

**SAFETY EVALUATION REPORT
WORK PLAN FOR REMEDIATION TO UNRESTRICTED USE OF THE AAR SITE, WESTERN
PARCEL (INKSTER ROAD, LIVONIA, MICHIGAN)
DOCKET 040-00235**

December 30, 2013

1.0 INTRODUCTION

1.1 AAR Submittal and Request

By letter dated August 7, 2013 (Agency Documents Access and Management System (ADAMS) Accession No. ML13220A447), and as amended by letter dated October 30, 2013 (ML13308A323) AAR Corporation (AAR) has submitted a "Remedial Work Plan for Regulatory Review, AAR Corp., Western Parcel, Strategic Waste Excavation Site Restoration" (hereafter, the Work Plan). The Work Plan describes the proposed excavation of certain areas of the AAR site to reduce residual radioactivity to concentrations that would allow unrestricted release of the site. AAR requests approval of the Work Plan to allow AAR to proceed with the proposed remedial action of the AAR site.

1.2 Background

The AAR site was previously owned by Brooks & Perkins, Incorporated (Brooks & Perkins), a former materials licensee of the NRC's predecessor agency, the U.S. Atomic Energy Commission (AEC). Brooks & Perkins's license was terminated by the AEC on May 17, 1971, but prior to that time Brooks & Perkins conducted licensed activities at the site using thorium master alloy and thorium magnesium alloy. In 1981, AAR purchased Brooks & Perkins and obtained ownership of the land. On February 23, 1994, an NRC inspector conducted an inspection of the AAR site, and subsequently notified AAR by letter dated March 29, 1994, that the NRC has "concluded that thorium was improperly disposed of at the site and certain areas of the building and grounds were in excess of the NRC release criteria for release of the facility for unrestricted use." AAR was directed to schedule and plan to characterize the extent of the contamination and to decontaminate the area to current NRC release criteria (ML110670259).

The AAR site at 12633 Inkster Road, Livonia, Michigan, was legally divided into the Eastern Parcel and the Western Parcel. The Western Parcel is that part of the site west of the 100W grid line of the site coordinate system (see Figure 1). As indicated by the locations of proposed excavations, the Work Plan addresses excavation of residual radioactive material primarily from the Western Parcel, but also from the Eastern Parcel near the Western Parcel. In addition, for purposes of evaluating potential dose and acceptability of the remaining residual radioactive material, AAR averages residual radioactivity concentrations over the Western Parcel and part of the Eastern Parcel. Thus, the Work Plan in actuality addresses that part of the AAR property that is west of gridline 60W (see Figure 1). For the remainder of this Safety Evaluation Report (SER), *the NRC staff considers the Western Parcel to be all the area west of gridline 60W.*

In 1999, AAR characterized the residual radioactivity in soils at the site. AAR subsequently began considering restricted use for the Western Parcel and conducting dose assessments.

Enclosure

AAR submitted a revised dose assessment on August 7, 2006 (ML062430114), based on proposed restricted use for the Western Parcel. As part of the August 2006 submittal, AAR proposed excavation of grids 73, 100, 219, and 249 in the Western Parcel to a depth of 1 m. The excavation was completed in late 2006/early 2007 and a completion report submitted to the NRC on April 11, 2007 (ML071100412 and ML071100415). As a result of NRC staff-raised technical issues, the NRC staff completed an independent dose assessment (ML093490979).

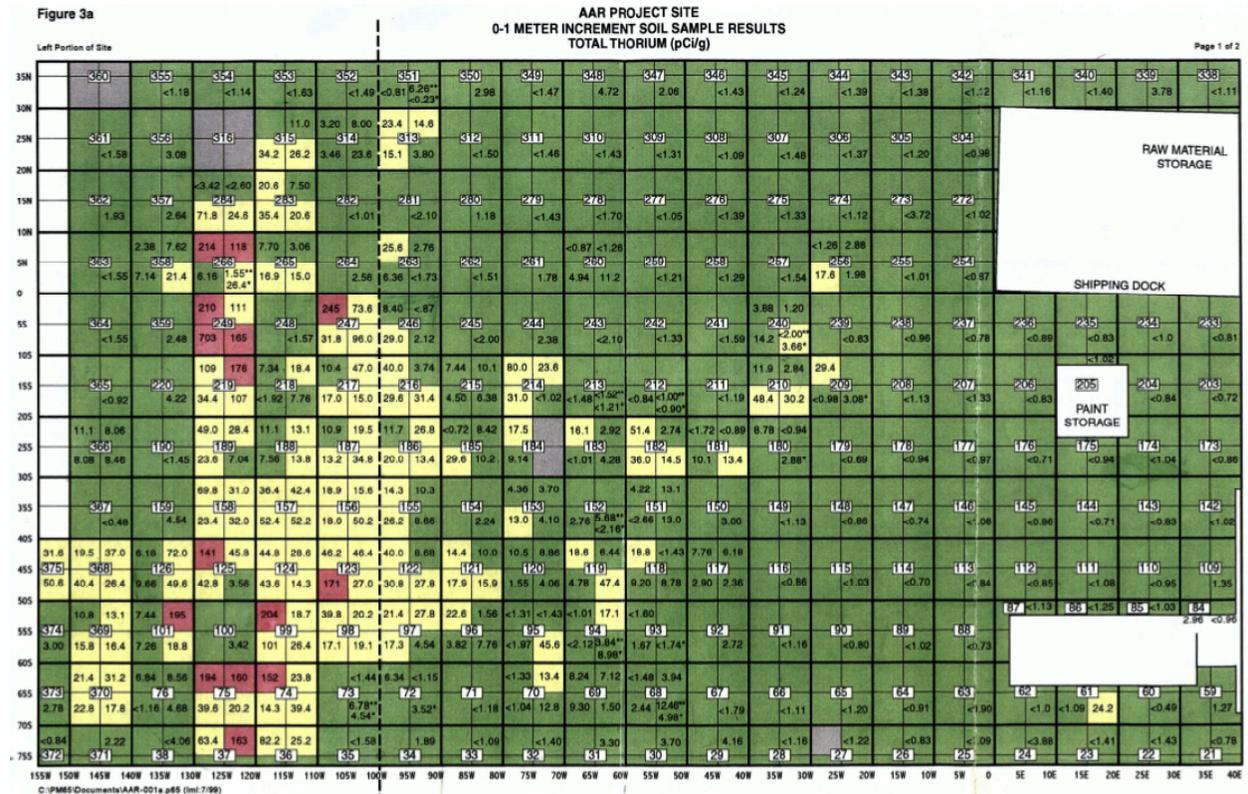


Figure 1. Grid layout of part of the AAR site. The legally divided Western Parcel is that part of the site west of the 100W gridline. For purposes of the AAR Work Plan, the western parcel includes the area west of the 60W gridline. For information, the grid numbers are boxed and the concentration values are Th-232 + Th-228 in pCi/g. Figure taken from 1999 AAR Phase II Characterization Report (ML091730164).

1.3 Summary of AAR Proposed Action

In the Work Plan, AAR proposes to excavate residual radioactivity from 32 grids to a depth of 1 meter (m) and dispose of the excavated material offsite. The excavated areas are to be backfilled with clean soil. The grids to be excavated are specified in Section 3.1 of the Work Plan and are listed in the table below.

Grids proposed to be excavated to a depth of 1 m							
36	37	74	75	76	94	98	99
101	122	123	124	125	126	156	157
158	187	188	189	216	217	247	265
266	283	284	315	368	369	370	375

2.0 REGULATORY BASIS

10 CFR Part 20, Subpart E – “Radiological Criteria for License Termination” and specifically 10 CFR 20.1402, “Radiological Criteria for Unrestricted Use,” establish the requirements for the release of a site for unrestricted use.

3.0 EVALUATION

This SER describes the NRC staff evaluation of the Work Plan for conformity with the radiological criteria for license termination for unrestricted use provided in 10 CFR 20.1402.

3.1 Radionuclides of Concern

The residual radioactivity at the AAR site is thorium, including natural thorium, which includes thorium-232 (Th-232) and thorium-228 (Th-228), plus thorium-230 (Th-230) from the uranium series. Because of the length of time the residual radioactivity has remained onsite (approximately 40 years), the NRC staff concludes it is reasonable to assume that the thorium series is present essentially in equilibrium. Therefore, the concentrations of radium-228 (Ra-228) and Th-228 are assumed equal to the concentration of Th-232, as are the concentrations of all radionuclides in the thorium decay chain. AAR had determined that the concentration of Th-230 was typically present at a ratio to Th-232 of Th-230:Th-232 equals 2:1. AAR usually reports concentrations as the total concentration of all three thorium isotopes (Th-232 + Th-228 + Th-230), which the NRC staff refers to here as “Th-total.” The NRC staff has generally described the radionuclide concentrations as the concentration of Th-232 (though it is always assumed the Th-228 and Th-230 are present). Because of the equilibrium and ratio for the Th-230, concentration values provided by AAR can be converted as: Th-total equals Th-232 times 4.0.

3.2 Demonstrating Conformity with Criteria for Unrestricted Use

The AAR Work Plan addresses conformity with the criteria for release of a site for unrestricted use in 10 CFR 20.1402. For unrestricted use, the dose criterion is 25 millirem per year (mrem/yr) to the average member of the critical group and as low as is reasonably achievable (ALARA). For demonstrating the 25 mrem/yr criterion is met, AAR’s general assessment in the Work Plan is as follows. Residual radioactivity at the AAR site occurs to a depth of 2 m, and the

conceptual model for dose assessment has split the soil into two layers: 0–1 m and 1–2 m. The site was characterized based on units of 100 square meters (m^2) (i.e., 10 m by 10 m) grids. The Work Plan provides a commitment to excavate certain (specified) grids to a depth of 1m, thus removing part of the residual radioactivity of the 0–1 m layer. The Work Plan provides a determination of the average residual radioactivity concentrations expected to remain on site after excavation, based on existing characterization data. The Work Plan then provides a calculation of the dose due to the remaining (after excavation) 0–1 m layer of residual radioactivity. That dose is less than 25 mrem/yr. The difference of 25 mrem/yr minus the dose from the 0–1 m layer is the maximum allowable dose that the 1–2 m layer could contribute and still be in conformity overall. From the maximum allowable dose from the 1–2 m layer, a derived concentration guideline level (DCGL) is developed for the 1–2 m layer. The proposed DCGL is an average over the entire western parcel, thus considered a wide-area DCGL (DCGL_w).

As part of the staff's independent dose assessment for the AAR site from December 2009 (ML093490979), the NRC staff has already concluded that averaging over areas up to 10,000 m^2 is acceptable. (The NRC staff also evaluated dose due to smaller areas of elevated concentrations to better understand the potential risk; see Section 3.4 of this SER.) The area of the western parcel is approximately 10,000 m^2 .

In the Work Plan, AAR separately addressed the ALARA requirement of 10 CFR 20.1402 and determined that the proposed decommissioning action will result in residual radioactivity levels that are ALARA, as discussed in section 3.5 below.

3.2.1 Final Survey (Characterization Survey)

The primary characterization of residual radioactive material at the site is based on the 1999 AAR Phase II Characterization Report (ML091730164). That effort was a comprehensive characterization of the soils of the site involving measuring concentrations in 100 m^2 areas or "grids" that are each 10 m by 10 m. Soils at the site were sampled in two layers: 0–1 m and 1–2 m. In a letter to AAR dated October 27, 2006 (ML062980515), and in the NRC staff independent dose assessment of December 2009 (ML093490979), the NRC staff concluded that the 1999 characterization was sufficient to determine doses to an average member of the critical group (for conformity with the unrestricted use criterion of 10 CFR 20.1402). The NRC staff still concludes that the characterization data from 1999 is sufficient for purposes of a final survey to determine potential dose to an average member of the critical group. Therefore, the NRC staff concludes that no additional final status survey is needed. However, AAR has committed to performing a confirmatory survey, which is discussed in Section 3.3 below.

3.2.2 Concentration Remaining in 0–1 m Layer

Section 3.1 of the Work Plan identifies the grids that AAR has committed to excavate to a depth of 1 m. The soil excavated will be disposed offsite. Table 3.1 of the Work Plan shows AAR's determination of the average radionuclide concentration that is expected to remain in the Western Parcel after excavation of the named grids. The expected remaining average is 6.0 pCi/g total thorium (Th-total). Based on the conversion of units described above, this is equal to an expected average concentration of 1.5 picocuries per gram (pCi/g) Th-232. The NRC staff reviewed the calculation of the average concentration and also independently evaluated the concentrations in each grid of the western parcel based on the AAR 1999 characterization (ML091730164). Based on the AAR data, the NRC staff determined the area-weighted average

concentration to be 1.5 pCi/g. The NRC staff concludes that the expected average concentration in the 0–1 m layer in the western parcel is 1.5 pCi/g Th-232.

3.2.3 Determination of DCGL_w for 1–2 m Layer

In Section 3.2 of the Work Plan, AAR describes results of their dose assessment, including consideration that the maximum dose may occur at different times (within the 1000-year compliance period) for the 0–1 m and 1–2 m layers. Based on limiting dose to the 10 CFR 20.1402 criterion of 25 mrem/yr, AAR determined that the concentration in the 1–2 m layer must be no greater than 27 pCi/g Th-total (equivalent to 6.8 pCi/g Th-232). This determination by AAR was based on the dose from both soil layers at the time of peak dose for the 1–2 m layer. This may be nonconservative (the peak combined dose from both layers may occur at a time in between the peak for the 0–1 m layer and the peak for the 1–2 m layer). However, in Section 3.3 of the Work Plan, AAR commits that if measurements in an exposed grid (100 m² area) of the 1–2 m layer cause the average concentration in the 1–2 m layer to exceed 20 pCi/g Th-total (equivalent to 5.0 pCi/g Th-232), AAR will remove the exposed grid to an appropriate depth and replace it with clean fill. Thus, AAR is committing to meeting a DCGL_w of 20 pCi/g Th-total (5.0 pCi/g Th-232) for the 1–2 m layer. Regarding this commitment, the NRC staff has not evaluated acceptability of the dose assessment methodology that AAR used. Instead, the NRC staff has only evaluated the acceptability of the DCGL_w to which AAR commits.

The NRC staff independently evaluated the dose from the combination of the expected concentration in the 0–1 m layer after excavation and the DCGL_w for the 1–2 m layer. The NRC staff used the dose assessment that staff performed in 2009 (ML093490979), as a basis for determining dose for the current proposed concentrations that would remain at the AAR site. In the NRC staff assessment, the staff used a ratio of Th-230 to Th-232 concentrations of 2.62, which is higher than the ratio of 2.0 that AAR had used. From the NRC dose assessment, the NRC staff used results from Scenario 5d of that assessment, which is a scenario of a resident gardener under unrestricted use. The staff extracted dose-to-source ratios (DSRs) from that assessment, for times from 0 to 1000 years and for the two layers. DSRs are factors that express the dose per unit concentration of the radionuclide source, in this case with units mrem/yr per pCi/g Th-232. Because the DSRs vary as a function of time and are different for the two layers, the NRC staff evaluated the potential dose for the full compliance period, up to 1000 years. The maximum dose determined by the NRC staff for the expected concentration in the 0–1 m layer plus the DCGL_w for the 1–2 m layer (i.e., 20 pCi/g Th-total) is 24 mrem/yr, projected to occur at time around 800 years (750 to 820 years).

Based on existing characterization data from the 1999 characterization, Table 3.4 of the Work Plan describes the expected concentration in the 1–2 m layer as 7.4 pCi/g Th-total, or 1.85 pCi/g Th-232. At that expected concentration, the NRC staff-calculated potential dose (including 0–1 m and 1–2 m layers) would be 12.4 mrem/yr, which occurs at time range 470–680 years.

The NRC staff concludes that the dose from residual radioactivity remaining on the AAR site, western parcel, after the proposed excavation, conforms to the 25 mrem/yr dose criterion for unrestricted use in 10 CFR 20.1402. Therefore, the proposed excavation is acceptable and the proposed DCGL_w for the 1–2 m layer is acceptable.

3.3 Confirmatory Survey Plan for Exposed 1–2 m Layer

In Section 3.3 of the Work Plan, AAR commits to performing a confirmatory survey of the average concentration of residual radioactivity remaining in the 1–2 m layer that is exposed by the excavation. The NRC staff considers this proposed survey to be a confirmatory survey, not a final status survey. As discussed in Section 3.2.1 above, staff considers the characterization that already was performed to serve as a final status survey for purposes of demonstrating conformity with the criteria for unrestricted use. The confirmatory survey proposed by AAR could provide additional assurance that concentrations remaining are not significantly different from the expected concentrations.

AAR's proposed confirmatory survey (Section 3.3 of the Work Plan) would be performed for the exposed part of the 1–2 m layer after excavation. AAR would obtain four samples from each 100 m² grid over the 1–2 m depth, as was done for the 1999 characterization. AAR would use data from the new samples to add to the existing data set for the 1–2 m layer. AAR would then calculate a revised average concentration for the 1–2 m layer. AAR commits that if the average thorium concentration of an exposed grid in the 1–2 m layer causes the average concentration in the entire 1–2 m layer to exceed the DCGL_w of 20 pCi/g Th-total or 5.0 pCi/g Th-232, then AAR will remove the exposed grid to an appropriate depth and replace it with clean fill. The proposal to obtain four samples from each 100 m² grid is consistent with the approach used by AAR in its characterization, which NRC considers acceptable for the final survey. This method is also consistent with the approach recommended in NUREG/CR-5849 for sampling of affected land areas. Thus, the NRC staff considers the method acceptable for a confirmatory survey of the exposed part of the 1–2 m layer.

3.4 Potential for Additional Elevated Areas and Dose from Elevated Areas

The NRC staff acknowledges the possibility of the existence of small elevated areas that have not been detected or explicitly evaluated at the AAR Western Parcel. AAR has performed scan surveys of the entire parcel, and has performed measurements of the soil concentrations on a 5 m grid spacing over the entire parcel. If there are elevated areas that have been missed, such areas would be of small size relative to the 10,000 m² area that is considered acceptable for averaging. Thus, the NRC staff concludes that there is reasonable assurance that elevated areas do not exist to an extent that would cause the average concentration to exceed the DCGL_w.

The NRC staff analyzed potential doses to individuals from smaller areas (relative to 10,000 m²) of elevated concentrations. These additional analyses were not for conformance with the dose criterion of 10 CFR 20.1402, but were done to provide additional information to understand the risk. Specifically, the NRC staff divided the Western Parcel into four roughly equal subareas, and evaluated radionuclide concentrations and then potential dose to people who might get exposed only to the smaller area. Using the 2009 NRC staff dose assessment for the AAR site (ML093490979), the doses were determined to be less than 25 mrem/yr. As was done in the 2009 NRC staff dose assessment (ML093490979), the NRC staff also considered dose due to exposure to single 100 m² grids. The single grid expected to have the highest 0–1 m layer concentration after excavation is grid 214, with an expected concentration of about 16 pCi/g Th-232. For the unlikely case of a house being built in the future directly above this grid, the NRC staff calculated a range of potential doses above 25 but less than 100 mrem/yr. This is not considered a reasonably foreseeable scenario and thus not considered for conformance with

the criterion of 10 CFR 20.1402. The NRC staff considers this potential dose range acceptable. The NRC staff concludes that the doses due to exposures to smaller elevated areas of the Western parcel to be acceptable.

3.5 ALARA Evaluation

The unrestricted use dose criterion of 10 CFR 20.1402 also requires that doses be reduced to ALARA levels. NUREG-1757, Vol. 2, (NRC, 2006) indicates that an ALARA evaluation for compliance with decommissioning criteria should address quantitative analyses, when appropriate, and typical good practice efforts. AAR provides its ALARA evaluation in Section 6 of the Work Plan.

Good practice efforts for soil contamination would involve removal of readily removable radioactivity. AAR addresses implementation of typical good practice efforts in Section 6.1 of the Work Plan. AAR describes the residual radioactivity at the site as being slag and incinerator ash mixed within a soil matrix. The slag is described as similar to crushed stone. AAR states that the slag and ash are not readily removable from the soil and that no large pieces of slag were identified in previous characterization or soil removal efforts at the site. The NRC staff has evaluated the various characterization reports and has seen the slag and ash material that contain the residual radioactivity during site visits. The staff agrees with the conclusion that the residual radioactivity is not readily removable. The NRC staff notes that AAR has proposed removal of residual radioactivity from the 0–1 m layer that is more removal than the minimum necessary to result in a calculated dose of 25 mrem/yr (see Section 3.2.3). This is considered a good practice as it provides a margin for uncertainty to ensure that actual final residual radioactivity will meet the 25 mrem/yr criterion. The NRC staff does not know of any other specific good practice efforts that would be appropriate for this decommissioning project. Therefore, the NRC staff considers the proposed approach acceptable in terms of ALARA good practice efforts.

AAR also performed a quantitative ALARA analysis, described in Section 6.1 of the Work Plan. AAR generally followed guidance and equations in NUREG-1757, Vol. 2, Appendix N, specifically using equation N-8 to calculate the relative concentration (relative to the $DCGL_W$) at which additional soil removal would be cost-beneficial. AAR proposes removal of residual radioactivity from the 0–1 m layer to reduce the concentration in that layer to 6 pCi/g Th-total (equal to 1.5 pCi/g Th-232). AAR indicates that this is less than the $DCGL_W$ of 10 pCi/g Th-total (2.5 pCi/g Th-232) that would result in 25 mrem/yr. AAR used parameters based on the costs of performing the proposed additional removal (extra beyond necessary to meet the $DCGL_W$). For other parameters for the equation, AAR used values from Table N-2 of NUREG-1757, Vol. 2, Appendix N. The NRC staff had an initial concern with the use of the discount rate of 3% per year. As discussed in the *Federal Register* Notice of August 16, 2007 (72 FR 46102), the NRC staff specifically withdrew the prior guidance (from NUREG-1757) on the acceptable discount rates. The NRC staff concern is that for very long half-life radioactive materials, licensees should perform quantitative ALARA analyses using no discounting or using a sensitivity analysis using lower discount rates. The NRC staff independently repeated AAR's calculation but using no discounting. For other parameters in the analysis, the NRC staff concludes that the values used are consistent with the guidance in NUREG 1757, Vol. 2, Appendix N, and are considered acceptable.

Results of the calculations are as follows: AAR's result was that the relative concentration at which soil removal would be beneficial is more than 50 times the $DCGL_w$. In the NRC staff's calculation, with no discounting, the relative concentration at which soil removal would be cost-beneficial is 1.75. Both relative concentrations, being greater than 1, indicate that additional remedial actions are not needed for quantitative ALARA purposes. Thus, the NRC staff agrees that the quantitative analysis shows that no additional remedial actions are needed to meet ALARA requirements.

Based on the conclusions about the ALARA good practices evaluation and the quantitative ALARA evaluation, the NRC staff concludes that the proposed decommissioning action will result in residual radioactivity levels that are ALARA in conformance with 10 CFR 20.1402.

3.6 Waste Disposal

3.6.1 Disposal of Soils under 40.13(a) at Wayne Disposal Hazardous Waste Landfill

The Work Plan proposes that soil within specified grids containing thorium be excavated and transported offsite for disposal. Section 10.3 of the Work Plan indicates that the facility selected by AAR is the EQ facility at Belleville, Michigan, also known as the Wayne Disposal facility. The Wayne Disposal facility is a hazardous waste landfill regulated under the Resource Conservation and Recovery Act (RCRA) Subtitle C. The residual radioactivity consists of thorium isotopes, and is source material. In Section 10.4 and Table 10.2 of the Work Plan, AAR describes the average concentration of the soil to be disposed as being 78 pCi/g Th-total (equivalent to 19.5 pCi/g Th-232), based on data from AAR and from an NRC confirmatory survey. AAR states that this material would be exempt under 10 CFR 40.13(a) (unimportant quantity of source material). The NRC staff independently evaluated the expected material to be disposed at the Wayne Disposal facility, and estimated the concentration to be 20 pCi/g Th-232 based on using the AAR data only. This Th-232 value is similar to what AAR determined (although in the NRC staff's determination the Th-230 concentration would be higher as mentioned earlier). NUREG-1717 provides information on activity concentrations equivalent to the 10 CFR 40.13(a) criterion of 0.05% by weight source material. For natural thorium, the criterion corresponds to an activity concentration of 55 pCi/g Th-232. The NRC staff concludes that it is likely (calculated concentration is 36% of criterion) that the material to be disposed at the Wayne Disposal facility would meet the criterion of 10 CFR 40.13(a), and thus is eligible for transfer to an unlicensed facility.

The NRC staff has a policy and practice for evaluating transfers of material exempt under 10 CFR 40.13(a). This practice is described in procedure EPPAD 3.5 (August 2009, ML092460058), which procedure provides dose guidelines for staff reviews. Requests for transfer of material exempt under 10 CFR 40.13(a) would normally be approved if the estimated dose to a member of the public is unlikely to exceed a dose of 25 mrem/yr. If estimated doses are higher, the NRC staff would inform the Commission and if higher than 100 mrem/yr ask the Commission for approval.

The NRC staff has performed an independent evaluation of doses to workers and members of the public due to the transport and disposal of the soils from AAR at the Wayne Disposal Facility Site #2 Landfill in Belleville, Michigan. The NRC staff developed exposure scenarios for workers including those involved in material transport and those involved in disposal facility operations, as well as potential long-term dose to members of the public, including inadvertent

intruders in the event of a loss of institutional controls. The results of the NRC staff's analysis show that the long-term peak dose within a 1,000 year compliance period is less than 25 mrem/yr (0.25 mSv/yr) under all scenarios with the possible exception of doses associated with a basement excavation scenario (intruder after loss of institutional control of the facility). The Wayne Disposal landfill has provided assurance that the AAR materials will be disposed of at a depth greater than 10 ft (0.3 m) (letter dated September 19, 2013, to NRC, ML13266A023), justifying elimination of the basement excavation scenario. Doses to workers associated with the delivery and disposal of material are also expected to be below 25 mrem/yr (0.25 mSv/yr). Thus all reasonably foreseeable scenarios results in doses less than 25 mrem/yr. Therefore, the NRC staff concludes that disposal of the AAR waste at the Wayne Disposal landfill is acceptable considering the NRC staff policy and practice (procedure EPPAD 3.5) for evaluating transfers under 10 CFR 40.13(a).

Section 2.2 of the Work Plan states that, when necessary, site soils will be intentionally mixed in order to achieve the project-specific Waste Acceptance Criteria (WAC). The NRC staff has guidance on the use of intentional mixing in NUREG-1757, Vol. 1, Rev. 2, Section 15.13. The guidance allows intentional mixing to meet WAC when homogeneous waste streams are mixed and the resulting waste classification is unchanged. The mixing proposed by AAR is for mixing of homogeneous waste streams (all the material is soil containing small pieces of slag or incinerator ash) and will not change the classification or nature of the material. The mixing is proposed only to meet the WAC for the Wayne Disposal facility. Therefore, the NRC staff concludes that the intentional mixing is within the guidance provided in NUREG-1757 and is therefore acceptable.

In Section 4.1 of the Work Plan, as amended by supplemental information submitted by AAR October 30, 2013 (ML13308A323), AAR commits to consolidating accumulated surface debris and also transporting this surface debris to the Wayne Disposal facility for disposal. The NRC staff considers it likely that the surface debris (including materials such as concrete, cinder blocks, and other debris) would have residual radioactivity at concentrations significantly lower than concentrations in the soil identified for excavation and disposal. Therefore, the addition of this material would not increase the overall concentration of residual radioactivity in the material planned for disposal at the Wayne Disposal facility. Therefore, the NRC staff concludes that disposal of the accumulated surface debris at the Wayne Disposal facility is acceptable.

3.6.2 Disposal of Mulched Brush and Trees at Solid Waste Landfill

In Section 4.2 of the Work Plan, as amended by supplemental information submitted by AAR October 30, 2013 (ML13308A323), AAR describes its plans for disposal of trees and scrub brush that will be cleared from the site before excavation of soils. AAR plans to remove the trees and scrub brush, chip the material and load it into 25-cubic yard roll-off boxes. Chipped material with residual radioactivity concentrations less than 3.7 pCi/g Th-232 would be shipped to the Sauk Trail Hills disposal facility in Canton, Michigan, for landfill disposal. The Sauk Trail Hills facility is a non-hazardous solid waste landfill regulated under RCRA Subtitle D.

The NRC staff has performed an independent evaluation of doses to workers and members of the public due to the transport and disposal of the brush from AAR at the Sauk Trail Hills solid waste landfill. The NRC staff considered that a potential future residential intruder scenario (a home is built on the landfill in the future) with assumption of no cover over the residual radioactivity would be a bounding scenario for other potential exposure scenarios. The

residential scenario can be evaluated using the same dose assessment methods discussed in Section 3.2 of this SER. In this case of the brush material, the staff anticipates the volume of material to be relatively small such that the thickness of the material would not exceed 1 m in thickness. The NRC staff used the DSRs for the 0–1 m layer. At the concentration of 3.7 pCi/g Th-232, the NRC staff determined the maximum dose over a 1,000-year compliance period is 23 mrem/yr. The NRC staff considers this to be bounding on the likely doses to people from the material disposed in a solid waste landfill. Therefore, the NRC staff considers the proposed disposal at the Sauk Trail Hills facility acceptable.

In the supplemental information (ML13308A323), AAR committed that material with concentrations exceeding 3.7 pCi/g Th-232 will be transported to the EQ Wayne Disposal facility. The NRC staff considers it likely the addition of this chipped brush material would not increase the overall concentration of residual radioactivity in the material planned for disposal at the Wayne Disposal facility. Therefore, the NRC staff concludes that disposal of the chipped brush material at the Wayne Disposal facility is acceptable.

In the October 30, 2013, supplemental information (ML13308A323), AAR describes its proposed survey method. AAR would obtain a representative sample of the chipped brush material from each roll-off box of material. The sample would be analyzed by gamma spectrometry to determine activity levels. AAR would also obtain samples of trees and scrub brush from outside the action area (area where excavation is planned) for use in determining background activity levels. The 3.7 pCi/g Th-232 action level would be implemented as a criterion for activity above background. The NRC staff considers the proposed sampling and analysis appropriate for the level of risk represented by the brush material to be disposed in the solid waste landfill. Thus, the NRC staff concludes the proposed survey method is acceptable.

3.7 Radiation Protection

AAR has proposed having the site remediation work performed by Solutient Technologies, LLC (Solutient), under Solutient's Ohio radioactive materials service provider license. The NRC staff reviewed Solutient's current license, and confirmed it allows Solutient to provide decommissioning services at temporary job sites in Ohio. 10 CFR 150.20 grants a general license to conduct the same activity in non-Agreement States. Thus, Solutient is allowed to provide its services under reciprocal license at temporary job sites in Michigan, including at the AAR site.

The Work Plan, in Section 8, describes assignments and areas of responsibility for the Radiation Safety Officer and Health Physicist for the AAR project. Sections 11 and 12 of the Work Plan describe some aspects of the radiation safety program that Solutient will implement for the project:

- A site-specific health and safety plan is based on Solutient's Corporate Health and Safety Plan Document and Standard Operating Procedures Manual.
- A site-specific radiation work plan will be developed to address occupational radiation protection and response to discovered anomalies.
- Instrument calibration and source checks will be recorded. Daily logs will be maintained.
- Incoming equipment will be surveyed before it is brought into the control zone.
- Transportation vehicles will be inspected.

- Outbound vehicles will be surveyed before leaving the transition zone.
- Records will be maintained of samples of each outbound load of soil.
- Waste manifests will be prepared.

Solutient's license authorizes activities including surveys, characterization, and remediation of radioactively contaminated materials, soils, and soil-like materials. The license authorizes use of thorium, with no single isotope exceeding 1 Ci. Based on the estimated concentration of Th-232, Th-228, and Th-230 in the soil to be removed from the AAR site, the NRC staff concludes that such soils to be removed are not likely to exceed the authorized limit. Based on the existing Ohio license and the commitments made in the Work Plan, the NRC staff concludes that Solutient has the necessary knowledge and experience to safely carry out the remediation work as planned. Thus, the NRC staff concludes that the provisions regarding radiation safety are acceptable. The NRC staff will inspect the remediation work, to verify that Solutient performs the work in a safe manner within regulations.

3.8 Environmental Considerations

A proposed action is excluded from an Environmental Review under Title 10 of the *Code of Federal Regulations* (10 CFR) 51.22(c)(11) if it is procedural in nature and satisfies the following requirements:

- i. There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.
- ii. There is no significant increase in the individual or cumulative occupational radiation exposure.
- iii. There is no significant construction impact.
- iv. There is no significant increase in the potential for or no consequences from radiological accidents.

Implementation of the proposed work plan meets the requirements listed above. No significant change in effluents is expected. No significant change in exposures is expected because the source term is relatively low, the exposure time is short and worker exposures will be monitored, and the exposures will be evaluated. There is no construction associated with the action and no significant potential for or consequences from an accident.

The proposed AAR Work Plan includes an evaluation of impact to endangered species by consultation with the U. S. Fish and Wildlife Service, which confirmed the absence of any endangered species on or in close proximity to the AAR site at 12633 Inkster Road. There is also no indication of historic properties in the site area. Although AAR does not possess an NRC license, the NRC staff reviewed the proposed Work Plan and determined that the proposed action does not adversely impact public health and safety or the environment, and the types of activities proposed are such that they would be categorically excluded under 10 CFR 51.22(c)(11). The NRC Staff finds the activities being approved by NRC in this action to be within the scope of those activities covered by 10 CFR 51.22(c)(11). Therefore, neither an Environmental Assessment nor an Environmental Impact Statement is warranted for this action.

3.9 State Consultations

A copy of the AAR Work Plan was provided to the State of Michigan's Department of Environmental Quality (MDEQ). MDEQ submitted minor comments, which were addressed by the NRC staff prior to completion of this SER.

3.10 Evaluation of EPA/NRC Memorandum of Understanding Consultation Triggers

The NRC staff considers whether concentrations of residual radioactivity in soil or ground water would trigger consultation with the U.S. Environmental Protection Agency (EPA) under the EPA/NRC Memorandum of Understanding (MOU) (see NUREG-1757, Vol. 1, Rev. 2, Appendix H). At the AAR site, the contaminants in soil of concern are the Th-232 series, presumed essentially in equilibrium, due to age of the slag materials, and Th-230. The MOU includes consultation triggers for Th-232 (5 pCi/g) and Th-228+D (15 pCi/g) in soil, but there is not a trigger value for Th-230 in soil. Since the trigger value for Th-228+D is greater than that for Th-232, and the present concentrations of each radionuclide should be equal (because of equilibrium), the trigger value for Th-232 is more limiting.

The NRC staff guidance indicates that staff should compare soil concentrations to the MOU values on a survey unit basis. For this western parcel, the survey unit is considered the 10,000 m² area of the western parcel as described above. As described above, the proposed remediation would result in residual radioactivity remaining in the 0–1 m soil layer at a concentration of 1.5 pCi/g Th-232. For the 1–2 m soil layer, the proposed remediation would allow concentration up to 5.0 pCi/g Th-232 and the expected concentration remaining is 1.85 pCi/g Th-232. None of these expected or allowable soil concentrations exceeds the EPA-NRC MOU consultation trigger values (5 pCi/g Th-232) for unrestricted use, which AAR is currently pursuing.

Regarding potential ground water contamination, AAR provided information in its 1996 characterization report, which was included as Appendix A to the AAR Remediation Plan, Rev. 2, October 1998 (ML13282A580). The characterization report included measured concentrations of Th-232 and Th-228. The maximum concentrations were 6.8 and 6.5 pCi/L Th-232 and Th-228, respectively. The consultation trigger for ground water is exceedance of the EPA maximum contaminant levels (MCLs). There is no specific value for thorium, so the applicable MCL is that of 15 pCi/L gross alpha (not including uranium). The measured ground water concentrations did not exceed the gross alpha MCL.

Therefore, the NRC staff concludes that consultation with the EPA is not triggered.

4.0 CONCLUSIONS

As discussed in detail above, the NRC staff makes the following conclusions:

1. The NRC staff has reasonable assurance that the residual radioactivity to remain on the Western Parcel after remediation would be in conformance with the criteria for unrestricted use in 10 CFR 20.1402.
2. The NRC staff has reasonable assurance that the radiation protection program is sufficient to protect safety of workers and members of the public.

3. The proposed transfer of unimportant quantities of source material under 10 CFR 40.13(a) for disposal at the Wayne Disposal facility would result in doses that are acceptable.

Therefore, the NRC staff concludes that the AAR Work Plan is consistent with applicable NRC criteria and guidance. The staff has no objection to AAR proceeding with the remediation as described in the Work Plan.

Principal Contributors:

Duane Schmidt, FSME/DWMEP/DURLD
Theodore Smith, FSME/DWMEP/DURLD