



ORAU TEAM Dose Reconstruction Project for NIOSH

Oak Ridge Associated Universities | Dade Moeller | MJW Technical Services

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EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
04/11/2005	00	New technical basis document for the Pinellas Plant – Introduction. Initiated by Mark D. Notich.
04/18/2011	01	This technical basis document was predominantly revised to address SC&A’s issue with the document, as identified in SCA-TR-TASK1-0015. To resolve that issue, the table summarizing the data capture searches performed for the Pinellas Plant has been revised. In addition, the summaries of the other TBDs in the Pinellas Plant’s Site Profile have been revised. Incorporates formal internal and NIOSH review comments. Constitutes a total rewrite of the document. Training required: As determined by the Objective Manager. Initiated by Peter Darnell and Brian P. Gleckler.

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ACRONYMS AND ABBREVIATIONS

AP	anterior-posterior X-ray exposure
DOE	Department of Energy
EEOICPA	Energy Employees Occupational Illness Compensation Program Act
FRC	Federal Records Center
GE	General Electric Company
GEND	GE Neutron Devices
GENDD	GE Neutron Devices Department
GEPP	GE Pinellas Plant
GEXF	GE X-ray Division in Florida
KUB	Kidneys, Ureters, Bladder
LAT	lateral X-ray exposure
LAHDRA	Los Alamos Historical Document Retrieval and Assessment
NARA	National Archives and Records Administration
NIOSH	National Institute for Occupational Safety and Health
ORAUT	Oak Ridge Associated Universities Team
OSTI	Office of Scientific and Technical Information
PA	posterior-anterior X-ray exposure
SAIC	Science Applications International Corporation
SC&A	S. Cohen & Associates
TBD	technical basis document
U.S.C.	United States Code

1.0 INTRODUCTION

Technical basis documents and site profile documents are not official determinations made by the National Institute for Occupational Safety and Health (NIOSH) but are rather general working documents that provide historic background information and guidance to assist in the preparation of dose reconstructions at particular sites or categories of sites. They will be revised in the event additional relevant information is obtained about the affected site(s). These documents may be used to assist NIOSH staff in the completion of the individual work required for each dose reconstruction.

In this document the word “facility” is used as a general term for an area, building, or group of buildings that served a specific purpose at a site. It does not necessarily connote an “atomic weapons employer facility” or a “Department of Energy [DOE] facility” as defined in the Energy Employees Occupational Illness Compensation Program Act [EEOICPA; 42 U.S.C. § 7384l(5) and (12)]. EEOICPA defines a DOE facility as “any building, structure, or premise, including the grounds upon which such building, structure, or premise is located ... in which operations are, or have been, conducted by, or on behalf of, the Department of Energy (except for buildings, structures, premises, grounds, or operations ... pertaining to the Naval Nuclear Propulsion Program)” [42 U.S.C. § 7384l(12)]. Accordingly, except for the exclusion for the Naval Nuclear Propulsion Program noted above, any facility that performs or performed DOE operations of any nature whatsoever is a DOE facility encompassed by EEOICPA.

For employees of DOE or its contractors with cancer, the DOE facility definition only determines eligibility for a dose reconstruction, which is a prerequisite to a compensation decision (except for members of the Special Exposure Cohort). The compensation decision for cancer claimants is based on a section of the statute entitled “Exposure in the Performance of Duty.” That provision [42 U.S.C. § 7384n(b)] says that an individual with cancer “shall be determined to have sustained that cancer in the performance of duty for purposes of the compensation program if, and only if, the cancer ... was at least as likely as not related to employment at the facility [where the employee worked], as determined in accordance with the POC [probability of causation¹] guidelines established under subsection (c) ...” [42 U.S.C. § 7384n(b)]. Neither the statute nor the probability of causation guidelines (nor the dose reconstruction regulation, 42 C.F.R. Pt. 82) define “performance of duty” for DOE employees with a covered cancer or restrict the “duty” to nuclear weapons work (NIOSH 2010).

The statute also includes a definition of a DOE facility that excludes “buildings, structures, premises, grounds, or operations covered by Executive Order No. 12344, dated February 1, 1982 (42 U.S.C. 7158 note), pertaining to the Naval Nuclear Propulsion Program” [42 U.S.C. § 7384l(12)]. While this definition excludes Naval Nuclear Propulsion Facilities from being covered under the Act, the section of EEOICPA that deals with the compensation decision for covered employees with cancer [i.e., 42 U.S.C. § 7384n(b), entitled “Exposure in the Performance of Duty”] does not contain such an exclusion. Therefore, the statute requires NIOSH to include all occupationally-derived radiation exposures at covered facilities in its dose reconstructions for employees at DOE facilities, including radiation exposures related to the Naval Nuclear Propulsion Program. As a result, all internal and external occupational radiation exposures are considered valid for inclusion in a dose reconstruction. No efforts are made to determine the eligibility of any fraction of total measured exposure for inclusion in dose reconstruction. NIOSH, however, does not consider the following exposures to be occupationally derived (NIOSH 2010):

- Background radiation, including radiation from naturally occurring radon present in conventional structures
- Radiation from X-rays received in the diagnosis of injuries or illnesses or for therapeutic reasons

¹ The U.S. Department of Labor (DOL) is ultimately responsible under the EEOICPA for determining the POC.

1.1 PURPOSE

This site profile documents the historical practices at the Pinellas Plant. The site profile also provides technical basis information to be used to evaluate the total occupational radiation dose for EEIOCPA claimants. The purpose of this Introduction TBD is to provide a summary of the contents of the other five TBDs that constitute the remainder of the Pinellas Plant Site Profile, and to summarize the records searches that were performed to construct this site profile.

1.2 SCOPE

The Pinellas Plant's Site Profile consists of six TBDs: (1) this Introduction, (2) Site Description, (3) Occupational Medical Dose, (4) Occupational Environmental Dose, (5) Occupational Internal Dose, and (6) Occupational External Dose. The following sub-sections provide summaries of the contents of these TBDs, excluding this one.

1.2.1 Site Description

The Site Description TBD (ORAUT 2011a) describes facilities and processes that took place at the Pinellas Plant. The Pinellas Plant has been known by several names throughout its history. Those names include: 908 Plant, Pinellas Peninsula Plant, GE X-ray Division-Florida (GEXF), GE Neutron Devices Department (GENDD), GE Neutron Devices (GEND), GE Pinellas Plant (GEPP), and the Pinellas Plant.

The General Electric Company built and operated the Pinellas Plant for DOE from its initial startup in January 1957 until June 1992. In June 1992, Martin Marietta Specialty Components, Inc. (MMSC) took over as the managing and operating contractor for the Pinellas Plant. In 1994, Lockheed merged with Martin Marietta and the managing and operating contractor for the Pinellas Plant was renamed Lockheed Martin Specialty Components (LMSC). The Pinellas Plant completed its war reserve fabrication of neutron generators at the end of September 1994, and began the transition from a defense mission to an environmental management mission. That transition included a number of decontamination and decommissioning activities that allowed the Plant to be turned over for commercial uses. LMSC continued as the managing and operating contractor until decontamination and decommissioning activities ended in 1997 (ORAUT 2011a).

The Plant was built to manufacture neutron generators, a principal component in nuclear weapons. The neutron generators consisted of a miniaturized linear ion accelerator assembled with pulsed electric power supplies. The ion accelerator, or neutron tube, required ultraclean, high-vacuum technology; hermetic seals between glass, ceramic, glass-ceramic, and metal materials; and high-voltage generation and measurement technology. The Plant manufactured only neutron generators for its first 10 years of operation. It later manufactured other products including neutron detectors, radioisotopic thermoelectric generators (RTGs), high-vacuum switch tubes, specialty capacitors, and specialty batteries (Weaver 1990). As part of its program to promote commercial uses of the site, DOE sold most of the Plant to the Pinellas County Industry Council in March 1995 and leased back a portion through September 1997 to complete safe shutdown and transition activities (MMSC 1996).

1.2.2 Occupational Medical Dose

The Occupational Medical Dose TBD (ORAUT 2006) provides information about the dose individual workers received from screening X-rays that were required as a condition of employment. Under the EEOICPA program, doses from occupational medical X-ray procedures that were performed at a covered facility on Energy Employees for occupational health screening and as a condition of

employment must be included in the EEOICPA dose reconstructions. The doses from those screening X-ray exposures were not measured, considered, or included as part of the employees' occupational exposures. Therefore, the worker's doses from those X-ray exposures are estimated based on the best available information, which is typically documented in this TBD and, when available, a worker's occupational medical records.

The Pinellas Plant operations contractors required preemployment and routine medical examinations as part of its occupational health and safety program. The preemployment as well as some of the routine medical examinations typically required screening X-ray examinations. At the Pinellas Plant, the screening X-ray examinations typically included posterior-anterior (PA) and infrequent lateral (LAT) chest X-rays. For some years, these medical examinations may have also included abdominal, KUB (Kidneys, Ureters, Bladder), and/or lumbar spine X-ray examinations. For this site, the abdominal, KUB, and lumbar spine X-ray examinations are considered to be screening X-rays, because they were performed on so many Pinellas Plant workers.

A wide variety of other X-ray examinations (e.g. cervical spine, dorsal spine, hand, ankle, foot, sinuses, wrist, etc.) were performed on Pinellas Plant workers. These X-rays were not performed as screening X-ray examinations and as a condition of employment. Thus far, the available information indicates that these X-ray examinations were solely performed for diagnostic purposes. Therefore, the doses associated with these diagnostic X-ray examinations are not included in dose reconstruction under EEOICPA.

X-ray equipment and the techniques used for taking X-rays changed over the years covered by this Site Profile. This analysis took these factors into account in estimating the dose a worker would have received from each type of X-ray exposure that might have been received. The parameters considered included the tube current and voltage, exposure time, filtration, source-to-skin distance, the exposure/view (PA, AP, or LAT), and any other factor that could affect the dose received by the worker.

The analysis calculated doses to other exposed organs from the X-ray examinations. The calculated doses take into account the uncertainty associated with each of the parameters mentioned above. Tables in the TBD list the doses received by the various organs in the body for convenient reference for dose reconstruction.

1.2.3 Occupational Environmental Dose

The Occupational Environmental Dose TBD (ORAUT 2011b) provides historical environmental dose information for Pinellas Plant workers about onsite exposure to Plant radiological releases to air and ambient conditions. The information is based on the available literature on the site, which consists primarily of environmental monitoring reports and site environmental reports published between 1971 and 1995.

The Occupational Environmental Dose TBD principally applies to workers that were not monitored for external or internal radiation exposure. Workers received the environmental dose when working on the site from inhalation of radioactive materials in the air, direct radiation from process equipment, contact with particles on the skin, and direct exposure to radionuclides.

Inhalation of environmental radionuclides results in internal dose to the whole body or body organs. Whole- or partial-body external dose results from deposited radionuclides or submersion in a cloud of radioactive material.

1.2.4 Occupational Internal Dose

The Occupational Internal Dose TBD (ORAUT 2011c) describes the internal dosimetry program at the Pinellas Plant. Tritium was the only radioactive material that was a significant internal dose concern. The primary method for monitoring employees for tritium intakes was urine bioassay. There have not been a variety of methods used historically to analyze for tritium at Pinellas. Liquid scintillation detection was always used for tritium analysis.

The Occupational Internal Dose TBD (ORAUT 2011c) discusses interferences that could be encountered in the collection and analysis of urine samples, and the uncertainties in the urine analysis measurements. In addition, it presents information that could be useful in estimating possible missed doses due to the limitation of monitoring practices and the limitations of equipment and techniques for radiation detection and measurement. It also presents methods for evaluating potential doses that could fall into this category.

1.2.5 Occupational External Dose

The Occupational External Dose TBD (ORAUT 2011d) describes the external dosimetry program at the Pinellas Plant. The Pinellas Plant started an external dosimetry program in 1957 to monitor individual employees working in production areas for neutron generators. The Occupational External Dose TBD (ORAUT 2011d) discusses the dosimeter types and technologies for measuring dose from the different types of radiation. It also discusses the evaluation of doses measured from exposure to beta, gamma, and neutron radiation; sources of bias, workplace radiation field characteristics, responses to different beta/gamma and neutron dosimeters in the workplace fields, and adjustments to the recorded dose measured by these dosimeters during specific years. In addition, this TBD provides guidance on assigning doses for unmonitored workers at the Pinellas Plant, and for monitored workers with missing dosimetry records.

1.3 **DESCRIPTION AND HISTORY OF RECORDS SEARCHES**

Site Profile documents are reviewed and updated as new data are discovered. The following is a summary of the data capture efforts made to obtain the records needed to develop the general working documents that provide guidance for dose reconstructions.

Summary of data capture searches for the Pinellas Plant^a

Data capture source	General description of documents captured	Date complete	Files uploaded to SRDB
Internet - DOE OSTI - SC&A	Pinellas feasibility study; neutron devices information; environmental assessment for decontamination and dismantlement; and radiological dose assessment of Pinellas plant waste.	03/03/04	4
Unknown	Indoor radon study; employee roster; radiation surveys; 1970s Landauer dosimetry information; inventory on microfilmed records (1992); and radiological monitoring information (e.g., urine samples, personal and environmental dosimetry).	05/06/04	9
Unknown - SC&A	Employee listing; annual radionuclide air emission report; environmental assessment; epidemiologic study agreement; radiation hazards questionnaire; radiological monitoring; DOE indoor radon study; and an inventory of all microfilmed records.	06/16/04	12

Data capture source	General description of documents captured	Date complete	Files uploaded to SRDB
SAIC	Radiation exposure data.	09/02/04	3
Pinellas Plant	Single phase generators information	12/08/04	1
NARA Atlanta - SC&A	ALARA program report; environmental report; area hazard report and worksheets; bioassay results; building descriptions; contamination assessment; DOE review team report; dosimeter fade study; employee listing; Health & Safety plans; incident reports; Internal Dosimetry technical basis document; NESHAPS data; personnel dosimetry and exposure data; radioactive on-site discharges report; radioactive waste implementation plan; radiological procedures; radiological surveys; radon results; and information on: environmental monitoring, health physics instrumentation, hydride protection, ion acceleration, the counting laboratory; the uranium bed processing system, the PuBe neutron source, the quality assurance program, radiation training, radiological waste, RTG heat sources, shipments of radioactive material, and the use of X-ray producing equipment.	03/03/05	331
FRC San Bruno	Correction action plan to task group on tritium facilities.	11/30/05	1
NARA Atlanta	Wide array of documents covering: personnel exposure (1950s–1990s); general site information; NESHAPS and stack sampling data; incident reports; radiological procedures; RTG program information; and numerous radiological final status reports.	07/01/06	186
[Name Redacted] Personal Files	Eighteenth Annual Report Radiation Exposures for DOE and DOE Contractor Employees - 1985.	10/11/06	1
OSTI	DOE/NV/10594-H1: History of the Production Complex: The Methods of Site Selection.	05/15/07	1
Internet - DOE Environmental Mgmt (EM)	Linking Legacies Chapter 3 – Wastes.	10/28/07	1
ORAUT	Project generated documents (e.g., documented communications, site description information).	12/03/07	20
LAHDRA	Nonnuclear Consolidation Environmental Assessment Volume II.	12/06/07	1
FRC Atlanta	Environmental monitoring reports; air sample data; annual stack emissions reports; area film badge results; bioassay data; plutonium delivered onsite; radiological incidents; alpha counting procedure; Landauer dosimetry data; plutonium bioassay test program; tritium information; and neutron generator information.	03/03/08	24
FRC Denver	CY 1973 Onsite Discharge Data Compilations.	11/18/08	1
DOE Albuquerque	ES&H Reports 1959–1962; internal and external dosimetry 1993–1996; and final radiological status reports for various site buildings.	11/26/08	100
Interlibrary Loan	Environmental Levels of Radioactivity at Atomic Energy Commission Installations.	04/01/10	13

Data capture source	General description of documents captured	Date complete	Files uploaded to SRDB
DOE Legacy Mgmt - MoundView (Fernald Holdings, includes Fernald Legal Database)	Hazardous chemical reports and effluent information summary (1980s), DOE Annual Air Emissions Report (1985), and personnel exposure information.	05/18/10	11
DOE Idaho National Laboratory - SC&A	Environmental survey.	06/24/10	1
Pinellas Plant -SC&A	Conduct of Operations Implementation; Development of the Pinellas Plant Site Profile; Medical X-ray Survey; Gas Leak at Nuclear Facility; Health Physics Report; Medical Facility Shielding Document; NIOSH Dose Reconstruction Meeting; Community Health Concerns Report; and a Radiation Protection Survey.	06/24/10	11
DOE Legacy Mgmt - Morgantown	Environmental, Safety, and Health needs of the DOE.	06/30/10	1
Internet - DOE Hanford Declassified Document Retrieval System (DDRS)	Comments on proposed Washington Administrative Code Air Emission Program.	09/01/10	1
Internet - DOE Legacy Mgmt Considered Sites	Building 100 area corrective measures study and area plume control technology selection reports; Department of Energy financial awards; and a Pinellas environmental restoration project quarterly progress report.	09/01/10	8
Internet - DOE OpenNet	Shipping request and procedure; and Linking Legacies Appendix B, Major Process of the Nuclear Weapons Complex.	09/01/10	4
Internet - National Academies Press (NAP)	Management for health, safety, and the environment; groundwater and soil cleanup.	09/01/10	3
Internet - NIOSH	Building 200 information.	09/01/10	2
Internet - NRC Agencywide Document Access and Mgmt (ADAMS)	Integrated data base: U.S. spent fuel and radioactive waste inventories, projections, and characteristics; evaluation of the potential for recycling of scrap metals from nuclear facilities; and a long-term surveillance and monitoring program report.	09/01/10	7
Internet - Oak Ridge Associated Universities (ORAU)	Medical testing for beryllium sensitivity or exposures to other hazardous substances.	09/01/10	1
NIOSH OCAS Claims Tracking System (NOCTS)	Electron beam welder instructions; and Pinellas newsletter articles.	10/05/10	2
Internet - Google	Pinellas County soil survey, environmental restoration activities, and preliminary survey (1977).	10/06/10	99
NIOSH	Pinellas environmental baseline report; facts and sources for EEOICPA claimants; and worker outreach meeting information.	10/14/10	23

Data capture source	General description of documents captured	Date complete	Files uploaded to SRDB		
Internet - DOE OSTI Energy Citations	Annual report of waste generation; application to ship radioactive waste; environmental assessment; environmental restoration activities; environmental survey; radiological exhaust stack monitoring report; environmental monitoring plan; plant facts; groundwater protection plan; low-level waste characterization; low-level waste program certification and quality assurance plan; radiological stack flow report; AEC pollution control conference; Radiological Control Manual; Radiological Health report; site dose assessment; Technical Safety Appraisal; Tiger team assessment; and waste characterization information.	11/15/10	36		
Internet - DOE OSTI Information Bridge	Environmental assessment of the relocation of neutron tube target loading operations; environmental monitoring reports; hazardous waste shipment data; US spent nuclear fuel and radioactive waste inventories; environmental dose models; Pinellas plant ion accelerator facility: tritiated wastewater treatment evaluation; workforce estimates for environmental restoration; and information on waste reduction activities and risks and costs associated with transportation of contaminated carbon steel.	11/15/10	21		
DOE Legacy Mgmt - Grand Junction Office	Baseline Environmental Management report.	11/18/10	1		
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a. In the data capture source column, sources followed by the designation “- SC&A” were provided by S. Cohen & Associates.

REFERENCES

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