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EPA REGION 9

RCRA ENFORCEMENT, PERMITTING, AND ASSISTANCE CONTRACT

FINAL
ROCKETDYNE TECHNICAL SUPPORT AND FIELD OVERSIGHT DOCUMENT REVIEW FOR BUILDINGS T009, T011, T019, T055, AND T100

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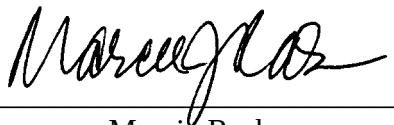

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ABBREVIATIONS AND ACRONYMS

DHS	Department of Health Services
DOE	U.S. Department of Energy
dpm/100cm^2	Disintegrations per minute per 100 square centimeters
EPA	U.S. Environmental Protection Agency
ETEC	Energy Technology and Engineering Center
FCEL	Fast Critical Experimental Laboratory
m	Meter
m^2	Square meter
MARSSIM	Multi-Agency Radiation Site Survey Investigation Manual
NMDF	Nuclear Materials Development Facility
NRC	U.S. Nuclear Regulatory Commission
OMR	Organic moderated reactor
ORISE	Oak Ridge Institute for Science and Education
OV	Oversight/Verification
Rocketdyne	Boeing-Rocketdyne
SGR	Sodium graphite reactor
SSFL	Santa Susana Field Laboratory
SNAP	Systems for Nuclear Auxiliary Power
Tetra Tech	Tetra Tech EM Inc.

EXECUTIVE SUMMARY

This report documents completion of an independent technical review by Tetra Tech EM Inc. (Tetra Tech) of: (1) decommissioning survey work plans and final radiological survey reports prepared by Boeing-Rocketdyne (Rocketdyne) for Buildings T009, T011, T019, T055, and T100; and (2) oversight and confirmation surveys of Buildings T019 and T055 performed by Department of Energy contractor Oak Ridge Institute for Science and Education. A previous draft of this report was provided to the Santa Susana Field Laboratory (SSFL) Workgroup and to Rocketdyne for review and comment. This final report incorporates Rocketdyne's comments on the draft report and additional data they provided and includes Tetra Tech's final summary and recommendations regarding release of the five buildings from further radiological controls.

The initial draft of this report was forwarded to the SSFL Workgroup and Rocketdyne by the U.S. Environmental Protection Agency (EPA). Tetra Tech recommended that Rocketdyne provide the following information to EPA:

- For Building T011: Documentation of a 100 percent qualitative survey of the southern wall of Room 108 and data for the five sink traps, as discussed in the report entitled, Building T011 Final Survey Procedure (Rockwell International 1996)
- For Building T019: Clarification of the apparent disagreement between the Executive Summary and the body of the Building T019 status report about the configuration of the survey lots
- For Building T019: Removable activity data from Lot 5 of Building T019, as discussed in the Building 4019 (T019) status report
- For Building T100: A copy of the detailed survey results of the original radiological surveys that are believed to have been conducted in 1980. It was reported in Rocketdyne correspondence that the detailed data are on file at Rocketdyne.

In addition, Tetra Tech made a general recommendation that any future final status surveys be performed and documented in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (EPA 2000). Tetra Tech also recommended use of the Nuclear Regulatory Commission document, A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys, NUREG 1505 (Nuclear Regulatory Commission 1998).

Rocketdyne provided responses to the comments and recommendations in a letter forwarded to EPA on October 1, 2001. The Rocketdyne response to Tetra Tech comments and recommendations satisfactorily resolved each comment.

Tetra Tech concludes that the radiological surveys of Buildings T009, T011, T019, T055, and T100 discussed in this report were adequately performed and that the surveys were sufficiently documented. This conclusion is based on review of survey procedures and resultant reports and the supplemental information provided in the October 2001 Rocketdyne submittal. The acceptability of the radiological surveys was based on a review of the practices that were ordinarily used within the industry at the time they were performed. The review considered:

- Sensitivity and reliability of the survey instruments used
- Frequency and rigor of instrument calibration
- Representativeness of sampling locations
- Level of detail of the survey
- Correlation between text and data tables
- Adequacy of documentation

1.0 INTRODUCTION

On May 30, 1997, Tetra Tech EM Inc. (Tetra Tech) received Work Assignment No. R09805 from U.S. Environmental Protection Agency (EPA) Region 9, under Contract No. 68-W 99-008, Resource Conservation and Recovery Act Enforcement, Permitting, and Assistance, Zone III. As of April 1, 2002, this work assignment expired and incomplete tasks have been continued under Work Assignment No. R09107, Contract No. 68-W-02-021. Under this work assignment, Tetra Tech provides oversight, sampling, and independent technical reviews of documents pertaining to the radiological status of the Boeing-Rocketdyne (Rocketdyne) Santa Susana Field Laboratory (SSFL) and the U.S. Department of Energy's (DOE) Energy Technology and Engineering Center (ETEC) located within the SSFL.

Tetra Tech was tasked to perform an independent evaluation of the process used to assess the radiological status of selected facilities at SSFL and ETEC in Santa Susana, California. This review has three basic components:

- Technical review and documentation of measurements performed by Rocketdyne and DOE measurement contractor (Environmental Survey and Site Assessment Program, Energy/Environment Systems Division, Oak Ridge Institute for Science and Education [ORISE])
- Independent measurements by the EPA contractor
- Evaluation of independent measurements

This report documents a technical review of the following categories of documentation for Buildings T009, T011, T019, T055, and T100:

- Decommissioning survey work plans and final radiological survey reports prepared by Rocketdyne for five buildings selected by EPA for a technical review
- Oversight and confirmation surveys, where available, performed by the DOE measurement contractor
- Correspondence by Rocketdyne, the Nuclear Regulatory Commission (NRC), DOE, and the California Department of Health Services (DHS) about the radiological status of the involved facility

A draft report summarizing the technical review results was prepared by Tetra Tech. In the draft report, Tetra Tech recommended that Rocketdyne provide, if available, the following information to EPA:

- For Building T011: Documentation of a 100 percent qualitative survey of the southern wall of Room 108 and data for the five sink traps, as discussed in the report entitled, Building T011 Final Survey Procedure, published by Rocketdyne in 1996

- For Building T019: Clarification of the apparent disagreement between the Executive Summary and the body of the Building T019 status report about the configuration of the survey lots
- For Building T019: Removable activity data from Lot 5 of Building T019, as discussed in the Building 4019 status report
- For Building T100: A copy of the detailed survey results of the original radiological surveys that are believed to have been conducted in 1980. It was reported in Rocketdyne correspondence that the detailed data are on file at Rocketdyne.

This Final Report presents the findings and recommendations for the radiological status review of Buildings T009, T011, T019, T055, and T100 and incorporates additional information and comments from Rocketdyne.

2.0 SCOPE OF WORK

The scope of this report documents completion of an independent technical review by Tetra Tech of: (1) decommissioning survey work plans and final radiological survey reports prepared by Rocketdyne for Buildings T009, T011, T019, T055, and T100; and (2) oversight and confirmation surveys of Buildings T019 and T055 performed by ORISE. A previous draft of this report was provided to the SSFL Workgroup and to Rocketdyne for review and comment. This final report includes the Rocketdyne response to Tetra Tech comments, Tetra Tech's analysis of the Rocketdyne response, and Tetra Tech's final summary and recommendations regarding the decommissioning of Buildings T009, T011, T019, T055, and T100.

Subsequent to preparing the draft report, Tetra Tech has conducted verification surveys in Buildings T011, T019, T055, and T100. The verification surveys focused on areas with past contamination history or areas previously noted as having activity levels above acceptance criteria. Details of the verification surveys are discussed in the work plan addendum for Buildings T011, T019, T055, and T100 (Tetra Tech 2001). The verification survey data support the conclusion reached in this report that these buildings meet the acceptance criteria for release from radiological controls. The report of the verification surveys will be published separately.

Reports, letters, and other documents relating to Buildings T009, T011, T019, T055, and T100 have been reviewed in accordance with the statement of work. Over the history of the Rocketdyne SSFL, the numbering system for the various buildings has been revised. The same building may be identified as Building 019, T019, or 4019 in various Rocketdyne documents. For the purpose of this review, Tetra Tech will use the "TXXX" numbering system, even though some of the Rocketdyne or ORISE documents reviewed and referred to may use one of the other numbering systems. The documents reviewed for this project are listed in Appendix A.

3.0 GENERAL COMMENTS

Comments are divided into sections relating to: (1) survey reports for the specific sites and (2) the adequacy of the measurement process applied to the sites. This final report includes a description of findings associated with document reviews and, where applicable, a summary of Rocketdyne responses or comments and a final analysis and conclusion by Tetra Tech based on Rocketdyne responses.

3.1 COMMENTS ON SURVEY REPORTS

This section briefly discusses the survey reports published by Rocketdyne and ORISE. Rocketdyne performed surveys and published reports for each of the five buildings (T009, T011, T019, T055, and T100) covered in this report. ORISE performed confirmation surveys in two buildings (T019 and T055).

3.1.1 Rocketdyne Documents

Issue dates for survey procedures and survey reports for the five buildings (T009, T011, T019, T055, and T100) included in this review span a period from 1980 to 1999. The data provided to support the contamination status of the five buildings vary considerably in level of detail. For example, Building T100 was the location of the Fast Critical Experimental Laboratory (FCEL) reactor. Building T100 was surveyed in 1980. The survey report is a brief summary of the results of alpha and beta-gamma swipe or smear surveys collected in each room of the facility. In addition, beta-gamma radiation readings were taken in each area. Details, such as the location of individual smears, the total quantity of smears in each room, whether a statistically based sampling plan was used, calibration data for the instruments used, and background levels, were not included in the report. The survey of Building T100 met acceptance criteria applicable at the time and was approved as an adequate survey by NRC, following an on-site inspection. The building was released from radiological controls by NRC in October 1980.

In contrast, Building T019 was surveyed in 1998. Building T019 housed a reactor test chamber for the Systems for Nuclear Auxiliary Power (SNAP) program. The survey documentation for this building is far more detailed. Each area of the building was divided by grid and scan surveyed, both qualitatively and quantitatively. A statistically based sampling plan was employed, and survey data details, including error information, instrument information, and background levels, were recorded, Furthermore, a confirmation survey of the building was conducted by ORISE. Release of this building from radiological controls by DOE and DHS is pending.

In 1997, EPA published detailed guidance on design, performance, and documentation of final status radiological surveys. Revision 1 to this guidance was published in 2000. Implementation of this new guidance, Multi-Agency Radiation Site Survey Investigation Manual (MARSSIM Revision 1) (EPA 2000), will establish consistency in the application and acceptance of techniques used for facility characterization. Any future surveys should be performed in accordance with MARSSIM. Furthermore, when surveys must demonstrate compliance with multiple radionuclide criteria, MARSSIM and Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys (NRC 1998), which provides an approach based on sound statistical principles, should be consulted for guidance.

3.1.2 Oak Ridge Institute for Science and Education Documents

Tetra Tech reviewed verification survey reports prepared in 1987, 1996, and 1999 by DOE's oversight verification contractor, ORISE. The verification reports were issued for two of the subject buildings: T019 and T055. The verification reports did not provide specific detail on the location of measurements taken. A building layout was used to show where measurements were taken in Building T019. For Building T055, a grid system was employed for some of the measurements and a building layout was used for locating point measurements. Results of the survey measurements were reported in summary form, which listed the range of readings but not the specific data for each measurement taken.

3.1.3 Summary: General Comments on Survey Reports

The level of detail and content of the Rocketdyne reports varied considerably over the approximately 20-year period covered by the reports discussed herein.

Recommended Rocketdyne Action No. 1 – Future final status surveys should be designed, performed, and documented in accordance with MARSSIM.

Additional Information Provided by Rocketdyne

In the October 2001 letter, Rocketdyne stated that the surveys of Buildings T009, T011, T055, and T100 were planned and performed prior to publication of MARSSIM. The survey for Building T019 was planned shortly after initial publication of MARSSIM but before training of Rocketdyne staff. Rocketdyne also stated that all final status surveys performed since April 1999 have followed MARSSIM guidelines.

Tetra Tech Final Conclusion to General Comments on Survey Reports

The Rocketdyne response is satisfactory. For each of the five buildings discussed in this report, the final surveys and, where applicable, the confirmation surveys demonstrated compliance with applicable federal and state criteria for unrestricted release. No further action is required.

3.2 GENERAL COMMENTS ON THE MEASUREMENT PROCESS

As noted above, surveys of the five buildings covered in this report spanned almost 20 years. The types of surveys performed have not changed over that time. However, the design of the survey plan was changed to develop a statistically well-founded basis for reaching a conclusion regarding the radiological status of the facility.

4.0 SITE-SPECIFIC COMMENTS

Comments are divided into sections relating to survey reports for the specific sites. This final report includes a description of findings associated with document reviews and, where applicable, a summary of Rocketdyne responses or comments and a final analysis and conclusion by Tetra Tech based on Rocketdyne responses. The review comments are in numerical order by building.

4.1 BUILDING T009

Building T009 housed two critical test assemblies in side-by-side, high-bay areas. Testing work on the critical assemblies was performed between 1960 and 1965. Rocketdyne surveyed the Organic Moderated Reactor (OMR) portion of the building in 1988. The Sodium Graphite Reactor (SGR) portion of the building was surveyed in 1990 and 1995.

4.1.1 Documents from Rocketdyne

Tetra Tech reviewed the document titled, Radiological Survey of Building T009 (Rocketdyne 1988), that detailed the survey procedure and results of the OMR portion of the building. A quantitative scan survey

for total alpha, total beta-gamma, and removable alpha and beta activity were conducted in 1square meter (m^2) of each 9-m^2 grid. Direct gamma radiation levels also were recorded. For the OMR portion of Building T009, a total of 57 grids was surveyed. Sixteen additional locations were surveyed for removable alpha and beta activity. The survey data for the OMR portion of Building was analyzed by Rocketdyne using acceptance inspection by variables. The statistical analysis of the OMR portion of the building demonstrated that there was less than a 10 percent chance that 10 percent of the area surveyed exceeded the survey limits. The survey of the OMR portion of the building revealed detectable (but below acceptance criteria) levels of alpha contamination on the floor and walls of the fuel storage vault (Room 124), inside of the cabinets in the counting room (Room 114), and inside of the cabinets in the tool room (Room 116). This survey also noted that the SGR holdup tank was internally contaminated and should be removed under radiological controls.

Tetra Tech also reviewed the document titled, Final Decontamination and Radiological Survey of Portions of Building T009 (Rockwell International 1990). This document reports the isotopic analysis of almost 200 soil samples collected from the area around the SGR holdup tank and associated drain line following their removal. The data indicate that no detectable leakage was found from the drain line. Tetra Tech reviewed the 1995 radiological survey data packages, which present the survey data for the SGR portion of the building (in particular, Rooms 121, 123, 127, and 131) and the connecting hallway on the northern and the eastern sides of Building T009. Surveys were performed for total alpha, total beta-gamma, and removable alpha and beta activity, as well as gamma radiation levels. No survey data exceeded acceptance criteria. No information was included in the data packages for the SGR portion of the building that indicated a statistical analysis was conducted. Specific grid locations for survey measurements were not included.

Following review of the Rocketdyne survey data and a site visit in August 1998, DHS released Building T009 from radiological controls in January 1999.

4.1.2 Documents from the Oak Ridge Institute for Science and Education

No surveys of Building T009 were performed by ORISE.

4.1.3 Summary – Building T009

Tetra Tech reported in the draft report that although the surveys reported in the Rocketdyne documents reviewed were technically acceptable, sufficient detail was not available to permit an overall evaluation of the facility. In particular, it was not possible to determine what surveys were performed in hard-to-reach

locations (for example, areas where the survey instruments used could not be placed close to the surface). In addition, for the SGR portion of the building, it was not clear whether statistical analysis of the survey data was performed. Because of security considerations, Building T009 is not accessible for EPA confirmation surveys. Building T009 has been surveyed by Rocketdyne and has been released from radiological controls by DHS, following their own confirmation surveys.

Recommended Rocketdyne Action No. 2 – In anticipation of a future release survey, Rocketdyne is requested to provide EPA with information on statistical analyses used and details on the locations of surveys in hard-to-reach areas.

Additional Information Provided by Rocketdyne

The October 2001 letter from Rocketdyne states that the statistical analysis suggested by Tetra Tech would be of no benefit, because "all measurements are much less than the acceptance criteria, and ...the majority of measurements indicate 'no detectable activity'." Rocketdyne also indicated that all surface areas were surveyed, including air conditioning and high-efficiency filter ventilation ducts, pits, sink traps, and drain lines. Surfaces not accessible for direct measurement were swipe surveyed.

Tetra Tech Final Conclusion to Comments on Building T009

After further review of the survey information packages provided by Rocketdyne, Tetra Tech notes that in excess of 280 swipe samples were collected in the SGR portion of Building T009. Each swipe was analyzed for removable alpha and beta activity. None of the samples was greater than 50 percent of the removable activity limit. Direct alpha and beta-gamma surface activity scan measurements were conducted. The results of the direct scans were reported as less than 5,000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) beta-gamma and less than 500 dpm/100 cm^2 alpha. Gamma radiation levels were measured in each room of the SGR portion of the building. Tetra Tech concurs that statistical analysis of measurements is of no benefit when the measurements are far below the acceptance criteria or are not an actual value. As noted above, Building T009 was not accessible and a confirmation survey could not be accomplished by Tetra Tech. The planned confirmation survey by Tetra Tech is not considered to be necessary. Building T009 has been released from radiological controls by DHS. Building T009 meets the criteria for release from radiological controls. No further survey action is recommended.

4.2 BUILDING T011

Building T011 primarily was used to calibrate instruments with sealed sources. Other operations included repairing contaminated air pumps and other equipment that contained low levels of internal contamination. Comments pertaining to Building T011 are presented below.

4.2.1 Documents from Rocketdyne

Tetra Tech reviewed the document titled, Building T011 Final Survey Procedure (Rocketdyne 1996). The Final Survey Procedure separates the building into "affected" and "unaffected" areas in the northern end of the building, where handling of radioactive materials occurred. The "affected" areas were those rooms where radioactive materials were handled. The "unaffected" areas were the remaining rooms in the northern end of the building. The southern portion of the building was considered to not have any potential for contamination, because it was used as a warehouse and was separated from the northern portion by walls and doors.

Tetra Tech also reviewed Rocketdyne's Final Radiological Survey Data Package, compiled in 1998. Documentation of the 100 percent qualitative survey of the southern wall of Room 108, a room in the affected area of Building T011, is not included. (Note: the eastern wall is reported twice.) Data for external surface scans (alpha, beta, and gamma) and sludge samples of five identified sink traps are not included. For the purpose of completeness, these survey data should be provided, if available. The only contamination identified by Rocketdyne was in the janitor's sink drain line in Room 120. The sink and drain line have been removed.

Based on the identified uses of Building T011, the potential for residual contamination is low. In addition, interior walls (including the southern wall of Room 108), dropped ceilings, and floor tiles have been removed, surveyed, and disposed of as nonradioactive waste. Building T011 was released from radiological controls by DHS in December 1998. In October 2001, Tetra Tech conducted oversight verification surveys of Building T011, as identified under the EPA work assignment.

4.2.2 Documents from the Oak Ridge Institute for Science and Education

No surveys of Building T011 were performed by ORISE.

4.2.3 Summary – Building T011

In the draft document review report, Tetra Tech states that the radiological surveys at Building T011 are acceptable, pending review of the missing data for Room 108 and the sink traps.

Recommended Rocketdyne Action No. 3 – Provide missing data for survey of Building T011, Room 108, and sink traps, if available.

Additional Information Provided by Rocketdyne

Rocketdyne reported that the qualitative survey data for the southern wall of Room 108 was erroneously labeled "east wall" and was provided previously. The data for the scan surveys of the five sink traps and the gamma spectroscopy data for the one sink trap containing sludge material were provided in the October 2001 letter. The sludge from the sink trap in Room 120 was found to contain low levels of naturally occurring uranium. The sink and trap and a portion of the drain line were removed and disposed of.

Tetra Tech Final Conclusion to Comments on Building T011

The qualitative survey data for the southern wall of Room 108 have been reviewed and are satisfactory. The survey and sludge sample data from the sink traps also have been reviewed and are satisfactory. Building T011 has been released from radiological controls by DHS. An oversight/verification (OV) survey performed by Tetra Tech confirms the previous surveys. Building T011 meets the criteria for release from radiological controls. No further survey action is required.

4.3 BUILDING T019

Building T019 was constructed in 1962 and was the SNAP System Nuclear Qualification Test Facility until the SNAP program ended in 1970. Comments pertaining to Building T019 are presented below.

4.3.1 Documents from Rocketdyne

In 1988, Rocketdyne conducted a radiological survey of Building T019. The report of that survey was not available for review. In 1996, the DOE measurement contractor, ORISE, performed a confirmation survey of Building T019 (see Section 4.3.2 for a review of the ORISE documents). ORISE detected beta surface contamination above acceptance limits on the floor of the high bay. Rocketdyne decontaminated the area on the high bay floor and performed a complete final status survey of Building T019 in September 1998. Tetra Tech reviewed the 1999 report, Building 4019 (T019) Final Status Survey Report.

Rocketdyne divided Building T019 into five distinct lots for the survey. Three of the lots were identified as affected, and two were identified as unaffected, as follows:

- Lot 1 (affected area): high bay floor and walls to a height of 3 meters (m)
- Lot 2 (unaffected area): high bay walls above 3 m and the ceiling
- Lot 3 (affected area): Reactor Test Chamber
- Lot 4 (affected area): Room 109 Fuel Storage Vault
- Lot 5 (unaffected area): Office Areas and Equipment Room 110

The Executive Summary and the appendices of the final status survey report containing data appear to recognize only four lots. In the Executive Summary, Room 109 is included with the high bay area in Lot 1. In the data appendices, Lot 4 is separately identified as Room 109 and no data are provided for Lot 5. Survey criteria for each lot are listed in Table 1 in Section 3.1. Lot 5 (Office Areas and Room 110) was to receive a 100 percent qualitative scan survey, and 500 random smears were to be collected for removable activity. Data from Lot 5 for the 500 smear samples are not provided; data are provided for the other four lots.

4.3.2 Documents from the Oak Ridge Institute for Science and Education

Tetra Tech reviewed the Verification Survey of Buildings T019 and T024, Santa Susana Field Laboratory, Rockwell International, published by ORISE in 1996, and the letter Addendum to the Verification Survey Report for Buildings T019 and T024, Santa Susana Field Laboratory, issued in 1999. In the 1996 survey, ORISE stated that 50 to 100 percent of the accessible floors and lower walls were scan surveyed for total alpha and beta activity, as well as gamma radiation levels. The below-ground Reactor Test Chamber in the high bay area was not accessible for ORISE to survey. The ORISE scan survey identified one location on the floor of the high bay area with beta surface activity measurements exceeding the acceptance criterion of an average 5,000 dpm/100 cm^2 in a 1-m^2 area. In addition to scan surveys, surface activity measurements were taken for total and removable alpha and beta activity in 44 locations. Gamma radiation level readings were taken at two locations. No surface activity measurements or gamma radiation levels were taken in the New Fuel Storage Vault (Room 109). ORISE reported that, as a result of: (1) the beta surface activity above acceptance criteria in the high bay, (2) the inability to gain access to the Reactor Test Chamber, and (3) documentation deficiencies in an earlier Rocketdyne survey of Building T019, it was not possible to determine whether the building met DOE guidelines for release for unrestricted use.

In 1999, following Rocketdyne decontamination of areas in Building T019 that showed beta surface activity greater than acceptance criteria noted above, ORISE performed an additional verification survey of Building T019. The area of beta surface activity above acceptance criteria was verified to have been decontaminated. ORISE also performed a detailed survey of the below-ground test chamber and confirmed the results of the previous Rocketdyne surveys. ORISE concluded that the surface activity levels and the gamma radiation levels met DOE guidelines. The new fuel storage vault was not surveyed by ORISE. DHS also performed a confirmation survey of the reactor test chamber.

Rocketdyne made over 70 confined space entries into the test chamber to allow cleaning, removal of hazardous materials, and removal of fixtures that would interfere with the survey. Survey of the test chamber by Rocketdyne, then ORISE, and finally by DHS involved at least 25 more confined space entries. No contamination and no radiation levels exceeding the limits were detected.

Rocketdyne has requested that DOE and DHS approve the radiological release of Building T019. Radiological release of Building T019 is pending.

In October 2001, Tetra Tech performed OV surveys of the Building T019 high bay. Emphasis was placed on the area previously identified by ORISE as exhibiting beta activity above acceptance criteria. In addition, Tetra Tech performed an OV survey in Building T019, with emphasis on the Fuel Storage Vault and removable alpha and beta activity surveys in the high bay above 10 feet and in the office areas. Tetra Tech did not survey inside of the Reactor Test Chamber, because it already has been surveyed sufficiently by Rocketdyne, ORISE, and DHS. The report of the Tetra Tech surveys is published separately.

4.3.3 Summary – Building T019

In the draft document review report, Tetra Tech stated that the surveys of the Building T019 high bay area by Rocketdyne and ORISE were acceptable. Questions remained about the documentation of Lot 4 (Fuel Storage Vault) and Lot 5 (unaffected areas). Although ORISE visited the building twice, the records reviewed do not indicate that the Fuel Storage Vault received a confirmation survey. The Reactor Test Chamber was surveyed three times after being decommissioned and cleaned by Rocketdyne.

Recommended Rocketdyne Action No. 4 – Clarify the apparent disagreement between the Executive Summary and the body of the "Building 4019 Final Status Survey Report" about the configuration of the survey lots.

Additional Information Provided by Rocketdyne

The Rocketdyne letter of October 2001 clarified the configuration of the survey lots in Building T019 and confirm that the building was divided into five survey lots, as described in Section 4.3.1.

Recommended Rocketdyne Action No. 5 – If available, provide documentation of the removable activity surveys for Lot 5 at Building 4019 (T019), as discussed in the Building 4019 Final Status Survey Report.

Additional Information Provided by Rocketdyne

Rocketdyne provided survey documentation for the Lot 5 unaffected areas. The data included removable activity information for 290 of an estimated 500 swipe survey locations in Lot 5 and the qualitative total surface alpha and beta contamination results for the Lot 5 portions of the building.

Tetra Tech Final Conclusion to Comments on Building T019

The Rocketdyne response resolved the question regarding the configuration of the survey lots. Five survey lots were included in the survey. Survey data provided by Rocketdyne for the Lot 5 portion of Building T019 (equipment room, offices, and corridor) were reviewed and are satisfactory. Rocketdyne provided the removable activity information for 290 of an estimated 500 swipe survey locations. The original survey report stated that all removable activity measurements were less than activity limits. Specifically, the highest removable alpha activity remaining was 5 dpm/100 cm^2, and the highest removable beta activity remaining was 25 dpm/100 cm^2. The removable activity data provided by Rocketdyne in October 2001 confirm that information. The additional information provided by Rocketdyne has been reviewed and is satisfactory. The Tetra Tech OV surveys confirm that Building T019 meets the criteria for release from radiological controls. No further survey action is required.

4.4 BUILDING T055

Building T055, also referred to as the Nuclear Materials Development Facility (NMDF), was used for research, development, and production of nuclear fuels and radioactive sources. Starting materials for this project were plutonium and depleted uranium. The most hazardous work was performed in gloveboxes in Room 127 of this building. Rocketdyne reports that two contamination incidents occurred in the glovebox room—both of which resulted in some spread of contamination to the entire room, including overhead piping and ductwork. A liquid spill also occurred in the process laboratory (Room 126) of the building.

4.4.1 Rocketdyne Documents

Tetra Tech reviewed the Building T055 Decontamination and Deactivation, Final Radiation Survey of the NMDF, published by Rocketdyne in 1986. For the purpose of the survey, Rocketdyne divided the building into three lots:

- Lot 1: the radiologically unposted area (Rooms 101 through 115, 117, 118, 128, 132, and 133)
- Lot 2: the glovebox room (Room 127)
- Lot 3: the radiologically posted areas (Rooms 114, 116, 123, 124, 126, 129, 130, and 131 and the hallway near 118 to 121)

In each survey lot, one 1-m^2 grid of each 9 m^2 (approximately 11 percent) was surveyed for total alpha and beta activity. In addition, one 100-square-centimeter swipe survey was collected within the 1-m^2 grid and analyzed for removable alpha and beta activity. Additional surveys were performed in areas considered to be suspect because of either the initial survey results or the previous history of the area. These data were statistically analyzed using an acceptable error tolerance of 10 percent in the same manner as discussed for Building T009 in Section 4.1.1. Rocketdyne detected three locations with contamination above acceptance criteria: (1) the floor in Room 126, (2) the eastern wall in Room 127, and (3) the floor in the storage vault (Room 131). Any contamination above acceptance criteria was decontaminated.

4.4.2 Documents from the Oak Ridge Institute for Science and Education

Tetra Tech reviewed the Confirmatory Radiological Survey Nuclear Materials Development Facility (Building T055), Rockwell International, Santa Susana, California, published by ORISE in July 1987. The ORISE surveys included:

- Surveys of the floor surfaces of the glovebox room (127) using a floor monitor and gamma scintillation detectors
- Five-point grid surveys for total alpha and beta activity in 63 floor and lower wall grids
- Swipe surveys in each of the grids and total and removable alpha and beta activity measurements on the upper walls, ceiling, and other surfaces below the ceiling

Gamma radiation level measurements were taken, and paint samples were collected. Additional surveys were performed outside of the building proper. One location on the inside of the southern wall of the glovebox room (Room 127) was found to have alpha activity above acceptance criteria. After decontamination, this area was reduced to less than minimum detectable activity (MDA). Surface

contamination measurement data presented in the ORISE report are summary data. The report lists the number of grid blocks surveyed, the highest grid block average reading, and the range of grid block measurements for each room.

The ORISE survey supports the Rocketdyne survey's conclusion that Building T055 is radiologically suitable for unrestricted release.

4.4.3 Summary – Building T055

Tetra Tech had no specific recommendations regarding the previously performed surveys of Building T055. Building T055 experienced at least three contamination incidents: two in Room 127 and one in Room 126. During the surveys after building closure, Rocketdyne detected contamination above acceptance criteria in Rooms 126, 127, and 131. ORISE additionally detected one wall grid in Room 127 with removable alpha surface activity exceeding criteria. The reports indicate that all contamination was removed. Building T055 was released from radiological controls by NRC in October 1987.

Tetra Tech performed OV surveys, including collection of four solid samples from selected areas in the floor of Building T055 and one solid sample from the wall of the former glovebox room (Room 127). Swipe surveys were collected from several areas, including the ceiling of the glovebox room.

Tetra Tech Final Conclusion to Comments on Building T055

The Rocketdyne surveys and the ORISE confirmation surveys verified that Building T055 meets the acceptance criteria for release from radiological controls. NRC released Building T055 from radiological controls in 1987. The Tetra Tech OV surveys also confirm that Building T055 meets the criteria for release from radiological controls. No further survey action is required.

4.5 BUILDING T100 FAST CRITICAL EXPERIMENTAL LABORATORY

This facility was used for epithermal and fast neutron-critical experiments between 1961 and 1974. The NRC license for the facility was terminated in 1980. The building contained a large, shielded critical assembly room; a fuel vault; and supporting laboratories, equipment rooms, storage areas, changing rooms, lavatories, and offices.

4.5.1 Documents from Rocketdyne

Tetra Tech reviewed a letter, issued in April 1980, regarding the Radiation Survey Report of the FCEL Reactor Facility Following Dismantlement and Decontamination of the Facility (Rockwell International 1980). This letter is the earliest documentation of the five buildings included in this report, and the level of detail is far less than would be expected, should such a facility be proposed for radiological survey in the present time. Detailed results of the surveys were reported to be on file at Rocketdyne. The letter from Rocketdyne describing the surveys performed states that the facility "...has also been decontaminated…."

Tetra Tech has reviewed the NRC letter, dated July 11, 1980, regarding the NRC Inspection of Rockwell International's FCEL Facility. NRC reports the results of an independent inspection, which included surveys of Building T100, an inspection of records, and interviews with facility personnel. Based on the independent inspection, NRC confirmed that the FCEL had been decontaminated.

In an NRC letter, dated October 6, 1980, NRC terminated the facility license for the FCEL, Building T100, and released the building from radiological controls.

It is noted that three rooms (Rooms 112, 113, and 114) of Building T100 currently are being used as a radiation counting and calibration facility. Those portions of the building being used for storage or use of radioactive materials will need to be resurveyed, as appropriate, once those areas are no longer used for that purpose.

4.5.2 Documents from the Oak Ridge Institute for Science and Education

No ORISE documents were associated with the survey and release of Building T100. Confirmation surveys for this building were performed by NRC, as discussed above.

4.5.3 Summary – Building T100

In the draft report, Tetra Tech stated that the survey data provided by Rocketdyne are not sufficiently detailed to assess the status of the areas surveyed. However, NRC has conducted confirmation surveys of this building, and no indications exist of activity above acceptance criteria. Those portions of Building T100 that are no longer being used for radiological purposes are considered to be acceptable.

Building T100 was released from radiological controls by NRC in October 1980. Currently, three rooms (Rooms 112, 113, and 114) are again being used for radiological purposes.

Recommended Rocketdyne Action No. 6 – Provide the detailed survey data for Building T100 to EPA.

Additional Information Provided by Rocketdyne

The October 2001 letter from Rocketdyne forwards alpha and beta survey information for each room of Building T100. The survey data provided has been reviewed and demonstrates that all scan surveys and swipe surveys met the acceptance criteria. No specific information was included identifying locations that were decontaminated.

Tetra Tech Final Conclusion to Comments on Building T100

The data provided by Rocketdyne are satisfactory. NRC released the building from radiological controls. No further survey action is required. The Tetra Tech OV surveys confirm that Building T100 meets the criteria for release from radiological controls. No further survey action is required, except for the three rooms still being used for radiological work.

5.0 SUMMARY AND RECOMMENDATIONS

Based on the review of survey procedures and reports and the supplemental information provided by the October 2001 Rocketdyne submittal, Tetra Tech concludes that the radiological surveys of Buildings T009, T011, T019, T055, and T100 performed by Rocketdyne and the confirmation surveys of Buildings T019 and T055 performed by ORISE discussed in this report were adequately performed and that the surveys were sufficiently documented. Four of the five buildings discussed in this report have been released from radiological controls by the appropriate regulatory agency. Release of Building T019 has been requested by Rocketdyne and is pending. Independent OV surveys performed by Tetra Tech in Buildings T011, T019, T055, and T100 confirm that the buildings meet the criteria for release from radiological controls. The acceptability of the radiological surveys was based on a review of the practices that were ordinarily used within the industry at the time they were performed. The review considered:

- Sensitivity and reliability of the instruments used
- Frequency and rigor of instrument calibration
- Representativeness of sampling locations
- Level of detail of the survey
- Correlation between text and data tables
- Adequacy of documentation

Tetra Tech recommends that any future final status surveys should be performed and documented in accordance with EPA's MARSSIM (EPA 2000) guidance to establish consistency and broader acceptance of the techniques used for facility characterization. Use of MARSSIM (EPA 2000) provides statistical guidance for demonstrating compliance with radioactivity concentration limits. Tetra Tech notes that surveys performed prior to the introduction of MARSSIM need not be repeated, as long as the quality of the surveys can be supported and documented. Rocketdyne has committed to conducting future surveys in accordance with MARSSIM.

REFERENCES

Department of Health Services. 1998. Letter Regarding Release of Building T011 for Unrestricted Use. From David Wesley, Radiologic Health Branch, to James G. Barnes, Boeing-Rocketdyne. December 16.

Department of Health Services. 1999. Letter Regarding Amendment 102 to License 0015-70 Releasing for Unrestricted Use Building 009. January 20.

Nuclear Regulatory Commission (NRC). 1987. Letter Regarding Modifying Materials License No. SNM-21. From Leland C. Rouse, Chief, Fuel Cycle Safety Branch. To Dr. M.E. Remley, Director Health, Safety and Radiation Services, Energy Systems Group, Rockwell International Corporation. October 7.

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Rocketdyne. 1995. Building 009 Radiological Survey Data Package. March 1.

Rocketdyne. 1995. Building 009 East High-Bay Room 131 Concrete Core Floor Data Package. October 26.

Rocketdyne. 1996. "Building T011 Final Survey Procedure." No. N001SRR140128. April 23.

Rocketdyne. 1998. Final Radiological Survey Data Package. Building 011 SSFL. Compiled by James G. Barnes. July 28.

Rocketdyne. 1999. "Building 4019 Final Status Survey Report." Number RS-00002. July 21.

Rocketdyne. 2001. Letter Response to EPA/Tetra-Tech Review of Survey Documentation for Buildings 4009, 4011, 4019, 4055, and 4100 at the Santa Susana Field Laboratory. From Phil Rutherford, Boeing-Rocketdyne, to Larry Bowerman, U.S. Environmental Protection Agency. October 1.

Tetra Tech. 2001. "Rocketdyne Technical Support and Field OV and Confirmation Radiological Survey Final Workplan Addendum for Buildings T011, T019, T055, and T100."

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APPENDIX A

REVIEWED DOCUMENTS

(Four Pages)

ROCKETDYNE DOCUMENTS REVIEWED

Building T009

1. Energy Technology Engineering Center. 1988. "Radiological Survey of Building T009." No. GEN-ZR-0014. August 26.

2. Rockwell International (Rockwell). 1990. "Final Decontamination and Radiological Survey of Portions of Building T009." December 18.

3. California Department of Health Services (DHS). 1995. Letter Concerning Radioactive Material License 0015-70. From Paul P. Baldenweg, Health Physicist, to Phil Rutherford, Manager, Radiation Protection and Health Physics Services, Rocketdyne Division, Rockwell International Corporation. February 24.

4. Boeing-Rocketdyne (Rocketdyne). 1995. Building 009 Radiological Survey Data Package. March 1.

5. Rocketdyne. 1995. Building 009 Roof Survey Data Package. May 4.

6. Rocketdyne. 1995. Building 009 East High-Bay Room 131 Concrete Core Floor Data Package. October 26.

7. Rocketdyne Division. 1995. Letter Requesting the Release of Building 009 for Unrestricted use and Approval to Dispose of Concrete from Building 009-License. From Phil Rutherford, Manager, Radiation Protection and Health Physics Services, to Ben Kapel, Radiologic Health Branch, California Department of Health Services (DHS). October 26.

8. Rocketdyne Division. 1998. Letter Requesting the Release of Building 009, Santa Susana Field Laboratory (SSFL), for Unrestricted Use. From P.D. Rutherford, Manager Radiation Safety, to Dr. Gerard Wong, Radiologic Health Branch, DHS. February 17.

9. Rocketdyne Division. 1998. Letter Requesting the Release of Building 009 and Removal from Radioactive Material License 0015-70. From P.D. Rutherford, Manager Radiation Safety, to Paul Baldenweg, Radiologic Health Branch, DHS. March 16.

10. Space Systems, Rocketdyne Propulsion and Power. 1998. Letter – B/009Survey/Sampling Data. License 0015-70. From Phil Rutherford, Manager, Radiation Safety, to Paul Baldenweg, Radiologic Health Branch, DHS. August 19.

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Building T011

1. Rockwell. 1996. "Building T011 Final Survey Procedure." No. N001SRR140128. April 23.

2. Boeing-Rocketdyne 1998. Final Radiological Survey Data Package. Building 011 SSFL. Compiled by James G. Barnes. July 28.

3. Rocketdyne Division. 1998. Letter – Disposal of Building 11 Building Debris; Survey Request. From James Gary Barnes, CHP, Radiation Safety Officer, Safety, Health and Environmental Affairs. To Mr. Stephen Y. Hsu, Radiologic Health Branch, DHS. August 3.

4. DHS. 1998. Letter Regarding Release of Building T011 Building Debris. From Gerard Wong, Ph.D., Chief Radioactive Materials Licensing, Radiologic Health Branch. To James G. Barnes, CHP, Radiation Safety Officer, Radiation Protection and Health Physics Services, Rocketdyne Division. September 17.

5. Space Systems, Rocketdyne Propulsion and Power. 1998. Letter Regarding Release of Building 4011, Area IV, SSFL, for Unrestricted Use and Removal from Radioactive Materials License 0015-19. From Phil Rutherford, Manager, Radiation Safety. To Lisa Austin, Materials Licensing, Radiologic Health Branch, DHS. November 4.

Building T019

1. Rockwell. 1988. "Radiological Survey of Buildings T019 and T013; an Area Northwest of T059, T019, T013, and T012; and a Storage Yard West of Buildings T626 and T038". August 26. (Note: this document was not available for review and is listed because it was mentioned in the report.)

2. Rocketdyne. 1999. "Building 4019 Final Status Survey Report." Number RS-00002. July 21.

3. Department of Energy. 1999. Memorandum – Release of Decontaminated Building 4019 without Radiological Restrictions at the Site Formerly Known As the Energy Technology Engineering Center (ETEC). From Michael Lopez, ETEC, Oakland Environmental Programs Division. To Robert Fleming, EM-44, Department of Energy, Oakland Operations Office. September 2.

4. Rocketdyne. 1999. "Final Report Decontamination and Dismantlement Operations at SSFL Building 4019 for Release without Radiological Restrictions." September 11.

Building T055

1. Rocketdyne. 1986. "Building 055 Decontamination and Decommissioning, Final Radiation Survey of the NMDF." No. N704SRR99027. December 19.

2. U.S. Nuclear Regulatory Commission (NRC). 1987. Letter Regarding Modifying Materials License No. SNM-21. From Leland C. Rouse, Chief, Fuel Cycle Safety Branch. To Dr. M.E. Remley, Director Health, Safety and Radiation Services, Energy Systems Group, Rockwell International Corporation. October 7.

Building T100

1. Rockwell International. 1980. Letter Regarding the "Radiation Survey Report of the Fast Critical Experimental Laboratory (FCEL) Reactor Facility Following Dismantlement and Decontamination of the Facility." From M.E. Remley, Director Health, Safety and Radiation Services. To Mr. William Gammill, Acting Assistant Director for Operating Reactor Projects, Division of Operating Reactors, Nuclear Regulatory Commission (NRC). April 30.

2. NRC. 1980. Letter Regarding NRC's Inspection of Rockwell International's FCEL Facility. From H.E Book, Chief Fuel Facility and Materials Safety Branch. To Dr. M.E. Remley, Director Health, Safety and Radiation Services, Energy Systems Group. July 11.

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4. Science Applications International Corporation. 1994. "Final RCRA Facility Assessment Report for Rockwell International Corporation, Rocketdyne Division, Technical Enforcement Support at Hazardous Waste Sites, TES 11." May. (Note: includes assessment of Building 100 Trench.)

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION DOCUMENTS REVIEWED

Building T009

1. None identified

Building T011

1. None identified

Building T019

1. Oak Ridge Institute for Science and Education (ORISE). 1996. "Verification Survey of Buildings T019 and T024, Santa Susana Field Laboratory [SSFL], Rockwell International." February.

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Building T055

1. Oak Ridge Associated Universities. 1987. "Confirmatory Radiological Survey, Nuclear Materials Development Facility [Building T-055], Rockwell International." July.

Building T100

1. None identified