Appendix A. Oral Reporting and Screening Levels for Bioassay Measurements

This appendix lists the levels of routine bioassay measurement results that initiate response by Internal Dosimetry, according to practices discussed in Chapter 2.0. The bioassay measurement laboratories provide prompt verbal notification to Internal Dosimetry for any results that exceed the oral reporting level. Results reported to Internal Dosimetry are compared with the screening levels in Tables A.1 through A.4 to determine if additional investigation or initiation of the dose assessment process is required.

Oral reporting levels (ORL) are specified in the bioassay laboratory statement of work. For excreta samples processed using routine processing codes, the ORL is a numerical value determined as specified in Tables A.1 through A.4. All excreta samples processed using priority, expedite, or emergency processing codes are reported verbally or electronically to Internal Dosimetry. The ORL for any in vivo measurement is the detection of any radionuclide other than ^{40}K, ^{208}Tl, or ^{214}Bi.

Individual-specific screening levels may be established for workers with unusual background levels due to environmental sources or long-term detectable levels resulting from an assessed intake. Such levels are established by the dose assessment process and documented in the resulting evaluations.

Screening levels for bioassay measurements are listed as follows:

Table A.1	Transuranics and ^{90}Sr Urinalysis
Table A.2	Tritium Urinalysis
Table A.3	Uranium Urinalysis
Table A.4	In Vivo Measurements

Table A.1. Transuranic and ^{90}Sr Urinalysis Oral Reporting and Screening Levels and Their Basis

Bioassay Measurement	Oral Report Level, dpm	Screening Level, dpm	Basis for Screening Level
Routine urine analysis results (per approximate 24-h sample unless noted)			
^{238}Pu (IPU)	$>L_c$ [(b)]	> ORL	Detected activity[(a)]
$^{239+240}$Pu (IPU)	$> L_c$ [(b)]	> ORL	Detected activity[(a)]
$^{239+240}$Pu (IPUL)	$> L_c$ [(b)]	> ORL	Detected activity[(a)]
^{241}Am	$> L_c$ [(b)]	> ORL	Detected activity[(a)]
^{242}Cm	$> L_c$ [(b)]	> ORL	Detected activity[(a)]
$^{243+244}$Cm	$> L_c$ [(b)]	> ORL	Detected activity[(a)]
^{90}Sr	5	> ORL	Detected activity[(a)]

(a) Any result greater than the oral reporting level (> ORL) indicates that a CEDE could potentially exceed 10 mrem.

(b) For alpha spectroscopy procedures, the oral reporting level is determined according to the following formula: L_c = 2*TPU, where TPU (total propagated uncertainty) = the sample specified estimate of the overall uncertainty associated with the analytical result.

Table A.2. Tritium Urinalysis Oral Reporting and Screening Levels and Their Basis

Tritium Measurement	Oral Reporting Level, dpm/ml	Screening Level, dpm/ml	Basis for Screening Level
Baseline	10	> ORL	Detected activity[a]
400-Area Baseline	10	40	Elevated 400 Area background
Multiple Acute Scenario			
Biweekly Routine	10	110	10 mrem CEDE[b]
Monthly Routine	10	80	10 mrem CEDE[c]
Supplemental Monthly	10	800	100 mrem CEDE[d]
Chronic Equilibrium		310	10 mrem
Single Acute Scenario, Days Post-Intake:			10 mrem/intake
1	10	7,400	
2	10	6,900	
3	10	6,400	
7	10	4,900	
14	10	3,000	
30	10	990	
Single Acute in Addition to a 10-mrem Chronic Average, Days Post-Acute Intake:			20-mrem total
1	10	7,700	
2	10	7,200	
3	10	6,700	
7	10	5,200	
14	10	3,300	
30	10	1,300	

(a) Indicates past tritium exposure. The potential source and dose need to be considered for possible inclusion in the lifetime dose estimate.

(b) Assumes 26 equally spaced intakes per year to give 10 mrem CEDE. No consideration is given to buildup of tritium levels in urine.

(c) Assumes 12 equally spaced intakes per year to give 10 mrem CEDE. No consideration is given to buildup of tritium levels in urine.

(d) Dose could potentially exceed 100 mrem; therefore, a change to biweekly sampling is recommended for closer monitoring until results fall below the biweekly screening level.

Table A.3. Uranium Urinalysis Oral Reporting and Screening Levels and Their Basis

Uranium Measurement	Oral Reporting Level	Screening Level	Basis for Screening Level
Isotopic Uranium (IU) (approximate 24-h sample)			
^{238}U	0.15 dpm	0.15 dpm	Background level
$^{233+234}U$	0.16 dpm	0.16 dpm	Background level
^{235}U	0.007 dpm	0.007 dpm	Background level
Insoluble Uranium Elemental Mass Analysis, (U)			
approximate 24-h	0.2 µg	0.2 µg	Background level
approximate 12-h	0.2 µg	0.2 µg	Oral reporting level [a]
Single void	Any result	0.14 µg/L [b]	Background level
Infrequent (single acute) Exposure Potential, (approximate 24-h sample)			
Quarterly – Elemental Uranium Mass	0.2 µg	0.5 µg [c]	10-mrem CEDE
Quarterly – Isotopic Uranium			
^{238}U	0.15 dpm	0.37 dpm	10-mrem CEDE for mixture [c]
$^{233+234}U$	0.16 dpm	0.40 dpm	
^{235}U	0.007 dpm	0.017 dpm	
Quarterly Supplemental	0.2 µg	2.5 µg	Chemical toxicity [d]
ICP/MS Analysis for ^{236}U	50 pg	> ORL	Detected activity [e]

(a) The oral reporting level is contractually the same as for approximate 24-hour samples. The screening level for 12-hour samples is numerically the same as for 24-hour samples, but extrapolation to a daily excretion implies a less sensitive daily screening level of 0.4 µg/d.

(b) Based on background level of 0.2 µg/d divided by Reference Man daily urine excretion rate of 1.4 L/d.

(c) Assumes 0.3µg from a 2.5 mg class W, 5-µm inhalation plus 0.2µg from environmental background, interpreted as natural uranium.

(d) Levels shown indicate a potential acute intake at one-third of the assumed threshold for acute chemical toxicity.

(e) Based on detection of ^{236}U which is reactor produced and not present in natural uranium.

Table A.4. Oral Reporting and Screening Levels for Routine In Vivo Bioassay Measurements and Their Basis

Bioassay Measurement	Oral Reporting Level	Screening Level	Basis for Screening Level
Baseline and Annual Whole Body Exam			
^{40}K	200 nCi	200 nCi	Environmental[a]
^{60}Co (as class Y)	> L_c	4 nCi	10 mrem CEDE[b]
^{137}Cs (as mixture indicator)	> L_c	> ORL	Detected activity[c]
^{137}Cs (pure nuclide)	> L_c	20 nCi	10 mrem CEDE[b]
^{152}Eu	> L_c	4 nCi	10 mrem CEDE[b]
^{154}Eu	> L_c	3 nCi	10 mrem CEDE[b]
^{208}Tl	0.46	> ORL	Environmental radon
^{214}Bi	6.4	> ORL	Environmental radon
Other Radionuclides[d]	> L_c	> ORL	Unknown source
Chest Count			
Any Radionuclide[d]	> L_c	> ORL	Unknown source
Thyroid Count (quarterly frequency using germanium detector)			
^{125}I	> L_c	5 nCi	10 mrem CEDE[e]

(a) Potassium-40 in the general public normally ranges up to about 200 nCi.
(b) Assumes one year post intake.
(c) Any result > ORL indicates a CEDE could potentially exceed 10 mrem.
(d) Excluding known medical administrations.
(e) Based on potential exposure each quarter with a possible dose of 2.5 mrem each quarter.