

SEC Petition Evaluation Report Petition SEC-00199

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| Site Expert(s): | N/A |

| Petitioner Administrative Summary | | | |
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| Petition Under Evaluation | | | |
| Petition # | Petition Type | Petition A Receipt Date | DOE/AWE Facility Name |
| SEC-00199 | 83.14 | March 13, 2012 | Winchester Engineering and Analytical Center |

| NIOSH-Proposed Class Definition |
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| All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Winchester Engineering and Analytical Center in Winchester, Massachusetts, from January 1, 1952 through December 31, 1961, 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 in the Special Exposure Cohort. |

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Evaluation Report Summary: SEC-00199, Winchester Engineering and Analytical Center

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 at the Winchester Engineering and Analytical Center in Winchester, Massachusetts, from January 1, 1952 through December 31, 1961, 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 personnel monitoring data, air monitoring data, process data, and radiological source term information, to allow it to estimate with sufficient accuracy the potential internal or external exposures to uranium and thorium ores, including uranium and thorium progeny, to which the proposed class may have been subjected. NIOSH finds that it is likely feasible to reconstruct occupational medical dose for Winchester Engineering and Analytical Center (WEAC) workers with sufficient accuracy.

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

- Principal sources of internal radiation for members of the proposed class included exposures to uranium and thorium, including the progeny of these radionuclides, as found in various grades of ores, raffinates, and process effluent samples sent to the facility for analysis. Potential for internal exposure through inhalation and ingestion of these materials during sample preparation and processing would have been significant if adequate exposure prevention protocols were not in place. Documentation verifying the use of such protocols is not currently available to NIOSH.
- Principal sources of external radiation for members of the proposed class included exposures to uranium and thorium, including the progeny of these radionuclides, as found in various grades of ores, raffinates, and process effluent samples sent to the facility for analysis.

- NIOSH has identified limited personnel internal monitoring data for select individuals for the years 1953, 1954 and 1955. The data are not comprehensive and there is no evidence to indicate these data are representative of the most highly-exposed workers at the WEAC facility, or to indicate that the available sample results are representative of all workers. Without additional personnel radiation monitoring data representing the period from 1952 through 1961, NIOSH has insufficient information to appropriately characterize radioactive material intakes during WEAC operations.
- NIOSH has not located any indication of external personnel exposure monitoring for the period under evaluation. NIOSH's research indicates personnel monitoring for external exposure to radiological materials was not performed. No records of any program for personnel external dose monitoring, or data that would be associated with such a program have been located.
- NIOSH has located little documentation on quantities of radiological materials shipped to WEAC for processing or testing. Available records indicate that a wide variety of material forms, including uranium ore and metal, pitchblende, and uranium dioxide were used for research and pilot plant projects at the site. Materials and experimental activities involved uranium and decay chain radionuclides being chemically separated and re-concentrated so that they were often out of the equilibrium state; the degree of disequilibrium is generally unknown to NIOSH. It is unknown if and how this material may have been stored on site. NIOSH can make no assumptions about what particular radionuclides, quantities, or forms of the source materials may have been used or stored at the site over the operational period under evaluation.
- NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate unmonitored internal exposures for WEAC workers during the periods of DOE operations from January 1, 1952 through December 31, 1961.
- Pursuant to 42 C.F.R. § 83.13(c)(1), NIOSH determined that there is insufficient information to either: (1) estimate the maximum 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 radiation doses of members of the class more precisely than a maximum dose estimate.

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 the Winchester Engineering and Analytical Center during the period from January 1, 1952 through December 31, 1961, 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 uranium and thorium and their progeny. 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 SEC.

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SEC Petition Evaluation Report for SEC-00199

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: M. Harrison-Maples, Oak Ridge Associated Universities. 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 the Winchester Engineering and Analytical Center 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 at the Winchester Engineering and Analytical Center in Winchester, Massachusetts from January 1, 1952 through December 31, 1961, 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 in the Special Exposure Cohort. During this period, employees at this facility were involved in research and development for the Atomic Energy Commission (AEC) on methods to extract uranium from ores and the preparation of metal-grade uranium tetrafluoride. Assays on foreign and domestic uranium ores with both conventional and refined analytical techniques were performed (WEAC, date unknown).

The evaluation responds to Petition SEC-00199 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).

4.0 Radiological Operations Relevant to the Proposed Class

The following subsections summarize the radiological operations at the Winchester Engineering and Analytical Center (WEAC) from January 1, 1952 through December 31, 1961 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.

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>.

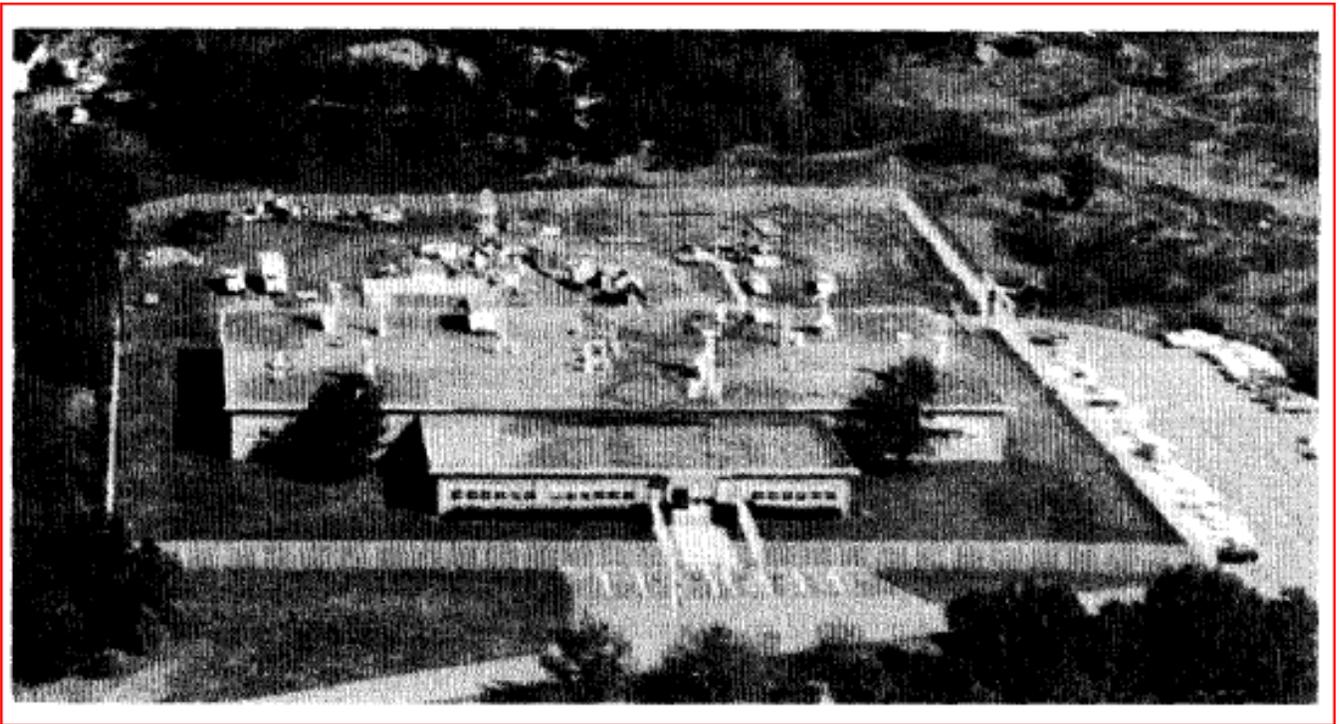
4.1 Operations Description

WEAC was located on 5.8 acres at 109 Holton Street in Winchester, Massachusetts, approximately 15 miles from Boston. The main facility, a single-floor masonry building with a floor area of approximately 31,400 square feet, housed administrative space and approximately 30 laboratories, work areas, shops, and offices. The site had well equipped machine and instrument shops (AEC Summary Report, 1959, pdf p. 20). Also on site was a solvent storage building and a small pilot plant housed in a corrugated metal building (FUSRAP, date unknown).

For the period evaluated by NIOSH, the entire covered DOE period of January 1952 through the end of 1961, the WEAC workforce consisted of 70-100 workers. This workforce estimate is supported by 1955 and 1958 organization charts for the facility included in the 1954-1959 Summary Report (AEC Summary Report, 1959, pdf pp. 31-32), which show approximately 40 professional positions. The estimate is further supported by the recollection of a former WEAC worker (Personal Communication, 2012). During an interview with this worker, the worker estimated between 70-100 people worked at the site.

The original purpose of the facility was the research and development of technology for extracting uranium and thorium from uranium-bearing ores from various mill locations, and the preparation of metal-grade uranium tetrafluoride. In 1957, the AEC directed WEAC to extend its research and development activities to procedures for reducing radiological hazards associated with mill operations. The basic studies of the chemical behavior of radium and thorium at extremely low concentrations constituted a major part of this program (AEC Major Activities, 1960). In 1959, the facility transitioned from the development of production methods to testing uranium waste environmental analysis methods and performing laboratory testing and analysis.

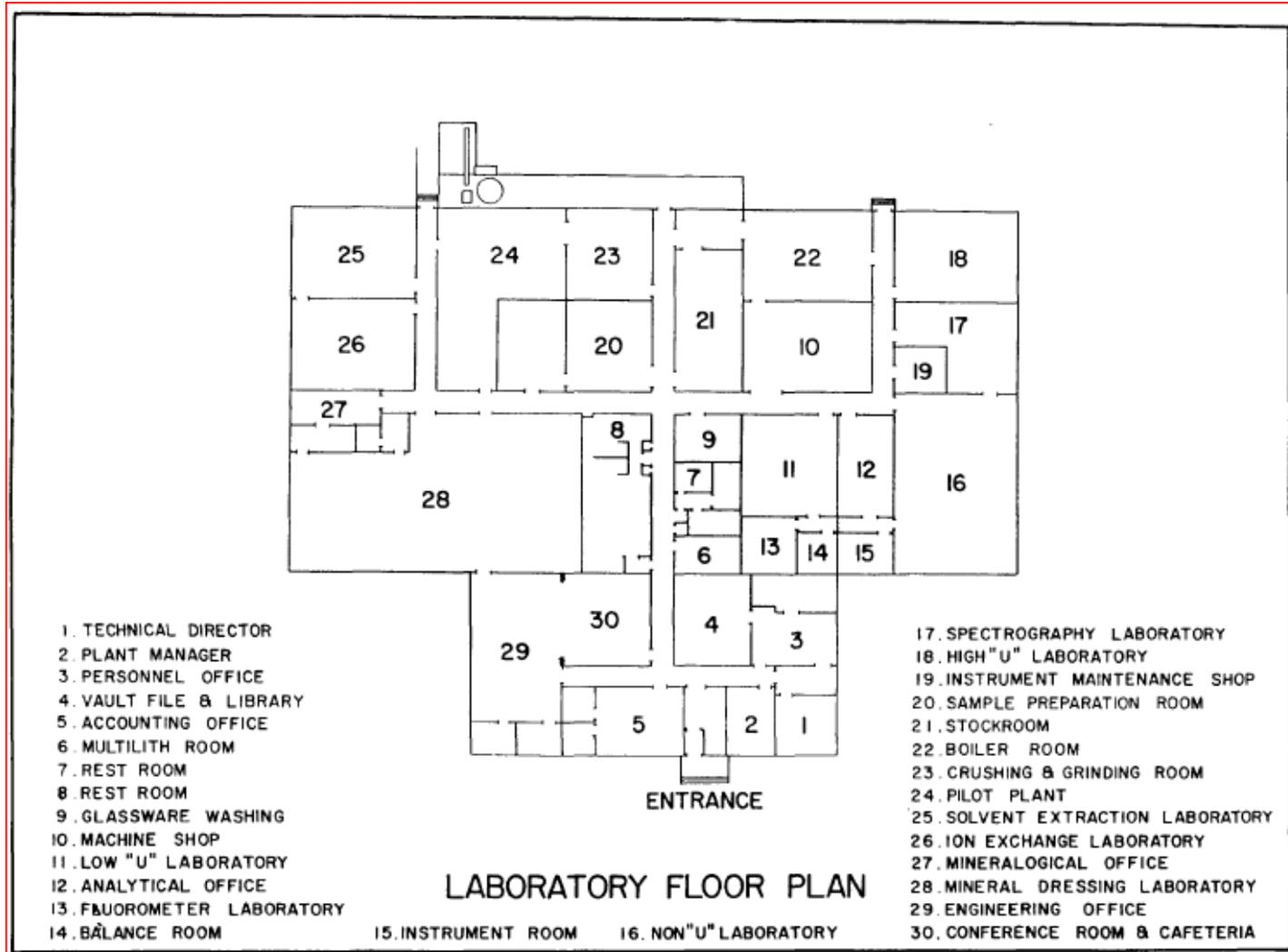
Figure 4-1 shows an aerial view of the WEAC site after it was transferred from AEC control to Health Education and Welfare (HEW) in 1961 (see Section 4.3). This photo was taken after the site's 1962 conversion to a low-level environmental radiation surveillance laboratory run by the U.S. Public Health Service (renamed the Northeastern Radiological Health Laboratory [NERHL]) (HEW Summary Report, 1966).



Source: HEW Summary Report, 1966

Figure 4-1: Aerial View of Winchester Facility

Figure 4-2 below shows a floor plan for the WEAC Laboratory.



Source: AEC Summary Report, 1959, pdf p. 22

Figure 4-2: WEAC Laboratory Floor Plan

4.2 Radiation Exposure Potential from Operations

The potential for external radiation dose existed at all site locations where radioactive materials were handled or stored, including laboratory, storage, and pilot plant facilities. NIOSH has identified some documentation describing a variety of projects involving raffinates from several different sites, with no specific information regarding their physical storage, location of use, or the length of time the material from each site remained at WEAC. The largest source of information regarding these materials is a list of publications from the site included in one of their reports to the AEC (AEC Summary Report, 1960). Based on the site operations outlined in Section 4.1, sources of exposure included beta and alpha particulate radiation and photon radiation emitted from uranium and thorium ores, raffinates, and effluent samples sent to WEAC for research or analysis.

The primary sources of internal radiation exposure at the site were uranium- or thorium-bearing ore samples, raffinates, and effluents. Available records indicate a wide variety of material forms, including uranium ore and metal, pitchblende, and uranium dioxide used for research and pilot plant projects at the site. In many cases, experiments were performed on ores from various sites, or on leach liquors and other raffinates. Materials and experimental activities involved uranium and decay chain radionuclides being chemically separated and re-concentrated so that they were often out of the equilibrium state; the degree of disequilibrium is generally unknown to NIOSH.

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 WEAC is from 1952 through 1961 with no specific dates identified. NIOSH has located documentation provided by the WEAC director in 1979 specifying October 1952 as the start of Winchester operations (Questionnaire Response, 1979), but without further documentation to support an October start date, NIOSH has evaluated this petition using the more conservative start date of January 1, 1952. NIOSH has not located an indication of a specific operational end date. Records indicate the facility was operated by American Cyanamid Company from 1952 to 1954; National Lead continued the operation from 1954 to 1961. The site was transferred from AEC control to Health Education and Welfare (HEW), now known as the Department of Health and Human Services. HEW took over the lab from AEC in October 1961 and decontamination of lab areas was performed to prepare the laboratory for the 1962 conversion to a low-level environmental radiation surveillance laboratory run by the U.S. Public Health Service (renamed the Northeastern Radiological Health Laboratory [NERHL]) (HEW Summary Report, 1966). Most of the equipment in the laboratory building was moved out, although most of the lab benches and hoods remained. Lacking any more definitive information, December 31, 1961 is assumed to be the end of covered DOE operations.

4.4 Site Locations Associated with Radiological Operations

The facility consisted of a single-floor masonry building with administrative and laboratory space, a solvent storage building, and a corrugated metal building used for pilot plant projects. Within the main laboratory building, the rooms in which radioactive materials were most likely used consisted of the low and high "U" laboratories, the analytical office, the fluorometer laboratory, the balance room, the spectography laboratory, the sample preparation room, the crushing and grinding room, the solvent extraction laboratory, the ion exchange laboratory, the mineralogical office, the mineral

dressings laboratory, and the pilot plant. While the laboratory and pilot plant buildings are specifically identified for the use of AEC-related radiological materials, documentation available to NIOSH does not indicate any definite boundaries between radiological and non-radiological areas for the period being evaluated.

NIOSH is therefore unable to define individual worker exposure scenarios based on specific work locations within the WEAC site during the period under evaluation. Based on this information, NIOSH has considered all WEAC work areas in its evaluation.

4.5 Job Descriptions Affected by Radiological Operations

Given the general lack of specific operational knowledge or detailed worker description information, and the potential for radioactive contamination in the affected locations, it is not possible to determine that any specific work group was not potentially exposed to radioactive material releases or possible subsequent contamination. From the *Summary Report 1954-1959* (AEC Summary Report, 1959), NIOSH has determined that the WEAC work was divided among three sections, Analytical, Chemical, and Metallurgical; however, NIOSH has no information indicating that any work performed in one or more of these sections may have excluded radiological operations or research.

NIOSH has determined that the site-specific and claimant-specific data available for WEAC for the time period under evaluation 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. Without such information, NIOSH is 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

As a standard practice, NIOSH completed an extensive database and Internet search for information regarding WEAC. The database search included the DOE Legacy Management Considered Sites database, the DOE Office of Scientific and Technical Information (OSTI) database, the Energy Citations database, and the Hanford Declassified Document Retrieval System. In addition to general Internet searches, the NIOSH Internet search included OSTI OpenNet Advanced searches, OSTI Information Bridge Fielded searches, Nuclear Regulatory Commission (NRC) Agency-wide Documents Access and Management (ADAMS) web searches, the DOE Office of Human Radiation Experiments website, and the DOE-National Nuclear Security Administration-Nevada Site Office-search. Attachment 1 contains a summary of WEAC documents. The summary specifically identifies data capture details and general descriptions of the documents retrieved.

In addition to the database and Internet searches listed above, NIOSH identified and reviewed numerous data sources to determine information relevant to determining the feasibility of dose reconstruction for the class of employees under evaluation. This included determining the availability of information on personal monitoring, area monitoring, industrial processes, and radiation source materials. The following subsections summarize the data sources identified and reviewed by NIOSH.

In addition to the above searches and data reviews, NIOSH contacted the National Lead Company, American Cyanamid, Wyeth General Insurance, and the Food and Drug Administration (FDA) in their capacity as former administrators of the WEAC facility. As a result of these contacts, NIOSH was provided two documents. In addition, although the FDA would not provide to NIOSH contact information for former workers, the FDA did provide ORAU contact information to former workers. To date, NIOSH has not been contacted by any former workers.

5.2 Worker Interviews

To obtain additional information, NIOSH interviewed one former WEAC employee by telephone:

- Personal Communication, 2012, *Personal Communication with former WEAC worker*; Telephone Interview by ORAU Team; March 6, 2012; SRDB Ref ID: 110551

5.3 Internal Personnel Monitoring Data

NIOSH has located limited bioassay results for uranium for the years 1953 and 1954, as well as radon (breath) results for 1955. The uranium bioassays were fluorometric analysis results. The results obtained were largely for the same group of individuals – there were no more than four workers per report. NIOSH has identified less than 50 uranium urinalysis results for personnel during the period under evaluation (Winchester Sample Results, 1952-1955; Winchester Urine Results, 1953-1954). No records of thorium bioassay have been located, nor has any other information been identified regarding personnel monitoring for radiation exposure for the period 1952 through 1961.

The NOCTS database was reviewed for claimants whose work history included WEAC during part or all of the covered period (1952 through 1961). A total of two claimants were identified. The files for the two claimants were thoroughly reviewed and no internal monitoring data were found. Requests for internal monitoring information were made directly to DOE for these claimants as standard procedure. DOE supplied no internal personnel monitoring data for these claimants. This is consistent with above determination that insufficient monitoring existed and that only very limited internal monitoring data are available to NIOSH for the period under evaluation.

5.4 External Personnel Monitoring Data

NIOSH has located no indication of external dosimetry or other radiation exposure monitoring records for the period 1952 through 1961 at WEAC. No records or documentation of surface contamination relevant to the DOE operational period have been located.

The NOCTS database was reviewed for claimants whose work history included the WEAC during part or all of the covered period (1952 through 1961). A total of two claimants were identified. The files for the two claimants were thoroughly reviewed and no external monitoring data were found. As in the case of internal records, requests for dosimetry-related information were made directly to DOE; no external personnel monitoring data were supplied for these claimants. This is consistent with above determination that insufficient monitoring existed and that only very limited external monitoring data are available to NIOSH for the period under evaluation.

5.5 Workplace Monitoring Data

NIOSH has obtained seven breathing zone dust sample results for 1953, approximately 25 uranium dust sampling results for 1955, and eight air sampling results for radon collected in 1955. No records of thorium air sampling have been found. These air and dust sample results are not comprehensive and do not constitute representative sampling of WEAC activities.

5.6 Radiological Source Term Data

Minimal information has been located on quantities of uranium or thorium maintained on site, but it is inferred from research reports that a wide variety of forms of uranium-bearing materials (uranium ore and metal, pitchblende, and uranium dioxide) were used for research and pilot plant projects. Experiments were performed on ores, leach liquors, and other raffinates. Materials and experimental activities involved uranium and decay chain radionuclides being chemically separated and re-concentrated so that they were often out of the equilibrium state; the degree of disequilibrium is generally unknown to NIOSH.

The above materials and forms were sources of potential exposure at the site. It is clear from the available research reports that WEAC worked with uranium; however, the documentation does not provide sufficient information on specific radionuclides, quantities, or forms of the source materials used at any given time during the period under evaluation. NIOSH is unable to make reasonable assumptions about source terms, concentrations, or radiological equilibrium conditions at the WEAC facility.

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 co-workers 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 discussed in Section 5.3, NIOSH has identified limited urinalysis results analyzed for uranium during the operating period (1953 and 1954), but has not found documentation that describes the sampling or analysis protocols used with that set of bioassay data. NIOSH has not located bioassay results for the other years of WEAC operation. Beyond those 1953-54 bioassay results, and the 1955 breath radon results also mentioned in Section 5.3, no other personnel bioassay monitoring results have been located. These limited internal personnel monitoring data are for select individuals, and there is no evidence to indicate these data are representative of the most highly-exposed workers at the WEAC facility, nor is there a way to verify that the available sample results are representative of all workers.

Less than 50 uranium urinalysis results for personnel during the period under evaluation is too limited a set of data to bound internal doses to unmonitored workers given the lack of program documentation describing why these individuals were chosen for monitoring while others were not. With no other personnel monitoring data for radiation exposure for the period from 1952 through 1961, NIOSH has

insufficient personnel monitoring data to appropriately characterize radiation intakes during operations at the WEAC facility.

NIOSH has not located any information documenting or describing a regular workplace monitoring program. During an interview with a former worker at the site (Personal Communication, 2012), the worker indicated that the facility did have a Radiation Safety Officer, but this worker was unaware of any routine area surveys or regular air sampling program.

NIOSH has located very little documentation as to quantities of radiological materials shipped to WEAC for processing or testing. It is clear from reports and worker communications that WEAC worked with uranium and thorium. As mentioned in Section 5.6, it is inferred from research reports that various forms of uranium-bearing materials were used in the site's research. However, without additional documentation, ORAUT can make no assumption about what particular radionuclides, quantities, or forms of the source materials may have been used or stored on site at any time during the period under evaluation.

In the absence of adequate internal dose monitoring criteria and adequate personnel monitoring data, NIOSH has not found sufficient general area air sampling, breathing zone air sampling, site survey, or source term information to allow it to bound potential exposures, or to demonstrate that workers were adequately monitored for potential exposures to radioactive materials at WEAC during the AEC operational period. NIOSH has determined that reconstruction of the total internal doses received from exposures to uranium, uranium progeny, and potentially from thorium, is not feasible using the information available to NIOSH for the period under evaluation from January 1, 1952 through December 31, 1961.

NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate potential internal exposures to uranium, thorium, or their progeny during the period of DOE operations. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, internal exposures to uranium or thorium 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, 1952 through December 31, 1961, 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 WEAC during the period from January 1, 1952 through December 31, 1961, 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

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

As indicated in Section 5.4, NIOSH has not located any indication of external personnel exposure monitoring for the period under evaluation. Requests to DOE for personal monitoring records of WEAC claimants have been unsuccessful. In the course of this evaluation, claimant records were

reviewed and a former worker was interviewed. Indications from these communications are that personnel monitoring for external exposure to radiological materials was not performed. No records of any program for personnel monitoring, or data that would be associated with such a program, have been located.

NIOSH has not located any information documenting or describing a regular workplace monitoring program. No records of any routine monitoring or area survey program have been located. This is consistent with the recollection of the former worker (Personal Communication, 2012) interviewed during this evaluation.

As stated in Section 6.1, NIOSH has located very little documentation on quantities of radiological materials shipped to WEAC for processing or testing. It is clear from reports and worker communications that WEAC worked with uranium and thorium and that various forms of uranium-bearing materials were used in the site's research. It is unknown if and how this material may have been stored on site. As with the case for internal exposure, without additional documentation, NIOSH can make no assumption about what particular radionuclides, quantities, or forms of the source materials may have been used or stored at the site over the operational period under evaluation.

At many DOE facilities, physical examinations were required as a condition of employment, sometimes including medical screening X-rays. Per 42 C.F.R. pt. 81, NIOSH includes in its dose reconstructions external doses received from medical X-rays if they were condition of employment and performed at the DOE site in question or at another covered facility. Medical X-rays administered off site at a non-covered facility are not included in dose reconstructions (ORAUT-OTIB-0079). NIOSH has not located historical documentation on where the medical X-rays were taken; however, according to a former worker (Personal Communication, 2012), the medical screenings were performed off site at the local hospital. In the absence of documentary evidence about where X-rays were taken, it is NIOSH policy to assume that X-rays were taken onsite, and therefore, occupational medical exposure is to be included in dose reconstruction for WEAC workers. NIOSH will perform reconstruction of medical dose using claimant-favorable assumptions in the Technical Information Bulletin, *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures* (ORAUT-OTIB-0006).

NIOSH does not have access to sufficient personnel monitoring, workplace monitoring, or source term data to estimate potential external exposures to uranium, thorium, or their progeny during the period of DOE operations. Consequently, NIOSH finds that it is not feasible to estimate with sufficient accuracy external exposures to uranium or thorium and resulting doses for the class of employees covered by this evaluation.

Although NIOSH found that it is not possible to completely reconstruct external radiation doses for the period from January 1, 1952 through December 31, 1961, NIOSH intends to use any 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 WEAC during the period from January 1, 1952 through December 31, 1961, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

6.3 Class Parameters Associated with Infeasibility

As indicated in Section 4.3, NIOSH has located information provided by the WEAC director in 1979, specifying October 1952 as the start of Winchester operations. NIOSH assumes in the absence of any contradictory statements or documents that AEC work at WEAC occurred during the period between January 1, 1952 and December 31, 1961. Based on the information in Section 6.0, NIOSH has determined that it has insufficient dose reconstruction information to perform dose reconstruction during this period. NIOSH therefore recommends that the class include the time period from January 1, 1952 through December 31, 1961.

As stated in Section 4.4, documentation available to NIOSH does not indicate any definite boundaries between radiological and non-radiological areas at WEAC for the period under evaluation. NIOSH is therefore unable to define individual worker exposure scenarios based on specific work locations. NIOSH recommends that the class definition include all areas of the WEAC site during the specified time period.

As stated in Section 4.5, it is not possible to determine that any specific work group was not potentially exposed to radioactive material releases or possible subsequent contamination. Given the lack of information regarding job descriptions or associations between job titles and/or job assignments with specific radiological conditions, NIOSH recommends that the class include all workers at the site.

7.0 Summary of Feasibility Findings for Petition SEC-00199

This report evaluates the feasibility for completing dose reconstructions for employees at WEAC from January 1, 1952 through December 31, 1961. NIOSH determined that members of this class may have received radiation exposures from intakes of uranium and thorium materials processed at the site and may have received unmonitored external exposures from the same materials. NIOSH lacks sufficient information, which includes personnel monitoring data, air monitoring data, process data, and radiological source term information that would allow it to estimate the internal or external radiation exposures to which the proposed class may have been exposed.

NIOSH has documented herein that it cannot complete the dose reconstruction 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.

Adequate reconstruction of medical dose is likely to be feasible by using claimant-favorable assumptions in the Technical Information Bulletin, *Dose Reconstruction from Occupational Medical X-Ray Procedures* (ORAUT-OTIB-0006).

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 WEAC during the period from January 1, 1952 through December 31, 1961, 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-00199

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 uranium, thorium, or their progeny and from direct exposure to these 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-00199

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 at the Winchester Engineering and Analytical Center in Winchester, Massachusetts from January 1, 1952 through December 31, 1961, 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 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 co-workers 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 analyses is required. If a second class is identified, it would require additional research and analyses. 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 the WEAC site 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; DCAS website

AEC Major Activities, 1960, *Major Activities in the Atomic Energy Programs: January-December 1959*, U.S. Atomic Energy Commission; January 1960; SRDB 9315, pdf p. 9

AEC Summary Report, 1959, *Topical Report WIN-115: Summary Report 1954-1959: Raw Materials Development Laboratory; Winchester, Massachusetts and Grand Junction, Colorado*, National Lead Company, Inc., for the U.S. Atomic Energy Commission Raw Materials Development Laboratory, Winchester, Massachusetts; September 30, 1959; SRDB Ref ID: 73881

AEC Summary Report, 1960, *Topical Report WIN-112: Summary Report, January 1960*; National Lead Company, Inc., for the U.S. Atomic Energy Commission Winchester Laboratory; February 1, 1960; SRDB Ref ID: 73969

FUSRAP, date unknown, Elimination report for Winchester Engineering and Analytical Center (Northeastern Radiological Health Laboratory), Winchester, Massachusetts; U.S. Department of Energy Formerly Utilized Sites Remedial Action Program; date unknown, but from context, after July 1985; SRDB Ref ID: 9315, pdf p. 20

HEW Summary Report, 1966, *Radiological Health Research: Summary Report, July 1965 – December 1966*, U.S. Department of Health, Education and Welfare, Public Health Service; 1966; SRDB Ref ID 106640, pdf p. 20

ORAUT-OTIB-0006, *Dose Reconstruction from Occupational Medical X-Ray Procedures*, Rev. 04, Oak Ridge Associated Universities; June 20, 2011; SRDB Ref ID: 98147

ORAUT-OTIB-0079, *Guidance on Assigning Occupational X-Ray Dose Under EEOICPA for X-Rays Administered Off Site*, Rev. 00; Oak Ridge Associated Universities; January 3, 2011; SRDB Ref ID: 89563

Personal Communication, 2012, *Personal Communication with former WEAC worker*; Telephone Interview by ORAU Team; March 6, 2012; SRDB Ref ID: 110551

Questionnaire Response, 1979, *Response to Questionnaire Regarding Contents of Site Summaries*, memo from P. C. Bolin (WEAC Director) to A. Wallo III (The Aerospace Corporation); November 16, 1979; SRDB Ref ID: 66734

WEAC, date unknown, *Northeast Radiological Laboratory (formerly Winchester Engineering and Analytical Center) Site History, Function and Description*, author unknown, but likely U.S. Department of Energy, Energy Research and Development Administration (ERDA); date unknown, but from context, soon after May 1977; SRDB Ref ID: 66722

Winchester Sample Results, 1952-1955, *Sample Reports for Urine, Radon, Breath, and Air Dust for the Winchester Plant*, U.S. Atomic Energy Commission, New York Operations Office, Health and Safety Division; various dates from 1952 to 1955; SRDB Ref ID: 9754

Winchester Urine Results, 1953-1954, *Sample Reports for Urine Samples for Winchester Plant*, U.S. Atomic Energy Commission, New York Operations Office, Health and Safety Division; various dates in 1953 and 1954; SRDB Ref ID: 9318

Attachment 1: Data Capture Synopsis

| Table A1-1: Data Capture Synopsis for Winchester Engineering and Analytical Center | | | |
|--|--|----------------|------------------|
| Data Capture Information | General Description of Documents Captured | Date Completed | Uploaded To SRDB |
| <p><u>Primary Site/Company Name:</u> Winchester Engineering and Analytical Center; DOE 1952-1961</p> <p><u>Alternate Site Names:</u> U.S. Public Health Service; N.E. Radiological Laboratory Northeastern Radiological Health Laboratory National Lead Co. AEC Raw Materials Development Laboratory</p> <p>[Name redacted], NL Industries Associate General Counsel [Phone No. redacted] [Name redacted], Wyeth General Insurance (American Cyanamid successor) [Phone No. redacted]</p> <p><u>Physical Size of the Site:</u> 5.8 Acres <u>Site Population:</u> ~100</p> | General information newspaper article related to American Cyanamid receiving the contract. | 02/29/2008 | 2 |
| State Contacted: MA Department of Public Health, Radiation Control Program [Phone No. redacted] | No relevant documents identified. | 01/17/2008 | 0 |
| Chemical and Biological Information Center | Radiological health research summary. | 01/05/2012 | 1 |
| Department of Labor / Paragon | Post remedial action survey. | 12/30/2008 | 1 |
| DOE Hanford | Awaiting response to Hanford Data Capture Activity 66. | OPEN | NA |
| DOE Legacy Management - Grand Junction Office | Description of radiological problems at inactive uranium mill sites, research and development reports, disposal of industrial plant equipment, reassessment of contractor facilities, radiological survey report, proposal for National Lead Company operation of Winchester Laboratory, report of pitchblende residues, site description, urinalysis, radon, breath, and air dust sample results. | 08/07/2010 | 22 |
| DOE Legacy Management - Morgantown | Technical report. | 04/05/2011 | 1 |
| DOE Legacy Management - MoundView (Fernald Holdings, includes Fernald Legal Database) | Analytical Laboratory Department monthly and weekly reports, employee uranium sample results, plant procedures, and a trip report. | 06/05/2008 | 19 |
| DOE ORO - RHTG | NIOSH notes on records holding area collection. | 12/10/2010 | 1 |
| DOE OSTI | Reports on uranium recovery and acid leach liquors. | 01/02/2008 | 2 |
| EM File Room | Raw materials development laboratory summary report. | 09/11/2002 | 1 |

Table A1-1: Data Capture Synopsis for Winchester Engineering and Analytical Center

| Data Capture Information | General Description of Documents Captured | Date Completed | Uploaded To SRDB |
|---|--|-----------------------|-------------------------|
| Environmental Measurements Laboratory (EML) / HASL | Environmental hazards associated with the milling of uranium ore. | 03/09/2005 | 1 |
| Internet - Defense Technical Information Center (DTIC) | Recovery of uranium, radiological health data, and classifying radioactive aerosols by particle size. | 12/23/2011 | 3 |
| Internet - DOE Comprehensive Epidemiologic Data Resource (CEDR) | No relevant documents identified. | 01/09/2012 | 0 |
| Internet - DOE Hanford Declassified Document Retrieval System (DDRS) | No relevant documents identified. | 01/05/2012 | 0 |
| Internet - DOE Legacy Management Considered Sites | Research and development report. | 01/05/2012 | 1 |
| Internet - DOE National Nuclear Security Administration (NNSA) - Nevada Site Office | No relevant documents identified. | 01/05/2012 | 0 |
| Internet - DOE OpenNet | Annual report to Congress of the Atomic Energy Commission and a radioecology study. | 01/05/2012 | 3 |
| Internet - DOE OSTI Energy Citations | No relevant documents identified. | 01/05/2012 | 0 |
| Internet - DOE OSTI Information Bridge | Topical reports. | 01/05/2012 | 6 |
| Internet - Google | Semiannual report of the Atomic Energy Commission, uranium dumped in North Woburn, radioactivity in dumps, and a residual radioactivity evaluation. | 01/05/2012 | 9 |
| Internet - Health Physics Journal | No relevant documents identified. | 01/09/2012 | 0 |
| Internet - Journal of Occupational and Environmental Hygiene | No relevant documents identified. | 01/09/2012 | 0 |
| Internet - National Academies Press (NAP) | No relevant documents identified. | 01/05/2012 | 0 |
| Internet - NRC Agencywide Document Access and Management (ADAMS) | NRC staff evaluations of sites, final environmental impact statement, and a FUSRAP sites review. | 01/12/2012 | 4 |
| Internet - USACE/FUSRAP | No relevant documents identified. | 01/05/2012 | 0 |
| Internet - US Transuranium and Uranium Registries | No relevant documents identified. | 01/05/2012 | 0 |
| Mesa State College | Topical report on uranium ores and progress reports. | 04/08/2011 | 2 |
| National Archives and Records Administration (NARA) - Kansas City | Preliminary survey and the history of US Military involvement in toxic contamination. | 08/14/2008 | 4 |
| ORAU Team | Documented communication on uranium processing. | 03/06/2012 | 1 |
| ORAU Vault | Visit to laboratory report. | 03/16/2005 | 1 |
| Unknown | Request for special enriched uranium quota, urine sampling data, film badge reports, final evaluation reports and site summaries, and an occupational exposure to airborne contaminants. | 07/17/2003 | 15 |
| Unknown / SC&A | Film badge reports. | 09/11/2002 | 4 |
| TOTAL | | | 104 |

| Table A1-2: Databases Searched for Winchester Engineering and Analytical Center | | | |
|--|---------------------------|-------------|-----------------|
| Database/Source | Keywords / Phrases | Hits | Selected |
| NOTE: Database search terms employed for each of the databases listed below are available in the Excel file called "Data Capture Synopsis for Winchester Engineering and Analytical Center Rev 03" | | | |
| Defense Technical Information Center (DTIC) https://www.dtic.mil/ COMPLETED 12/23/2011 | See Note above | 268 | 3 |
| DOE CEDR http://cedr.lbl.gov/ COMPLETED 01/09/2012 | See Note above | 0 | 0 |
| DOE Hanford DDRS http://www2.hanford.gov/declass/ COMPLETED 01/05/2012 | See Note above | 0 | 0 |
| DOE Legacy Management Considered Sites http://csd.lm.doe.gov/ COMPLETED 01/05/2012 | See Note above | 24 | 0 |
| DOE NNSA - Nevada Site Office www.nv.doe.gov/main/search.htm COMPLETED 01/05/2012 | See Note above | 0 | 0 |
| DOE OpenNet http://www.osti.gov/opennet/advancedsearch.jsp COMPLETED 01/05/2012 | See Note above | 41 | 3 |
| DOE OSTI Energy Citations http://www.osti.gov/energycitations/ COMPLETED 01/05/2012 | See Note above | 49 | 0 |
| DOE OSTI Information Bridge http://www.osti.gov/bridge/advancedsearch.jsp COMPLETED 01/05/2012 | See Note above | 81 | 6 |
| Google http://www.google.com COMPLETED 01/05/2012 | See Note above | 43,671,885 | 9 |
| HP Journal http://journals.lww.com/health-physics/pages/default.aspx COMPLETED 01/09/2012 | See Note above | 17 | 0 |
| Journal of Occupational and Environmental Health http://www.ijoeh.com/index.php/ijoeh COMPLETED 01/09/2012 | See Note above | 2 | 0 |

Table A1-2: Databases Searched for Winchester Engineering and Analytical Center

| Database/Source | Keywords / Phrases | Hits | Selected |
|--|--------------------|-------|----------|
| National Academies Press http://www.nap.edu/ COMPLETED 01/05/2012 | See Note above | 9,313 | 0 |
| NRC ADAMS Reading Room http://www.nrc.gov/reading-rm/adams/web-based.html COMPLETED 01/05/2012 | See Note above | 152 | 4 |
| USACE/FUSRAP http://www.lrb.usace.army.mil/fusrap/ COMPLETED 01/05/2012 | See Note above | 0 | 0 |
| U.S. Transuranium & Uranium Registries http://www.ustur.wsu.edu/ COMPLETED 01/05/2012 | See Note above | 3 | 0 |

Table A1-3: DTIC Documents Requested for Winchester Engineering and Analytical Center

| Document Number | Document Title | Requested Date | Received Date |
|----------------------|---|----------------|---------------|
| NA REF ID: 106640 | Radiological Health Research, Summary Report, July 1965-December 1966 | 1/3/2012 | 01/05/2012 |

Table A1-4: OSTI Documents Requested for Winchester Engineering and Analytical Center

| Document Number | Document Title | Requested Date | Received Date |
|-----------------------------|--|----------------|------------------------|
| ACCO-21 OSTI ID: 4827371 | Preliminary Leach Investigation of Babrosco and Afrikander Lease Residues dated May 1952 | 05/05/2008 | NA - Request Cancelled |
| ACCO-31 OSTI ID: 4361816 | Examination of Poisoned Ion Exchange Resins from the Western Reefs Pilot Plant dated February 1953 | 05/05/2008 | NA - Request Cancelled |
| ACCO-37 OSTI ID: 4806351 | Ion Exchange Studies on Acid Leach Liquors from Durango Residues dated January 1954 | 05/05/2008 | NA - Request Cancelled |

Table A1-4: OSTI Documents Requested for Winchester Engineering and Analytical Center

| Document Number | Document Title | Requested Date | Received Date |
|-----------------------------|--|-----------------------|------------------------|
| ACCO-58 OSTI ID: 4378441 | Field Work Performed at Monticello, Utah, Including Stockpile Amenability and Ion Exchange dated July 1954 | 05/05/2008 | NA - Request Cancelled |
| WIN-101 OSTI ID: 4262142 | Interim Report on Investigations into the Problem of Radioactive Pollution of Uranium Mill Effluents dated 12/15/1958 | 05/05/2008 | NA - Request Cancelled |
| WIN-111 OSTI ID: 4275750 | Second Interim Report on Investigations into the Problem of Radioactive Pollution of Uranium Mill Effluents dated 4/1/1959 | 05/05/2008 | NA - Request Cancelled |
| WIN-62 OSTI ID: 4356322 | Ion Exchange. Spectrophotometric Determination of Thorium dated 2/15/1957 | 05/05/2008 | NA - Request Cancelled |
| WIN-99 OSTI ID: 4313642 | Chemical Stream Pollution from Uranium Mills dated 6/13/1958 | 05/05/2008 | NA - Request Cancelled |
| WIN-113 | Third Interim Report on Investigations into the Problem of Radioactive Pollution of Uranium Mill Effluents dated 9/30/1959 | 05/05/2008 | NA - Request Cancelled |
| WIN-22 | Recovery of Uranium, Cobalt, Nickel, and Copper from AM-7 Residues dated 7/6/1955 | 05/05/2008 | NA - Request Cancelled |