

National Aeronautics and
Space Administration

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



March 26, 2008

Reply to Attn of: QD

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

Subject: Report of Reactor Status for the NASA Plum Brook Reactor
(License No. TR-3, Docket 50-30) and the NASA Plum Brook
Mock-Up Reactor (License No. R-93, Docket 50-185)

Enclosed is the Annual Status Report dated March 2008 for the Plum Brook Reactor (License TR-3) and the Plum Brook Mock-Up Reactor (License R-93). This Report is for the period January 1, 2007, through December 31, 2007. Submission of this Report is in compliance with Technical Specification 6.12.1 of the current TR-3 and R-93 possess-but-not-operate licenses that became effective March 20, 2002.

Subject reactors are currently undergoing decommissioning.

Sincerely,

A handwritten signature in black ink, appearing to read "Keith M. Peacock".

Keith M. Peacock
NASA Decommissioning Program Manager

Enclosure

A020
NRR

cc:

USNRC/C. J. Glenn (FSME)

USNRC/J. Webb (FSME)

USNRC/W. G. Snell (RIII/DNMS/DB)

ODH/M. J. Rubadue

ANNUAL STATUS REPORT
FOR THE
NASA PLUM BROOK REACTOR AND
PLUM BROOK MOCK-UP REACTOR

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ANNUAL STATUS REPORT
FOR THE
NASA PLUM BROOK REACTOR AND
PLUM BROOK MOCK-UP REACTOR

1. Introduction

The following Annual Status Report for the period January 1, 2007, through December 31, 2007, has been prepared pursuant to Technical Specification 6.12.1 of the Plum Brook Reactor Facility (PBRF) TR-3 and the Mock-up Reactor (MUR) R-93 Licenses, both effective March 20, 2002. These are possess-but-not-operate licenses, and the facility is operating in accordance with its Decommissioning Plan, also effective March 20, 2002.

2. Summary of Facility Activities

NASA estimates that 99 percent of the original radioactive source term has been removed since the beginning of the Decommissioning Project. In addition, nearly all of the fixed and loose equipment has been removed from the Plum Brook Reactor Facility.

Decommissioning activities have continued to concentrate on risk reduction activities. These activities have entailed work necessary to characterize the remaining work scope, to reduce the risk of migration of radioactive material, and to remove major risks to the cost and schedule of project completion.

A major task undertaken was to decontaminate the remaining Hot Cells after a successful demonstration in Hot Cell No. 1 in which the largest and most contaminated of the seven hot cells and was decontaminated to decommissioning release criteria. Decontamination of the structural surfaces of all seven Hot Cells was completed.

Decontamination of embedded piping continued throughout the year. Nearly all of the 20,000 linear feet of embedded and buried system pipe has been decontaminated. Only small sections remain to be completed. NASA expects to fill about 7200 linear feet of embedded pipe with grout and leave it in place. As sections of pipe were decontaminated and subjected to final survey, completed Survey Unit Release Records were submitted to NRC Region III staff for review against the criteria in our proposed Final Status Survey Plan. After review by Region III, the piping was grouted in place. About 5000 linear feet of embedded pipe has been grouted to date.

Decontamination of building surfaces proceeded in the Reactor Office and Laboratory Building (ROLB), Services Equipment Building (SEB), and Cold Pipe Tunnel (CPT). These areas were successfully cleaned to the Decommissioning License Termination criteria of 10 CFR 20 Sub-Part E. Surveys to the criteria of the proposed Final Status

Survey Plan were completed in the ROLB and are currently in progress in the SEB and CPT. Structural surface decontamination began and remains in progress in the Fan House, Waste Handling Building, Hot Pipe Tunnel, and Primary Pump House. NRC Region III staff has monitored our progress in these areas and has performed on-site inspections of our Final Status Survey activities.

Work began in October 2007 to decontaminate the wall surfaces in the quadrants and canals. About 46,000 square feet of surface is coated with mastic that contains asbestos. The mastic must be removed prior to survey of the wall surfaces.

The Water Effluent Monitoring Station (WEMS) pit was cleaned and the surfaces decontaminated during the summer of 2007. The sludge was discharged to a sedimentation area and allowed to dry. It will be processed later along with other soils from the site.

Characterization of Plum Brook has also continued with the services of a local hydrogeologist to assist in survey planning and sampling of Plum Brook and a marshy area where Plum Brook discharges into Sandusky Bay. In excess of 5000 soil and sediment samples have been collected in Plum Brook and Sandusky Bay. NASA is developing a dose model that will be used in establishing release criteria for these areas. Derived Concentration Guideline Levels (DCGLs) will be developed using the dose model. The dose model, proposed DCGLs, and Final Survey methodology will be submitted as a supplement to the Final Status Survey Plan for NRC review and approval prior to remediation of these areas and license termination.

In November 2007, NASA issued a Request for Proposal in preparation for contracting the final completion of remaining Decontamination and Decommissioning. The contract will address final decontamination, shipment of all remaining radioactive wastes, and preparation of all remaining areas of the facility for Final Status Survey. NASA expects to complete review of all submitted and selection of the successful bidder in April 2008, and mobilization of the Contractor by June 2008.

3. Major Preventative and Corrective Maintenance Operations

The only significant preventative or corrective maintenance operations conducted this year was roof repairs to several areas of the facility and sealant injection in several building foundations and sumps. This work was performed to reduce the amount of rain water and ground water intrusion that creates the potential for spread of contamination and creates a waste water stream requiring treatment and control.

4. Major Changes in Reactor Facility, Procedures, and Activities

Fixed and loose equipment removal has been completed in most areas of the site. To date, nearly all of the equipment has been removed from the facility and about 99

percent of the radioactive source term has been either removed and disposed, or is packaged awaiting transportation to a disposal facility. The only significant original reactor systems equipment that remains are four underground storage tanks in the Hot Retention System, overhead cranes that are still operational and in routine use, and two inverted cone shaped Cold Retention Basins of about ½ million capacity each. The remaining decommissioning work involves building structural decontamination, decontamination and survey of tank and transformer structural foundations, Decontamination and survey of the cooling tower basin and foundation, and remediation of soils, underground drainage systems, and the plant discharge pathways through Pentolite Ditch and Plum Brook. In addition, the bulk of the remaining radioactive source term resides in activated and contaminated concrete in the Reactor Biological Shield which will be remediated early next year.

The structural surfaces of all seven Hot Cells have been successfully decontaminated to the proposed free release criteria. Decontamination of small bore piping and conduit embedded in the hot cell structure continues. The Reactor Office and Laboratory Building (ROLB) and the Services Equipment Building (SEB) have been decontaminated. Final Status Survey has been completed in the ROLB and has begun in the SEB. Decontamination is in progress and nearly complete in the Fan House, Waste Handling Building, Primary Pump House and Warm Handling Room. In addition, nearly all embedded pipe has been cleaned and surveyed. Grouting has been completed of about 5000 linear feet of embedded pipe that was surveyed to the Final Status Survey Plan criteria. It is expected that about 7200 linear feet of embedded pipe will be grouted and left in place.

Seven activated control rods from Plum Brook Reactor are in safe storage in a commercially available dry storage cask located on the Plum Brook Station property away from the Reactor Facility. NASA has obtained approval from the US Department of Energy to dispose of the control rods at the DOE Nevada Test Site. Macro-encapsulation within a High Integrity Container and shipment of the rods for disposal is expected to occur in Mid January 2008.

There were no changes to the facility or to procedures, nor were there any tests or experiments conducted requiring safety evaluation pursuant to 10CFR50.59.

5. Release of Radioactive Effluents

There have been no uncontrolled releases from the site to the environs during this reporting period. This statement is based on the results of continuous local monitoring at the job site while work has been going on, and the results of offsite environmental monitoring as described in the next section.

During year 2007, water accumulated from system draining, ground and rain water infiltration into building areas not drained by operable sumps, and from flushing of embedded piping has collected and treated by filtration. This water was batch released by hauling to a Publicly Owned Treatment Works (POTW) for disposal into the

sanitary sewerage system. The water was isolated and sampled prior to discharge and was confirmed by offsite laboratory analysis to meet the discharge limits specified in 10 CFR 20, Appendix B, Table 3. About 44,000-gallons of water was released in this manner over the one year period. The total activity released was comprised of 35 milli-curies of H-3 (Tritium), 0.15 milli-curies of Cs-137 (Cesium-137), and 0.15 milli-curies of Sr-90 (Strontium-90). In addition, about 2500 gallons of similarly processed water was discharged directly to the environment by way of an operational building sump. This water was confirmed by offsite laboratory analysis to meet the discharge limits specified in 10 CFR 20, Appendix B, Table 2, Column 2. The total activity released was comprised of 92.5 micro-curies of H-3 (Tritium), 0.72 micro-curies of Cs-137 (Cesium-137), and 0.92 micro-curies of Sr-90 (Strontium-90).

6. Environmental Survey Results

NASA has continued offsite environmental monitoring for the PBRF. This has included monitoring of direct radiation, air, ground water, surface water, and silt.

Airborne monitoring was done using six continuous air samplers (four at the facility fence line, one ½ mile upwind, one 1 mile downwind). Filter elements from the units are collected weekly. They are sent to an off-site laboratory gross alpha and gross beta activity analysis. In addition, they are evaluated for airborne metals.

Environmental TLDs are used to monitor radiation exposure in the environment to assess the radiological impact of decommissioning activities. Six Environmental TLDs and one control TLD are changed and measured monthly. Five Environmental TLDs are changed and measured quarterly, and eight Environmental TLDs are changed and measured annually. Four of the monthly Environmental TLDs are co-located with each of the four fence line air samplers.

Water and silt sampling is performed in several locations in potentially impacted surface streams. Samples are collected monthly, and sent off site for analysis. Background samples (i.e. from locations well upstream) are also collected and analyzed. Groundwater monitoring is done using a number of wells, both overburden and bedrock, and building sumps that collect ground water in-leakage.

The following is a synopsis of the sampling from January 2007 through December 2007:

- Fenceline air filter results were below Project Specific Action Levels (PSALs) for the reporting period. Fenceline metal samples were similar to the background up-wind and down-wind results thus concluding no impacts from PBRF operations.
- Surface water samples exceeded the PSAL for gross alpha at Station 2 in May and June 2007. No PBRF-associated radionuclides (Americium 241, Curium 243/244, and Plutonium 238, 239/240) were detected in subsequent analysis. The gross

beta PSAL was exceeded once at Station 2 in June 2007. Small amounts of Cesium-137 and Strontium-90 were detected. Station 2 is in an area of known legacy contamination. No activity that could cause a release was performed during this period. The regulatory levels in 10 CFR 20, Appendix B, Table 2, Column 2 were not exceeded.

- Sediment samples were above PSALs for gross beta at Station 3 from June to October. Small amounts of Cesium, Cobalt-60, and Strontium-90 in sediment were detected. Station 3 is in an area of known legacy contamination. No activities that could have caused a release were performed during that timeframe. No exceedances of the gross alpha PSALs in sediment were found.
- In groundwater, random exceedances of the PSAL for gross alpha were found during the reporting period. After additional analysis, no PBRF-specific radionuclides were detected. One gross beta PSAL exceedance was found in RA01 in February 2007. No PBRF-specific radionuclides were detected.
- Based on environmental TLD measurements, elevated exposure rates were not observed at any offsite station that can be attributed to PBRF activities.

All other observed levels remained consistent with those seen through the last 30 years of shutdown monitoring. The levels are indistinguishable from background levels. Detailed monitoring results are available in the PBRF Annual Environmental Report dated March 2008.