



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

June 8, 2000

Mr. Mark Puett  
Manager, Environmental Affairs  
Mallinckrodt Chemical, Inc.  
Mallinckrodt & Second Streets  
P.O. Box 5439  
St. Louis, MO 63147

**SUBJECT: DOSE ANALYSIS FOR DISPOSAL OF UNIMPORTANT QUANTITIES OF SOURCE MATERIAL AT WCS ANDREWS FACILITY**

Dear Mr. Puett:

On February 1, 2000, you notified the U.S. Nuclear Regulatory Commission (NRC) that Mallinckrodt Inc. (Mallinckrodt) planned to transfer C-T Project decommissioning waste to Waste Control Specialists (WCS) in Andrews, TX, in accordance with 10 CFR Part 40.13 "Unimportant Quantities of Source Material." The NRC responded on March 22, 2000, stating that Mallinckrodt should prepare and submit a dose assessment showing that waste transfer will not result in individual doses exceeding 1 mSv/yr (100 mrem/yr), prior to shipping any waste off-site.

On April 17, 2000, you submitted a document entitled, "Analysis of Disposal of Unimportant Quantity of Source Material at WCS Andrews Facility," for NRC review and approval. The staff has reviewed your dose assessment and concludes that the dose consequences to the public from the disposal of unimportant quantities of source material at the WCS facility are well below .25mSv/yr (25 mrem/yr). Therefore, since the individual dose to members of the public will be less than 1 mSv/yr (100 mrem/yr), the staff will not object if Mallinckrodt transfers unimportant quantities of material to the WCS facility.

We note, however, that other requirements, such as those imposed by the Texas Natural Resource Conservation Commission and the Texas Department of Health, may apply to the transfer and disposal of this material. As such, we suggest that you contact the Texas officials on this matter.

Although the staff will not object to the transfer of unimportant quantities of source material to WCS, please remember that you were informed by letter dated January 4, 1999, that Mallinckrodt is not authorized to perform decommissioning activities until NRC approves the Phase 1 decommissioning plan (DP). Approval of the DP is anticipated by July 21, 2000.

*Note:*  
*See Sample Form*  
*for Other Applications*

M. Puett

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If you have any questions, please call John Buckley at (301) 415-6607.

Sincerely,

A handwritten signature in black ink, appearing to read "Larry W. Camper". The signature is fluid and cursive, with a small flourish at the end.

Larry W. Camper, Chief  
Decommissioning Branch  
Division of Waste Management  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 040-06563  
License No. STB-401

cc: A. Rogers, State of Texas  
Mallinckrodt Dist. List

5/1/00

Note to: John Buckley  
From: Richard Codell (867)  
Subject: Re: Mallinckrodt Review, TAC-L51568

### Introduction

I have reviewed the request by Mallinckrodt dated April 17, 2000, to move waste from their site in Saint Louis Missouri to the Waste Control Specialists (WCS) facility in Andrews Texas (License STB-401). I read their report and concur with their conclusions that the dose consequences to the public from disposal of the waste at the WCS site are safely below regulatory limits. The bases for my conclusion are discussed below.

### Dose assessment to workers

I restricted my analyses to doses to the general population following unrestricted release of the site. I did no analyses on dose assessments for the public or workers involved with transportation to the site and burial during active operation of the facility.

I agree with the licensee that the pathways for exposure to the general population are limited at the site. The site will be covered with a 5-meter thick clay layer. Building a house on top of the landfill with any reasonable excavation will not penetrate the clay cap, or exhume waste. Groundwater resources in any shallow water that could be contaminated by releases from the site are practically non-existent because of the thick sequence of red-bed clay beneath the site. Deeper groundwater is at least 900 feet deep, and is not considered potable because of its high dissolved solids. The nearest aquifer with high quality water is more than 10 miles from the site.

The licensee performed a RESRAD analysis for a resident farm scenario which considered a wide range of conservative pathways, including groundwater at the site. Results of this analysis indicated that there would be practically no exposure to the hypothetical residents of the farm for 1000 years. This result is entirely consistent with the expected behavior of the site; 1) The thick clay cap will not be penetrated by a reasonable excavation for a house foundation; 2) Plant roots will not penetrate the clay cap, and 3) there are no likely groundwater resources that would be contaminated within 1000 years. I felt that it was not necessary to redo the RESRAD analysis, and that doses would remain nearly zero. The most likely pathway would be direct exposure of penetrating gamma radiation from the waste, and all other pathways would be negligible.

Aside from the RESRAD analysis, the licensee states that the only plausible pathway for dose would be the inadvertent drilling through the waste material during the placement of a well (even though the water in the nearest aquifer is not considered potable). Only the well-drillers would be exposed, and for a relatively brief period. The well would be drilled with mud or water, and the cuttings and mud circulated to a muck pit. The drillers would be exposed for 8 hours a day for three days, which is the expected time to complete such a well. Following completion of the well, the muck pit would be filled, burying the waste. The muck pit would be 5.2 x 5.2 meters and contain a layer of cuttings from the well 0.41 meters thick, covered with a layer of water.

Exposure to the drillers was calculated conservatively at a point one meter above the muck pit. The licensee prepared calculations including shielding from the water layer, to be conservatively 2.5 millirem for the Condo landfill and 3.1 millirem for the Main landfill.

I was able to check these results using the model for exposure due to burial in the ground from NCRP Report 123, "Screening models for release of radionuclides to atmosphere, surface water and ground". The model for exposure from radioactive material present in the soil made different, but equally plausible assumptions about the waste: 1) Waste is spread uniformly over a 100 square meter area to a depth of 0.15 meters; and 2) there is no shielding from water overlying the waste. The results for the Condo landfill parameters using the conservative screening factors from NCRP 123, adjusted for the 24-hour exposure time to the well-drillers, was 2.3 millirem. This is in good agreement with the licensee's calculations. Either number is safely below the 25 or 100 millirem standards.