UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4

61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

August 30, 2010

4SD-SSB

MEMORANDUM

SUBJECT: Revised Data Evaluation, Tronox (Kerr-McGee) Site, Columbus, Lowndes County, Mississippi

FROM: Tim Frederick, Life Scientist
Technical Services Section
Superfund Division

TO: Russ McClean, Project Manager
Corrective Action Section
RCRA Division

THRU: Glenn Adams, Chief
Technical Services Section
Superfund Division

Note: *This memo has been updated to correct an error in Tables 1-6. Sample TN25 had previously been reported as a sediment sample, but it was actually a surface soil sample. This change has no impact on the data evaluation or on the conclusions. This corrected memo is intended to supersede and replace the previous memo issued August 6, 2010.*

Per your request, TSS has reviewed the available data collected for the investigation of the Tronox (Kerr-McGee) site, Columbus, Lowndes County, Mississippi. Data includes the results of soil/sediment samples collected from a school site, a church property, residential properties, and on-/off-site drainage ditches. Samples of public drinking water were also collected from taps at two residences and a church.

Soil & Sediment Data

The soils data were screened against EPA's residential Regional Screening Levels (RSLs). RSLs are conservative risk-based screening values developed by EPA to help identify contaminants of potential concern. RSLs are based on the lower of the $1x10^{-6}$ risk value or a Hazard Quotient of 1. The results of the semi-volatile organic compound (SVOC) data screening are shown in Table

1. The initial screening step indicates that a number of SVOCs (carcinogenic PAHs and pentachlorophenol) exceeded their respective RSLs at several locations.

In Table 2, the carcinogenic PAHs (cPAHs) were converted to benzo(a)pyrene equivalents (BaP eq.) EPA has adopted a Toxicity Equivalence Factor (TEF) methodology for carcinogenic PAHs. These TEFs are based on the relative potency of each compound relative to that of benzo(a)pyrene (BaP). Currently, the only carcinogenic slope factor available is for BaP and the other cPAHs are based on BaP. The following TEFs were used to convert each cPAH benchmark to an equivalent concentration of BaP:

Compound	TEF
Benzo(a)pyrene	1.0
Benzo(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenzo(a,h)anthracene	1.0
Indeno(1,2,3-c,d)pyrene	0.1

The BaP equivalents were found to exceed the RSL for benzo(a)pyrene at several locations.

The dioxin data were screened against a provisional screening value of 70 ppt in Table 3. The initial screening step indicates that dioxin exceeded the provisional screening value at three sample locations (TN01, TN09 and duplicate, and TN11).

Based on the results of the initial screening step, the data were then compared to residential soil values based on the lower of the $1x10^{-4}$ risk value or a Hazard Quotient of 3 for each constituent that exceeded its respective RSL. This comparison was done to see if any detected concentrations exceeded EPA's acceptable risk range.

Table 4 presents the results of the SVOC screening results. In the soil samples, only a single sample location (TN09 and its duplicate) had contaminant concentrations (cPAHs) that exceeded EPA's acceptable risk range. A few cPAHs exceeded EPA's acceptable risk range in sediment samples at several locations. No other SVOCs were found to exceed EPA's acceptable risk range.

Table 5 presents the comparison of the calculated BaP equivalents to the benzo(a)pyrene $1x10^{-4}$ risk value. Only a single soil sample location (TN09 and its duplicate) had concentrations that exceeded the benzo(a)pyrene $1x10^{-4}$ risk value with other exceedances in the sediment samples at several locations. Figure 1 shows the locations of samples where the calculated BaP equivalents are at or exceed the benzo(a)pyrene $1x10^{-4}$ risk value.

Sample locations that exceed the benzo(a)pyrene $1x10^{-4}$ risk value include:

- TN09 – Residential soil sample
- TN15 – Ditch next to apartments at 801Waterworks Road
- TN16 – Ditch north of 14th Ave, adjacent to former day care, west of North Storage Yard

- TN-17 – Along north boundary of North Storage Yard in depression outside of fence
- TN18 – Ditch east of Hunt Intermediate School field and west of cemetery property leased by Tronox
- TN24 – Ditch east of North Storage Yard, north of 14th Avenue

Two additional locations were found to have BaP equivalent concentrations that were at or near the benzo(a)pyrene $1x10^{-4}$ risk value: TN01 (school property swale) and TN19 (a Ditch east of RR tracks and South of 14th Avenue).

In Table 6, the dioxin TEQ data are compared to the OSWER policy residential action level, 1,000 ppt. The secondary screening shows that dioxin TEQ does not exceed this level at any sample locations. The highest concentration of dioxin TEQ (820 ppt) was found at location TN09 (duplicate). This location was also found to have elevated concentrations of BaP equivalents and is shown on Figure 1.

Water Data

Three water samples were collected from taps that are connected to the public water supply. The water sample data is being finalized and will be evaluated separately when it becomes available.

Conclusions

Based upon the available soil/sediment data, there are several BaP equivalents concentrations that are at or exceed the benzo(a)pyrene $1x10^{-4}$ risk value. Dioxin TEQ concentrations exceed the provisional screening value but are below the current OSWER level. Areas identified with elevated contaminant concentrations include: a school, residential property, and drainage pathways in or near a residential community. Additional data will be required to determine the nature and extent of the contamination, and to fill in any existing data gaps.

REFERENCE:

EPA. 1998. Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites. OSWER Directive 9200.4-26.

EPA. 2010. Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites.

Table 1: TRONOX, INC SVOC Data Screening Tables

	Surface Soil (mg/kg)														Residential 1E-6 Level
	TN01	TN02	TN04	TN05	TN06	TN07	TN08	TN09	TN09(D)	TN10	TN11	TN12	TN13	TN14	TN25	
1-Methylnaphthalene			0.059													2.20E+01
2-Methylnaphthalene			0.05					0.049				0.048	0.062			31.00
Benzaldehyde			0.13	0.056				0.052								780.00
Acenaphthylene								0.21	0.23							
Anthracene	0.35							0.21	0.26							1700.00
Benzo(a)anthracene*	0.81	0.19	0.069					1	1.6	0.042	0.12		0.1			0.02
Benzo(a)pyrene*	0.83	0.23	0.1		0.14			1.8	2.6		0.18	0.049	0.13			1.50E-02
Benzo(b)fluoranthene*	1.1	0.38	0.16	0.061	0.26			4.1	4.7	0.075	0.31	0.078	0.23			1.50E-01
Benzo(g,h,i)perylene	0.53	0.14	0.058					1.4	1.7		0.11		0.074			
Benzo(k)fluoranthene*	0.92	0.2	0.096	0.043	0.2			1.6	3.3	0.043	0.24	0.068	0.18			1.50E+00
Bis(2-ethylhexyl)phthalate			0.43										1.1			3.50E+01
Carbazole	0.19							0.12	0.14							
Chrysene*	0.98	0.3	0.11	0.057	0.17			1.5	2.4	0.07	0.21	0.079	0.16			1.50E+01
Dibenz(a,h)anthracene*	0.22	0.079						0.47	0.8		0.045					1.50E-02
Dibenzofuran								0.059								7.80
Fluoranthene	1.9	0.32	0.09	0.063	0.14			1.3	1.9	0.073	0.24	0.078	0.12			230.00
Ideno(1,2,3-cd)pyrene*	0.52	0.17	0.063					1.6	1.9		0.13		0.085			1.50E-01
Naphthalene								0.17	0.18			0.047				3.60E+00
Pentachlorophenol									1.4		0.095					3.00E+00
Phenanthrene	1.5	0.089	0.084					0.22	0.27		0.049	0.051	0.044			
Phenol														0.23		1800.00
Pyrene	1.7	0.34	0.11	0.077	0.17	0.044		2	3.2	0.072	0.36	0.11	0.16			170.00

	Sediment (mg/kg)										Residential 1E-6 Level
	TN15	TN16	TN17	TN18	TN19	TN20	TN21	TN22	TN23	TN24	
2,3,4,6-Tetrachlorophenol				0.096						0.37	180.00
2-Methylnaphthalene										0.35	31.00
Acenapthene										0.23	340.00
Acenaphthylene	0.07	0.78	0.39	0.2						1.3	
Anthracene	0.14	0.47	0.59	0.27	0.071					1.9	1700.00
Benzo(a)anthracene*	1.6	6.3	5	0.95	0.63					11	0.02
Benzo(a)pyrene*	1.4	15	6.9	1.6	0.79					24	1.50E-02
Benzo(b)fluoranthene*	2.9	24	15	3.3	1.5					41	1.50E-01
Benzo(g,h,i)perylene	0.53	5.3	4	1.3	0.49					15	
Benzo(k)fluoranthene*	1.7	11	8.9	0.3	0.98					33	1.50E+00
Carbazole	0.055		0.56	0.16						0.9	
Chrysene	2.2	9.5	11	1.6	0.96					17	1.50E+01
Dibenz(a,h)anthracene*	0.28	3.1	2	0.5	0.2					5.5	1.50E-02
Dibenzofuran	0.061			0.075						0.48	7.80
Fluoranthene	3.2	5	12	1.6	0.91					10	230.00
Ideno(1,2,3-cd)pyrene*	0.66	7	5.1	1.5	0.6					15	1.50E-01
Naphthalene	0.16			0.21	0.071					1.1	3.60E+00
Pentachlorophenol	0.39	0.33	3	5.5	0.19					12	3.00E+00
Phenanthrene	3.2	14	1.1	0.3	0.15					1.7	
Pyrene			17	2.7	1.3					21	170.00

Empty cells = ND

Table 2: TRONOX, INC BaP Equivalents Screening Tables

	Surface Soil (mg/kg)														
	TN01	**TN02**	**TN04**	**TN05**	**TN06**	**TN07**	**TN08**	**TN09**	**TN09(D)**	**TN10**	**TN11**	**TN12**	**TN13**	**TN14**	**TN25**
Benzo(a)anthracene	0.081	0.019	0.0069					0.1	0.16	0.0042	0.012		0.01		
Benzo(a)pyrene	0.83	0.23	0.1		0.14			1.8	2.6		0.18	0.049	0.13		
Benzo(b)fluoranthene	0.11	0.038	0.016	0.0061	0.026			0.41	0.47	0.0075	0.031	0.0078	0.023		
Benzo(k)fluoranthene	0.0092	0.002	0.00096	0.00043	0.002			0.016	0.033	0.00043	0.0024	0.00068	0.0018		
Chrysene	0.00098	0.0003	0.00011	0.000057	0.00017			0.0015	0.0024	0.00007	0.00021	0.000079	0.00016		
Dibenz(a,h)anthracene	0.22	0.079						0.47	0.8		0.045				
Ideno(1,2,3-cd)pyrene	0.052	0.017	0.0063					0.16	0.19		0.013		0.0085		
BaP-Equivalent	1.3	0.4	0.1	0.01	0.2			3.0	4.3	0.01	0.3	0.1	0.2		

	Sediment (mg/kg)									
	TN15	**TN16**	**TN17**	**TN18**	**TN19**	**TN20**	**TN21**	**TN22**	**TN23**	**TN24**
Benzo(a)anthracene	0.16	0.63	0.5	0.095	0.063					1.1
Benzo(a)pyrene	1.4	15	6.9	1.6	0.79					24
Benzo(b)fluoranthene	0.29	2.4	1.5	0.33	0.15					4.1
Benzo(k)fluoranthene	0.017	0.11	0.089	0.003	0.0098					0.33
Chrysene	0.0022	0.0095	0.011	0.0016	0.00096					0.017
Dibenz(a,h)anthracene	0.28	3.1	2	0.5	0.2					5.5
Ideno(1,2,3-cd)pyrene	0.066	0.7	0.51	0.15	0.06					1.5
BaP-Equivalent	2.2	21.9	11.5	2.7	1.3					36.5

Empty cells = ND

Residential 1E-6 Level	1.50E-02

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Table 3: TRONOX, INC Dioxin TEQ Screening Tables

Surface Soil (ng/kg)														
TN01	**TN02**	**TN04**	**TN05**	**TN06**	**TN07**	**TN08**	**TN09**	**TN09(D)**	**TN10**	**TN11**	**TN12**	**TN13**	**TN14**	**TN25**
90	43	11	7	9.2	8.9	4.6	760	820	54	260	48	37	4.9	2.3

*Provisional Screening Value = 70 ng/kg

Table 4: TRONOX, INC SVOC Data Screening Tables

	Surface Soil (mg/kg)															Residential 1E-4 Level
	TN01	TN02	TN04	TN05	TN06	TN07	TN08	TN09	TN09(D)	TN10	TN11	TN12	TN13	TN14	TN25	
1-Methylnaphthalene			0.059													2.2E+03
2-Methylnaphthalene			0.05					0.049				0.048	0.062			3.3E+03
Benzaldehyde			0.13	0.056				0.052								8.2E+04
Acenaphthylene								0.21	0.23							
Anthracene	0.35							0.21	0.26							1.8E+05
Benzo(a)anthracene*	0.81	0.19	0.069					1	1.6	0.042	0.12		0.1			9.0E+00
Benzo(a)pyrene*	0.83	0.23	0.1		0.14			1.8	2.6		0.18	0.049	0.13			1.5E+00
Benzo(b)fluoranthene*	1.1	0.38	0.16	0.061	0.26			4.1	4.7	0.075	0.31	0.078	0.23			9.0E+00
Benzo(g,h,i)perylene	0.53	0.14	0.058					1.4	1.7		0.11		0.074			
Benzo(k)fluoranthene*	0.92	0.2	0.096	0.043	0.2			1.6	3.3	0.043	0.24	0.068	0.18			9.0E+00
Bis(2-ethylhexyl)phthalate			0.43										1.1			3.5E+03
Carbazole	0.19							0.12	0.14							
Chrysene*	0.98	0.3	0.11	0.057	0.17			1.5	2.4	0.07	0.21	0.079	0.16			9.0E+01
Dibenz(a,h)anthracene*	0.22	0.079						0.47	0.8		0.045					2.6E+00
Dibenzofuran								0.059								
Fluoranthene	1.9	0.32	0.09	0.063	0.14			1.3	1.9	0.073	0.24	0.078	0.12			2.3E+04
Ideno(1,2,3-cd)pyrene*	0.52	0.17	0.063					1.6	1.9		0.13		0.085			9.0E+00
Naphthalene								0.17	0.18			0.047				3.9E+02
Pentachlorophenol									1.4		0.095					3.0E+02
Phenanthrene	1.5	0.089	0.084					0.22	0.27		0.049	0.051	0.044			
Phenol														0.23		1.9E+05
Pyrene	1.7	0.34	0.11	0.077	0.17	0.044		2	3.2	0.072	0.36	0.11	0.16			1.8E+04

	Sediment (mg/kg)										Residential 1E-4 Level
	TN15	TN16	TN17	TN18	TN19	TN20	TN21	TN22	TN23	TN24	
2,3,4,6-Tetrachlorophenol				0.096						0.37	1.9E+04
2-Methylnaphthalene										0.35	3.3E+03
Acenapthene										0.23	3.5E+04
Acenaphthylene	0.07	0.78	0.39	0.2						1.3	
Anthracene	0.14	0.47	0.59	0.27	0.071					1.9	1.8E+05
Benzo(a)anthracene*	1.6	6.3	5	0.95	0.63					11	9.0E+00
Benzo(a)pyrene*	1.4	15	6.9	1.6	0.79					24	1.5E+00
Benzo(b)fluoranthene*	2.9	24	15	3.3	1.5					41	9.0E+00
Benzo(g,h,i)perylene	0.53	5.3	4	1.3	0.49					15	
Benzo(k)fluoranthene*	1.7	11	8.9	0.3	0.98					33	9.0E+00
Carbazole	0.055		0.56	0.16						0.9	
Chrysene	2.2	9.5	11	1.6	0.96					17	9.0E+01
Dibenz(a,h)anthracene*	0.28	3.1	2	0.5	0.2					5.5	2.6E+00
Dibenzofuran	0.061			0.075						0.48	
Fluoranthene	3.2	5	12	1.6	0.91					10	2.3E+04
Ideno(1,2,3-cd)pyrene*	0.66	7	5.1	1.5	0.6					15	9.0E+00
Naphthalene	0.16			0.21	0.071					1.1	3.9E+02
Pentachlorophenol	0.39	0.33	3	5.5	0.19					12	3.0E+02
Phenanthrene	3.2	14	1.1	0.3	0.15					1.7	
Pyrene			17	2.7	1.3					21	1.8E+04

Empty cells = ND

Table 5: TRONOX, INC BaP Equivalents Screening Tables

	Surface Soil (mg/kg)														
	TN01	**TN02**	**TN04**	**TN05**	**TN06**	**TN07**	**TN08**	**TN09**	**TN09(D)**	**TN10**	**TN11**	**TN12**	**TN13**	**TN14**	**TN25**
Benzo(a)anthracene	0.081	0.019	0.0069					0.1	0.16	0.0042	0.012		0.01		
Benzo(a)pyrene	0.83	0.23	0.1		0.14			1.8	2.6		0.18	0.049	0.13		
Benzo(b)fluoranthene	0.11	0.038	0.016	0.0061	0.026			0.41	0.47	0.0075	0.031	0.0078	0.023		
Benzo(k)fluoranthene	0.0092	0.002	0.00096	0.00043	0.002			0.016	0.033	0.00043	0.0024	0.00068	0.0018		
Chrysene	0.00098	0.0003	0.00011	0.000057	0.00017			0.0015	0.0024	0.00007	0.00021	0.000079	0.00016		
Dibenz(a,h)anthracene	0.22	0.079						0.47	0.8		0.045				
Ideno(1,2,3-cd)pyrene	0.052	0.017	0.0063					0.16	0.19		0.013		0.0085		
BaP-Equivalent	1.3	0.4	0.1	0.01	0.2			3.0	4.3	0.01	0.3	0.1	0.2		

	Sediment (mg/kg)									
	TN15	**TN16**	**TN17**	**TN18**	**TN19**	**TN20**	**TN21**	**TN22**	**TN23**	**TN24**
Benzo(a)anthracene	0.16	0.63	0.5	0.095	0.063					1.1
Benzo(a)pyrene	1.4	15	6.9	1.6	0.79					24
Benzo(b)fluoranthene	0.29	2.4	1.5	0.33	0.15					4.1
Benzo(k)fluoranthene	0.017	0.11	0.089	0.003	0.0098					0.33
Chrysene	0.0022	0.0095	0.011	0.0016	0.00096					0.017
Dibenz(a,h)anthracene	0.28	3.1	2	0.5	0.2					5.5
Ideno(1,2,3-cd)pyrene	0.066	0.7	0.51	0.15	0.06					1.5
BaP-Equivalent	2.2	21.9	11.5	2.7	1.3					36.5

Empty cells = ND

Residential 1E-4 Level	1.50E+00

Table 6: TRONOX, INC Dioxin TEQ Screening Tables

Surface Soil (ng/kg)														
TN01	**TN02**	**TN04**	**TN05**	**TN06**	**TN07**	**TN08**	**TN09**	**TN09(D)**	**TN10**	**TN11**	**TN12**	**TN13**	**TN14**	**TN25**
90	43	11	7	9.2	8.9	4.6	760	820	54	260	48	37	4.9	2.3

OSWER Level = 1000 ng/kg
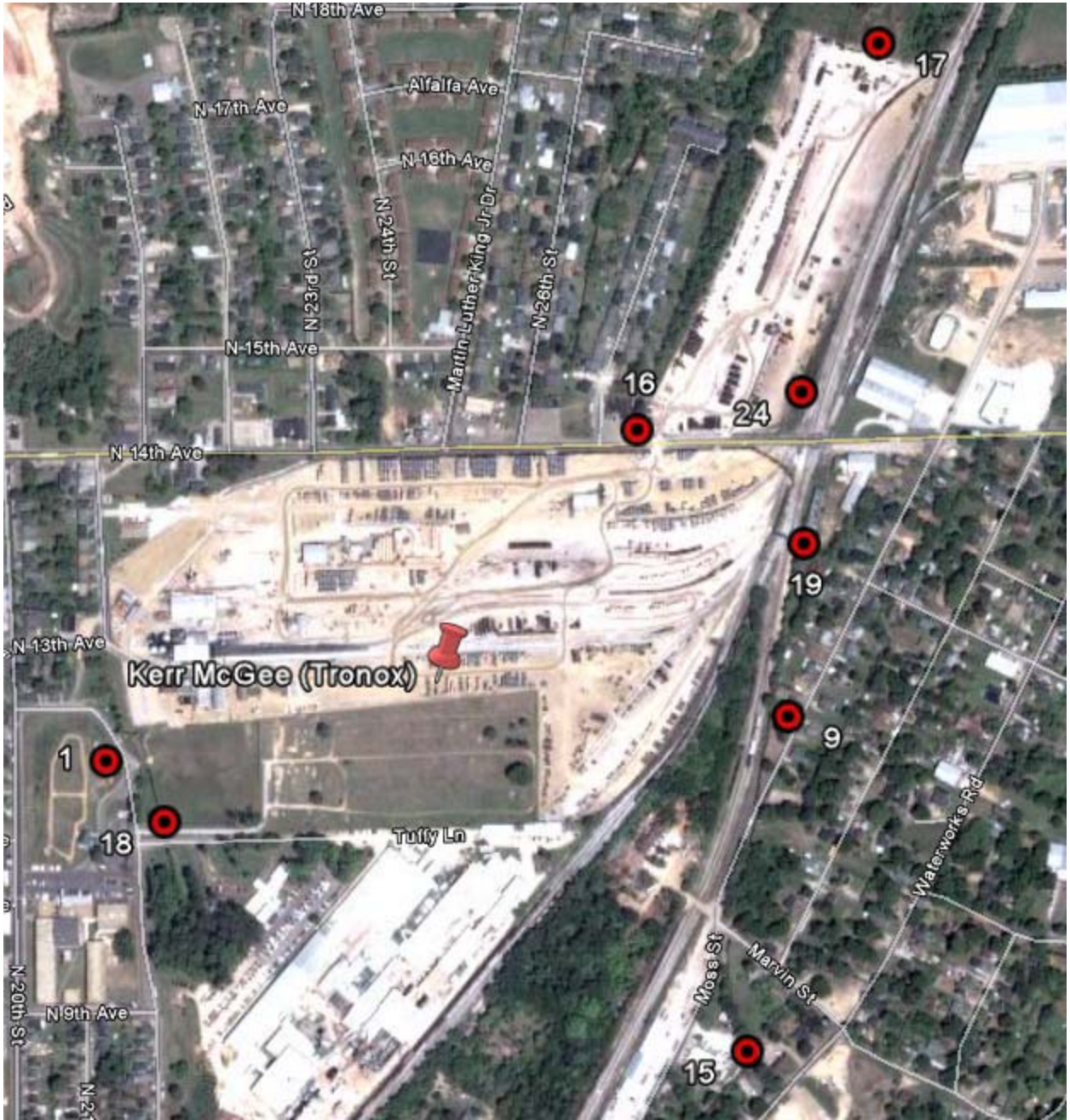
Figure 1: Locations of BaP Equivalents that Exceed the 1E-4 Risk Screening Level