Dose Reconstruction (DR) Methodology Templates and Peek Street Dose Reconstructions

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- History of DR Methodology Templates
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Purpose of DR Methodologies

Purpose of DR Methodology Templates

- Goal is to summarize information to assist in processing (completing) individual dose reconstructions.
- Templates have limited scope of applicability.
  - Applicability varies by site
- Use of templates usually requires Professional Judgement that is best discussed during the Subcommittee for Dose Reconstruction (SCDR) reviews of individual cases.

DR Template Limitations

- The DR templates are ***NOT*** Technical Basis Documents (TBDs) and unlikely to fit the needs for all potential claims at a specific site.
- DR templates may only apply to one claim or a small group of claims at a specific site. They may not apply to all potential claims at a site. For Example:
  - *A DR template developed for admin workers does not apply to operations workers.*
  - *A DR template developed for a small group of claims over a short time period. The template may not address the full operational period as there may not be any claims over the full period.*

Purpose and Use

- These are informational documents to help process certain Dose Reconstructions.
- General guidance is to use the DR templates with caution. If a claim doesn't fit, an individualized Dose Reconstruction is completed.
- DR Template language can be edited and customized for a particular claim.

Purpose and Use *cont*.

- DR Templates are routinely updated and revised when new Technical Information Bulletins (TIBs) are revised ***AND*** a Dose Reconstruction is needed.
  - *DR Template may not be revised until it is used again and may just be updated on a case by case basis.*
- The ***FINAL*** review / evaluation / determination of whether a template is applicable and used correctly, resides with the individual dose reconstruction.

History of DR Methodology Templates

Origin Story *(In the beginning…)*

- No Technical Basis Documents (TBDs) existed to perform Dose Reconstructions.
- A DR report was generated specifically for the claim being evaluated using as much site-specific information as we could compile and include to explain how we reconstructed the energy employee's radiation dose.

Origin Story *(In the beginning…)* *cont.*

- DCAS Health Physicist had a general format to write a DR report.
  - The goal of DR report was to include enough information so that another Health Physicist could review the report and understand how we reconstructed the dose and why we made certain decisions.
  - Effectively, it is the DR methodology templates outline.

ORAU and the Development of TBDs

- ORAU began to develop TBDs for the large sites (Hanford, Savannah River, Oak Ridge, Idaho National Laboratory) in 2002.
- The reliance on the documentation (DR methodology language) within the DRs for individual claims decreased as the methods were documented in the TBDs. The TBDs could be referenced in the DR instead of custom language.
- ORAU began to process large numbers of claims.
  - ORAU prioritized sites with large numbers of claims due to a large backlog of Dose Reconstructions.
  - As TBDs were completed, claims processing increased.

Focus on Smaller Sites

- The initial focus on large sites became clear in 2005/2006.
- To mitigate (or balance) claims processing, DCAS hired another contractor (Battelle) to focus specifically on smaller Atomic Weapons Employer (AWE) sites.
  - Battelle developed TBD-5000 (Methods/tools).
  - Battelle developed TBD-6000 (Primarily for Uranium Metal Facilities).
- This increased processing of smaller sites but still left a vacancy for sites that didn't just do uranium metal work.

Focus on First 1000 claims

- By 2007/2009 timeframe there was pressure to finish the first 1000 claims submitted.
- DCAS returned to the original practice of one-off Dose Reconstructions to complete these early claims.
- So similar cases could be processed, DCAS re-developed written DR methodology templates.

Focus on First 1000 claims cont.

- Some of these templates were written specifically to process the claims in house at the time.
  - For example, the DR Methodology could have been written to be overestimates for an administrative workers (likely non-compensable) and offer no guidance or information on operations workers or best estimate cases.
- Initially these templates were to process small numbers of claims from a particular site.
- Given the Dose Reconstruction and SEC workload, it was not an efficient use of resources to develop a TBD for a site that only has few claims.

DR templates initially developed for small numbers of claims

- Since 2005-2009 the number of claims has grown significantly and in unusual ways due to various external influences.
  - Special Exposure Cohort (SEC) influences - As SECs are evaluated the number of claims at a particular site increase significantly.
  - DOL/DOE/DHHS Worker Outreach Meetings – As outreach meetings are held in specific areas, claims at outreach sites also increase.
  - Media influence – If a member of Congress begins to inquire about a particular site and the inquiry appears in the local media the number of claims can increase. *(News cycle influence)*

Number of Claims using DR Methodology Templates by Site

Site[a]	Location	# of Claims[c]
Metals and Controls[b]	Attleboro, MA	476
BWXT[b]	Lynchburg, VA	374
General Electric[b]	Evendale, OH	351
Wah Chang[b]	Albany, OR	295
Amchitka Island	Amchitcka, AK	177
Westinghouse Nuclear Fuels	Cheswick, PA	148
Albuquerque Operations Office	Albuquerque, NM	119
General Electric Vallecitos	Pleasanton, CA	85
Norton Company	Worcester, MA	82
Office of Scientific and Technical Information	Oak Ridge, TN	52
South Albuquerque Works	Albuquerque, NM	48
Metallurgical Laboratory	Chicago, IL	48
Lake Ontario Ordinance Works (LOOW)	Niagara County, NY	45

Number of Claims by Site *cont.*

Site[a]	Location	# of Claims[c]
Westinghouse Electric Corporation	Bloomfield, NJ	44
Peek Street Facility	Schenectady, NY	30
Kirkland Operations Office, Kirkland Airforce Base	Albuquerque, NM	19
Lovelace Respiratory Research institute	Albuquerque, NM	19
Vitro Manufacturing (Canonsburg)	Canonsburg, PA	27
W.R. Grace and Company (Maryland)	Curtis Bay MD	17
Albany Research Center	Albany, OR	17
University of Rochester Atomic Energy Project	Rochester, NY	16
New Brunswick Laboratory	New Brunswick, NJ	5
Piqua Organic Moderated Reactor	Piqua, OH	7
Vitro Corporation of America	Chattanooga, TN	5
Latty Avenue Properties	Hazelwood, MO	2

(a) 9 sites not listed as we don't have current data
(b) TBD/Site Profile is being developed
(c) Number of claims is as of December 2019 – last NOCTS report

DCAS is re-evaluating the DR Methodology templates

- We are moving forward with developing TBDs for the top 4 sites based on the number of claims.
  - The top 4 sites comprise over 50% of all DR template cases.
- After completion of the top 4 sites, DCAS will move on to the next sites on the list until we have site profiles for all sites with more than 100 claims (0.2% of all claims).
  - Note: Metals and Controls comprises less than 1% of the total claims.
- DCAS will re-evaluate whether we are going to develop site profiles for sites with less than 100 claims (<0.2%).

NIOSH Response to SC&A Comments on Peek Street DR Methodology Template

Would like to emphasize that DR Templates are NOT TBDs

- How these templates are used in individual Dose Reconstructions (implementation) is the only real measure of the accuracy.
- We suggest that Subcommittee work with the Subcommittee on Dose Reconstruction Reviews to evaluate how the templates are used in individual DRs as part of the evaluation process.
  - *For example, template references of Occupational Medical Dose ORAUT-OTIB-0006, Mixed Fission Products ORAUT-OTIB-0054, but individual dose reconstruction may be correct.*

Finding 1 – Photon Energy Distribution (30-250keV)

- *Finding 1: The assumption of 100% 30–250 kiloelectron volts (keV) for the penetrating photon energy distribution is unsupported and inconsistent with assumptions used in the Hanford technical basis document.*
- NIOSH Response: The majority of the work at Peek Street involved uranium which has a claimant favorable photon energy distribution of 30-250keV. This claimant favorable assumption is common and used across multiple uranium facilities.
- Impact: None: SC&A agrees with NIOSH's reasoning but doesn't believe the basis is sufficiently articulated in the DR template.

Finding 2 – Uncertainty assumption of 1.3

- *Finding 2: The assumption of an uncertainty factor of 1.3 is unsupported and inconsistent with the cited reference.*
- NIOSH Response: NIOSH agrees current value in template references an older version of ORAUT-TKBS-0006-06 and that the template should be updated to reduce the factor to 1.2 when used for dose reconstructions.
- Impact: Likely negligible. In an overestimating case this "error" is simply a larger overestimate. In best estimate or underestimate cases, the Health Physicist should identify the difference in the individual dose reconstruction and apply the correct value if it applies to a claimant who worked in the specific time period.

Finding 3 – Neutron to Photon ratio of 1.2

- *<u>Finding 3:</u> SC&A was unable to verify the neutron-to-photon ratio of 1.2 using the cited references.*
- <u>NIOSH Response:</u> Although the citation in the template has changed the methodology, NIOSH believes the ratio of 1.2 is claimant favorable and still valid for the Peek Street Facility.
- <u>Impact:</u> None. SC&A agrees with NIOSH reasoning. However, SC&A suggests replacing the current DR Template wording with the N:P ratio technical basis in NIOSH's response. We can do so for clarity, but this is really modifying documentation of a professional judgement. There is no impact on dose reconstructions.

Finding 4 – Dosimeter LOD used in Template

- *<u>Finding 4:</u> The dosimeter LOD used in the DR Template is not specified in the template, and the value of 0.050 rem assumed based on NIOSH's calculation is not consistent with the Hanford dosimeter information.*
- <u>NIOSH Response:</u> The use of LOD values in a DR template are place holder values and are updated during the development of the individual dose reconstruction.
- Impact: None. The DR Templates are not Technical Basis Documents. If the Health Physicist chooses a value or a particular site based on professional judgement, they will update the LOD values accordingly based on the reference.

Finding 5 – PSF Annual Maximum Dose Value

- *Finding 5: SC&A was unable to verify the PSF annual maximum ambient dose value using the cited reference.*
- NIOSH Response: SC&A correctly identified a computational error. The original calculated value was 1.550 rem, but should have been 1.555 rem. However, NIOSH is reevaluating this maximum ambient dose for the PSF and will revise the template accordingly.
- Impact: There is a potential impact as this dose increases from the current template. Preliminary indications are that the current dose is a large overestimate. The revaluated dose may decrease as a result of the re-evaluation.

Finding 6 – Incorrect Occupational Medical Doses

- *Finding 6: The DR Template occupational medical dose basis contains incorrect information and outdated references.*
- NIOSH Response: NIOSH investigating whether occupational medical x-rays were performed onsite. The occupational medical dose will be updated in accordance with the latest guidance in ORAUT-OTIB-0006.
- Impact: Likely None: Again, during the dose reconstruction process, the Health Physicist reviews the latest guidance in the TIBs and makes updates to the individual dose reconstructions. The template does not have to be perfectly up to date to result in an accurate dose reconstruction.

Finding 7 – Mixed Fission Product Assignment

- *<u>Finding 7:</u> The fission product information in the DR Template is not consistent with current guidance in ORAUT-OTIB-0054, Revision 04.*
- <u>NIOSH Response</u>: NIOSH agrees that guidance associated with the current version of ORAUT-OTIB-0054 needs to be incorporated into the DR template.
- <u>Impact:</u> Likely None: Again, during the dose reconstruction process, the Health Physicist reviews the latest guidance in the TIBs and makes updates to the individual dose reconstructions.

Finding 8 – Mixed Fission Product Assignment

- *Finding 8: No basis or reference is cited for the recycled uranium activity fractions in Table 5 of the DR Template.*
- NIOSH Response: NIOSH agrees that the section on recycled uranium activity fractions should be updated based on guidance in Battelle-TBD-6000.
- Impact: Likely None: During the dose reconstruction process, the Health Physicist reviews the latest guidance in the TBDs being used and makes updates to the individual dose reconstructions.

Observation 1 – PSF Specific Tool

- *Observation 1: SC&A did not locate a PSF-specific tool containing the preprogrammed plutonium DCFs.*
- NIOSH Response: Given the limited number of claims for PSF, no site-specific tool has been created for PSF. For sites without a site-specific tool, the complex-wide generic "SM Calculation Workbook" is used. The template incorrectly references a PSF specific tool instead of the generic complex wide tool that is used. We will update the template to correctly reference the generic tool.
- Impact: None.

Observation 2 – Natural Uranium PSL

- *Observation 2: The natural uranium PSL in the DR Template is not consistent with information in ORAUT 1997 and is not referenced.*
- NIOSH Response: The color coding in the DR Template indicates that claim-specific PSL values are a placeholder value to be updated during the dose reconstruction process. This is why they do not match what is in "ORAUT 1997" [GE 1997].
- Impact: None. The DR Templates are not TBDs and placeholder values are commonly used. During the individual dose reconstruction process the Health Physicist applies the correct values.

Observation 3 – Plutonium composition reference

- *Observation 3: The plutonium composition information is correct. However, the reference cited is outdated and needs updating.*
- NIOSH Response: NIOSH agrees that the reference for the plutonium composition information is outdated and needs updating. NIOSH will update the reference as part of the next revision to the DR Template.
- Impact: None. Although the correct values are used in Dose Reconstruction, the citation needs to be updated.

Summary

DR Template Summary

- NIOSH would like to emphasize that DR Templates are not complete site profiles that provide the full technical basis for dose reconstructions.
- In most cases the template was originally designed to only process a few claims. The number of claims using templates has grown significantly over time and we are working to develop Technical Basis Documents (TBDs) for sites with a large numbers of claims.
- General guidance and place holder values are commonly used in DR templates. Sometimes these values are simply reminders to the Dose Reconstructor to evaluate the exposure potential.

DR Template Summary cont.

- How these templates are used in individual Dose Reconstructions (template implementation) is the only real measure of the accuracy.
- Again, we suggest that Subcommittee work with the Subcommittee on Dose Reconstruction Reviews to evaluate how the templates are used in individual DRs as part of the evaluation process.

Questions?

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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