DEFENSE THREAT REDUCTION AGENCY
NUCLEAR TEST PERSONNEL REVIEW PROGRAM

RADIATION DOSE ASSESSMENT

STANDARD OPERATING PROCEDURE

RA02 – Expedited Processing of Radiation Dose Assessments for Atmospheric Nuclear Weapons Testing Veterans

Revision 4.1

Key to SOP ID Codes

RA (Radiation Assessment - SOP)
ED (External Dose - Standard Methods)
ID (Internal Dose - Standard Methods)
UA (Uncertainty Analysis - Standard Methods)

Revision Control

Revision	Revision Description	Revision Date	Authorization Official
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3.1	Section 2 was rewritten to convey scope rather than descriptive text found in other sections and attachments; revisions made to Section 4 "Definitions," Sections 5.3, 5.6, 5.9, 5.10, and 5.12 for clarity and consistency with SOP RA05; added "Summary of Participation" to Section 5.10; added new Section 5.11 (RDA Analyst Technical Review); revisions made to introductory text of Attachment 2 to remove NuTRIS organ codes; some rearranging of the organ entries were made in Table Att 2-1; edits throughout.	10/30/2016	Lee A. Alleman
4.0	Sections 1-9 revised to remove XP doses to implement DTRA's decision to update expedited processing of NTPR cases to use the EPG dose set and eliminate the interim XP dose set. Added new Attachment 1 (Initial doses); removed XP organs from Table Att 2-1; deleted Attachment 3 (XP Doses).	09/20/2019	Lee A. Alleman
4.1	Revised to explicitly address veteran cases in which the EPG TOD is greater than the LD. Added Attachment 3 to easily identify situations where the EPG TOD is greater than LD. Updated throughout to reflect change of DTRA DSS definitions. Revised to address new terminology related to NuTRIS-Web case processing. Standardized capitalization of roles. Editing and formatting changes accomplished as needed.	10/10/2020	James D. Franks

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Standard Operating Procedure

RA02 – Expedited Processing of Radiation Dose Assessment for Atmospheric Nuclear Weapons Testing Veterans

1. Purpose and Summary

This standard operating procedure (SOP) describes the roles, responsibilities, and methodology for processing Department of Defense (DoD)/Defense Threat Reduction Agency (DTRA) Nuclear Test Personnel Review (NTPR) veterans' radiation dose assessments (RDAs). These assessments are performed in response to requests from the U.S. Department of Veterans Affairs (VA) on behalf of atmospheric nuclear weapons testing veterans. In particular, the SOP provides specific instructions for DTRA to use expedited processing to assess most atmospheric nuclear weapons testing veterans' cases as recommended by the Veterans' Advisory Board on Dose Reconstruction (DTRA, 2006; DTRA, 2007a; DTRA, 2007b; VBDR, 2007). Expedited processing involves assignment of upper-bound group-based radiation doses to veterans with qualifying potential radiation exposure scenarios. Expedited processing of RDAs results in faster responses to VA requests as compared to developing individualized full RDAs using all veteran-specific exposure scenarios, and therefore facilitates more timely VA decision-making for veterans' claims. For cases not qualifying for expedited processing under the criteria described in this SOP, direction is provided for conducting full RDAs, including references to appropriate DTRA NTPR SOPs. Finally, requirements and procedures for data and records management, and associated quality assurance (QA) activities are provided for completion of case processing.

This SOP is written for qualified NTPR Research Analysts, DTRA Analysts, RDA analysts, and QA auditors who process and evaluate atmospheric nuclear weapons testing veteran cases received from the VA. It is also targeted for managers who oversee the entire dose assessment process. The SOP conforms to procedures, methods, quality standards of assessment products, and established NTPR policies and guidelines.

2. Scope

This SOP applies to veterans' claims for which a request for dose information is received from the VA under Title 38, Code of Federal Regulations, Part 3.311, *Claims based on exposure to ionizing radiation* (38 CFR 3.311). The SOP addresses those requests that involve exposure scenarios related to U.S. atmospheric nuclear testing at both the Pacific Proving Ground (PPG) and the Nevada Test Site (NTS). For the purpose of this SOP, 32 groups were identified[1] for potential expedited processing and are described in Attachment 5.

All PPG and NTS cases are initially evaluated for expedited processing. Any case that does not qualify for expedited processing under the criteria described in this SOP will

[1] Attachment 5 describes the 32 groups that were identified in Case et al. (2011b). One of these groups (DOMINIC I, all personnel) was subsequently divided into two groups (DOMINIC I Ships, DOMINIC I Land) for inclusion in Attachment 7.

require an individualized assessment as described in SOP RA01. The scope of this SOP is primarily for claims involving cancers of one or more internal organs or skin, but also includes non-cancerous conditions when requested by the VA and documented in the NTPR veteran electronic case documents.

The expedited processing methodology described in this SOP addresses all aspects of radiation dose determination to satisfy the requirements of 38 CFR 3.311. The expedited process also addresses all aspects of radiation dose determination to satisfy the requirements of Title 32, Code of Federal Regulations, Part 218, *Guidance for the Determination and Reporting of Nuclear Radiation Dose for DoD Participants in the Atmospheric Nuclear Test Program* (32 CFR 218). The methodology described in this SOP also assures that radiation dose assessments consider the benefit of the doubt for assuring consistency with Department of Veterans Affairs (38 CFR 3.102) requirements (VA, 1985).

3. Responsibilities

3.1 NTPR Research Analyst

The NTPR Research Analyst is responsible for completing the input fields of the DTRA Dose Summary Sheet (DSS) that provide historical and dose-related information from the Nuclear Test Review Information System (NuTRIS) database. The NTPR Research Analyst summarizes veteran comments with clarifications and responses based on historical and dose-related information from all available records and documents that are relevant to the veteran's claim. The NTPR Research Analyst documents potential exclusions from expedited processing or other special considerations in the DSS. On a preliminary basis, the NTPR Research Analyst identifies the applicable expedited processing group(s) (EPG) and corresponding doses based on the veteran's scenario of participation and affected organ(s), tissue(s), or disease(s).

3.2 DTRA NTPR Case Manager/DTRA Analyst

The DTRA NTPR Case Manager or designee in the position of DTRA Case Manager, identified in this SOP as the DTRA Analyst, performs the majority of tasks for the expedited processing dose assignments, including:

- reviewing veteran-provided, historical, NTPR-developed, and other information pertinent to the veteran's potential exposure to radiation;
- determining the need for and requesting a Scenario of Participation and Radiation Exposure (SPARE) if deemed necessary to perform the dose assessment;
- determining the need for additional, veteran-specific information;
- determining the applicability of the expedited processing dose assignments to an individual veteran's case;
- requesting further technical evaluation by an RDA Analyst and reviewing the findings of the evaluation;

- documenting the radiation dose assignment evaluation and basis of the decision-making process in the DTRA DSS and the VA response letter;
- reviewing the results of QA auditor comments; and
- assigning expedited processing doses from this SOP, or bounding doses estimated by an RDA Analyst, and documenting the dose assessment results in the DTRA DSS and VA response letter.

3.3 Radiation Dose Assessment Analyst

At the request of the DTRA Analyst, the radiation dose assessment analyst (RDA Analyst) performs further evaluations of cases to support the dose assignment process. These further evaluations are in the form of technical reviews or full RDAs. The RDA Analyst may request assistance from the DTRA NTPR Case Manager if additional veteran-specific information is necessary to evaluate a case. Technical reviews by an RDA Analyst are documented in the form of memoranda with supporting dose calculations where applicable. If expedited processing is not possible for a specific case, the RDA Analyst performs a full RDA in accordance with SOP RA01 – *Radiation Dose Assessment for Cases Requiring Detailed Analysis*.

3.4 Quality Assurance Auditor

The quality assurance auditor (QA auditor), with the assistance of a QA reviewer as needed, performs and documents independent quality assurance/quality control (QA/QC) reviews of the decision-making process and the resulting dose assignment(s) as documented in the DTRA DSS and/or RDA Analyst documentation. This external review is conducted to assure that dose assignments and required documentation are clear, complete, and follow NTPR policies and procedures. The QA auditor documents the results of the review in a QA/QC Review Report for DTRA (Attachment 8) and/or an RDA Report Review Checklist (Attachment 9).

4. Definitions

BVA	Board of Veterans' Appeals
DoD	Department of Defense
Dose component	Potential contributor to total organ dose, including: – Initial external gamma dose – Initial external neutron dose – External gamma dose from residual radiation – Other external dose (e.g., check sources, calibration sources) – Internal alpha dose – Internal beta plus gamma dose

DSS	Dose Summary Sheet (see Attachment 4)
DTRA	Defense Threat Reduction Agency
EPG	Expedited processing group as documented in Case et al. (2011a and 2011b)
EPG TOD	Expedited processing group total organ dose, the sum of the target or surrogate organ EPG upper-bound dose values. These doses have been pre-determined to bound the actual doses received by all members of an EPG
Exclusion	A specific activity or exposure scenario that may result in distinctly higher doses than the exposure scenario used for the applicable EPG due to special exposure circumstances (Case et al., 2011a)
Expedited processing	An approach to radiation dose assessment that avoids the need for individualized assessments. Using this approach, some or all radiation dose components assigned for a veteran's participation are upper-bound group-based default values. The total of assigned expedited processing doses are either well above or well below doses that could result in a VA service-connection determination
Full RDA	An RDA developed by an RDA Analyst that uses veteran-specific dose parameter values and includes all dose components in accordance with SOP RA01. A full RDA is performed for cases that are excluded from expedited processing
Further evaluation	Case evaluation beyond the initial review by the DTRA Analyst for expedited processing
H&N	Hiroshima and Nagasaki, locations that are included in the NTPR program for selected World War II prisoners of war (POWs) and post-World War II occupation forces during specified time periods
LD	Limiting dose, a radiation dose value that corresponds to a generic 40 percent probability of causation for a specific cancer, as reported in DTRA-TR-10-29 (Case et al., 2011a), applicable only to cancers
NIOSH-IREP	National Institute of Occupational Safety and Health Interactive RadioEpidemiological Program, a computer code used to calculate the probability that a cancer was caused by a radiation dose (NIOSH, 2002 and NIOSH, 2019)
NTPR	Nuclear Test Personnel Review
NTS	Nevada Test Site, a site of U.S. atmospheric nuclear weapons testing

NuTRIS	Nuclear Test Review Information System, a computer database of veteran information and dosimetry data
NuTRIS-Web	NTPR Program's case management, document management, and database application
POW	Prisoner of war, a veteran held as a prisoner by the Japanese during World War II
PPG	Pacific Proving Ground, a site of U.S. atmospheric nuclear weapons testing
PM	Program Manager
QA/QC	Quality assurance / quality control
RDA	Radiation dose assessment
SD	Screening dose, a radiation dose value that corresponds to a generic 50 percent probability of causation for a specific cancer, as reported in DTRA-TR-10-29 (Case et al., 2011a), applicable only to cancers
SOP	Standard operating procedure
SPARE	Scenario of participation and radiation exposure, a document containing detailed information on an NTPR participant's activities and scenarios of exposure to radiation during involvement in the U.S. atmospheric nuclear weapon testing program or the occupation of Japan or as a POW in Japan
Surrogate organ	An NTPR standard organ used for dose calculations as a substitute organ when no published dose conversion factors are available for the requested disease or medical condition
Target organ	The biological organ or tissue that is associated with the specific medical condition for which a radiation dose determination has been requested by the VA
TOD	Total organ dose, the total of all external and internal dose components for a target organ
VA	U.S. Department of Veterans Affairs
VBDR	Veterans' Advisory Board on Dose Reconstruction

5. Procedure: Detailed Activity/Task Description

The methodology for expedited processing of NTPR cases with claimed target organs other than skin and lens of the eye described in this SOP utilizes the supporting technical information and the maximizing upper-bound doses estimated for large expedited processing groups (EPGs). This methodology and the EPG dose results were published in DTRA technical reports DTRA-TR-10-29, *A Technical Approach to Expedited*

Processing of NTPR Radiation Dose Assessments (Case et al., 2011a) and DTRA-TR-11-01, *Compendium of Proposed NTPR Expedited Processing Groups* (Case et al., 2011b). The EPG doses were developed for 32 groups based on similarity of activities and exposure pathways among EPG members participating at the PPG or NTS.

The use of well-documented EPG doses and supporting technical information developed in the above-mentioned DTRA technical reports, together with the procedures in this SOP, assures that expedited processing results in the assignment of total doses for cases other than skin or lens of the eye that are well below the screening doses (SD) as recommended by the VBDR. Use of the EPG information also assures that the assigned doses will "almost always be higher than doses that were estimated in previous RDAs for the same condition, thus providing maximum benefit of the doubt to the veteran" (VBDR, 2007).

The EPG doses are not intended to be representations of doses actually received by veterans. However, the EPG doses bound the actual doses received by any individual included in the applicable EPG. When individuals are found to have performed activities that exclude them from an EPG, such cases are reviewed further on a case-by-case basis.

A flow diagram that shows a process overview of expedited processing of dose assessments is provided in Figure 1. The major tasks are described below in this section.

5.1 Initial Case Review by NTPR Research Analysts

Upon receipt of a request for dose information from the VA, a veteran's case is supplemented by the NTPR Research Analyst, to include all relevant records and other information in accordance with the NTPR Program Support SOP (DTRA, 2015).

The NTPR Research Analyst reviews the completed case that may include, but is not limited to:

- veteran-provided information, including statements, comments, identification of unusual exposure conditions, and answers to questionnaires regarding the exposure;
- VA-furnished information, particularly the diseases or target organs for which doses are requested;
- historical veteran- and operation-specific information;
- previously-determined veteran-, cohort-, and operation-specific radiation doses;
- additional medical opinion(s) available regarding the disease(s) or the target organ(s); and
- the SPARE, if available.

5.2 Identification of NTPR Standard or Surrogate Organs

The NTPR Research Analyst uses the target organ(s), tissue(s), or disease(s) as stated in the VA dose request to make a preliminary identification of the NTPR standard organ(s)

or tissue(s) from Attachment 2 to be used for dose assessment. The NTPR Research Analyst documents the identified organ or tissue in the DSS.

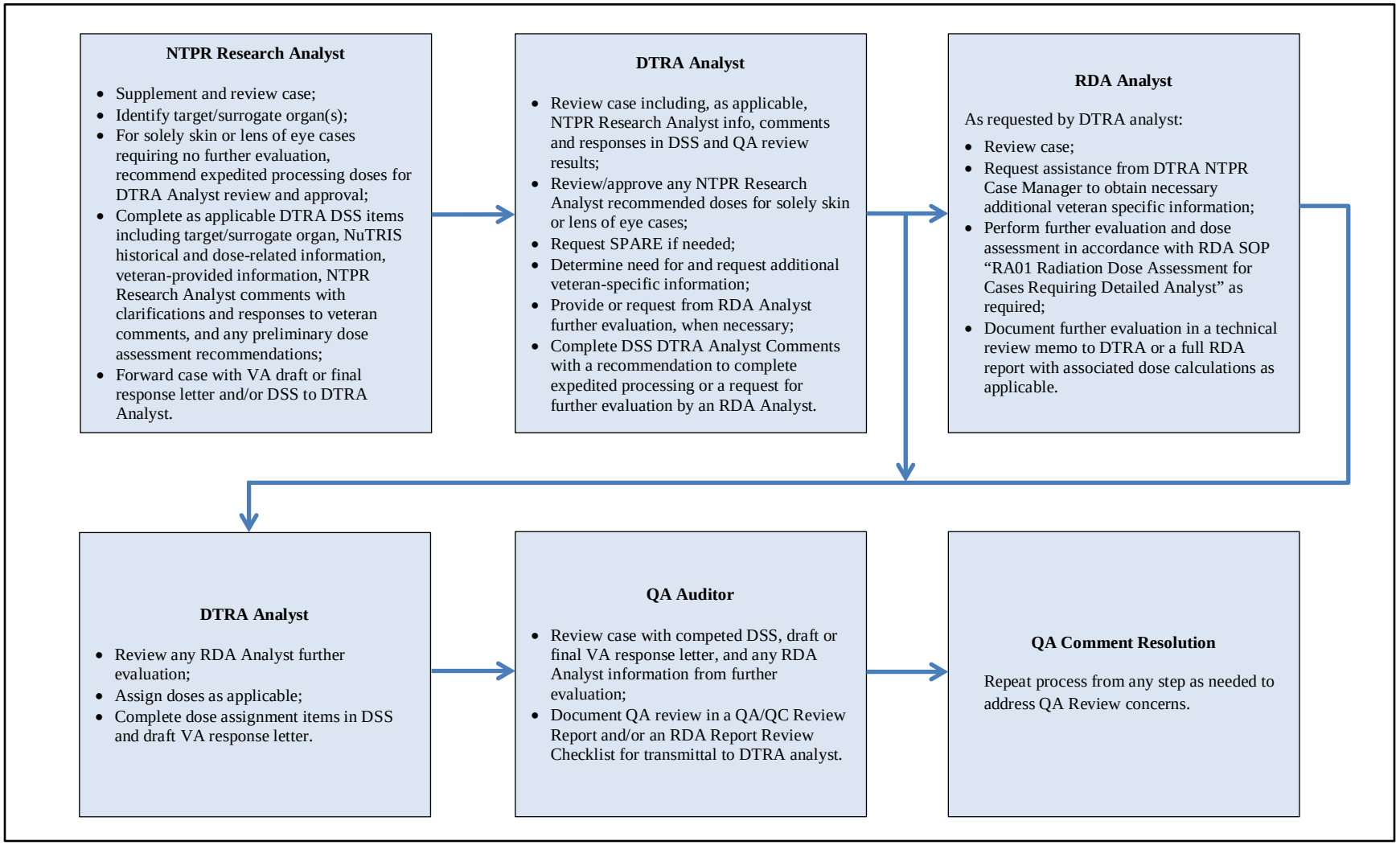


Figure 1. Expedited Processing of Dose Assessments: Process Overview

5.3 Expedited Processing Doses for the Skin or Lens of the Eye

Expedited processing doses for the skin and lens of the eye have previously been reviewed and approved by DTRA and the VBDR as 550 rem and 28 rem, respectively (DTRA, 2006, 2007a). These doses are applicable to any NTPR PPG or NTS participant with claims of relevant diseases regardless of specific exposure scenarios. These doses reflect the high level of uncertainty associated with determination of doses for which localized beta radiation-emitting contamination can play an important role. Although actual doses may be well below these conservatively estimated doses, the uncertainties in beta radiation dose estimation methods prevent ruling out with high enough confidence that at least some areas might have received non-uniform dose depositions that equal or exceed values that could result in a VA service-connection determination. The expedited processing skin dose of 550 rem is well above the NIOSH-IREP screening doses for skin cancers (Kocher and Apostoaei, 2007) and the 28 rem dose to the lens of the eye is considered "as likely as not" to result in cataracts (VA, 2011). Cases that involve skin and/or lens of the eye should be processed as follows:

- For PPG or NTS cases for which the applicable organ(s) is solely skin and/or lens of the eye, the NTPR Research Analyst recommends assigning the expedited processing doses shown above. This recommendation applies to cases involving cancers as well as non-cancer diseases. These recommendations are subject to DTRA Analyst review and approval. A QA auditor review is not required, and no DSS is needed for these dose assignments.
- For PPG or NTS cases that involve skin and/or lens of the eye and additional internal organs, the NTPR Research Analyst recommends assigning expedited processing doses for all diseases of the skin and/or lens of the eye. The dose assignments for all other organs should be made using the instructions given below. If further evaluation of the other organ dose assignments results in performing a full RDA, assessment of skin and/or lens of the eye doses is not necessary. This means that the expedited processing doses for skin and/or lens of the eye shown above should still be assigned even if the assessment of doses to other organs is performed using a full RDA.

5.4 Dose Summary Sheet Documentation by NTPR Research Analyst

For dose assignments for other than solely skin and/or lens of the eye, following initial case review, the NTPR researcher completes the "Researcher's Comments" section of the DTRA DSS (Attachment 4). In completing this, the NTPR Research Analyst summarizes veteran comments, particularly those that might pertain to, or that the veteran might expect to pertain to, potential radiation exposure. The NTPR Research Analyst may clarify or respond to issues raised by the veteran when pertinent historical information is available to do so.

The NTPR Research Analyst completes additional items in the DTRA DSS (Attachment 4), and selects applicable EPG(s) and the corresponding pre-estimated doses for the applicable target/standard organ(s) identified per guidance in Section 5.2.

The NTPR Research Analyst prepares a draft response letter for reporting NTPR assigned doses to the VA. For VA dose requests that are for a specific disease instead of a physical location or organ, such as for chronic lymphocytic leukemia (CLL), the requested disease should be indicated in the draft VA response letter.

The NTPR Research Analyst then forwards the case, including the DTRA DSS and the draft VA response letter, to the DTRA Analyst for review and decision on dose assignment.

5.5 DTRA Analyst Case Review

The DTRA Analyst reviews available case information, including completed portions of the DTRA DSS. During this review, the DTRA Analyst:

- reviews the case, including the NTPR Research Analyst-summarized information, veteran comments, and clarifications and responses to the veteran's comments that are documented in the DSS;
- verifies that the NTPR standard organ(s) or tissue(s) is correctly identified and, if necessary, requests an expert medical opinion. If there is a question regarding the applicable organ or the radiogenicity of a medical condition, the DTRA Analyst should seek a medical opinion from a qualified physician knowledgeable in radiogenic illnesses;
- verifies the applicable EPG(s); and
- determines the need for and requests additional information.

Information from this review is documented in the DSS per Section 5.11.

5.6 Determination of Significant Initial Neutron or Gamma Dose

For cases that do not involve any general or EPG-specific exclusions listed in Attachment 5, the DTRA Analyst reviews Attachment 1, Tables Att 1-1 and Att 1-2, to determine potential contribution to the veteran's dose from initial external neutron and/or gamma radiation. The DTRA Analyst requests further evaluation by the RDA Analyst if additional information is necessary to make this determination.

Per Weitz and Egbert (2010), for PPG participation, only selected Operation REDWING and Operation HARDTACK I aircrews may have received initial neutron doses that are potentially above 0.001 rem upper-bound dose, and "…participants in the oceanic test series [PPG] who were present on land or aboard ship at the times of detonation received initial gamma doses of less than 0.001 rem."

5.7 Assigning Expedited Processing Group Doses

The DTRA Analyst performs dose assignment using the following guidance unless otherwise documented in the DSS. If the conditions below are not met, then determine the need for further evaluation per Section 5.8.

- For cases in which the applicable organ(s) includes skin and/or lens of the eye, the DTRA Analyst assigns expedited processing doses as described in Section 5.3.
- For cases with only one PPG or NTS operation participation, the DTRA Analyst assigns the applicable EPG dose components plus any initial external gamma and neutron doses for the target organ if:
  - the veteran is a member of an identified EPG;
  - the veteran's radiation exposure scenario does not include an identified general or EPG-specific exclusion; and
  - the EPG total organ dose (TOD) plus any initial external gamma and neutron doses is less than the limiting dose (LD) for the target organ in the case of cancers (see Attachments 1 and 6). For cases with no initial radiation exposures, all situations where the EPG TOD is higher than the LD are shown in the chart in Attachment 3.
- For cases with multiple PPG and/or NTS operation participation, the DTRA Analyst assigns the sum of the applicable EPG dose components plus any initial external gamma and neutron doses for the target organ if:
  - the veteran is a member of an identified EPG for each separate participation;
  - there are no exclusions other than multiple operations; and
  - the sum of the applicable PPG and/or NTS EPG TODs plus any initial external gamma and neutron doses is less than the LD in the case of cancers (see Attachments 1 and 6).
- For cases with PPG and/or NTS participation plus H&N participation, the DTRA Analyst assigns the EPG dose components plus any initial external gamma and neutron doses for the target organ if:
  - H&N doses are determined in accordance with SOP RA05;
  - the veteran is a member of an identified PPG and/or NTS EPG, and there are no exclusions other than multiple operations (H&N skin cancer exclusions can be ignored for PPG and NTS skin dose assignments); and
  - the sum of the PPG and/or NTS EPG TODs including any initial gamma or neutron dose and the H&N EPG or RDA TOD is less than the LD in the case of cancers (see Attachments 1 and 6).
- For cases involving solely non-malignant thyroid diseases such as benign thyroid nodular disease, the DTRA Analyst assigns the applicable EPG dose components for thyroid if:

- the veteran is a member of an identified PPG and/or NTS EPG, and there is not an identified exclusion to the applicable EPG(s); and
- the sum of the applicable EPG TODs plus initial external gamma and neutron doses is not more than 36 rem.

This dose assignment is supported by expert medical opinion indicating that radiation doses in the range of 25–36 rem would be unlikely to change the probability of causation for benign thyroid nodular disease from "unlikely" to "as likely as not." (Reeves, 2012)

5.8 Identifying the Need for and Performing Further Evaluation

Further evaluation of a case should be initiated if any of the following conditions exist:

- the criteria of Section 5.7 are not met;
- there is no applicable EPG for the veteran's exposure scenario;
- the applicable EPG TOD is greater than the applicable LD; or
- there are unusual aspects or a poorly defined veteran exposure scenario identified by the DTRA Analyst.

Further evaluation may consist of a more detailed review by the DTRA Analyst, a technical review by an RDA Analyst, and/or a full RDA. These three options are described as follows:

- A DTRA Analyst more detailed review of available information. Typically this more detailed review will be conducted for reasons such as the veteran is not a member of an identified EPG, or that the veteran's specific exposure scenario includes, or is likely to include, one or more exclusion activities other than participation in multiple operations. The purpose of the review is to determine if it can be concluded that the veteran's actual TOD, including doses from any exclusion activities, is less than or equal to the applicable EPG TOD and is less than the applicable LD for cancers. If these conclusions can be reached by the DTRA Analyst, the EPG doses are assigned. If the conclusions cannot be reached by the DTRA Analyst, the case is referred to an RDA Analyst for a technical review or full RDA. Pertinent results of a DTRA Analyst review are documented in the Case Manager Comments of the DTRA DSS (Attachment 4).

  If the DTRA Analyst determines that an RDA Analyst technical review is required, the DTRA Analyst documents the reasons in the DSS and forwards the request to an RDA Analyst. For all RDA Analyst technical reviews, the DTRA Analyst requests the development of either a SPARE or a "Summary of Participation" as deemed necessary to effectively evaluate the veteran's exposure scenario. If a "Summary of Participation" is requested by the DTRA Analyst, it is prepared by the NTPR Research Analyst and can be included in the DSS in the "Researcher's Comments"

section or provided as a separate document. The "Summary of Participation" should include the following information:

- Veteran's Statements (similar to Section I of a SPARE);
- Service and unit records (similar to Section IIa of a SPARE); and
- Operational records and reports to include only the information relevant to the veteran and his unit's participation and activities (an abbreviated version of Section IIb of a SPARE).

- An RDA Analyst technical review. A technical review may be performed by an RDA Analyst sufficiently experienced in performing full RDAs. Following a review of the case information, the RDA Analyst should determine with few or no detailed calculations whether it is possible to estimate bounding doses for the veteran's scenario of participation with a TOD that is less than the applicable LD. A description of the technical review process performed by an RDA Analyst is provided in Section 5.9.
- An RDA Analyst full RDA. A full RDA addresses all radiation dose components, generally with detailed calculations. A full RDA is performed and documented in accordance with RDA SOP RA01.

5.9 RDA Analyst Technical Review

An RDA Analyst technical review is performed to support a veteran case expedited processing decision as described in Section 5.8. A technical review is conducted in accordance with the steps described below.

- **Review Case Information**

  Upon receipt of a request for a technical review, the RDA Analyst obtains the case and performs an initial review of the DTRA DSS, and the veteran's SPARE if included, and identifies the reason(s) for the request. If additional reasons for conducting a technical review are identified, these are noted and communicated to the DTRA Analyst. The RDA Analyst should confirm the exclusion(s), select or verify the identified EPG(s) (as applicable), and verify the identified target and NTPR standard organ(s)/tissue(s).

  As necessary, the RDA Analyst conducts additional review of the case, the applicable EPG documentation, and related supporting reports and analyses. The RDA Analyst should determine if additional information needs to be obtained and/or reviewed in order to complete the technical review. Any discrepancies between the case documentation (DSS, SPARE, and draft letter to VA) and the veteran's statements or participation history should be noted and resolved.

- **Identify Applicable Exposure Scenarios**

  Applicable scenarios include all potential pathways of exposure involved in the veteran's participation activities, and are determined from the review of the case,

including any veteran statements. If an applicable EPG has been identified, corresponding generic cohort exposure scenarios and dose assessments have already been reported (Case et al., 2011a and 2011b). The veteran's exposure scenarios may be the same as those included in the applicable EPG assessment if the case was referred for reasons other than exclusion activities, or they may involve additional pathways if exclusion activities have been identified. If no EPG is applicable, exposure pathways must be determined as described in DTRA, 2017, SOP RA01.

- **Conduct Dose Assessments for Applicable Exposure Scenarios**

  An assessment of all potential doses is conducted to determine total upper-bound external and internal doses that clearly bound the veteran's actual doses, and that can be compared to the applicable EPG doses (Attachment 7). In addition, the bounding veteran TOD should be compared to the applicable LD (Attachment 6). The RDA Analyst should initially determine if it will be possible to estimate a bounding TOD that meets the criteria for expedited processing of the case (Sections 5.7 and 5.8). If that determination cannot be made, a request for additional information is made, or the case is recommended for a full RDA.

  The technical review dose assessment should follow the general methodology used for full RDA dose estimates (SOP RA01) with additional simplifications and use of maximum plausible parameter values in order to expedite the determination of bounding doses. The technical review dose assessment must consider external doses from initial neutron and gamma radiation and all applicable sources of external and internal doses from residual gamma radiation. Upper-bound doses are calculated using standard uncertainty factors and typically are estimated assuming that all doses are correlated. Internal technical reviews are conducted using SOP RA04 as guidance.

  The technical review dose assessment can often be completed by modifying the dose calculation worksheets of the applicable EPG through the addition of exposure pathways for veteran-specific exclusion activities. The EPG worksheet parameters may also be modified to reflect known veteran-specific or NTPR RDA default values. Also, additional dose calculation worksheets should be developed as needed. Finally, a concise description of the case and a listing of all bounding dose components should be summarized in a technical memorandum (see below) and supporting calculation worksheets.

- **Prepare and Transmit a Technical Memorandum**

  If the RDA Analyst concludes that the veteran's bounding TOD is less than the applicable LD, then a summary of the assessment and dose results are transmitted to the DTRA Analyst in a technical memorandum. The technical memorandum should generally include the following elements:

  - the NTPR case Person ID and reference of the request to perform a technical review;
  - a clear and specific statement of the conclusion reached by the RDA Analyst;

- a summary description of the key features of the veteran's participation that are relevant to the technical review;
- the reason(s) that the RDA Analyst technical review was requested, and any other elements of the veteran's participation that are specifically addressed in the technical review;
- a description of the bounding dose estimation, including veteran-specific assumptions, as well as a side-by-side EPG versus veteran-specific bounding dose parameter values, if applicable; and
- a summary table containing a comparison of the bounding and EPG dose components and TODs, or the bounding dose components for cases where the bounding TOD is higher than the EPG TOD and lower than the LD.
- Dose calculation worksheets should be enclosed with the technical memorandum and may serve as a substitute for certain items listed above, or provide additional details supporting the bounding dose estimates.

If the RDA Analyst determines that it is not possible to readily estimate bounding doses for the veteran that result in a TOD, plus any applicable initial doses, which is less than the applicable LD for any of the claimed organs, then the DTRA Analyst is informed with the RDA Analyst's conclusion and recommendation to conduct a full RDA. Upon concurrence of the DTRA Analyst, the RDA Analyst performs a full RDA.

5.10 Assigning Dose Components from Further Evaluation

For cases where the target organ is other than solely skin or lens of the eye, doses from further evaluation, as described in Section 5.8, are assigned as follows:

- If the RDA Analyst concludes that the veteran's TOD from estimated bounding doses is less than or equal the applicable EPG TOD (or sum of EPG TODs in the case of multiple operations) and less than the applicable LD, i.e., "Estimated TOD" ≤ "EPG TOD" < LD, then the applicable EPG doses (or the sum of applicable EPG doses in the case of multiple operations) are assigned for each veteran's claimed organ. In cases with applicable initial neutron and gamma doses, such initial doses should be added to the EPG TOD (or sum of EPG TODs in the case of multiple operations) for comparison with each organ LD. Initial doses are assigned to the veteran in addition to other doses.
- If the RDA Analyst's estimated bounding doses (or the sum of estimated bounding doses in the case of multiple operations) result in a TOD that is greater than the applicable EPG TOD (or sum of EPG TODs in the case of multiple operations) but less than the applicable LD, i.e., "EPG TOD" < "Estimated TOD" < LD, then the estimated bounding doses for each applicable operation are assigned. In cases with applicable initial neutron and gamma doses, such initial doses should be added to the estimated TOD (or sum of estimated TODs in the case of multiple operations) for

comparison with each organ LD. Initial doses are assigned to the veteran in addition to other doses.

- If the RDA Analyst's estimated bounding doses (or the sum of estimated bounding doses in the case of multiple operations) result in a TOD that is greater than the applicable LD, a full RDA is performed. In these cases, all RDA dose components, including any initial doses, are assigned to the veteran's affected organs.

5.11 Completion of Applicable DSS Sections and the VA Response Letter

The DTRA Analyst completes applicable sections of the DSS (Attachment 4) using Research Analyst-documented information from the DSS, the SPARE if available, veteran-provided information, and other relevant information from the case. The DTRA Analyst documents the reference document, typically this or another RDA SOP, that is the basis for the dose assignment decision.

In Case Manager Comments, the DTRA Analyst documents the specific EPG(s) used in the decision-making and additional exposure scenarios–including applicable exclusions that are consistent with historical records, different than those of the applicable EPG and that could potentially result in radiation doses greater than those of the applicable EPG. The DTRA Analyst documents whether any such additional exposure scenarios could increase the TOD to above the applicable EPG TOD. The DTRA Analyst also summarizes the rationale used for the dose assignment, pertinent historical and dose information, and veteran comments and applicable responses.

The standard organ, tissue or disease identified per Section 5.2 should be entered for the Internal Organ in the DSS. The DTRA Analyst documents the DSS dose assignment and justification in the VA response letter. For cases in which the RDA Analyst completes a technical memorandum or a full RDA, the total rounded external and internal doses are reported in final VA response letters.

5.12 Quality Assurance Auditor Review

The QA auditor reviews the case and documents the performance of the quality review of the decision-making process, the DTRA DSS (Attachment 4), the draft VA response letter, RDA Analyst documentation, if applicable, and the resulting dose assignment for clarity, completeness, and conformance to NTPR policies and procedures. The QA auditor may be assisted by a QA reviewer for this review. The QA auditor documents the results of the review on a QA/QC Review Report and/or an RDA Report Review Checklist, Attachments 8 and 9, respectively. If corrections or changes are recommended by the QA auditor, actions described above may be repeated as appropriate for the completion and documentation of the dose assignment and reporting of results to the VA.

6. Data and Records Management

Documentation resulting from implementation of this SOP is entered into the case and may include any of the following, as applicable:

- Relevant documentation obtained or developed in accordance with NTPR Program Support SOP (DTRA, 2015);
- NTPR Research Analyst additions to the DTRA DSS (Attachment 4);
- DTRA Analyst additions to the DTRA DSS (Attachment 4);
- Results of the RDA Analyst's further evaluation of the case, if applicable, including a technical review memorandum to the DTRA Analyst;
- Full RDA reports, if applicable, prepared in accordance with RDA SOP RA01;
- QA auditor QA/QC Review Report and/or RDA Report Review Checklist; and
- Draft and/or final VA response letter.

7. Quality Control and Quality Assurance

Expedited processing of dose assignments is performed under DTRA NTPR program management by authorized qualified personnel following SOPs and documenting both the process and the results as described in this and other applicable SOPs (DTRA, 2015). This and other quality assurance- and RDA-related SOPs have been reviewed by Subcommittees 1 (DTRA Dose Reconstruction Procedures) and 3 (Quality Management and VA Process Integration with DTRA NTPR Program) of the Veterans' Advisory Board on Dose Reconstruction. The VBDR was established in 2003 and provided guidance and oversight of the dose reconstruction and claims compensation program for veterans through 2013. The VBDR also provided assistance to the VA and DTRA in communicating information on the mission, procedures and requirements of the VBDR to veterans.

In addition to performing reviews of SOPs, the VBDR Subcommittee 1 provided reviews of selected cases processed using historic expedited processing and using full RDAs performed in accordance with detailed RDA SOPs. Lessons learned were identified for full RDA processing during these reviews and any recommendations for improvement of expedited or full RDA processing were documented and tracked to completion.

Independent review of the records, processes, and results related to radiation dose assignment, including both expedited processing and full RDAs, is performed and documented by the QA auditor. Results of case processing and quality reviews are reported to DTRA NTPR program management during semi-annual NTPR Program Management Reviews and an associated Reported Quality Issues (RQIs) spreadsheet. Areas in need of corrective action are identified and tracked through to correction on the RQI.

8. Referenced NTPR SOPs and Standard Methods from this RDA SOP Manual

(1) SOP RA01 – Radiation Dose Assessment for Cases Requiring Detailed Analysis

(2) SOP RA04 – Internal RDA Reviews

(3) SOP RA05 – Expedited Processing of Radiation Dose Assessments for NTPR Hiroshima and Nagasaki Veterans

(4) Standard Method ID01 – Doses to Organs from Intake of Radioactive Materials

9. Reference Materials

(1) Case, D. R., Chehata, M., Dunavant, J. D., Egbert, S. D., Mason, C. L., McKenzie-Carter, M. A., Singer, H. A., and Weitz, R. L., 2011a. *A Technical Approach to Expedited Processing of NTPR Radiation Dose Assessments*. DTRA-TR-10-29, Defense Threat Reduction Agency. Fort Belvoir, VA. October 17.

(2) Case, D. R., Chehata, M., Dunavant, J. D., Mason, C. L., McKenzie-Carter, M. A., Singer, H. A., and Weitz, R. L., 2011b. *Compendium of Proposed NTPR Expedited Processing Groups*. DTRA-TR-11-01, Defense Threat Reduction Agency. Fort Belvoir, VA. November 30.

(3) DTRA (Defense Threat Reduction Agency), 2006. *Expedited Process for Radiation Dose Assessment for Skin Cancer in Veterans' Compensation Claims*. DTRA Point Paper (FOUO), Defense Threat Reduction Agency, Fort Belvoir, VA. October 31.

(4) DTRA (Defense Threat Reduction Agency), 2007a. *Expedited Process for Radiation Dose Assessment for Veterans' Compensation Claims Involving Posterior Subcapsular Cataract Formation*. DTRA Technical Basis Document (FOUO), Defense Threat Reduction Agency, Fort Belvoir, VA. March 22.

(5) DTRA (Defense Threat Reduction Agency), 2007b. *Expedited Radiation Dose Assessment of Non-Presumptive Medical Claims (Other than Skin, Prostate, and Cataract)*. DTRA Technical Basis Document (FOUO), Defense Threat Reduction Agency, Fort Belvoir, VA. July 4.

(6) DTRA (Defense Threat Reduction Agency), 2008. *Radiation Dose Assessment for Expedited Cases*. DTRA NTPR Program RDA SOP RA03, Rev. 1.2, Defense Threat Reduction Agency, Fort Belvoir, VA. October 31. (Superseded by this SOP).

(7) DTRA (Defense Threat Reduction Agency), 2015. *NTPR Program Support SOP*. CDRL-A008, Defense Threat Reduction Agency, Fort Belvoir, VA. March 27.

(8) DTRA (Defense Threat Reduction Agency), 2017. *Nuclear Test Personnel Review, Standard Operating Procedures for Radiation Dose Assessments – List and Overview,*

Update: January 2017. DTRA-SOP-17-01, Defense Threat Reduction Agency, Fort Belvoir, VA. January 13.

(9) Kocher, D. C. and Apostoaei, J. A., 2007. *Screening Doses for Induction of Cancers Calculated with the Interactive RadioEpidemiological Program (IREP)*. DTRA-TR-07-4. Defense Threat Reduction Agency, Fort Belvoir, VA. March.

(10) Mannis, D. N., Murray, B. L., and Blake, P. K., 2013. *Technical Justification for Revising NTPR SOP RA02 Rev 2.0 to include CLL Cases*. NTPR-TM-13-02, Defense Threat Reduction Agency. Fort Belvoir, VA. December 1.

(11) NIOSH (National Institute of Occupational Safety and Health), 2002. *NIOSH-Interactive RadioEpidemiological Program (NIOSH-IREP) Technical Documentation, Final Report*. 77 pp. June 18.

(12) NIOSH (National Institute of Occupational Safety and Health), 2019. *User's Guide for the Interactive RadioEpidemiological Program (NIOSH-IREP)*, Version 5.8.2, 22 pp. September.

(13) Reeves, G. to Murray, B., 2012. Electronic mail (email), Subject: Expedited doses for non-malignant thyroid disease. June 28.

(14) Title 32, Code of Federal Regulations, Part 218, *Guidance for the Determination and Reporting of Nuclear Radiation Dose for DoD Participants in the Atmospheric Nuclear Test Program (1945-1962)*.

(15) VA (U.S. Department of Veterans Affairs), 1985. 38 CFR 3.102. Title 38 - Pensions, Bonuses, and Veterans' Relief. Chapter 1 – Department of Veterans Affairs (Continued). Part 3 – Adjudication. Section 3.102 - Reasonable doubt. 50 FR 34458, Aug. 26, 1985, as amended at 66 FR 45630, Aug. 29, 2001.

(16) VA (U.S. Department of Veterans Affairs), 2011. "Instructions for VBA Staff for Screening "Worst Case" Posterior Subcapsular Cataract (PSC) Compensation Claims from "Radiation-Exposed Veterans." April 25.

(17) VBDR (Veterans' Advisory Board on Dose Reconstruction), 2007. "VBDR Recommendations on Alternative Methods for Dose Reconstruction," Letter to Director, Defense Threat Reduction Agency, Fort Belvoir, VA. May 7.

(18) Weitz, R. L. and Egbert, S. D., 2010. "Compilation of Initial Radiation Doses to Atmospheric Test Participants, Rev. 1," NTPR-TM-09-01(R1) Defense Threat Reduction Agency, Fort Belvoir, VA. November 30.

Attachment 1.

Initial Radiation Doses to Atmospheric Test Participants

Initial radiation doses are defined as external doses received from neutrons or gamma radiation emitted simultaneously with a nuclear detonation and from the fireball and the cloud column during the first minute after a nuclear detonation. This attachment summarizes the available initial radiation doses calculated for participants in atmospheric nuclear testing whose participant scenario does not include any general or EPG-specific exclusions. The initial radiation doses included in this attachment, as well as those for participants whose cases are excluded from expedited processing, are documented in Weitz and Egbert (2010). Excluded cases typically are for participation in scientific project support, aircrew scenarios, or as a volunteer observer.

The initial doses in this attachment include doses only for specific units or project elements for which initial doses greater than 0.001 rem were previously estimated.

Geometric mean and upper-bound initial neutron doses are organized in Table Att 1-1 by Operation, Unit or Project and Shot. Mean and upper-bound initial gamma doses are contained in Table Att 1-2 using the same organization as the neutron doses.

Table Att 1-1. Units and Project Elements with Initial Neutron Doses of 0.001 rem or greater

Unit or Project Element	Geometric Mean Dose (rem)	Uncertainty Factor	Upper-bound Dose (rem)
Operation UPSHOT-KNOTHOLE (1953)			
Troop Observers at Shot ANNIE	0.032	2.2	0.071
Troop Observers at Shot NANCY	0.002	1.9	0.004
Troop Observers at Shot SIMON	0.005	2.2	0.012
Battalion Combat Teams A & B at Shot ANNIE	0.032	2.2	0.071
Battalion Combat Teams A & B at Shot SIMON	0.005	2.2	0.012
Operation TEAPOT (1955)			
Troop Observers at Shot MOTH	0.32	1.5	0.46
Troop Observers at Shot TESLA	2.7	1.5	4.0
Troop Observers at Shot BEE	0.020	1.5	0.030
Troop Observers at Shot APPLE I	0.048	3.0	0.14
Troop Observers at Shot APPLE II	0.10	3.1	0.31
Marine Brigade (3rd MCPAEB) at Shot BEE	0.020	1.5	0.030
TF RAZOR, 723rd Tank Bn at Shot APPLE II			
Company A	0.78	3.0	2.4
Company B	0.026	3.4	0.088
Company C	0.28	3.1	0.86
TF RAZOR, Arm Inf Plt at Shot APPLE II			
Right Flank	0.062	3.3	0.21
Center Flank	0.020	3.3	0.066
Left Flank	0.008	3.3	0.026
TF RAZOR, Staff Element at Shot APPLE II	0.042	3.3	0.14
Operation PLUMBBOB (1957)			
Observers in trenches at Shot PRISCILLA	0.004	3.0	0.012
Observers in trenches 3.8 km from Shot DIABLO	0.011	3.0	0.033
Observers in trenches 3.2 km from Shot KEPLER	0.11	3.0	0.33
Observers in trenches at Shot DOPPLER	0.54	3.0	1.7
Task Force BIG BANG at Shot GALILEO	0.020	3.0	0.060
Task Force WARRIOR at Shot DOPPLER	0.54	3.0	1.7
Operation HARDTACK II (1958)			
1352nd Motion Picture Squadron at Shot HAMILTON	NR[1]	NR	NR

Table Att 1-1. Units and Project Elements with Initial Neutron Doses of 0.001 rem or greater (cont.)

Unit or Project Element	Geometric Mean Dose (rem)	Uncertainty Factor	Upper-bound Dose (rem)
Operation DOMINIC II (1962)			
IVY FLATS Maneuver Troops and Military Observers at Shot LITTLE FELLER I	NR	NR	NR

[1] "NR" indicates that the dose and upper bound have not been reconstructed although the dose may be 0.001 rem or greater.

Table Att 1-2. Doses from Initial Gamma Radiation for NTPR Participants

Unit or Project Element	Initial Gamma Dose (rem)	
	Mean Dose	**UB Dose***
Operation BUSTER-JANGLE (1951)		
All ground-based military personnel at all shots	<0.001	<0.001
Operation TUMBLER-SNAPPER (1952)		
All ground-based military personnel at all shots	<0.001	< 0.001
Operation UPSHOT-KNOTHOLE (1953)		
Troop Observers at Shot ANNIE	0.019	0.057
Troop Observers at Shot NANCY	0.007	0.021
Troop Observers at Shot BADGER	0.010	0.030
Troop Observers at Shot SIMON	0.015	0.045
Troop Observers at Shots ENCORE and GRABLE	<0.001	<0.001
Troop Observers at Shot HARRY	0.013	0.039
Battalion Combat Teams A & B at Shot ANNIE	0.012	0.036
Battalion Combat Teams A & B at Shot NANCY	0.004	0.012
Battalion Combat Teams A & B at Shot SIMON	0.012	0.036
Battalion Combat Teams A & B at Shots ENCORE and GRABLE	<0.001	<0.001
Marine Brigade (2nd MCPAEB) at Shots DIXIE and RAY	<0.001	<0.001
Marine Brigade (2nd MCPAEB) at Shot BADGER	0.006	0.018
Operation TEAPOT (1955)		
Observers at Shot MOTH	0.083	0.25
Observers at Shot TESLA	0.32	0.96
Observers at Shot TURK	<0.001	<0.001
Observers at Shot BEE	0.029	0.087
Observers at Shot APPLE I	0.045	0.14
Observers at Shot APPLE II	0.082	0.25
VIP Observers at Shot APPLE II	0.002	0.006
Marine Brigade (3rd MCPAEB) at Shot BEE	0.02	0.06
TF RAZOR, 723rd Tank Bn at Shot APPLE II		
Company A	0.17	0.51
Company B	0.026	0.078
Company C	0.1	0.3
TF RAZOR, Arm Inf Plt at Shot APPLE II		
Right Flank	0.17	0.51
Center Flank	0.11	0.33
Left Flank	0.058	0.18

Table Att 1-2. Doses from Initial Gamma Radiation for NTPR Participants (cont.)

Unit or Project Element	**Initial Gamma Dose (rem)**	
	Mean Dose	**UB Dose***
TF RAZOR, Tank Command Group at Shot APPLE II	0.14	0.42
TF RAZOR, Staff Element at Shot APPLE II	0.15	0.45
TF RAZOR, Engineer Platoon at Shot APPLE II	0.01	0.03
TF RAZOR, Artillery Battery at Shot APPLE II	<0.001	<0.001
TF RAZOR, Observers at Shot APPLE II	<0.001	<0.001
Operation PLUMBBOB (1957)		
Observers in trenches at Shot PRISCILLA	0.005	0.015
Observers in trenches at Shot HOOD	0.002	0.006
Observers in trenches 3.8 km from Shot DIABLO	0.007	0.021
Observers in trenches 3.2 km from Shot KEPLER	0.025	0.075

* Mean initial gamma doses are multiplied by an uncertainty factor of 3 to obtain an upper-bound (UB) dose (Weitz and Egbert, 2010). Upper-bound initial gamma doses were not included in Weitz and Egbert (2010).

Attachment 2.

Cross Reference of Diseased Organs, NTPR Standard Organs, and NIOSH IREP Cancer Risk Models

Table Att 2-1 in this attachment is based on Table A-1 in Case et al. (2011a) and contains a listing of diseased organs and tissues cross referenced to the NTPR Standard Organs used in FIIDOS internal dose calculations (DTRA, 2017, SM ID01), and the cancer risk models of NIOSH-IREP (NIOSH, 2002). Entries in the "NTPR Standard Organ Type" column of Table Att 2-1 indicate whether the assignment in the NTPR Standard Organ column is an actual NTPR Standard Organ used in FIIDOS calculations (FIIDOS), or if it is an NTPR Standard Organ selected as a surrogate for the diseased organ (Surrogate). NuTRIS organ codes that were present in earlier versions of this table have been deleted because these codes are not needed for expedited processing.

Table Att 2-1 of a previous version of RA02 (Revision 3.0) contained four entries that were proposed for future implementation, based on an assessment of cancer models and associated organs found in NIOSH-IREP supporting documentation (Kocher and Apostoaei, 2007; NIOSH, 2002). These entries were proposed to improve harmonization of references within the VA and DTRA processes. These four entries, which are cervix, middle ear, ovary, and pleura, are added in this revision of Table Att 2-1.

Table Att 2-1. Cross-Reference of Diseased Organs, NTPR Standard Organs, and NIOSH-IREP Cancer Models*

Organ, Tissue, or Disease	NTPR Standard Organ	NTPR Standard Organ Type†	NIOSH-IREP Cancer Model (ICD-9)
Acute lymphocytic leukemia (ALL)	Red Marrow	Surrogate	Acute Lymphocytic Leukemia (204.0)
Acute myeloid leukemia (AML)	Red Marrow	Surrogate	Acute Myeloid Leukemia (205.0)
Adrenal glands	Adrenals	**FIIDOS**	Other endocrine glands (194)
Arthritic Tissue	Bone Surface	Surrogate	Not applicable (not a malignant neoplasm)
Bladder	Urinary Bladder Wall	**FIIDOS**	Bladder (188)
Blood, **bone marrow**, **red marrow**, yellow marrow, leukemia (excluding ALL, AML, CLL, and CML)‡	Red Marrow	**FIIDOS**, Surrogate	Leukemia, excl. CLL (204-208, excl. 204.1)
Bone, **bone surface**, endosteum, joints, and all other **bones** (e.g., ankle, **elbow**, **femur**, hand, jaw, **pelvis**, shoulder, spine, vertebrae)	Bone Surface	**FIIDOS**, Surrogate	Bone (170)
Brain, anterior commissure, brain stem, cranial nerve	Brain	**FIIDOS**, Surrogate	Nervous system(191-192)
Breast	Breast	**FIIDOS**	Breast (174-175)
Cervix	Uterus	Surrogate	Female Genitalia, excl. ovary (179-182, 184)
Chronic lymphocytic leukemia (CLL)	Spleen	Surrogate	Chronic Lymphocytic Leukemia (204.1)
Chronic myeloid leukemia (CML)	Red Marrow	Surrogate	Chronic Myeloid Leukemia (205.1)
Connective tissue	Muscle	Surrogate	Connective tissue (171)

Table Att 2-1. Cross-Reference of Diseased Organs, NTPR Standard Organs, and NIOSH-IREP Cancer Models (cont.)*

Organ, Tissue, or Disease	**NTPR Standard Organ**	**NTPR Standard Organ Type**†	**NIOSH-IREP Cancer Model (ICD-9)**
Endocrine glands (endocrine glands not included elsewhere)	Specific diseased organ must be known.	Surrogate	Other endocrine glands (194)
Esophagus	ET Region‡	**FIIDOS**	Esophagus (150)
Eye, choroid, retina	Brain	Surrogate	Eye (190)
Gallbladder, bile duct	Liver	Surrogate	Gallbladder (155.1, 156)
Heart, aorta, atrial sarcoma	Muscle	Surrogate	Other respiratory (160, 161, 163-165)
Kidney	Kidney	**FIIDOS**	Urinary organs, excluding bladder (189)
Larynx, including glottis, vocal cords	ET Region‡	Surrogate	Other respiratory (160, 161, 163-165)
Lipoma	Muscle	Surrogate	Not applicable (not a malignant neoplasm)
Liver	Liver	**FIIDOS**	Liver (155.0)
Lower large intestine, colon, **large intestine**	LLI Wall‡	**FIIDOS**, Surrogate	Colon (153)
Lung, trachea	Lung	**FIIDOS**, Surrogate	Lung (162)
Lymph system, including lymph glands, lymph nodes, lymphatic tissue, lymphoma	Thymus (If this is primary disease)	Surrogate	Lymphoma and multiple myeloma (200-203)
Middle ear	Brain	Surrogate	Other respiratory (160, 161, 163-165)

Table Att 2-1. Cross-Reference of Diseased Organs, NTPR Standard Organs, and NIOSH-IREP Cancer Models (cont.)*

Organ, Tissue, or Disease	NTPR Standard Organ	NTPR Standard Organ Type†	NIOSH-IREP Cancer Model (ICD-9)
Muscle, including, **thigh muscle**, eye muscle, eyelid muscle, neuro-muscular	Muscle	**FIIDOS**, Surrogate	Other and ill-defined sites (195)
Nasal cavities, including sinus (maxillary), sinus (nasal), nasal tip	ET Region‡	Surrogate	Other respiratory (160, 161, 163-165)
Nervous system, spinal cord, spine nerves	Brain	Surrogate	Nervous system (191-192)
Neuroendocrine system, including hypothalamus, pituitary gland, pineal gland	Brain	Surrogate	Other endocrine glands (194)
Oral cavity and pharynx, including epiglottis, gum, hypopharynx, lip, mouth, nasopharynx, oropharynx, palate, parotid gland, pharynx, salivary gland, throat, tongue, tonsil, uvula, and nasolabial fold (specific disease needed if not skin cancer)	ET Region‡	Surrogate	Oral Cavity and Pharynx (140-149)
Ovary	Ovary	**FIIDOS**	Ovary (183)
Pancreas	Pancreas	**FIIDOS**	Pancreas (157)
Parathyroid	Thyroid	Surrogate	Other endocrine glands (194)
Peritoneum, peritoneal cavity muscle	Muscle	Surrogate	All digestive (150-159)
Pleura	Lung	Surrogate	Other respiratory (160, 161, 163-165)
Rectum, anus, anal canal	LLI Wall‡	Surrogate	Rectum (154)

Table Att 2-1. Cross-Reference of Diseased Organs, NTPR Standard Organs, and NIOSH-IREP Cancer Models (cont.)*

Organ, Tissue, or Disease	NTPR Standard Organ	NTPR Standard Organ Type†	NIOSH-IREP Cancer Model (ICD-9)
Respiratory other than Lung	ET Region‡	Surrogate	Other respiratory (160, 161, 163-165)
Small intestine, duodenum	SI Wall‡	**FIIDOS**, Surrogate	All digestive (150-159)
Soft tissue, e.g., hip, shoulder, thigh, upper arm	Muscle	Surrogate	Other and ill-defined sites (195)
Spleen	Spleen (Use only if solid cancer of spleen is the primary disease)	**FIIDOS**	All digestive (150-159)
Stomach	Stomach Wall	**FIIDOS**	Stomach (151)
Testes and other male genitalia, including penis prostate, scrotum	Testes	**FIIDOS**, Surrogate	All Male Genitalia (185-187)
Thymus	Thymus	**FIIDOS**	Other respiratory (160, 161, 163-165)
Thyroid	Thyroid	**FIIDOS**	Thyroid (193)
Upper large intestine, including appendix, cecum	ULI Wall‡	**FIIDOS**, Surrogate	Colon (153)
Urinary tract, urethra, ureter	Urinary Bladder Wall	Surrogate	Urinary organs, excluding bladder (189)

* Modified from Table A-1 of Case et al. (2011a).

† FIIDOS (in bold) means that there are FIIDOS dose conversion factors for the organ(s) in bold. Surrogate means that dose conversion factors for the NTPR Standard Organ are used for the non-bolded diseased organ(s).

‡ ET=extra-thoracic, ALL = Acute lymphocytic leukemia, AML = Acute myeloid leukemia, CLL=chronic lymphocytic leukemia, CML = chronic myeloid leukemia, LLI=lower large intestine, SI=small intestine, ULI = upper large intestine.

Attachment 3.

EPG and Organ Combinations not Recommended for Expedited Processing

This attachment contains a table showing the EPG/organ combinations that are not recommended for expedited processing. The shaded cells show at a glance which organ doses for a particular EPG exceed the applicable Limiting Dose (LD), initial neutron and gamma doses excluded. For example, EPG TODs for liver and thyroid exceed the applicable LDs for the XRDS Support Ship EPG. In cases involving doses from initial radiation, a comparison should be conducted in accordance with Sections 5.7 and 5.10, where applicable initial doses should be added to EPG TODs, and Table Att 3-1 should not be used.

Table Att 3-1. EPG and Organ Combinations not Recommended for Expedited Processing (shaded cells)

NTPR Standard Organ ➔	Adrenals	Bone surface	Brain				Breast	St Wall	SI Wall	ULI Wall	LLI Wall		Kidneys	Liver		ET Region			Lung		Muscle				Pancreas	Red Marrow				Spleen		Testes	Thymus		Thyroid		Bladder Wall	
NIOSH-IREP Cancer Model ➔ EPG ↓	Other endocrine	Bone	Other endocrine	Nervous system	Eye	Other respiratory	Breast	Stomach	All digestive	Colon	Colon	Rectum	Other urinary orgs	Liver	Gallbladder, incl. Bile Duct	Esophagus	Oral cavity	Other respiratory	Lung	Other respiratory	Connective tissue	Other & ill-defined	All digestive	Other respiratory	Pancreas	ALL*	AML*	CML*	Leukemia	CLL*	All digestive	Male genitalia	Lymphoma	Other respiratory	Thyroid	Other endocrine	Urinary organs	Bladder
	Pacific Proving Ground, Ship-Based Personnel†																																					
XRDS Support Ships														■																					■			
XRDS Target Ships		■									■			■	■																				■	■		
USS BRUSH		■												■	■																							
SANDSTONE																																						
GREENHOUSE																																			■			
IVY																																						
CASTLE (High)		■						■		■	■			■	■	■			■							■	■								■	■		
CASTLE (Low)														■	■																				■			
WIGWAM																																						
REDWING																																			■			
HARDTACK I																																			■			
HT-I Unexposed																																						
ARGUS																																						
DOMINIC I																																						

NTPR Standard Organ ➔	Adrenals	Bone surface	Brain				Breast	St Wall	SI Wall	ULI Wall	LLI Wall		Kidneys	Liver		ET Region			Lung		Muscle				Pancreas	Red Marrow				Spleen		Testes	Thymus		Thyroid		Bladder Wall	
NIOSH-IREP Cancer Model ➔ EPG ⬇	Other endocrine	Bone	Other endocrine	Nervous system	Eye	Other respiratory	Breast	Stomach	All digestive	Colon	Colon	Rectum	Other urinary orgs	Liver	Gallbladder, incl. Bile Duct	Esophagus	Oral cavity	Other respiratory	Lung	Other respiratory	Connective tissue	Other & ill-defined	All digestive	Other respiratory	Pancreas	ALL*	AML*	CML*	Leukemia	CLL*	All digestive	Male genitalia	Lymphoma	Other respiratory	Thyroid	Other endocrine	Urinary organs	Bladder
	Pacific Proving Ground, Land-Based Personnel†																																					
XRDS																																						
Bikini Resurvey (1947)																																						
SANDSTONE																																						
GREENHOUSE																																						
IVY																																						
CASTLE																																						
REDWING																																						
HARDTACK I																																						
	Pacific Proving Ground, Inter-Operation Personnel†																																					
Post-SANDSTONE																																						
Post-GREENHOUSE																																						
Post-IVY																																						
Post-CASTLE																																						
Post- REDWING																																						
Post-HARDTACK I																																						

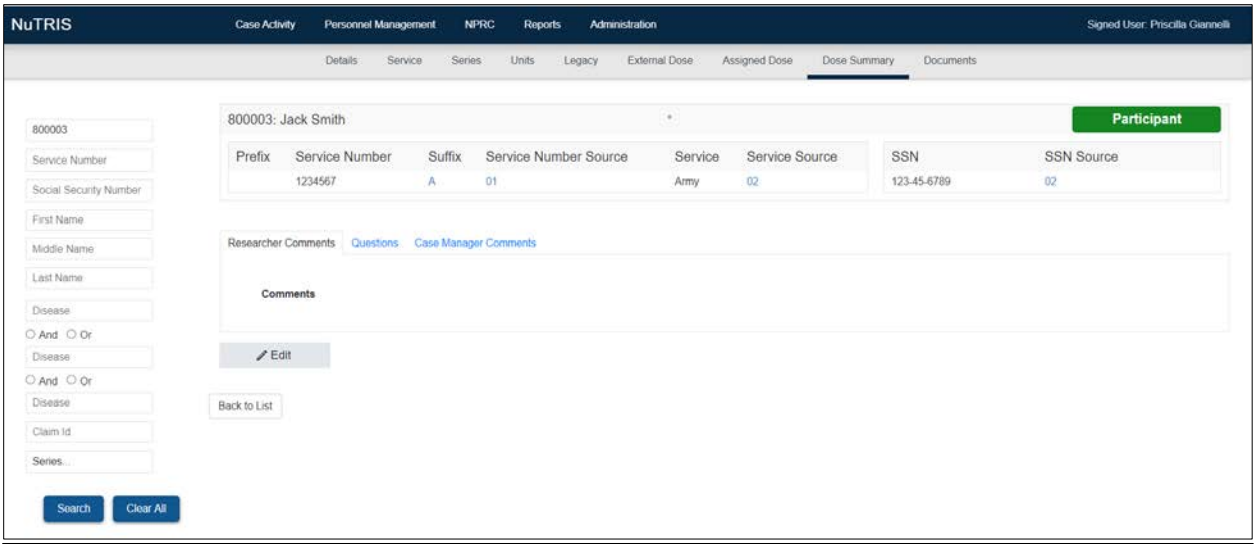
NTPR Standard Organ ➔	Adrenals	Bone surface	Brain				Breast	St Wall	SI Wall	ULI Wall	LLI Wall		Kidneys	Liver		ET Region			Lung		Muscle				Pancreas	Red Marrow				Spleen		Testes	Thymus		Thyroid		Bladder Wall	
NIOSH-IREP Cancer Model ➔ EPG ⬇	Other endocrine	Bone	Other endocrine	Nervous system	Eye	Other respiratory	Breast	Stomach	All digestive	Colon	Colon	Rectum	Other urinary orgs	Liver	Gallbladder, incl. Bile Duct	Esophagus	Oral cavity	Other respiratory	Lung	Other respiratory	Connective tissue	Other & ill-defined	All digestive	Other respiratory	Pancreas	ALL*	AML*	CML*	Leukemia	CLL*	All digestive	Male genitalia	Lymphoma	Other respiratory	Thyroid	Other endocrine	Urinary organs	Bladder
	Nevada Test Site Personnel†																																					
NTS Observer and Maneuver Troops																																						
NTS Support																																						
2MCPAEB (UK)																																						
Task Force WARRIOR (PB)																																						

* ALL = Acute Lymphocytic Leukemia; AML = Acute Myeloid Leukemia; CML = Chronic Myeloid Leukemia; CLL = Chronic Lymphocytic Leukemia.

† XRDS = CROSSROADS, HT I = HARDTACK I, UK = UPSHOT-KNOTHOLE, PB = PLUMBBOB, 2MCPAEB = 2nd Marine Corps Atomic Exercise Brigade.

Attachment 4.

Example Blank DTRA Dose Summary Sheet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Case Activity
Personnel Management
NPRC
Reports
Administration
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Details
Service
Series
Units
Legacy
External Dose
Assigned Dose
Dose Summary
Documents
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Social Security Number
First Name
Middle Name
Last Name
Disease
And Or
Disease
And Or
Disease
Claim Id
Series...
Search
Clear All
800003: Jack Smith
Participant
Prefix
Service Number
Suffix
Service Number Source
Service
Service Source
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SSN Source
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Army
02
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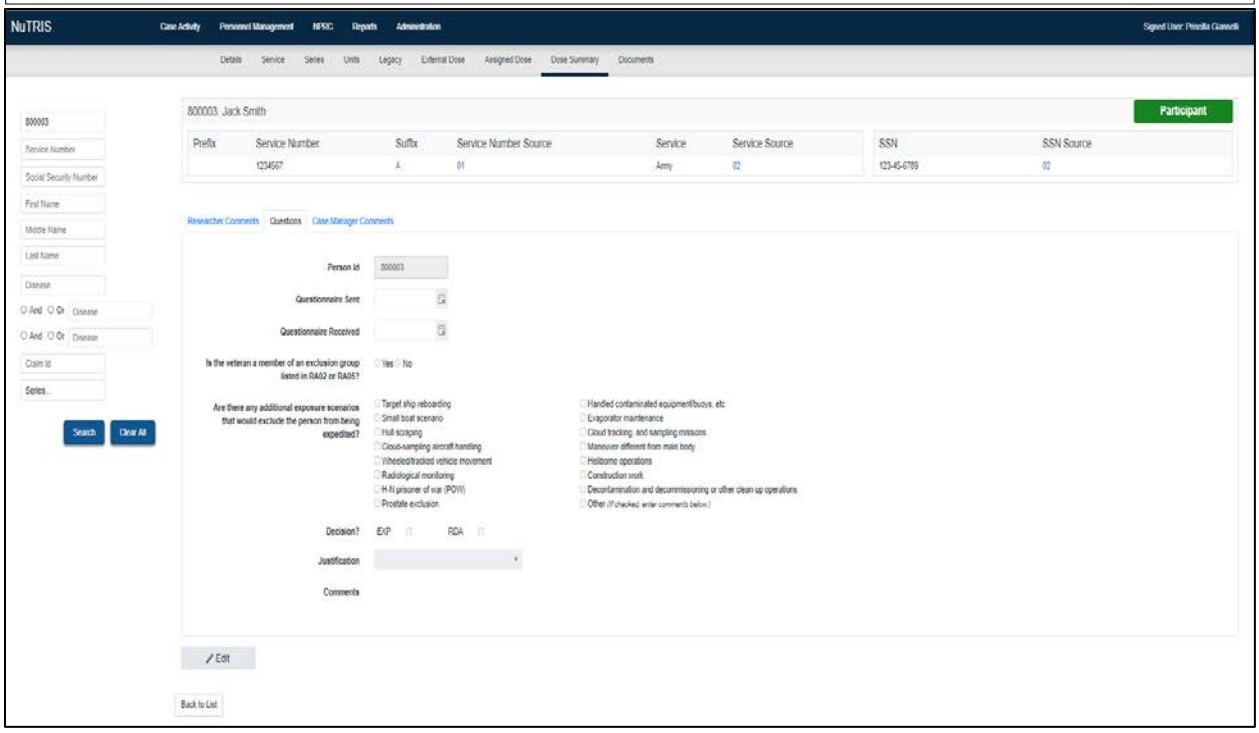
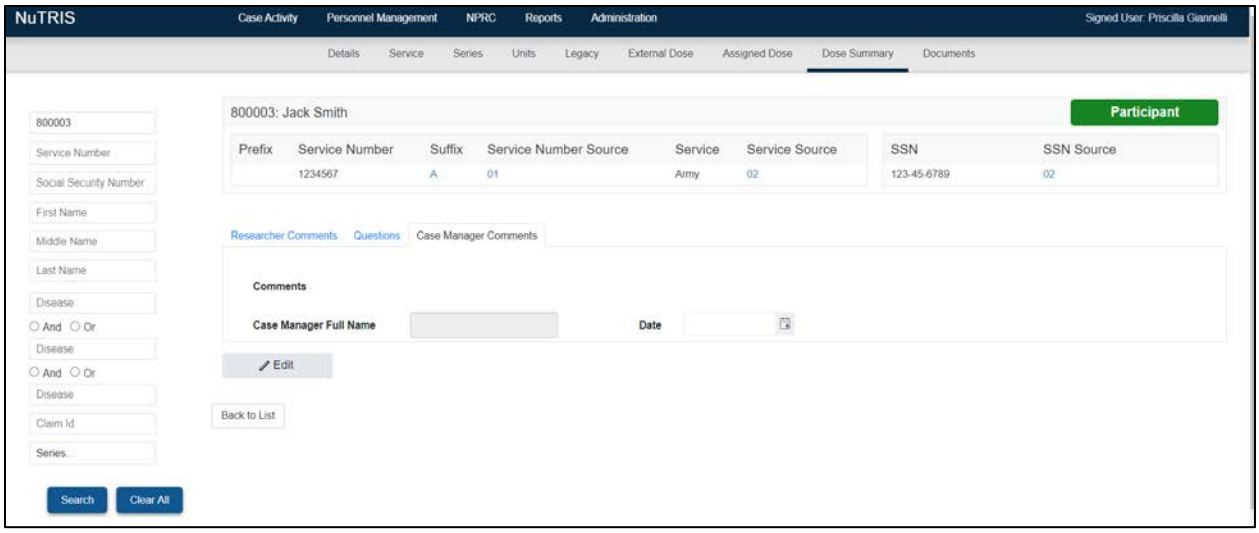
02
Researcher Comments
Questions
Case Manager Comments
Comments
Edit
Back to List


NuTRIS
Case Activity
Personnel Management
NPRC
Reports
Administration
Signed User: Priscilla Giannelli
Details
Service
Series
Units
Legacy
External Dose
Assigned Dose
Dose Summary
Documents
800003
Service Number
Social Security Number
First Name
Middle Name
Last Name
Disease
And Or
Disease
And Or
Disease
Claim Id
Series...
Search
Clear All
800003: Jack Smith
Participant
Prefix
Service Number
Suffix
Service Number Source
Service
Service Source
SSN
SSN Source
1234567
A
01
Army
02
123-45-6789
02
Researcher Comments
Questions
Case Manager Comments
Person Id
800003
Questionnaire Sent
Questionnaire Received
Is the veteran a member of an exclusion group listed in RA02 or RA05?
Yes
No
Are there any additional exposure scenarios that would exclude the person from being expedited?
Target ship reboarding
Small boat scenario
Hull scraping
Cloud-sampling aircraft handling
Wheeled/tracked vehicle movement
Radiological monitoring
H-N prisoner of war (POW)
Prostate exclusion
Handled contaminated equipment/buoys, etc
Evaporator maintenance
Cloud tracking, and sampling missions
Maneuver different from main body
Heliborne operations
Construction work
Decontamination and decommissioning or other clean-up operations
Other (If checked, enter comments below.)
Decision?
EXP
RDA
Justification
Comments
Edit
Back to List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Case Activity
Personnel Management
NPRC
Reports
Administration
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Details
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Units
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Dose Summary
Documents
800003
Service Number
Social Security Number
First Name
Middle Name
Last Name
Disease
And Or
Disease
And Or
Disease
Claim Id
Series...
Search
Clear All
800003: Jack Smith
Participant
Prefix
Service Number
Suffix
Service Number Source
Service
Service Source
SSN
SSN Source
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A
01
Army
02
123-45-6789
02
Researcher Comments
Questions
Case Manager Comments
Comments
Case Manager Full Name
Date
Edit
Back to List

Attachment 5.

General and EPG-Specific Exclusions for Expedited Processing Groups

Treatment of Exclusions

NTPR participants are excluded from an EPG if they had the potential for higher doses than the EPG or if there is insufficient information regarding their activities. One or more cohorts having well-characterized, common activities may be organized into a separate EPG. Cohorts are organized into separate EPGs if their overall exposure is deemed distinct from the members of the EPG.

Participants or cohorts excluded from EPGs based on operational activities that are specific to the group are shown in the column labeled "Exclusions (Units, cohorts, activities, etc.)." These exclusions are either organized as a separate EPG or identified for further, case-specific evaluation, and possibly a full RDA. Personnel and activities to be excluded are grouped into three general categories of participation as listed in Tables Att 5-1 to 5-3. These exclusions apply unless otherwise stated for a specific EPG as described in the Compendium of EPGs (Case et al., 2011b).

Highest-Dose Cohort

Expedited Processing Groups (EPGs) are listed in Tables Att 5-4 to 5-13 for participants in test operations conducted in the Pacific Proving Ground, in Table Att 5-14 for participants in test operations conducted at the Nevada Test Site, and in Table Att 5-15 for individuals who were residents of Enewetak Atoll during post-operational periods. In these tables, the column labeled "Highest-Dose Cohort External Residual Gamma Dose" includes doses previously assessed and documented in the publications referred to as NTPR White Books, Blue Books or other technical reports. These doses are not the proposed expedited doses for the expedited processing groups (EPG) in Case et al. (2011b). They do, however, help identify the cohort receiving the highest external gamma dose from residual radioactive material. The schedules and activities of the "highest-dose cohort" are used as a starting point for a scenario of participation and radiation exposure for an EPG. Refer to Section 3 of Case et al. (2011a) for further discussion regarding the "highest-dose cohort."

Note: This attachment is from Appendix B, "Proposed NTPR Expedited Processing Groups," Tables B-1 through B-15 of DTRA-TR-10-29, *A Technical Approach to Expedited Processing of NTPR Radiation Dose Assessments* (Case et al., 2011a). Introductory narrative and table numbers have been re-numbered and modified from Appendix B of DTRA-TR-10-29 (Case et al., 2011) for this attachment for consistency with and application to this SOP.

Note: In this attachment Tables Att 5-1 through 5-15 are references to Case et al. (2011b), which is DTRA-TR-11-01, *Compendium of Proposed NTPR Expedited Processing Groups*. Defense Threat Reduction Agency. Fort Belvoir, VA. November 2011.

Table Att 5-1. General Exclusions Applicable to Pacific Proving Ground Ship-based Personnel*

Activity or Cohort
Participation in more than one test series (operation)
Decontamination of any equipment (except for CROSSROADS target ship crews)
Personnel who performed maintenance or repair on contaminated equipment prior to decontamination
Personnel who were topside during one or more fallout events and thus may have inhaled descending fallout
Personnel whose regular assignment was to a small boat crew
Divers
Crews of cloud-tracking or cloud-sampling aircraft
Involvement in or near heliborne operations (crew members or passengers)
Radioactive sample recovery, handling, or preparation
Personnel who were assigned to support scientific projects (e.g., weapon development projects or effects experiments)
Personnel whose regular assignment was to a Radiological Safety (Rad-Safe) unit
Flight drone or sounding rocket operations
Personnel assigned to ships that experienced evaporator or potable water system failures that lead to contaminated drinking water
Shore excursion to any island where a test shot was performed
Consumption of meals while topside during episodes of descending fallout
Individuals with film badge records and whose total film badge dose is greater than the EPG external dose determined for their respective EPG

* These exclusions apply unless otherwise stated for a specific EPG as described in the Compendium of Proposed EPGs (Case et al., 2011b).

Table Att 5-2. General Exclusions Applicable to Pacific Proving Ground Land-Based Personnel*

Activity or Cohort
Participation in more than one testing series (operation)
Decontamination of aircraft, helicopters, vehicles, or equipment
Personnel who performed maintenance or repair on contaminated aircraft, helicopters, vehicles, or equipment prior to decontamination
Personnel whose regular assignment was to a small boat crew
Divers
Crews of cloud-tracking, cloud-sampling, or air delivery aircraft
Involvement in or near heliborne operations (crew members or passengers)
Radioactive sample recovery, handling, or preparation
Personnel who were assigned to support scientific projects, e.g., weapon development projects or effects experiments (except if participation was as Bikini Resurvey personnel in 1947)
Personnel whose regular assignment was to a Radiological Safety (Rad-Safe) unit
Flight drone or sounding rocket operations
Excursion to any island where a test shot was performed
Consumption of meal(s) while outside during episodes of descending fallout at their location
Individuals with film badge records and whose total film badge dose is greater than the EPG external dose determined for their respective EPG

* These exclusions apply unless otherwise stated for a specific EPG as described in the Compendium of Proposed EPGs (Case et al., 2011b).

Table Att 5-3. General Exclusions Applicable to Participants During Testing at the Nevada Test Site*

Activity or Cohort
Participation in more than one testing series (operation)
Volunteer observers
Participation in decontamination of aircraft, helicopters, vehicles, or equipment
Personnel who performed maintenance or repair on contaminated aircraft, helicopters, vehicles, or equipment prior to decontamination
Crews of cloud-tracking, cloud-sampling, or air-delivery aircraft
Members of helicopter crews
Radioactive sample recovery, handling, or preparation
Personnel whose regular assignment was to a Radiological Safety (Rad-Safe) unit
Personnel who were assigned duties in the forward test area for any reason other than to observe a shot or participate in a maneuver (e.g., Instructor/Control, Signal, Transportation, Engineering, etc.)
Personnel who were assigned to support scientific projects (e.g., weapons development projects and military or civil effects projects)
Consumption of meals while outside during episodes of descending fallout
Individuals with film badge records and whose total film badge dose is greater than the maximized upper-bound external dose determined for their respective EPG

* These exclusions apply unless otherwise stated for a specific EPG as described in the Compendium of Proposed EPGs (Case et al., 2011b).

Table Att 5-4. Expedited Processing Groups for Operation CROSSROADS (1946)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)‡	Number of Participants (Approx.)
CROSSROADS Support Ship-Based Personnel	Crews of CROSSROADS support ships§, and crews of the re-manned target ships USS BLADEN, USS CORTLAND, USS FILLMORE, USS GENEVA, USS NIAGARA, and USS LCI(L)615.	• Target ship boardings after BAKER (distinct EPG, see below). • Flight/drone operations aboard USS SHANGRI-LA and USS SAIDOR. • USS BRUSH (distinct EPG, see below). • Ammunition Disposal Units at Kwajalein (Post-XRD). • Bikini resurvey (distinct EPG, see below). • Crew member of the USS ACHOMAWI, USS COUCAL, and USS O'BRIEN.	USS RECLAIMER†	1.7 §	30,000

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† Crews of USS O'BRIEN received limited fallout after ABLE, in addition to BAKER's. The corresponding external dose when added to that due to exposure to BAKER fallout is smaller than that for the USS RECLAIMER. USS ACHOMAWI and possibly other support ships had faulty evaporators that may have resulted in an additional internal dose due to ingestion of contaminated drinking water.

‡ These are not assigned doses to members of EPGs (see introductory narrative of this attachment).

§ See DNA-TR-82-05-V1, *Analysis of Radiation Exposure for Naval Units of Operation CROSSROADS; Volume 1-Basic Report* (March 3, 1982), including Table 7-1 for external dose estimate.

Table Att 5-4. Expedited Processing Groups for Operation CROSSROADS (1946) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)‡	Number of Participants (Approx.)
CROSSROADS Land-Based Personnel	Land-based personnel at Kwajalein and Enewetak Atolls and weather station islands (there were no land-based personnel at Bikini Atoll).	• Decontamination of target ships moored at Kwajalein Island. • Towing of target ships to Kwajalein Island. • Small boat operations involving contaminated target or support ships moored at Kwajalein Island. • Performing surveys, construction, or experiments on Bikini Atoll after Shot ABLE. • Unloading, inspecting, handling, moving, and decontaminating ammunition on target ships moored at Kwajalein Island. • Handling of contaminated clothing, waste, or equipment created during ammunition inspection and unloading operations at Kwajalein Island.	Army Air Group TG 1.5	0.1	2,600

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

‡ These are not assigned doses to members of EPGs (see introductory narrative of this attachment). See "Appendix B-1, Operation CROSSROADS" of (DTRA, 2017), for estimated dose.

Table Att 5-4. Expedited Processing Groups for Operation CROSSROADS (1946) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)‡	Number of Participants (Approx.)
CROSSROADS Target Ship-Based Personnel	Crews that boarded contaminated target ships after Shot BAKER.	• Crews of six re-manned target ships that did not receive topside contamination from Shot BAKER: USS BLADEN, USS CORTLAND, USS FILLMORE, USS GENEVA, USS NIAGARA, and USS LCI(L)-615. These personnel are included in the CROSSROADS Support Ship-Based Personnel EPG. • Crew members of any target ships who did not participate in target ship boardings after Shot BAKER – these personnel are included in the CROSSROADS Support Ship Crew EPG. • Crew members of any target ships who were subsequently assigned to Ammunition Disposal Units and participated in ammunition unloading at Kwajalein. • Personnel who were crew members of target submarines.	USS CARTERET	2.9 (previous RDA)	8,000

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

‡ These are not assigned doses to members of EPGs (see introductory narrative of this attachment).

Table Att 5-4. Expedited Processing Groups for Operation CROSSROADS (1946) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)‡	Number of Participants (Approx.)
USS BRUSH Crew (February 25-27, 1947)	Crew of USS BRUSH in Kwajalein Lagoon, February 1947.	• Personnel who transferred to USS BRUSH after the ship's departure from Kwajalein Atoll on February 27, 1947.	Crew members who participated in excursions to target ships.	0.07 (previous RDA)	250
Bikini Resurvey Personnel July-August 1947	Crew members of USS CHILTON, USS COUCAL and LCI(L)-615 who participated as members of the Bikini Resurvey team in July and August 1947.	• None specific to this group.	Navy Construction Battalion Detachment 1800.	0.8 (previous RDA)	700

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

‡ These are not assigned doses to members of EPGs (see introductory narrative of this attachment).

Table Att 5-5. Expedited Processing Groups for Operation SANDSTONE (1948)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
SANDSTONE Ship-Based Personnel	Personnel on ships during Operation SANDSTONE to include transient ships.	• Individuals who participated in Enewetak and Bikini Atoll resurveys (Post-SANDSTONE). • Individuals who Boarded Operation CROSSROADS target ships moored at Kwajalein. • Individuals who participated in a special project known as Operation FITZWILLIAM that involved laboratory measurements of radioactive samples.	USS HENRY W. TUCKER	0.05	6,400

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-2, Operation SANDSTONE" of (DTRA, 2017), for estimated dose.

Table Att 5-5. Expedited Processing Groups for Operation SANDSTONE (1948) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
SANDSTONE Land-Based Personnel	Army, Navy, and Air Force personnel stationed at Enewetak and Kwajalein Atolls.	• Individuals who participated in Enewetak and Bikini Atoll resurveys (Post-SANDSTONE). • Individuals who boarded Operation CROSSROADS target ships moored at Kwajalein. • Individuals who participated in a special project known as Operation FITZWILLIAM that involved laboratory measurements of radioactive samples. • Individuals who were stationed at Majuro Atoll, Rongerik Atoll, or Wake Island.	TG 7.4 (Air Force) at Kwajalein Atoll	0.08	5000

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-2, Operation SANDSTONE" of (DTRA, 2017), for estimated dose.

Table Att 5-6. Expedited Processing Groups for Operation GREENHOUSE (1951)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
GREENHOUSE Ship-Based Personnel	Personnel on ships during Operation GREENHOUSE including transient ships.	• No specific exclusions.	USNS SGT. C. E. MOWER	0.68	4,700
GREENHOUSE Land-Based Personnel	Army, Navy, and Air Force personnel stationed at Enewetak Atoll, Kwajalein Atoll, and weather station islands.	• Individuals who participated in clothing contamination tests.	Headquarters, Joint Task Force-3	3.1	4,700

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-3, Operation GREENHOUSE" of (DTRA, 2017), for estimated doses.

Table Att 5-7. Expedited Processing Groups for Operation IVY (1952)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
IVY Ship-Based Personnel	Personnel on ships during Operation IVY including transient ships.	• None specific to this group.	USS LIPAN	0.036	4,700
IVY Land-Based Personnel	Army, Navy, and Air Force personnel stationed at the residence islands of Enewetak Atoll, Kwajalein Atoll, and weather station islands.	• None specific to this group.	7126th Army Unit on Enewetak Atoll.	0.059	4,700

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-4, Operation IVY" of (DTRA, 2017), for estimated doses.

Table Att 5-8. Expedited Processing Groups for Operation CASTLE (1954)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
CASTLE High-Dose Ship-Based Personnel	Personnel on Operation CASTLE ships that received heavier fallout.	• Personnel on Operation CASTLE ships that received light fallout to include transient ships (distinct EPG, see below). • Shore excursions on Rongelap or Rongerik Atolls. • Crew members of YAG 39 (USS GEORGE EASTMAN), USS PATAPSCO (AOG 1), or YAG 40 (GRANVILLE S. HALL).	USS PHILIP (average crew)	3.56	1350
CASTLE Low-Dose Ship-Based Personnel	Personnel on ships at Operation CASTLE that received light fallout and transient ships.	• Personnel on Operation CASTLE ships that received heavy fallout (distinct EPG, see above). • Shore excursions on Rongelap or Rongerik Atolls. • Were crew members of YAG 39 (USS GEORGE EASTMAN), USS PATAPSCO (AOG 1), or YAG 40 (GRANVILLE S. HALL).	USS ESTES	1.76	4,300

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See “Appendix B-5, Operation CASTLE” of (DTRA, 2017), for estimated doses.

Table Att 5-8. Expedited Processing Groups for Operation CASTLE (1954) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
CASTLE Land-Based Personnel	Army, Navy, and Air Force personnel stationed at Enewetak Atoll, Kwajalein Atoll, and weather station islands.	• Excursions on Rongelap or Rongerik Atolls.	7126th Army Unit stationed at Enewetak Island	1.09	2,600

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-5, Operation CASTLE" of (DTRA, 2017), for estimated dose.

Table Att 5-9. Expedited Processing Group for Operation WIGWAM (1955)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
WIGWAM Ship-Based Personnel	All participants.	• Individuals who performed large scale ship decontamination.	USS CHANTICLEER	0.13	6,200

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-6, Operation WIGWAM" of (DTRA, 2017), for estimated dose.

Table Att 5-10. Expedited Processing Groups for Operation REDWING (1956)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
REDWING Ship-Based Personnel	Military personnel who were assigned to a ship that participated in Operation REDWING activities including transient ships.	• None specific to this group.	USS SILVERSTEIN	1.4	est. 6,000
REDWING Land-Based Personnel	Military personnel who supported Operation REDWING and resided on Enewetak Atoll, Kwajalein Atoll, or weather station islands during Operation REDWING.	• None specific to this group.	7126th Army Unit	3.6	4,000

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-7, Operation REDWING" of (DTRA, 2017), for estimated doses.

Table Att 5-11. Expedited Processing Groups for Operation HARDTACK I (1958)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)‡	Number of Participants (Approx.)
HARDTACK I Ship-Based Personnel	Personnel on ships at Operation HARDTACK I including transient ships.	• Crew Members of ships that only participated in shots at Johnston Island (distinct EPG, see below). • Crew Members of ships that served as unmanned target vessels for the underwater shots WAHOO and UMBRELLA to include three destroyers (KILLEN, HOWORTH, and FULLAM), a liberty ship (SS MICHAEL MORAN), and a submarine (BONITA).	USS ARIKARA	0.8	6,000
HARDTACK I Non-exposed Ship-Based Personnel	All ships that only participated in Shots at Johnston Atoll.	• Individuals with non-zero film badge doses.	USS EPPERSON (DDE-719)	NPE†	1,000

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† NPE stands for no potential for exposure.

‡ These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-8, Operation HARDTACK I" of (DTRA, 2017), for estimated dose.

Table Att 5-11. Expedited Processing Groups for Operation HARDTACK I (1958) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)‡	Number of Participants (Approx.)
HARDTACK I Land-Based Personnel	Personnel resident on Parry and Enewetak Islands of Enewetak Atoll and Eneu Island of Bikini Atoll.	• Personnel who resided on Japtan Island during the operation. • Personnel assigned to Johnston Island.	TG 7.1 (Scientific Group stationed on Parry Island)	1.9	3,500

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† NPE stands for no potential for exposure.

‡ These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-8, Operation HARDTACK I" of (DTRA, 2017), for estimated dose.

Table Att 5-12. Expedited Processing Groups for Operation ARGUS (1958)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)‡	Number of Participants (Approx.)
ARGUS Ship-Based Personnel	All participants in ARGUS.	• None specific to this group.		NPE†	4,369

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† NPE stands for no potential for exposure.

‡ These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See "Appendix B-9, Operation ARGUS" of (DTRA, 2017).

Table Att 5-13. Expedited Processing Groups for Operation DOMINIC I (1962)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)‡	Number of Participants (Approx.)
DOMINIC I Personnel	All participants in DOMINIC I.	• Crewmembers of USS SIOUX (ATF 75), USC&GSS PIONEER (OSS-31), and USS MONTICELLO (LSD-35) during Shot SWORDFISH. • Personnel involved in the recovery/handling of radioactively contaminated instrumented pods and rocket nose cones associated with successful THOR missile and rocket launches. • Personnel involved in recovery and decontamination operations after any of the THOR missile incidents during Shots BLUEGILL, STARFISH, BLUEGILL PRIME. • Personnel involved in recovery, servicing, or boarding of target rafts after airdrop shots. • Personnel involved in the recovery and handling of other contaminated with radioactive materials due to neutron activation.	N/A	NPE†	25,000

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† NPE stands for no potential for exposure.

‡ These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See “Appendix B-10, Operation DOMINIC I” of (DTRA, 2017).

Table Att 5-14. Expedited Processing Groups for Nevada Test Site (NTS)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)§	Number of Participants (Approx.)
NTS Observer and Maneuver Troops, 1951–1962	Personnel that participated as a member of ground-based official EDR observer groups or maneuver groups during NTS shots from 1951 through 1962, including Exercise IVY FLATS at DOMINIC II. Members of 505th Military Police Battalion that performed traffic control or march guide activities during UPSHOT-KNOTHOLE (1953) or TEAPOT (1955).	• Individuals who participated in one of the Volunteer Observer Programs conducted during some of the test series. • Any individuals who participated in more than one maneuver group at more than one shot. • The following maneuver groups are excluded and are each evaluated as a distinct EPG: - The 2nd MCPAEB at Operation UPSHOT-KNOTHOLE, Shot BADGER - Task Force WARRIOR at Operation PLUMBBOB, Shot SMOKY.	UPSHOT-KNOTHOLE SIMON BCT-A	3.2	42,600

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

‡ Members of 1st Battalion 8th Marines of the 2nd MCPAEB received a higher total dose from external residual radiation (4.7 rem) than did the 2nd MCPAEB HQ personnel. However, no internal dose was accrued concurrently with approximately half of this total dose that was due to direct radiation from the BADGER stem as it passed the troops. Most of the dose to 2nd MCPAEB HQ personnel was from fallout, for which internal dose was concurrently accrued.

§ These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See Appendices C-3 to C-7 of (DTRA, 2017), for estimated dose.

Table Att 5-14. Expedited Processing Groups for Nevada Test Site (NTS) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)§	Number of Participants (Approx.)
NTS Participants with no Forward Area Activities, 1951–1962	Support personnel stationed at Camp Desert Rock, Camp Mercury, Indian Springs Air Force Base, or Nellis Air Force Base during any single operation from 1951 through 1962 who did not conduct any activities in any NTS forward area. Inter-operational personnel at CDR, Camp Mercury, and Indian Springs Air Force Base.	• None specific for this group.	UPSHOT-KNOTHOLE CDR support troops	0.02	Unknown

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

‡ Members of 1st Battalion 8th Marines of the 2nd MCPAEB received a higher total dose from external residual radiation (4.7 rem) than did the 2nd MCPAEB HQ personnel. However, no internal dose was accrued concurrently with approximately half of this total dose that was due to direct radiation from the BADGER stem as it passed the troops. Most of the dose to 2nd MCPAEB HQ personnel was from fallout, for which internal dose was concurrently accrued.

§ These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See Appendices C-3 to C-7 of (DTRA, 2017), for estimated dose, in addition to various internal technical memos.

Table Att 5-14. Expedited Processing Groups for Nevada Test Site (NTS) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)§	Number of Participants (Approx.)
Operation UPSHOT-KNOTHOLE 2nd Marine Corps Provisional Atomic Exercise Brigade (2MCPAEB)	Marines that participated in the maneuver at UPSHOT-KNOTHOLE Shot BADGER (1953).	• Marine Helicopter Transport Group 16 that conducted air operations during the 2MCPAEB activities at Shot BADGER. • Personnel in the 2MCPAEB Provisional Helicopter Atomic Test Unit that participated in the Operational Helicopter Test Program at several shots including Shot BADGER.	2nd MCPAEB HQ‡	3.7	2,167

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

‡ Members of 1st Battalion 8th Marines of the 2nd MCPAEB received a higher total dose from external residual radiation (4.7 rem) than did the 2nd MCPAEB HQ personnel. However, no internal dose was accrued concurrently with approximately half of this total dose that was due to direct radiation from the BADGER stem as it passed the troops. Most of the dose to 2nd MCPAEB HQ personnel was from fallout, for which internal dose was concurrently accrued.

§ These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See Appendix C-5 of (DTRA, 2017), for estimated dose.

Table Att 5-14. Expedited Processing Groups for Nevada Test Site (NTS) (cont.)

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)§	Number of Participants (Approx.)
Operation PLUMBBOB Task Force WARRIOR (TFW)	Army infantry troop test Task Force WARRIOR conducted at PLUMBBOB Shot SMOKY (1957).	• Canadian Army Platoon (7th Platoon, Queen's Own Rifles). • 3rd Transportation Battalion (Helicopter). • Personnel not in an element of Company C, 1st Battle Group whose activities are not encompassed by the TFW highest-dose cohort scenario.	2nd Platoon	0.7	350

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

‡ Members of 1st Battalion 8th Marines of the 2nd MCPAEB received a higher total dose from external residual radiation (4.7 rem) than did the 2nd MCPAEB HQ personnel. However, no internal dose was accrued concurrently with approximately half of this total dose that was due to direct radiation from the BADGER stem as it passed the troops. Most of the dose to 2nd MCPAEB HQ personnel was from fallout, for which internal dose was concurrently accrued.

§ These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). See DNA 4747F, *Analysis of Radiation Exposure for Task Force Warrior-Shot Smoky-Exercise Desert Rock VII-VIII Operation PLUMBBOB* (May 31, 1979) for estimated dose.

Table Att 5-15. Expedited Processing Groups for PPG Post Operations

Proposed EPG*	EPG Members	Exclusions (Units, cohorts, activities, etc.)	Highest-Dose Cohort	Estimated External Residual Gamma Dose for the Highest-Dose Cohort (rem)†	Number of Participants (Approx.)
Post-SANDSTONE Enewetak Atoll	Residents of Enewetak Atoll on the islands of Enewetak, Parry and Japtan.	• None specific for this group.	Residents of Enewetak Island	0.05	1,900
Post-GREENHOUSE Enewetak Atoll	Residents of Enewetak Atoll on the islands of Enewetak, Parry and Japtan.	• None specific for this group.	Residents of Parry Island	2.4	2,600
Post-IVY Enewetak Atoll	Residents of Enewetak Atoll on the islands of Enewetak, Parry and Japtan.	• None specific for this group.	Residents of Enewetak Island	0.028	600
Post-CASTLE Enewetak Atoll	Residents of Enewetak Atoll on the islands of Enewetak, Parry and Japtan.	• None specific for this group.	Residents of Enewetak Island	0.25	1,000
Post-REDWING Enewetak Atoll	Residents of Enewetak Atoll on the islands of Enewetak, Parry and Japtan.	• None specific for this group.	Residents of Parry Island	1.9	4,500
Post-HARDTACK I Enewetak Atoll	Residents of Enewetak Atoll on the islands of Enewetak and Parry.	• Individuals who resided on Japtan Island.	Residents of Enewetak Island	0.56	973

* Detailed descriptions with complete lists of ships, cohorts, excluded units, etc., are included in the EPG Compendium (Case et al., 2011b).

† These are not assigned doses to members of EPGs (see the introductory narrative of this attachment). All listed doses are from NTPR-TM-09-02, *Doses Accrued at the Residence Islands of Enewetak Atoll from Previous Operations* (December 31, 2009).

Attachment 6.

Organ Doses Corresponding to the Limiting Dose (PC=40 percent) and Screening Dose (PC=50 percent)

The limiting dose is the dose that corresponds to a probability of causation (PC) of cancer due to exposure to ionizing radiation of 40 percent. The screening dose is the dose that corresponds to a PC of 50 percent. The screening dose is used to pre-determine if a cancer was "at least as likely as not" caused by exposure to ionizing radiation. The limiting dose is used in NTPR expedited processing as a value below which there is no possibility that a cancer was "at least as likely as not" caused by exposure to ionizing radiation.

The values in Table Att 6-1 were taken from Table 3 of the technical report DTRA-TR-10-29 (Case et al., 2011a). In addition, the technical memorandum NTPR-TM-13-02, (Mannis et al., 2013) provided the guidance for cases involving Chronic Lymphocytic Leukemia (CLL).

Table Att 6-1. Organ Doses Corresponding to the Limiting Doses and Screening Doses

Cancer of Organ/Disease	Limiting Dose (rem) at 40% PC*	Screening Dose (rem) at 50% PC*†
Acute Lymphocytic Leukemia (ALL)	14‡	24‡
Acute Myeloid Leukemia (AML)	20‡	29‡
All digestive (other than esophagus, stomach, colon, rectum/anus)	44	66
All male genitalia	41	60
Bone	32	48
Breast (male)	36	53
Chronic Lymphocytic Leukemia (CLL) §	45	68
Chronic Myeloid Leukemia (CML)	41‡	57‡
Colon	26	39
Connective tissue	34	50
Endocrine glands other than Thyroid	30	45
Esophagus	22	35
Eye	32	49
Gallbladder	11	17
Leukemia, excluding ALL, AML, CML, and CLL	29‡	41‡
Liver	7.7	11
Lung (never smokers)	30	44
Lymphoma and multiple myeloma	41	61
Nervous system	64	95
Oral cavity and Pharynx	66	98
Other and ill-defined sites	34	51
Pancreas	61	89
Rectum	72	110
Respiratory tract other than Lung	67	100
Stomach	18	27
Thyroid	5.1**	7.5**
Urinary Bladder	33	49
Urinary organs, excluding bladder	31	46

* Probability of Causation (PC) is calculated for exposure at age 18 years and attained age of 50 years (elapsed time of 32 years) unless noted otherwise.

† From Kocher and Apostoaei (2007).

‡ PC is calculated for an elapsed time of 30 years.

§ From Mannis et al. (2013).

** PC is calculated for an elapsed time of ≥10 years.

Attachment 7.

Expedited Processing Group Upper-Bound Doses Excluding Initial Gamma and Initial Neutron Doses

The dose values in this attachment were taken from Tables 4 through 7 of DTRA-TR-10-29, *A Technical Approach to Expedited Processing of NTPR Radiation Dose Assessments*, Defense Threat Reduction Agency, Fort Belvoir, VA. October 2011 (Case et al, 2011a). The doses in the tables in this attachment were checked against the dose worksheets that contain the results of the dose estimates performed using the Mathcad software.

Table Att 7-1. Estimated Radiation Dose (rem) for Ship-Based Personnel at the Pacific Proving Ground*

EPG Name		Radiation Type†	Adrenals	Bone Surface	Brain	Breast	Stomach wall	Small Intestine wall	Upper Large Intestine Wall	Lower Large Intestine Wall	kidneys	Liver	Extra-Thoracic Region	Lung	Muscle	Pancreas	Red Marrow	Spleen	Testes	Thymus	Thyroid	Urinary Bladder Wall
XRDS Target Ships		UB α	0.09	47	0.09	0.09	0.09	0.09	0.09	0.09	0.2	11	0.5	1	0.09	0.09	3	0.09	0.7	0.09	0.09	0.09
Ext Dose	Upper Bound	UB β+γ	0.3	3	0.2	0.2	0.9	2	8	19	0.4	0.7	9	19	0.3	0.3	0.9	0.3	0.2	0.3	45	0.6
3	9	total	9	58	9	9	10	11	17	28	10	20	19	28	9	9	12	9	10	9	53	10
XRDS Support Ships		UB α	0.003	2	0.003	0.003	0.003	0.003	0.003	0.003	0.006	0.3	0.02	0.03	0.003	0.003	0.07	0.003	0.02	0.003	0.003	0.003
Ext Dose	Upper Bound	UB β+γ	0.009	0.09	0.005	0.006	0.04	0.08	0.4	0.9	0.02	0.03	0.2	0.4	0.009	0.01	0.04	0.008	0.007	0.007	2	0.03
3	9	total	9	10	9	9	9	9	9	10	9	9	9	9	9	9	9	9	9	9	10	9
USS BRUSH		UB α	0.09	51	0.09	0.09	0.1	0.1	0.2	0.2	0.3	11	0.5	1	0.09	0.09	3	0.09	0.7	0.09	0.09	0.09
Ext Dose	Upper Bound	UB β+γ	0.3	3	0.2	0.2	0.5	1	5	13	0.3	0.6	0.5	4	0.2	0.3	0.8	0.2	0.2	0.2	0.2	0.3
0.08	0.3	total	0.6	53	0.5	0.5	0.9	2	5	13	0.7	12	2	5	0.6	0.6	4	0.6	2	0.6	0.6	0.6
SANDSTONE Ships		UB α	<0.001	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ext Dose	Upper Bound	UB β+γ	<0.001	0	<0.001	<0.001	<0.001	0.002	0.006	0.02	<0.001	<0.001	0.02	0.03	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.03	<0.001
0.09	0.3	total	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
GREENHOUSE Ships		UB α	<0.001	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.03	0.001	0.003	<0.001	<0.001	0.005	<0.001	0.002	<0.001	<0.001	<0.001
Ext Dose	Upper Bound	UB β+γ	0.02	0.2	0.01	0.02	0.1	0.2	0.7	2	0.02	0.03	2	3	0.02	0.02	0.06	0.02	0.009	0.02	3	0.06
3	7	total	7	7	7	7	7	7	7	8	7	7	9	9	7	7	7	7	7	7	9	7
IVY Ships		UB α	<0.001	0.03	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Ext Dose	Upper Bound	UB β+γ	<0.001	0.02	<0.001	<0.001	0.002	0.004	0.02	0.04	<0.001	0.004	0.05	0.08	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.05	<0.001
0.07	0.2	total	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2
CASTLE Ships (High)		UB α	0.009	5	0.009	0.009	0.009	0.009	0.009	0.009	0.03	1	0.05	0.2	0.009	0.009	0.3	0.009	0.07	0.009	0.009	0.009
Ext Dose	Upper Bound	UB β+γ	0.2	5	0.08	0.2	1	2	7	13	0.3	0.8	21	24	0.2	0.2	0.5	0.2	0.2	0.2	16	0.5
8	23	total	23	32	23	23	24	25	30	36	23	25	43	47	23	23	24	23	23	23	38	23
CASTLE Ships (Low)		UB α	0.02	7	0.02	0.02	0.02	0.02	0.02	0.02	0.03	2	0.07	0.2	0.02	0.02	0.4	0.02	0.1	0.02	0.02	0.02
Ext Dose	Upper Bound	UB β+γ	0.08	5	0.04	0.07	0.4	0.7	3	6	0.2	0.9	8	12	0.07	0.08	0.4	0.07	0.08	0.09	7	0.2
4	12	total	12	22	12	12	12	13	15	17	12	14	20	23	12	12	13	12	12	12	18	12

* The total organ doses do not sum up to their components due to rounding.

† UB means upper bound dose for the given radiation type: internal alpha (α), internal beta plus gamma (β+γ), or total (external γ dose plus internal α and β+γ dose, excluding any initial external γ dose).

Table Att 7-1. Estimated Radiation Dose (rem) for Ship-Based Personnel at the Pacific Proving Ground (cont.)*

EPG Name		Radiation Type†	Adrenals	Bone Surface	Brain	Breast	Stomach wall	Small Intestine wall	Upper Large Intestine Wall	Lower Large Intestine Wall	kidneys	Liver	Extra-Thoracic Region	Lung	Muscle	Pancreas	Red Marrow	Spleen	Testes	Thymus	Thyroid	Urinary Bladder Wall
WIGWAM Ships		UB α	<0.001	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.03	0.002	0.003	<0.001	<0.001	0.006	<0.001	0.002	<0.001	<0.001	<0.001
Ext Dose	Upper Bound	UB β+γ	0.007	0.1	0.004	0.006	0.04	0.07	0.3	0.5	0.007	0.009	0.8	0.7	0.006	0.007	0.02	0.006	0.004	0.007	1	0.03
0.3	0.6	total	0.6	0.8	0.6	0.6	0.6	0.7	0.9	1	0.6	0.6	2	2	0.6	0.6	0.6	0.6	0.6	0.6	2	0.6
REDWING Ships		UB α	<0.001	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.02	<0.001	0.002	<0.001	<0.001	0.005	<0.001	0.002	<0.001	<0.001	<0.001
Ext Dose	Upper Bound	UB β+γ	0.01	0.1	0.005	0.008	0.05	0.09	0.4	0.8	0.02	0.02	2	2	0.009	0.01	0.03	0.008	0.005	0.02	2	0.03
3	7	total	7	7	7	7	7	7	7	7	7	7	8	8	7	7	7	7	7	7	8	7
HARDTACK I Ships		UB α	0.003	2	0.003	0.003	0.003	0.003	0.003	0.003	0.007	0.4	0.02	0.04	0.003	0.003	0.08	0.003	0.03	0.003	0.003	0.003
Ext Dose	Upper Bound	UB β+γ	0.03	0.4	0.02	0.03	0.08	0.2	0.8	2	0.2	0.09	3	3	0.03	0.03	0.09	0.2	0.02	0.03	3	0.2
2	6	total	6	8	6	6	6	6	7	8	6	7	9	9	6	6	6	6	6	6	9	6
HARDTACK I Non-Exposed Ships		UB α	No Potential for Exposure (NPE)																			
Ext Dose	Upper Bound	UB β+γ	No Potential for Exposure																			
NPE+	NPE+	total	No Potential for Exposure																			
ARGUS Ships		UB α	No Potential for Exposure																			
Ext Dose	Upper Bound	UB β+γ	No Potential for Exposure																			
NPE+	NPE+	total	No Potential for Exposure																			
DOMINIC I Ships		UB α	No Potential for Exposure																			
Ext Dose	Upper Bound	UB β+γ	No Potential for Exposure																			
NPE+	NPE+	total	No Potential for Exposure																			

* The total organ doses do not sum up to their components due to rounding.

† UB means upper bound dose for the given radiation type: internal alpha (α), internal beta plus gamma (β+γ), or total (external γ dose plus internal α and β+γ dose, excluding any initial external γ dose).

\+ NPE means no potential for exposure.

Table Att 7-2. Estimated Radiation Doses (rem) for Land-Based Personnel at the Pacific Proving Ground*

EPG Name		Radiation Type†	Adrenals	Bone Surface	Brain	Breast	Stomach wall	Small Intestine wall	Upper Large Intestine Wall	Lower Large Intestine Wall	kidneys	Liver	Extra-Thoracic Region	Lung	Muscle	Pancreas	Red Marrow	Spleen	Testes	Thymus	Thyroid	Urinary Bladder Wall
CROSSROADS Land		UB α	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext Dose	Upper Bound	UB β+γ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.03	0.09	total	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
BIKINI Resurvey		UB α	0.09	49	0.09	0.09	0.09	0.09	0.09	0.09	0.3	11	0.5	1	0.09	0.09	3	0.09	0.7	0.09	0.09	0.09
Ext Dose	Upper Bound	UB β+γ	0.02	1	0.007	0.01	0.02	0.03	0.1	0.3	0.01	0.3	0.2	3	0.008	0.01	0.08	0.01	0.02	0.02	0.008	0.008
0.8	3	total	3	52	3	3	3	3	3	3	3	14	3	6	3	3	5	3	4	3	3	3
SANDSTONE Land		UB α	<0.001	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.1	0.005	0.01	<0.001	0.002	0.03	0.003	0.006	<0.001	0.002	<0.001
Ext Dose	Upper Bound	UB β+γ	0.007	0.07	0.003	0.006	0.02	0.03	0.2	0.3	0.005	0.02	0.4	0.8	0.005	0.006	0.03	0.005	0.003	0.007	0.6	0.01
0.2	0.6	total	0.6	1	0.6	0.6	0.6	0.6	0.7	0.8	0.6	0.7	0.9	2	0.6	0.6	0.6	0.6	0.6	0.6	1	0.6
GREENHOUSE Land		UB α	0.005	3	0.005	0.005	0.005	0.005	0.005	0.005	0.02	0.6	0.03	0.06	0.005	0.005	0.2	0.005	0.04	0.005	0.005	0.005
Ext Dose	Upper Bound	UB β+γ	0.2	2	0.08	0.2	0.9	2	5	8	0.2	0.3	12	15	0.2	0.2	0.5	0.2	0.06	0.2	16	0.4
7	21	total	21	25	21	21	22	23	26	29	21	22	33	36	21	21	22	21	21	21	36	22
IVY Land		UB α	0.002	2	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.3	0.02	0.03	0.002	0.002	0.06	0.002	0.02	0.002	0.002	0.002
Ext Dose	Upper Bound	UB β+γ	0.02	0.7	0.007	0.02	0.04	0.08	0.4	0.7	0.02	0.2	1	3	0.02	0.02	0.08	0.02	0.009	0.02	0.8	0.02
0.2	0.4	total	0.4	3	0.4	0.4	0.4	0.5	0.7	1	0.4	0.7	2	3	0.4	0.4	0.5	0.4	0.4	0.4	2	0.4
CASTLE Land		UB α	0.02	7	0.02	0.02	0.02	0.02	0.02	0.02	0.03	2	0.07	0.2	0.02	0.02	0.4	0.02	0.1	0.02	0.02	0.02
Ext Dose	Upper Bound	UB β+γ	0.1	5	0.05	0.08	0.5	0.9	4	7	0.2	0.9	11	15	0.08	0.09	0.4	0.08	0.08	0.1	8	0.2
2	5	total	5	16	5	5	6	6	8	12	5	7	16	20	5	5	6	5	5	5	13	5
REDWING Land		UB α	0.02	9	0.02	0.02	0.02	0.02	0.02	0.02	0.04	2	0.09	0.2	0.02	0.02	0.5	0.02	0.2	0.02	0.02	0.02
Ext Dose	Upper Bound	UB β+γ	0.2	5	0.2	0.2	2	3	9	16	0.4	0.9	25	30	0.2	0.2	0.7	0.2	0.2	0.3	23	0.6
6	18	total	19	31	18	18	20	21	27	34	19	21	43	48	18	18	19	18	19	19	41	19
HARDTACK I Land		UB α	0.02	12	0.02	0.02	0.02	0.02	0.02	0.02	0.06	3	0.2	0.3	0.02	0.02	0.6	0.02	0.2	0.02	0.02	0.02
Ext Dose	Upper Bound	UB β+γ	0.2	3	0.07	0.2	0.4	0.8	4	8	0.6	0.6	12	11	0.2	0.2	0.5	0.5	0.08	0.2	11	0.6
3	8	total	8	22	8	8	8	9	12	16	9	11	20	19	8	8	9	9	8	8	19	9
DOMINIC I Land		UB α	No Potential for Exposure																			
Ext Dose	Upper Bound	UB β+γ	No Potential for Exposure																			
NPE+	NPE+	total	No Potential for Exposure																			

* The total organ doses do not sum up to their components due to rounding.

† UB means upper bound dose for the given radiation type: internal alpha (α), internal beta plus gamma (β+γ), or total (external γ dose plus internal α and β+γ dose, excluding any initial external γ dose).

\+ NPE means no potential for exposure.

Table Att 7-3. Estimated Radiation Doses (rem) for Post-Operations Personnel at the Pacific Proving Ground*

EPG Name		Radiation Type†	Adrenals	Bone Surface	Brain	Breast	Stomach wall	Small Intestine wall	Upper Large Intestine Wall	Lower Large Intestine Wall	kidneys	Liver	Extra-Thoracic Region	Lung	Muscle	Pancreas	Red Marrow	Spleen	Testes	Thymus	Thyroid	Urinary Bladder Wall
POST-SANDSTONE		UB α	<0.001	0.08	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.02	<0.001	0.002	<0.001	<0.001	0.004	<0.001	0.002	<0.001	<0.001	<0.001
Ext Dose	Upper Bound	UB β+γ	0.002	0.02	<0.001	0.002	0.002	0.002	0.009	0.03	<0.001	0.003	0.03	0.2	<0.001	<0.001	0.005	<0.001	<0.001	0.002	0.009	<0.001
0.05	0.2	total	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
POST-GREENHOUSE		UB α	0.004	3	0.004	0.004	0.004	0.004	0.004	0.004	0.009	0.5	0.03	0.05	0.004	0.004	0.1	0.004	0.03	0.004	0.004	0.004
Ext Dose	Upper Bound	UB β+γ	0.06	0.6	0.02	0.05	0.07	0.2	0.5	2	0.04	0.1	2	7	0.04	0.05	0.3	0.04	0.02	0.06	2	0.04
3	8	total	8	10	8	8	8	8	8	9	8	8	9	14	8	8	8	8	8	8	9	8
POST_IVY		UB α	<0.001	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.03	0.002	0.003	<0.001	<0.001	0.006	<0.001	0.002	<0.001	<0.001	<0.001
Ext Dose	Upper Bound	UB β+γ	<0.001	0.07	<0.001	<0.001	<0.001	<0.001	0.004	0.009	<0.001	0.02	0.02	0.05	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	0.01	<0.001
0.03	0.09	total	0.09	0.3	0.09	0.09	0.09	0.09	0.09	0.1	0.09	0.2	0.1	0.2	0.09	0.09	0.1	0.09	0.09	0.09	0.1	0.09
POST-CASTLE		UB α	0.006	3	0.006	0.006	0.006	0.006	0.006	0.006	0.02	0.7	0.03	0.07	0.006	0.04	0.006	0.2	0.006	0.006	0.05	0.006
Ext Dose	Upper Bound	UB β+γ	0.008	2	0.005	0.008	0.008	0.02	0.04	0.1	0.008	0.4	0.2	0.8	0.006	0.03	0.007	0.08	0.005	0.007	0.03	0.009
0.3	0.8	total	0.8	6	0.8	0.8	0.8	0.8	0.8	0.9	0.8	2	0.9	2	0.8	0.8	0.8	1	0.8	0.8	0.8	0.8
POST-REDWING		UB α	0.02	8	0.02	0.02	0.02	0.02	0.02	0.02	0.04	2	0.08	0.2	0.02	0.02	0.4	0.02	0.2	0.02	0.02	0.02
Ext Dose	Upper Bound	UB β+γ	0.05	3	0.02	0.05	0.06	0.09	0.4	1	0.04	0.5	2	7	0.03	0.04	0.3	0.04	0.04	0.06	0.8	0.03
2	6	total	6	16	6	6	6	6	7	7	6	8	7	12	6	6	7	6	6	6	7	6
POST-HARDTACK I		UB α	0.006	4	0.006	0.006	0.006	0.006	0.006	0.006	0.02	0.7	0.04	0.08	0.006	0.006	0.2	0.006	0.05	0.006	0.006	0.006
Ext Dose	Upper Bound	UB β+γ	0.009	0.5	0.004	0.007	0.02	0.02	0.2	0.4	0.06	0.1	0.4	1	0.005	0.007	0.05	0.05	0.007	0.008	0.02	0.02
0.4	1	total	1	5	1	1	1	1	2	2	2	2	2	3	1	1	2	2	2	1	1	1

* The total organ doses do not sum up to their components due to rounding.

† UB means upper bound dose for the given radiation type: internal alpha (α), internal beta plus gamma (β+γ), or total (external γ dose plus internal α and β+γ dose, excluding any initial external γ dose).

Table Att 7-4. Estimated Radiation Doses (rem) for Personnel at the Nevada Test Site*

EPG Name		Radiation Type†	Adrenals	Bone Surface	Brain	Breast	Stomach wall	Small Intestine wall	Upper Large Intestine Wall	Lower Large Intestine Wall	kidneys	Liver	Extra-Thoracic Region	Lung	Muscle	Pancreas	Red Marrow	Spleen	Testes	Thymus	Thyroid	Urinary Bladder Wall
NTS Obs/Man		UB α	0.008	5	0.008	0.008	0.008	0.008	0.008	0.008	0.02	1	0.05	0.1	0.008	0.008	0.3	0.008	0.06	0.008	0.008	0.008
Ext Dose	Upper Bound	UB β+γ	0.02	0.2	0.006	0.01	0.05	0.07	0.2	0.4	0.009	0.03	0.7	2	0.009	0.02	0.05	0.01	0.005	0.02	0.8	0.02
4	10	total	10	14	10	10	10	10	10	10	10	11	11	11	10	10	10	10	10	10	11	10
NTS Support Troops		UB α	0.007	4	0.007	0.007	0.007	0.007	0.007	0.007	0.02	0.8	0.04	0.08	0.007	0.007	0.2	0.007	0.05	0.007	0.007	0.007
Ext Dose	Upper Bound	UB β+γ	<0.001	0.05	<0.001	<0.001	0.006	0.009	0.03	0.05	<0.001	0.02	0.09	0.09	<0.001	<0.001	0.004	<0.001	0.001	0.001	0.2	0.003
0.04	0.1	total	0.2	4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.9	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.3	0.2
2MCPAEB		UB α	0.003	2	0.003	0.003	0.003	0.003	0.003	0.003	0.007	0.4	0.02	0.04	0.003	0.003	0.09	0.003	0.03	0.003	0.003	0.003
Ext Dose	Upper Bound	UB β+γ	0.03	0.3	0.02	0.02	0.2	0.2	0.6	2	0.02	0.04	2	3	0.02	0.02	0.08	0.02	0.009	0.03	2	0.05
6	17	total	17	19	17	17	17	17	17	18	17	17	19	20	17	17	17	17	17	17	19	17
TF WARRIOR		UB α	0.02	10	0.02	0.02	0.02	0.02	0.02	0.02	0.05	2	0.2	0.4	0.02	0.02	0.5	0.02	0.2	0.02	0.02	0.02
Ext Dose	Upper Bound	UB β+γ	0.09	2	0.06	0.07	0.7	1	3	4	0.08	0.4	9	8	0.08	0.09	0.4	0.08	0.06	0.1	9	0.3
2	5	total	5	16	5	5	6	6	8	9	5	7	13	12	5	5	6	5	5	5	13	5

* The total organ doses do not sum up to their components due to rounding.

† UB means upper bound dose for the given radiation type: internal alpha (α), internal beta plus gamma (β+γ), or total (external γ dose plus internal α and β+γ dose, excluding any initial external γ dose).

Attachment 8.

QA/QC Review Report for Dose Summary Sheet

ORAU OAK RIDGE ASSOCIATED UNIVERSITIES	**QA/QC Review Report for Dose Summary Sheet**	**Nuclear Test Personnel Review Program Support**

Name: **Key #:** **DSS Date:**
ORAU Batch Date:

Recommended Disposition:

1) ☐ Case meets DTRA guidance; recommend for release

2) ☐ Make editorial changes and recommend for release

3) ☐ Comments to be discussed with NTPR RDA analyst before decision

4) ☐ Resolve administrative issues and resubmit for review

5) ☐ Case does not meet DTRA guidance; return for NTPR RDA analyst revision with comments below

Reviewer Comments:

QA Report Approval Signature: _____ **Date:**
Name
Title
Organization

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Dose Summary Sheet Review Checklist

Name: **Key #:** **DSS Date:**
ORAU Batch Date:

Instructions: Further explanation of any "No" responses for items 1 through 9 or a "Yes" response for item 10 should be included in Comments. Reference the item number. Other pertinent comments also may be added.

Eligibility for expedited processing

1. Is the determination regarding Board of Veteran's Appeal or non-participant case status correct and documented? ☐ Yes ☐ No

2. Are the following exposure conditions correctly identified and documented?
   a. Operations and tests, including multiple-test operations: ☐ Yes ☐ No
   b. Veteran's duty assignment: ☐ Yes ☐ No
   c. Veteran's applicable work, residence and recreation locations: ☐ Yes ☐ No

3. Are target/surrogate organs correctly identified? ☐ Yes ☐ No

4. Is eligibility for expedited processing correctly determined? ☐ Yes ☐ No

Determination of dose to be assigned

5. Are additional potential exposure scenarios correctly identified, correctly addressed in doses, and clearly documented as to impact on dose? ☐ Yes ☐ No ☐ NA

6. Are radiation dose assessments (RDAs) accurately calculated and Mathcad input information correctly documented? ☐ Yes ☐ No ☐ NA

7. Are correct expedited doses assigned? ☐ Yes ☐ No ☐ NA

Additional supporting documentation

8. Are responses to veteran's comments and claims clear, complete, responsive, and accurate? ☐ Yes ☐ No ☐ NA

9. Is pertinent historical dose information accurately and clearly documented? ☐ Yes ☐ No ☐ NA

10. Are there any remaining exposure, dose, or administrative issues that should be addressed? ☐ Yes ☐ No

Comments (include item number):

DSS Reviewer Signature: _____ **Date:**

Name (printed):

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Attachment 9.

RDA Report Review Checklist

This attachment is applicable to ORAU reviews of cases that are not expedited.

ORAU OAK RIDGE ASSOCIATED UNIVERSITIES	**RDA Report Review Checklist** **Privacy Act Data**	**ORAU TEAM** **NTPR Program** **Support Project**

Name: **Key #:** **RDA Date:** **ORAU Batch Date:**

Recommended Disposition:

1) ☐ **No comments; forward to DTRA**

2) ☐ **Make editorial changes and forward to DTRA**

3) ☐ **Comments to be discussed with analyst before decision**

4) ☐ **Resolve administrative issues and resubmit for review**

5) ☐ **Revise RDA per comments and resubmit for review**

Comments:

Signature: _____ **Date:** _____
Name, Title
Organization

RDA Report Review Checklist (Continued)
Privacy Act Data

Name: **Key #:** **RDA Date:** **ORAU Batch Date:**

Verify that each of the following correspond with the SPARE and/or are correctly used in the report:

Dose Reconstruction Overview	**Yes**	**No**	**N/A**
1. Site/Series/Shot name included?	☐	☐	☐
2. Participation dates as noted in veteran's records?	☐	☐	☐
3. Additional dates noted by veteran included?	☐	☐	☐
4. Additional dates noted in dosimetry records included?	☐	☐	☐
5. Rating, grade, position or job title included?	☐	☐	☐
6. Other positions/titles noted by veteran considered?	☐	☐	☐
7. Veteran's statements considered vs. unit records?	☐	☐	☐
8. Veteran's material statements addressed in the RDA?	☐	☐	☐
9. Is the exposure scenario complete?	☐	☐	☐
10. Is the RDA consistent with the SPARE?	☐	☐	☐
11. Is the appropriate target organ for RDA identified?	☐	☐	☐
12. Is the total dose assigned to the target organ?	☐	☐	☐
13. Is the benefit of the doubt consistently applied?	☐	☐	☐
Dose Estimate			
14. Discussion of veteran's locations and exposures?	☐	☐	☐
15. Discussion of exposure sources and scientific principles?	☐	☐	☐
16. Discussion of gamma exposure included?	☐	☐	☐
17. Discussion of neutron exposure (if applicable)?	☐	☐	☐
18. Discussion of skin/eye dose (if applicable)?	☐	☐	☐
19. Discussion of internal dose (if applicable)?	☐	☐	☐
20. Does dose summary table include all radiation types discussed in the RDA report?	☐	☐	☐
21. Are α, β, γ and neutron doses reported separately?	☐	☐	☐

RDA Report Review Checklist (Continued)
Privacy Act Data

Name: **Key #:** **RDA Date:** **ORAU Batch Date:**

Individual Film Badge Data (FBD)	**Yes**	**No**	**N/A**
22. Was individual FBD used if available and appropriate?	☐	☐	☐
23. Consideration of when and how long badge(s) worn?	☐	☐	☐
24. Benefit of doubt given for uncertain issue/turn-in dates?	☐	☐	☐
25. Are gaps in film badge data addressed?	☐	☐	☐
26. Overlapping mission and permanent badges considered?	☐	☐	☐
27. Was archived film reviewed for damage?	☐	☐	☐
28. Was damaged film value used if justified?	☐	☐	☐
29. Was upper bound of film badge dose properly estimated?	☐	☐	☐
External Gamma-ray Dose Reconstruction			
30. Was cohort FBD used if available and appropriate?	☐	☐	☐
31. Dose reconstruction done if no film badge data?	☐	☐	☐
32. Consideration of individual departures from unit dose?	☐	☐	☐
33. All sources of gamma exposure included?	☐	☐	☐
34. Reasonable locations assigned for gamma exposure?	☐	☐	☐
35. Benefit of doubt given for upper bound, e.g., 3x?	☐	☐	☐
Neutron Dose Estimate			
36. Is potential for neutron exposure assessed?	☐	☐	☐
37. Is neutron dose assigned if appropriate?	☐	☐	☐
Beta Dose (external ambient exposure)			
38. Beta dose assigned for skin cancer/eye disease?	☐	☐	☐
39. Beta dose based on upper bound of gamma dose?	☐	☐	☐
40. Ship-based exposure included if appropriate?	☐	☐	☐
41. Land--based exposure included if appropriate?	☐	☐	☐

RDA Report Review Checklist (Continued)
Privacy Act Data

Name: **Key #:** **RDA Date:** **ORAU Batch Date:**

	Yes	No	N/A
Beta Dose (dermal contamination)			
42. Exposure from descending fallout included?	☐	☐	☐
43. Topside/outdoors location assumed for direct deposition of descending fallout?	☐	☐	☐
44. Exposure from resuspended fallout included?	☐	☐	☐
45. Exposure to old fallout resuspended by blast (NTS only)?	☐	☐	☐
46. Discussion of resuspension factor used?	☐	☐	☐
47. Exposure from contaminated water if appropriate?	☐	☐	☐
48. Reasonable time to showering assumed?	☐	☐	☐
49. Upper bound of uncertainty assigned to beta dose?	☐	☐	☐
Internal Dose--inhalation			
50. Exposure from inhalation of descending fallout included?	☐	☐	☐
51. Topside/outdoor location assumed for direct inhalation of descending fallout?	☐	☐	☐
52. Inhalation of resuspended fallout included?	☐	☐	☐
53. Inhalation of old fallout resuspended by blast (NTS only)?	☐	☐	☐
54. Discussion of resuspension factor used?	☐	☐	☐
55. Upper bound (factor of 10) of uncertainty used?	☐	☐	☐
Internal Dose--ingestion			
56. Exposure from ingestion of descending fallout included?	☐	☐	☐
57. Exposure from ingestion of contaminated water included?	☐	☐	☐
58. Upper bound (factor of 10) of uncertainty used?	☐	☐	☐
References			
59. Are all references cited in the report listed?	☐	☐	☐
60. Are all references used appropriate citations?	☐	☐	☐

RDA Report Review Checklist (Continued)
Privacy Act Data

Name: **Key #:** **RDA Date:** **ORAU Batch Date:**

Comments (include item number—mandatory for all "No" blocks checked):

Signature: _____ Date: _____
Name (printed):