

INSPECTION OF REMEDIAL AND FINAL SURVEYS AT PERMANENTLY SHUTDOWN REACTORS

Effective Date: 07/26/16

PROGRAM APPLICABILITY: 2561A

83801-01 INSPECTION OBJECTIVES

01.01 To verify that permanently shutdown power reactor sites have been decontaminated to acceptable residual radioactivity levels in accordance with the License Termination Plan (LTP) requirements for unrestricted or restricted use, as specified in Subpart E, "Radiological Criteria for License Termination," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection Against Radiation."

01.02 To verify that the radiological measurements, surveys and documentation of remedial action support surveys (RASS) and final status surveys (FSS), are conducted in accordance with the approved LTP and written implementation procedures.

01.03 To verify that the licensee's implementation or completion of RASS has been adequately performed and the survey units have been prepared and are acceptable for the performance of FSS.

01.04 To verify the licensee's implementation of the FSS program and to confirm the acceptability of the FSS results. (See Appendix A, "Final Status Survey Program Inspection Checklist.")

83801-02 SURVEY TYPES

02.01 Scoping Surveys (Licensee Performed)

Scoping surveys are defined as those surveys that are performed by the licensee to augment the historical site assessment (HSA) in areas with the potential for residual contamination. Scoping surveys are used to provide input into characterization survey design and support appropriate classification of the impacted areas of the site.

02.02 Characterization Surveys (Licensee Performed)

Characterization surveys are defined as those surveys that are performed by the licensee prior to any soil remediation or structure dismantling and decontamination activities in order to determine the extent and types of contamination at the site.

Characterization surveys are performed to support HSA conclusions, and in order to establish a plan to conduct remediation activities and design an FSS program.

02.03 Remedial Action Support Surveys (Licensee Performed)

RASS are defined as those surveys that are performed by the licensee after soil remediation activities or structure dismantling and decontamination activities have been completed. RASS are performed to support remediation activities, as a pre-requisite to verify that the area has been properly decontaminated and prepared for the FSS to be implemented, and provide data for planning the FSS. RASS typically include verification that there is no significant contamination-at-depth either in soil or in structures, cracks, crevices and floor-wall interfaces, and that there is no significant loose surface contamination on structures.

02.04 Final Status Surveys (Licensee Performed)

FSS are measurements and sampling performed by the licensee following the completion of decontamination activities in preparation for release. The FSS is typically conducted to demonstrate that the potential dose from residual radioactivity is below the release criterion for each survey unit per the approved LTP. This demonstration is often achieved through the usage of derived concentration guideline levels (DCGLs), though either a dose assessment approach or a DCGL approach is acceptable.

As such, an FSS may utilize either DCGLs or a value associated with a dose assessment approach (both of which should be consistent with the approved LTP). Additional information on the two compliance approaches can be found in the NUREG-1757 series (Consolidated Decommissioning Guidance). Additionally, there may be situations where residual radioactivity in a survey unit is indistinguishable from background, in which case an action level approved in the LTP would be used as the compliance value. For simplicity, the remainder of this procedure discusses only DCGLs as the compliance values.

02.05 In-Process Surveys (NRC Performed)

The NRC's in-process surveys and sampling are typically conducted simultaneously with the licensee's activities. The in-process surveys may be conducted either during or prior to completing remediation activities to assess the licensee's progress in preparing for FSS, or may be conducted during the licensee's performance of FSS to verify that the licensee is performing radiological measurements and obtaining results consistent with the FSS design and procedures and the approved LTP.

The inspectors should collect side-by-side, split samples or arrange for additional NRC sampling with the licensee for comparative purposes, and should compare in-field instrument readings and sensitivity. In the additional NRC sampling approach, the samples are collected in the presence of the inspector, counted by the licensee, and the inspector sends the samples to the NRC contracted laboratory for analysis using the appropriate chain-of-custody approach. To validate laboratory capability, the inspector may count samples previously collected and analyzed by the licensee.

NOTE: NRC lessons learned and experience have shown that the in-process approach has resulted in significant savings in cost, assured a more accurate FSS, and had less of an impact on the licensee in maintaining survey unit accessibility for NRC inspectors.

02.06 Confirmatory Surveys (NRC Performed)

Confirmatory surveys are performed after the licensee has completed their FSS measurements. Confirmatory surveys are performed to validate the licensee's survey program and to provide assurance that the survey unit meets residual radioactivity levels for release.

83801-03 INSPECTION PLANNING AND CONDUCT

03.01 Inspection Survey Preparation

- a. The inspector should review licensee records for the types of radioactive materials expected to be present, occurrence of any significant safety issues during the operation or decommissioning of the facility, and any special concerns about the site expressed by the headquarters project manager (PM), NRC staff, or other stakeholders.
- b. The inspector should review the licensee's HSA and LTP to determine the scope of facility contamination and the licensee's decontamination, remediation survey, and FSS programs. If the licensee does not have an approved LTP, the inspectors should review the licensee's procedures for performing these tasks and discuss them with the headquarters PM and health physicist to ensure their adequacy to eventually meet the applicable license termination requirements.

NOTE: Without an approved LTP that establishes the permissible residual radioactivity levels, the licensee is at risk while performing remediation and FSS activities. In the absence of approved DCGLs or other established clean-up criteria, power reactor licensees must ultimately demonstrate compliance with the criteria for license termination, as specified in 10 CFR 20, Subpart E, "Radiological Criteria for License Termination."

- c. The inspector, in conjunction with the headquarters PM and a health physicist, should consider the following when planning inspection surveys:
 1. In areas where in-process surveys were not conducted, or samples were not collected, confirmatory surveys and sampling may be performed after the licensee has completed decontamination activities and performed the FSS.
 2. Sites where in-process surveys and sampling have not identified significant weaknesses in the FSS program may not require confirmatory surveys and sampling. However, confirmatory surveys may be deemed necessary for sites where unresolved radiological program weaknesses were previously identified or where repetitive violations have occurred.

3. Confirmatory surveys should be considered where there is historical information of spills or unusual occurrences involving the spread of contamination at the site.
4. Confirmatory surveys should be considered in any survey unit where the licensee is planning to backfill the area with clean fill dirt after remediation activities are complete. Attention should be paid to the licensee's backfill schedule to ensure that confirmatory surveys can be completed while the area remains accessible.
5. The goal is to conduct sufficient confirmatory surveys and to collect an adequate number of samples so that the inspector and NRC staff can conclude that the licensee's decommissioning activities and survey program have been implemented in a manner that provides confidence in the results.

03.02 Inspection Effort

- a. Based on the characterization data and other information provided by the licensee during the course of decommissioning, the headquarters PM, the health physicist, and the inspector should determine in advance the level of effort to be employed to collect sufficient data and information that will allow the staff to confirm that the licensee has met the residual radioactivity requirements. Table A below provides recommendations for focusing the inspection effort during various phases of decommissioning, and references sections from NUREG-1757, "Consolidated Decommissioning Guidance," Volume 2.

Table A – Recommended Inspection Focus

<u>Licensee Activity</u>	<u>NUREG-1757 Guidance</u>	<u>Inspection Purpose</u>	<u>Inspection Process</u>
Dismantling and Decontamination in Support of Remediation Activities, Scoping and Characterization Surveys	Section 4.2 – Validate data consistency with licensee's characterization surveys	Ensure health and safety of remediation workers and public	NRC Inspection Manual Chapter 2561, "Decommissioning Power Reactor Inspection Program," and NRC Inspection Procedure 83750, "Occupational Radiation Exposure"
Remedial Action Support Surveys	Section 4.3 – Verify area is prepared for FSSs and validate the FSS design	Ensure areas are prepared for FSS	Observation of licensee surveys and survey records for compliance with LTP survey requirements
FSS In Progress	Section 4.4 – Validate FSS design and performance	Verify compliance with the FSS design approved in the LTP (as applicable)	Observation and inspection of licensee surveys and performance of NRC in-process surveys

<u>Licensee Activity</u>	<u>NUREG-1757 Guidance</u>	<u>Inspection Purpose</u>	<u>Inspection Process</u>
FSS Completed	Section 4.4 – Verify FSS residual radioactivity levels	Verify compliance with the FSS requirements approved in the LTP (as applicable)	Performance of NRC confirmatory surveys and review of licensee survey records
FSS Reports	Section 4.5 – Verify FSS report requirements	Verify compliance with the FSS reporting requirements approved in the LTP (as applicable)	Review of licensee survey records, and results of NRC in-process or confirmatory surveys, for agreement with licensee conclusions

- b. Inspections at facilities where the NRC in-process surveys have not identified significant weaknesses in the facility's radiation protection program implementation or deficiencies in the FSS program and FSS report may not require additional in-process or confirmatory surveys after completion of the licensee's FSS. A determination on the need for additional in-process surveys is made by the headquarters PM in consultation with the regional inspection staff and health physics technical experts.
- c. Facilities that have experienced the following may require extensive in-process or confirmatory surveys to be performed during and after the licensee's FSS:
 - 1. Significant unresolved weaknesses that are identified during the inspection of the licensee's survey program.
 - 2. Repetitive radiation protection violations.
 - 3. Partial site releases that include impacted areas.
 - 4. Records of spills or unusual occurrences involving the spread of contamination during decommissioning activities at the site.
 - 5. A history of releases with higher levels of radioactivity, such as hot particles.

03.03 Inspection Plan

The inspector should develop an inspection plan outlining the types of measurements needed, the samples to be taken, the survey units to be surveyed, and the documents to be reviewed. The inspection plan should include a survey plan that is consistent with the data quality objectives contained in the licensee's approved LTP or FSS plan, survey unit classification, and media sampling and survey methods. Inspections should be biased toward the conduct of surveys and the review of documents from survey

areas classified as Class 1 as a higher priority than Class 2 or 3, per the guidance contained in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)." The inspectors should also ensure that survey units have been properly classified or re-classified as a result of decommissioning activities.

03.04 Inspection of Remediation Activities and Transition to FSS

Inspection of remediation activities should include reviews of procedures that govern sample chain-of-custody, access control to future FSS areas, survey data collection and data management, quality control surveys, and records retention and management requirements. Instrumentation calibration and survey methods should also be evaluated to verify (1) measurements are meeting the required percentage of the area to be surveyed, (2) instrument scan sensitivity, and (3) direct survey or sampling requirements appropriate to the survey unit classification.

Inspection activities should evaluate the licensee's RASS completion and that the prerequisite activities required for FSS have been performed. During this evaluation, the inspector should review the procedures and performance of RASS as follows:

- a. Review the radiation technician / surveyors training and qualification records to ensure compliance with technical specifications and the LTP.
- b. Verify that field screening methods and instrumentation are capable of detecting residual radioactivity at the $DCGL_W$, and that methods are consistent with the LTP.
- c. Review the method for determining the background radioactivity level for the survey, and verify that the method is consistent with the LTP.
- d. For remnant structures, review the procedures for performing surveys that determine contamination-at-depth in cracks, crevices, and floor wall interfaces. Evaluate the licensee's surveys or samples taken to verify that remnant structures were remediated to the appropriate depth.
- e. For remnant structures, review the surveys that determine the loose surface contamination is less than 10 percent of the total residual radioactivity.
- f. For soil areas, review the surveys that demonstrate that the areas were remediated to the appropriate depth and verify that groundwater considerations have been evaluated and considered as appropriate as part of the FSS plan.
- g. If automated measurement systems are employed, a review of the licensee's technical bases documents, including calculations, validation tests, and software verification, must be performed. These systems may include portable in-situ gamma spectroscopy systems, conveyor based monitors, bulk monitors, etc.
- h. Ensure access control measures were followed for areas where FSS have been completed.

- i. Verify that appropriate re-survey protocols were followed for any areas that underwent remediation during or after an FSS, or for survey units that failed a statistical test for compliance. Ensure that re-surveys are performed in accordance with the LTP and/or applicable NRC guidance.
- j. The inspector should also review the licensee's investigation level and investigation process as described in the survey documents related to RASS. The investigation level is a radionuclide-specific concentration or activity level of radioactivity that: (1) is based on the release criterion, and (2) triggers a response, such as further investigation or cleanup, if exceeded. It is considered the level below which there is an acceptable level of assurance that the established DCGLs have been obtained. Appropriate use of the investigation level supports survey decisions that are consistent with the intent of MARSSIM in that the investigation level indicates when additional investigations may be necessary in a survey unit. The inspector should verify that the chosen investigation levels associated with each DCGL are reasonable and in accordance with the LTP, and that surveys are being conducted in accordance with the program.

03.05 Conduct of In-Process Surveys

The "in-process" final survey inspection is intended to provide confidence that the licensee's survey results are accurate and representative of the conditions at the facility. The inspector should review any license conditions related to prerequisite activities for performing the RASS and FSS in the LTP. In addition, review the licensee's final status survey design packages, and/or survey reports, as applicable. (See Appendix A, "Final Status Survey Program Inspection Checklist.")

03.06 Conduct of Confirmatory Surveys

Inspection activities for completed FSS may include the collection of confirmatory samples or measurements to provide confidence that the licensee's FSS program is adequate. These surveys may be in addition to the findings of the in-process survey inspection. The confirmatory surveys are performed to ensure that the survey results reported by the licensee are accurate and representative of the conditions at the facility.

03.07 Review of FSS Records

The review of FSS records shall include the following: evaluation of (1) FSS records packages for completeness; (2) appropriate licensee review and approvals; (3) training and qualification records for survey technicians; and (4) instrument calibration records. For a detailed discussion of FSS inspection areas, see Appendix A.

The inspector should also consider a general review of records maintained under 10 CFR 50.75, "Reporting and recordkeeping for decommissioning planning," Section (g), especially in regard to records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site.

03.08 Inspection Report

- a. The inspector will prepare an inspection report that summarizes the actions taken under this inspection procedure and the findings and evaluations of the inspection staff. The report should include or reference any NRC contractor reports documenting the in-process or confirmatory surveys performed during the inspection period.
- b. The FSS reports are the licensee's demonstration that the residual radioactivity levels remaining in each survey unit meet the DCGLs in the LTP. The inspection report includes the NRC in-process and confirmatory survey results, documents the licensee's FSS results, and is part of the basis for the staff's finding that the licensee has met the release criteria approved in the LTP, which is used as part of the basis for NRC approval of license termination.

83801-04 RESOURCE ESTIMATE

The direct onsite inspection hours required to complete this procedure depend on the complexity of the facility and the duration of the licensee's remediation and final survey program. For facilities needing a significant final survey effort, approximately 20 to 40 inspection hours will be needed to complete the inspection of each soil or building survey unit. For facilities with less complex or significant final survey efforts, approximately 10 to 20 inspection hours will be needed to complete the inspection of each soil or building survey unit.

83801-05 REFERENCES

NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)"

NUREG-1700, "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans"

NUREG-1757, "Consolidated Decommissioning Guidance"

NRC Inspection and Enforcement (IE) Circular No. 81-07, "Control of Radioactively Contaminated Material"

END

APPENDIX A
FINAL STATUS SURVEY PROGRAM INSPECTION CHECKLIST

1.0. CONSIDERATION FOR DESIGNING FINAL STATUS SURVEY INSPECTIONS

- A. Final status survey (FSS) inspections should be made against commitments in the site's License Termination Plan (LTP) and the licensee's FSS program, including any changes to the LTP approved by the NRC. Although not common, if items for further or future review were identified in the Safety Evaluation Report (SER) that supported LTP approval, the inspector should also verify that these items are addressed.

In addition, as part of the overall document review, the inspector should evaluate changes made to the LTP that did not require prior NRC approval to ensure that the FSS program is being conducted in accordance with the associated SER, and that the changes were made in accordance with acceptable change control criteria.

- B. Inspection of a licensee's FSS program may include independent in-process or confirmatory measurements by the inspector or an NRC contractor. The extent of the confirmatory measurements, and whether the use of an NRC contractor is warranted, is at the discretion of the NRC, and depends on a number of factors discussed in Section III below.
- C. For each inspection, the inspector should identify which inspection areas and activities listed below are covered and create an inspection plan accordingly.

2.0. INSPECTION ITEMS DURING FSS

- A. Review the organization and personnel responsibility requirements for adequacy and completeness in the following areas:
1. Survey program documentation
 2. Responsibilities and qualifications of the survey staff
 3. Implementation of relevant LTP, FSS program, and facility procedure changes in accordance with 10 CFR 50.59 or 10 CFR 72.48
- B. Review the quality assurance and/or quality control (QA/QC) program requirements for adequacy and completeness in the following areas:
1. Organizational structure
 2. QC surveillance program
 3. Document control and records management programs
 4. Equipment maintenance and control program
 5. Audits and corrective action program
- C. Determine if the laboratory analytical procedures, sample chain-of-custody procedures, and data management procedures (including QA/QC) are acceptable, and if the results are adequately documented.

- D. Determine if the licensee's survey implementation procedures are consistent with the LTP and FSS plan.
- E. Determine if the field and laboratory instrumentation are adequate and appropriate for scanning, direct measurements, and analysis for the radionuclides of concern (ROCs), the DCGLs, and the DCGL-Elevated Measurement Comparison (DCGL_{EMC}).
- F. Determine if instrument calibration accounts for the ROCs.
- G. Review the adequacy of the ROCs, area classification, survey unit size, estimated mean, and standard deviation for samples, as well as the appropriateness of the background measurements taken for each survey unit or classification area.
- H. Review the methods used to address the impact of multiple ROCs in FSS planning, as well as the methods to address hard-to-detect (HTC) radionuclides.
- I. Review instrument use procedures and/or associated documentation to determine the following:
 - 1. Minimum detectable concentration (MDC) and scan MDC calculations
 - 2. Actual versus required scan sensitivity
 - 3. Calibration, including accounting for multiple radionuclides and any environmental factors that may influence instrument performance, such as temperature limitations or moisture concerns
- J. Review project documentation for completeness, accuracy, and verify that it represents current radiological conditions relative to the DCGLs.

3.0. NRC IN-PROCESS AND CONFIRMATORY SURVEYS

- A. The headquarters PM and inspector should determine if in-process or confirmatory surveys are to be performed, and to what extent. Extensive in-process or confirmatory surveys should be considered if any of the following exist:
 - 1. Significant, unresolved weaknesses identified during the inspection of the licensee's final status survey program
 - 2. Repetitive radiation protection violations
 - 3. Partial site release of impacted areas
 - 4. Records of spills or unusual occurrences involving the spread of contamination during decommissioning activities at the site
 - 5. A history of releases with higher levels of radioactivity, such as hot particles

NOTE: Additional considerations for conducting a more detailed technical review for a survey unit can be found in NUREG-1757, Volume 2, Section 4.5.3.2.

- B. If an in-process or confirmatory survey is to be performed, determine if an NRC contractor should be used. Meeting any of the criteria listed below will, in general, justify the use of an NRC contractor:

1. Licensee's FSS involves unique or complex technical issues
 2. Confirmatory survey activity is expected to require more than a person-week of effort to complete field surveys and sampling
 3. Confirmatory survey is a very high priority project that cannot be completed by NRC staff in a timely manner
- C. Evaluate each anomaly identified during in-process or confirmatory surveys for compliance with the LTP Survey Plan requirements, the DCGL, and the DCGL_{EMC}. For each anomaly, determine the following:
1. Is it acceptable relative to size and concentration
 2. Has the licensee adequately addressed it
 3. Is it within the bounds of the survey unit classification
- D. Select survey units / areas for confirmation of the following:
1. Determine adequate scan coverage based on classification
 2. Review the analytical procedures for appropriateness for measuring the ROCs, the DCGL, and the DCGL_{EMC}
 3. Cross-check FSS data packages against the FSS plan requirements
- E. For soil sampling, determine sampling depth requirements and sampling intervals. At a minimum, samples should be collected from anomalous or other judgmental areas, together with selected licensee-archived samples, for confirmatory analysis. The necessity for, and the specific numbers of, other random / systematic samples should be separately evaluated, using the Data Quality Objectives (DQO) process.
- F. For structure surfaces, perform direct measurement surveys or sampling to determine contamination-at-depth in cracks, crevices, and floor wall interfaces.

END

ATTACHMENT 1
Revision History for IP 83801

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment / Feedback Resolution Accession Number (Pre-Decisional, Non-Public)
N/A	08/11/97	<u>IP 83801</u> (Inspection of Final Surveys at Permanently Shutdown Reactors) has been revised to be consistent with the dose based criteria used in the license termination rule and MARSSIM guidance. The previous guidance was NUREG-5849, which was based on concentration limits. Therefore, in order to comply with 10 CFR 20 Subpart E, the licensee needs to do a dose analysis and follow MARSSIM guidance; the procedure has been updated to reflect the appropriate changes.	None Required	None
N/A	01/28/02	Incorporated updated MARSSIM guidance.	None Required	None
N/A	09/05/06 CN 06-020	Major revision incorporating lessons learned from the decommissioning of Maine Yankee and T. ...	None Required	ML061090058
N/A	ML15202A331 07/26/16 CN 16-018	The procedure was updated to address content and format changes, and reflect additional lessons learned from ongoing decommissioning activities.	None Required	ML16117A246