

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS

<p>PURPOSE OF THE TABLE:</p> <ul style="list-style-type: none"> • To provide a summary of the variables used to calculate cancer risks • To show the EPC (medium-specific or route-specific) and intake used in the cancer risk calculations • To present the result of the calculation for each exposure route/pathway for each COPC • To provide the total cancer risks for all exposure routes/pathways for the scenario timeframe, exposure medium, and receptor presented in this table. 	<p><i>The medium-specific or Medium EPC is the same for a particular medium regardless of exposure route.</i></p> <p><i>The route-specific or Route EPC differs from the Medium EPC in that the Route EPC may consider the transfer of contaminants from one medium to another, where applicable for a particular exposure route.</i></p>
<p>INFORMATION DOCUMENTED:</p> <ul style="list-style-type: none"> • The cancer risk value for each COPC for each exposure route/pathway • The values used for EPC, cancer intake, and cancer slope factor for each COPC for each exposure route. 	
<p>TABLE NUMBERING AND SUMMARY BOX INSTRUCTIONS:</p> <ul style="list-style-type: none"> • Complete one copy of Table 8 for each unique combination of the following six fields that will be quantitatively evaluated (Scenario Timeframe, Medium, Exposure Medium, Exposure Point, Receptor Population, and Receptor Age). • Enter each combination of these six fields in the Summary Box in the upper left corner of the table. • Number each table uniquely, beginning with 8.1 and ending with 8.n where “n” represents the total number of combinations of the six key fields. • Different tables should be prepared to address RME and CT cancer risk calculations. • Tables 8.1. RME through 8.n. RME should be completed for RME cancer risk calculations. • Tables 8.1. CT through 8.n. CT should be completed for CT cancer risk calculations. 	<p><i>It is possible that some tables may contain the same data associated with different descriptions in the Summary Box in the upper left corner.</i></p> <p><i>In the example Standard Tables, the sediment EPC values in Tables 8.4.RME through 8.7.RME may be the same. However the intakes may vary due to differences in the Scenario Timeframes and Receptor Ages.</i></p> <p><i>Separate tables are necessary to ensure transparency in data presentation and appropriate information transfer to CERCLIS 3 for each exposure pathway. Replication of information is readily accomplished using spreadsheet software.</i></p>

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS (continued)

TABLE NUMBERING AND SUMMARY BOX INSTRUCTIONS (continued):

For the example data provided, there should be seven copies of Table 8 for the RME calculations, numbered 8.1.RME through 8.7.RME. Seven corresponding tables should be prepared for CT calculations, numbered 8.1.CT through 8.7.CT.

<u>Table Number</u>	<u>Scenario Timeframe</u>	<u>Medium</u>	<u>Exposure Medium</u>	<u>Exposure Point</u>	<u>Receptor Population</u>	<u>Receptor Age</u>
8.1.RME	Current	Groundwater	Groundwater	Aquifer 1-- Tap Water	Resident	Adult
8.2.RME	Current	Groundwater	Groundwater	Aquifer 1-- Tap Water	Resident	Child
8.3.RME	Current	Groundwater	Air	Aquifer 1-- Water Vapors at Showerhead	Resident	Adult
8.4.RME	Current	Sediment	Animal Tissue	Trout from Dean's Creek	Fisher	Adult
8.5.RME	Current	Sediment	Animal Tissue	Trout from Dean's Creek	Fisher	Child
8.6.RME	Future	Sediment	Animal Tissue	Trout from Dean's Creek	Fisher	Adult
8.7.RME	Future	Sediment	Animal Tissue	Trout from Dean's Creek	Fisher	Child

GENERAL NOTES/INSTRUCTIONS FOR THIS TABLE:

- All table entries with the exception of intake and cancer risk are presented on tables preceding Table 8.
- With the exception of modeled intakes, the intake value is the result of calculations performed using parameters and equations presented in Table 4 and concentrations presented in Table 3.
- The total cancer risk for each exposure route is to be summed and the total cancer risk for all exposure pathways is to be presented as a sum at the end of the table. This value represents the cancer risk of the various exposure routes/pathways combined.

The medium-specific or Medium EPC is the same for a particular medium regardless of exposure route.

The route-specific or Route EPC differs from the Medium EPC in that the Route EPC may consider the transfer of contaminants from one medium to another, where applicable for a particular exposure route.

Medium EPC and Route EPC Examples for Frequently Evaluated Pathways

<u>Medium</u>	<u>Exposure Medium</u>	<u>Exposure Route</u>	<u>Medium EPC</u>	<u>Route EPC</u>	<u>EPC Selected For Calculation</u>
Groundwater	Groundwater	Ingestion	Measured	Measured	M
Groundwater	Groundwater	Dermal	Measured	Modeled	R
Groundwater	Air	Inhalation	Measured	Modeled	R
Soil	Soil	Ingestion	Measured	Measured	M
Soil	Soil	Dermal	Measured	Modeled	R
Soil	Air	Inhalation	Measured	Modeled ¹	R

¹EPC's will be modeled separately for particulates and vapors.
 Measured - Developed from a statistical derivation of measured data.
 Modeled - Developed from model based on measured data.
 M - Medium EPC R - Route EPC

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS (continued)

HOW TO COMPLETE/INTERPRET THE TABLE	
SUMMARY BOX IN UPPER LEFT CORNER	
Row 1 - Scenario Timeframe	
Definition: <ul style="list-style-type: none"> The time period (current and/or future) being considered for the exposure pathway. 	
Instructions: <ul style="list-style-type: none"> Choose from the picklist to the right. 	<i>Current</i> <i>Future</i> <i>Current/Future</i> <i>Not Documented</i>
Row 2 - Medium	
Definition: <ul style="list-style-type: none"> The environmental substance (e.g., air, water, soil) which has been contaminated. 	
Instructions: <ul style="list-style-type: none"> Choose from the picklist to the right. 	<i>Groundwater</i> <i>Leachate</i> <i>Sediment</i> <i>Sludge</i> <i>Soil</i> <i>Surface Water</i> <i>Debris</i> <i>Other</i> <i>Liquid Waste</i> <i>Solid Waste</i> <i>Air</i> <i>Surface Soil</i> <i>Subsurface Soil</i>
Row 3 - Exposure Medium	
Definition: <ul style="list-style-type: none"> The contaminated environmental medium to which an individual is exposed. Includes the transfer of contaminants from one medium to another. <p><i>For example:</i></p> <ol style="list-style-type: none"> <i>Contaminants in Groundwater (the Medium) remain in Groundwater (the Exposure Medium) and are available for exposure to receptors.</i> <i>Contaminants in Groundwater (the Medium) may be transferred to Air (the Exposure Medium) and are available for exposure to receptors.</i> <i>Contaminants in Sediment (the Medium) may be transferred to Animal Tissue (the Exposure Medium) and are available for exposure to receptors.</i> 	

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS (continued)

<p>Instructions:</p> <ul style="list-style-type: none"> Choose from the picklist to the right. 	<p><i>Groundwater Leachate Sediment Sludge Soil Surface Water Debris Other Liquid Waste Solid Waste Air Plant Tissue Animal Tissue Spring Water Surface Soil Subsurface Soil Particulates Vapors</i></p>
<p>Row 4 - Exposure Point</p>	
<p>Definition:</p> <ul style="list-style-type: none"> An exact location of potential contact between a person and a chemical within an exposure medium. <p><i>For example:</i></p> <ol style="list-style-type: none"> <i>Contaminants are in Groundwater (the Medium and the Exposure Medium) and exposure to Aquifer 1 - Tap Water (the Exposure Point) is evaluated.</i> <i>Contaminants in Groundwater (the Medium) may be transferred to Air (the Exposure Medium) and exposure to Aquifer 1 - Water Vapors at Showerhead (the Exposure Point) is evaluated.</i> <i>Contaminants in Sediment (the Medium) may be transferred to Animal Tissue (the Exposure Medium) and Trout from Dean's Creek (the Exposure Point) is evaluated.</i> 	
<p>Instructions:</p> <ul style="list-style-type: none"> Provide the information as text in the Table (not to exceed 80 characters). 	<p><i>The text in the Table can not exceed 80 characters</i></p>
<p>Row 5 - Receptor Population</p>	
<p>Definition:</p> <ul style="list-style-type: none"> The exposed individual relative to the exposure pathway considered. 	<p><i>For example, a resident (receptor population) who drinks contaminated groundwater.</i></p>

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS (continued)

<p>Instructions:</p> <ul style="list-style-type: none"> Choose from the picklist to the right. 	<p><i>Resident Industrial Worker Commercial Worker Construction Worker Other Worker Golfer Jogger Fisher Hunter Fisher/Hunter Swimmer Other Recreational Person Child at School/Daycare/ Playground Trespasser/Visitor Farmer Gardener Other</i></p>
<p>Row 6 - Receptor Age</p>	
<p>Definition:</p> <ul style="list-style-type: none"> The description of the exposed individual, as defined by the EPA Region or dictated by the site. 	<p><i>For example, an adult (receptor age) resident (receptor population) who drinks contaminated groundwater.</i></p>
<p>Instructions:</p> <ul style="list-style-type: none"> Choose from the picklist to the right. 	<p><i>Child Adult Adolescents (teens) Pre-Adolescents Not Documented Child/Adult Geriatric Sensitive Other Infant Toddler Pregnant</i></p>
<p>BODY OF THE TABLE</p>	
<p>Column 1 - Exposure Route</p>	
<p>Definition:</p> <ul style="list-style-type: none"> The way a chemical comes in contact with a person (e.g., by ingestion, inhalation, dermal contact). 	
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the exposure route considered from the picklist to the right. 	<p><i>Inhalation Ingestion Combined (i.e., Inhalation and Ingestion) Dermal Absorption Not Documented External (Radiation)</i></p>

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS (continued)

Column 2 - Chemical of Potential Concern	
<p>Definition:</p> <ul style="list-style-type: none"> Chemicals that are potentially site-related, with data of sufficient quality, that have been retained for quantitative analysis as a result of the screening documented in Table 2. 	
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the COPCs selected from the COPC screening. 	<i>Table 2 documents COPC screening.</i>
Column 3 - Medium EPC Value	
<p>Definition:</p> <ul style="list-style-type: none"> The EPC, based on either a statistical derivation of measured data or modeled data, that was selected to represent the medium-specific concentration for the exposure calculations. The Medium EPC differs from the Route EPC in that the Medium EPC does not consider the transfer of contaminants from one medium to another. <p><i>For example, the Medium EPC value may be statistically derived by calculating the 95% UCL of measured groundwater contaminant concentrations from multiple residential wells. Alternatively, the Medium EPC value may be selected as a single measured value, if one data point is used to calculate the risk for each residential well individually. In some cases, the Medium EPC value may be a modeled value (e.g., if upgradient groundwater contaminant concentrations are used to model a downgradient exposure point.) Note that none of these examples consider the transfer of contaminants from one medium to another, as is evaluated by Route EPC.</i></p>	<i>The Medium EPC Value may be developed from a statistical derivation of measured data or from modeled data.</i>
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the medium EPC value for each COPC. 	<i>Table 3 documents medium EPC calculations for RME and CT.</i>
Column 4 - Medium EPC Units	
<p>Definition:</p> <ul style="list-style-type: none"> The units associated with the medium EPC value. 	
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the units for medium EPC values. 	<i>The units may vary depending on the medium.</i>

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS (continued)

Column 5 - Route EPC Value	
<p>Definition:</p> <ul style="list-style-type: none"> The EPC, based on either a statistical derivation of measured data or based on modeled data, that was selected to represent the route-specific concentration for the exposure calculations. The Route EPC differs from the Medium EPC in that the Route EPC may consider the transfer of contaminants from one medium to another, where applicable for a particular exposure route. <p><i>For example,</i></p> <p><i>for groundwater ingestion, the Medium EPC and the Route EPC will typically be the same value. Alternatively, for groundwater inhalation, the Medium EPC will often be a statistical derivation of measured concentrations in groundwater, while the Route EPC will often be a modeled inhalation concentration that is based on the measured concentrations.</i></p>	<p><i>The Route EPC may be developed from a statistical derivation of measured data or from modeled data. The Route EPC may be identical to the Medium EPC or it may be modeled based on the Medium EPC.</i></p>
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the route EPC value for each COPC. 	<p><i>Supporting information should be provided documenting Route EPC calculations.</i></p>
Column 6 - Route EPC Units	
<p>Definition:</p> <ul style="list-style-type: none"> The units associated with the route EPC value. 	<p><i>The units may vary depending on route of exposure.</i></p>
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the units for route EPC values. 	
Column 7 - EPC Selected for Risk Calculation	
<p>Definition:</p> <ul style="list-style-type: none"> The EPC that will be used to quantify potential cancer risks. 	
<p>Instructions:</p> <ul style="list-style-type: none"> Identify the type of EPC used for cancer risk calculations for each COPC for each exposure route. Enter “M” for medium EPC. Enter “R” for route EPC. 	<p><i>M (Medium EPC) R (Route EPC)</i></p> <p><i>Follow Regional guidance for selection of this value.</i></p>

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS (continued)

Column 8 - Intake (Cancer)	
<p>Definition:</p> <ul style="list-style-type: none"> A measure of exposure expressed as the mass of a substance in contact with the exchange boundary per unit body weight per unit time (e.g. mg chemical/kg body weight/day). 	<i>Refers to the intake result using the parameters and equations/calculations, and or models presented in Table 4.</i>
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the result of the intake calculations/modeling performed for each COPC and exposure route. 	<i>The intake calculations and/or models are documented in Table 4.</i>
Column 9 - Intake Units (Cancer)	
<p>Definition:</p> <ul style="list-style-type: none"> The units for intake for each COPC and exposure route. 	
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the units from the intake calculation for each COPC which corresponds to each exposure route. 	
Column 10 - Cancer Slope Factor	
<p>Definition:</p> <ul style="list-style-type: none"> A plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. Usually the cancer slope factor is the upper 95th % confidence limit of the dose-response curve. 	
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the cancer slope factor for each COPC which corresponds to each exposure route. 	<i>The slope factors for each COPC are presented in Table 6.</i>
Column 11 - Cancer Slope Factor Units	
<p>Definition:</p> <ul style="list-style-type: none"> Usually, the cancer slope factor is the upper 95th % confidence limit of the dose-response curve and is expressed as (mg/kg-day)⁻¹. 	
<p>Instructions:</p> <ul style="list-style-type: none"> Enter the cancer slope factor units for each COPC for each exposure route. 	

INSTRUCTIONS FOR TABLE 8.1

CALCULATION OF CANCER RISKS (continued)

Column 12 - Cancer Risk	
<p>Definition:</p> <ul style="list-style-type: none">• The result of the cancer risk calculation for each COPC for each exposure route and pathway.	
<p>Instructions:</p> <ul style="list-style-type: none">• Enter the cancer risk calculation for each COPC.• Sum the cancer risk results for each exposure route/pathway.• Sum the total cancer risk results for all exposure routes/pathways.	<p><i>The sum of all exposure routes represents the total cancer risk for all exposure routes/ pathways.</i></p>