

National Aeronautics and  
Space Administration

**John H. Glenn Research Center**  
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Sandusky, OH 44870



July 12, 2012

QD

Reply to Attn of:

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

Subject: Response to NRC Staff Comments on Final Status Survey Report Main Body, for the Plum Brook Reactor Facility, Licenses Nos. TR-3, Docket No. 50-30 and R-93, Docket No. 50-185

On June 6, 2012, the NRC Staff submitted questions via email related to staff reviews of our submittal of the Main Body of the Final Status Survey Report for the Plum Brook Reactor Facility.

Our responses to the staff's questions are contained in Enclosure 1 to this letter. A revision to the Main Body of the Final Status Survey Report will be submitted in the near future incorporating these comments and responses.

Should you have any questions or need additional information, please contact me at NASA Glenn Research Center, 21000 Brookpark Road, M.S. 3-11, Cleveland, Ohio, 44135, or by telephone at (216) 433-3103.

A handwritten signature in black ink, appearing to read "P. Kolb", with a long horizontal line extending to the right.

Peter C. Kolb  
NASA Decommissioning Program Manager

Enclosure

Response to NRC Staff comments on the Plum Brook Reactor Facility Final Status Survey Report, Main Body, Revision 0, March 30, 2012 (ML 12095A156).

cc:  
USNRC/C. J. Glenn (FSME)  
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FSME20

**Response to NRC Staff comments on the Plum Brook Reactor Facility Final Status Survey Report, Main Body, Revision 0, March 30, 2012 (ML 12095A156)**

**Question 1:**

MBR Section 1, Page 1 NASA states, "The PBRF Final Status Survey (FSS) Report comprises 19 volumes: this volume and 18 attachments". This statement does not encompass the Plum Brook project discussed in the MBR (e.g., page 14, 31, and 80) which is not an attachment. Brief mention of the Plum Brook project should be included up front in the MBR.

**NASA Response:**

This section was modified by adding the following: "It also provides an overview of the characterization, surveying, and cleanup activities of the Plum Brook. These activities were previously reviewed and evaluated by the NRC. In that evaluation, NASA demonstrated that the dose to a member of the critical group from residual radioactivity in sediments from Plum Brook is well below the dose criterion for unrestricted use in 10 CFR 20.1402."

**Question 2:**

Section 2, Page 2, Last paragraph of this section includes statement "By late 2011, all the PBRF buildings and most structures, except the Reactor Building, Hot Laboratory, and Primary Pump House, were demolished and excavated to 3 ft below grade and backfilled." Based on the current status of decommissioning activities, this statement is no longer true.

**NASA Response:**

Section 2, Page 2, Last paragraph is revised to read, "By July 2012, all the PBRF buildings were demolished and excavated to 3 ft. below grade and backfilled. The only structure remaining is the Reactor Security Control Building (RSCB) which will remain intact for future use."

**Question 3:**

Section 2.3, Page 14, Under the "Plum Brook" heading, there is a summary discussion addressing offsite contamination. This section states "From discussions with NRC and Ohio DOH, it was agreed that the 25 mrem/year dose criterion approved for PBRF would also apply to the Plum Brook and environs. In accordance with this agreement, the Plum Brook and environs were shown to be suitable for release for unrestricted use through dose modeling calculations."

Since offsite contamination is not part of the NRC licensed facility, there would be no "release" of offsite areas for unrestricted use.

NASA Response:

The Section was modified to read; "In accordance with this agreement, NASA demonstrated through dose modeling calculations that the dose to a member of the critical group from residual radioactivity in sediments from Plum Brook is well below the dose criterion for unrestricted use in 10 CFR 20.1402."

Question 4:

Section 3.4, Page 32, The "Handling and Processing of Excavated Materials" heading includes a discussion of material disposition resulting from pre-excavation scan surveys. The discussion related to "action level" is confusing, for example:

1. Refers to **material determined to be above the action level for offsite disposal (>DCGL)** was, transported directly to an "above criterion" radwaste stockpile and staged for disposal as radioactive waste;
2. Refers to **material determined to be below the RAL** was transported to an "overburden stockpile"; and
3. Refers to **material above the RAL and below the DCGL** was transported to a "contaminated stockpile."

Clarify the meaning of "action level" in Item 1 and "RAL" in Items 2 and 3.

NASA Response:

Item 1 was amended to read, "Material determined to be above the action level for offsite disposal (> DCGL) was transported directly to a stockpile and staged for disposal as radioactive waste – no FSS of this material was performed. For Items 2 and 3, the definition of RAL was added to the List of Acronyms & Symbols. RAL is also defined in Footnote 13.

Question 5:

Section 3.4, Page 37, Tables 1 and 2, According to a recent conference call on the status of PBRF decommissioning, NASA plans to make another waste shipment in 2012. Update Tables 1 and 2, for 2012 waste shipments, as appropriate.

NASA Response:

When all radioactive waste shipping is completed and NASA is prepared to submit the formal request for termination of the Licenses, a revision to Tables 1 and 2 in the MBR will be submitted reflecting the final data on waste material shipping.

Question 6:

Section 4.1, Page 38, Last paragraph states "The PBRF dose goal for EP is 1 mrem/y. However, a different dose goal may be applied in an area as long as the residual

contamination on the structure surface in the survey unit containing the given EP is sufficiently low to allow for the selected dose goal.”

This sentence is unclear since it leaves open the value of the selected dose goal. NASA should clarify the constraint on the selection of a different dose goal for Embedded Piping (EP) survey unit consistent with NASA’s Final Status Survey Plan (FSSP). Clarify constraint of the selection of a different dose goal for EP consistent with NASA’s FSSP.

NASA Response:

The following was added to this section to read, “The FSSP, Section 3.3 states “The PBRF dose goal for EP is 1 mrem/yr. However, at the discretion of PBRF, different dose goals could be applied in different areas as long as the residual contamination on the structure surface in the survey unit containing the given EP is sufficiently low to allow for the selected dose goal. For example, if the FSS results indicate that the residual contamination level in Hot Dry Storage is 0.5 times the DCGL, the dose from the two drains in this survey unit could be as high as 12.5 mrem/yr.”

Question 7:

Section 4.5, Page 55, Table 17 states that for FSS of most of the excavated soil where Cs-137 is the predominate radionuclide, the most limiting  $DCGL_{sur}$  value, 10.3 pCi/g, was used as the basis for scan survey investigation and action levels, but in Table 17, under the column Scan  $DCGL_{sur}$  there are different values. This suggests the most limiting  $DCGL_{sur}$  value, 10.3 pCi/g was not used in other areas. The values in Table 17, do not comport with the statement in the first paragraph. Provide an explanation for the difference in the first paragraph or correct the values in Table 17.

NASA Response:

This section was modified to read, “Excavated soils from various locations were stockpiled prior to FSS as described in Attachment 18. For the FSS of the previously excavated soil, the most restrictive  $DCGL_{sur}$  values were used as the basis for scan survey investigation and action levels (10.31 pCi/g Cs-137; 3.28 pCi/g Co-60) since the soil from different areas was comingled and the exact location of soil origin could not be assured.” The DCGLs shown in Table 17 refer to specific land areas within the PBRF where radionuclide ratios were determined to be unique. The development of the various associated DCGLs for these areas is contained in PBRF-TBD-09-001.

Question 8:

In Section 5.1, Page 68 NASA states “However, the scan action level was exceeded in only 76, or 11%, of the 665 PBRF structure survey units.” Is this good or bad? Does this indicate a problem of non compliance? Are 76 survey units still not in

compliance? Provide more clarity to the statement and indicate the impact of this statement, if any?

NASA Response:

This section was modified to read, "It also identifies those structures in which the scan investigation level was exceeded in one or more survey units. Investigation levels are provided in each Survey Design Package and are typically set at a fraction of the DCGL. The scan action level was exceeded and investigative measurements performed in 76, or 11%, of the 665 PBRF structure survey units. Locations identified by scan or static measurements that exceed an investigation level are marked, verified, and additional measurements are collected. The results of these investigations are shown in Table 27. In all these cases, the measurements were below the DCGL<sub>EMC</sub> and the EMT unity rule sum was  $< 1.0$ . It is noted that most localized areas of elevated activity were quite small, typically about 100 cm<sup>2</sup> or less and an area factor of 40.2 applied. Thus, in no case was the 25 mrem dose criterion exceeded by the added contribution from localized areas with concentrations in excess of the DCGL."

Question 9:

In Section 5.1, Page 70, Table 26 the foot note 2 to Table 26, "Systematic Total Surface Beta Activity Measurement Results for PBRF Structures", states that "The DCGL<sub>w</sub> values shown in the table for comparison to measurement results are the smaller of the original or revised DCGL<sub>w</sub> values for the structure survey units in each building or structure". However, the values provided in the last column of Table 26, (DCGL<sub>w</sub>) do not seem to reflect this statement. Revise, as necessary, to correct apparent discrepancies.

NASA Response:

The DCGL<sub>w</sub> values shown in Table 26 were modified to exclude the contribution from deselected radionuclides (10%). This fact was not mentioned in the table footnote. To avoid confusion, the DCGL<sub>w</sub> values given in Table 26 have been corrected to show the lowest of the DCGL<sub>w</sub> given in Table 8 of TBD-11-002 for the survey units in each building or structure. The footnote was also revised for clarity.

Question 10:

In Section 5.3, Page 74, NASA needs to revise this section (and other areas in this report that reference Buried Piping (BP) or Miscellaneous Piping (MP) consistent with the response to the NRC staff request for additional information (RAI) on Attachment 17. Review and update the MBR to accurately reflect the response to NRC staff RAI on Attachment 17.

NASA Response:

Section 5.3 was revised to reflect the changes made to Attachment 17 as a result of NRC Staff request for additional information. Specifically, a discussion was added to describe the dose assessment that was performed and documented in TBD-12-002. The result of this assessment shows that the dose contribution from BP/MP is less than 0.2 mrem/yr.

Question 11:

Section 5.3, Page 75, Table 31, According to NASA, some values for maximum activity in Table 31 are not correct. Correct maximum activity values in Table 31.

NASA Response:

Class 1 survey unit values were corrected in Table 31. The Class 3 values are correct and unchanged.

Question 12:

Section 5.3, Page 74, under heading "Buried and Miscellaneous Piping", the description of MP is not consistent with the description of MP used elsewhere in the FSSR. NASA's description of MP should be consistent with [the] description [of] MP in FSSR Attachment 17, which states MP is "any piping, conduit or similar piping which does not meet the definition of Buried Piping or Embedded Piping as defined in the PBRF FSS plan, **but will remain in the structure.**" Ensure [the] description of MP in MBR is consistent with description in FSSR Attachment 17.

NASA Response:

See NASA's response to Question #10 above. The description of MP was revised to be consistent with Attachment 17.

Question 13:

Section 5.4, Page 80, based on discussion under "Water Sample Results", NRC staff could not determine if other radionuclides (i.e., Co-60, Cs-137, or Sr-90) were considered when conducting analyses.

NRC staff suggests that NASA reference PBRF Technical Basis Document on groundwater monitoring and incorporate relevant information from this document into MBR to address this point. NASA needs to clarify if other radionuclides, such as Co-60, Cs-137, or Sr-90, were present during analysis of groundwater and state accordingly.

NASA Response:

The following was added to this section, "All PBRF environmental water samples are analyzed by the on-site laboratory for gamma emitting radionuclides and tritium prior to being sent to an off-site laboratory for additional gross alpha and beta analysis. If gross activity results exceed a Project Specific Action Limit (PSAL) additional radionuclide measurements are performed (e.g., Sr-90, Am-241, Cm-242, Pu-238, etc.)." The Technical Basis Document, TBD-12-001 is referenced in the third sentence of this section.

**Question 14:**

Section 6.0, Page 88, based on NRC comments on MBR, NASA needs to revise and update conclusion section. More specifically, the very last statement would have to be revised and updated based on Comment 10. Revise and update conclusion section based on NRC comments on MBR and FSSR Attachment 17.

NASA Response:

Section 6.0 was revised to incorporate the changes made as a result of NRC comments on MBR and Attachment 17.

**Response to NRC Staff minor editorial comments on the Plum Brook Reactor Facility Final Status Survey Report, Main Body, Revision 0, date March 30, 2012 (ML 12095A156)**

**Comment 1:**

List of Effective Pages, update Revision Level Column to reflect latest revision number for Attachments

NASA Response:

The List of Effective Pages will be updated in the final MBR to reflect the final revision status of all eighteen attachments.

**Comment 2:**

Section 2.1, Pages 5-11, the nomenclature should be consistent. Under Reactor Building (Building 1111), it begins with "The Reactor Building (RB)..." The nomenclature for other subtopics is not consistent with the nomenclature used in the Reactor Building. For example, the next subtopic is Hot Laboratory and there is no nomenclature (HL). In other subtopics, NASA uses only nomenclatures and not the identity of the structure (see pg. 6). NASA on some occasions uses only nomenclatures to identify an issue in the report.

NASA Response:

The text was revised to provide a consistent nomenclature for subtopics.

**Comment 3:**

Section 2.1, Page 7, the title begins with un-numbered Buildings and Structures. This subtopic is not tied to an Attachment and it is uncertain as to what the author is describing. As with other subtopics, tie the subtopic to an Attachment. Each subtopic should be traced to an Attachment.

NASA Response:

This section was removed from the text. Figure 3 was changed to show all major PBRF structures and pads. All subtopics reference the appropriate FSSR Attachment.

**Comment 4:**

Section 3.4, Page 32, use of acronym "RAL" in Item #2 (Question #4). This is not in List of Acronyms and Symbols, and it is not clearly define in text. Spell out what is "RAL".

NASA Response:

A definition of RAL was added to List of Acronyms & Symbols.

**Comment 5:**

Section 4.1, Page 38, Last paragraph incorrectly refers to EP DCGL values in Table 3. The DCGL values for EP are actually listed in Table 5. Table 3 provides DCGL values for PBRF structures. Correct reference to correct table for EP.

NASA Response:

The text was corrected to refer the reviewer to Table 5, DCGL Values for Embedded Piping.

**Comment 6:**

Section 4.1, Page 38, Table 3 identifies U-236 as a Radionuclide. This is not consistent with TBD-11-002, Table 5, which shows U-238. Is this the correct uranium radionuclide in Table 3? Use the correct radionuclide or provide an explanation as to why U-236 should be there.



NASA Response:

Table 3 correctly identifies the DCGL for U-236 as a radionuclide of concern in PBRF structures per the FSSP. However, U-236 and other radionuclides representing less than 10% of the 25 mrem/y dose were eliminated from further evaluation. To ensure the 25 mrem/yr criterion is met, if any structural survey unit FSS results indicated that the dose may be greater than 22.5 mrem/yr a further review would be made to ensure compliance with the unrestricted use dose limit. The U-238 is shown in TBD-11-002, Table 5 to demonstrate that the U-234/U-238 ratio is strongly indicative of natural uranium.

Comment 7:

Section 4.5, Page 57, the purpose of Table 19 is not readily apparent based on the discussion preceding this table. MBR discussion should clarify purpose of Table 19.

NASA Response:

This sentence is added to the end of the paragraph preceding Table 19, "The purpose of this table is to demonstrate that the FSS survey design parameters are not significantly affected by the changes in the DCGLs calculated in TBD-11-002 [PBRF 2012]."

Comment 8:

Section 4.8, Page 67, in the 3rd paragraph correct spelling of embedded "pie" to embedded pipe.

In 4th paragraph, which includes 5 items on data analysis and statistical testing, check No. 2 for accuracy?

No. 5 is missing a parenthesis. In sentence "If the results of the statistical test (S+ for Sign Test, or W for the WRS test) > the critical value, the survey unit passes. If not true the survey unit fails. However, No. 5 doesn't state what happens if survey unit fails. Should add if survey unit fails, what further remediation and resurvey is required?"

NASA Response:

The spelling and typographical errors noted are corrected in the Revision 1 text. The 4<sup>th</sup> paragraph correctly describes the DQA process as presented in the FSSP. Item No. 2 accurately presents the action levels for each survey unit classification. In Item No. 5, the last sentence was amended to read, "If not true, the survey unit fails and reclassification or further remediation and resurvey are required."

**Comment 9:**

Section 5.2, Page 7, Table 28, Column titled "Investigative Sample Results (pCi/g)" first description uses "pi/g". This is not the correct units.

**NASA Response:**

Typographical error was corrected to read "pCi/g".