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| <p><b>ORAU Team</b><br/> <b>Dose Reconstruction Project for NIOSH</b></p> <p>Technical Information Bulletin – Use of Coworker<br/> Dosimetry Data For External Dose Assignment</p>   | <p>Document Number:<br/> ORAUT-OTIB-0020<br/> Effective Date: 12/29/2004<br/> Revision No.: 00<br/> Controlled Copy No.: _____<br/> Page 1 of 6</p> |
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**RECORD OF ISSUE/REVISIONS**

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| Draft                           | 11/30/2004            | 00-A            | New technical information bulletin to provide general information to allow ORAU Team dose reconstructors to assign doses to workers at DOE sites who have no or limited monitoring data, based on site coworker external dosimetry data. Initiated by Steven E. Merwin. |
| Draft                           | 12/14/2004            | 00-B            | Incorporates internal review comments. Initiated by Steven E. Merwin.   |
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## 1.0 PURPOSE

The purpose of this Technical Information Bulletin (TIB) is to provide general information to allow ORAU Team dose reconstructors to assign doses to workers at DOE sites who have little or no individual monitoring data, based on site coworker external dosimetry data. This TIB is to be used in conjunction with separate TIBs or other approved documents that provide site-specific coworker data.

## 2.0 BACKGROUND

The ORAU Team is conducting a series of coworker data studies to permit dose reconstructors to complete certain cases for which external and/or internal monitoring data are unavailable or incomplete. Coworkers are considered to be workers at a site (potentially grouped by work location, job description, or other appropriate category) whose measured doses are considered representative of those received by one or more claimants with no individual monitoring data.

Cases without individual external monitoring data may fall into one of several categories, including:

- the worker was unmonitored and, even by today's standards, did not need to be monitored (e.g., a non-radiological worker).
- the worker was unmonitored, but by today's standards would have been monitored.
- the worker may have been monitored but the data are not available to the dose reconstructor.
- the worker may have partial information, but the available information is insufficient to permit a dose reconstruction to occur.

Some cases with little or no individual monitoring data can be processed in the absence of completed coworker studies, most notably those falling under the first category listed above. For example, non-radiological workers with no potential for workplace radiation exposures may be assigned on-site ambient doses. Even some cases falling under the second and third categories above do not require coworker studies, e.g., radiological workers who may in some cases be assigned reasonable upper limits provided that the total probability of causation (POC) is less than 45%. Regarding the last category above, if sufficient information is available, a prorated dose could be assigned in certain circumstances. Note, however, that many of the cases without external monitoring data that can be processed using one of these types of approaches have already been processed at this point in the program.

## 3.0 GENERAL APPROACH

The general approach to applying coworker data for cases with little or no individual external monitoring data involves two phases. The first phase (Phase I) permits cases to be processed when a "best and final" estimate of dose is not required for claim determination. This approach supports the statement included in most dose reconstruction reports that "*NIOSH has determined that further research and analysis will not produce a level of radiation dose resulting in a probability of causation of 50% or greater [for a low POC case] or less [for a high POC case].*" Section 7.0 of this TIB outlines the methodology for analyzing external coworker data such that dose reconstructors can complete the external dose reconstruction portion of cases for which Phase I applies.

The second phase (Phase II) of the external coworker data approach facilitates the assignment of "best and final estimates" of dose, when necessary. This phase involves fitting the available data to

one or more dose distributions defined in a manner consistent with input parameters required by IREP. Section 8.0 of this TIB outlines the methodology for analyzing external coworker data such that dose reconstructors can complete the external dose reconstruction portion of cases for which Phase II applies.

The actual coworker data sets and distributions to be applied for both Phase I and Phase II are provided in separate, site-specific TIBs. These TIBs also provide information on the sources of the site data, validation of the data, and conversion of the data into annual doses to be applied in dose reconstructions.

#### **4.0 APPLICATIONS AND LIMITATIONS**

In parallel with the development of site-specific TIBs that document the external coworker data sets and distributions to be used in dose reconstructions, cases not yet completed are being screened to identify those cases requiring external coworker data to facilitate case processing. As described previously, some cases with little or no individual monitoring data have been processed using methods not dependent on coworker data. Cases requiring coworker data will be processed using either a Phase I approach as described in Section 7.0 (such cases typically will clearly have a high or low POC and will not require the application of internal coworker data) or a Phase II approach as described in Section 8.0 (most such cases requiring this approach for external dose assignment will require a similar "best and final estimate" approach for internal dose assignment).

#### **5.0 REFERENCES**

1. NIOSH (National Institute for Occupational Safety and Health), *External Dose Reconstruction Implementation Guideline*, Rev. 0, OCAS-IG-001, Office of Compensation Analysis and Support, Cincinnati, Ohio, 2002.

#### **6.0 DEVELOPMENT OF SITE COWORKER DATA SETS AND DISTRIBUTIONS**

External dosimetry data for DOE sites are potentially available from several sources. These include the Center for Epidemiologic Research (CER) databases maintained by Oak Ridge Associated Universities (ORAU), the Comprehensive Epidemiologic Data Resource (CEDR) databases maintained by the Department of Energy, other data sets maintained by the Department of Energy, and data maintained by the sites themselves. Additionally, claimant data submitted by DOE sites to NIOSH as part of the EEOICPA Subtitle B program provide a useful subset of site-wide data.

Development of site-specific data summaries and distributions involve a careful examination of the various data sources with the objective of identifying the most complete and accurate data set available. Prior to the analysis of the selected data and the development of summary statistics and dose distributions, a sampling of the data are compared to claim-specific data submitted to NIOSH by the DOE sites. This comparison helps verify the accuracy and completeness of the site data selected for use in coworker studies since the data submitted to NIOSH are often more detailed than the site-wide data sets (e.g., individual badge data are typically provided to NIOSH, while the site-wide data often represent annual summarized data). The comparison also provides information needed to adjust the site-wide data sets to account for missed dose, partial year data, etc. (discussed later in this section). Should significant issues arise during the course of this comparison that shed doubt on the accuracy or completeness of the site data selected for analysis, additional evaluations will take place to ensure that a valid data set has been selected.

The specific data sets selected for a particular site and the rationale for their selection are documented in site-specific coworker data TIBs titled "External Coworker Dosimetry Data for the [DOE Site]." Prior to publication of these site-specific TIBs, the data are subjected to an independent and separately documented validation process.

Once coworker data have been selected to represent a particular site, the data are analyzed for the purpose of developing summary statistics and dose distributions. Summary statistics are developed to support coworker data Phase I dose reconstructions as described generally in Section 7.0, and dose distributions are developed to support coworker data Phase II dose reconstructions as described generally in Section 8.0. The Phase I summary statistics are developed initially, and the Phase II dose distributions are developed later and documented in a revision to the site-specific TIB (Note: the timing of the revision and the effort expended depend on the expected benefit for completing dose reconstructions; for example, if the monitoring program and data reporting are sufficiently robust for a particular site such that external dose distributions are expected to be necessary for only a few cases, development of Phase II dose distributions may be delayed).

The site-specific external coworker dosimetry data TIBs provide information on adjustments to the data necessary to develop annual doses and distributions for use in dose reconstructions. For example, partial-year dosimetry data included in the site data must be extrapolated to provide annual values that represent the doses that would have been received for a full year of employment for all monitored employees. The objective is to provide data on the annual doses received by employees had they been monitored for a full year; dose reconstructors may then prorate the data for individual cases, as appropriate, to account for partial years of employment.

The site dosimetry data also require adjustment to account for missed dose based on the badge exchange frequency and the dosimeter limit of detection (LOD). For example, the median annual reported dose might be zero at a particular site and in a particular year, but it would be inappropriate to assign a dose of zero as a median value because of the potential for missed dose, which must be included in the dose estimates to claimants.<sup>1</sup> Specific information on the incorporation of missed dose in the site coworker data is provided in the site-specific TIBs.

Site-specific adjustments to the dose summaries and distributions based on technical considerations (e.g., dosimeter underresponse) must be incorporated by the dose reconstructor based on the site Technical Basis Documents (TBDs).

## **7.0 PHASE I – USE OF SITE COWORKER DATA SETS FOR CASES NOT REQUIRING BEST ESTIMATES**

Data are presented in site-specific external coworker TIBs as 50th-percentile, 95th-percentile, and 99th-percentile annual doses for monitored workers. These percentiles may be used by dose reconstructors for likely high or likely low POC cases using the guidance presented below. If a case cannot be processed successfully using any of these approaches, the instructions in Section 8.0 must be applied.

### **Likely High POC Cases**

The 50th-percentile values may be used for cases for which individual monitoring data do not exist, if the dose reconstructor believes, based on a review of all pertinent information, that the energy employee was likely to have received doses greater than the median dose received by monitored workers at the site. The data should be prorated, as appropriate, to account for partial years of employment or portions of employment that did not involve the potential for radiation exposure.

**Likely Low POC Cases**

The 50th-percentile values may be used for cases for which individual monitoring data do not exist, if the dose reconstructor believes, based on a review of all pertinent information, that the energy employee was likely to have received doses substantially less than the median dose received by monitored workers at the site. Note that for unmonitored employees who were not potentially exposed to workplace radiation sources (e.g., non-radiological workers), it may be appropriate to assign only external on-site ambient dose and not unmonitored dose based on coworker studies—refer to the site Occupational Environmental TBD.

The 95th-percentile values may be used for cases for which individual monitoring data do not exist, if the dose reconstructor believes, based on a review of all pertinent information, that the energy employee was likely to have received doses not substantially above the median dose received by monitored workers at the site.

The 99th-percentile values may be used for cases for which individual monitoring data do not exist, if the dose reconstructor believes, based on a review of all pertinent information, that the energy employee was likely to have received doses approaching the highest doses received by monitored workers at the site.

**8.0 PHASE II – USE OF SITE COWORKER DATA DISTRIBUTIONS FOR CASES REQUIRING BEST ESTIMATES****Reserved**