National Aeronautics and
Space Administration

John H. Glenn Research Center
Lewis Field
Plum Brook Station
Sandusky, OH 44870

July 22, 2009

Reply to Attn of: QD

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Subject: Processing and Blending of Contaminated Soils During Remediation of the Plum Brook Reactor Facility, Licenses Nos. TR-3, Docket No. 50-30 and R-93, Docket No. 50-185

During recent telephone discussions regarding National Aeronautics and Space Administration plans for remediation of contaminated soils at the Plum Brook Reactor Facility, the Staff has raised questions on mixing and blending of soils. On June 26, 2009, members of the Staff requested that NASA submit by letter a description of the plans for sorting and segregation soils during remediation activities.

The enclosure to this letter describes NASA's program for remediation of contaminated soils in various areas of the facility. The plans, as described in the enclosure, include excavation and sorting of soils followed by radiological scanning to meet the survey requirements of our NRC approved Final Status Survey Plan of soils that will remain on site. Disposition of the soils will be in a manner that meets the following criteria:

- Clean soil will not be intentionally mixed with contaminated soil to achieve sufficient dilution to allow reclassification as 'clean' so that it may remain on-site at license termination.

- Clean soil will not be intentionally mixed with contaminated soil to satisfy Waste Acceptance Criteria (WAC) at either the processor's facility or at the disposal site.

- Low level contaminated soils will be blended with higher level contaminated soils to satisfy WAC requirements when necessary and to achieve the most cost effective shipping and disposal program. This blending will be controlled in such a manner that it will not result in a reduction in the waste classification of any material (for example, Class B waste will not be diluted to Class A concentrations).

These criteria and their implementation are described in more detail in the enclosure. NASA believes that this program is consistent with the criteria applied at other facilities, both operating reactor sites and those in decommissioning. In addition, NASA believes that it is consistent with the criteria in SECY-04-0035, Regulatory Issues Summary RIS-2004-08, and section 15 of NUREG 1757. Please advise if you have any further issues with our plans.

NMSS01
FSME

Should you have any questions or need additional information, please contact me at NASA Plum Brook Station, 6100 Columbus Avenue, Sandusky, Ohio 44870 or by telephone at (419) 621-3277.

Sincerely,

Keith M. Peecook
NASA Decommissioning Program Manager

Enclosure

1. Description of the Soil Survey and Segregation Process

cc:
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USNRC/J. Webb (FSME)
USNRC/W. G. Snell RIII/DNMS/MCID
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Description of the Soil Survey and Segregation Process

Background:

During decommissioning of the Plum Brook Reactor Facility, a number of areas will require excavation of soils that are either contaminated, potentially contaminated, or are expected to be uncontaminated but need to be removed to access the areas underneath. Several million pounds of soil will be excavated. This includes overburden from the removal of storm drains within the restricted area, overburden from removal of the Cold Retention Basins, overburden from excavation and removal of the four underground storage tanks related to the Hot Retention Area, removal of the levees and clay liner from the emergency retention basin, decontamination of known spill areas, and remediation of the original plant's main environmental outfall to Pentolite Ditch and the surrounding land areas.

Soil that remains on site at License Termination must be surveyed under a protocol that satisfies the MARSSIM based criteria presented in the Final Status Survey Plan. Soil meeting the DCGL requirements will be acceptable for leaving on-site. To assure that materials pass the survey requirements when performing FSS, a conservative Remediation Action Level (RAL) goal is set administratively at ½ of the calculated DCGL. In general, soils and demolition debris that meet the RAL will be candidate materials for reuse as fill material on site. Materials that exceed the DCGL will be disposed by either shipment as radioactive waste to a licensed offsite disposal facility, or by shipment as licensed material to a processor who is licensed to receive, process, and disposition the material.

Excavation Activities:

Soil will be excavated from the areas using conventional earth moving equipment. The location and degree of soil removal will be guided by current characterization data and by Radiation Control Technicians who will be performing ongoing field surveys and/or sampling as excavation progresses. Excavation will be geared toward removal of material that exceeds the established Remediation Action Level criteria. As soil is excavated, it will be sorted by three potential classifications, which are defined in our work procedures:

- *Overburden Soil: This is soil layered over tanks, piping systems, or structures requiring remediation. Overburden soils are not expected to exceed the RAL. This is confirmed during excavation by surveying and/or sampling during the excavation process.*

- *Contaminated Soil: This is excavated soil that contains radioactive contaminants exceeding the RAL but are below the calculated Derived Concentration Guideline Limits (DCGL). The contamination levels are confirmed prior to excavation through characterization and are continuously monitored during excavation by ongoing job coverage surveying and/or sampling.*

- *Direct Off-Site Disposal Threshold: This is excavated soil known through characterization to exceed the DCGL. The soil contamination levels are continuously monitored during excavation by ongoing job coverage surveying and/or sampling.*

Clean overburden soils are excavated only in areas where its removal is necessitated by a need to access components and structures beneath, or to expose area of known contamination. Contaminated soils and soils meeting the Direct Off-Site Disposal Threshold are excavated from any areas where there existence is known or where it is found through ongoing surveys. Excavation will be guided by field surveys and characterization information and will be geared toward removal of material that exceeds the RAL. Where localized areas of elevated activity are found, attempts will be made to remove the localized contamination, but a great deal of "surgical" precision will not be applied. Some mixing of this soil with the surrounding media will occur as a result of normal conventional earthmoving and excavation techniques. However, the classes of soil, as discussed above, will be segregated during excavation at the point of excavation and there will be no attempt to dilute the activity levels by deliberate and excessive over-excavation.

As the soil is excavated, it will be loaded into a transport vehicle for transfer to a designated on-site stockpile. If, as in the case of remediation of Pentolite Ditch, the soil is extremely wet, it will be deposited along the banks of the ditch near the point of excavation to drain prior to trucking to the stockpile.

Sorting and Segregation:

As the soil is removed, it will be kept segregated by classification as discussed above. As the soil is loaded into on-site transport vehicles, a system will be in place through NASA's work control document program to assure that segregation of the material is maintained while it is collected and transported to the appropriate on-site stockpile. The stockpiles will be located inside the 27 acre fenced restricted area of Plum Brook Reactor Facility. Three separate stockpiles will be established and designated by the three soil classification levels discussed previously. The piles will be separated so there is no mixing of soil between the piles. The piles will be periodically churned with earthmoving equipment to facilitate drying to a level that allows survey and scanning. Moisture content limitations are based on qualitative rather than quantitative limits since the radiological survey system can accommodate a wide range of moisture levels. The limits are based on the ability to easily handle and convey the material without plugging and clogging of the machinery. Typically, the moisture content will be below 30% by weight.

Survey Process:

Radiological survey of the soil that has been previously segregated according to the criteria described above is accomplished using an automated proprietary system owned by our sub-contractor, MACTEC, Inc.. The details of the system design is fully described in other correspondence. In general, a segregated pile of soil is fed into the system using a scoop loader. It is batched in nominal 500 ton batches that constitute a Survey Unit. The soil passes through

two stages of screening that removes rocks and debris larger than 3 ½ inches in size. The screened soil is deposited onto a moving conveyor in a six-inch layer where it is scanned by a series of sodium iodide detectors. Feed rates and scan speeds are designed to achieve a minimum detectable concentration scan (MDC_{SCAN}) of less than ½ of the respective DCGL. The density of the material is measured by the equipment so than conversion of direct gamma readings to an isotopic concentration are automatically compensated for variations in density and total moisture content. The automated system is set up to divert the system conveyors to either 'acceptable' or 'reject' pathways based on large volume scan rates and on detectable point sources. The design of the set points and scan rates is described in the Technical Basis Documents submitted under separate correspondence. In general, the system is designed to segregate material that exceeds the DCGL from material that is below the DCGL with significant levels of conservatism applied. The scanning process is supported by sampling and laboratory analysis to confirm the integrity of the scanning process. In addition, it is subjected to periodic re-scans to perform Quality Control checks and verifications.

Soil that is classified as *overburden soil* is fed into the scanning equipment. Material that successfully passes through and is demonstrated to be below the DCGL is discharged by the system conveyors to a clean release pile located outside of the fenced restricted area. This material, when finally released after QC checks and confirmatory analyses, will be used later as fill material on-site. Material that exceeds the DCGL will be automatically diverted by the system's conveyors to a stockpile located inside the fenced restricted area for later transport to a disposal facility.

Soil designated as *contaminated soil* (i.e., field surveys show radioactivity levels above the RAL but below the DCGL) is fed into the scanning equipment. Some of this soil is likely to successfully pass through and be demonstrated to be below the DCGL. It will be discharged by the system conveyors to a clean release pile located outside of the fenced restricted area for use later as fill material on-site. Material that exceeds the DCGL will be automatically diverted by the system's conveyors to a stockpile located inside the fenced restricted area for later transport to a disposal facility.

Soil determined by field surveys to meet the *direct off-site disposal threshold* will be stockpiled inside the fenced restricted area. This soil will be assayed to obtain sufficient data to perform the necessary evaluations for preparation of shipping manifests, evaluate the 10CFR61 classifications, and confirm conformance to the disposal site or processor's Waste Acceptance Criteria. Assay will be performed by either direct sample and laboratory analysis, field survey, scanning with the MACTEC, Inc. equipment, historical survey information, or a combination of these. If any of this material, which is known to exceed the limits for remaining on site at license termination, is scanned using the automated MACTEC, Inc. equipment, the conveyors which divert material to the "clean" soil stock pile will be deactivated to preclude any potential comingling of clean and contaminated material. This material will be packaged and shipped for disposal via an off-site licensed processor or by direct transport to a licensed disposal facility.

Disposal Options:

Soil determined to be radioactively contaminated above the levels that would allow it to remain on site as described in the Decommissioning Plan and Final Status Survey Plan will be packaged for disposal at an offsite disposal facility.

There are two disposal alternatives currently being considered as viable options for offsite disposal of this material.

This material could be packaged for transport and be shipped to a licensed disposal facility meeting the license requirements of 10 CFR 61. An example is the Energy Solutions burial facility in Clive Utah. This facility is licensed for the disposal of certain Low Level Radioactive Waste under a State of Utah License (Utah is an Agreement State). The material shipped to this site would be disposed under a Waste Acceptance Criteria (WAC) that in general includes radionuclide concentrations up to the 10 CFR 61 Class A limit, with some exceptions and additional restrictions.

This material could also be shipped to a licensed processor for processing and disposal under their license. An example is Impact Services, Inc., of Oak Ridge Tennessee. Impact Services is licensed by the State of Tennessee (an Agreement State) to receive certain types of Radioactive Material for processing. They are in turn licensed by the State of Tennessee to characterize and release for disposal certain materials containing radionuclides under the State's Volumetric Clearance for Disposal Program.

These options both constitute disposal as specified in 10 CFR 20.2001(a)(1). NASA does not intend to propose or seek NRC approval for any forms of alternate disposal requiring approval under 10 CFR 20.2002.

Process Controls:

The processes described above will be prescribed by written procedures and Work Execution Packages that have been reviewed and approved by the Project Safety Committee.
During storage in the stockpile, it will be protected from dispersal in accordance with the requirements of our Storm Water Pollution Protection Program. Procedural controls will be established that assure the following are specified:

- Excavation will be guided by field survey measurements and known characterization data.

- Soil that appears to be below our remediation action levels (currently set at ½ of the DCGL) will be set aside in "clean" stock pile for subsequent radiological survey and performance of FSS scanning. Material cleared through the scanner will be stockpiled for later use as backfill material that will be left on site at License Termination. Material that the equipment rejects as being above the DCGL will be diverted to a stockpile that will later be prepped for packaging and shipment to a disposal facility.

- Soil that appears to contain a level of contamination that exceeds the remediation action level but is below the DCGL will be excavated and placed in a pile for later scanning. It is recognized that there will be some degree of mixing of this material as a result of periodic turning to dry it, removal of oversized debris such as rocks, and from its relocation. However, it will be segregated from the 'clean' stockpile described above to avoid any intentional blending. The MACTEC, Inc. scanning process is expected to clear some of this soil as 'clean' but will discharge a portion of it to the stockpile that will later be prepped for packaging and shipment to a disposal facility.

- Soil that field surveys determine to be likely to exceed the DCGL will be segregated in a stockpile slated for disposal. No attempt will be made to clear this material for free release or to blend it down to a lower concentration to meet free release criteria.

- Where a known hot spot appears or where field scanning shows known contamination at a level at some multiple (as yet to be determined) of the DCGL, the excavated soil will be removed and stockpiled as known contaminated material. Scanning of this material, when performed, will be for the purpose of assaying it to determine transportation and disposal classification. It may be segregated by level of contamination for later blending to meet Waste Acceptance Criteria at the chosen disposal site. No attempt will be made to clear any of this material for remaining on site.

While stockpiled, material will be protected from inadvertent dispersion by wind and rain using appropriate covers and construction techniques as specified in our Storm Water Pollution Protection Plan.

Disposition of the soils will be in a manner that meets the following criteria:

- Clean soil will not be intentionally mixed with contaminated soil to achieve sufficient dilution to allow reclassification as 'clean' so that it may remain on-site at license termination.

- Clean soil will not be intentionally mixed with contaminated soil to satisfy Waste Acceptance Criteria (WAC) at either the processor's facility or at the disposal site.

- Low level contaminated soils will be blended with higher level contaminated soils to satisfy WAC requirements when necessary and to achieve the most cost effective shipping and disposal program. This blending will be controlled in such a manner that it will not result in a reduction in the waste classification of any material (for example, Class B waste will not be diluted to Class A concentrations).

The processes used for sorting and segregation of the materials as well as characterization data have been reviewed by both our intended off-site processor and the potential off-site waste burial sites. The processes have been determined by both to be capable of achieving an end product that meets all of the size, physical characteristics, and homogeneity requirements of their facility licenses and Waste Acceptance Criteria.