

OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
ENVIRONMENTAL ASSESSMENT  
RELATED TO THE APPROVAL OF THE MALLINCKRODT C-T PROJECT  
DECOMMISSIONING PLAN, PART 1 FOR  
MALLINCKRODT CHEMICAL, INC.  
ST. LOUIS, MISSOURI  
LICENSE NO. STB-401 DOCKET NO. 40-6563

1. INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) is considering approval of the Mallinckrodt C-T Project Decommissioning Plan (DP), Part 1, originally submitted to NRC on November 20, 1997, and revised on January 10, 2002, February 13, 2002, and March 8, 2002. In the DP, Mallinckrodt Chemical Inc., (Mallinckrodt), is proposing to remediate the above-grade portion of buildings, and equipment. Mallinckrodt is proposing (1) to release columbium-tantalum (C-T) project process equipment in accordance with NRC's "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," (2) to release buildings in accordance with 10 CFR 20, Subpart E; and (3) to release building waste material which meets the requirements of NRC Policy and Guidance Directive FC 83-23, "Termination of Byproduct, Source, and Special Nuclear Material Licenses," November 1983, in accordance with license condition 16, or future NRC regulations on clearance of materials, or under the provisions of 10 CFR 20.2002. To demonstrate compliance with these documents, Mallinckrodt has derived beta release criteria based solely on measured beta emission.

Mallinckrodt has been operating at the St. Louis Plant since 1867 producing various products including metallic oxides and salts, ammonia, and organic chemicals. From 1942 to 1957, Mallinckrodt was under contract with the Manhattan Engineering District and the Atomic Energy Commission (MED-AEC) to process uranium ore to produce uranium for development of atomic weapons. From 1961 to 1985, Mallinckrodt extracted C-T from natural ores and tin slags.

Radiological contamination at the site resulted from MED-AEC and C-T processing activities. MED-AEC contamination is being removed by the U.S. Army Corps of Engineers (USACE) under the Formerly Utilized Sites Remedial Action Program (FUSRAP). USACE developed a preferred cleanup approach for the MED-AEC contamination, based on the data and findings presented in four documents: (1) Remedial Investigation Report; (2) Baseline Risk Assessment; (3) Initial Screening of Alternatives; and (4) Feasibility Study.

## 2. PURPOSE AND NEED FOR THE PROPOSED ACTION

Mallinckrodt has requested that NRC terminate License No. STB-401. Before the license can be terminated, NRC must be assured that the areas of the Mallinckrodt facility associated with the C-T project meet NRC's release criteria.

Mallinckrodt is planning to conduct the C-T decommissioning project in two phases. In Phase 1, Mallinckrodt will decommission buildings and equipment used during C-T production. C-T project buildings and equipment remaining on-site will be cleaned and released for unrestricted use. In Phase 2, Mallinckrodt will remediate building slabs and foundations, paved surfaces, and all subsurface materials. This environmental assessment (EA) addresses only Phase 1 of decommissioning.

Mallinckrodt has proposed a two phase decommissioning approach. The two phase approach is needed because:

- The facility is an operating facility with limited areas for staging decommissioning activities. Removal of buildings and equipment in Phase 1 will provide staging areas necessary for Phase 2 decommissioning.
- On-site workers have access to buildings containing residual contamination. Removal of buildings and equipment in Phase 1 reduces the potential that workers will be exposed to residual radioactive material. Further, some of the C-T process buildings have not been used for several years, and the buildings are starting to physically deteriorate.

## 3. PROPOSED ACTION

The ultimate goal of the C-T project decommissioning is to remediate those areas of the site associated with C-T production, to the extent necessary, to terminate License STB-401. Mallinckrodt is proposing to decommission the C-T Project areas of the site in two phases. In Phase I, Mallinckrodt will decommission the buildings and equipment to the extent necessary to meet NRC's unrestricted release criteria as presented in 10 CFR part 20, Subpart E. Phase 1 remediation is expected to take approximately two years. Phase II will include the remediation of the building slabs and foundations, paved surfaces, and all subsurface materials. Mallinckrodt will submit the DP for Phase II to the NRC for review and approval in 2003.

### 3.1 Site History

Mallinckrodt has been operating at the St. Louis Plant since 1867 producing various products including metallic oxides and salts, ammonia, and organic chemicals. From 1942 to 1957, Mallinckrodt was under contract with the MED-AEC to process uranium ore to produce uranium for development of atomic weapons. The St. Louis Plant, comprised of over 50 buildings on approximately 43 acres, is subdivided into smaller areas, called plants, based on the similarity of operations being performed.

In 1961, Mallinckrodt was issued License No. STB-401 to extract C-T from natural ores and tin slags. From 1961 to 1985, Mallinckrodt purchased and processed materials for C-T production. The ores and processing byproduct materials contained uranium and thorium isotopes.

C-T processing was shut down from 1985 through early 1987, when Mallinckrodt began a two month pilot production run. During the pilot production run, approximately 20,000 pounds of tin slag were processed. In July 1993, NRC amended Mallinckrodt's license to a possession only license for decommissioning and license termination. Approximately 6 Ci of natural uranium and 19 Ci of natural thorium isotopes were contained in the ores and tin slags processed under License STB-401. C-T processing and support occurred in 21 buildings, mainly within Plant 5, but also within Plants 1, 3, 6, 7 and 8.

### 3.2 Site description

The facility is located adjacent to the west bank of the Mississippi River. The area surrounding the site is completely developed, and includes a mixture of commercial, industrial and residential uses. The St. Louis plant is located within Census Tract 1267. The residential population within this tract was 2,867 in 1990, and the total residential population within one mile of the plant was approximately 10,000. Section 1 of the DP provides maps showing the site location, plant site, and C-T production and process areas.

The Mississippi, Missouri, and Meramec rivers are the main surface water bodies near the facility. Storm runoff from the St. Louis plant flows via the sewer system to the Metropolitan Sewer District. The City of St. Louis municipal water intakes are located up stream from the St. Louis Plant. The Mississippi River is subject to flooding. A levee constructed in 1964 on City of St. Louis property protects the plant from flood waters.

The St. Louis plant is underlain by two unconsolidated soil units and one bedrock unit. The upper soil unit consists of fill material and is between 12 and 30 feet thick. This unit contains a perched groundwater unit at depths of three to nine feet below the surface. The lower soil unit is composed of silt and clay above sandy alluvium, and ranges between 0 and 60 feet thick. Groundwater in the sandy alluvium is saline and very hard, and flows to the east towards the Mississippi River. The bedrock unit is limestone. Groundwater in the bedrock is saline and non-potable. Groundwater beneath the St. Louis Plant and surrounding area is not used for drinking water, and there are no drinking water wells located near the plant.

The climate in the St. Louis area is warm and moist in the summer and cold and dry in the winter. The annual average high and low temperatures are 88 degrees Fahrenheit and 23 degree Fahrenheit, respectively. The average annual precipitation is 36 inches.

### 3.3 Decommissioning Criteria

Mallinckrodt is proposing; (1) to release C-T process equipment in accordance with NRC's "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," (2) to release buildings remaining on site in accordance with 10 CFR 20, Subpart E; and (3) to release building waste material which meets the requirements of NRC Policy and Guidance Directive FC 83-23, "Termination of Byproduct, Source, and Special Nuclear Material Licenses," November 1983, in accordance with license condition 16, or future NRC regulations on clearance of materials, or under the provisions of 10 CFR 20.2002. To demonstrate compliance with these documents, Mallinckrodt has derived beta release criteria based solely

on measured beta emission. Section 2.2 of the DP provides the release criteria for equipment and materials.

Mallinckrodt's rationale for developing release criteria based on beta emission is: (1) direct measurement of alpha particles can be unreliable if the contaminated surface is painted, (2) direct measurement of gamma concentration on equipment and building surfaces will not be representative due to significant gamma contributions from subsurface areas, and (3) the minimum detectable activity for beta will be lower than for combined beta-gamma since background is about one-third of the combined beta-gamma background.

### 3.4 Site Characterization

Several site characterization studies have been conducted at the Mallinckrodt facility to quantify the physical and chemical characteristics of the C-T process areas. The primary isotopes of concern are U-238, U234, Th-230, Ra-226, Th-232, Th-228, Ra-228 and K-40.

Mallinckrodt completed Phase 1 characterization in 1996. Characterization included direct beta measurements for fixed contamination, and alpha measurements of surface wipe samples for removable contamination. An evaluation of the site characterization program and radiological status of each C-T process and support building is provided in Appendix A of the DP. Most of the contamination from the C-T project is located within Plant 5. However, some structures and areas outside Plant 5 were also involved in C-T processing and support. Based on the site characterization data, the C-T process buildings and equipment have been divided into survey units, with each wall, roof, floor, and equipment item making up one survey unit. The areas to be remediated are identified in Section 3.5 below.

### 3.5 Areas to be Remediated

C-T process and support areas to be remediated are as follows:

#### Process and Support Area

##### Plant 3

Building 62 (change rooms/lockers)

##### Plant 5

Building 200 (organic/inorganic manufacturing process area)  
Building 204 (inorganic chemical manufacturing)  
Building 213 (Change and Break Rooms)  
Building 214 (Transformer/Switchgear Room)  
Building 222 (warehouse)  
Building 223 (warehouse)  
Building 235 (feed material/ URO storage (east half))  
Building 236 (maintenance area/product drying)  
Building 238 (C-T ore grinding/dissolving/T processing)  
Building 240 (offices)  
Building 245 (not used for C-T)  
Building 246A (offices)

Building 246B (solvent extraction process)  
Building 247A (C-T solvent extraction/product storage)  
Building 247B (Columbium filtration and drying)  
Building 248 (Columbium filtration/drying/calcining)  
Building 250 (offices and quality control laboratories)

#### Plant 6

Building 101 roof  
Building 101 (incinerator pad)

#### Plant 8

Building 90/91 (maintenance areas)

Plants 1, 6, and 7 contain some support areas used during C-T processing. However, since these areas also contain widespread contamination from MED-AEC operations, remediation will be conducted under FUSRAP.

Based on site characterization data, Mallinckrodt estimates that the total volume of radioactive waste to be generated during Phase 1 decommissioning is approximately 126,000 cubic feet (ft<sup>3</sup>). Waste volume breakdown is as follows:

Equipment	38,280 ft <sup>3</sup>
Building materials	87,600 ft <sup>3</sup>

The generated waste is expected to have an average concentration of natural uranium and natural thorium significantly less than 0.05 weight percent.

### 3.6 Approach to Decommissioning

Mallinckrodt states that its preferred approach for decommissioning is to dismantle/demolish and dispose of radioactively contaminated buildings and equipment. The general approach to decommissioning proposed by Mallinckrodt consists of:

- removing equipment and services, and demolishing Buildings 213, 214, 238, 246, 247 and 248
- roof sampling, and decontaminating roof and exterior surfaces of Buildings 101, 200, 204, 222, 223, 235, 236, 240, 245, and 250, if necessary
- decontaminating and surveying selected interior areas of Building 250
- surveying Building 62
- surveying Buildings 90 and 91
- removing incinerator from pad near Building 101
- crushing concrete slabs from elevated floors, block and brick in preparation for sampling and disposal
- packaging and shipping waste to an NRC authorized licensed facility or disposal at an appropriate waste disposal facility
- removing or fixing any contamination on remaining concrete ground floor slabs. Ground floor slabs will be removed during Phase II decommissioning.

Mallinckrodt's DP states that C-T process equipment will be removed using standard equipment. High efficiency, or HEPA, filters will be used during demolition of interior walls. Localized surface contamination on building surfaces will be removed by scrubbing or abrasive cleaning. If dry abrasive cleaning is used, containment zones will be established and air will be exhausted through HEPA filters.

Roofs on the buildings to be demolished on-site contain limited amounts of asbestos material. Mallinckrodt has committed to perform asbestos abatement work in conformance with U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Act (OSHA), and State of Missouri regulations. Demolition of C-T process buildings will be done in sections, starting with the brick and block sections between the structural steel, then the roof and structural steel. Surface contamination remaining on the concrete floor slabs after building demolition will either be removed or fixed in place. Process building ground floor slabs will be removed during Phase 2. Airborne dust will be controlled during demolition by air filtration and construction of temporary enclosures, as needed. Building material will be crushed using standard bulk materials handling equipment.

### 3.7 Final Survey Plan

Mallinckrodt has committed to conducting a final status survey consistent with the approach presented in the draft Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), to the extent possible. The residual radioactive material release criteria or derived concentration guideline limit (DCGL) have been derived for building surfaces. The equipment release criteria is based on the limits found in NRC's "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material." Building release criteria were derived from NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning", June 1994, assuming a dose limit of 25 mrem to a worker. The release criteria for building waste material is found in NRC Policy and Guidance Directive FC 83-23.

The final status survey will consist of surface scanning, stationary dose measurements, and material sample analysis. Mallinckrodt has committed to using instruments appropriate to the type of survey and the concentration of radioactivity to be measured. Table 4.1 of the DP lists the instrumentation that will be used for final status survey activities.

### 3.8 Radiation Control Plan

Mallinckrodt has committed to perform decommissioning activities in accordance with a Health and Safety Program, which will include (1) an Industrial Safety Program, (2) a Radiation Protection Program, and (3) an Environmental Safety Program. Although a detailed Health and Safety Program has not yet been developed, the DP provides the minimum requirements for each element of the program. Implementation of the Health and Safety Program will be evaluated during NRC site inspections.

The Radiation Protection Program will include procedures to protect workers and the public from ionizing radiation and keep exposures to radiation "as low as reasonably achievable"

(ALARA ). Mallinckrodt has stated that the remediation contractor will be required to implement a Radiation Safety Program which incorporates the following elements from Section 3.3 of the DP:

- health and safety protection measures and policies
- instrumentation, calibration and equipment
- use of air samplers, monitoring policy methods, frequency and procedures
- contamination control and personnel decontamination
- external exposure control
- airborne releases and monitoring
- Radiation Safety Work Permits
- engineering controls
- transportation
- accident response
- posting and labeling
- records and reports, and
- potential sources of contamination exposure
- ALARA

The DP states that Mallinckrodt will be responsible for overall project direction and ensuring that NRC requirements are met. The remediation contractors, Burns & McDonnell Engineering Company, Inc., and Nextep Environmental Inc., will be responsible for implementation of the radiological, occupational, environmental safety and quality assurance programs. The contractor will also be responsible for providing trained personnel to conduct decommissioning activities. The DP describes an acceptable organizational structure and presents minimum qualifications for safety related personnel.

### 3.9 ALARA Plan

Mallinckrodt will keep radiation exposures to workers, the public, and the environment ALARA mainly through the use of safety work permits. The remediation contractor is responsible for implementing the Radiation Protection Program. Under the Radiation Protection Program, the contractor is required to consider how exposures will be kept ALARA in the preparation of safety work permits. In addition, all individuals will be trained in the concepts of ALARA before being allowed to work in controlled areas.

The Radiation Protection Program requires that workers be adequately trained. All unescorted individuals involved in C-T Project decommissioning activities will be required to receive Industrial Safety Training and Radiation Safety Training. All individuals will receive Radiation Safety Training before entering a controlled area to perform work. Workers safety performance will be reviewed annually, and workers will receive refresher training every two years.

Mallinckrodt will also implement an Environmental Safety Program to monitor air and water effluents discharged during decommissioning. Mallinckrodt will routinely collect samples or take measurements at locations on-site, site boundaries, and off-site, to determine the extent of environmental discharges during remediation. NRC staff will evaluate implementation of the Environmental Safety Program during routine inspections to ensure that Mallinckrodt is adequately monitoring effluent releases.

Mallinckrodt does not expect effluent air releases because no point discharge of ventilation air is planned. However, air samples will be collected if a point discharge of process exhaust ventilation is employed. Environmental sampling stations will collect continuous samples during demolition and decontamination activities to verify that there are no significant adverse impacts to workers or the public.

Mallinckrodt has committed to minimize the production of contaminated liquids. There are expected to be three sources of contaminated liquids: sink and shower water; decontamination fluids; and water used for dust suppression. Sink and shower water is expected to contain insignificant amounts of radioactivity and will be discharged into the sewer in accordance with 10 CFR Part 20.2003. Aqueous waste from decontamination fluids and dust suppression containing potentially significant concentrations of radionuclides will be filtered to remove the solids, sampled and analyzed to estimate the concentration in the sewerage. The concentration will be compared with 10 CFR Part 20 concentration limits and the total inventory discharged will be calculated. All contaminated liquids will be disposed to the Metropolitan St. Louis Sewer District (MSD) following confirmation that MSD specifications for sampling, analysis, and pre-treatment have been met.

Mallinckrodt has also committed to monitor direct radiation using thermoluminescent dosimeters (TLDs). TLDs will be placed at various locations around the perimeter of the restricted area to ensure that direct radiation in unrestricted areas does not exceed the limits specified in 10 CFR 20.1301.

#### 4. ALTERNATIVES TO THE PROPOSED ACTION

The remediation approach proposed by Mallinckrodt provides for the systematic remediation of the C-T process areas at the St. Louis Plant. This approach provides Mallinckrodt the opportunity to remove C-T process building material and equipment from the site, and release usable buildings and equipment for unrestricted use. Removal of C-T process buildings from the site will provide Mallinckrodt necessary staging areas for Phase 2 remediation activities. There are two alternatives to the proposed action: (1) no action, and (2) prepare a single DP and conduct all C-T process decommissioning activities in accordance with it.

The no action alternative is not acceptable because the C-T process buildings, equipment and surrounding areas contain residual contamination exceeding NRC's release criteria. Although the second alternative would be an acceptable decommissioning approach, this alternative does not provide Mallinckrodt the advantages discussed above.

#### 5. AFFECTED ENVIRONMENT

As stated in the Introduction, MED-AEC contamination at Mallinckrodt facility is being removed by USACE under FUSRAP. USACE developed a preferred cleanup approach for the MED-AEC contamination, based on the data and findings presented in four documents: (1) Remedial Investigation Report; (2) Baseline Risk Assessment; (3) Initial Screening of Alternatives; and (4) Feasibility Study.

Section 2.2 of the Feasibility Study provides an evaluation of the affected environment surrounding the Mallinckrodt facility. The findings in Section 2.2 of the Feasibility Study also

apply to remediation of the C-T process areas. The following issues are addressed: (1) Land use and recreational and Aesthetic resources; (2) Climatology, meteorology, and air quality; (3) Geology and soils; (4) Water resources; (5) Biological resources; (6) Threatened and endangered species; (7) Wetlands and floodplains; (8) Population and socioeconomics; and (9) Historical, archeological, and cultural resources.

## 6. ENVIRONMENTAL IMPACTS

### 6.1 Radiological Impacts

Remediation of the C-T process buildings and equipment creates a potential for radiological environmental impacts. Radiological environmental impacts that could result from remediation activities include exposure, inhalation, and ingestion hazards to workers and the public. These hazards could occur during the decontamination and demolition of buildings.

Mallinckrodt has committed to perform work activities in accordance with a Health and Safety Program as described in Section 3 of the DP. The Health and Safety Program will consist of: (1) an Industrial Safety Program; (2) a Radiation Protection Program; and (3) an Environmental Safety Program. The Radiation Protection Program will contain controls to monitor exposures to workers. Action levels have been established based on 10 CFR 20, Appendix B. If action levels are exceeded, Mallinckrodt will take corrective action, as necessary. The Radiation Protection Program will keep exposures due to ingestion and inhalation ALARA by controlling and monitoring airborne releases in work areas, and by utilizing respiratory protection, as necessary.

Mallinckrodt will implement an Environmental Safety Program to monitor air and water effluents discharged during decommissioning. Mallinckrodt is proposing to collect air and water samples on-site and off-site routinely to determine the extent of environmental discharges. Mallinckrodt does not anticipate the need for effluent air monitoring since there will likely be no point sources of effluent air. However, if Mallinckrodt uses a decommissioning process exhaust ventilation system, the effluent air will be sampled and analyzed. Mallinckrodt will provide environmental monitoring stations to verify that there are no significant adverse impacts to the workers or the environment.

Mallinckrodt has committed to minimize the production of contaminated liquids. There are three potential sources of contaminated liquids: sink and shower water; decontamination fluids; and water used for dust suppression. Sink and shower water is expected to contain insignificant amounts of radioactivity and will be discharged into the sewer in accordance with 10 CFR Part 20.2003. Aqueous waste from decontamination fluids and dust suppression containing potentially significant concentrations of radionuclides will be filtered to remove the solids, sampled and analyzed to estimate the concentration in the sewerage. The concentration will be compared with 10 CFR Part 20 concentration limits and the total inventory discharged will be calculated. All contaminated liquids will be disposed to the Metropolitan St. Louis Sewer District (MSD) following confirmation that MSD specifications for sampling, analysis, and pre-treatment have been met.

Mallinckrodt has also committed to monitor direct radiation using TLDs. TLDs will be placed at various locations around the perimeter of the restricted area to ensure that direct radiation in unrestricted areas does not exceed the limits specified in 10 CFR 20.1301.

Mallinckrodt has established action levels for air and water effluents based on the levels provided in 10 CFR 20, Appendix B, Tables 2 and 3. The action levels for environmental air, effluent water and sewage are 0.75, 0.6, and 0.6 of the limits, respectively. If action levels are exceeded, Mallinckrodt will take corrective actions.

Mallinckrodt has performed dose assessments to determine an occupational exposure estimate, and the dose associated with credible accident scenarios. The occupational exposure estimate for a representative worker during Phase 1 decommissioning is 43.4 mrem. The dose estimate to a maximum exposed worker as a consequence of the worst case hypothetical accident is less than 0.1 percent of the annual limit of uptake (ALI) of 10 CFR Part 20.

## 6.2 Nonradiological Impacts

The St. Louis Plant is located in an area which is completely developed with no pre-settlement vegetation existing. Land use within a one mile radius from the site is a mixture of commercial, industrial, and residential. Commercial or industrial properties in the area include McKinley Iron Company, Thomas and Proetz Lumber company, and several railroad properties. The USACE Feasibility Study states that there was no sign of federal or state designated endangered or threatened species present at the Mallinckrodt facility. The Feasibility Study also states that the Mallinckrodt facility does not contain any historic buildings. Further, available data indicate that there are no archeological sites in the area.

The residential population within one mile of the site is approximately 10,000, with most of the residences located on the opposite side of Interstate 70. Mallinckrodt estimates that approximately 14 workers will be required to Phase 1 decommissioning activities. Due to the small number of workers required for decommissioning, and the short duration of the project, this effort should have minimal socioeconomic impact on the local community.

NRC staff performed an environmental justice review of the Mallinckrodt site. The review concluded that since Phase 1 decommissioning activities result in an insignificant risk to the public health and safety, and the human environment, that there are no environmental justice issues with this site.

Air quality and noise impacts will result from demolition of buildings, and transport of waste. Mallinckrodt will use appropriate dust control measures during building demolition. Asbestos abatement work will be performed in accordance with EPA, OSHA, State, and City regulations. These activities will be sporadic in nature and short in duration; and, therefore, will have minimal impact on the surrounding community and environment.

The St. Louis Plant can be serviced by road, rail, and river barge. Interstate 70 (east and west) can be accessed within one mile from the St. Louis Plant. Rail lines from the Chicago, Burlington, and Quincy Railroad, the Norfolk and Western Railroad, and the St. Louis Terminal Railroad Association, transect the St. Louis Plant from north to south. Waste will be shipped from the site by rail. Mallinckrodt estimates that the total volume of waste to be shipped from

the site will be approximately 126,000 ft<sup>3</sup>. This volume of waste will require less than 100 rail cars spread over a one year time period. Therefore, the impact of transporting waste from the site should be insignificant.

## 7. AGENCIES AND PERSONS CONSULTED AND SOURCES USED

Much of the information contained in this EA was taken directly from the Mallinckrodt DP and the USACE Feasibility Study. In preparation of the Feasibility Study, USACE consulted with the U.S. Fish and Wildlife Service and the State Historic Preservation Office. Since Phase 1 decommissioning activities will be occurring at the same site as USACE decommissioning activities, with a much more limited scope, NRC has utilized the input of the U.S. Fish and Wildlife Service and the State Historic Preservation Office by reference of the Feasibility Study. NRC staff provided a draft of this EA to the State of Missouri for review, and the States concerns were addressed in the final EA.

## 8. CONCLUSION

Radiological exposures to workers and the public will be in accordance with 10 CFR Part 20 limits. NRC believes the DP contains sufficient controls to keep potential doses to workers and the public from direct exposure, airborne material, and released effluents, ALARA. The staff also believes that the remediation alternative proposed by Mallinckrodt minimizes the potential dose to workers and members of the public, and other environmental impacts.

## 9. LIST OF PREPARERS

This EA was prepared by John Buckley, Project Manager, Division of Waste Management (DWM), and Anna Bradford, Environmental Engineer, DWM, and Phyllis Sobel, Project Manger, DWM. No other sources were used beyond those referenced.

## 10. FINDING OF NO SIGNIFICANT IMPACT

Pursuant to 10 CFR Part 51, NRC has prepared this EA related to the approval of Mallinckrodt's DP. On the basis of this EA, NRC has concluded that this Federal action would not have any significant affect on the quality of the human environment and does not warrant the preparation of an Environmental Impact Statement. Accordingly, it has been determined that a Finding of No Significant Impact is appropriate.

Since the conclusion of this EA is that the remediation of the C-T project areas of Mallinckrodt's St. Louis Plant represents no significant risk to the public health and safety and the human environment, NRC concludes that there are no environmental justice issues related to remediation.

The aforementioned documents related to this proposed action are available for public inspection and copying at NRC's Public Document Room at One White Flint North, 11555 Rockville Pike, Rockville, MD 20852-2738.

11. LIST OF REFERENCES

- 11.1 Mallinckrodt Chemical, Inc., Mallinckrodt C-T Project Decommissioning Plan (DP), Part 1, January 18, 2001.
- 11.2 U.S. Army Corps of Engineers, Proposed Plan for the St. Louis Downtown Site, April 1998.
- 11.3 U.S. Army Corps of Engineers, Feasibility Study for the St. Louis Downtown Site, April 1998.
- 11.4 NRC, Policy and Guidance Directive FC 83-23, "Termination of Byproduct, Source, and Special Nuclear Material Licenses," November 1983.
- 11.5 NRC, 10CFR Part 20, "Radiological Criteria for License Termination: Final Rule," July 1997
- 11.6 NRC, NUREG/CR-5512, "Residual Radioactive Contamination From Decommissioning," October 1992.