Memorandum

To: David Bowers

From: Aimee Reynolds

Date: 5/31/16

Re: Montana Pole Direct Contact Cleanup Level 5-Year Review

At your request I recalculated the site-specific cleanup levels (SSCLs) for Montana Pole using updated exposure parameters and toxicity criteria as appropriate. The calculated cleanup levels are provided in the table below along with the preliminary remediation goals (PRGs) provided in Table 2 of the September 1993 Record of Decision (ROD). I did not include residential PRGs or recalculate SSCLs since I understand that this usage is not being considered for the site. All concentrations are in milligrams per kilogram (mg/kg). I added SSCLs for construction worker exposure to both surface and subsurface soil in case they were needed since they were not provided in the ROD. Based upon this analysis, offloading the land treatment unit soils that meet the pentachlorophenol and carcinogenic polynuclear aromatic hydrocarbons (cPAHs) PRGs and capping those soils would still be protective of the proposed uses from a direct contact standpoint. However, the leaching to groundwater analysis should still be completed to determine the appropriate cap design.

Chemical (mg/kg)	Recreational		Industrial		Construction	
	PRG	SSCL	PRG	SSCL	PRG	SSCL
Pentachlorophenol	34	36	9	7	NA	77
Dioxins/Furans (TEF)	0.0002	0.0001	0.00003	0.00004	NA	0.0004
Carcinogenic PAHs (TEF)	4	2	0.7	0.5	NA	5

The following is a parameter by parameter comparison between the PRG toxicity and risk criteria and exposure parameters and those used in the SSCL calculations.

Toxicity Criteria:
The most current toxicity criteria were used to calculate the SSCLs. I have provided the former values where they were available. Inhalation risks were not included in the PRG calculations likely due to the lack of inhalation toxicity criteria available at the time of the PRG calculations.

Dioxins/furans: Updated 2005 World Health Organization toxicity equivalence factors (TEFs) should be used when calculating toxicity equivalents (TEQs) for the data. The oral cancer slope

factor has been updated from 1.5E+05 to 1.3E+05 milligram per kilogram per day $(mg/kg\text{-}day)^{-1}$ based upon California Environmental Protection Agency (EPA) criteria accepted by the United States EPA and provided in the EPA Regional Screening Levels (RSL) table. Dioxins/furans now have an inhalation unit risk (IUR) of 38 microgram per cubic meter $(\mu g/m^3)^{-1}$ also developed by California EPA and provided in the RSL table. Dioxins/furans also now have an oral reference dose (RfD) of 7E-10 mg/kg-day found on the EPA Integrated Risk Information System (IRIS) and an inhalation reference concentration (RfC) of 4E-8 milligram per cubic meter (mg/m^3) developed by California EPA and provided in the RSL table. Inhalation risks were added for both carcinogenic and non-carcinogenic SSCLs and employed the current volatilization factor of 1.96E+06 m^3/kg and particulate emission factor (PEF) of 1.36E+09 m^3/kg as well as a trespasser/recreational exposure time of 2 hours based upon professional judgement.

Pentachlorophenol: The oral cancer slope factor found in IRIS has been updated from 0.12 $(mg/kg\text{-}day)^{-1}$ to 0.4 $(mg/kg\text{-}day)^{-1}$ and pentachlorophenol now has an IUR of 5.1E-06 $(\mu g/m^3)^{-1}$ developed by California EPA and provided in the RSL table. Inhalation risk was added for carcinogenic SSCLs and employed the current PEF of 1.36E+09 m^3/kg as well as a trespasser/recreational exposure time of 2 hours based upon professional judgement. The IRIS RfD for pentachlorophenol has been updated from 0.03 mg/kg-day to 0.005 mg/kg-day.

Carcinogenic polynuclear aromatic hydrocarbons (cPAHs): The cPAH or B2 PAH toxicity is still based upon the toxicity equivalence to benzo(a)pyrene and the same TEFs are used to calculate cPAH TEQ SSCLs as were used to calculate the PRGs. The oral cancer slope factor used is still 7.3 $(mg/kg\text{-}day)^{-1}$ but now there is an IUR of 0.0011 $(\mu g/m^3)^{-1}$ developed by California EPA and inhalation risk was added for SSCLs and employed the current PEF of 1.36E+09 m^3/kg as well as a trespasser/recreational exposure time of 2 hours based upon professional judgement.

Target Risks and Hazard Quotients:
Target risks and hazard quotients cannot be less protective than those used to calculate the PRGs included in the ROD. Consistent with the ROD, all carcinogenic SSCLs are based upon a target risk of 1E-06. Non-carcinogenic SSCLs for dioxins/furans and pentachlorophenol were calculated based upon a target hazard quotient of 1 based upon critical effects of reproductive effects and liver effects, respectively. All SSCLs are based upon carcinogenic risks because these SSCLs were the more protective of the potential SSCLs (carcinogenic and non-carcinogenic).

Averaging Times:
Carcinogenic averaging times are based upon the average human lifespan of 78 years multiplied by 365 days included in the EPA Exposure Factors Handbook dated October 2011. This is an update from the 70 year lifespan upon which the PRG is based. The non-carcinogenic averaging times are based upon the exposure duration multiplied by 365 days consistent with the ROD.

Exposure Frequencies:
The site-specific exposure frequencies of 150 days per year for industrial workers and 60 days per year for trespassers/recreational users from the ROD are still appropriate and were used to develop the SSCLs. The Montana Department of Environmental Quality (DEQ) default exposure frequency of 124 days per year was used to calculate the construction worker SSCLs.

Exposure Durations:
The exposure durations for trespassers/recreational users of 12 years (6-18 year olds) and industrial workers of 25 years included in the ROD are still appropriate. The DEQ default exposure duration of 1 year was used to calculate the construction worker SSCLs.

Absorption Factors:
All oral relative absorption factors are 100% consistent with the ROD. Dermal absorption factors have been updated from 0.1 for organics, and 0.01 for inorganics and dioxins/furans upon which the PRGs were based. The dermal absorption factors for dioxins/furans, pentachlorophenol, and cPAHs used to calculate the SSCLs are 0.03, 0.25, and 0.13, respectively.

Conversion Factors:
Conversion factors for ingestion and inhalation are used as appropriate in both the PRG and SSCL calculations.

Ingestion Rates:
Soil ingestion rates for both trespassers/recreational users and industrial workers are 100 mg/day. Based upon current DEQ default values, trespassers/recreational users are assumed to ingestion 100% of their total daily soil quantity from onsite sources on the days that they visit the site, which is more protective than the 50% included in the PRG calculation. An ingestion rate of 330 mg/day was used for the construction worker.

Body Weights:
The adult body weight provided in the EPA February 2014 Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors of 80 kg was used for the industrial and construction worker SSCLs. This is an update of the 70 kg body weight used for the PRG calculation. A 45 kg DEQ default body weight for the trespasser/recreational user was used for the SSCLs as an update to the 43 kg used for PRG calculation.

Skin Surface Areas:
The updated skin surface of 3,527 square centimeters per day (cm^2/day) was used for both the industrial and construction workers based upon the EPA February 2014 default exposure factors, which is an update of the 3,120 cm^2/day used for PRG calculation. The DEQ default skin surface area for trespassers/recreational users of 4,400 cm^2/day was used as an update to the 5,165 cm^2/day used for PRG calculation.

Adherence Factors:
The PRGs were based upon a skin adherence factor of 1.45 mg/cm^2 was used for all receptors. Current adherence factors for trespassers/recreational users, industrial workers, and construction workers are 0.04, 0.12, and 0.3 mg/cm^2, respectively and were used in the SSCLs calculations.