SEC Petition Evaluation Report
Petition SEC-00156

Report Rev #: 0 Report Submittal Date: January 12, 2010

Subject Expert(s):	Michael Kubiak
Site Expert(s):	N/A

Petitioner Administrative Summary			
Petition Under Evaluation			
Petition #	Petition Type	Petition A Receipt Date	DOE/AWE Facility Name
SEC-00156	83.14	November 27, 2009	Area IV of the Santa Susana Field Laboratory

NIOSH-Proposed Class Definition
All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area of Area IV of the Santa Susana Field Laboratory from January 1, 1959 through December 31, 1964, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

Related Petition Summary Information			
SEC Petition Tracking #(s)	Petition Type	DOE/AWE Facility Name	Petition Status
SEC-00093	83.13	Area IV of the Santa Susana Field Laboratory	Class included in the SEC for 1955-1958

Related Evaluation Report Information	
Report Title	DOE/AWE Facility Name
SEC Petition Evaluation Report for Petition SEC-00093	Area IV of the Santa Susana Field Laboratory

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Evaluation Report Summary: SEC-00156, Santa Susana Field Laboratory-Area IV

This evaluation report by the National Institute for Occupational Safety and Health (NIOSH) addresses a class of employees proposed for addition to the Special Exposure Cohort (SEC) per the *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended, 42 U.S.C. § 7384 *et seq.* (EEOICPA) and 42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*.

NIOSH-Proposed Class Definition

All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area of Area IV of the Santa Susana Field Laboratory from January 1, 1959 through December 31, 1964, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

Feasibility of Dose Reconstruction Findings

NIOSH lacks sufficient information, which includes biological monitoring data, sufficient air monitoring information, or sufficient process and radiological source information, to allow it to estimate with sufficient accuracy the potential internal exposures to various radionuclides to which the proposed class may have been subjected during the time period from January 1, 1959 through December 31, 1964. NIOSH finds that it is likely feasible to reconstruct external dose, including occupational medical dose, for Area IV of the Santa Susana Field Laboratory workers with sufficient accuracy.

The NIOSH dose reconstruction feasibility findings are based on the following:

- There is currently one class of Santa Susana Field Laboratory, Area IV workers associated with a previous NIOSH evaluation of SEC petition SEC-00093. The period currently designated for inclusion in the SEC extends from January 1, 1955 through December 31, 1958.

- Through the course of ongoing dose reconstruction, continued data capture efforts, and investigations associated with SEC-00093, NIOSH has since determined that although bioassay data are available for some monitored workers after 1958, some SSFL-Area IV workers could have received intakes of radioactive materials after 1958 that went unmonitored.

- During the development of co-worker distribution models to assess potential internal dose to unmonitored workers, NIOSH has found that the available bioassay data have limitations which preclude the development of adequate co-worker models for the years prior to 1965. Therefore, NIOSH determined that it is necessary to propose an extension of the SEC time period for the SSFL-Area IV site through December 31, 1964.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Therefore, dose reconstructions for individuals employed at Area IV of the Santa Susana Field Laboratory during the period from January 1, 1959 through December 31, 1964, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

Health Endangerment Determination

The NIOSH evaluation did not identify any evidence supplied by the petitioners or from other resources that would establish that the class was exposed to radiation during a discrete incident likely to have involved exceptionally high-level exposures, such as nuclear criticality incidents or other events involving similarly high levels of exposures. However, the evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of fission products and other radionuclides and from direct exposure to radioactive materials. Therefore, 42 C.F.R. § 83.13(c)(3)(ii) requires NIOSH to specify that health may have been endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort.

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SEC Petition Evaluation Report for SEC-00156

ATTRIBUTION AND ANNOTATION: This is a single-author document. All conclusions drawn from the data presented in this evaluation were made by the ORAU Team Lead Technical Evaluator: Michael Kubiak, MJW Technical Services. These conclusions were peer-reviewed by the individuals listed on the cover page. The rationales for all conclusions in this document are explained in the associated text.

1.0 Purpose and Scope

This report evaluates the feasibility of reconstructing doses for employees who worked at a specific facility during a specified time. It provides information and analysis germane to considering a petition for adding a class of employees to the Congressionally-created SEC.

This report does not make any determinations concerning the feasibility of dose reconstruction that necessarily apply to any individual energy employee who might require a dose reconstruction from NIOSH, with the exception of the employee whose dose reconstruction could not be completed, and whose claim consequently led to this petition evaluation. The finding in this report is not the final determination as to whether or not the proposed class will be added to the SEC. This report will be considered by the Advisory Board on Radiation and Worker Health (the Board) and by the Secretary of Health and Human Services (HHS). The Secretary of HHS will make final decisions concerning whether or not to add one or more classes to the SEC in response to the petition addressed by this report.

This evaluation, in which NIOSH provides its findings both on the feasibility of estimating radiation doses of members of this class with sufficient accuracy and on health endangerment, was conducted in accordance with the requirements of EEOICPA and 42 C.F.R. § 83.14.

2.0 Introduction

Both EEOICPA and 42 C.F.R. pt. 83 require NIOSH to evaluate qualified petitions requesting that the Department of Health and Human Services add a class of employees to the SEC. The evaluation is intended to provide a fair, science-based determination of whether it is feasible to estimate, with sufficient accuracy, the radiation doses of the proposed class of employees through NIOSH dose reconstructions.[1]

NIOSH is required to document its evaluation in a report, and to do so, relies upon both its own dose reconstruction expertise as well as technical support from its contractor, Oak Ridge Associated Universities (ORAU). Once completed, NIOSH provides the report to both the petitioners and the Advisory Board on Radiation and Worker Health. The Board will consider the NIOSH evaluation report, together with the petition, comments of the petitioner(s) and such other information as the Board considers appropriate, to make recommendations to the Secretary of HHS on whether or not to add one or more classes of employees to the SEC. Once NIOSH has received and considered the

[1] NIOSH dose reconstructions under EEOICPA are performed using the methods promulgated under 42 C.F.R. pt. 82 and the detailed implementation guidelines available at http://www.cdc.gov/niosh/ocas.

advice of the Board, the Director of NIOSH will propose a decision on behalf of HHS. The Secretary of HHS will make the final decision, taking into account the NIOSH evaluation, the advice of the Board, and the proposed decision issued by NIOSH. As part of this final decision process, the petitioner(s) may seek a review of certain types of final decisions issued by the Secretary of HHS.[2]

3.0 NIOSH-Proposed Class Definition and Petition Basis

The NIOSH-proposed class includes all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area of Area IV of the Santa Susana Field Laboratory from January 1, 1959 through December 31, 1964, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort. During this period, employees at this facility were involved with the operation of various types of nuclear reactors and particle accelerators, low-power criticality testing, manufacture of reactor fuels, and the disassembly and inspection of reactor components and fuel assemblies.

The evaluation responds to Petition SEC-00156 which was submitted by an EEOICPA claimant whose dose reconstruction could not be completed by NIOSH due to a lack of sufficient dosimetry-related information. NIOSH's determination that it is unable to complete a dose reconstruction for an EEOICPA claimant is a qualified basis for submitting an SEC petition pursuant to 42 C.F.R. § 83.9(b).

There is currently one class of Santa Susana Field Laboratory (SSFL)-Area IV workers associated with the previous NIOSH evaluation of SEC petition SEC-00093, for which the Secretary of Health and Human Services (HHS) has designated inclusion in the Special Exposure Cohort:

> Class added to the SEC effective July 18, 2009: *Employees of the Department of Energy (DOE), its predecessor agencies, and DOE contractors and subcontractors who worked in any area of Area IV of the Santa Susana Field Laboratory for a number of work days aggregating at least 250 work days from January 1, 1955 through December 31, 1958, or in combination with work days within the parameters established for one or more other classes of employees in the SEC* (HHS, 2009).

Detailed information associated with the worker class added to the SEC can be found in the NIOSH evaluation report, *SEC Petition Evaluation Report, Petition SEC-00093* (NIOSH, 2009). The basis for the designated 1955-1958 SEC class is the determination that NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to bound potential internal exposures from the various radionuclides for the evaluated worker class at Area IV of SSFL during the period from January 1, 1955 through December 31, 1958 (HHS, 2009).

[2] See 42 C.F.R. pt. 83 for a full description of the procedures summarized here. Additional internal procedures are available at http://www.cdc.gov/niosh/ocas.

The timeframe of the designated SEC class was originally determined by NIOSH to correspond to the date after which an established bioassay program existed at SSFL and after which sufficient internal monitoring data were believed to have been identified (NIOSH, 2009). In the SEC-00093 Evaluation Report, NIOSH determined that the site initiated a routine bioassay program in August 1958, and that NIOSH had access to sufficient urinalysis results and other supporting data beginning in January 1959. NIOSH determined that, beginning in late 1958, the practice at the facility was to collect quarterly urine samples based on job assignments that required exposures to radioactive materials (NIOSH, 2009).

Through the course of on-going dose reconstruction, continued data capture efforts, and investigations associated with SEC-00093, NIOSH has since determined that there were insufficient access controls employed at SSFL-Area IV; as a result there were some workers who should have been monitored who were not. Although bioassay data are available for some monitored workers after 1958, NIOSH has determined that some SSFL-Area IV workers could have received intakes of radioactive materials after 1958 that went unmonitored. During the development of co-worker distribution models to assess potential internal dose to unmonitored workers, NIOSH has also found that the available bioassay data have limitations prior to 1965 (i.e., missing values for some positive sample results) which preclude the development of adequate co-worker models for the years prior to 1965. Therefore, NIOSH has determined that it is necessary to propose an extension of the SEC time period for the SSFL-Area IV site through December 31, 1964.

4.0 Radiological Operations Relevant to the Proposed Class

The following subsections summarize the radiological operations at the SSFL-Area IV site through December 31, 1964, and the information available to NIOSH to characterize particular processes and radioactive source materials. Using available sources, NIOSH has attempted to gather process and source descriptions, information regarding the identity and quantities of radionuclides of concern, and information describing processes through which the radiation exposures of concern may have occurred and the physical environment in which they may have occurred. The information included within this evaluation report is meant only to be a summary of the available information.

Unless otherwise indicated, information for Section 4.0 and its subsections was obtained from *SEC Petition Evaluation Report for Petition SEC-00093, Santa Susana Field Laboratory-Area IV* (NIOSH, 2009), and its referenced documents.

4.1 Operations Description

This section describes the operations at SSFL-Area IV that are relevant to the NIOSH-proposed SEC class for all workers through December 31, 1964.

SSFL consists of a total of 2,850 acres and is located in the Simi Hills of Ventura County, approximately 30 miles northwest of downtown Los Angeles, California. Based on ownership and operations, SSFL is divided into four administrative and operational portions—Area I, Area II, Area III, and Area IV. Department of Energy (DOE) operations were conducted in Rockwell International-owned and DOE-owned facilities on a 290-acre westernmost administrative and operational portion designated as Area IV.

Following World War II, the potential of atomic energy captured the interest of the United States Government and many companies. This interest resulted in the need for nuclear research and development (R&D) facilities. SSFL was initially established in 1947 by North American Aviation (NAA) to meet the requirements for a field test laboratory to static-fire large rocket engines; however, it also met NAA's need for a nuclear research facility. As a result, Area IV was established in 1953 at SSFL as a nuclear research and development facility. EEOICPA-related radiological operations at SSFL-Area IV began in 1955 (DOE, 2010). Since then, SSFL-Area IV has housed both nuclear development and rocket development groups, although in distinct and separate locations. In December 1955, the nuclear development and rocket development groups were transformed into separate divisions: Atomics International (AI) and Rocketdyne.

Two distinct AI groups were housed in Area IV and supported by DOE. One focused on development of civilian nuclear power, and the other was a center of excellence for research and testing of non-nuclear components related to liquid metals. These two groups were referred to as AI and Liquid Metal Engineering Center (LMEC), respectively. Nuclear R&D activities in Area IV increased rapidly from 1953 into the late 1960s, and then began to decline. AI was eventually merged into Rocketdyne in 1984 as a result of this decline.

The LMEC was created in 1966 as a government-owned and contractor-operated organization; its purpose was to provide development and non-nuclear testing of Liquid Metal Reactor (LMR) components and to establish the Liquid Metal Information Center (LMIC) for the AEC's Liquid Metal Fast-Breeder Reactor (LMFBR) program. The LMEC was renamed Energy Technology Engineering Center (ETEC) in 1978 to reflect DOE's desire to broaden its mission beyond the LMFBR program.

Several corporate mergers and organizational changes occurred over the years. In 1967, NAA merged with Rockwell Standard to become North American Rockwell. In 1973, the corporate name changed to Rockwell International (RI). Rockwell International continued to exist with AI and Rocketdyne as independent divisions until 1984 when AI was absorbed by the Rocketdyne division. The Boeing Company purchased RI in 1996; Rocketdyne is now a division of Boeing.

SSFL-Area IV operations included two functional areas: Nuclear Reactor Development and Testing; and Nuclear Support Operations. Additional information regarding SSFL-Area IV functional areas and radiological operations can be found in ORAUT-TKBS-0038-2 and the SEC-00093 Evaluation Report (NIOSH, 2009).

SSFL-Area IV Nuclear Reactor Development and Testing included operations associated with:

- Homogeneous Water Boiler Reactors
- Sodium-Cooled Graphite-Moderated Reactor, designated as the Sodium Reactor Experiment (SRE)
- Uranium-Zirconium Hydride Reactors associated with the Systems for Nuclear Auxiliary Power (SNAP) program
- Critical Test Facilities
- Civilian Nuclear Power Test Facilities
- Organic Moderated Reactor (OMR)
- Sodium Graphite Reactor (SGR)
- Advanced Epithermal Thorium Reactor (AETR)
- Fast Critical Experiment Laboratory

SSFL-Area IV Nuclear Support Operations included work associated with:

- Reactor Fuel Manufacturing
- Fuel Storage
- Disassembly and Examination of Reactors and Used Reactor Fuel Assemblies
- Fabrication, Use, and Storage of Radioactive Sources
- Preparation of Radioactive Material for Disposal
- Research on Reprocessing Used Reactor Fuel
- Operation of Particle Accelerators
- Research using Radioisotopes
- Fuel Storage
- Corrosion Testing
- Mechanical Component Development
- Sodium Disposal

4.2 Radiation Exposure Potential from Operations

There were many different types of facilities and processes conducted at Area IV of the SSFL, which included reactors, critical test facilities, fuel preparation and post-irradiation examination facilities, accelerator and calibration facilities, and support facilities. Most reactors were low-power (a few kilowatts), with the maximum being 20 thermal MW, and all had relatively short operating histories. There was a Van de Graaff (deuterium-tritium) accelerator producing neutrons with a maximum energy of 14 MeV. The fuel examination and manufacturing facilities, reactors, and critical facilities handled fissionable fuels with various enrichments, mostly compounds of uranium including carbides. They also handled relatively small quantities of plutonium and thorium, with the exception of Buildings 4023, 4029, and 4030 where no thorium or plutonium was handled. Area IV of the SSFL did declad some fuels in the hot cells, resulting in the release of considerable quantities of fission products with high fission yields (e.g., Sr-90 and Cs-137) into the hot cell environment; there were smaller amounts of Eu-152, Eu-154, and tritium (ORAUT-TKBS-0038-6). The separations of irradiated fuel consisted only of pilot-scale operations conducted outside the hot cells; therefore, there were minimal contamination issues with gross fission products in non-hot-cell areas.

The operations summarized above resulted in potential internal and external radiation exposures for SSFL-Area IV workers during the DOE operations period 1955 through 1988. Because NIOSH has found indications that not all potentially-exposed workers were included in the personnel radiation monitoring program, an individual worker's potential for radiation exposure at SSFL-Area IV cannot be determined based solely on the existence or non-existence of individual monitoring records. Additional information regarding the radioisotopes, work areas, and operations associated with radiation exposures at SSFL-Area IV can be found in the NIOSH evaluation report, *SEC Petition Evaluation Report, Petition SEC-00093* (NIOSH, 2009).

4.3 Time Period Associated with Radiological Operations

Per the DOE Office of Health, Safety and Security, the time period associated with DOE operations at SSFL-Area IV is from 1955-1988, with a DOE remediation period from 1988 to the present (DOE, 2010). As presented in Section 3.0 of this report, HHS has already designated that SSFL-Area IV workers during the period from January 1, 1955 through December 31, 1958 be included in the SEC. NIOSH has subsequently determined that the inability to estimate, with sufficient accuracy, the total internal dose for the employees of SSFL-Area IV extends through December 31, 1964. The period of radiological operations associated with this evaluation begins on January 1, 1959 (the end of the current SEC class designation) and continues through December 31, 1964.

4.4 Site Locations Associated with Radiological Operations

The class of workers already designated for inclusion in the SEC includes all employees of DOE, its predecessor agencies, and DOE contractors and subcontractors who worked in any area of Area IV of the Santa Susana Field Laboratory during the period from January 1, 1955 through December 31, 1958. Through the course of ongoing dose reconstruction and continued research, NIOSH has determined that the site-specific and claimant-specific data available for SSFL-Area IV for the time period of this subsequent evaluation (1959-1964) are insufficient to allow NIOSH to characterize worker movements throughout the site. NIOSH is therefore unable to define individual worker exposure scenarios based on specific work locations within SSFL-Area IV.

4.5 Job Descriptions Affected by Radiological Operations

The class of workers already designated for inclusion in the SEC includes all employees of DOE, its predecessor agencies, and DOE contractors and subcontractors who worked in any area of Area IV of the Santa Susana Field Laboratory during the period from January 1, 1955 through December 31, 1958. Through the course of ongoing dose reconstruction and continued research, NIOSH has determined that the site-specific and claimant-specific data available for SSFL-Area IV for the time period of this subsequent evaluation (1959-1964) are insufficient to allow NIOSH to determine that any specific work group was not potentially exposed to radioactive material releases or possible subsequent contamination. NIOSH has insufficient information associating job titles and/or job assignments with specific radiological operations or conditions and is, therefore, unable to define potential radiation exposure conditions based on worker job descriptions.

5.0 Summary of Available Monitoring Data for the Proposed Class

The primary data used for determining internal exposures are derived from personal monitoring data, such as urinalyses, fecal samples, and whole-body counting results. If these are unavailable, the air monitoring data from breathing zone and general area monitoring are used to estimate the potential internal exposure. If personal monitoring and breathing zone area monitoring are unavailable, internal exposures can sometimes be estimated using more general area monitoring, process information, and information characterizing and quantifying the source term.

This same hierarchy is used for determining the external exposures to the cancer site. Personal monitoring data from film badges or thermoluminescent dosimeters (TLDs) are the primary data used to determine such external exposures. If there are no personal monitoring data, exposure rate surveys, process knowledge, and source term modeling can sometimes be used to reconstruct the potential exposure.

A more detailed discussion of the information required for dose reconstruction can be found in OCAS-IG-001, *External Dose Reconstruction Implementation Guideline,* and OCAS-IG-002, *Internal Dose Reconstruction Implementation Guideline*. These documents are available at: http://www.cdc.gov/niosh/ocas/ocasdose.html.

5.1 Data Capture Efforts and Sources Reviewed

In addition to examining its Site Research Database (SRDB) to locate documents supporting the evaluation of the proposed class, NIOSH identified and reviewed numerous data sources to locate information relevant to determining the feasibility of dose reconstruction for the class of employees proposed for this petition. This included determining the availability of information on personnel monitoring, workplace monitoring, and radiological source term data.

NIOSH's continuing data capture efforts since the evaluation of petition SEC-00093 (April 2009) have included visits to the SSFL site in September and November 2009, and one visit to the San Bruno Federal Records Center in September 2009. NIOSH has worked with representatives from DOE Legacy Management and the SSFL site in an attempt to gather documents and data relevant to dose reconstruction of SSFL-Area IV claims. NIOSH's SRDB currently contains over 900 documents associated with the SSFL-Area IV site.

5.2 Internal Personnel Monitoring Data

Radionuclides of concern for the facilities and processes at Area IV of the SSFL were primarily fission products. Exposure to fissionable material, transuranics, and activation products was also possible (NIOSH, 2009). Summaries of the available *in vitro* and *in vivo* data, as well as general overviews of sampling and analytical protocols, are provided in the previous NIOSH evaluation report, *SEC Petition Evaluation Report, Petition SEC-00093* (NIOSH, 2009). Additional details, including analytical methods, detectable activities, and reporting protocols can be found in ORAUT-TKBS-0038-5.

Subsequent to the NIOSH evaluation of SEC-00093, which identified data deficiencies through December 31, 1958, NIOSH continued data capture activities in an attempt to refine the methods and data available for the development of internal dose coworker distributions beginning in 1959. NIOSH worked with current site representatives for Area IV of SSFL to obtain an improved database of internal monitoring results.

NIOSH determined that SSFL used a number of bioassay labs throughout its history. Each vendor had its own reporting methods and report format. SSFL historically maintained the results as reported and also transferred these results onto sheets summarizing the results for an individual; these were called the McBee cards and are relatively consistent through time. For some analyses of interest, the McBee cards had only a "+" entered when the result was positive and the reviewer was directed to go to the original lab card for the magnitude of the result. NIOSH worked with the SSFL site representative to evaluate the varying formats for the original vendor lab reports, and to assign more appropriate and descriptive field names, enter missing information, and recombine the data into a searchable database.

Through continuing data capture activities, NIOSH has obtained additional data and reports that may be useful for determining the exposure potential for various work groups at SSFL-Area IV. However, NIOSH has evaluated the available database and supporting reports, and finds that the database still contains a substantial amount of ambiguous or indeterminate field entries for years prior to 1965, making the available database inadequate to support NIOSH's development of bounding coworker distribution models for years prior to 1965. The database contains over 1100 urinalysis results for 1963, and over 1400 for 1964, but there are still approximately 135 analyses for these years that are indicated to be positive for which NIOSH does not have a value to quantify the positive result.

Beginning in 1965, the data available to NIOSH are sufficient for the development of bounding coworker internal dose distributions. The database contains over 1350 urinalysis results for the year 1965, with adequate values being given for positive results. The database contains over 17,000 results for the years post-1964, and NIOSH has determined the data to be sufficient for statistical modeling.

5.3 External Personnel Monitoring Data

NIOSH has access to photon, beta, and neutron external dosimetry results, as well as other supporting data for the entire period evaluated in this report (available for all years of site operation). The policy at SSFL was to assign the applicable dosimetry to anyone with the potential for photon, beta, or neutron exposure; it was assigned based on job assignments that required exposure to radioactive materials (NIOSH, 2009; ORAUT-TKBS-0038-6). Summaries of the available external monitoring data can be found in the previous NIOSH evaluation report, *SEC Petition Evaluation Report, Petition SEC-00093* (NIOSH, 2009). Details regarding the various analyses used, and the associated minimum detectable activities, are presented in ORAUT-TKBS-0038-6.

Through the course of on-going dose reconstruction and investigations associated with SEC-00093, NIOSH determined that although external monitoring data are available for almost all monitored workers at SSFL-Area IV, some workers could have received external radiation exposures that went unmonitored. To assess potential external dose to unmonitored workers, NIOSH has developed a co-worker dose distribution model (ORAUT-OTIB-0077).

5.4 Workplace Monitoring Data

NIOSH has access to limited workplace air, surface, and environmental monitoring data for SSFL-Area IV prior to 1965. The data available prior to 1965 are inadequate for sufficiently accurate dose reconstructions in the absence of personnel monitoring data. Summaries of the available workplace and air monitoring data can be found in the previous NIOSH evaluation report, *SEC Petition Evaluation Report, Petition SEC-00093* (NIOSH, 2009) and ORAUT-TKBS-0038-4.

5.5 Radiological Source Term Data

The diverse reactor, accelerator, and support operations at the SSFL-Area IV site resulted in potential exposures to radioisotopes of cobalt, strontium, cesium, europium, uranium, thorium, plutonium, and americium. The source term and activity data available to NIOSH for years prior to 1965 are inadequate for sufficiently accurate dose reconstructions in the absence of personnel or workplace monitoring data. Summaries of the general and building-specific source term information available to NIOSH for the SSFL-Area IV site can be found in the previous NIOSH evaluation report, *SEC Petition Evaluation Report, Petition SEC-00093* (NIOSH, 2009) and ORAUT-TKBS-0038-2.

6.0 Feasibility of Dose Reconstruction for the Proposed Class

42 C.F.R. § 83.14(b) states that HHS will consider a NIOSH determination that there was insufficient information to complete a dose reconstruction, as indicated in this present case, to be sufficient, without further consideration, to conclude that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy.

In the case of a petition submitted to NIOSH under 42 C.F.R. § 83.9(b), NIOSH has already determined that a dose reconstruction cannot be completed for an employee at the DOE or AWE facility. This determination by NIOSH provides the basis for the petition by the affected claimant. Per § 83.14(a), the NIOSH-proposed class defines those employees who, based on completed research, are similarly affected and for whom, as a class, dose reconstruction is similarly not feasible.

In accordance with § 83.14(a), NIOSH may establish a second class of coworkers at the facility for whom NIOSH believes that dose reconstruction is similarly infeasible, but for whom additional research and analysis is required. If so identified, NIOSH would address this second class in a separate SEC evaluation rather than delay consideration of the claim currently under evaluation (see Section 10). This would allow NIOSH, the Board, and HHS to complete, without delay, their consideration of the class that includes a claimant for whom NIOSH has already determined a dose reconstruction cannot be completed, and whose only possible remedy under EEOICPA is the addition of a class of employees to the SEC.

This section of the report summarizes research findings by which NIOSH determined that it lacked sufficient information to complete the relevant dose reconstruction and on which basis it has defined the class of employees for which dose reconstruction is not feasible. NIOSH's determination relies on the same statutory and regulatory criteria that govern consideration of all SEC petitions.

6.1 Feasibility of Estimating Internal Exposures

NIOSH has evaluated the available personnel and workplace monitoring data and source term information and has determined that there are insufficient data for estimating internal exposures, as described below.

As presented in Section 3.0 of this report, HHS has previously designated an SEC class for SSFL-Area IV workers for the period from January 1, 1955 through December 31, 1958 (HHS, 2009). In the class designation letter, HHS states:

> *NIOSH has concluded that it cannot reconstruct pre-1959 internal doses for the evaluated worker class at Area IV of SSFL. NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to bound potential internal exposures from the various radionuclides for the evaluated worker class at Area IV of SSFL during the period from January 1, 1955 through December 31, 1958. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, the total internal dose for the class of employees covered by this evaluation.*

In its previous evaluation report, *SEC Petition Evaluation Report, Petition SEC-00093* (NIOSH, 2009), NIOSH determined that a routine bioassay monitoring program was established at SSFL-Area IV in late 1958, and therefore, sufficiently accurate internal dose reconstruction was feasible beginning in 1959. Subsequent to NIOSH's SEC-00093 evaluation, through the course of on-going dose reconstruction, continued data capture efforts, and related investigations, NIOSH determined that there were insufficient access controls in place at SSFL-Area IV; as a result, there were some workers who should have been monitored who were not. Although bioassay data are available for some monitored workers after 1958, NIOSH has determined that some SSFL-Area IV workers could have received intakes of radioactive materials after 1958 that went unmonitored. To assess potential internal dose to unmonitored workers, NIOSH continued its data capture activities in an attempt to refine the methods and data available for the development of internal dose coworker distributions beginning in 1959. As presented in Section 5.3 of this report, NIOSH has since determined that the available data contain a substantial amount of ambiguous or indeterminate results for periods prior to 1965, making the available data inadequate for developing bounding coworker distribution models for years prior to 1965.

NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate potential internal exposures to fission products and other radionuclides during the period from January 1, 1959 through December 31, 1964. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, internal exposures to fission products and other radionuclides and resulting doses for the class of employees covered by this evaluation.

Although NIOSH found that it is not possible to completely reconstruct internal radiation doses for the period from January 1, 1959 through December 31, 1964, NIOSH intends to use any internal monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at Area IV of the Santa Susana field Laboratory during the period from January 1, 1959 through December 31, 1964, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

6.2 Feasibility of Estimating External Exposures

This evaluation responds to a petition based on NIOSH determining that internal radiation exposures to fission products and other radionuclides could not be reconstructed for a dose reconstruction referred to NIOSH by DOL. As noted above, HHS will consider this determination to be sufficient without further consideration to determine that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy. Consequently, it is not necessary for NIOSH to fully evaluate the feasibility of reconstructing external radiation exposures for the class of workers covered by this report.

In its previous SEC class designation for SEC-00093, HHS states:

> *NIOSH has access to sufficient personnel monitoring and workplace monitoring data to bound potential external exposures for workers at Area IV of SSFL during the period from January 1, 1955 through December 31, 1958. NIOSH also finds it is feasible to reconstruct occupational medical dose with sufficient accuracy for workers at Area IV of SSFL.*

This current evaluation has found no evidence to the contrary for the period January 1, 1959 through December 31, 1964; NIOSH has established that it has access to sufficient information to either: (1) estimate the maximum external radiation dose for every type of cancer for which radiation doses are reconstructed that could have been incurred under plausible circumstances by any member of the class; or (2) estimate the external radiation doses to members of the class more precisely than a maximum dose estimate.

Adequate reconstruction of medical dose is likely to be feasible by using claimant-favorable assumptions in the technical information bulletin titled *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures* (ORAUT-OTIB-0006) and SSFL-Area IV site profile documents (ORAUT-TKBS-0038).

6.3 Class Parameters Associated with Infeasibility

HHS has already designated an SEC class for SSFL-Area IV workers for the period from January 1, 1955 through December 31, 1958 (HHS, 2009). Through the course of on-going dose reconstruction, continued data capture efforts, and investigations associated with SEC-00093, NIOSH has determined that the inability to estimate, with sufficient accuracy, the total internal dose for the employees of SSFL-Area IV extends through December 31, 1964. NIOSH therefore recommends that the proposed class include the period from January 1, 1959 through December 31, 1964.

As discussed in Section 4.4, NIOSH is unable to define individual worker exposure scenarios based on specific work locations within SSFL-Area IV. Therefore NIOSH recommends that the proposed class definition include all areas of Area IV of the Santa Susana Field Laboratory during the specified time period.

NIOSH has found insufficient documentation associating job titles and/or job assignments with specific radiological operations or conditions. Without such information, NIOSH is unable to define the proposed SEC class based on worker job descriptions or the availability of individual monitoring data. NIOSH therefore recommends that the proposed class definition include all employees of the

Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at SSFL-Area IV during the specified time period, regardless of whether a worker was monitored for radiation exposure.

7.0 Summary of Feasibility Findings for Petition SEC-00156

This report evaluates the feasibility for completing dose reconstructions for employees at Area IV of the Santa Susana Field Laboratory from January 1, 1959 through December 31, 1964. NIOSH determined that members of this class may have received radiation exposures from intakes of fission products and other radionuclides. NIOSH lacks sufficient information, which includes biological monitoring data, sufficient air monitoring information, or sufficient process and radiological source information that would allow it to estimate the potential internal exposures to which the proposed class may have been exposed.

NIOSH has documented herein that it cannot complete the dose reconstructions related to this petition. The basis of this finding demonstrates that NIOSH does not have access to sufficient information to estimate either the maximum radiation dose incurred by any member of the class or to estimate such radiation doses more precisely than a maximum dose estimate.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the period from January 1, 1959 through December 31, 1964, NIOSH intends to use any internal or external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at Area IV of the Santa Susana Field Laboratory during the period from January 1, 1959 through December 31, 1964, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

8.0 Evaluation of Health Endangerment for Petition SEC-00156

The health endangerment determination for the class of employees covered by this evaluation report is governed by EEOICPA and 42 C.F.R. § 83.14(b) and § 83.13(c)(3). Pursuant to these requirements, if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, NIOSH must determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. The regulations require NIOSH to assume that any duration of unprotected exposure may have endangered the health of members of a class when it has been established that the class may have been exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. If the occurrence of such an exceptionally high-level exposure has not been established, then NIOSH is required to specify that health was endangered for those workers who were employed for a number of work days aggregating at least 250 work days within the parameters established for the class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

NIOSH has determined that members of the class were not exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. However, the evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of fission products and other radionuclides and from direct exposure to radioactive materials. Consequently, NIOSH is specifying that health was endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

9.0 NIOSH-Proposed Class for Petition SEC-00156

The evaluation defines a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. This class includes all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area of Area IV of the Santa Susana Field Laboratory from January 1, 1959 through December 31, 1964, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

10.0 Evaluation of Second Similar Class

In accordance with § 83.14(a), NIOSH may establish a second class of coworkers at the facility, similar to the class defined in Section 9.0, for whom NIOSH believes that dose reconstruction may not be feasible, and for whom additional research and analysis is required. Such a class would be addressed in a separate SEC evaluation rather than delay consideration of the current claim. At this time, NIOSH has not identified a second similar class of employees at Area IV of the Santa Susana Field Laboratory for whom dose reconstruction may not be feasible.

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11.0 References

42 C.F.R. pt. 81, *Guidelines for Determining the Probability of Causation Under the Energy Employees Occupational Illness Compensation Program Act of 2000;* Final Rule, Federal Register/Vol. 67, No. 85/Thursday, p 22,296; May 2, 2002; SRDB Ref ID: 19391

42 C.F.R. pt. 82, *Methods for Radiation Dose Reconstruction Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 2, 2002; SRDB Ref ID: 19392

42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 28, 2004; SRDB Ref ID: 22001

42 U.S.C. §§ 7384-7385 [EEOICPA], *Energy Employees Occupational Illness Compensation Program Act of 2000*; as amended; OCAS website

DOE, 2010, U.S. Department of Energy, Office of Health, Safety, and Security; Energy Employees Occupational Illness Compensation Program; Find facilities List: http://www.hss.energy.gov/healthsafety/fwsp/advocacy/faclist/findfacility.cfm

HHS, 2009, *HHS Designation of Additional Members of the Special Exposure Cohort under the Energy Employees Occupational Illness Compensation Program Act of 2000, Designating a Class of Employees from Santa Susana Field Laboratory – Area IV Santa Susana, California*; Department of Health and Human Services (HHS); July 23, 2009; OSA Ref ID: 109364

NIOSH, 2009, *SEC Petition Evaluation Report for Petition SEC-00093, Santa Susana Field Laboratory-Area IV*; National Institute for Occupational Safety and Health; April 28, 2009; available on OCAS website at: http://www.cdc.gov/niosh/ocas/pdfs/sec/area4/ssfler-r1.pdf; SRDB Ref ID: 76961

ORAUT-OTIB-0006, *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures*, Rev. 03 PC-1; Oak Ridge Associated Universities (ORAU); Oak Ridge, Tennessee; December 21, 2005; SRDB Ref ID: 20220

ORAUT-OTIB-0077, *External Coworker Dosimetry Data for Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility (Vanowen Building, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International)*, Rev. 00; Oak Ridge Associated Universities (ORAU); Oak Ridge, Tennessee; August 3, 2009; SRDB Ref ID: 72162

ORAUT-TKBS-0038-1; *Atomics International – Introduction*, Rev. 01; Oak Ridge Associated Universities (ORAU); Oak Ridge, Tennessee; August 30, 2006; SRDB Ref ID: 30080

ORAUT-TKBS-0038-2; *Energy Technology Engineering Center – Site Description*, Rev. 00; Oak Ridge Associated Universities (ORAU); Oak Ridge, Tennessee; February 2, 2006; SRDB Ref ID: 22140

ORAUT-TKBS-0038-3; *Atomics International – Occupational Medical Dose*, Rev. 01; Oak Ridge Associated Universities (ORAU); Oak Ridge, Tennessee; September 8, 2006; SRDB Ref ID: 30081

ORAUT-TKBS-0038-4; *Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility (Vanowen Building), the Downey Facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International) – Occupational Environmental Dose*, Rev. 01; Oak Ridge Associated Universities (ORAU); Oak Ridge, Tennessee; March 8, 2007; SRDB Ref ID: 30622

ORAUT-TKBS-0038-5; *Energy Technology Engineering Center – Occupational Internal Dose*, Rev. 00; Oak Ridge Associated Universities (ORAU); Oak Ridge, Tennessee; February 22, 2006; SRDB Ref ID: 22287

ORAUT-TKBS-0038-6; *Atomics International – Occupational External Dose*, Rev. 01; Oak Ridge Associated Universities (ORAU); Oak Ridge, Tennessee; November 16, 2006; SRDB Ref ID: 30082