

MEMORANDUM TO: John W. N. Hickey, Chief  
Low-Level Waste and Decommissioning  
Projects Branch  
Division of Waste Management  
Office of Nuclear Material Safety  
and Safeguards

June 6, 1997

FROM: Jack D. Parrott, Project Scientist [ORIGINAL SIGNED BY:]  
Low-Level Waste and Decommissioning  
Projects Branch  
Division of Waste Management  
Office of Nuclear Material Safety  
and Safeguards

SUBJECT: DOW CHEMICAL COMPANY'S LICENSE AMENDMENT REQUEST TO APPROVE  
THE RELEASE CRITERIA AND FINAL SURVEY PLAN FOR  
DECOMMISSIONING ITS THORIUM STORAGE SITES IN MIDLAND AND BAY  
CITY, MICHIGAN

By letters dated October 12, 1993, December 6, 1995, March 11, 1996, and March 31, 1997, the Dow Chemical Company (Dow) submitted its plans for the final survey of, and proposed release criteria for, its sites in Midland and Bay City, Michigan, currently undergoing decommissioning, and requested a license amendment to approve those plans.

Based on NRC staff's Safety Evaluation Report (SER) of Dow's proposed final survey plan, it was determined that Dow's proposal can be approved in accordance with NRC regulations. The proposed methods for conducting the final survey are adequately described in the license amendment request and the final survey plan is acceptable to NRC.

Based on NRC staff's Environmental Assessment (EA) of Dow's proposed release criteria, it was determined that Dow's proposal complies with NRC's regulations and guidance, and that authorizing the license amendment would not be a major Federal action significantly affecting the quality of the human environment.

The staff concludes that a license amendment approving Dow's proposed final survey plan and release criteria can be issued without undue risk to workers, the public, or the environment, and that the amendment meets the requirements for approval described in 10 CFR 40.32. The staff also concludes that a Finding of No Significant Impact (FONSI) is justified and appropriate and that an environmental impact statement is not required. Attached are the SER and EA/FONSI.

Docket No. 040-00017  
Attachments: As stated

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

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Docket No. 040-00017

Attachments: As stated

U.S. NUCLEAR REGULATORY COMMISSION  
ENVIRONMENTAL ASSESSMENT,  
FINDING OF NO SIGNIFICANT IMPACT AND,  
OPPORTUNITY FOR A HEARING  
RELATED TO THE APPROVAL OF RELEASE CRITERIA  
FOR DECOMMISSIONING DOW CHEMICAL COMPANY'S  
THORIUM-CONTAMINATED SLAG STORAGE PILES  
IN MIDLAND AND BAY CITY, MICHIGAN  
DOCKET NO. 040-00017

FOREWORD: The U.S. Nuclear Regulatory Commission is considering a license amendment request, submitted by The Dow Chemical Company (Dow). The proposed action is the approval of Dow's final radiation survey plan and unrestricted release criteria for the thorium-contaminated slag storage piles at Dow's Midland and Bay City, Michigan, plant sites. This environmental assessment evaluates Dow's proposed unrestricted release criteria.

SUMMARY AND CONCLUSIONS: Based on staff's evaluation of Dow's unrestricted release criteria, it was determined that the proposed criteria complies with NRC's guidance on criteria for release for unrestricted use, and that authorizing the license amendment would not be a major Federal action significantly affecting the quality of the human environment. The staff concludes that a finding of no significant impact is justified and appropriate and that an environmental impact statement is not required. Since this is a proceeding on an application for a license amendment falling within the scope of the hearing procedures in Subpart L of 10 CFR Part 2, an Opportunity for a Hearing will be offered.

## 1. INTRODUCTION

Dow submitted its proposed release criteria by letter dated March 11, 1996. The proposed action is the approval of the release criteria so that Dow can complete remediation of the storage areas, release them for unrestricted use, and terminate the license. Dow is currently decommissioning the Midland and Bay City, Michigan, sites, by excavating and transporting, by truck, the contaminated material from the Midland facility to the Bay City facility. The thorium-contaminated material from both facilities is then transported by rail for burial at the Envirocare low-level radioactive waste facility in Clive, Utah. NRC issued the license amendment authorizing the current decommissioning activities on July 19, 1996.

## 2. FACILITY DESCRIPTION/OPERATING HISTORY

Dow began using thorium metal and compounds for the production of magnesium-thorium alloys at a Dow-owned site in Bay City, Michigan, in 1956. The waste slag from the alloying process was disposed of on Dow property in Bay City. Magnesium-thorium material returned by Dow customers was received at the Midland site for storage. The buildings at Bay City used for magnesium-thorium alloying have been decommissioned under another license. The remaining materials licensed to Dow are in the two waste storage piles, in Midland and Bay City, that are currently being decommissioned.



### 3. RADIOLOGICAL STATUS OF THE FACILITIES

The 49-m-by-91-m (160-ft-by-300-ft) Midland site, located within the Midland city limits, is fenced off and posted, to prevent inadvertent employee access, and is within a fenced Dow-owned industrial complex controlled by Dow security. The contaminated material, which lies below grade, is currently being excavated and trucked to a railhead at Dow's Bay City site.

The Bay City site is located 1.6 km (1 m) south of Saginaw Bay and 32 km (20 m) east of Midland. This contaminated material is also stored on a fenced Dow-owned area controlled by Dow security. This material is being excavated and, along with the Midland material, is being shipped by rail to the Envirocare facility.

Past monitoring of groundwater at the Bay City site has generally shown that thorium and radium concentrations are at background levels. The potential for groundwater impact at the Midland and Bay City sites will be evaluated during the decommissioning of the sites.

### 4. ALTERNATIVES TO THE PROPOSED ACTION

The staff-identified alternatives for approving Dow's proposed release criteria are: 1) no action; or 2) adherence to the remediation criteria in the "Action Plan to Ensure Timely Cleanup of Site Decommissioning Management Plan Sites" (SDMP Action Plan)(57 FR 13389, April 16, 1992).

### 5. RADIATION PROTECTION PROGRAMS

The occupational direct exposure, inhalation, and ingestion hazards will be kept as low as is reasonably achievable during the decommissioning and within NRC guidelines as discussed in the licensee's submittals and the NRC Safety Evaluation Report for this licensing action. The licensee estimates that the maximum dose to the onsite worker from decommissioning activity would be 2.3 mSv/year (230 mrem/year). The site is within property protected by Dow security so inadvertent intrusion hazards will be minimized. Therefore, no threat to public health and safety is expected from the site during decommissioning.

### 6. ENVIRONMENTAL IMPACTS

#### 6.1 Preferred Alternative

##### 6.1.1 Soil Release Criteria

The radioactive contamination on the Dow sites is a mixture of three thorium isotopes: thorium-232, thorium-228, and thorium-230. By activity the thorium-232 and thorium-228 are in equal concentration and they are both part of the thorium-232 decay chain. Thorium-230 is from the uranium-238 decay chain; therefore its concentration is independent of the thorium-232 or thorium-228 concentration. The licensee has found that, by activity, the

average ratio of thorium-232:thorium-230 in the contaminated material ranges from 1:3 to 1:1.

NRC's soil remediation criteria for thorium and uranium wastes, referenced in the SDMP Action Plan, is from the Branch Technical Position (BTP) entitled "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations" (46 FR 52601, October 23, 1981). In the BTP the option 1 (unrestricted use) remediation criterion for natural thorium (thorium-232 + thorium-228) is 0.37 Bq (10 pCi)/g. The option 1 remediation criterion for natural uranium (uranium-238 + uranium-235 + uranium-234) is also 0.37 Bq (10 pCi)/g. There is no specific remediation criterion in the BTP for thorium-230.

Because of the mixture of thorium isotopes at the Dow sites and the variable isotopic ratios, the licensee has proposed a total thorium remediation criterion for each 10-m-by-10-m (33-ft-by-33-ft) survey grid square that is limited by the dose an individual would receive from the BTP option 1 concentrations of thorium-232 + thorium-228. The dose limit is then applied to the soil concentration and ratio of thorium-232 + thorium-228 to thorium-230 in that grid square.

The licensee made calculations to verify that the potential dose from the residually contaminated soil, at any isotopic ratio, to an onsite resident, would be less than or equal to the potential dose from the option 1 thorium remediation criteria in the BTP. The licensee determined that a concentration of purely thorium-230 at 0.78 Bq (21 pCi)/g would give a dose equivalent to 0.37 Bq (10 pCi)/g of thorium-232 + thorium-228. Therefore, the guideline concentration for thorium-230 is 21 pCi/g and for thorium-232 + thorium-228 it is 0.37 Bq (10 pCi)/g.

The licensee has proposed a fractional contribution approach (NUREG/CR-5849, Appendix A) (Ref. 1) to determine an activity guideline for any potential mixture of thorium isotopes at this site. This approach uses the sum of the ratios equation to determine the site-specific guidelines for each isotope:

Equation. The sum of the ratios equation specific for Dow's sites.

$$1 \geq \frac{1}{C_{Th-230}/21 + (C_{Th-232} + C_{Th-228})/10}$$

Where:  $C_{Th-2xx}$  = Concentration of specific thorium isotope in pCi/g in any given grid square.

Using the sum of the ratios approach a hypothetical range of limiting thorium isotope and total thorium concentrations for a range of thorium isotopic ratios that could be allowed on this site is given in the following table.

Limiting Concentrations of Thorium Isotopes and Total Thorium Concentration Remediation Criteria (in pCi/g) as a Function of the Th-232:Th-230 Ratio

Th-232:Th-230 ratio	Th-232 (pCi/g)	Th-228 (pCi/g)	Th-230 (pCi/g)	Total Thorium (pCi/g)
0:1	0.0	0.0	21.0	21.0
1:3	2.9	2.9	8.8	14.6
1:2	3.4	3.4	6.8	13.6
1:1	4.1	4.1	4.0	12.2
1:0	5.0	5.0	0.0	10.0

The staff evaluated the licensee's dose calculations that support its thorium limits using the U.S. Department of Energy's dose assessment methodology contained in the "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD" (Ref. 2). RESRAD is the computer code that implements DOE's dose assessment methodology.

RESRAD contains a scenario with default parameters for an onsite resident. NRC has a limited set of default parameters for dose assessments as identified in Policy and Guidance Directive PG-8-08 (Ref. 3). The RESRAD code (Version 5.62) was run using the PG-8-08 default parameters and the thorium remediation standards described above. The thickness of the residual contamination zone was set at 15 cm (6 in). This seemed reasonable considering the extensive remediation that will have occurred at these sites.

The dose modeling results for Dow's proposed remediation criteria gave a maximum dose at or below the dose modeling results for the BTP option 1 thorium remediation criteria (maximum modeled dose of 0.03 mSv (30 mrem)/year predominantly from the direct radiation and inhalation pathways). Based on these results, Dow's proposed isotope specific concentration limits for soil comply with NRC's guidance for unrestricted release and are acceptable for unrestricted release.

#### 6.1.2 Surface Release Criteria

NRC's guidance for release of facility and equipment surfaces is contained in NRC Policy and Guidance Directive FC 83-23 (Ref. 4) and also in NRC Regulatory Guide 1.86 (Ref. 5). Dow proposes to use this guidance for release of facility and equipment surfaces contaminated with thorium. However, the remediation criteria for average contamination levels in NRC guidance are different for thorium-232 and thorium-230 (17 Bq (1000 dpm)/100 cm<sup>2</sup> and 1.7 Bq (100 dpm)/100 cm<sup>2</sup> respectively). When multiple radionuclides are present, NUREG/CR-5849 provides guidance for determining site specific guidelines based on the relative ratios of the contribution of each radioisotope to the total activity level. Using this guidance, and the more conservative thorium-232 to thorium-230 ratio of 1 to 3, Dow proposes to use 2.2 Bq (129 dpm)/100 cm<sup>2</sup> as

the average contamination level for release of facility and equipment surfaces for unrestricted use. Since the determination of this value was made in compliance with NRC's guidance, Dow's proposed remediation criterion for surfaces is acceptable for unrestricted release.

### 6.1.3 Non-radiological Environmental Impact

There is also the potential for non-radiological environmental impact from residual material being left at Midland and Bay City. However, materials from both the Midland and Bay City sites were tested by Dow using the extraction procedure toxicity test. None of the materials tested were found to contain heavy metals above the limits required to establish toxicity.

## 6.2 Other Alternatives

### 6.2.1 No Action

The no-action alternative would mean that Dow would not obtain approved remediation criteria. Therefore, the site could not be released for unrestricted use. This conflicts with NRC's requirement, in 10 CFR §40.42, of timely remediation at sites that have ceased operation. Although there would be no immediate threat to the public health and safety from the sites, not completing remediation at this time is not otherwise in the public interest.

### 6.2.2 Using Established Guidance

This alternative is complete adherence to the remediation criteria in the SDMP Action Plan. The SDMP Action Plan calls for SDMP sites to be released for unrestricted use. The SDMP Action Plan specifies the residual contamination criteria that are deemed to be acceptable for unrestricted use.

As was pointed out earlier there is a mixture of thorium-232/thorium-228 and thorium-230 at this site. Because the remediation criterion in the SDMP Action Plan is for thorium-232/thorium-228 only, the licensee had to determine site-specific remediation criteria for its site and could not rely directly on the established guidance in the SDMP Action Plan. Therefore, established guidance does not fully cover the variety of radionuclides available at this site.

## 7. CONCLUSIONS

Dow's preferred alternative provides the most complete and optimum level of protection of human health and safety and the environment among the various alternatives for release of this site. The staff believes that approving Dow's proposed release criteria will not cause any significant impacts on the human environment and is acceptable.

## 8. AGENCIES AND INDIVIDUALS CONSULTED, AND SOURCES USED

Only NRC prepared this Environmental Assessment. The staff consulted with the



Michigan Department of Environmental Quality staff for review of Dow's proposed final radiation survey plan, release criteria, and this Environmental Assessment.

## 9. REFERENCES

1. U.S. Nuclear Regulatory Commission, "Manual for Conducting Radiological Surveys in Support of License Termination, Draft Report for Comment," NUREG/CR-5849, 1992.
2. Yu, C., et al., "A Manual for Implementing Residual Radioactive Material Guideline Using RESRAD, Version 5.0," ANL/EAD/LD-2, 1993, prepared by Argonne National Laboratory, Argonne, IL, for U.S. Department of Energy, Washington, D.C.
3. U.S. Nuclear Regulatory Commission, "Scenarios for Assessing Potential Doses Associated with Residual Radioactivity," Policy and Guidance Directive PG-8-08, 1994.
4. U.S. Nuclear Regulatory Commission, "Termination of Byproduct, Source and Special Nuclear Material Licenses," Policy and Guidance Directive FC 83-23, 1983.
5. U.S. Nuclear Regulatory Commission, "Termination of Operating Licenses for Nuclear Reactors," Regulatory Guide 1.86, 1974.

## FINDING OF NO SIGNIFICANT IMPACT:

Based on the findings in the environmental assessment, the staff has determined that, under the National Environmental Policy Act of 1969, as amended, and NRC's regulations in 10 CFR Part 51, authorizing this license amendment would not be a major Federal action significantly affecting the quality of the human environment, and therefore an environmental impact statement is not required. The staff concludes that a finding of no significant impact is justified and appropriate.

The staff believes that approving of Dow's release criteria will not cause any significant impacts on the human environment and is acceptable. Dow's preferred alternative provides the most complete and optimum level of protection of human health and safety and the environment among the various alternatives for release of this site.

## OPPORTUNITY FOR A HEARING:

NRC hereby provides notice that this is a proceeding on an application for a license amendment falling within the scope of Subpart L, "Informal Hearing Procedures for Adjudications in Materials Licensing Proceedings," of NRC's rules of practice for domestic licensing proceedings in Part 2. Pursuant to 10 CFR §2.1205(a), any person whose interest may be affected by this proceeding may file a request for a hearing in accordance with 10 CFR

§2.1205(c). A request for a hearing must be filed within thirty (30) days of the date of publication of this Federal Register notice.

The request for a hearing must be filed with the Office of the Secretary either:

1. By hand delivery to: Docketing and Service Branch, Office of the Secretary, 11555 Rockville Pike, Rockville, MD 20852, between 7:45 a.m. and 4:15 p.m., Federal workdays; or
2. By mail or telegram to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Docketing and Services Branch.

In addition to meeting other applicable requirements of Part 2 of NRC's regulations, a request for a hearing filed by a person other than an applicant must describe in detail.

1. The interest of the requestor in the proceeding;
2. How that interest may be affected by the results of the proceeding, including the reasons why the requestor should be permitted a hearing, with particular reference to the factors set out in 10 CFR § 2.1205(g);
3. The requestor's areas of concern about the licensing activity that is the subject matter of the proceeding; and
4. The circumstances establishing that the request for a hearing is timely in accordance with 10 CFR § 2.1205(c).

Each request for a hearing must also be served, by delivering it personally or by mail to:

1. The applicant, The Dow Chemical Company, Attention: Mr. Larry Giebelhaus, Project Manager, 1261 Building, Midland, MI 48667; and
2. NRC, by delivery to the Executive Director for Operations, One White Flint North, 11555 Rockville Pike, Rockville, MD 20852, or by mail addressed to the Executive Director for Operations, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Dated at Rockville, Maryland, this \_\_\_\_ day of June, 1997.