DRAFT SITE PROFILE ISSUES MATRIX FOR PORTSMOUTH

October 2012 Update – New or edited information appears in red text.

No.	TBD	Issue	SC&A Draft Finding	NIOSH Response
1	0015-5 (Occupational Internal Dose) ***IN ABEYANCE***	Activity values provided for Tc-99 in reactor tails understated by several orders of magnitude.	The TBD provides activity values for TRU elements and Tc-99 in reactor tails processed at PORTS; however, values cited for Tc-99 were understated by several orders of magnitude.	The consistent error in Tc-99 values in Table 5.1.2.6-3 was confirmed. It should be noted that the yearly values listed in Table 5.1.2.6-3 are typically not used to reconstruct a Portsmouth worker's dose; rather, the facility-specific TRU and Tc-99 activity fractions provided in Table 5.1.2.6-4 are used to calculate RU contaminant intakes and/or intake rates based on the calculated uranium intakes and/or intake rates and subsequent worker doses. The Recycled uranium contaminant activity fractions are under review at this time. If required, Table 5.1.2.6-4 will be revised. If Table 5.1.2.6-3 is retained in the revised TBD, the Tc-99 values will be corrected.
	SC&A Response (April 2011): Agree that in the context of inaccurate Table 5.1.2.6-3 values for Tc-99, "…information collected since the issuance of this document [ORAU-TKBS-0015-5] will be reviewed and the recycled uranium components will be revised as necessary." (However, this statement is not a definitive commitment to revise this table; i.e., judgment will be made at some point in the future). **July 2011 update: In abeyance,** pending completion of the recycled uranium review. Updated DCAS Response: In order to ensure that claimant-favorable activity fractions for recycled uranium contaminants are applied, the highest isotopic concentration values recorded during the CIP/CUP period are going to be applied for all years, unless the values based on 1990's air sampling data are larger. Some of the values from the CIP/CUP era, particularly those for Tc-99, exceed the current TBD values derived from the 1990's air sampling data by a couple orders of magnitude. In addition, separate higher values have been calculated for the oxide conversion plant based on the results of filter ash sampling mentioned on page 39 of the DOE Portsmouth Mass Balance Report (reference SRDB ID 10916). The facility-specific activity fractions for the assignment of recycled uranium contaminants are being revised where appropriate and incorporated into the Internal Dose TBD.			
2	0015-5 ***CLOSED***	Inconsistent bioassay protocols employed that significantly affect interpretation of urine bioassay data.	Interpretation of urinalysis data includes variables such as the time at which the urine sample is collected relative to the worker's most recent exposure; that critical time interval apparently changed over time and it is not clear what specific protocol was in place at certain times.	Sampling dates are provided with bioassay records which are to be used rather than an assumed bioassay date. NIOSH assesses two types of intakes: intakes from positive results and missed intakes from negative results. Missed intake is assigned based on a theoretical assumption of a continuous intake that was not detected on the date(s) of sampling; in this situation (no detectable intake) additional detail of monitoring protocol are not needed because a continuous intake is assumed up to the limit of detection, unless other information indicates the individual had no potential for exposure.

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				If a positive bioassay result(s) is in the records, the DR must consider all available information, including, but not limited to, individual records, information provided in the TBD, and the actual dates of bioassay collection. Thus, an intake based on a positive bioassay is case-specific based on all available data.
	SC&A Response (April 2011): Agree. **July 2011 update:** The Work Group also acknowledged NIOSH's response at the July 6, 2011, Work Group meeting on the question of sampling times in the preceding discussion at the meeting of Paducah review issue #15. Work Group **closed** this issue at its July 6, 2011 meeting.			
3	0015-5 ***IN ABEYANCE***	Current guidance for estimating internal exposure to recycled uranium contaminants is unachievable and/or inappropriate.	Guidance is considered "unachievable" because TBD guidance relies upon source term data that may not exist, e.g., filter ash, cascade deposits, cylinder heels, and pond sludges. "Inappropriate" is a reference to the use of general air sample data collected in the 1990s, that would be back-extrapolated to earlier years with different processes, facilities, and radiological conditions.	The Recycled uranium contaminant issue is under review at this time. Until the current evaluation is complete, it is not possible to make a determination of whether the TBD guidance is indeed unachievable.
	SC&A Response (April 2011): **In abeyance**. NIOSH has not stated agreement or disagreement with the issue as stated; only a commitment to review "information collected since issuance of this document…" [ORAU-TKBS-0015-5], which appears to be a standardized response. **July 2011 update:** **In abeyance,** pending completion of the recycled uranium review. Updated DCAS Response: In order to ensure that claimant-favorable activity fractions for recycled uranium contaminants are applied, the highest isotopic concentration values recorded during the CIP/CUP period are going to be applied for all years, unless the values based on 1990's air sampling data are larger. Some of the values from the CIP/CUP era, particularly those for Tc-99, exceed the current TBD values derived from the 1990's air sampling data by a couple orders of magnitude. In addition, separate higher values have been calculated for the oxide conversion plant based on the results of filter ash sampling mentioned on page 39 of the DOE Portsmouth Mass Balance Report (reference SRDB ID 10916). The facility-specific activity fractions for the assignment of recycled uranium contaminants are being revised where appropriate and incorporated into the Internal Dose TBD.			
4	0015-5	Generic default value of 3.5% enrichment for uranium is inappropriate/claimant	Empirically derived yearly average values for average specific activity for monitored workers, as well as for	The default uranium enrichment of 3.5% in the Portsmouth TBD should provide a favorable mass to total uranium alpha conversion for a worker monitored only for exposure to

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	CLOSED	unfavorable.	specific job functions, suggest that worker exposures involved high to very highly enriched uranium, making suspect the generic default assumption of 3.5%.	depleted, normal, or low enriched uranium, but not higher enriched uranium. However, gross alpha bioassay results are available until 1995, after which isotopic uranium results are available. Gross alpha (or isotopic U) would typically be used for a dose reconstruction. Gross alpha urinalysis results eliminate the need to know the enrichment of the uranium. Doses are calculated from activity rather than mass, and the retention fractions and dose coefficients are similar enough for the uranium isotopes of interest that dose reconstructors assess all of them as U-234.
	SC&A Response (April 2011): More information needed. Are gross alpha bioassay results adequate for dose reconstruction such that they can substitute for the application of the generic default value of 3.5%, which NIOSH agrees does not apply to enrich uranium exposures? **July 2011 update:** NIOSH further clarified its augmented matrix response at the July 6, 2011, Work Group meeting, noting that only gross alpha activity is used, obviating the need to know uranium enrichment. SC&A **agrees** and at the July 6, 2011, meeting, the Work Group **closed** the issue.			
5	0015-5 ***CLOSED***	TBD provides contradictory or erroneous data and guidance for MDC value.	Table 5.1.1-1 of TBD-5 identified that for 1954-1995, the MDC for gross alpha counting was 10 dpm/liter; however, a minimum recorded concentration level of 50 dpm/liter is cited from GAT dosimetry documentation – a factor of 5 difference between the table value and a site reference.	The 10 dpm/L value in Table 5.1.1-1 is equivalent to the 1 dpm/100 ml typically seen in Portsmouth bioassay records. The source of the information stating bioassay results had a reporting level of 50 dpm/L in the TBD Section 5.1.2.1 is incorrect, i.e., 50 dpm/L is not consistent with observed reporting level. This is pointed out in a rather vague manner in the last sentence of the first paragraph of that section; that wording will be changed to be more precise in the next TBD revision. However, the TBD does leave open the possibility that the reference may be correct (higher reporting level) for some data, and if a higher reporting level is found in a worker's bioassay records it is incorporated as the limit of detection for that sample in dose assessments. No technical change is needed to the TBD because individual bioassay data are used.
	SC&A Response (April 2011): Agree that "more precise wording" needs to be added in the next TBD revision. **July 2011 update:** Work Group **closed** the issue at July 6, 2011 meeting.			
6	0015-5	Mobile in-vivo chest counts	Mobile In Vivo Radiation Monitoring	The chest counting results from the MIVRML have limited

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	CLOSED	subject to significant limitations and uncertainties.	Laboratory (MIVRML) chest counts for the detection of uranium, TRUs, and fission products are subject to significant limitations and uncertainties.	use, but are good for detection of U-235, as the finding mentioned, although total U (U-238 + U-235), depleted uranium (U-238), Tc-99, and Np-237 are also typically reported in MIVRML records. If U-235 can be quantified, then total U from a broad range of enrichments can be bounded based on the radioactivity ratio of U-235 to total U, which can be estimated for gaseous diffusion enriched uranium. Transuranics are present at the Portsmouth site only as contaminants in recycled uranium and as such are found in small quantities relative to uranium. Because of this, the in vivo results are not useful for determining intakes because the MDA is too large for detecting the small potential intakes. Ratios to uranium quantities are instead used for assigning intakes of transuranic radionuclides, as well as Tc-99. The primary use of a uranium chest count is for detecting the long term buildup of insoluble material in the lungs. As noted in the SC&A comments, U-235 activity is a small fraction of even highly enriched uranium, with U-234 activity always at much greater concentrations. Additionally, the U-238 MDA is quite large because it is monitored through its daughter rather than directly. Given these limitations, the uranium *in vivo* results are of limited usefulness to dose reconstruction; urine samples will be limiting in almost all cases and there have been no cases to date where an individual had only chest counts. Chest counts are reviewed by the dose reconstructor to determine if they provide any additional information. This information will be added to the site profile, and extraneous information (such as discussion of nuclides that are not monitored) will be removed.
	SC&A Response (April 2011): More information needed. Will NIOSH revise current wording in TBD to indicate that only U-235 data from the			

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	MIVRML should be relied upon for the purpose stated in the response? **July 2011 update:** At the July 6, 2011, Work Group meeting, NIOSH committed to providing the additional direction indicated in its response in the next revision of the TBD. On that basis, the Work Group **closed** this issue.			
7	0015-6 (Occupational External Dose) ***IN ABEYANCE***	Assumed LOD for shallow dose lacks technical support and is not claimant favorable.	The assumed LOD value for shallow dose (as defined by the two-element film dosimeter used between 1954 and 1980) lacks technical support and is not claimant favorable.	SRDB references 3782 and 8573. These references describe the ORNL coordinated effort to specify and procure the 4-element combination security and personnel dosimeter used by Portsmouth, Paducah, Y-12, K-25 and ORNL. PORTS implemented the combination dosimeter August 1, 1960. Prior to August 1960, Portsmouth used a two-element film dosimeter likely of identical design to the one used at ORNL, Hanford, etc. Substantial documentation exists (SRDB 8573, 4793, 11296) regarding its capabilities. Several sites quote the MDL as 30 mrem (i.e, X-10, Y-12, Paducah, Fernald, etc.). The Site Profile will be revised to include the combination dosimeter information.
	SC&A Response (April 2011): Agree. NIOSH apparently agrees that more technical support information for the combination dosimeter is necessary and will revise the TBD accordingly. **July 2011 update:** At the July 6, 2011, Work Group meeting, NIOSH noted that they were working on this issue with the likelihood that the LOD would need to be increased based on additional data (given that site went from a two to a four element dosimeter in 1960). The Work Group decided to hold this issue **in abeyance**. **Updated DCAS Response:** Portsmouth maintained onsite personnel dosimetry from 1954-1998. For the period 1954-1980, the LOD for photons and electrons is 30 mrem as given by Table 6-3 in the Portsmouth External TBD (ORAUT-TKBS-0015-6) footnote c. The supporting reference for the information in Table 6-3 of the TBD is found in "Film Badge Procedure", Goodyear Atomic Corporation, 1963, reference SRDB ID 8121. Further research identified supporting information for the electron LOD value in the ORNL External TBD (ORAUT-TKBS-0012-6), Section 6.5.2 and Table 6-24. The two-element film system used at ORNL also had a reported LOD value of 30 mrem that was applicable to photon and electron dose. Note that the two-element system was used at Portsmouth from 1954 up until the implementation of a multi-element TLD system on 1/1/1981 (ORAUT-TKBS-0015-6, Section 6.3.2.1).			
8	0015-6 ***IN ABEYANCE***	Unmonitored shallow doses derived from coworker data suffer deficiencies likely result of dosimeter design limitations.	The non-penetrating (or beta) component that would be expected to have registered on the open window portion of the film dosimeter was, on average, essentially zero. With presence of Tc-99, plus uranium	Tc-99 exposure, as discussed on p. 26 of ORAUT-TKBS-0015-6, poses minimal external exposure potential because of limited range and the shielding afforded by clothing and gloves. Energy employee exposure situations that potentially involved Tc-99 skin contamination would be addressed using VARSKIN to assist with the skin dose

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			daughters, near absence of measureable beta radiation up until 1980 unlikely. Another problem is accountability for missing or unmonitored exposures.	estimation. Null values can result for coworker shallow dose due to subtraction (see page 8 of ORAUT-OTIB-0040). In these situations, dose to the skin is entered into IREP as 30–250 keV photons (which has a higher POC effectiveness compared to >15 keV electrons). In addition, this quantity of 30-250 keV photons contains missed dose as described in ORAUT-OTIB-0040 and ORAUT-OTIB-0020.
	SC&A Response (April 2011): <u>More information needed</u>. How does Table 8-2 of OTIB-0040 correctly reflect the coworker shallow doses when shallow dose was not correctly determined until around 1987 (TBD-6, page 27)? This problem is illustrated by the coworker 50% dose levels showing mostly zeros until the mid 1980s. **July 2011 update:** At the July 6, 2011, Work Group meeting, NIOSH/ORAUT further explained how null values can be generated in calculations; however missed photon dose added in at 50th and 95th percentile, which is claimant favorable. SC&A agreed with the explanation and the Work Group closed that portion of the issue, leaving **<u>in abeyance</u>** the issue that deals with Tc-99, which is the subject of a NIOSH review (see issue #9 below). **SC&A Response (October 2012):** NIOSH provided ORAUT-RPRT-0059, *External Exposure to Technetium-99 at the Gaseous Diffusion Plants,* dated Feb. 7, 2012. SC&A subsequently recommended closure of this issue for the Paducah Gaseous Diffusion Plant, and likewise, recommends **closure** of the issue for the Portsmouth TBD.			
9	0015-6 ***<u>IN ABEYANCE</u>***	External exposures to localized skin and to extremities inadequately monitored; guidance to dose reconstructors too subjective.	Numerous activities at PORTS subjected workers to external radiation fields in which extremities would have received substantially higher exposures than shallow doses recorded by personnel dosimeters. The TBD provides several hypothetical "examples," including source term models, that SC&A believes, as guidance, are too subjective and arbitrary.	When information is presented that indicates a skin contamination may have occurred, an evaluation is performed during dose reconstruction on a case by case basis using claimant records and claimant favorable methods described in project documents. In addition, modeling programs such as VARSKIN, Microshield, or ATILLA can be used to calculate a skin dose – including dose to the extremities. The TBD will be updated to include current references that are available to assist with the calculation of dose to the skin and extremities. These include DCAS-TIBs-0010 and -0013, which provide guidance regarding geometric correction factors, and, in the case of TIB-0010, methods for calculating extremity dose using the results of ATILLA modeling. Also, OTIB-0017 will be included as a

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				reference for calculating dose to the skin from contamination and hot particle exposure scenarios. Further, the use of VARSKIN to calculate dose to the skin is discussed in OTIB- 0017.
	SC&A Response (April 2011): **Agree**. Localized skin and geometry issues are addressed to some extent in the TBD and associated references to be added; further development concerning this issue is most likely a global item. **July 2011 update:** NIOSH agreed following discussions at the July 6, 2011, Work Group meeting that further review on its part is necessary for the broader question of how skin dose is addressed in the context of Tc-99 exposure at all three GDPs. The Work Group decided to hold this issue **in abeyance**. **SC&A Response (October 2012):** NIOSH provided ORAUT-RPRT-0059, *External Exposure to Technetium-99 at the Gaseous Diffusion Plants,* dated Feb. 7, 2012. SC&A subsequently recommended closure of this issue for the Paducah Gaseous Diffusion Plant, and likewise, recommends **closure** of the issue for the Portsmouth TBD.			
10 neutron	0015-6 ***CLOSED***	Before 1992, PORTS failed to monitor workers for neutron exposures; current guidance for unmonitored exposures incomplete.	Dosimetry programs at PORTS from 1954 to 1992 failed to monitor workers using calibrated personnel neutron dosimeters. A Health Hazard Evaluation (HHE) conducted by NIOSH at PORTS in 1997 highlighted the potential for increased production of neutrons due to "slow cookers," i.e., subcritical neutron generation due to buildups of uranium in processing. Although the TBD acknowledges the HHE conclusions, it ignores the issue of past unaccounted neutron doses associated with slow cookers.	PORTS TBD revision dated August 20, 2007 does contain guidance for neutron dose reconstruction including for unmonitored exposures. SRDB 10913 describes a NIOSH Health Hazards Evaluation during 1996 of PORTS worker exposure to neutron radiation including slow cookers. Workplace neutron dose and spectra measurements during 1992 (SRDB 8119) do identify low-level neutron exposures rates below 1.0 mrem/hr at the respective measurement locations (X-7000 Radiation Calibrations, X-326 Assay Laboratory, and X-326 PW Vault). Dose reconstruction practices do include evaluation of potential neutron dose by reviewing the claim, CATI and exposure record documentation. DCAS believes that the neutron doses in the cylinder yards are more significant/routine than neutron doses due to a buildup of material in processing systems. While it is understood that there was some buildup of material in the systems, DCAS is unaware of any significant deposits that would have routinely/ chronically caused significant subcritical multiplication. Therefore, the neutron dose rate in the cylinder yard should be considerably higher and the

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				neutron to photon ratio given by the TBD of (0.2) should provide a bounding and claimant favorable estimate of neutron dose especially when compared to the neutron to photon ratio estimated in SRDB 10913 of 0.125.
	SC&A Response (April 2011): <u>More information needed</u>. How are "slow cooker" neutron doses included in the n/p value of 0.2 in Table 6-23 when this value was taken from a survey of cylinders at the Paducah GDP (p. 33 of Port GDP TBD-6)? Ref #10913, page 7, states that slow cooker neutrons were not addressed in their evaluation. Ref #8119 is concerned with neutron energy spectra and dose rates, but does not address slow cooker neutrons specifically. **July 2011 update:** At the July 6, 2011, Work Group meeting, SC&A agreed with NIOSH that the referenced site-specific review was more speculative than fact-based regarding the likelihood and significance of this phenomenon. The Work Group agreed to **<u>close</u>** this issue.			
11	0015-4 (Occupational Environmental Dose) ***<u>CLOSED</u>***	Use of generic ambient environmental dose of 35.9 mrem/y is too restrictive for non-compensable claims and claimant unfavorable.	SC&A disagrees with the implicit assumption in the TBD that there were not significant environmental releases at PORTS that would give rise to radiation dose rates above natural background.	In Rev 1 (2006) and Rev 2 (2009) of the Environmental TBD, a maximum value of 44.8 mrem/2000 hrs (which is adjusted for 2600 hrs during DR) is recommended for workers in areas near Perimeter Road based upon the highest reading outside the DU cylinder storage. However, this value is only assigned if a more refined estimate is necessary. A maximizing dose of 0.452 rem/yr (which is derived from the 1987 result at monitoring location 874, adjusted for 2,600 hours exposure time and multiplied by an uncertainty factor of 1.3) is actually assigned during most dose reconstructions. Attachment B of ORAUT-PROC-0060 *"Occupational Onsite Ambient Dose Reconstruction for DOE Sites"* lists maximizing ambient dose values for various sites, including Portsmouth, and provides the basis for those values.
	SC&A Response (April 2011): <u>More information needed</u>. Agree conceptually, but cannot locate guidance regarding application of 0.452 rem/yr as maximum dose for bounding environmental dose during dose reconstructions. If this is not in the TBD, it seemingly should be, for clarity sake. **July 2011 update:** With NIOSH's clarification, SC&A agreed with the response and the Work Group **<u>closed</u>** the issue.			
12	0015-4 ***<u>CLOSED</u>***	Default ambient environmental dose of 267 mrem/y to workers	Table 4.3.1-1 of TBD-4 identifies the origin of the 267 mrem/y value as that corresponding to location 874 for the	In Rev. 2 of TBD-4, the 267 mrem/2,000 hr yr for location 874 for the year 1987 is now in Table 4-6 and the value of 178 mrem/2,000 hr yr for location X-745E for the year 2000

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		exposed at Cylinder Storage Yards is without technical basis and may be too low.	year 1989; and Table 4.3-3 of TBD-4 identifies the value 178 mrem/y as the average deep dose for location X-745E (depleted uranium cylinder storage yard) for the year 2000. It is difficult to match and rationalize these two independent measurements based on facts presented by SC&A.	is now in Table 4-5. The 178 mrem/2,000 hr yr does not represent only neutron exposure because these TLDs were calibrated for both Gamma and neutrons. The TBD discussed the assumption that the portion of the 267 mrem/yr in 1987 could be attributed to neutron exposure of 178 mrem/yr, not that it should be additive.
	SC&A Response (April 2011): Agree. **July 2011 update:** Working Group **closed** issue.			
13	0015-4 ***CLOSED***	Ambient environmental doses are confined to deep dose that may significantly underestimate potential shallow dose to skin.	Claims involving skin cancer, as well as other surficial tissues, must be evaluated on the basis of shallow dose estimates. Dose estimates involving external ambient environmental doses are restricted to the deep dose, which may significantly underestimate the shallow dose.	Due to the nature of non-penetrating dose, it would not be expected to see elevated levels compared to the penetrating dose for areas where environmental doses apply. ORAUT-OTIB-0017 is the approved document for addressing the assignment of shallow dose.
	SC&A Response (April 2011): Agree. **July 2011 update:** Working Group **closed** issue.			
14	0015-3 (Occupational Medical Dose) ***CLOSED***	TBD identifies two timeframes for photofluorography (1954–1960 and 1954–1957); the shorter period was selected and based on single record.	A time period for PFG is restricted to 1954 to 1957, despite statements in the TBD verifying extended PFG use at PORTS from 1954 through 1960.	The TBD will be revised for consistency and to clarify guidance regarding which years to assign PFGs. We have completed 1,119 Portsmouth cases and while we have seen several PFGs performed between 1954 and 1957, we have not seen evidence of PFG X-rays beyond 1957.
	SC&A Response (April 2011): Agree that "the TBD does need clarification and consistency regarding PFGs;" this wording suggests that the next version of the TBD will be revised accordingly. **July 2011 update:** The Work Group **closed** the issue with the understanding that dates will be clarified.			