4 SITE REMEDIATION PLANS

4.1 Introduction

In accordance with 10CFR50.82 (a)(9)(ii)(C) (Reference 4-1), the LTP must provide the "plans for site remediation." These plans must include the provisions to meet the criteria from Subpart E of 10CFR20 (Reference 4-2) before the site may be released for unrestricted use:

- Annual total effective dose equivalent to the average member of the critical group not to exceed 25 mrem, and
- The dose to the public must be "as low as reasonably achievable," or ALARA.

Decontamination and dismantlement (D&D) activities are being conducted in accordance with the YNPS Radiation Protection, Safety and Waste Management Programs, which are well established and frequently inspected. Changes made to the programs for D&D activities are documented and processed in accordance with existing plant administrative procedures and 10CFR50.59, as appropriate.

This section describes the methodologies and criteria that will be used to perform activities to remove residual radioactivity and to demonstrate compliance with the ALARA criterion, required by 10CFR20. More specific detail regarding remediation activities may be found in Section 3.

4.2 Remediation Actions

Remediation actions may be required to reduce the radioactivity levels below the applicable cleanup criteria as provided in Sections 5 and 6. The specific remedial actions depend on the type of area under consideration. These area types are categorized as one of the following:

- Soils/sediment,
- Structures (including building interiors and exteriors, major freestanding exterior structures, exterior surfaces of plant systems, and paved exterior ground surfaces), and
- Groundwater and surface water.

Potential remediation activities for each category are described below. Specific decommissioning and remediation activities will be performed in accordance with applicable site procedures. Post-remediation surveys will be used to confirm that the remediation target is achieved.

The selection of appropriate instrumentation for post-remediation surveys is important from a planning and financial risk management perspective. In some cases small handheld beta-gamma detectors may be used to determine if remedial actions have been successful; their use depends

upon the radionuclides present in the survey unit, the DCGL for that radionuclide and the MDC of the detector. In other cases, the actual final status survey instrumentation may be used to evaluate remedial actions.

4.2.1 Soils

Soils not meeting the criteria for license termination will be removed and disposed of as radioactive waste. Offsite fill may be used to replace the excavated materials. As discussed previously in Section 2, the site characterization process establishes the location, depth and extent of soil contamination. As needed, additional investigations will be performed to ensure that any soil contamination profiles that may change during the remediation actions are adequately identified and characterized. In cases where offsite fill is used to replace the excavated materials, a radiation survey of the material will be conducted. This will be done as a documented survey to ensure that the background radiation levels (from the presence of naturally occurring radioactive material) from this fill material is not significantly higher than that from the onsite material. Based upon the results of this survey, either background radiation levels will be accounted for in subsequent final status surveys or the material will be rejected for use.

4.2.2 Structures

As discussed in Section 3, only a small portion of site structures will remain at the time of license termination. Generally speaking, the remaining structures will be building slabs and basements, although some non-RCA structures will remain. Remaining concrete from contaminated structures will be remediated to a level meeting the radiological criteria for unrestricted release of the site, as discussed in Section 6. Methods for remediating structures may include a variety of techniques, and a number of factors determine the choice of the remediation method for a given area. These include: the size of the contaminated area, the extent of contamination, surface material, depth of contamination, and accessibility.

Remediation activities for an area may include wiping, vacuuming, and washing with low- or high-pressure applications. Surfaces may also be remediated using surface removal techniques such as scabbling or grinding. Use of surface removal techniques controls the removal depth, minimizing the waste volume produced.

For concrete surfaces, remediation methods may include core drilling, concrete sawing, or scabbling. Scabbling removes the concrete surface using roto-peen devices, flappers, or similar devices and is effective for removing contamination that resides close to the surface. Abrasive blasting may also be used as an effective technique for contamination removal from surfaces that are not necessarily smooth. Also, chipping, jack-hammering, and other similar aggressive methods may be needed for removal of concrete surfaces as deep as the first mat of reinforcing steel. Contamination control barriers will be used as appropriate during activities, such as these, that may result in airborne contamination. Strippable coatings can be used to remove contaminants from surfaces where more aggressive methods may not be appropriate or when other techniques are not successful.

4.2.3 Surface Water and Groundwater

Characterization data available to date indicated that no remediation of surface or ground waters will be required at YNPS to meet the site release criteria.

4.3 ALARA Evaluations

When dismantlement and decontamination actions are completed, residual radioactivity may remain on building surfaces and on site soils. Residual radioactivity must satisfy the provisions of 10CFR20, Subpart E. As depicted on Figure 4-1, the ALARA cleanup levels for the YNPS decommissioning may be established at one of two levels:

(1) a pre-defined generic ALARA screening, or
(2) a survey unit-specific ALARA evaluation.

In either case, the ALARA evaluation uses an action level. This action level corresponds to a residual radioactivity concentration at which the averted collective radiation dose converted into dollars is equal to the costs of clean-up (e.g., risk of transportation accidents converted into dollars, worker and public doses associated with the action converted into dollars, and the actual costs to perform the activity).

If the dollar-value of further dose reduction from additional clean-up is greater than the "costs" of the action, then the action being evaluated is cost-effective and should be performed. Conversely, if the dollar-value of dose reduction associated with further clean-up is less than the costs of that action, the current level of residual radioactivity is already considered to be ALARA, and further action would not be required. The methodology and equations used for calculating remediation levels are consistent with those provided in Appendix N of NUREG-1757, Volume 2. (Reference 4-3). These are provided in Appendix 4.A of the LTP. Documentation of ALARA evaluations will be included in the final status survey report for each survey area.

4.3.1 Generic ALARA Screening Levels

As discussed in Appendix N to NUREG-1757, Volume 2, clean-up of soils beyond the DCGLs is not likely to be cost-beneficial due to the high costs of waste disposal. A generic ALARA evaluation for soils will be developed to determine if this is the case for YNPS. If clean-up of soils beyond the DCGL is determined not to be cost-beneficial, soils meeting the site-specific DCGLs, determined in Section 6, will be considered to be at levels that are "as low as reasonably achievable."

For structures, a generic ALARA screening level will be calculated using conservative estimates for building clean-up costs. This generic ALARA screening level will be calculated using the guidance of Appendix N to NUREG-1757, Volume 2, and documented. This value will represent the level, expressed as a percentage or fraction of the DCGL, for which the benefit of further clean-up of structures is greater than the associated costs.

As discussed in Section 3, some structural elements and embedded or buried piping and conduit are to remain that will be surveyed to ensure that no detectable radioactivity is present. Per NUREG-1757, Volume 2, Appendix N, material may be left onsite without performing an ALARA evaluation, if it contains no residual radioactivity distinguishable from background. Accordingly, no ALARA analysis will be applied to structures or equipment which has been surveyed to ensure that no detectable radioactivity is present and are below this threshold. Upon completion of post-remediation surveys and satisfaction of the 25 mrem/yr TEDE criteria, the level of residual radioactivity in the survey area will be compared against the appropriate generic ALARA screening level (soil or building surface). Where the level of residual radioactivity is lower than the generic ALARA screening level, the residual radioactivity is clearly ALARA, no further action is required, and final status surveys can proceed. Where the level of residual radioactivity is greater than the generic ALARA screening level, a survey-unit ALARA evaluation may be performed to determine the unit-specific ALARA action level, or additional clean-up can be performed.

4.3.2 Survey Unit-Specific ALARA Evaluations

In cases where levels of residual radioactivity are above the generic ALARA screening levels described above, YAEC may adopt the option to perform survey unit-specific ALARA evaluations using approved site procedures. These survey unit-specific ALARA evaluations will be performed using survey unit-specific data from post-remediation surveys in accordance with Appendix N to NUREG-1757, Volume 2, and will take into account:

- Radiation doses and environmental impacts for the decommissioning process and from the residual radioactivity remaining onsite following the decommissioning, and

- Other costs and risks associated with the decontamination and decommissioning of the site.

Once the total cost, $Cost_T$, for a survey-unit specific clean-up activity has been calculated, a remediation level, expressed as a fraction of a DCGL, can be determined and the ALARA evaluation can be performed using the process described in NUREG-1757, Volume 2.

The action levels represent the radioactivity concentrations at which a clean-up action is cost beneficial but do not represent the post-cleanup "not-to-exceed" concentrations. The ALARA criterion is met by performing the action and not necessarily by achieving results below the specified action level. An ALARA analysis ensures that the efforts to remove residual contamination are commensurate with the risk that exists with leaving the residual contamination in place, even if the target remediation levels are not achieved. However, the residual contamination must be low enough to assure the annual dose to the average member of the critical group does not exceed 25 mrem/yr TEDE.

4.4 References

4-1 Title 10 to the Code of Federal Regulations, Part 50.82. "Termination of licenses."

4-2 Title 10 to the Code of Federal Regulations, Subpart E to Part 20, "Radiological Criteria for License Termination."

4-3 NUREG-1757, Vol. 2 "Consolidated NMSS Decommissioning Guidance," dated September 2003.

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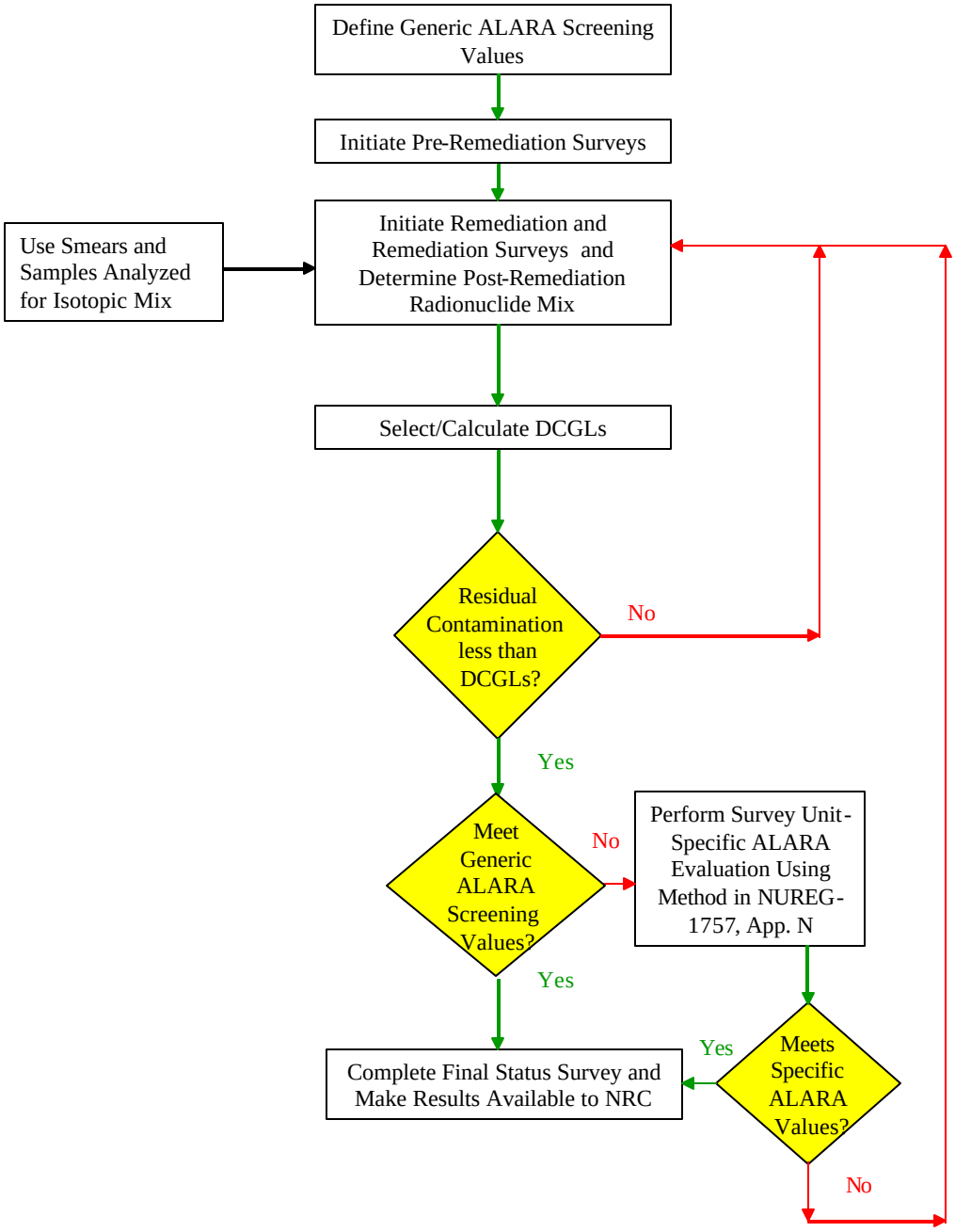
Figure 4-1
Survey Unit ALARA Evaluation Process



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