical basis work that frequently had to be revisited and revised.

Although a site assessment for blocks and other material may seem relatively simple, developing a standardized process for identifying the presence of CY-related radioactivity was a complex process. This was due to the difficulty in distinguishing natural background radiation from the low levels of plant-related radioactivity that were being sought. Another issue that had to be resolved included the large variability in conditions encountered at the 145 sites surveyed. These included the type of CY materials obtained and their configuration and use on a wide array of properties for over twenty years. Other factors that contributed to the Project's complexity were the wide variety of industrial safety challenges in the field and the training, supervision, and turnover of a large number of temporary personnel (necessary to augment the plant's staff for a project of this size).

## 2.0 OMRP Revisions Summary

The Plan was revised during July of 1999. The primary change in the first revision of the Plan concerned background Cs-137 levels in soil. The original submittal of the Plan had distinguished between "disturbed" and "undisturbed" soil. Technical evaluations of OMRP survey measurements found that background Cs-137 varied considerably between areas that were undisturbed, such as a grove of trees, and disturbed areas such as residential gardens and yards. Although this difference in radioactivity was apparent, the OMRP found that it was not often easy or practical to group areas into one or the other for purposes of establishing background levels of Cs-137. At many of the survey areas there was no clear line of demarcation between disturbed and undisturbed soil regions as the property owners used their land for many different purposes over the years. In Revision 1 of the Plan, the segregation of soil samples into disturbed and undisturbed was eliminated.

Revision 2 of the MRP is attached. It includes some technical modifications from Revision 1 and also contains summary information on the developed framework for the program and its findings. The latest Plan includes changes in the Action Levels. It establishes Limits that can be applied when a preponderance of survey data suggests that the radioactivity levels measured are not related to CY. These new Action Levels for the OMRP are based on instrument detectability. The initial OMRP Action Levels were based on a *hypothetical* distribution of background radioactivity. This revision uses the same formulae to derive Action Levels but with the *known* distributions of background radioactivity. During the conduct of the surveys these were discovered to be far more variable than the theoretical distributions. The initial Action Levels resulted in numerous false positives, i.e., identifying a property as containing CY-related radioactivity when this was not the case. This revision also eliminates the delineation between two types of concrete; instead it amasses them into one material type.

### **3.0**

#### **OMRP Framework**

To implement an effective and consistent method for the numerous site assessments performed, the OMRP utilized existing plant procedures or developed new ones. A listing of these procedures is detailed in Table 1. The basis for these procedures were the Technical Support Documents (TSD) generated for the Program. A number of such documents were developed and refined during the implementation of the OMRP. A list of the Technical Support Documents is provided in Table 2.

**Table 1 – OMRP Procedures**

CY RPM 5.1-00	Offsite Material Recovery Program
CY RPM 5.1-1	Decommissioning Scoping and Characterization Surveys (Offsite Use Only)
CY RPM 5.1-2	Instructions for Scoping and Characterization Surveys (Offsite Use Only)
Bechtel CY – 24265-000-GPP-GGGR-5102-001	Collection of Surface and Subsurface Soil, Shoreline Sediment, Asphalt and Liquid Samples for Scoping and Characterization Surveys
CY RPM 5.1-4	Control and Accountability of Portable Survey Instruments for Scoping and Characterization Surveys (Offsite Use Only)
Bechtel CY – 24265-000-GPP-GGGR-5104-000	Chain of Custody for Scoping and Characterization Surveys
Bechtel CY – 24265-000-GPP-GGGR-5105-000	Decommissioning Scoping and Characterization Radiological Background Assessment Surveys
CY RPM 5.1-7	Site Characterization Survey Data Evaluation (Offsite Use Only)
CY RPM 5.1-8	Site Characterization Survey Data Integrity and Database Maintenance (Offsite Use Only)
CY RPM 5.1-9	Site Characterization Survey Data Investigation (Offsite Use Only)
CY RPM 5.1-10	Site Characterization Survey Report Preparation and Closure (Offsite Use Only)
CY RPM 5.2-1	Setup and Operation of the E-600 Digital Survey Instrument for Scoping and Characterization Surveys(Offsite Use Only)
Bechtel CY – 24265-000-GPP-GGGR-0031-000	Radioactive Material Shipping Program
Bechtel CY – 24265-000-GPP-GGGR-0028-003	Radioactive Material Control Program
Bechtel CY – 24265-000-GPP-GGGR-0012-001	Radiation Protection Training Program
Bechtel CY – 24265-000-GPP-GGGR-0041-000	Health Physics Instrumentation Program
Bechtel CY – 24265-000-GPP-GGGR-2206-001	Vehicle and Material Release from Radiologically Controlled Areas and Restricted Areas
Bechtel CY – 24265-000-GPP-GGGR-2207-000	Radiological Surveys
Bechtel CY – 24265-000-GPP-GGGR-1102-001	Split Sample Program
ACP 1.2-16.11	Identification and Resolution of Issues Associated with Package Closure for the Offsite Material Recovery Program

**Table 2 - OMRP Technical Support Documents**

TSD Number	Title	Content Summary
BCY-HP-0022	Evaluation of Eberline Portable Survey Instruments Used for Radiological Surveys in Support of the OMRP	Instrument operation, calibration, and response information
BCY-HP-0025	Detection of Alpha-Emitting Contamination for Radiological Surveys in Support of the Offsite Material Recovery Program	Evaluates the detection of alpha-emitting radionuclides during implementation of the OMRP
BCY-HP-0034	Offsite Material Recovery Program Radiological Material Characterization Report	Provides radiological findings from assessed off site locations
BCY-HP-0035	Material Backgrounds and Action Levels for Scoping, Characterization and Final Status Surveys	Development of Action Levels and Limits
BCY-HP-0041	Realistic Dose Assessment for Offsite Radioactive Materials Released from the Haddam Neck Plant	Provides a realistic dose assessment for the original bounding dose assessment site, number 9632
BCY-HP-0042	Generic Radiological Dose Assessment Method for Offsite Materials Released from the Haddam Neck Plant	Provides a methodology to assess site dose based on materials and level of radioactivity discovered at each site
BCY-HP-0057	Hypothetical Dose When Using the Eberline SPA-3 NaI Detector for Material Screening	Examines capabilities of the SPA-3, which was used extensively in the OMRP, especially during scoping surveys
BCY-HP-0063	Background Cs-137 Concentration in Soil	Develops reference background Cs-137 distribution in unaffected soil
BCY-HP-0071	Offsite Material Recovery Program Dose Assessment Summary	Summarizes the OMRP's dose assessment process

TSD BCY-HP-0034 provides the quantitative information about the material recovered from each offsite property. The data contained in this document provided a basis to conduct a site-specific dose assessment using the methodology provided in TSD BCY-HP-0042, Generic Radiological Dose Assessment Method for Offsite Materials Released from the Haddam Neck Plant.

## 4.0

### Quality Assurance

As mentioned before, the OMRP was being developed at the same time it was implemented. As a result, deficiencies in program data were identified after the site assessment work was complete. These deficiencies were documented through an established OMRP process termed a "Request for Management Resolution" (RMR). CY management also established the Management Review Board (MRB) as a part of this process. The MRB was chartered to approve RMR resolution actions that necessitated a return to site and to reach consensus on generic issues that affected the entire Program.

In total, over 1200 RMR deficiencies were identified. Many of the identified discrepancies were of a relatively minor clerical nature such as missing signatures or missing forms. More significant issues were identified and addressed concerning instrument operability and procedural compliance. Table 3 summarizes the categories and significance of each identified RMR issue.

A Site Characterization Engineer identified each issue. These engineers also made a recommendation on how the issue should be resolved and, in many instances, corrected the issues as they identified them. A senior level Technical Advisor then reviewed information germane to the issue and developed a recommendation for CY management consideration. Unless the RMR disposition required a site revisit or generic issue, the Safety Oversight Manager reviewed the recommendations and either approved or rejected them. As stated previously, the MRB was required to approve RMR dispositions that required a site revisit or generic issue. The Review Board would also resolve issues of differing professional opinions over proposed resolutions. Results of the RMR process have been documented and are retained in each site's work package.

To date, a number of sites have been revisited to resolve issues identified in the RMR process that could not be resolved by evaluating the documentation at hand. The rework at these sites has consisted of investigating and surveying areas where there was an insufficient quantity or quality of survey data to support the conclusion that no CY-related radioactivity remained there. As of this date, no detectable plant-related radioactivity has been discovered during any site return.

**Table 3 – Results of the RMR Process**

**RMR Issue**

Incorrect or missing data, signature, or other information	34%
Measured levels greater than interim action levels	7%
Instrument operability	8%
Program requirements not followed	43%
Quality assurance issue	8%

**RMR Disposition**

Issue unfounded (missing data located, instrument operability was satisfactory, below current action level, in line with current procedures, etc. )	52%
Issue found to be valid but not vital to site assessment	39%
Issue found to be valid and requires additional administrative work	5%
Issue found to be valid and requires a site return	4%

**5.0 Summary**

Once CY-related radioactivity was identified in the public domain, CY Management established the OMRP to recover the material and to quantify any potential public dose. Technical Support Documents and procedures were written and revised as necessary to support the OMRP. To address issues identified during survey data evaluation the OMRP developed a comprehensive quality assurance program to evaluate the adequacy of the material identification and recovery process. Additional administrative or on-site work was then conducted to ensure that all detectable CY-related radioactivity had been returned to the licensee. The OMRP has been evaluating the potential release of CY-related radioactivity for more than 3 years. It is our conclusion that most of the targeted material was released to a very limited number of offsite locations (see Attachment C, Summary of Recovered Material) and that that material has been recovered. It is important to note that the OMRP will continue to a limited degree as long as new “leads” are discovered about the offsite presence of potential CY-related materials.

**ATTACHMENT 2**  
**HADDAM NECK PLANT**  
**OFFSITE MATERIAL RECOVERY PROGRAM**  
**MATERIAL RECOVERY PLAN**  
**REVISION 2**

**November 2001**

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## 1.0 Introduction

During the historical site assessment of the Haddam Neck Plant (HNP), Connecticut Yankee (CY) personnel discovered that low levels of radioactive materials, in the form of concrete shield blocks, soil and other miscellaneous materials, were inappropriately released from site. Specifically it was determined that a concrete block shield wall around the resin processing area had been removed from the plant site in 1975. The survey records available were inadequate to identify if the concrete shield blocks had been appropriately surveyed for unconditional release. On November 26, 1997, initial surveys of two former Connecticut Yankee (CY) employee properties, which contained some of the concrete shield blocks, were completed. Low levels of licensed material were detected at each of the properties. As a result of the discovery of licensed material at an off site location, actions have been taken to identify and recover HNP licensed material and concrete shield blocks that were inappropriately released to off site locations.

CY management is committed to recovering all HNP licensed material and recovery of all available concrete shield blocks. To achieve this goal, this Offsite Material Recovery Plan (OMRP) will be implemented to complete, as applicable, the following major activities at each identified site in a timely manner:

- Contact former and current employees and selected long-term contract personnel to determine if materials from the HNP are present on their property or on property previously controlled by them.
- Perform a scoping survey and site assessment of property which contains potential HNP materials.
- Complete an historical property use survey and site characterization survey of property which contains contaminated HNP materials.
- Complete the recovery of any detected licensed material or CY concrete shield blocks from the property.
- Complete a final site status survey.
- Complete site restoration.
- Complete a dose reconstruction.
- Issue a Final Status Survey report.

Figure 1, "Offsite Material Recovery Process" illustrates the general process for the Offsite Material Recovery Project.

## 2.0 Document Hierarchy

CY created the Offsite Material Recovery Program (OMRP) to recover HNP materials with residual radioactivity. The OMRP is comprised of the necessary staffing and procedures to effectively implement the goals established in the MRP. The OMRP document hierarchy is as follows:

- CY's Nuclear Regulatory Commission License
- MRP
- OMRP Technical Support Documents (TSD)
- Safety Procedures
- OMRP Implementing Procedures

- Survey Sampling Work Plan (SSWP)

All actions conducted by CY involving radioactive materials will be within the restrictions identified in CY's NRC license. The OMRP establishes the responsibilities of CY and the OMRP. Technical Support Documents (TSD) provide the technical bases for program elements. A list of the TSDs can be found in Attachment 2. OMRP Procedures are based on TSDs, when such procedures require a technical foundation. Safety and Implementing Procedures are used to specifically direct the execution of activities necessary to fulfill the requirements of the OMRP. SSWPs are written to direct activities at each specific site where HNP-related materials blocks or fill are known or suspected and where a licensed miscellaneous material was found.

### **3.0 Project Organization**

Figure 2 is an overview of the reporting and coordination relationship for this project. The OMRP's Site Characterization Supervisor is responsible for coordinating activities with representatives of the NRC and Connecticut Department of Environmental Protection (CT DEP). Inspectors from the NRC and the CT DEP will be kept informed of off site activities.

The Site Characterization Supervisor reports to the Safety Oversight Manager (SOM) and is responsible for the overall direction of work activities associated with the OMRP including:

- Identification of properties containing HNP licensed material;
- Design of surveys to obtain required data;
- Remediation and removal of licensed material;
- Restoration of the property;
- Notification of the NRC and the CT DEP of work in progress; and
- Preparation of dose estimates and final survey reports.

The functional positions identified on the organizational chart report to the Site Characterization Supervisor. The Site Characterization Engineer, Construction Services Supervisor and Radiation Protection Technicians are responsible for completing assigned duties.

### **4.0 Quality Assurance**

The Material Recovery Plan provides project specific quality elements to be implemented for recovery of licensed material from off site locations. These project specific quality elements will be used in conjunction with applicable portions of the CY procedures. The project specific quality control items are addressed below.

#### **4.1 Personnel Qualification and Training**

Personnel assigned to this effort will be selected based upon their previous work experience and familiarity with site characterization, final survey and radiation projects. Personnel will receive training and be qualified in the appropriate procedures, plans and work packages, commensurate with their specific work assignment. All personnel assigned to perform radiation work at off site locations will be qualified Radiation Workers unless exempted by the SOM.

## 4.2 Survey Documentation/Records

Characterization surveys will be documented following instructions provided in an approved site specific SSWP. The SSWP and the data associated with the SSWP may contain any or all of the following information:

- SSWP which provides the package identification, survey location codes, and specific survey instructions;
- Initial Scoping Data;
- Sample Chain of Custody Records;
- Survey unit diagrams or maps of the area;
- Photographs of the survey areas;
- Hard copy printouts of laboratory analysis results;
- Copies of Log book notes or field notes; and
- Download data files.

Completed survey records are reviewed by the personnel performing the survey and by the Site Characterization Engineer assigned to the SSWP. Upon review, if corrections are necessary, the corrections will be made and documented. Survey documentation will be retained as required by the CY procedures and site record retention requirements.

## 4.3 Instrumentation

Survey instrumentation has been selected which reliably detects the primary radionuclides associated with HNP operations (Co-60 and Cs-137). Survey instrumentation described in this report are calibrated using approved calibration procedures, and with sources and equipment which are traceable to the National Institute of Standards and Technology (NIST). Upon completion of instrument calibrations, labels showing the instrument identification number, calibration date and the calibration due date are attached to the field instrumentation. Instrumentation will be calibrated or verified to be within calibration prior to use. Instrumentation will be source/response checked prior to and after use. Procedures for instrument QC checks, instrument use and instrument operation are controlled by respective Bechtel/CY procedures.

## 4.4 Off Site Laboratory Quality Control Measures

Quality Control measures to assess off site laboratory analysis results will include split sample analysis and duplicate sample analysis. Approximately 5 percent of the off site samples for most properties will involve the analysis of split or duplicate samples. Split samples are samples collected from the same location but are sufficiently large to split into two samples. Duplicate sample analysis involves the repeat analysis of the same sample at a different time or on a different detector. Sample results will be evaluated for acceptability using the criteria in Bechtel/CY Procedure – 24265-000-GPP-GGGR-1102-001, “Split Sample Program.”

## 5.0 Health and Safety Plans

Each work location and planned work activities will be evaluated for occupational safety in accordance with CY Procedure – RPM 5.1-2, “Instructions for Scoping and Characterization Surveys,” which has

provisions for a job safety analysis. Pre-job briefings will also be conducted. All radiological work at off site locations will be performed and controlled in accordance with appropriate procedures.

To the extent possible, the work area will be controlled and maintained in a neat and orderly manner consistent with the work in progress. Normal housekeeping and cleaning of structures, areas and equipment may be accomplished with the standard decontamination methods, which are typically manual methods. At completion of work for the day, the affected areas of the site will be left in a safe and secure condition.

## **6.0 Survey Design**

A process with appropriate program controls that will allow for identification of licensed materials, site remediation and restoration, and public dose reconstruction, as necessary, will be implemented as shown in Figure 1. The process includes six major phases as follows:

1. Site Identification with initial screening and scoping surveys;
2. Site Characterization Process;
3. Site Remediation Process;
4. Site Restoration;
5. Dose Reconstruction; and
6. Final Status Report.

### **6.1 Site Identification**

The goal of the site identification phase is to identify properties or personnel, which may have received material from the HNP. The site identification process includes:

- review of plant personnel lists during the time of concern;
- review of gate logs for the dates the material was removed;
- distribution of questionnaires to past and present CY personnel;
- interviews with persons logged as having removed materials to determine the quantity of material removed and if additional distribution of material had occurred and;
- discussions with members of the public who responded to pertinent news releases
- site visits to the current material location point to assess the presence of licensed material.

## 6.2 Scoping Survey

During the property visit, an initial scan of any identified concrete shield blocks, known storage locations and other material from the HNP will be performed. Items with residual contamination greater than any of the screening criteria provided below will be immediately removed or public access controlled.

### Initial Screening Criteria:

If any of the following criteria are exceeded during the site's initial screening, materials will be immediately removed or controlled:

- A measurement of two-times-background with 2" by 2" NaI gamma detector, or
- Contact exposure rate of greater than or equal to 0.5 mR/hr, or
- Removable beta-gamma contamination greater than or equal to 3000 dpm/100 cm<sup>2</sup>

Normally, a 2" by 2" NaI gamma detector is the only instrument used to identify radioactivity during initial site screening activities. Site-specific dose rate or removable radioactivity measurements are only taken as deemed necessary by investigating personnel. TSD BCY-0057, "Hypothetical Dose When Using the Eberline SPA-3," notes that the 2" by 2" NaI gamma detector is capable of detecting radioactive materials that could lead to a dose of 10 millirem per year. Typical actions taken during initial scoping surveys include:

- Interviews with the property owner to identify current and previous locations of HNP material;
- Photos of property and potential HNP material;
- Sketches of area lay outs; and
- Initial area scans

## 6.3 Confidentiality

To protect the privacy of individuals that own or occupy properties where HNP material is identified, evaluated sites are assigned a unique location code. During the course of the material recovery process, the privacy and confidentiality of the property owner will be protected to the extent reasonably possible.

## 6.4 Site Characterization Process

The purpose of the site characterization process is to identify the extent of licensed material from the HNP at a specific site in sufficient detail to develop plans for site remediation and restoration, and to provide data, if dose reconstruction is necessary. To accomplish these goals an organized method to document the extent and history of former material from the HNP at the site will be conducted. Additionally, a method to document and control the remediation process is required. The following sections identify specific methods, which will be used.

### Survey Unit Classification

Survey units at a specific location will be designated as "Affected" or "Unaffected" based on the likelihood that the area may be contaminated as follows:

- Affected Survey Unit - Survey units containing licensed material from CY, locations having a history of containing licensed material from CY, or areas adjacent to an area, which contained licensed material from CY. Affected Survey Areas are evaluated using a program of systematic measurements and samples to assess the extent and presence of licensed material.
- Unaffected Survey Unit - Survey Units without a history of containing licensed material from CY evaluated using a program of systematic or combination of systematic and biased measurements and/or samples to provide a valid assessment that licensed materials are not present in an area..

If during the survey and sampling program, additional areas containing licensed material from the HNP are identified, area reclassification with the associated SSWP revision will occur.

### SSWP Development

The SSWP is developed from information gathered during the Site Identification process, results of the scoping/screening survey and follow up interviews with the property owner. The current property owner and, if available and applicable, previous property owners, will be interviewed. An interview checklist similar to Figure 3 will be completed for each interview. This checklist will be used as an aid to determine occupancy and use times for particular areas, and historical locations of former materials from the HNP.

The SSWP shall be prepared using the guidance provided in CY Procedure – RPM 5.1-2 “Instructions for Scoping and Characterization Surveys”. Survey units on each property will initially be classified as Affected or Unaffected. Specific minimum survey requirements for each type of area are summarized in Table 1. The Safety Oversight Manager may authorize deviations from the minimum survey requirement on a case-by-case basis. The deviation and reason will be identified in the SSWP. Surveys will be completed for each site location as specified by the applicable SSWP. During the implementation of the survey, the Site Characterization Engineer may modify the survey and sampling approach, based on results obtained and other relevant information. These changes and their basis will be documented with the SSWP.

### Background Determination - Materials

Background radioactivity levels have been determined from areas and materials unaffected by plant operations. Reference background radioactivity levels for various materials were determined in accordance with TSD BCY-HP-0035, “Material Backgrounds and Action Levels for Scoping, Characterization and Final Status Surveys.”

Within this TSD, Action Levels and Limits for materials are developed and are based on the minimum amount of radioactivity that a particular instrument is capable of detecting above background. Action levels are used to identify a measurement point that initially appears to exceed background. Normally, when an Action Level is exceeded, additional measurements will be taken to confirm the initial finding and to identify an area of elevated radioactivity. When an Action Level is exceeded and confirmed, and the source of radioactivity is suspected to be related to CY, remediation is normally undertaken. When a Limit is exceeded, remediation is necessary unless the source of the elevated measurement can be shown to be due to unusual concentrations of natural background radioactivity at a specific site.

## Background Determination - Soil

Soil background analysis was conducted through development of TSD BCY-HP-0063, "Background Cs-137 Concentration in Soil." Although Cs-137 is not a naturally occurring radionuclide, it is present in readily measurable quantities from nuclear weapons testing, which was done in the 1950's, 60's and 70's.

In, TSD BCY-HP-0063, soil background levels of Cs-137 were determined at 22 offsite locations, randomly selected and not affected by plant operations. Sites selected were from two to ten miles away from the CY site. The total distribution of Cs-137 in surface soil samples (i.e. 0 -15 cm) ranged from 0 to 1.80 pCi/g with a mean and standard deviation of 0.52+/- 0.48 pCi/g. An Action Level equal to the 98th percentile of the Cs-137 reference background distribution (1.68 pCi/g) was selected to ensure an appropriate degree of confidence that the proper recovery of CY related Cs-137 is performed at off site locations, while minimizing the potential for unnecessarily continuing remediation at sites where only background concentrations remain.

The 98th percentile action level (1.68 pCi/g) will be applied to individual surface soil results on a sample-by-sample comparison. Cs-137 levels below the 98th percentile, without any other positive plant-related radioisotope identified, will be considered evidence that no CY-related radioactivity is present.

Due to the known high variability of environmental levels of Cs-137, an extended evaluation range has also been established. If a surface soil sample from an off-site location exceeds the 98th percentile action level (1.68 pCi/g), is less than 2.60 pCi/g, and has no other positive plant related radioactivity (e.g. Co-60), the soil location possessing the Cs-137 will be evaluated to determine if the Cs-137 activity is due to CY material or elevated background. This value (2.6 pCi/g) was selected based on the maximum concentration observed from approximately 90 surface soil samples obtained over an eleven-year period from 1975 to 1985 under the Radiological Environmental Monitoring Program (REMP) decay corrected to the present.

## 6.5 Site Remediation

The following text outlines CY's approach to remediating offsite locations that contain CY-related radioactivity.

### Remediation Process

The successful remediation and restoration of the property is viewed as a major responsibility of CY management. Prior to property restoration, all detectable licensed material, including concrete shield blocks, will be removed from the site. The site remediation process may involve:

- The removal of all concrete shield blocks which were previously obtained from the HNP
- Removal of soils or other material containing detectable licensed material;
- Maintenance of a controlled, safe and neat work place and;
- Verification that remediation was completed.

Acceptable methods for the removal of the licensed material include excision of concrete shield blocks, associated structures and soil by hand, with hand equipment or with power equipment. If removal methods capable of generating airborne radioactivity, such as concrete scabbling, are needed, or if an item cannot be removed without destruction of a facility, the SSWP will be revised and the methodology for remediation of the site will be coordinated with the CT DEP and the NRC.

## Regulatory Interface

The NRC and CT DEP will be contacted typically 3 to 5 business days prior to commencing work at newly identified properties to allow for appropriate oversight at the locations.

## Remediation Acceptance Criteria

Acceptable remediation is achieved for each off-site location once no detectable CY-related radioactivity exists. This is defined by the following:

### Soil

- There is no individual soil sample possessing Cs-137 greater than the 98th percentile (1.68 pCi/g), or,
- the sample has been evaluated, documented, and determined to be indistinguishable from background and is less than 2.6 pCi/g of Cs-137, and,
- there are no other licensed radionuclides confirmed present.

### Materials (including concrete target blocks)

- The beta/gamma radioactivity for gross counting instruments is less than the minimum detectable count rate (MDCR) calculated for the reference background and instrument parameters as defined in CYD TSD BCY-HP-0035.
- Tool and/or equipment monitoring satisfies the release criteria in Bechtel CY Procedure 24265-000-GPP-GGGR-R2206-001, "Vehicle and Material Release from Radiologically Controlled Areas and Restricted Areas," which is basically no positive instrument response.

## 6.6 Site Restoration

Restoration and/or replacement of facilities and components will be completed to the satisfaction of the property owner. This activity is considered to be normal maintenance. Unless a major addition or structural modification is required, construction permits are not anticipated to be required.

## 6.7 Dose Estimation and Final Survey Reports

A Final Survey Report and Property Owner Letter will be prepared for each location assessed as part of the OMRP. The Final Survey Report will summarize activities and survey data collected at each site. If CY-related radioactivity is confirmed present, a screening dose assessment will be performed using TSD BCY-HP-0042, "Generic Radiological Dose Assessment Method for Offsite Materials Released from the Haddam Neck Plant."

Upon review and approval of the Final Survey Report, the property owner will be sent a Property Owner Letter, which will summarize material recovery activities and confirmation that their property no longer contains licensed materials from the HNP or no HNP licensed material was identified at the property.

## 7.0 Instrumentation and Analysis Capabilities

The following text describes the instruments to be used to assess offsite areas for CY-related radioactivity.

## 7.1 Field Instrumentation

The Eberline E-600 digital survey instrument will be used and is capable of being connected to a variety of survey detectors, storing the applicable detector calibration information and storage of survey readings. Survey readings and QC checks can be down loaded to a computer database. The various detectors that are typically used in the OMRP are listed in Table 2. Applied Action Levels are provided in Table 3.

## 7.2 Smear Analysis

Gross analysis of smears for beta and alpha activity will be performed for suspect materials and items. Sample count times and the minimum detectable activity (MDA) for alpha and beta activity will be established in accordance with procedures related to smear counting instrumentation.

## 7.3 Off Site Sample Analysis

Vendors on the CY approved suppliers list will analyze samples of soil and debris to verify remediation effectiveness. Sample sizes, sample geometry and sample count times will be optimized to achieve an a priori MDA of less than 0.15 pCi/g for Co-60 and 0.18 pCi/g for Cs-137. To further ensure all CY-related radioactivity is identified, current OMRP procedures have established MDA goals for soil samples at levels between 0.02 and 0.05 pCi/g.

## 8.0 Material Management

Packaging and shipping of licensed materials will be made in compliance with DOT regulations using CY procedures and qualified personnel. Contaminated or potentially contaminated materials recovered from off site locations will be packaged and returned to the HNP using direction provided in respective Bechtel/CY procedures. Transfer of any licensed material to licensed off site processing or disposal facilities will comply with the requirements of 10 CFR 20, 10CFR61, 10CFR71 and 49 CFR as applicable.

## 9.0 Schedules

The OMRP work is nearly complete. To date, 145 sites have been radiologically assessed. A limited number of sites are currently being revisited to address data gaps or other missing information from previous site work. This rework is being done as a small part of an extensive quality assurance process that has been applied to the OMRP over the last two years.

## 10.0 References

- NRC Letter, dated March 24, 1998, from A. Randolph Blough to Russ A. Mellor, Offsite Remediation Plans.
- State of Connecticut Letter, dated March 5, 1998, from Denny Galloway to Russell A. Mellor, no title.
- CY Letter, dated July, 20, 1999, from R.A. Mellor to NRC regarding Offsite Material Recovery Plan, Revision 1.

**Table 1 - Survey Unit Classification and Final Status Survey/Sample Density**

<b>Unit Classification</b>	<b>Survey Approach</b>	<b>Configuration Material Type</b>	<b>Exposure Rate Measurement</b>	<b>Total Surface Contamination (TSC) &amp; Smears</b>	<b>Surface Scan</b>	<b>Soil Samples</b>
Affected Structure	Systematic	Generic / Concrete / Tile Etc.	1 measurement per 4 square meters at 1 meter from surface	1 TSC measurement per square meter plus 1 smear at each TSC location	Beta Scan of 100% of accessible surfaces. For inaccessible surfaces, perform a 100% gamma scan.	None
Affected Paved	Systematic	Asphalt or Concrete	1 meter from sample locations	1 TSC measurement per square meter plus 1 smear at each TSC location	Beta Scan 100% of surface area	Soil sample from under or adjacent to asphalt or concrete pavement (as applicable) <sup>(1)</sup>
Affected Open land	Systematic	Soil	1 meter from sample locations	None	Gamma Scan 100% of surface area	4 samples per 100 square meters
Unaffected Structure	Systematic and Biased	Generic / Concrete / Tile Etc.	None	1 TSC measurement per 50 square meters plus 1 smear at each TSC location	Beta Scans 10% of accessible surface area	None
Unaffected Paved	Systematic and Biased	Asphalt or Concrete	At 1 meter from sample locations	1 TSC measurement per 50 square meters plus 1 smear at each TSC location	Beta Scans 10% of accessible surface area	Soil sample from under or adjacent to asphalt or concrete pavement (as applicable) <sup>(1)</sup>
Unaffected Open Land	Systematic and Biased	Soils	At 1 meter from sample locations	None	Gamma Scan 10% of surface area	1 sample per 1250 square meters. A minimum of 10

<sup>1</sup> For offsite property surveys, paved areas asphalt and including areas with concrete pads, may be surveyed as a structure (affected or unaffected) to avoid damaging the property. Miscellaneous Material will be surveyed IAW RPM 2.2-22 *Vehicle and Material Release from Radiologically Controlled Areas and Restricted Areas*

**Table 2 – Typical Material Recovery Plan Portable Instrumentation**

<b>Instrument/ Detector</b>	<b>Detector Type</b>	<b>Radiation Detected</b>	<b>Use</b>
E-600/HP-300	Compensated GM tube	Gamma	Gamma Exposure Rates
E-600/SPA-3	2" by 2" Na(I) detector	Gamma	Gamma Surface Contamination
E-600/SHP-360	15.5 cm <sup>2</sup> GM detector	Beta	Total Surface Contamination
E-600/100CGS	100 cm <sup>2</sup> gas flow proportional detector	Beta	Total Surface Contamination
Ludlum 2200	ZnS and HP210	Alpha & Beta	Removable Surface Contamination

**Table 3 - Instrument/Material Specific Background Information**

Instrument	Mode	Material		Bkg.	MDCR <sub>1</sub>	AL <sup>2</sup>	Limit	Units
		Material	Code					
SHP-300	Scaler	All materials		10.3	7	17	20	uR/h
SHP-100	Peak Hold	Brick	D	873	249	1122	1227	cpm
SHP-100	Peak Hold	Concrete	C	687	465	1151	1346	cpm
SHP-100	Peak Hold	Concrete Block	B	679	254	933	1040	cpm
SHP-100	Peak Hold	Generic	G	568	360	928	1079	cpm
SHP-100	Peak Hold	Porcelain	P	1103	410	1513	1685	cpm
SHP-100	Peak Hold	Tile	T	954	494	1448	1654	cpm
SHP-100	Peak Hold	Slate	I	888	359	1247	1398	cpm
SHP-100	Peak Hold	Asphalt	A	715	335	1050	1191	cpm
SHP-100	Scaler	Brick	D	483	55	539	563	cpm
SHP-100	Scaler	Concrete	C	390	345	735	880	cpm
SHP-100	Scaler	Concrete Block	B	372	212	585	674	cpm
SHP-100	Scaler	Generic	G	295	180	474	551	cpm
SHP-100	Scaler	Porcelain	P	760	143	903	964	cpm
SHP-100	Scaler	Tile	T	604	326	930	1067	cpm
SHP-100	Scaler	Slate	I	486	113	599	647	cpm
SHP-100	Scaler	Asphalt	A	375	215	589	680	cpm
SHP-360	Peak Hold	Brick	D	227	123	350	403	cpm
SHP-360	Peak Hold	Concrete	C	191	158	350	417	cpm
SHP-360	Peak Hold	Concrete Block	B	184	136	320	378	cpm
SHP-360	Peak Hold	Generic	G	152	167	319	390	cpm
SHP-360	Peak Hold	Porcelain	P	278	163	441	510	cpm
SHP-360	Peak Hold	Tile	T	235	219	455	547	cpm
SHP-360	Peak Hold	Slate	I	227	132	359	415	cpm
SHP-360	Peak Hold	Asphalt	A	193	131	324	380	cpm
SHP-360	Scaler	Brick	D	76	42	117	136	cpm
SHP-360	Scaler	Concrete	C	53	53	106	129	cpm
SHP-360	Scaler	Concrete Block	B	51	47	98	120	cpm
SHP-360	Scaler	Generic	G	34	40	74	93	cpm
SHP-360	Scaler	Porcelain	P	108	50	158	180	cpm
SHP-360	Scaler	Tile	T	84	68	151	181	cpm
SHP-360	Scaler	Slate	I	76	50	127	149	cpm
SHP-360	Scaler	Asphalt	A	55	52	107	130	cpm
SPA-3	Peak Hold	All materials		10,153	8,289	18,442	21,884	cpm

<sup>1</sup> MDCR = Minimum Detectable Count Rate for SHP-100, SHP-360 and SPA-3

MDCR for SHP-300 is the minimum detectable exposure rate (MDER)

<sup>2</sup> AL = Action Level = MDCR(.05  $\alpha$  and  $\beta$ ) + Bkg.

<sup>3</sup> Limit = MDCR(.01  $\alpha$  and  $\beta$ ) + Bkg.

AL and Limit are discussed further in BCY TSD 0035

**Figure 1 – Material Recovery Process**

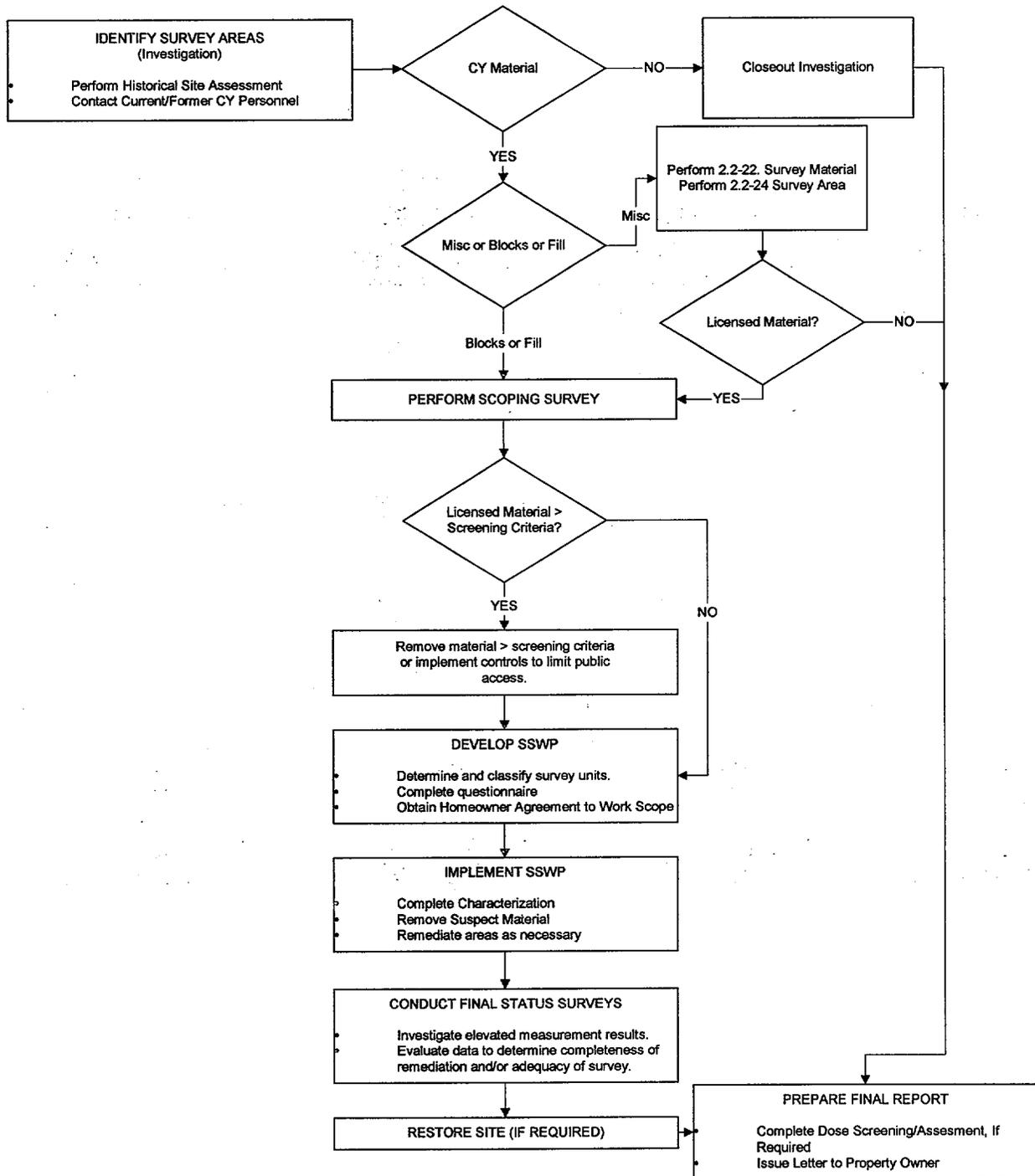
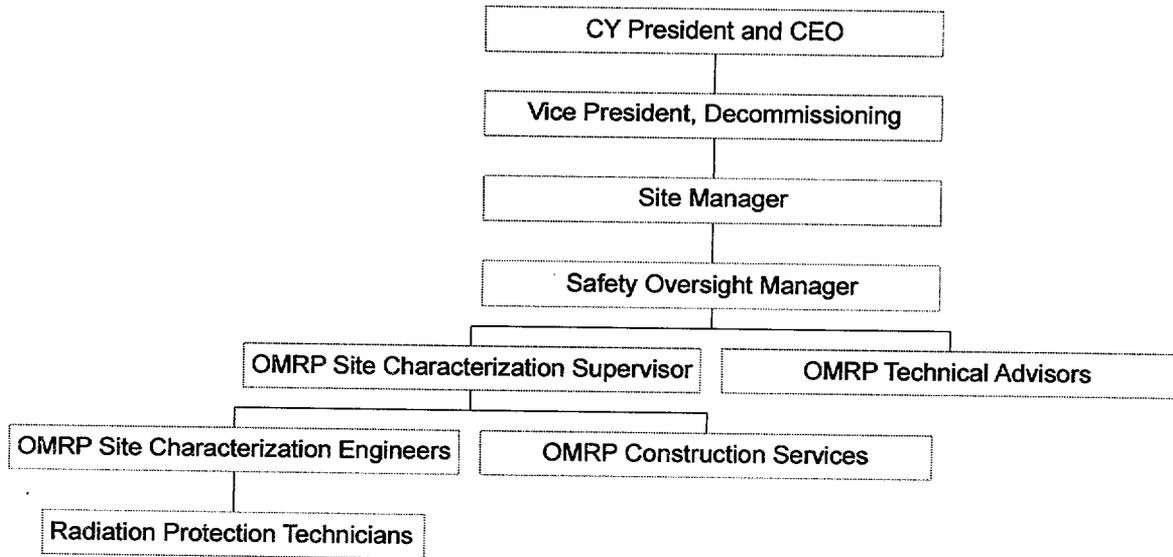


Figure 2 - Material Recovery Project Organization



### Figure 3 - Offsite Survey Area Questionnaire

The following are questions to be asked of the owner/occupants of the offsite survey areas to determine the following: materials involved, the material present and previous locations, who had access to the materials and/or locations and for how long.

Survey Area Number: \_\_\_\_\_

<b>What CY materials are present on the property?</b>
<b>When did the material arrive on the property?</b>
<b>Where is the material presently located on the property?</b>
<b>Where was the material previously located on the property?</b>
<b>What has been the use of the material at the different locations?</b>
<b>Who had access to the material or locations where the material is or has been?</b>
<b>What is the nature of the access to the materials or locations?</b>
<b>What has been the duration of the access to the materials or locations?</b>
<b>Have any materials been removed from this site?</b>

Completed by: \_\_\_\_\_ Date: \_\_\_\_\_