Memorandum

From: Kathryn Morris

Date: 7/15/2020

Re: Risk-Based Corrective Action (RBCA) Risk-Based Screening Level (RBSL) Changes

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In May of 2020, the United States Environmental Protection Agency (EPA) adopted California's Environmental Protection Agency's (Cal EPA) oral cancer slope factor for naphthalene. California's Office for Environmental Health Hazard Assessment is a Tier III source for establishing default toxicity values used to calculate the Regional Screening Levels (RSLs) for soil (USEPA, 2020).

The Risk-based Screening Levels (RBSLs) listed in the Risk-Based Corrective Action Guidance (RBCA) are referenced in rules regarding tank releases, landfarm closure, and Comprehensive Environmental Cleanup and Responsibility Act (CECRA) listing (17.56.608, 17.50.1617, 17.55.109, 2018 version). These previous RBSLs must still be used for the purposes defined by these regulations. The RBCA Guidance document is scheduled for annual review in the fall of 2020 and DEQ will update the Guidance and regulations as appropriate. However, in the interim, DEQ has updated the RBSLs based upon the new toxicity data adopted by EPA.

Based on the new cancer slope factor, the naphthalene RBSLs for residential and commercial receptors is now lower than the previous RBSLs. Since this change only effects the calculation of carcinogenic screening levels, no changes were made to the non-carcinogenic screening level calculations. Below are comparison tables for each groundwater depth comparing the 2018 naphthalene Tier 1 RBSL and the 2020 Interim naphthalene RBSLs based upon either leaching or direct contact, whichever is lower. Tables 1 – 4 are also attached to this memorandum with any changes highlighted in red.

Tier I Surface Soil Comparison				
Distance to groundwater	**< 10 feet to groundwater**			
Chemical **units (mg/kg)**	**2018 Residential RBSL (mg/kg)**	**2020 Residential RBSL (mg/kg)**	**2018 Commercial RBSL (mg/kg)**	**2020 Commercial RBSL (mg/kg)**
Naphthalene	4.3	2.2	12	9.5

Tier I Surface Soil Comparison				
Distance to groundwater	**10-20 feet to groundwater**			
Chemical **units (mg/kg)**	**2018 Residential RBSL (mg/kg)**	**2020 Residential RBSL (mg/kg)**	**2018 Commercial RBSL (mg/kg)**	**2020 Commercial RBSL (mg/kg)**
Naphthalene	4.3	2.2	19	9.5

Tier I Surface Soil Comparison				
Distance to groundwater	**> 20 feet to groundwater**			
Chemical **units (mg/kg)**	**2018 Residential RBSL (mg/kg)**	**2020 Residential RBSL (mg/kg)**	**2018 Commercial RBSL (mg/kg)**	**2020 Commercial RBSL (mg/kg)**
Naphthalene	4.3	2.2	19	9.5

Tier I Subsurface Soil Comparison						
Distance to groundwater	**<10 feet to groundwater**		**10-20 feet to groundwater**		**> 20 feet to groundwater**	
Chemical **units (mg/kg)**	**2018 Construction RBSL (mg/kg)**	**2020 Construction RBSL (mg/kg)**	**2018 Construction RBSL (mg/kg)**	**2020 Construction RBSL (mg/kg)**	**2018 Construction RBSL (mg/kg)**	**2020 Construction RBSL (mg/kg)**
Naphthalene	12	12	40	40	62	62

Memo Attachments:

Attachment 1 – Table 1 – Tier 1 Surface Soil (0-2ft) RBSLs, changes in red

Attachment 2 – Table 2 – Tier 1 Subsurface Soil (>2ft) RBSLs, no changes needed

Attachment 3 – Table 3 – Tier 1 Groundwater RBSLs and Standards, no changes needed

Attachment 4 – Table 4 – Master Table – All Potential Tier 1 RBSLs For Soil, changes in red

References:

United States Environmental Protection Agency (EPA). 2020. Regional Soil Screening Level – User's Guide. https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide#toxicity. May.

Attachment 1

Table 1
Tier 1 Surface Soil (0-2ft) RBSLs

TABLE 1
TIER 1 SURFACE SOIL (0-2 ft) RBSLs (mg/kg)
(includes default RBSLs)

This table applies to contaminated surface soil from 0-2 feet below ground surface. Distance to water is from the sample depth to the water table. **For VPH compounds at UST sites, default RBSLs (bold) are used to determine if a release has occurred at a site. Default RBSLs apply to the entire soil column and always apply in the absence of adequate information. For EPH compounds, the 200 ppm EPH screen concentration is used to determine if additional analysis (fractionation) is needed.**

Distance to groundwater		**< 10 feet to groundwater**				**10-20 feet to groundwater**				**> 20 feet to groundwater**			
Chemical units (mg/kg = ppm)	**E**	**Residential RBSL (mg/kg)**	**B**	**Commercial RBSL (mg/kg)**	**B**	**Residential RBSL (mg/kg)**	**B**	**Commercial RBSL (mg/kg)**	**B**	**Residential RBSL (mg/kg)**	**B**	**Commercial RBSL (mg/kg)**	**B**
For Gasoline and Light Hydrocarbons measured using the Massachusetts Method for Volatile Petroleum Hydrocarbons (VPH)													
C5-C8 Aliphatics	n	**52**	dc	220	l	52	dc	290	dc	52	dc	290	dc
C9-C12 Aliphatics	n	**77**	dc	360	dc	77	dc	360	dc	77	dc	360	dc
C9-C10 Aromatics	n	**130**	l/dc	130	l	130	dc	470	l	130	dc	720	l
MTBE	c	**0.078***	l	0.078*	l	0.16	l	0.16	l	0.25	l	0.25	l
Benzene	c	**0.07**	l	0.07	l	0.21	l	0.21	l	0.33	l	0.33	l
Toluene	n	**21**	l	21	l	65	l	65	l	100	l	100	l
Ethylbenzene	c	**6.4**	dc	26	l	6.4	dc	28	dc	6.4	dc	28	dc
Xylenes	n	**72**	dc	310	dc	72	dc	310	dc	72	dc	310	dc
Naphthalene	c	**2.2**	dc	9.5	dc	2.2	dc	9.5	dc	2.2	dc	9.5	dc
Lead Scavengers													
1,2-Dibromoethane (EDB)	c	**0.000086***	l	0.000086*	l	0.00022*	l	0.00022*	l	0.00033*	l	0.00033*	l
1,2-Dichloroethane (DCA)	c	**0.019**	l	0.019	l	0.052	l	0.052	l	0.079	l	0.079	l
For Diesel and Heavy Hydrocarbons measured using the Massachusetts Method for Extractable Petroleum Hydrocarbons (EPH)													
EPH Screen, Fractionate		**200**		200		200		200		200		200	
C9-C18 Aliphatics	n	**110**	dc	540	dc	110	dc	540	dc	110	dc	540	dc
C19-C36 Aliphatics	n	**24,000**	dc	200,000	dc	24,000	dc	200,000	dc	24,000	dc	200,000	dc
C11-C22 Aromatics	n	**370**	l	370	l	490	dc	1,300	l	490	dc	2,000	l
Acenaphthene	n	**27**	l	27	l	91	l	91	l	140	l	140	l
Anthracene	n	**2,200**	dc	2,600	l	2,200	dc	8,800	l	2,200	dc	14,000	l
Benz(a)anthracene	c	**1.3**	dc	6.8	l	1.3	dc	23	l	1.3	dc	24	dc
Benzo(a)pyrene	c	**0.13****	dc	2.3	l	0.13**	dc	2.4	dc	0.13**	dc	2.4	dc
Benzo(b)fluoranthene	c	**1.3**	dc	23	l	1.3	dc	24	dc	1.3	dc	24	dc
Benzo(k)fluoranthene	c	**13**	dc	230	l	13	dc	240	dc	13	dc	240	dc
Chrysene	c	**130**	dc	690	l	130	dc	2,300	l	130	dc	2,400	dc
Dibenzo(a,h)anthracene	c	**0.13****	dc	2.4	dc	0.13**	dc	2.4	dc	0.13**	dc	2.4	dc
Fluoranthene	n	**85**	l	85	l	280	l	280	l	300	dc	440	l
Fluorene	n	**35**	l	35	l	120	l	120	l	180	l	180	l
Indeno(1,2,3-cd)pyrene	c	**1.3**	dc	24	dc	1.3	dc	24	dc	1.3	dc	24	dc
Naphthalene	c	**2.2**	dc	9.5	dc	2.2	dc	9.5	dc	2.2	dc	9.5	dc
Pyrene	n	**83**	l	83	l	220	dc	280	l	220	dc	430	l
1-Methylnaphthalene	c	**2.1**	l	2.1	l	7.1	l	7.1	l	11	l	11	l
2-Methylnaphthalene	n	**6.9**	l	6.9	l	23	l	23	l	30	dc	35	l

Notes:

E = Effect is either:
n = non-carcinogenic and direct contact RBSLs are based on a hazard quotient of 0.125 for a total hazard index which does not exceed 1, or
c = carcinogenic and direct contact RBSLs are based on a cancer risk of $1X10^{-0}$ for a total cancer risk which does not exceed $1X10^{-5}$.

RBSLs for residential and commercial exposure to naphthalene are based upon carcinogenic inhalation risk.

B = Basis is the most conservative of:
l = leaching from soil to groundwater;
dc = residential direct contact including ingestion, inhalation, and dermal; or
bu = adversely affects beneficial uses (foul odor or taste).

If the leaching pathway is not the most conservative basis, residential or commercial RBSLs apply to surface soil.
* = The best achievable practical quantitation limit (0.20) is greater than the RBSL; therefore, if the compound is detected, additional evaluation may be necessary.
** = The best achievable practical quantitation limit (0.33) is greater than the RBSL; therefore, if the compound is detected, additional evaluation may be necessary.

For information regarding odor considerations, please refer to the Odors as a Significant Risk to Public Welfare/Nuisance Condition Section of the Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases.

The RBSLs for soil and water are not designed to be protective of the vapor intrusion (VI) pathway. Please refer to the Vapor Intrusion t Indoor Air Section of the Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases.

Attachment 2

Table 2
Tier 1 Subsurface Soil (>2ft) RBSLs

TABLE 2
TIER 1 SUBSURFACE SOIL (>2 ft) RBSLs (mg/kg)

This table applies to contaminated subsurface soil (>2 feet below the ground surface). Distance to water is from the sample depth to the water table. **For VPH compounds at UST sites, default RBSLs, provided in bold on Table 1, are used to determine if a release has occurred at a site. Default RBSLs apply to the entire soil column and always apply in the absence of adequate information. For EPH compounds the 200 ppm screen concentration is used to determine if additional analysis (fractionation) of the soil sample is needed.**

Distance to groundwater		**< 10 feet to ground water**		**10-20 feet to ground water**		**> 20 feet to ground water**	
Chemical units (mg/kg = ppm)	**E**	**>2 ft Construction RBSL (mg/kg)**	**B**	**>2 ft Construction RBSL (mg/kg)**	**B**	**>2 ft Construction RBSL (mg/kg)**	**B**
For Gasoline and Light Hydrocarbons measured using the Massachusetts Method for Volatile Petroleum Hydrocarbons (VPH)							
C5-C8 Aliphatics	n	220	l	410	dc	410	dc
C9-C12 Aliphatics	n	640	dc	640	dc	640	dc
C9-C10 Aromatics	n	130	l	470	l	720	l
MTBE	c	0.078*	l	0.16	l	0.25	l
Benzene	c	0.07	l	0.21	l	0.33	l
Toluene	n	21	l	65	l	100	l
Ethylbenzene	c	26	l	84	l	130	l
Xylenes	n	320	l	610	dc	610	dc
Naphthalene	n	12	l	40	l	62	l
Lead Scavengers							
1,2-Dibromoethane (EDB)	c	0.000086*	l	0.00022*	l	0.00033*	l
1,2-Dichloroethane (DCA)	c	0.019	l	0.052	l	0.079	l
For Diesel and Heavy Hydrocarbons measured using the Massachusetts Method for Extractable Petroleum Hydrocarbons (EPH)							
EPH Screen, Fractionate		200		200		200	
C9-C18 Aliphatics	n	900	dc	900	dc	900	dc
C19-C36 Aliphatics	n	200,000	dc	200,000	dc	200,000	dc
C11-C22 Aromatics	n	370	l	1,300	l	2,000	l
Acenaphthene	n	27	l	91	l	140	l
Anthracene	n	2,600	l	8,800	l	14,000	l
Benz(a)anthracene	c	6.8	l	23	l	35	l
Benzo(a)pyrene	c	2.3	l	7.5	l	12	l
Benzo(b)fluoranthene	c	23	l	76	l	120	l
Benzo(k)fluoranthene	c	230	l	750	l	1,200	l
Chrysene	c	690	l	2,300	l	3,500	l
Dibenzo(a,h)anthracene	c	7.5	l	24	l	38	l
Fluoranthene	n	85	l	280	l	440	l
Fluorene	n	35	l	120	l	180	l
Indeno(1,2,3-cd)pyrene	c	77	l	250	l	380	l
Naphthalene	n	12	l	40	l	62	l
Pyrene	n	83	l	280	l	430	l
1-Methylnaphthalene	c	2.1	l	7.1	l	11	l
2-Methylnaphthalene	n	6.9	l	23	l	35	l

Notes:

E = Effect is either:

n = non-carcinogenic and direct contact RBSLs are based on a hazard quotient of 0.125 for a total hazard index which does not exceed 1, or

c = carcinogenic and direct contact RBSLs are based on a cancer risk of $1X10^{-6}$ for a total cancer risk which does not exceed $1X10^{-5}$.

RBSLs for construction work are based upon noncarcinogenic risk, including ingestion, dermal, and inhalation.

B = Basis is the most conservative of:

l = leaching from soil to groundwater;
dc = residential direct contact including ingestion, inhalation, and dermal; or
bu = adversely affects beneficial uses (foul odor or taste).

If the leaching pathway is not the most conservative basis, excavation RBSLs apply to subsurface soil.

* = The best achievable practical quantitation limit (0.20) is greater than the RBSL; therefore, if the compound is detected, additional evaluation may be necessary.

For information regarding odor considerations, please refer to the Odors as a Significant Risk to Public Welfare/Nuisance Condition Section of the Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases.

The RBSLs for soil and water are not designed to be protective of the vapor intrusion (VI) pathway. Please refer to the Vapor Intrusion to Indoor Air Section of the Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases.

Attachment 3

Table 3

Tier 1 Groundwater RBSLs and Standards

TABLE 3
TIER 1 GROUNDWATER RBSLs AND STANDARDS

This table applies to groundwater and consists of DEQ-7 Human Health Standards (HHSs; DEQ 2012), where available. For compounds without DEQ-7 HHSs, DEQ has developed RBSLs and included them in the table. For EPH compounds, a total extractable hydrocarbon (TEH) concentration of 1,000 µg/L is used to determine if additional analysis (fractionation) is needed. Surface water impacts require a minimum of a Tier 2 evaluation.

Chemical	Effect	Basis	Groundwater Standard or RBSL (µg/l)
For Gasoline and Light Hydrocarbons measured using the Massachusetts Method for Volatile Petroleum Hydrocarbons (VPH)			
C5-C8 Aliphatics [(b)]	n	rb	650
C9-C12 Aliphatics[(b)]	n	rb	1,400
C9-C10 Aromatics[(b)]	n	rb	1,100
MTBE	n	hhs	30
Benzene	c	hhs	5
Toluene	n	hhs	1,000
Ethylbenzene	n	hhs	700
Xylenes	n	hhs	10,000
Naphthalene	c	hhs	100
Lead Scavengers			
Ethylene dibromide (EDB)	c	hhs	0.017
1,2-Dichloroethane (DCA)	c	hhs	4
For Diesel and Heavy Hydrocarbons measured using the Massachusetts Method for Extractable Petroleum Hydrocarbons (EPH)			
EPH / TEH Screen fractionation required[(a)]			1,000
C9-C18 Aliphatics[(b)]	n	rb	1,400
C19-C36 Aliphatics	n	bu	1,000
C11-C22 Aromatics[(b)]	n	rb	1,100
Acenaphthene	n	hhs	70
Anthracene	n	hhs	2,100
Benz(a)anthracene	c	hhs	0.5
Benzo(a)pyrene	c	hhs	0.05*
Benzo(b)fluoranthene	c	hhs	0.5
Benzo(k)fluoranthene	c	hhs	5
Chrysene	c	hhs	50
Dibenzo(a,h)anthracene	c	hhs	0.05*
Fluoranthene	n	hhs	20
Fluorene	n	hhs	50
Indeno(1,2,3-cd)pyrene	c	hhs	0.5
Naphthalene	c	hhs	100
Pyrene	n	hhs	20
1-Methylnaphthalene	c	rsl	11
2-Methylnaphthalene	n	rsl	36

Notes:

(a) = An exceedance of the 1,000 µg/l EPH/TEH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH/TEH value does not need to be identified as a COPC exceeding RBSLs.

(b) = The fraction surrogate (for modeling purposes) uses a representative compound with a mid range Equivalent Carbon Number (Massachusetts DEP 2002 Table 4-14). This number doesn't take into account the higher molecular weight compounds that have higher solubilities than the fraction surrogate therefore underestimating the overall solubility of the fraction.

Effect is either:

n = non-carcinogenic RBSLs and RSLs are based on a hazard quotient of 1, or
c = carcinogenic RBSLs and RSLs are based on a cancer risk $1X10^{-5}$.

Basis is:

rb = risk-based screening level;
hhs = DEQ-7 Human Health Standard (DEQ, October 2012. Circular DEQ-7 Montana Numeric Water Quality Standards); or
rsl = tapwater risk-based screening level based upon TR of 1E-05 and THQ of 1.0 consistent with DEQ-7
bu = adversely affects beneficial uses (foul taste or odor).
* = The best achievable practical quantitation limit (0.1 µg/L) may be greater than the human health standard; therefore, if the compound is detected, additional evaluation may be necessary.

The RBSLs for soil and water are not designed to be protective of the vapor intrusion (VI) pathway. Please refer to the Vapor Intrusion to Indoor Air Section of the Montana Risk-Based Corrective Action Guidance for Petroleum Releases.

Attachment 4

Table 4

Master Table

All Potential Tier 1 RBSLs For Soil

MASTER TABLE
ALL POTENTIAL TIER 1 RBSLs FOR SOIL (mg/kg)
Leaching RBSLs are based on the distance from the bottom of the contamination to the groundwater.

Chemical	Leaching 0-10 feet	Leaching 10-20 feet	Leaching >20 feet	Direct Contact Residential	Direct Contact Commercial*	Direct Contact Construction
For Gasoline and Light Hydrocarbons measured using the Montana Method for Volatile Petroleum Hydrocarbons (VPH)						
C5-C8 Aliphatics	220	770	1,200	52	290	410
C9-C12 Aliphatics	11,000	40,000	60,000	77	360	640
C9-C10 Aromatics	130	470	720	130	1,000	1,000
MTBE	0.078	0.16	0.25	52	230	8,900
Benzene	0.07	0.21	0.33	1.3	5.7	240
Toluene	21	65	100	610	5,500	5,500
Ethylbenzene	26	84	130	6.4	28	1,300
Xylenes	320	1,000	1,600	72	310	610
Naphthalene	12	40	62	2.2[c]	9.5[c]	140[n]
Lead Scavengers						
1,2-Dibromoethane (EDB)	0.000086	0.00022	0.00033	0.04	0.18	7.8
1,2-Dichloroethane (DCA)	0.019	0.052	0.079	0.52	2.3	110
For Diesel and Heavy Hydrocarbons measured using the Montana Method for Extractable Petroleum Hydrocarbons (EPH)						
C9-C18 Aliphatics	53,000	170,000	270,000	110	540	900
C19-C36 Aliphatics	Considered Immobile			24,000	200,000	200,000
C11-C22 Aromatics	370	1,300	2,000	490	3,900	3,900
Acenaphthene	27	91	140	450	3,800	3,800
Anthracene	2,600	8,800	14,000	2,200	19,000	19,000
Benz(a)anthracene	6.8	23	35	1.3	24	390
Benzo(a)pyrene	2.3	7.5	12	0.13	2.4	39
Benzo(b)fluoranthene	23	76	120	1.3	24	390
Benzo(k)fluoranthene	230	750	1,200	13	240	3,900
Chrysene	690	2,300	3,500	130	2400	39,000
Dibenzo(a,h)anthracene	7.5	24	38	0.13	2.4	39
Fluoranthene	85	280	440	300	2,500	2,500
Fluorene	35	120	180	300	2,500	2,500
Indeno(1,2,3-cd)pyrene	77	250	380	1.3	24	390
Naphthalene	12	40	62	2.2[c]	9.5[c]	140[n]
Pyrene	83	280	430	220	1,900	1,900
1-Methylnaphthalene	2.1	7.1	11	20	81	1,400
2-Methylnaphthalene	6.9	23	35	30	250	250

c = based upon carcinogenicity

n = based upon non-carcinogenicity

* = Construction workers are exposed to both surface and subsurface soil. The lower of construction or commercial RBSLs are provided here.