Division of Waste Management
Superfund Branch - Petroleum Cleanup Section
200 Fair Oaks Lane, 2nd Floor
Frankfort, KY 40601

INSTRUCTION BOOKLET FOR DEP 7097C

[Closure Report for Petroleum Releases and Exempt Petroleum Tank Systems]

Revised January 2005

Notice: On March 18, 2004, Kentucky enacted a new cleanup regulation (401 KAR 100:030), which establishes standards under KRS 224.01-400 and 224.01-405 with respect to hazardous substances, pollutants, contaminants, petroleum, and petroleum products that are protective of human health, safety, and the environment. This administrative regulation governs remediation under KRS 224.01-400 and 224.01-405, 224.01-510 through 224.01-532, and 224.01-450 to 224.01-465.

The purpose of this instruction booklet is to provide information and illustrations to complete the closure report to document the remediation of any site impacted by releases of petroleum or petroleum products, and the closure of petroleum storage tank systems that are not regulated under 401 KAR Chapter 42 (the Underground Storage Tank Program). **Please read the Instruction Booklet and Appendices to form DEP 7097C completely. New evaluation procedures have been implemented for screening and remediating sites.** This evaluation process requires calculations for determining contaminants of concern (CoCs) and the associated cancer risks and non-cancer hazards. Results of "non-detect" are considered to be at one-half their detection limit for purposes of calculation. Please note that sites with multiple contaminants must consider additivity when determining overall site risk. **Therefore, individual PRG values are not directly compared to individual sample results when screening or remediating sites with multiple contaminants of concern.**

For a detailed listing of tanks not regulated under the Underground Storage Tank Program, refer to 40 CFR Part 280. Registration and Notice of Intent to close exempt tanks and/or release sources is not required. While the use of this form is not required, the information requested on this form must be submitted to the Cabinet to receive a letter documenting closure of the site in accordance with KRS 224.01-405. **This form is not to be used for the closure of underground storage tanks regulated under 401 KAR Chapter 42.** For information on closure requirements for underground storage tanks regulated under 401 KAR Chapter 42, you may contact the Underground Storage Tank Branch at (502) 564-5981.

Applicable unregulated (exempt) tank and/or release sources include the following:

- farm or residential tanks with a capacity of 1,100 gallons or less used for storing motor fuel for noncommercial purposes;

- tanks used for storing heating oil for consumptive use on premises where stored;
- underground petroleum storage tanks that were closed before January 1, 1974 by removing all product and do not currently contain free product [less than one (1) inch];
- petroleum storage tanks on or above the floor of underground areas such as basements or tunnels;
- petroleum storage tanks with a capacity of 110 gallons or less;
- above ground storage tanks (greater than 90% of the volume of the tank including piping is above ground);
- surface releases of petroleum from spills, overfills, mechanical failure, transportation accidents, etc;
- petroleum releases from oil and gas sites, pipelines, pumps, sumps, pits, ponds, tanks or other containers; and
- all other potential release sources.

In accordance with KRS 224.01-400(11), [reportable releases of petroleum include twenty-five (25) gallons or more of petroleum or petroleum products in a 24 hour period or seventy-five (75) gallons or more of diesel fuel in a 24-hour period,] or any release which causes a sheen on the water or which violates any provision of Section 311 of the Clean Water Act is reportable. **Releases must be immediately reported to the Cabinet's 24 hour Environmental Response Team (ERT) number at (800)-928-2380 or (502) 564-2150. [All releases, whether they be reportable or not, must be remediated in accordance with KRS 224.01-400(18) to (21), KRS 224.01-405 and 401 KAR 100:030.]**

If there are questions concerning the regulatory status of a given tank system, a representative of the Underground Storage Tank Branch should be contacted at (502) 564-5981 or contact the Superfund Branch at (502) 564-6716.

INSTRUCTIONS

The following are instructions for completing the Closure Report. Contact the Superfund Branch at (502) 564-6716 if you have any questions concerning the form or the instructions.

Please read the **INSTRUCTIONS** below and complete the attached **CLOSURE REPORT** carefully and address all items. The appropriate information on the report must be complete with all requested attachments or it will not be accepted for review. **Submit the original report and one (1) copy to the Superfund Branch at the address on page 1 of the instructions.** Upon request by the Cabinet, for petroleum releases in which the regional office has oversight authority, the closure report should be submitted to the appropriate Division of Waste Management (DWM) regional office for review. A list of DWM regional offices is included as **Appendix F**.

Depending on the closure option that is chosen the following sections of the report must be completed:

- If clean closure or closure in-place under item 8 a, b or c is chosen, then Section I, II, and V of the Closure Report is to be completed.
- If Risk Assessment in item 8 d is chosen, then refer to Section I, III, and V.
- If site treatment under item 8 e is chosen, then Section I, IV, and V is to be completed.

SECTION I: FACILITY INFORMATION

1. Enter the name of the company, business, or owner of the property where the release occurred or where the tank is located.

   Enter the property owner information.

2. If the location of the facility is different from item #1, enter the information.

3. Enter the Latitude and Longitude of the facility locations(s). This information may be obtained from a USGS topographic map.

4. If the facility has been assigned an identification number by any program within the Department for Environmental Protection including the Facility Index System (FINDS), enter the number here.

5. Indicate the type of facility where the tank is located or the surface release occurred.

6. Enter the name, address, phone number and email address of the company or contractor performing the tank removal or release cleanup. Although a certified tank remover is not required for removal of unregulated tanks, it is **recommended** due to safety and liability concerns. You may contact the State Fire Marshal's office at **(502) 573-0382** to obtain a list of certified tank removal contractors.

7. Enter the number of tanks and/or releases to be closed at the site. **NOTE: for releases, items 7 b) and c) must also be completed.**

   7 a) **For tanks**, indicate the substance(s) currently or previously stored in each tank by entering the date when each substance was last stored in the tank. Enter the information in the tank/release content information section. Also indicate the size of the tank, date of installation, date of last use, and whether the tank is above ground or underground in the tank information section.

   7 a) **For releases**, check the box indicating the substance(s) released in the tank/release content information section. Enter the estimated volume released if known (in gallons) along with estimated volume recovered if any (in gallons) in the release information section. The approximate date the release occurred or was discovered should also be indicated in this section including whether the release was reported to the Cabinet. If reported, give the TEMPO Agency Interest Number assigned.

   See pages 6 to 8 of this booklet for an example on completing this chart.

   7 b) For each release indicated on the chart in item 7 a), enter the type of release.

   7 c) Provide a brief explanation of how the release occurred and any measures taken to prevent releases in the future. Attach additional sheets if necessary.

8. Indicate the type of closure being requested for each release or tank. Enter the release or tank number(s) from item 7 a).

   FOR MORE INFORMATION ON AVAILABLE CLOSURE OPTIONS, REFER TO (APPENDIX A) IN THIS BOOKLET.

9. Every effort should be made to remove the storage tank and/or piping, but if it cannot be removed, provide justification (technical, environmental, etc.) for leaving the tank(s) and/or piping in place.

10. a) Provide a site map drawn to scale with north arrow **(label as Attachment A)** showing the location of the tank or release, ancillary equipment, and other items of importance. This map may be hand-drawn, under the condition that all important features are included.

    b) Provide a USGS 7.5 minute topographic map **(label as Attachment B)** showing the location of the facility, the property boundaries, and any important features of the facility. List the quadrangle name.

    Topographic maps may be available through your local soil conservation district or county agricultural agent.

SECTION II: CLEAN CLOSURE OR CLOSURE IN-PLACE

Complete items 11 and 12 if an underground or above ground tank was closed and all contamination was removed. For surface releases not involving a tank system, skip items 11 and 12 and proceed to item 13.

11. Any sediment remaining in the tank must be properly characterized to determine if it will be regulated as a hazardous waste. This must be done by the Toxicity Characteristic Leaching Procedure (TCLP) and must comply with EPA SW-846 test methods. If the TCLP analysis indicates that the sediment is not a hazardous waste, it may be solidified and taken to a contained landfill for disposal. **If the analysis indicates that the sediment is hazardous, contact the Division of Waste Management, Hazardous Waste Branch at (502) 564-6716 for further information.** Provide receipts for disposal of any sediment or free product **(label as Attachment C)**.

12. a) What was done with the tank after it was removed? Was it taken to a landfill, scrap recycler, etc.?

    b) Provide proper documentation for tank disposal **(label as Attachment D).**

    c) If there was no release of petroleum to the environment and the tank was closed in-place, the tank must have been filled with an inert solid fill material (concrete, sand, gravel, etc.). What material was used?

13-15 Clean closure for unregulated UST's and surface petroleum releases from AST's and other sources can be achieved through removal of the contaminants to acceptable levels based on the **U.S. EPA Region 9 Preliminary Remediation Goals (PRG) (October 1, 2002) used in accordance with the U.S. EPA Region 9 Preliminary Remediation Goals Guidance Document (October 1, 2002) and other guidance documents established in 401 KAR 100:030. Copies of these documents can be found in the Appendices of this Instruction Booklet.** This evaluation process requires calculations for determining contaminants of concern (CoCs) and the associated cancer risks and non-cancer hazards. Results of "non-detect" are considered to be at one-half their detection limit for purposes of calculation. Please note that sites with multiple contaminants must consider additivity when determining overall site risk. **Therefore, individual PRG values are not directly compared to individual sample results when screening or remediating sites with multiple contaminants of concern.**

This requires taking separate samples of the excavated soils, pit walls, pit floor, and water in the pit (if applicable), and other samples as necessary. The type of analysis performed depends on which substance(s) was stored in the tank at any time since installation. All analyses must be performed in accordance with EPA SW-846 test methods. See Table A, on page 6 of the Closure Report for analytical requirements.

If the release involves **waste oil** it must be demonstrated that the appropriate metal(s) concentrations in the pit were not above naturally occurring levels for the geologic setting of the site. Therefore, the sampling plan for closure of a site with potential metals contamination must accurately establish background levels for each constituent of concern as well as characterize levels in the pit. For releases of **new oil**, **hydraulic oil**, **mineral oil** and **other petroleum products**, it will be necessary to establish that **no carcinogenic PAH constituents exist above Region 9 PRG screening levels and that the reporting level for those analyses must be at or below the PRG screening levels for the individual PAH constituents.** The total petroleum hydrocarbons (TPH) levels must be **at or below 100 ppm with no carcinogenic PAH constituents present for residential sites** and **at or below 250 ppm with no carcinogenic PAH constituents present for industrial sites.**

Copies of laboratory analysis data sheets for **all pit samples** (pit walls, floor, excavated soils, and any water in the pit) must be submitted, as well as all chain of custody documents and a legible sampling map that shows the location of all samples collected **(label as Attachment E).** A table summarizing the data is helpful but will not substitute for submission of the individual lab sheets and custody documents.

Provide disposal receipts for any excavated soil that clearly identifies the disposal facility **(label as Attachment F)**.

Copies of laboratory analysis data sheets and chain of custody documents for **inorganic background samples** must be submitted **(label as Attachment G)**. A table summarizing the data is helpful but will not substitute for submission of the individual lab sheets and chain of custody documents.

16. Table A, on page 6 of the closure report, lists the required analytical test methods for petroleum products. Only approved EPA SW-846 laboratory methods are acceptable. Extended SW-846 methods may also be used for some petroleum releases. Contact the Superfund Branch for further information on acceptable laboratory methods.

17. Clean closure for unregulated UST's and surface petroleum releases from AST's and other sources can be achieved through removal of the contaminants to acceptable levels based on the **U.S. EPA Region 9 Preliminary Remediation Goals (PRG) (October 1, 2002) used in accordance with the U.S. EPA Region 9 Preliminary Remediation Goals Guidance Document (October 1, 2002) and other guidance documents established in 401 KAR 100:030. Copies of these documents can be found in the Appendices of this Instruction Booklet.** This evaluation process requires calculations for determining contaminants of concern (CoCs) and the associated cancer risks and non-cancer hazards. Results of "non-detect" are considered to be at one-half their detection limit for purposes of calculation. Please note that sites with multiple contaminants must consider additivity when determining overall site risk. **Therefore, individual PRG values are not directly compared to individual sample results when screening or remediating sites with multiple contaminants of concern.**

SECTION III: RISK ASSESSMENT

Two options, Option A (No Further Action) and Option B (Management), allow waste to be left in-place with demonstration that the risk posed by the contaminants is acceptable or will be managed. Closure under these options requires the submittal of risk screening or risk assessment reports. **Appendix A** discusses general requirements. Refer to KRS 224.01-400 and any regulations adopted thereafter for detailed information. Contact Jerri Martin, Supervisor, Risk Assessment Section, Superfund Branch at (502) 564-6716, Extension 4727, with questions on acceptable risk assessment procedures.

SECTION IV: SITE TREATMENT

Complete this section if contaminated soils and/or groundwater from the tank or release are to be treated to achieve acceptable levels for clean closure. **A Corrective Action Plan (CAP) must be submitted for all sites proposing to treat petroleum-contaminated soils and/or groundwater.** The CAP must address all of the items listed in Section IV of the Closure Report to be approved prior to starting the treatment (label as **Attachment H**). **If groundwater has been impacted, contact the Superfund Branch at (502) 564-6716. For guidance, see Appendix C, Kentucky Guidance for Groundwater Assessment Screening, January 15, 2004.**

18. Enter the amount of contaminated soil that is to be treated and the type of proposed treatment for soils and/or groundwater.

19. Enter location of treatment area if different from tank or release location in Section I.

20. All analyses must comply with EPA SW-846 test methods listed in item 16, Table A. Enter the dates treatment will begin and end.

21. Enter the requested information regarding the company that is performing the soil and/or groundwater treatment.

22. If the contaminated soil is going to be transported to a permitted off-site treatment facility, enter the information.

SECTION V: APPLICANT CERTIFICATION

Complete all items.

THE FOLLOWING IS AN EXAMPLE:

A facility had four (4) tanks. The owner wished to close three of them. The fourth was involved in a reportable surface release of petroleum that will require corrective action. Another separate petroleum release was also closed.

Tank number 1 was a 1,000 gallon capacity underground tank installed in July 1968 and last used in October 1973. From the date of installation until December 1970, the tank contained leaded gasoline. From December 1970 until October 1973 it contained diesel.

Tank number 2 was a 110 gallon capacity underground tank installed in October 1980 and last used in August 1990. During this time the tank contained heating oil, which was used to heat the facility.

Tank number 3 was a 500 gallon capacity above ground storage tank installed in June 1983 and last used in July 1993. The tank contained diesel, which was sold for commercial purposes.

Release number 4 occurred on December 19, 1995, as the result of an equipment failure that caused a tank supply truck to accidentally overfill a fourth above ground tank. This resulted in the release of approximately 400 gallons of heating oil at the surface of the facility. The SPCC dike failed to contain most of the product and approximately 100 gallons of heating oil was recovered from the release. The release was reported to the Environmental Response Team (ERT) in accordance with KRS 224.01-400(11).

Release number 5 occurred in a separate part of the property, within a fenced-in area, used for a number of years as a routine maintenance area and as a storage area for out-of-service vehicles, resulting in releases of waste oil at the surface.

An example of a chart that was completed using the information provided above can be found below.

Substance Stored in Tank(s) or Released	Release or Tank No. 1	Release or Tank No. 2	Release or Tank No. 3	Release or Tank No. 4	Release or Tank No. 5
Tank/Release Content Information					
Kerosene					
Leaded Gasoline	Dec 1970				
Unleaded Gasoline					
Diesel	Oct 1973		July 1993		
Waste Oil					X
Heating Oil		Aug 1990		X	
Other (List product)					
Unknown					
Tank Information					
Size of Tanks (gals)	1000	110	500	NA	NA
Date Of Installation	July 1968	Oct 1980	June 1983	NA	NA
Date of Last Use	Oct 1973	Aug 1990	July 1993	NA	NA
Above Ground Tank (AG) Underground Tank (UG)	UG	UG	AG	NA	NA
Release Information					
Volume Released (gals)				400	Unknown
Volume Recovered (gals)				100	None
Date Release Discovered				12/19/95	Unknown
Release Reported? (yes or no)				Yes	No
Notification/Complaint Number (if applicable)				10001	NA

In the example provided above, the owner wished to close each tank/release under a different option. These examples illustrate the following remediation options:

a) 1 Clean Closure. (Underground Storage Tanks only) Complete Section II.
b) 2 Closure in-place. (UST's and/or piping) Complete Section II.
c) 3 Clean Closure. (Above Ground Tanks and Surface Releases)
d) 5 Risk Assessment. Refer to Section III.
e) 4 Site Treatment. Complete Section IV.

Tank Number 1 had a small volume of contamination, which included lead in the soil surrounding the tank. The owner chose to remove and properly dispose of the tank and soil at a contained landfill. The tank was clean closed.

Tank Number 2 had not leaked, as indicated by samples collected from soil borings around the tank. However, due to the tank's proximity to a large building on the facility, it was not feasible for it to be removed. The owner chose to close this tank in-place. The tank was cleaned out, filled with an inert material (such as sand or gravel) and sealed. This tank was also clean closed.

Tank Number 3 was above ground. It had leaked for several years and there was contamination on the ground surface underneath and around the tank. The tank and piping were removed and sold to a scrap dealer. The contaminated soil was removed and hauled to an approved disposal facility. This tank was clean closed.

Release Number 4 occurred in close proximity to Tank Number 2 and the building. Soil borings indicated that heating oil released at the fill pipe of the AST, at the surface, and had migrated underneath the building. As a result, removal and disposal of contaminated soils would have been extremely difficult. A corrective action plan (CAP) was submitted to the Superfund Branch proposing to treat the contaminated soils by in-situ bioremediation. The CAP was approved and after six months of treatment, the soils met the allowable levels. The release was clean closed.

Release Number 5 involved an unknown number of surface releases of waste oil. A record search and fieldwork conducted on the site indicated contamination had impacted soil to a significant depth and that several buried utility conduits were involved. The area was isolated with relatively low levels of contamination, limited exposure pathways, and few potential receptors. Complete removal of the impacted media would have been difficult in this case; therefore, the owner chose to submit a risk assessment and management plan for the impacted area. The release was closed under option B (Management) under KRS 224.01-400(18).

Please note the following: The cabinet does not discriminate on the basis of race, color, national origin, sex, religion, age, or disability in employment or the provision of services. Upon request, the cabinet will provide reasonable accommodations including auxiliary aides and services necessary to afford individuals with disabilities an equal opportunity to participate in programs and activities. To request an alternate format for this report, contact the Superfund Branch at (502) 564-6716.

APPENDICES

Appendix A - Closure Options for Petroleum Releases

Appendix B - Kentucky Guidance for Ambient Background Assessment (January 8, 2004)

Appendix C - Kentucky Guidance for Groundwater Assessment Screening (January 15, 2004)

Appendix D - EPA Region 9 Preliminary Remediation Goals Guidance Document (October 1, 2002)

Appendix E - EPA Region 9 PRG Table (October 2002)

Appendix F - List of Division of Waste Management Regional Offices

APPENDIX A

CLOSURE OPTIONS FOR PETROLEUM RELEASES

CLOSURE OPTIONS FOR PETROLEUM RELEASES

This part of the **Closure Report** provides guidance on the current options that are available for remediation of sites impacted by releases of petroleum or petroleum products, and closure of petroleum storage tank systems that are not regulated under 401 KAR Chapter 42 (the Underground Storage Tank Program). The regulations and statutes referenced in this Appendix should be consulted for further information concerning regulatory requirements and procedures.

KRS 224.01-405 addresses the requirements for performing corrective action in the event of a release of petroleum or petroleum products from a source other than a regulated storage tank. This statute, which became effective on July 15, 1994, allows use of the cleanup options in KRS 224.01-400 (18) as listed below:

a) demonstrating that no action is necessary to protect human health, safety, and the environment;

b) managing the release in a manner that controls and minimizes the harmful effects of the release and protects human health, safety, and the environment;

c) restoring the environment through the removal of the petroleum or petroleum product;

d) any combination of the above.

I. Clean Closure or Closure in-Place (Underground Storage Tanks)

Clean closure for unregulated UST's can be achieved through removal of the contaminants to acceptable levels **based on the U.S. EPA Region 9 Preliminary Remediation Goals (PRG) (October 1, 2002) used in accordance with the U.S. EPA Region 9 Preliminary Remediation Goals Guidance Document (October 1, 2002) and other guidance documents established in 401 KAR 100:030. Copies of these documents can be found in the Appendices of this Instruction Booklet.** This evaluation process requires calculations for determining contaminants of concern (CoCs) and the associated cancer risks and non-cancer hazards. Results of "non-detect" are considered to be at one-half their detection limit for purposes of calculation. Please note that sites with multiple contaminants must consider additivity when determining overall site risk. **Therefore, individual PRG values are not directly compared to individual sample results when screening or remediating sites with multiple contaminants of concern.**

Closure in-place for unregulated UST's can be achieved through the collection of soil samples from around the tank to ensure that allowable levels have been met, **based on the U.S. EPA Region 9 Preliminary Remediation Goals (PRG) (October 1, 2002) used in accordance with the U.S. EPA Region 9 Preliminary Remediation Goals Guidance Document (October 1, 2002) and other guidance documents established in 401 KAR 100:030. Copies of these documents can be found in the Appendices of this Instruction Booklet.** This evaluation process requires calculations for determining contaminants of concern (CoCs) and the associated cancer risks and non-cancer hazards. Results of "non-detect" are considered to be at one-half their detection limit for purposes of calculation. Please note that sites with multiple contaminants must consider additivity when determining overall site risk. **Therefore, individual PRG values are not directly compared to individual sample results when screening or remediating sites with multiple contaminants of concern.** After it is demonstrated that allowable levels are met, the tank must be cleaned and filled with an inert material (sand, concrete, gravel, etc.).

II. Clean Closure (Above Ground Storage Tanks and Surface Releases)

Clean closure, or restoring the environment, for **surface** petroleum releases from above ground storage tanks (AST's) and other sources can be achieved through removal of the contaminants to acceptable levels **based on the U.S. EPA Region 9 Preliminary Remediation Goals (PRG) (October 1, 2002) used in accordance with the U.S. EPA Region 9 Preliminary**

Remediation Goals Guidance Document (October 1, 2002) and other guidance documents established in 401 KAR 100:030. Copies of these documents can be found in the Appendices of this Instruction Booklet. This evaluation process requires calculations for determining contaminants of concern (CoCs) and the associated cancer risks and non-cancer hazards. Results of "non-detect" are considered to be at one-half their detection limit for purposes of calculation. Please note that sites with multiple contaminants must consider additivity when determining overall site risk. **Therefore, individual PRG values are not directly compared to individual sample results when screening or remediating sites with multiple contaminants of concern.** Completion of the **Closure Report** and submittal of all documentation achieving allowable levels as required by the form effectively meets the requirements for an Option C cleanup under KRS 224.01-400 (18) and 401 KAR 100:030.

Suggested Method for Soil Analysis

Our current regulation 401 KAR 100:030 (http://www.lrc.state.ky.us/kar/401/100/030.htm) specifies that data is to be screened using the Oct. 2002 EPA Region 9 PRG's and associated EPA guidance document (both located at the bottom of the page under **Cleanup Standards for Voluntary Cleanup)** at: (http://www.waste.ky.gov/branches/sf/VERPPage.htm).

Our regulation defines target risk to be an excess cancer risk of one in a million for carcinogenic endpoints and a hazard index of 1.0 for non-cancer endpoints. **We always calculate the target risk for a residential scenario to determine if any remedial actions, including land use restrictions, are necessary.** However, we also calculate the target risk for industrial scenarios to determine if an acceptable risk can be reached with land use controls alone. **We calculate these risks for both surface (0 to 1') and subsurface (1' and deeper) exposure.**

The target risks are calculated only for those substances determined to be contaminants of concern (CoCs). Our Risk Assessment Section has provided us with the criteria for determining CoCs, developed primarily from the EPA Risk Assessment Guidance for Superfund document (RAGS).

First, we define an Exposure Concentration **(EC)** for each compound. **The EC is the lower of these two values:**

a) the 95% UCL of the arithmetic mean of the site data **or**
b) the maximum detected value.

We use 1/2 the detection limit for non-detect values, and we use ProUCL for calculating the 95%UCL. Where there is insufficient variation or sample amounts to run ProUCL, we usually select the highest value as the EC.

A compound is **not a CoC if:**

1) For **inorganic compounds**, the concentrations fall within ambient background concentrations. To do this, **the site data must pass three sub tests:**

a) the mean site concentration for the compound must be below the 95% UCL of the mean concentration of background (or the generic statewide value in the regulation's guidance document); **and**
b) at least half the sample values are less than the 60th percentile of the background data (or the generic statewide value in the regulation's guidance document); **and**
c) no sample value is above the upper bound value (95th percentile) of the background data (or the generic statewide value in the regulation's guidance document).

2) The EC is less than 1/10th of the respective PRG.

3) The compound is detected in less than 5% of the samples, **and** no single value is greater than ten times the respective PRG;

Note: In Item 3 above, 5% is the default percentage that our risk assessors use but there might be situations where we could use up to 10%. If so, we can consult with our risk assessors.

The compounds that "fail" the above tests are considered to be CoCs.

We then **separate the CoCs**, by **surface and subsurface horizons**, into **carcinogen and non-carcinogen lists (as defined by the PRG table).** Some compounds might fall in both cancer and non-cancer lists, as they have both characteristics.

For each list, we divide the exposure concentration (EC) for each CoC by its PRG. We add up the quotients in each list. For the carcinogen list, we multiply this number by 1 x 10 ^-6 to give us the **site cancer risk.** The sum of the non-carcinogen list is the **hazard index.**

We determine if any carcinogen risk is greater than 1 x 10 ^-6, or if the hazard index is greater than 1. We can then see which compounds are causing the risk to exceed the target level, and therefore require remediation.

III. Risk Assessment

Under KRS 224.01-400 (18), there are two options available to address a release through risk assessment - Option A (No Further Action) and Option B (Management).

Option A applies to sites where some contamination is left in place but where the responsible party can demonstrate through risk screening and risk assessment procedures that the risk posed by the release is a "de minimus" risk for human health and does not pose an unacceptable ecological risk without management or restoration.

Option B allows the responsible party to manage the release in a manner that minimizes its harmful effects and protects human health, safety, and the environment. In this option, concentrations of petroleum constituents may remain at a site if management of the release results in exposures that do not exceed "de minimus" risk levels for human health, and do not pose an unacceptable ecological risk. Management techniques include those measures that act to contain the release such as installing caps, slurry walls, disposal cells, soil solidification/stabilization, and an environmental covenant. In this option, a risk assessment for human health and ecological health must be submitted for approval along with a plan to manage the site and an environmental covenant must be placed on the property.

IV. Site Treatment

This option is available to those facilities that have the proper site conditions and types of petroleum contaminants, which may allow them to treat contaminated soils and/or groundwater to meet allowable levels. Allowable levels for unregulated UST's and surface petroleum releases from AST's and other sources can be achieved through removal of the contaminants to acceptable levels based on the **U.S. EPA Region 9 Preliminary Remediation Goals (PRG) (October 1, 2002) used in accordance with the U.S. EPA Region 9 Preliminary Remediation Goals Guidance Document (October 1, 2002) and other guidance documents established in 401 KAR 100:030. Copies of these documents can be found in the Appendices of this Instruction Booklet.** This evaluation process requires calculations for

determining contaminants of concern (CoCs) and the associated cancer risks and non-cancer hazards. Results of "non-detect" are considered to be at one-half their detection limit for purposes of calculation. Please note that sites with multiple contaminants must consider additivity when determining overall site risk. **Therefore, individual PRG values are not directly compared to individual sample results when screening or remediating sites with multiple contaminants of concern.** To close under this option, a Corrective Action Plan (CAP) must be submitted along with the Closure Report. The CAP must be a detailed plan of the proposed remediation system designed to reduce the petroleum constituents in soil and/or groundwater to allowable levels. The CAP must address all of the items mentioned in Section IV of the Closure Report in addition to any other technology-specific requirements. There are a variety of technologies available to treat contaminated soils and groundwater through physical, chemical or biological methods. Section IV of the Closure Report lists some of the common technologies.

APPENDIX B

KENTUCKY GUIDANCE FOR AMBIENT BACKGROUND ASSESSMENT

(January 8, 2004)

Sampling shall be conducted in accordance with 40 CFR 260.11, specifically per "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (United States (US) Environmental Protection Agency (EPA) Publication SW-846 (US EPA SW-846)) to ensure that a representative sample is collected. Soil samples shall be collected with a corer, a trowel, or a similar instrument (preferably made of stainless steel); however, if safety conditions warrant, samples may be obtained from a backhoe bucket. Recognized methods, in accordance with US EPA Standard Operating Procedures, shall be followed for decontamination of all sampling equipment.

Introduction

This guidance document is intended to assist in comparing site data and background data for sites undergoing environmental assessment. These procedures provide a simplified statistical procedure for determining if the site data is part of the background population. It also provides generic statewide background values for inorganic chemicals that may be used in lieu of collecting site-specific background samples. The statistical procedures may be used for site-specific data or the generic statewide values in Tables 1 and 2. This guidance does not preclude other appropriate statistical comparisons from being made, but rather a simplified screening method that does not require a deep knowledge of statistics. If the site data set fails the statistical procedures in this guidance, it may be appropriate to perform a more complete statistical comparison.

Background, as defined in 401 KAR 42:005 (definitions codified to support the Underground Storage Tank regulations), means the concentration of substances consistently present in the environment at, or regionally proximate to, a release but outside the influence of the release. There are two types of background:

a) Natural background is the amount of naturally occurring substances in the environment, exclusive of that from anthropogenic sources.

b) Ambient background means the concentrations of naturally occurring inorganic substances and ubiquitous anthropogenic inorganic substances in the environment that are representative of the region surrounding the site and not attributable to an identifiable release.

Since sites undergoing environmental assessment are often found in industrialized and potentially contaminated areas, the determination of site-specific background concentrations is difficult. Generic ambient background values applicable to all sites in Kentucky would be useful for comparison to site data for the purpose of identifying those constituents requiring remedial action (i.e., removal or exposure control). These generic ambient background values would provide an alternative to attempting to identify site-specific background soils in areas that are likely contaminated.

Methodology

To provide an alternative to site-specific background sampling, the NREPC used background sample values provided by regulated facilities, as well as background sample values collected by cabinet employees. These samples were collected from areas generally considered to be outside of the influence of site activities, but were potentially impacted by regional or urban activity. Therefore, these samples represent “ambient,” as opposed to “natural,” background. From 400 to over 800 samples for each constituent were used in the analysis. For each constituent, a 95% Upper Confidence Limit (UCL) of the arithmetic mean,

60th percentile, and 95th percentile were calculated. The 95% UCL is the value below which the true mean of the data set falls, with 95% confidence. The 60th and 95th percentiles indicate that 60 percent and 95 percent of the data falls below those values.

The following methodology was employed to calculate ambient background:

1. Values reported as "non-detected" were retained in the database at half the reporting limit (USEPA, 1998).

2. As the data sets came from areas having varied uses (e.g., industrial, commercial, residential, agricultural, woodlands, etc.), the probability that some of the samples were taken in contaminated areas is significant. Data sets were tested for outliers by the Grubb's test, and individual samples that had a calculated Z-score above 3.8 were generally removed from the background data set. The Grubb's test formula is as follows:

$$Z = \frac{\left| population\ mean - value\ of\ individual\ sample \right|}{standard\ deviation}$$

3. The descriptive statistics of mean and standard deviation were calculated by standard parametric methods assuming normality and are listed in Table 1. Parametric methods were used to allow for comparisons between these generic ambient background values and the results of other published studies of background.

   a. Standard deviation was calculated by the "nonbiased" method employing the formula:

$$S.D. = \sqrt{\frac{\sum \left(X_i - \overline{X} \right)^2}{n-1}}$$

   b. Mean was calculated as the sum of all individual scores divided by the total number of observations.

4. The data sets were analyzed with Lillefor's test for normality. Since the data sets are not normally or lognormally distributed, the parameters that are to be used in determining if site samples are consistent with background (i.e. 95% UCL of mean, 60th percentile and 95th percentile) were calculated by nonparametric methods and are listed in Table 2.

5. The 95% UCL of the arithmetic mean for each constituent was calculated on the trimmed data set using ProUCL. ProUCL is a statistical package developed by Lockheed Martin under contract with the U.S. EPA.

6. The 60th percentile value is used as the midpoint for each constituent. It was calculated as follows:

   a. The constituent values were ranked in increasing order of magnitude.

   b. The quantity 60(n)/100 was used to identify the measurement with the resulting rank.

7. The 95th percentile value is used as the upper bound value for each constituent and was calculated as follows:

   a. The constituent values were ranked in increasing order of magnitude.

   b. The quantity 95(n)/100 was used to identify the measurement with the resulting rank.

The thallium data were characterized by a large number of non-detects (633 non-detects verses 54 detects). Due to the large number of non-detects, non-detects were not entered as ½ the non-detect concentration. Each non-detect sample was assumed to have a concentration equal to the recorded non-detect concentration. Considering the number of non-detects and the likelihood that the recorded values skew thallium concentrations upward, only the 95th percentile of the total data is cited in Table 2.

Procedure for Comparison to Background

The site data should be segregated by surface and subsurface data. The surface and subsurface site data may be compared to the statewide numbers in Table 2, or to site-specific background samples. The following three criteria may be used to demonstrate that the site data is background:

1. The mean site concentration for inorganic constituents must be below the 95% UCL of the mean concentrations of background for inorganic constituents.
2. At least half of the data points should be less than the 60th percentile.
3. No data points should be above the upper bound value (95th percentile).

These procedures provide a tool for comparing site data with either generic statewide or site-specific background using the statistical characteristics of the two populations. Other statistical comparisons may be used, if appropriate.

Determining Site-specific Background

Site-specific ambient background levels may be determined at the site. The site-specific ambient background data set shall consist of an appropriate number of samples for the statistical method employed. The number of samples necessary to characterize site-specific background will vary based on the variability of the data. Twenty data points may be used as a minimum number of samples per horizon (surface and subsurface) as a default number, unless other statistical methods can be used to develop a different number. A site-specific determination of the number of required samples may be calculated based on the statistical characteristics of the background population.

Upgradient groundwater samples are to be obtained from the same hydrogeological unit as the groundwater contamination at the site. The background monitoring wells shall be located hydrogeologically upgradient from the release(s) of concern, unless it can be demonstrated to the cabinet that the upgradient location is undefinable or infeasible.

Background soil samples should be collected from native soil in areas of similar soil type as found at the site. Background concentrations should be determined separately for surface and subsurface areas that are consistent with the on-site investigation.

The following areas are inappropriate to sample when determining soil background unless otherwise necessary to reach a corrective action decision or identify potential sources of contamination:

1. Fill areas;
2. Areas in which management, treatment, handling, storage or disposal activities of any of the following are known or suspected to have occurred: hazardous substances or petroleum, solid or hazardous wastes, or waste waters;
3. Areas within three feet of a roadway;
4. Parking lots and areas surrounding parking lots or other paved areas;
5. Railroad tracks or railway areas or other areas affected by their runoff;
6. Areas of concentrated air pollutant depositions or areas affected by their runoff;
7. Storm drains or ditches presently or historically receiving industrial or urban runoff; or
8. Areas within three feet of any current structure, or the former location of any structure, which is likely to have been painted with lead-based paint.

Literature Cited

United States Environmental Protection Agency (USEPA), 1995. Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites. Office of Research and Development. Office of Solid Waste and Emergency Response. EPA/540/S-96/500. December, 1995.

United States Environmental Protection Agency (USEPA), 1998. Statistical Tests for Background Comparison at Hazardous Waste Sites. Supplemental Guidance to RAGS: Region 4 Bulletins – Addition #1. Interim Draft. USEPA Region 4, Waste Management Division. Atlanta, Georgia. November, 1998.

Table 1. Summary Statistics for Ambient Inorganic Chemicals

Element	**Number of Samples**	**Range (mg/kg)**	**Mean (mg/kg)**	**Standard Deviation (mg/kg)**
Aluminum	679	1290 - 38,100	10969	5462.9
Arsenic	539	0.059 - 55.5	8.9	7
Barium	756	6.14 – 1160	111.3	92.4
Beryllium	696	0.061 - 3.57	0.8	0.5
Cadmium	701	0.004 - 9.46	0.68	1.4
Chromium	771	2.83 - 168	20.5	13.9
Cobalt	649	0.29 - 67.6	11.9	8.1
Copper	729	0.49 - 636	18.9	39.7
Iron	697	222 - 86,900	22456	13269.7
Lead	808	0.03 - 284	30	31.3
Manganese	685	8.43 - 5100	1017	854.9
Mercury	459	0.007 - 0.721	0.06	0.1
Nickel	716	0.39 - 83.7	20.9	13.1
Selenium	714	0.001 - 3.93	0.94	0.7
Silver	697	0.006 - 5.2	0.42	0.6
Thallium	633	0.13 - 28		
Vanadium	679	4.82 - 92.1	26.9	11.8
Zinc	721	6 - 470	55	46.3

Table 2. Generic Statewide Ambient Background for Kentucky

Element	Mean (mg/kg)	**95% UCL of Mean (mg/kg)**	**60th Percentile (mg/kg)**	**95th Percentile (mg/kg)**
Aluminum	10969	11314	10800	21000
Arsenic	8.9	9.4	8.3	21.2
Barium	111.3	116.9	100	241
Beryllium	0.8	0.83	0.75	1.8
Cadmium	0.68	0.78	0.27	3.9
Chromium	20.5	21.3	19.3	40
Cobalt	11.9	12.4	13.1	25.1
Copper	18.9	21.3	13.8	41.7
Iron	22456	23284	22000	47600
Lead	30	33	20.9	84.6
Manganese	1017	1071	948	2620
Mercury	0.06	0.07	0.059	0.14
Nickel	20.9	21.7	20.2	46.8
Selenium	0.94	0.99	1.38	2.1
Silver	0.42	0.45	0.257	1.2
Thallium				7.95
Vanadium	26.9	27.7	27.3	48.6
Zinc	55	57	48.6	115

APPENDIX C

KENTUCKY GUIDANCE FOR GROUNDWATER ASSESSMENT SCREENING

(January 15, 2004)

Introduction

This document provides guidance for evaluating contaminated sites to determine whether superficial and shallow contamination in soils indicates an existing or potential groundwater contamination problem, and whether a direct assessment of groundwater conditions is necessary. This method is intended to provide the party or applicant a cost-effective approach using soils data collected as part of the site characterization for determining the need to assess groundwater quality.

Methodology

An assessment of the effect of a release of a hazardous substance or petroleum on groundwater quality may not be necessary at all sites. This process is intended for sites that lack adequate groundwater monitoring data and where the party or applicant anticipates to leave in place contaminants of concern (COCs).

This approach to evaluating impacts and potential impacts of a release on groundwater is based on the attenuation of contaminants moving through the soil profile by means of biodegradation, hydrolysis, volatilization, adsorption, and dilution. Contaminants may not attenuate similarly in all situations, and therefore conservative Dilution Attenuation Factor (DAF) values are applied. However, conditions at some sites may result in contaminant migration through the soil profile in a manner that bypasses physical, chemical, and biological processes in the soils. Caution should be applied to use of this methodology at sites where normal physical, chemical, and biological processes in the soils are bypassed, including sites underlain by soils with large, interconnected pores (macropores) that provide for the rapid transport of water and contaminants through the soil profile, sites underlain by well-developed karst terrane, sites underlain by highly fractured media, or where contamination extends to the soil-bedrock interface. These types of sites may not provide for the soil processes assumed to be in effect in this method. In addition, this process is primarily intended for COCs that are relatively insoluble and are expected, under normal conditions, to remain in the soil profile and not to migrate to groundwater. Therefore, caution should be used in applying this methodology at sites where soluble or mobile COCs such as volatile organic compounds, nitrates, or dense non-aqueous phase liquids (DNAPL) are present; the presence of such COCs in the soils may indicate that a groundwater assessment may be necessary. The cabinet reserves the authority to require a direct assessment of groundwater at sites where it deems such investigation is prudent to understanding the extent of contamination and the risks associated with the release.

To determine whether a direct assessment of groundwater conditions is necessary, analytical data from the soil profile may be evaluated by the methods outlined in this document in combination with an evaluation of other soil conditions, and the geology and hydrology of the site. These data can be used to determine whether groundwater was likely to have been impacted, and whether these soils will serve as a future source of groundwater contamination.

In order to use this method, the horizontal and vertical extent of soil contamination must be known. An adequate number of soil borings with multiple, discreet sampling intervals of sufficient length and spacing to characterize vertical distribution of contamination are also necessary.

If it can be demonstrated using one of the following options that a release has not had and will not have an adverse effect on groundwater quality, a direct assessment of groundwater impacts may not be necessary.

1. An assessment of groundwater for a release may not be necessary if the applicable Soil Screening Levels, or SSL (DAF 1), in the U.S. EPA Region 9 Preliminary Remediation Goals (October 1, 2002) are not exceeded in the bottom two (2) sampling intervals of each soil boring.

2. Rather than using the default SSLs (DAF 1), a modified SSL may be used. This modified SSL takes into account the surface area of the site, the vertical separation between the contamination in the soil profile and groundwater, and the underlying bedrock conditions. The appropriate modified SSL is equivalent to the SSL (DAF 1) referenced in the U.S. EPA Region 9 Preliminary Remediation Goals,

(October 1, 2002) multiplied by the applicable value in Table 1, below. An assessment of groundwater for a release may not be necessary if the applicable modified SSLs are not exceeded in samples from the bottom two (2) sampling intervals.

Table 1.

Vertical Separation Between Contamination in the Soil Profile and the Zone of Saturation	Surface Area of Site and other considerations		
	< 0.5 acres	**0.5-10 acres**	**> 10 acres, or site underlain by karst or highly fractured media**
0-5 ft	1	1	1
5-10 ft	5	2.5	1
10-15 ft	10	5	1
15-20 ft	15	7.5	2.5
Greater than 20 ft	20	10	5

3. A site-specific SSL may be developed and applied based on site-specific conditions, including soil types, characteristics of COCs, total organic carbon in the soil, soil porosity, infiltration rate, and the vertical separation between the contamination in the soil profile and groundwater. If the analytical results in the bottom two (2) sampling intervals do not exceed the site-specific SSLs, a groundwater assessment may not be necessary for that site.

4. A fate and transport evaluation may be developed to demonstrate that levels of COCs in the soils will not result in groundwater contamination beyond the property boundary. If a fate and transport evaluation adequately demonstrates that levels of COCs in the soils will not result in groundwater contamination beyond the property boundary, a groundwater assessment may not be necessary. However, a direct groundwater assessment will be required to make such a determination in most situations.

5. An analysis of the results of current and historical groundwater monitoring may be used to determine whether groundwater has been adequately characterized. Such an analysis shall contain sufficient information to determine whether groundwater has been affected by any releases at the site. The report of this analysis shall include:

a. The location of monitoring wells relative to the location of the soil contamination at the site, and to groundwater flow direction at the property;

b. Monitoring well construction details, including diameter of the annulus, diameter of the well casing, the depth and length of the screened interval, construction of the sand pack, and the type and manner of sealing materials used;

c. The proximity of wells to one another and to the property boundary; and

d. The results of all groundwater analyses conducted to date on samples collected at the property, including sample dates, the parameters analyzed, and the methods of collection and analysis.

A groundwater assessment is necessary and prudent in some circumstances. Any direct evidence of groundwater contamination, including seeps, contaminated wells and springs, or other similar information is compelling evidence to conduct a thorough groundwater investigation. The cabinet may direct a person or applicant to conduct a groundwater assessment in regards to a known or suspected release, regardless of the results of the methods employed above.

References

1. U.S. EPA 1996. Soils Screening Guidance: Technical Background Document, May 1996. United States Environmental Protection Agency 9355.-17a, EPA/540/R-95/128, PB96-963502.

2. U.S. EPA 2002. Region 9 Preliminary Remediation Goals and the Region 9 PRGs Table User's Guide/Technical Background Document (October 1, 2002).

APPENDIX D

EPA REGION 9 Preliminary Remediation Goals Guidance Document

(October 1, 2002)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105
October 1, 2002

Subject: **Region 9 PRGs Table 2002 Update**

From: Stanford J. Smucker, Ph.D.
Regional Toxicologist (SFD-8-B)
Technical Support Team

To: PRGs Table Users

With this cover letter, we announce the update to the Region 9 PRGs table for 2002. The PRGs table contains over 600 preliminary remediation goals (PRGs) for contaminants in soil, air, and tap water. Region 9 PRGs are risk-based concentrations that are intended to assist risk assessors and others in initial screening-level evaluations of environmental measurements.

As their name implies, Region 9 PRGs may also be viewed as preliminary cleanup goals for an individual chemical, but in this context, they are best viewed as dynamic and subject to change because they are generic and based on direct contact exposures which may not address site-specific conditions and/or indirect exposure pathways at sites (See Exhibit 1-1 in "Region 9 PRGs Table Users Guide/Technical Background Document"). Also for planning purposes, these human health based PRGs should always be considered in conjunction with ARAR-based PRGs (e.g. MCLs), ecological benchmarks, and "background" conditions before establishing a final cleanup level for a particular site.

You can find the PRGs 2002 table, InterCalc tables, "Region 9 PRGs Table Users Guide/Technical Background Document", and additional helpful toxicological and risk assessment information at:

http://www.epa.gov/region09/waste/sfund/prg/

We view risk-based PRGs as "evergreen". Ongoing changes to the PRGs reflect continuing improvements in our scientific knowledge base and state-of-the-art approaches to risk assessment. In the new *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (Supplemental SSL Guidance, EPA 2001a), two different soil ingestion rates are assumed for nonconstruction workers: 100 mg/day is assumed for outdoor workers whereas 50 mg/day is assumed for indoor workers. The default value of 100 mg/day for outdoor workers is also recommended by EPA's Technical Review Workgroup for Lead (TRW), and it reflects increased exposures to soils for outdoor workers relative to their indoor counterparts. For more on this, please see Section 4.1 of the "Region 9 PRGs Table Users Guide/Technical Background Document" or refer to the Supplemental SSL Guidance available at the following website:

http://www.epa.gov/superfund/resources/soil/index.htm

Because the Region 9 PRGs are generic and intended for screening sites early in the investigation process (often before site-specific information is available), we have chosen to use the 100 mg/day soil ingestion (i.e. outdoor worker) assumption to calculate industrial soil PRGs. Please note that previous issues of the Region 9 PRGs table assumed 50 mg/day soil ingestion rate for workers. This change in soil ingestion rates is reflected in a somewhat lower (more stringent) industrial soils PRG for many contaminants. The appropriateness of this assumption for a particular site may be evaluated when additional information becomes available regarding site conditions or site development.

In addition to changes in exposure factor assumptions, several chemicals have new or revised toxicity values that results in changes to the PRG calculations. To facilitate the users review, chemicals with new and revised toxicological criteria are presented in bold in the 2002 table and also listed here for convenience: **acetonitrile, benzyl chloride, boron, bromate, 1,3-butadiene, 1-butanol, butylbenzenes, cacodylic acid, cadmium (California State value), chloroform, chloro-nitrobenzenes, chrysene (California State value), cobalt, 1,2-dibromo-3-chloropropane (California State value), 1,1-dichloroethylene, diethylene glycol ethers, diethylformamide, dinitrobenzenes, di-n-octyl phthalate, diphenyl sulfone, ethylbenzene, HCH, hexachloro-cyclopentadiene, kepone, lead (California State value), MTBE, 2-nitroaniline, carcinogenic PAHs, perchlorate, polychlorinated terphenyls, benzo(k)fluoranthene (California State value), propylbenzene, propylene glycol, quinoline, tetrachloroethylene, tetrahydrofuran, thiocyanate, 1,1,1-trichloroethane, trichloroethylene, 2,4,6-trichlorophenol, 1,2,3- trichloropropane, triphenylphosphine oxide, tris(2-chloroethyl) phosphate, vinyl chloride, and xylene.**

Also in this update to the "Region 9 PRGs Table User's Guide/Technical Background Document", we have added a brief discussion of special case chemicals for which an alternate approach was applied in the derivation of the Region 9 PRGs (Section 2.3). Increasingly, chemical-specific approaches are being used that do not lend themselves to a single PRG model. Special case chemicals that are discussed include: cadmium, chromium 6, lead, manganese, nitrate/nitrite, thallium, and vinyl chloride.

Finally it should be recognized by all that use the PRGs table that not all PRG values in the table are "created equal". For some chemicals, a robust data set exists upon which the toxicological criteria are based whereas for others, there may be relatively few studies that form the basis of the PRG calculation. Also, PRGs for some chemicals are based on withdrawn toxicity values or route-extrapolated values. Withdrawn and route-extrapolated numbers are shown in the table because we still need to deal with these contaminants during the long delays before replacement numbers are ready. Please consult with your toxicologist or agency risk assessor to best address potential uncertainties associated with chemical-specific PRGs, especially if the chemical is a risk driver at your site.

As with any risk-based tool, there exists the potential for misuse. We try to highlight potential problems in Section 3.8. However, it should be noted that the use of PRGs at a particular site becomes the responsibility of the user. It is recommended that the user verify the numbers with an agency toxicologist or risk assessor because the toxicity / exposure information in the table may contain errors or default assumptions that need to be refined based on further evaluation. If you find an error please send me a note via email at smucker.stan@epa.gov.

DISCLAIMER

Preliminary remediation goals (PRGs) focus on common exposure pathways and may not consider all exposure pathways encountered at CERCLA / RCRA sites (Exhibit 1-1). PRGs do not consider impact to groundwater or address ecological concerns. The PRG table is specifically not intended as a (1) stand-alone decision-making tool, (2) as a substitute for EPA guidance for preparing baseline risk assessments, (3) a rule to determine if a waste is hazardous under RCRA, or (4) set of final cleanup or action levels to be applied at contaminated sites. The guidance set out in this document is not final Agency action. It is not intended, nor can it be relied upon to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided herein, or act at variance with the guidance, based on an analysis of specific circumstances. The Agency also reserves the right to change this guidance at any time without public notice.

1.0 INTRODUCTION

Region 9 Preliminary Remediation Goals (PRGs) are risk-based tools for evaluating and cleaning up contaminated sites. They are being used to streamline and standardize all stages of the risk decision-making process. The Region 9 PRG table combines current EPA toxicity values with "standard" exposure factors to estimate contaminant concentrations in environmental media (soil, air, and water) that the agency considers protective of humans (including sensitive groups), over a lifetime. Chemical concentrations above these levels would not automatically designate a site as "dirty" or trigger a response action. However, exceeding a PRG suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate. Further evaluation may include additional sampling, consideration of ambient levels in the environment, or a reassessment of the assumptions contained in these screening-level estimates (e.g. appropriateness of route-to-route extrapolations, appropriateness of using chronic toxicity values to evaluate childhood exposures, appropriateness of generic exposure factors for a specific site etc.). The PRG concentrations presented in the table can be used to screen pollutants in environmental media, trigger further investigation, and provide an initial cleanup goal if applicable. When considering PRGs as cleanup goals, residential concentrations should be used for maximum beneficial uses of a property. Industrial concentrations are included in the table as an alternative cleanup goal for soils. **In general, it recommended that industrial PRGs not be used for screening sites unless they are used in conjunction with residential values.**

Before applying PRGs as screening tools or initial goals, the user of the table should consider whether the exposure pathways and exposure scenarios at the site are fully accounted for in the PRG calculations. Region 9 PRG concentrations are based on direct contact pathways for which generally accepted methods, models, and assumptions have been developed (i.e. ingestion, dermal contact, and inhalation) for specific land-use conditions and do not consider impact to groundwater or ecological receptors (see Developing a Conceptual Site Model below).

EXHIBIT 1-1
TYPICAL EXPOSURE PATHWAYS BY MEDIUM
FOR RESIDENTIAL AND INDUSTRIAL LAND USES[a]

EXPOSURE PATHWAYS, ASSUMING:		
MEDIUM	**RESIDENTIAL LAND USE**	**INDUSTRIAL LAND USE**
Ground Water	***Ingestion from drinking***	Ingestion from drinking
	Inhalation of volatiles	Inhalation of volatiles
	Dermal absorption from bathing	Dermal absorption
Surface Water	***Ingestion from drinking***	Ingestion from drinking
	Inhalation of volatiles	Inhalation of volatiles
	Dermal absorption from bathing	Dermal absorption
	Ingestion during swimming	
	Ingestion of contaminated fish	
Soil	***Ingestion***	***Ingestion***
	Inhalation of particulates	***Inhalation of particulates***
	Inhalation of volatiles	***Inhalation of volatiles***
	Exposure to indoor air from soil gas	Exposure to indoor air from soil gas
	Exposure to ground water contaminated by soil leachate	Exposure to ground water contaminated by soil leachate
	Ingestion via plant, meat, or dairy products	Inhalation of particulates from trucks and heavy equipment
	Dermal absorption	***Dermal absorption***

Footnote:

[a]Exposure pathways considered in the PRG calculations are indicated in boldface italics.

2.0 READING THE PRG TABLE

2.1 General Considerations

With the exceptions described below, PRGs are chemical concentrations that correspond to fixed levels of risk (i.e. either a one-in-one million [10^{-6}] cancer risk or a noncarcinogenic hazard quotient of 1) in soil, air, and water. In most cases, where a substance causes both cancer and noncancer (systemic) effects, the 10^{-6} cancer risk will result in a more stringent criteria and consequently this value is presented in the printed copy of the table. PRG concentrations that equate to a 10^{-6} cancer risk are indicated by "ca". PRG concentrations that equate to a hazard quotient of 1 for noncarcinogenic concerns are indicated by "nc". If the risk-based concentrations are to be used for site screening, it is recommended that both cancer and noncancer-based PRGs be used. Both carcinogenic and noncarcinogenic values may be obtained at the Region 9 PRG homepage at:

http://www.epa.gov/region09/waste/sfund/prg/

It has come to my attention that some users have been multiplying the cancer PRG concentrations by 10 or 100 to set "action levels" for triggering remediation or to set less stringent cleanup levels for a specific site after considering non-risk-based factors such as ambient levels, detection limits, or technological feasibility. This risk management practice recognizes that there may be a range of values that may be "acceptable" for carcinogenic risk (EPA's risk management range is one-in-a million [10^{-6}] to one-in-ten thousand [10^{-4}]). However, this practice could lead one to overlook serious noncancer health threats and it is strongly recommended that the user consult with a toxicologist or regional risk assessor before doing this. For carcinogens, I have indicated by asterisk ("ca*") in the PRG table where the noncancer PRGs would be exceeded if the cancer value that is displayed is multiplied by 100. Two stars ("ca**") indicate that the noncancer values would be exceeded if the cancer PRG were multiplied by 10. There is no range of "acceptable" noncarcinogenic "risk" so that under no circumstances should noncancer PRGs be multiplied by 10 or 100, when setting final cleanup criteria. In the rare case where noncancer PRGs are more stringent than cancer PRGs set at one-in-one-million risk, a similar approach has been applied (e.g. “nc**”). In general, PRG concentrations in the printed table are risk-based but for soil there are two important exceptions: (1) for several volatile chemicals, PRGs are based on the soil saturation equation ("sat") and (2) for relatively less toxic inorganic and semivolatile contaminants, a non-risk based "ceiling limit" concentration is given as 10^{+5} mg/kg ("max"). At the Region 9 PRG website, the risk-based calculations for these same chemicals are also available in the “InterCalc Tables” if the user wants to view the risk-based concentrations prior to the application of “sat” or “max”. For more information on why the “sat” value and not a risk-based value is presented for several volatile chemicals in the PRGs table, please see the discussion in Section 4.5.

With respect to applying a “ceiling limit” for chemicals other than volatiles, it is recognized that this is not a universally accepted approach. Some within the agency argue that all values should be riskbased to allow for scaling (for example, if the risk-based PRG is set at a hazard quotient = 1.0, and the user would like to set the hazard quotient to 0.1 to take into account multiple chemicals, then this is as simple as multiplying the risk-based PRG by 1/10th). If scaling is necessary, PRG users can do this simply by referring to the “InterCalc Tables” at our website where risk-based soil concentrations are presented for all chemicals (see soil calculations, “combined” pathways column). In spite of the fact that applying a ceiling limit is not a universally accepted approach, we have opted to continue applying a “max”soil concentration to the PRGs table for the following reasons:

- Risk-based PRGs for some chemicals in soil exceed unity (>1,000,000 mg/kg) which is not possible.
- The ceiling limit of 10^{+5} mg/kg is equivalent to a chemical representing 10% by weight of the soil sample. At this contaminant concentration (and higher), the assumptions for soil contact may be violated (for example, soil adherence and windborne dispersion assumptions) due to the presence of the foreign substance itself.

- PRGs currently do not address short-term exposures (e.g. pica children and construction workers). Although extremely high soil PRGs are likely to represent relatively non-toxic chemicals, such high values may not be justified if in fact more toxicological data were available for evaluating short-term and/or acute exposures.

In addition to Region 9 PRG values, the PRGs table also includes California EPA PRGs ("CAL-Modified PRGs") for specific chemicals where CAL-EPA screening values may be “significantly” more restrictive than the federal values (see Section 2.4) and EPA OSWER soil screening levels (SSLs) for protection of groundwater (see Section 2.5).

2.2 Toxicity Values

Hierarchy of Toxicity Values

EPA toxicity values, known as noncarcinogenic reference doses (RfD) and carcinogenic slope factors (SF) were obtained from IRIS, NCEA through September 2002, and HEAST (1997). The priority among sources of toxicological constants in order of preference is as follows: (1) IRIS (indicated by "i"), (2) NCEA ("n"), (3) HEAST ("h"), (4) withdrawn from IRIS or HEAST and under review ("x") or obtained from other EPA documents (“o”). This hierarchy is subject to change once the HEAST tables are updated.

Inhalation Conversion Factors

As of January 1991, IRIS and NCEA databases no longer present RfDs or SFs for the inhalation route. These criteria have been replaced with reference concentrations (RfC) for noncarcinogenic effects and unit risk factors (URF) for carcinogenic effects. However, for purposes of estimating risk and calculating risk-based concentrations, inhalation reference doses (RfDi) and inhalation slope factors (SFi) are preferred. This is not a problem for most chemicals because the inhalation toxicity criteria are easily converted. To calculate an RfDi from an RfC, the following equation and assumptions may be used for most chemicals:

$$RfDi\ \frac{mg}{(kg\text{-}day)} = RfC\ (mg/m^3) \times \frac{20m^3}{day} \times \frac{1}{70kg}$$

Likewise, to calculate an SFi from an inhalation URF, the following equation and assumptions may be used:

$$SFi\ \frac{(kg\text{-}day)}{(mg)} = URF\ (m^3/ug) \times \frac{day}{20m^3} \times 70kg \times \frac{10^3\ ug}{mg}$$

Substances with New or Withdrawn Toxicity Values

To help users rapidly identify substances with new or revised toxicity values, these chemicals are listed in boldface type in the PRGs table. This issue of the table contains new or revised toxicity values for: **acetonitrile, benzyl chloride, boron, bromate, 1,3-butadiene, 1-butanol, butylbenzenes, cacodylic acid, cadmium (California State value), chloroform, chloronitrobenzenes, chrysene (California State value), cobalt, 1,2-dibromo-3-chloropropane (California State value), 1,1-dichloroethylene, diethylene glycol ethers, diethylformamide, dinitrobenzenes, di-n-octyl phthalate, diphenyl sulfone, ethylbenzene, HCH, hexachlorocyclopentadiene, kepone, lead (California State value), MTBE, 2-nitroaniline, carcinogenic PAHs, perchlorate, polychlorinated terphenyls, benzo(k)fluoranthene (California State value), propylbenzene, propylene glycol, quinoline, tetrachloroethylene, tetrahydrofuran, thiocyanate, 1,1,1-trichloroethane, trichloroethylene, 2,4,6-trichlorophenol, 1,2,3- trichloropropane, triphenylphosphine oxide, tris(2-chloroethyl) phosphate, vinyl chloride, and xylene.**

Chemicals that have been delisted because they are outdated, undocumented, or derived from a data base other than IRIS, HEAST or NCEA include: acifluorfen, 4-bromophenyl phenyl ether, chloroacetaldehyde, 2-chloroethyl vinyl ether, hexachlorodibenzo-p-dioxin mixture (HxCDD), maneb, methyl chlorocarbonate, nitrapyrin, nitric oxide, and 4-nitrophenol.

Route-to-Route Methods

Route-to-route extrapolations ("r") were frequently used when there were no toxicity values available for a given route of exposure. Oral cancer slope factors ("SFo") and reference doses ("RfDo") were used for both oral and inhaled exposures for organic compounds lacking inhalation values. Inhalation slope factors ("SFi") and inhalation reference doses ("RfDi") were used for both inhaled and oral exposures for organic compounds lacking oral values. Route extrapolations were not performed for inorganics due to portal of entry effects and known differences in absorption efficiency for the two routes of exposure.

An additional route extrapolation is the use of oral toxicity values for evaluating dermal exposures. For many chemicals, a scientifically defensible data base does not exist for making an adjustment to the oral slope factor/RfD to estimate a dermal toxicity value. Based on the current guidance (USEPA 2001b), the only chemical for which an adjustment is recommended is cadmium. An oral absorption efficiency of 5% is assumed for cadmium which leads to an estimated dermal reference dose (RfDd) of $2.5E^{-05}$ that was used in the soil PRG calculations for cadmium.

Although route-to-route methods may be a useful screening procedure, the appropriateness of these default assumptions for specific contaminants should be verified by a toxicologist or regional risk assessor. Please note that whenever route-extrapolated values are used to calculate risk-based PRGs, additional uncertainties are introduced in the calculation.

2.3 Region 9 PRGs Derived with Special Considerations

Most of the Region 9 PRGs are readily derived by referring to Equations 4-1 thru 4-8 contained in this “User’s Guide/Technical Background Document” to the Region 9 PRGs. However, there are some chemicals for which the standard equations do no apply and/or adjustments to the toxicity values are recommended. These special case chemicals are discussed below.

Cadmium The PRGs for Cadmium are based on the oral RfD for water which is slightly more conservative (by a factor of 2) than the RfD for food. Because the PRGs are considered screening values, we elected to use the more conservative RfD for cadmium. However, reasonable arguments could be made for applying an RfD for food (instead of the oral RfD for water) for some media such as soils.

The water RfD for cadmium assumes a 5% oral absorption factor. The assumption of an oral absorption efficiency of 5% for Cadmium leads to an estimated dermal RfD of $2.5E^{-05}$. The PRG calculations incorporate these adjustments per recent guidance (USEPA 2001b).

Chromium 6 For Chromium 6 (Cr6), IRIS shows an air unit risk of $1.2E^{-2}$ per (ug/cu.m) or expressed as an inhalation cancer slope factor (adjusting for inhalation/body weight) of 42 $(mg/kg\text{-}day)^{-1}$. However, the supporting documentation in the IRIS file states that these toxicity values are based on an assumed 1:6 ratio of Cr6:Cr3. Because of this assumption, we in Region 9 prefer to present PRGs based on these cancer toxicity values as “total chromium” numbers.

In the PRG tables, we also include a Cr6 specific value (assuming 100% Cr6) that is derived by multiplying the “total chromium” value by 7, yielding a cancer potency factor of 290 $(mg/kg\text{-}day)^{-1}$. This is considered to be an overly conservative assumption by some within the Agency. However, this calculation is also consistent with the State of California's interpretation of the Mancuso study that forms the basis of Cr6's toxicity values.

If you are working on a project outside of California (and outside of Region 9), you may want to contact the appropriate regulatory officials to determine what their position is on this issue. As

mentioned, Region 9 also includes PRGs for "total chromium" which is based on the same ratio (1:6 ratio Cr6:Cr3) that forms the basis of the cancer slope factor of 42 $(mg/kg\text{-}day)^{-1}$ presented in IRIS.

Lead Residential PRGs for Lead (Region 9 EPA and California EPA) are derived based on pharmacokinetic models. Both EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model and California's LeadSpread model are designed to predict the probable blood lead concentrations for children between six months and seven years of age who have been exposed to lead through various sources (air, water, soil, dust, diet and *in utero* contributions from the mother). Run in the reverse, these models also allow the user to calculate lead PRGs that are considered "acceptable" by EPA or the State of California.

The California LeadSpread model can also estimate PRGs for non-residential exposures (e.g. worker) whereas EPA uses a second Adult Lead Model to estimate PRGs for an industrial setting.

For more information on EPA Lead models used to estimate residential and industrial PRGs, please refer to the following website:

http://www.epa.gov/oerrpage/superfund/programs/lead/

For more information on California's LeadSpread Model and Cal-Modified PRGs for lead, please go to:

http://www.dtsc.ca.gov/ScienceTechnology/ledspred.html

Manganese The IRIS RfD (0.14 mg/kg-day) includes manganese from all sources, including diet. The author of the IRIS assessment for manganese recommends that the dietary contribution from the normal U.S. diet (an upper limit of 5 mg/day) be subtracted when evaluating non-food (e.g. drinking water or soil) exposures to manganese, leading to a RfD of 0.071 mg/kg-day for non-food items. The explanatory text in IRIS further recommends using a modifying factor of 3 when calculating risks associated with non-food sources due to a number of uncertainties that are discussed in the IRIS file for manganese, leading to a RfD of 0.024 mg/kg-day. This modified RfD is applied in the derivation of the Region 9 PRGs for soil and water. For more information regarding the Manganese RfD, you may want to contact Dr. Bob Benson at (303) 312-7070.

Nitrates/Nitrites Tap water PRGs for Nitrates/Nitrates are based on the MCL as there is no available RfD for these compounds. For more information, please see IRIS at:

http://www.epa.gov/iriswebp/iris/index.html

Thallium IRIS has many values for the different salts of thallium. However, our analytical data packages typically report "thallium". Therefore, as a practical matter it makes more sense to report a PRG for plain thallium. We have done this by making the adjustment contained in the IRIS file for thallium sulfate based on the molecular weight of the thallium in the thallium salt. The adjusted oral RfD for plain thallium is 6.6 E^{-05} mg/kg-day which we use to calculate a thallium PRG.

Vinyl Chloride In EPA's recent reassessment of vinyl chloride toxicity, IRIS presents two cancer slope factors for vinyl chloride (VC): one that is intended to be applied towards evaluating adult risks and a second more protective slope factor that takes into account the unique susceptibility of developing infants and young children. For residential PRGs, the Region 9 PRGs table applies the more conservative cancer potency factor that addresses exposures to both children and adults whereas for the industrial soils PRG, the adult only cancer slope factor is applied.

Because of the age-dependent vulnerability associated with vinyl chloride exposures, and due to the method that is applied in deriving the cancer slope factor for VC, an assumption of a 70 year exposure over the lifetime is assumed, consistent with the way that the toxicity value for VC was derived. Therefore, instead of the usual exposure assumption of 6 years as a child and 24 years as an adult that is assumed for carcinogenic substances, we have revised the exposure assumption for VC to 6 years as a child and 64 years as adult. Since most of the cancer risk is associated with the first 30 years of exposure to VC, there is actually little difference between a 30 year exposure assumption

(typically assumed for Superfund risk assessments) and the 70 year exposure assumption that is assumed in calculating the PRG for VC.

2.4 "Cal-Modified PRGs"

When EPA Region 9 first came out with a Draft of the PRGs table in 1992, there was concern expressed by California EPA's Department of Toxic Substances and Control (DTSC) that for some chemicals the risk-based concentrations calculated using Cal-EPA toxicity values were "significantly" more protective than the risk-based PRGs calculated by Region 9. At an interagency meeting comprised of mostly toxicologists, it was agreed that PRG values are at best order-of-magnitude estimates, so that if we assume a logarithmic scale, then a difference greater than 3.3 (½ log above or below) would be considered a significant difference. Therefore, for individual chemicals where California PRG values are significantly more protective than Region 9 EPA PRGs, Cal-Modified PRGs are included in the Region 9 PRGs table. For more information on Cal-Modified PRGs, the reader may want to contact Dr. Michael Wade in Cal-EPA's Department of Toxic Substances (DTSC) at (916) 255-6653.

Please note that in the State of California, Cal-Modified PRGs should be used as screening levels for contaminated sites because they are more stringent than the Federal numbers.

2.5 Soil Screening Levels

Generic, soil screening levels (SSLs) for the protection of groundwater have been included in the PRG table for 100 of the most common contaminants at Superfund sites. Generic SSLs are derived using default values in standardized equations presented in EPA OSWER's *Soil Screening Guidance* series, available on the web at: http://www.epa.gov/superfund/resources/soil/index.htm.

The SSLs were developed using a default dilution-attenuation factor (DAF) of 20 to account for natural processes that reduce contaminant concentrations in the subsurface. Also included are generic SSLs that assume no dilution or attenuation between the source and the receptor well (i.e., a DAF of 1). These values can be used at sites where little or no dilution or attenuation of soil leachate concentrations is expected at a site (e.g., sites with shallow water tables, fractured media, karst topography, or source size greater than 30 acres).

In general, if an SSL is not exceeded for the migration to groundwater pathway, the user may eliminate this pathway from further investigation.

It should be noted that in the State of California, the California Regional Water Quality Control Board has derived "California SSLs" for a number of pathways including migration to groundwater. These are not included in the Region 9 PRGs table, but may be accessed at the following website: http://www.swrcb.ca.gov/rwqcb2/rbsl.htm

Or, for more information on the "California SSLs", please contact Dr Roger Brewer at: (510) 622-2374.

2.6 Miscellaneous

Volatile organic compounds (VOCs) are indicated by "1" in the VOC column of the table and in general, are defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole). Three borderline chemicals (dibromochloromethane, 1,2-dibromochloropropane, and pyrene) which do not strictly meet these criteria of volatility have also been included based upon discussions with other state and federal agencies and after a consideration of vapor pressure characteristics etc. Volatile organic chemicals are evaluated for potential volatilization from soil/water to air using volatilization factors (see Section 4.1).

Chemical-specific dermal absorption values for contaminants in soil and dust are presented for arsenic, cadmium, chlordane, 2,4-D, DDT, lindane, TCDD, PAHs, PCBs, and pentachlorophenols as

recommended in the “Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance” (USEPA 2001b). Otherwise, default skin absorption fractions are assumed to be 0.10 for nonvolatile organics. Please note that previous defaults of 0.01 and 0.10 for inorganics and VOCs respectively, have been withdrawn per new guidance.

3.0 USING THE PRG TABLE

The decision to use PRGs at a site will be driven by the potential benefits of having generic risk-based concentrations in the absence of site-specific risk assessments. The original intended use of PRGs was to provide initial cleanup goals for individual chemicals given specific medium and land-use combinations (see RAGS Part B, 1991), however risk-based concentrations have several applications. They can also be used for:

- Setting health-based detection limits for chemicals of potential concern
- Screening sites to determine whether further evaluation is appropriate
- Calculating cumulative risks associated with multiple contaminants

A few basic procedures are recommended for using PRGs properly. These are briefly described below. Potential problems with the use of PRGs are also identified.

3.1 Developing a Conceptual Site Model

The primary condition for use of PRGs is that exposure pathways of concern and conditions at the site match those taken into account by the PRG framework. Thus, it is always necessary to develop a conceptual site model (CSM) to identify likely contaminant source areas, exposure pathways, and potential receptors. This information can be used to determine the applicability of PRGs at the site and the need for additional information. For those pathways not covered by PRGs, a risk assessment specific to these additional pathways may be necessary. Nonetheless, the PRG lookup values will still be useful in such situations for focusing further investigative efforts on the exposure pathways not addressed.

To develop a site-specific CSM, perform an extensive records search and compile existing data (e.g. available site sampling data, historical records, aerial photographs, and hydrogeologic information). Once this information is obtained, CSM worksheets such as those provided in ASTM's *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (1995) can be used to tailor the generic worksheet model to a site-specific CSM. The final CSM diagram represents linkages among contaminant sources, release mechanisms, exposure pathways and routes and receptors. It summarizes our understanding of the contamination problem.

As a final check, the CSM should answer the following questions:

- Are there potential ecological concerns?
- Is there potential for land use other than those covered by the PRGs (that is, residential and industrial)?
- Are there other likely human exposure pathways that were not considered in development of the PRGs (e.g. impact to groundwater, local fish consumption, raising beef, dairy, or other livestock)?
- Are there unusual site conditions (e.g. large areas of contamination, high fugitive dust levels, potential for indoor air contamination)?

If any of these four conditions exist, the PRG may need to be adjusted to reflect this new information. Suggested websites for the evaluation of pathways not currently addressed by Region 9 PRG's are presented in Exhibit 3-1.

EXHIBIT 3-1
SUGGESTED WEBSITES FOR EVALUATING EXPOSURE PATHWAYS NOT CURRENTLY ADDRESSED BY REGION 9 PRGs

EXPOSURE PATHWAY	WEBSITE
Migration of contaminants to an underlying potable aquifer	EPA Soil Screening Guidance: http://www.epa.gov/superfund/resources/soil/index.htm California Water Board Guidance: http://www.swrcb.ca.gov/rwqcb2/rbsl.htm
Ingestion via plant uptake	EPA Soil Screening Guidance: http://www.epa.gov/superfund/resources/soil/index.htm EPA Fertilizer Risk Assessment: http://www.epa.gov/epaoswer/hazwaste/recycle/fertiliz/risk/
Ingestion via meat, dairy products, human milk	EPA Protocol for Combustion Facilities: http://www.epa.gov/epaoswer/hazwaste/combust/riskvol.htm#volume1 California "Hot Spots" Risk Guidelines: http://www.oehha.ca.gov/air/hot_spots/HRSguide.html
Inhalation of volatiles that have migrated into basements or other enclosed spaces.	EPA's Version of Johnson & Ettinger Model: http://www.epa.gov/oerrpage/superfund/programs/risk/airmodel/johnson_ettinger.htm
Ecological pathways	EPA Ecological Soil Screening Guidance: http://www.epa.gov/superfund/programs/risk/ecorisk/ecossl.htm NOAA Sediment Screening Table: http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html

3.2 Background Levels Evaluation

A necessary step in determining the applicability of Region 9 risk-based PRGs is the consideration of background contaminant concentrations. There is new EPA guidance on determining background at sites. *Guidance for Characterizing Background Chemicals in Soil at Superfund Sites* (USEPA 2001c) is available on the web at:

http://www.epa.gov/superfund/programs/risk/background.pdf

EPA may be concerned with two types of background at sites: naturally occurring and anthropogenic. Natural background is usually limited to metals whereas anthropogenic (i.e. human made) "background" includes both organic and inorganic contaminants. Before embarking on an extensive sampling and analysis program to determine local background concentrations in the area, one should first compile existing data on the subject. Far too often there is pertinent information in the literature that gets ignored, resulting in needless expenditures of time and money.

Generally EPA does not clean up below natural background. In some cases, the predictive risk-based models generate PRG levels that lie within or even below typical background. If natural background concentrations are higher than the risk-based PRGs, an adjustment of the PRG is probably needed. Exhibit 3-2 presents summary statistics for selected elements in soils that have background levels that may exceed risk-based PRGs. An illustrative example of this is naturally occurring arsenic in soils which frequently is higher than the risk-based concentration set at a one-in-one-million cancer risk (the PRG for residential soils is 0.39 mg/kg). After considering background concentrations in a local area, EPA Region 9 has at times used the non-cancer PRG (22 mg/kg) to evaluate sites recognizing that this value tends to be above background levels yet still falls within the range of soil concentrations (0.39-39 mg/kg) that equates to EPA's "acceptable" cancer risk range of $10E^{-6}$ to $10E^{-4}$.

Where anthropogenic "background" levels exceed PRGs and EPA has determined that a response action is necessary and feasible, EPA's goal will be to develop a comprehensive response to the widespread contamination. This will often require coordination with different authorities that have jurisdiction over the sources of contamination in the area.

EXHIBIT 3-2
BACKGROUND CONCENTRATIONS OF SELECTED ELEMENTS IN SOILS

TRACE	U.S. STUDY DATA[1]			CALIFORNIA DATA[2]		
ELEMENT	Range	GeoMean	ArMean	Range	GeoMean	ArMean
Arsenic	<.1-97	5.2 mg/kg	7.2 mg/kg	0.59-11	2.75 mg/kg	3.54 mg/kg
Beryllium	<1-15	0.63 "	0.92 "	0.10-2.7	1.14 "	1.28 "
Cadmium	<1-10	--	<1	0.05-1.7	0.26	0.36
Chromium	1-2000	37	54	23-1579	76.25	122.08
Nickel	<5-700	13	19	9.0-509	35.75	56.60

[1]Shacklette and Hansford, "Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States",USGS Professional Paper 1270, 1984.

[2]Bradford et. al, "Background Concentrations of Trace and Major Elements in California Soils", Kearney Foundation Special Report, UC-Riverside and CAL-EPA DTSC, March 1996.

3.3 Screening Sites with Multiple Pollutants

A suggested stepwise approach for PRG-screening of sites with multiple pollutants is as follows:

- Perform an extensive records search and compile existing data.
- Identify site contaminants in the PRG table. Record the PRG concentrations for various media and note whether PRG is based on cancer risk (indicated by "ca") or noncancer hazard (indicated by "nc"). Segregate cancer PRGs from non-cancer PRGs and exclude (but don't eliminate) non-risk based PRGs ("sat" or "max").
- For cancer risk estimates, take the site-specific concentration (maximum or 95 UCL) and divide by the PRG concentrations that are designated for cancer evaluation ("ca"). Multiply this ratio by 10^{-6} to estimate chemical-specific risk for a reasonable maximum exposure (RME). For multiple pollutants, simply add the risk for each chemical:

$$Risk = [(\frac{conc_x}{PRG_x}) + (\frac{conc_y}{PRG_y}) + (\frac{conc_z}{PRG_z})] \ x \ 10^{-6}$$

- For non-cancer hazard estimates. Divide the concentration term by its respective non-cancer PRG designated as "nc" and sum the ratios for multiple contaminants. The cumulative ratio represents a non-carcinogenic hazard index (HI). A hazard index of 1 or less is generally considered “safe”. A ratio greater than 1 suggests further evaluation. **[Note that carcinogens may also have an associated non-cancer PRG that is not listed in the printed copy of the table sent to folks on the mailing list. To obtain these values, the user should view or download the PRG table at our website and display the appropriate sections.]**

$$Hazard\ Index = [(\frac{conc_x}{PRG_x}) + (\frac{conc_y}{PRG_y}) + (\frac{conc_z}{PRG_z})]$$

For more information on screening site risks, the reader should contact EPA Region 9's Technical Support Team.

3. 4 Potential Problems

As with any risk-based tool, the potential exists for misapplication. In most cases the root cause will be a lack of understanding of the intended use of Region 9 PRGs. In order to prevent misuse of PRGs, the following should be avoided:

- Applying PRGs to a site without adequately developing a conceptual site model that identifies relevant exposure pathways and exposure scenarios,
- Not considering background concentrations when choosing PRGs as cleanup goals,
- Use of PRGs as cleanup levels without the nine-criteria analysis specified in the National Contingency Plan (or, comparable analysis for programs outside of Superfund),
- Use of PRGs as cleanup levels without verifying numbers with a toxicologist or regional risk assessor,
- Use of antiquated PRG tables that have been superseded by more recent publications,
- Not considering the effects of additivity when screening multiple chemicals, and
- Adjusting PRGs upward by factors of 10 or 100 without consulting a toxicologist or regional risk assessor.

4.0 TECHNICAL SUPPORT DOCUMENTATION

Region 9 PRGs consider human exposure hazards to chemicals from contact with contaminated soils, air, and water. The emphasis of the PRG equations and technical discussion are aimed at developing screening criteria for soils, since this is an area where few standards exist. For air and water, additional reference concentrations or standards are available for many chemicals (e.g. MCLs, non-zero MCLGs, AWQC, and NAAQS) and consequently the discussion of these media are brief.

4.1 Soils - Direct Ingestion

Calculation of risk-based PRGs for direct ingestion of soil is based on methods presented in RAGS HHEM, Part B (USEPA 1991a) and *Soil Screening Guidance* (USEPA 1996a,b, USEPA 2001a). Briefly, these methods backcalculate a soil concentration level from a target risk (for carcinogens) or hazard quotient (for noncarcinogens).

Residential Soil PRGs

A number of studies have shown that inadvertent ingestion of soil is common among children 6 years old and younger (Calabrese et al. 1989, Davis et al. 1990, Van Wijnen et al. 1990). To take into account the higher soil intake rate for children, two different approaches are used to estimate PRGs, depending on whether the adverse health effect is cancer or some effect other than cancer.

For carcinogens, the method for calculating PRGs uses an age-adjusted soil ingestion factor that takes into account the difference in daily soil ingestion rates, body weights, and exposure duration for children from 1 to 6 years old and others from 7 to 31 years old. This health-protective approach is chosen to take into account the higher daily rates of soil ingestion in children as well as the longer duration of exposure that is anticipated for a long-term resident. For more on this method, see USEPA RAGs Part B (1991a).

For noncarcinogenic concerns, the more protective method of calculating a soil PRG is to evaluate childhood exposures separately from adult exposures. In other words, an age-adjustment factor is not applied as was done for carcinogens. This approach is considered conservative because it combines the higher 6-year exposure for children with chronic toxicity criteria. In their analysis of the method, the Science Advisory Board (SAB) indicated that, for most chemicals, the approach may be overly protective. However, they noted that there are specific instances when the chronic RfD may be based on endpoints of toxicity that are specific to children (e.g. fluoride and nitrates) or when the dose-response is steep (i.e., the dosage difference between the no-observed-adverse-effects level [NOAEL] and an adverse effects level is small). Thus, for the purposes of screening, EPA Region 9 has adopted this approach for calculating soil PRGs for noncarcinogenic health concerns.

Industrial Soil PRGs

In the new *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (Supplemental SSL Guidance, EPA 2001a), two different soil ingestion rates are assumed for nonconstruction workers: 100 mg/day is assumed for outdoor workers whereas 50 mg/day is assumed for indoor workers. The default value of 100 mg/day for outdoor workers is also recommended by EPA's Technical Review Workgroup for Lead (TRW), and it reflects increased exposures to soils for outdoor workers relative to their indoor counterparts. For more on this, please see the Supplemental SSL Guidance available at the following website:

http://www.epa.gov/superfund/resources/soil/index.htm

Because the Region 9 PRGs are generic and intended for screening sites early in the investigation process (often before site-specific information is available), we have chosen to use the 100 mg/day soil ingestion (i.e. outdoor worker) assumption to calculate industrial soil PRGs. Please note that previous issues of the Region 9 PRGs table assumed 50 mg/day soil ingestion rate for workers. This change in soil ingestion rates is reflected in a somewhat lower (more stringent) industrial soils PRG for many contaminants. The appropriateness of this assumption for a particular site may be evaluated when additional information becomes available regarding site conditions or site development.

4.2 Soils - Vapor and Particulate Inhalation

Agency toxicity criteria indicate that risks from exposure to some chemicals via inhalation far outweigh the risk via ingestion; therefore soil PRGs have been designed to address this pathway as well. The models used to calculate PRGs for inhalation of volatiles/particulates are updates of risk assessment methods presented in RAGS Part B (USEPA 1991a) and are identical to the *Soil Screening Guidance: User's Guide and Technical Background Document* (USEPA 1996a,b).

It should be noted that the soil-to-air pathway that is evaluated in the PRGs calculations is based on direct inhalation exposures that result from the volatilization or particulate emissions of chemicals from soil to outdoor air. The soil PRG calculations currently do not evaluate potential for volatile contaminants in soil to migrate indoors. For this evaluation, a site-specific assessment is

required because the applicable model, the Johnson and Ettinger model, is extremely sensitive to a number of model parameters that do not lend themselves to standardization on a national basis. For more information on the indoor air model and/or to download a copy, please go to:

http://www.epa.gov/oerrpage/superfund/programs/risk/airmodel/johnson_ettinger.htm

To address the soil-to-outdoor air pathways, the PRG calculations incorporate volatilization factors (VF_s) for volatile contaminants and particulate emission factors (PEF) for nonvolatile contaminants. These factors relate soil contaminant concentrations to air contaminant concentrations that may be inhaled on-site. The VF_s and PEF equations can be broken into two separate models: an emission model to estimate emissions of the contaminant from the soil and a dispersion model to simulate the dispersion of the contaminant in the atmosphere.

The box model in RAGS Part B has been replaced with a dispersion term (Q/C) derived from a modeling exercise using meteorological data from 29 locations across the United States because the box model may not be applicable to a broad range of site types and meteorology and does not utilize state-of-the-art techniques developed for regulatory dispersion modeling. The dispersion model for both volatiles and particulates is the AREA-ST, an updated version of the Office of Air Quality Planning and Standards, Industrial Source Complex Model, ISC2. However, different Q/C terms are used in the VF and PEF equations. Los Angeles was selected as the 90th percentile data set for volatiles and Minneapolis was selected as the 90th percentile data set for fugitive dusts (USEPA1996 a,b). A default source size of 0.5 acres was chosen for the PRG calculations. This is consistent with the default exposure area over which Region 9 typically averages contaminant concentrations in soils. If unusual site conditions exist such that the area source is substantially larger than the default source size assumed here, an alternative Q/C could be applied (see USEPA 1996a,b).

Volatilization Factor for Soils

Volatile chemicals, defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole, were screened for inhalation exposures using a volatilization factor for soils (VF_s). Please note that VF_s's are available at our website.

The emission terms used in the VF_s are chemical-specific and were calculated from physical-chemical information obtained from several sources. The priority of these sources were as follows: *Soil Screening Guidance* (USEPA 1996a,b), *Superfund Chemical Data Matrix* (USEPA 1996c), *Fate and Exposure Data* (Howard 1991), *Subsurface Contamination Reference Guide* (EPA 1990a), and *Superfund Exposure Assessment Manual* (SEAM, EPA 1988). When there was a choice between a measured or a modeled value (e.g. Koc), we went with modeled values. In those cases where Diffusivity Coefficients (Di) were not provided in existing literature, Di's were calculated using Fuller's Method described in SEAM. A surrogate term was required for some chemicals that lacked physico-chemical information. In these cases, a proxy chemical of similar structure was used that may over- or under-estimate the PRG for soils.

Equation 4-9 forms the basis for deriving generic soil PRGs for the inhalation pathway. The following parameters in the standardized equation can be replaced with specific site data to develop a simple site-specific PRG

- Source area
- Average soil moisture content
- Average fraction organic carbon content
- Dry soil bulk density

The basic principle of the VF_s model (Henry's law) is applicable only if the soil contaminant concentration is at or below soil saturation "sat". Above the soil saturation limit, the model cannot predict an accurate VF-based PRG. How these particular cases are handled, depends on whether the contaminant is liquid or solid at ambient soil temperatures (see Section 4.5).

Particulate Emission Factor for Soils

Inhalation of chemicals adsorbed to respirable particles (PM_{10}) were assessed using a default PEF equal to 1. 316 x 10^9 m^3/kg that relates the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from contaminated soils. The generic PEF was derived using default values in Equation 4-11, which corresponds to a receptor point concentration of approximately 0.76 ug/m^3. The relationship is derived by Cowherd (1985) for a rapid assessment procedure applicable to a typical hazardous waste site where the surface contamination provides a relatively continuous and constant potential for emission over an extended period of time (e.g. years). This represents an annual average emission rate based on wind erosion that should be compared with chronic health criteria; it is not appropriate for evaluating the potential for more acute exposures.

The impact of the PEF on the resultant PRG concentration (that combines soil exposure pathways for ingestion, skin contact, and inhalation) can be assessed by accessing the Region 9 PRG website and viewing the pathway-specific soil concentrations. Equation 4-11 forms the basis for deriving a generic PEF for the inhalation pathway. For more details regarding specific parameters used in the PEF model, the reader is referred to *Soil Screening Guidance: Technical Background Document* (USEPA 1996a).

Note: the generic PEF evaluates windborne emissions and does not consider dust emissions from traffic or other forms of mechanical disturbance that could lead to greater emissions than assumed here.

4.3 Soils - Dermal Exposure

Dermal Contact Assumptions

Exposure factors for dermal contact with soil are based on recommendations in "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance" (USEPA 2001b). Recommended RME (reasonable maximum exposure) defaults for adult workers' skin surface areas (3300 cm^2/day) and soil adherence factors (0.2 mg/cm^2) now differ from the defaults recommended for adult residents (5700 cm^2/day, 0.07 mg/cm^2) as noted in Exhibit 4-1. This is due to differences in the range of activities experienced by workers versus residents.

Dermal Absorption

Chemical-specific skin absorption values recommended by the Superfund Dermal Workgroup were applied when available. Chemical-specific values are included for the following chemicals: arsenic, cadmium, chlordane, 2,4-D, DDT, lindane, TCDD, PAHs, PCBs, and pentachlorophenols. The "Supplemental Guidance for Dermal Risk Assessment" (USEPA 2001b) recommends a default dermal absorption factor for semivolatile organic compounds of 10% as a screening method for the majority of SVOCs without dermal absorption factors. Default dermal absorption values for other chemicals (VOCs and inorganics) are not recommended in this new guidance. Therefore, the assumption of 1% for inorganics and 10% for volatiles is no longer included in the Region 9 PRG table. This change has minimal impact on the final risk-based calculations because human exposure to VOCs and inorganics in soils is generally driven by other pathways of exposure.

4.4 Soils - Migration to Groundwater

The methodology for calculating SSLs for the migration to groundwater was developed to identify chemical concentrations in soil that have the potential to contaminate groundwater. Migration of contaminants from soil to groundwater can be envisioned as a two-stage process: (1) release of contaminant in soil leachate and (2) transport of the contaminant through the underlying soil and aquifer to a receptor well. The SSL methodology considers both of these fate and transport mechanisms.

SSLs are backcalculated from acceptable ground water concentrations (i.e. nonzero MCLGs, MCLs, or risk-based PRGs). First, the acceptable groundwater concentration is multiplied by a dilution factor to obtain a target leachate concentration. For example, if the dilution factor is 10 and the acceptable ground water concentration is 0.05 mg/L, the target soil leachate concentration would be 0.5 mg/L. The partition equation (presented in the *Soil Screening Guidance* document) is then used to calculate the total soil concentration (i.e. SSL) corresponding to this soil leachate concentration.

The SSL methodology was designed for use during the early stages of a site evaluation when information about subsurface conditions may be limited. Because of this constraint, the methodology is based on conservative, simplifying assumptions about the release and transport of contaminants in the subsurface. For more on SSLs, and how to calculate site-specific SSLs versus generic SSLs presented in the PRG table, the reader is referred to the *Soil Screening Guidance* document (USEPA 1996a,b).

4.5 Soil Saturation Limit

The soil saturation concentration "sat" corresponds to the contaminant concentration in soil at which the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached. Above this concentration, the soil contaminant may be present in free phase, i.e., nonaqueous phase liquids (NAPLs) for contaminants that are liquid at ambient soil temperatures and pure solid phases for compounds that are solid at ambient soil temperatures.

Equation 4-10 is used to calculate "sat" for each volatile contaminant. As an update to RAGS HHEM, Part B (USEPA 1991a), this equation takes into account the amount of contaminant that is in the vapor phase in soil in addition to the amount dissolved in the soil's pore water and sorbed to soil particles.

Chemical-specific "sat" concentrations must be compared with each VF-based PRG because a basic principle of the PRG volatilization model is not applicable when free-phase contaminants are present. How these cases are handled depends on whether the contaminant is liquid or solid at ambient temperatures. Liquid contaminant that have a VF-based PRG that exceeds the "sat" concentration are set equal to "sat" whereas for solids (e.g., PAHs), soil screening decisions are based on the appropriate PRGs for other pathways of concern at the site (e.g., ingestion).

4.6 Tap Water - Ingestion and Inhalation

Calculation of PRGs for ingestion and inhalation of contaminants in domestic water is based on the methodology presented in RAGS HHEM, Part B (USEPA 1991a). Ingestion of drinking water is an appropriate pathway for all chemicals. For the purposes of this guidance, however, inhalation of volatile chemicals from water is considered routinely only for chemicals with a Henry's Law constant of 1×10^{-5} atm-m^3/mole or greater <u>and</u> with a molecular weight of less than 200 g/mole.

For volatile chemicals, an upperbound volatilization constant (VF_w) is used that is based on all uses of household water (e.g showering, laundering, and dish washing). Certain assumptions were made. For example, it is assumed that the volume of water used in a residence for a family of four is 720 L/day, the volume of the dwelling is 150,000 L and the air exchange rate is 0.25 air changes/hour (Andelman in RAGS Part B). Furthermore, it is assumed that the average transfer efficiency weighted by water use is 50 percent (i.e. half of the concentration of each chemical in water will be transferred into air by all water uses). Note: the range of transfer efficiencies extends from 30% for toilets to 90% for dishwashers.

4.7 Default Exposure Factors

Default exposure factors were obtained primarily from RAGS Supplemental Guidance Standard Default *Exposure Factors* (OSWER Directive, 9285.6-03) dated March 25, 1991 and more recent information from U.S. EPA's Office of Solid Waste and Emergency Response, U.S. EPA's Office of Research and Development, and California EPA's Department of Toxic Substances Control (see Exhibit 4-1).

Because contact rates may be different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors ("adj"). Use of age-adjusted factors are especially important for soil ingestion exposures, which are higher during childhood and decrease with age. However, for purposes of combining exposures across pathways, additional age-adjusted factors are used for inhalation and dermal exposures. These factors approximate the integrated exposure from birth until age 30 combining contact rates, body weights, and exposure durations for two age groups - small children and adults. Age-adjusted factors were obtained from RAGS PART B or developed by analogy (see derivations below).

For soils only, noncarcinogenic contaminants are evaluated in children separately from adults. No age-adjustment factor is used in this case. The focus on children is considered protective of the higher daily intake rates of soil by children and their lower body weight. For maintaining consistency when evaluating soils, dermal and inhalation exposures are also based on childhood contact rates.

(1) ingestion([mg-yr]/[kg-d]:

$$IFS_{adj} = \frac{ED_c \text{ x } IRS_c}{BW_c} + \frac{(ED_r - ED_c) \text{ x } IRS_a}{BW_a}$$

(2) skin contact([mg-yr]/[kg-d]:

$$SFS_{adj} = \frac{ED_c \text{ x } AF \text{ x } SA_c}{BW_c} + \frac{(ED_r - ED_c) \text{ x } AF \text{ x } SA_a}{BW_a}$$

(3) inhalation ([m^3-yr]/[kg-d]):

$$InhF_{adj} = \frac{ED_c \text{ x } IRA_c}{BW_c} + \frac{(ED_r - ED_c) \text{ x } IRA_a}{BW_a}$$

EXHIBIT 4-1
STANDARD DEFAULT FACTORS

Symbol	Definition (units)	Default	Reference
CSFo	Cancer slope factor oral (mg/kg-d)-1	--	IRIS, HEAST, or NCEA
CSFi	Cancer slope factor inhaled (mg/kg-d)-1	--	IRIS, HEAST, or NCEA
RfDo	Reference dose oral (mg/kg-d)	--	IRIS, HEAST, or NCEA
RfDi	Reference dose inhaled (mg/kg-d)	--	IRIS, HEAST, or NCEA
TR	Target cancer risk	10^{-6}	--
THQ	Target hazard quotient	1	--
BWa	Body weight, adult (kg)	70	RAGS (Part A), EPA 1989 (EPA/540/1-89/002)
BWc	Body weight, child (kg)	15	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
ATc	Averaging time - carcinogens (days)	25550	RAGS(Part A), EPA 1989 (EPA/540/1-89/002)
ATn	Averaging time - noncarcinogens (days)	ED*365	
SAa	Exposed surface area for soil/dust (cm^2/day)		Dermal Assessment, EPA 2000 (EPA/540/R-99/005)
	– adult resident	5700	
	– adult worker	3300	
SAc	Exposed surface area, child in soil (cm^2/day)	2800	Dermal Assessment, EPA 2000 (EPA/540/R-99/005)
AFa	Adherence factor, soils (mg/cm^2)		Dermal Assessment, EPA 2000 (EPA/540/R-99/005)
	– adult resident	0.07	
	– adult worker	0.2	
AFc	Adherence factor, child (mg/cm^2)	0.2	Dermal Assessment, EPA 2000 (EPA/540/R-99/005)
ABS	Skin absorption defaults (unitless):		
	– semi-volatile organics	0.1	Dermal Assessment, EPA 2000 (EPA/540/R-99/005)
	– volatile organics	--	Dermal Assessment, EPA 2000 (EPA/540/R-99/005)
	– inorganics	--	Dermal Assessment, EPA 2000 (EPA/540/R-99/005)
IRAa	Inhalation rate - adult (m^3/day)	20	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRAc	Inhalation rate - child (m^3/day)	10	Exposure Factors, EPA 1997 (EPA/600/P-95/002Fa)
IRWa	Drinking water ingestion - adult (L/day	2	RAGS(Part A), EPA 1989 (EPA/540/1-89/002)
IRWc	Drinking water ingestion - child (L/day)	1	PEA, Cal-EPA (DTSC, 1994)
IRSa	Soil ingestion - adult (mg/day)	100	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRSc	Soil ingestion - child (mg/day),	200	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRSo	Soil ingestion - occupational (mg/day)	100	Soil Screening Guidance (EPA 2001a)
EFr	Exposure frequency - residential (d/y)	350	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EFo	Exposure frequency - occupational (d/y)	250	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDr	Exposure duration - residential (years)	30[a]	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDc	Exposure duration - child (years)	6	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDo	Exposure duration - occupational (years)	25	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
	Age-adjusted factors for carcinogens:		
IFSadj	Ingestion factor, soils ([mg-yr]/[kg-d])	114	RAGS(Part B), EPA 1991 (OSWER No. 9285.7-01B)
SFSadj	Dermal factor, soils ([mg-yr]/[kg-d])	361	By analogy to RAGS (Part B)
InhFadj	Inhalation factor, air ([m^3-yr]/[kg-d])	11	By analogy to RAGS (Part B)
IFWadj	Ingestion factor, water ([L-yr]/[kg-d])	1.1	By analogy to RAGS (Part B)
VFw	Volatilization factor for water (L/m^3)	0.5	RAGS(Part B), EPA 1991 (OSWER No. 9285.7-01B)
PEF	Particulate emission factor (m^3/kg)	See below	Soil Screening Guidance (EPA 1996a,b)
VFs	Volatilization factor for soil (m^3/kg)	See below	Soil Screening Guidance (EPA 1996a,b)
sat	Soil saturation concentration (mg/kg)	See below	Soil Screening Guidance (EPA 1996a,b)

_____
Footnote:
[a]Exposure duration for lifetime residents is assumed to be 30 years total. For carcinogens, exposures are combined for children (6 years) and adults (24 years) .

4.8 Standardized Equations

The equations used to calculate the PRGs for carcinogenic and noncarcinogenic contaminants are presented in Equations 4-1 through 4-8. The PRG equations update RAGS Part B equations. The methodology backcalculates a soil, air, or water concentration level from a target risk (for carcinogens) or hazard quotient (for noncarcinogens). For completeness, the soil equations combine risks from ingestion, skin contact, and inhalation simultaneously. **Note: the electronic version of the table also includes pathway-specific PRGs, should the user decide against combining specific exposure pathways; or, the user wants to identify the relative contribution of each pathway to exposure.**

To calculate PRGs for volatile chemicals in soil, a chemical-specific volatilization factor is calculated per Equation 4-9. Because of its reliance on Henry's law, the VF_s model is applicable only when the contaminant concentration in soil is at or below saturation (i.e. there is no free-phase contaminant present). Soil saturation ("sat") corresponds to the contaminant concentration in soil at which the adsorptive limits of the soil particles and the solubility limits of the available soil moisture have been reached. Above this point, pure liquid-phase contaminant is expected in the soil. If the PRG calculated using VF_s was greater than the calculated sat, the PRG was set equal to sat, in accordance with *Soil Screening Guidance* (USEPA 1996 a,b). The equation for deriving sat is presented in Equation 4-10.

PRG EQUATIONS

Soil Equations: For soils, equations were based on three exposure routes (ingestion, skin contact, and inhalation).

Equation 4-1: Combined Exposures to Carcinogenic Contaminants in Residential Soil

$$C(mg/kg) = \frac{TR \times AT_c}{EF_r \left[\left(\frac{IFS_{adj} \times CSF_o}{10^6 mg/kg} \right) + \left(\frac{SFS_{adj} \times ABS \times CSF_o}{10^6 mg/kg} \right) + \left(\frac{InhF_{adj} \times CSF_i}{VF_s^a} \right) \right]}$$

Equation 4-2: Combined Exposures to Noncarcinogenic Contaminants in Residential Soil

$$C(mg/kg) = \frac{THQ \times BW_c \times AT_n}{EF_r \times ED_c \left[\left(\frac{1}{RfD_o} \times \frac{IRS_c}{10^6 mg/kg} \right) + \left(\frac{1}{RfD_o} \times \frac{SA_c \times AF \times ABS}{10^6 mg/kg} \right) + \left(\frac{1}{RfD_i} \times \frac{IRA_c}{VF_s^a} \right) \right]}$$

Equation 4-3: Combined Exposures to Carcinogenic Contaminants in Industrial Soil

$$C(mg/kg) = \frac{TR \times BW_a \times AT_c}{EF_o \times ED_o \left[\left(\frac{IRS_o \times CSF_o}{10^6 mg/kg} \right) + \left(\frac{SA_a \times AF \times ABS \times CSF_o}{10^6 mg/kg} \right) + \left(\frac{IRA_a \times CSF_i}{VF_s^a} \right) \right]}$$

Equation 4-4: Combined Exposures to Noncarcinogenic Contaminants in Industrial Soil

$$C(mg/kg) = \frac{THQ \times BW_a \times AT_n}{EF_o \times ED_o \left[\left(\frac{1}{RfD_o} \times \frac{IRS_o}{10^6 mg/kg} \right) + \left(\frac{1}{RfD_o} \times \frac{SA_a \times AF \times ABS}{10^6 mg/kg} \right) + \left(\frac{1}{RfD_i} \times \frac{IRA_a}{VF_s^a} \right) \right]}$$

Footnote:

[a]Use VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

Tap Water Equations:

Equation 4-5: Ingestion and Inhalation Exposures to Carcinogenic Contaminants in Water

$$C(ug/L) = \frac{TR \times AT_c \times 1000ug/mg}{EF_r\ [(IFW_{adj} \times CSF_o) + (VF_w \times InhF_{adj} \times CSF_i)]}$$

Equation 4-6: Ingestion and Inhalation Exposures to Noncarcinogenic Contaminants in Water

$$C(ug/L) = \frac{THQ \times BW_a \times AT_n \times 1000ug/mg}{EF_r \times ED_r\ [(\frac{IRW_a}{RfD_o}) + (\frac{VF_w \times IRA_a}{RfD_i})]}$$

Air Equations:

Equation 4-7: Inhalation Exposures to Carcinogenic Contaminants in Air

$$C(ug/m^3) = \frac{TR \times AT_c \times 1000ug/mg}{EF_r \times InhF_{adj} \times CSF_i}$$

Equation 4-8: Inhalation Exposures to Noncarcinogenic Contaminants in Air

$$C(ug/m^3) = \frac{THQ \times RfD_i \times BW_a \times AT_n \times 1000ug/mg}{EF_r \times ED_r \times IRA_a}$$

Footnote:

[a]Use VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

SOIL-TO-AIR VOLATILIZATION FACTOR (VF_s)

Equation 4-9: Derivation of the Volatilization Factor

$$VF_s(m^3/kg) = (Q/C) \times \frac{(3.14 \times D_A \times T)^{1/2}}{(2 \times \rho_b \times D_A)} \times 10^{-4}(m^2/cm^2)$$

where:

$$D_A = \frac{[(\Theta_a^{10/3} D_i H' + \Theta_w^{10/3} D_w)/n^2]}{\rho_B K_d + \Theta_w + \Theta_a H'}$$

Parameter	Definition (units)	Default
VF_s	Volatilization factor (m^3/kg)	--
D_A	Apparent diffusivity (cm^2/s)	--
Q/C	Inverse of the mean conc. at the center of a 0.5-acre square source ($g/^{M2}$-s per kg/m^3)	68.81
T	Exposure interval (s)	9.5×10^8
ρ_b	Dry soil bulk density (g/cm^3)	1.5
Θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28 or n-Θ_w
n	Total soil porosity (L_{pore}/L_{soil})	0.43 or 1 - (ρ_b/ρ_s)
Θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
ρ_s	Soil particle density (g/cm^3)	2.65
Di	Diffusivity in air (cm^2/s)	Chemical-specific
H	Henry's Law constant (atm-m^3/mol)	Chemical-specific
H'	Dimensionless Henry's Law constant	Calculated from H by multiplying by 41 (USEPA 1991a)
D_w	Diffusivity in water (cm^2/s)	Chemical-specific
K_d	Soil-water partition coefficient (cm^3/g) = $K_{oc}f_{oc}$	Chemical-specific
K_{oc}	Soil organic carbon-water partition coefficient (cm^3/g)	Chemical-specific
f_{oc}	Fraction organic carbon in soil (g/g)	0.006 (0.6%)

SOIL SATURATION CONCENTRATION (sat)

Equation 4-10: Derivation of the Soil Saturation Limit

$$sat = \frac{S}{\rho_b} \left(K_d \rho_b + \Theta_w + H' \Theta_a\right)$$

Parameter	Definition (units)	Default
sat	Soil saturation concentration (mg/kg)	--
S	Solubility in water (mg/L-water)	Chemical-specific
ρ_b	Dry soil bulk density (kg/L)	1.5
n	Total soil porosity (L_{pore}/L_{soil})	0.43 or 1 - (ρ_b/ρ_s)
ρ_s	Soil particle density (kg/L)	2.65
K_d	Soil-water partition coefficient (L/kg)	K_{oc} x f_{oc} (chemical-specific)
k_{oc}	Soil organic carbon/water partition coefficient (L/kg)	Chemical-specific
f_{oc}	Fraction organic carbon content of soil (g/g)	0.006 or site-specific
Θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
Θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28 or n-Θ_w
w	Average soil moisture content (kg_{water}/kg_{soil} or L_{water}/kg_{soil})	0.1
H	Henry's Law constant (atm-m^3/mol)	Chemical-specific
H'	Dimensionless Henry's Law constant	H x 41, where 41 is a units conversion factor

SOIL-TO-AIR PARTICULATE EMISSION FACTOR (PEF)

Equation 4-11: Derivation of the Particulate Emission Factor

$$PEF(m^3/kg) = Q/C \times \frac{3600 s/h}{0.036 \times (1-V) \times (U_m/U_t)^3 \times F(x)}$$

Parameter	Definition (units)	Default
PEF	Particulate emission factor (m^3/kg)	1.316×10^9
Q/C	Inverse of the mean concentration at the center of a 0.5-acre-square source ($g/^{M2}$-s per kg/m^3)	90.80
V	Fraction of vegetative cover (unitless)	0.5
U_m	Mean annual windspeed (m/s)	4.69
U_t	Equivalent threshold value of windspeed at 7 m (m/s)	11.32
F(x)	Function dependent on U_m/U_t derived using Cowherd (1985) (unitless)	0.194

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APPENDIX E

EPA REGION 9 PRG TABLE

(October 2002)

Key : SFo,I=Cancer Slope Factor oral, Inhalation RfDo,I=Reference Dose oral, Inhalation I=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca**(where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION																CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
8.7E-03	I	4.0E-03	I	8.7E-03	r	4.0E-03	r	0	0.10	30560-19-1	Acephate	5.6E+01	ca**	2.0E+02	ca*	7.7E-01	ca*	7.7E+00	ca*		
				7.7E-03	I	2.6E-03	I	1		75-07-0	Acetaldehyde	1.1E+01	ca**	2.3E+01	ca**	8.7E-01	ca*	1.7E+00	ca		
		2.0E-02	I			2.0E-02	r	0	0.10	34256-82-1	Acetochlor	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	I			1.0E-01	r	1		67-64-1	Acetone	1.6E+03	nc	6.0E+03	nc	3.7E+02	nc	6.1E+02	nc	1.6E+01	8.0E-01
		8.0E-04	h			8.0E-04	r	0	0.10	75-86-5	Acetone cyanohydrin	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
		1.7E-02	r			1.7E-02	I	1		75-05-8	Acetonitrile	4.2E+02	nc	1.8E+03	nc	6.2E+01	nc	1.0E+02	nc		
		2.0E-02	h			5.7E-06	I	1		107-02-8	Acrolein	1.0E-01	nc	3.4E-01	nc	2.1E-02	nc	4.2E-02	nc		
4.5E+00	I	2.0E-04	I	4.5E+00	I	2.0E-04	r	0	0.10	79-06-1	Acrylamide	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca		
		5.0E-01	I			2.9E-04	I	0	0.10	79-10-7	Acrylic acid	2.9E+04	nc	1.0E+05	max	1.0E+00	nc	1.8E+04	nc		
5.4E-01	I	1.0E-03	h	2.4E-01	I	5.7E-04	I	1		107-13-1	Acrylonitrile	2.1E-01	ca*	4.9E-01	ca*	2.8E-02	ca*	3.9E-02	ca*		
8.1E-02	h	1.0E-02	I	8.0E-02	r	1.0E-02	r	0	0.10	15972-60-8	Alachlor	6.0E+00	ca	2.1E+01	ca	8.4E-02	ca	8.4E-01	ca		
		1.5E-01	I			1.5E-01	r	0	0.10	1596-84-5	Alar	9.2E+03	nc	9.2E+04	nc	5.5E+02	nc	5.5E+03	nc		
		1.0E-03	I			1.0E-03	r	0	0.10	116-06-3	Aldicarb	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E-03	I			1.0E-03	r	0	0.10	1646-88-4	Aldicarb sulfone	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
1.7E+01	I	3.0E-05	I	1.7E+01	I	3.0E-05	r	0	0.10	309-00-2	Aldrin	2.9E-02	ca*	1.0E-01	ca	3.9E-04	ca	4.0E-03	ca	5.0E-01	2.0E-02
		2.5E-01	I			2.5E-01	r	0	0.10	74223-64-6	Ally	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		5.0E-03	I			5.0E-03	r	0	0.10	107-18-6	Allyl alcohol	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		5.0E-02	h			2.9E-04	I	0	0.10	107-05-1	Allyl chloride	3.0E+03	nc	3.0E+04	nc	1.0E+00	nc	1.8E+03	nc		
		1.0E+00	n			1.4E-03	n	0		7429-90-5	Aluminum	7.6E+04	nc	1.0E+05	max	5.1E+00	nc	3.6E+04	nc		
		4.0E-04	I					0		20859-73-8	Aluminum phosphide	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc		
		3.0E-04	I			3.0E-04	r	0	0.10	67485-29-4	Amdro	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		9.0E-03	I			9.0E-03	r	0	0.10	834-12-8	Ametryn	5.5E+02	nc	5.5E+03	nc	3.3E+01	nc	3.3E+02	nc		
		7.0E-02	h			7.0E-02	r	0	0.10	591-27-5	m-Aminophenol	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-05	h			2.0E-05	r	0	0.10	504-24-5	4-Aminopyridine	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		2.5E-03	I			2.5E-03	r	0	0.10	33089-61-1	Amitraz	1.5E+02	nc	1.5E+03	nc	9.1E+00	nc	9.1E+01	nc		
						2.9E-02	I			7664-41-7	Ammonia					1.0E+02	nc				
		2.0E-01	I					0	0.10	7773-06-0	Ammonium sulfamate	1.2E+04	nc	1.0E+05	max			7.3E+03	nc		
5.7E-03	I	7.0E-03	n	5.7E-03	r	2.9E-04	I	0	0.10	62-53-3	Aniline	8.5E+01	ca**	3.0E+02	ca*	1.0E+00	nc	1.2E+01	ca*		
		4.0E-04	I					0		7440-36-0	Antimony and compounds	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc	5.0E+00	3.0E-01
		5.0E-04	h					0		1314-60-9	Antimony pentoxide	3.9E+01	nc	5.1E+02	nc			1.8E+01	nc		
		9.0E-04	h					0		28300-74-5	Antimony potassium tartrate	7.0E+01	nc	9.2E+02	nc			3.3E+01	nc		
		4.0E-04	h					0		1332-81-6	Antimony tetroxide	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc		
		4.0E-04	h			5.7E-05	I	0		1309-64-4	Antimony trioxide	3.1E+01	nc	4.1E+02	nc	2.1E-01	nc	1.5E+01	nc		
		1.3E-02	I			1.3E-02	r	0	0.10	74115-24-5	Apollo	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
2.5E-02	I	5.0E-02	h	2.5E-02	I	5.0E-02	r	0	0.10	140-57-8	Aramite	1.9E+01	ca	6.9E+01	ca	2.7E-01	ca	2.7E+00	ca		
		3.0E-04	I					0	0.03	7440-38-2	Arsenic (noncancer endpoint)	2.2E+01	nc	2.6E+02	nc						

Key : SFo,I=Cancer Slope Factor oral, Inhalation RfDo,I=Reference Dose oral, Inhalation I=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca**(where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION														CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.					Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
1.5E+00	I	3.0E-04	I	1.5E+01	I			0	0.03	7440-38-2				Arsenic (cancer endpoint)	3.9E-01	ca*	1.6E+00	ca	4.5E-04	ca	4.5E-02	ca	2.9E+01	1.0E+00
						1.4E-05	I	0		7784-42-1				Arsine (see arsenic for cancer endpoint)					5.2E-02	nc				
		9.0E-03	I			9.0E-03	r		0.10	76578-12-6				Assure	5.5E+02	nc	5.5E+03	nc	3.3E+01	nc	3.3E+02	nc		
		5.0E-02	I			5.0E-02	r	0	0.10	3337-71-1				Asulam	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
2.2E-01	h	3.5E-02	h	2.2E-01	r	3.5E-02	r	0	0.10	1912-24-9				Atrazine	2.2E+00	ca	7.8E+00	ca	3.1E-02	ca	3.0E-01	ca		
		4.0E-04	I			4.0E-04	r	0	0.10	71751-41-2				Avermectin B1	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
1.1E-01	I			1.1E-01	I			0	0.10	103-33-3				Azobenzene	4.4E+00	ca	1.6E+01	ca	6.2E-02	ca	6.1E-01	ca		
		7.0E-02	I			1.4E-04	h	0		7440-39-3				Barium and compounds	5.4E+03	nc	6.7E+04	nc	5.2E-01	nc	2.6E+03	nc	1.6E+03	8.2E+01
		4.0E-03	I			4.0E-03	r	0	0.10	114-26-1				Baygon	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		3.0E-02	I			3.0E-02	r	0	0.10	43121-43-3				Bayleton	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	68359-37-5				Baythroid	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-01	I			3.0E-01	r	0	0.10	1861-40-1				Benefin	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		5.0E-02	I			5.0E-02	r	0	0.10	17804-35-2				Benomyl	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		3.0E-02	I			3.0E-02	r	0	0.10	25057-89-0				Bentazon	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		1.0E-01	I			1.0E-01	r	0	0.10	100-52-7				Benzaldehyde	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
5.5E-02	I	3.0E-03	n	2.9E-02	I	1.7E-03	n	1		71-43-2				Benzene	6.0E-01	ca*	1.3E+00	ca*	2.3E-01	ca*	3.4E-01	ca*	3.0E-02	2.0E-03
2.3E+02	I	3.0E-03	I	2.3E+02	I	3.0E-03	r	0	0.10	92-87-5				Benzidine	2.1E-03	ca	7.5E-03	ca	2.9E-05	ca	2.9E-04	ca		
		4.0E+00	I			4.0E+00	r	0	0.10	65-85-0				Benzoic acid	1.0E+05	max	1.0E+05	max	1.5E+04	nc	1.5E+05	nc	4.0E+02	2.0E+01
1.3E+01	I			1.3E+01	r			0	0.10	98-07-7				Benzotrichloride	3.7E-02	ca	1.3E-01	ca	5.2E-04	ca	5.2E-03	ca		
		3.0E-01	h			3.0E-01	r	0	0.10	100-51-6				Benzyl alcohol	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
1.7E-01	I	2.9E-03	r	1.7E-01	r	2.9E-03	n	1		100-44-7				**Benzyl chloride**	8.9E-01	ca*	2.2E+00	ca	4.0E-02	ca	6.6E-02	ca		
		2.0E-03	I	8.4E+00	I	5.7E-06	I	0		7440-41-7				Beryllium and compounds	1.5E+02	nc	1.9E+03	ca**	8.0E-04	ca*	7.3E+01	nc	6.3E+01	3.0E+00
		1.0E-04	I			1.0E-04	r	0	0.10	141-66-2				Bidrin	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.5E-02	I			1.5E-02	r	0	0.10	82657-04-3				Biphenthrin (Talstar)	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		5.0E-02	I			5.0E-02	r	1		92-52-4				1,1-Biphenyl	3.5E+02	sat	3.5E+02	sat	1.8E+02	nc	3.0E+02	nc		
1.1E+00	I			1.2E+00	I			1		111-44-4				Bis(2-chloroethyl)ether	2.1E-01	ca	5.5E-01	ca	5.8E-03	ca	9.8E-03	ca	4.0E-04	2.0E-05
7.0E-02	x	4.0E-02	I	3.5E-02	x	4.0E-02	r	1		39638-32-9				Bis(2-chloroisopropyl)ether	2.9E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
2.2E+02	I			2.2E+02	I			1		542-88-1				Bis(chloromethyl)ether	1.9E-04	ca	4.3E-04	ca	3.1E-05	ca	5.2E-05	ca		
7.0E-02	x	4.0E-02	I	3.5E-02	x	4.0E-02	r	1		108-60-1				Bis(2-chloro-1-methylethyl)ether	2.9E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
1.4E-02	I	2.0E-02	I	1.4E-02	r	2.2E-02	r	0	0.10	117-81-7				Bis(2-ethylhexyl)phthalate (DEHP)	3.5E+01	ca*	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		5.0E-02	I			5.0E-02	r	0	0.10	80-05-7				Bisphenol A	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.0E-01	I			5.7E-03	x	0		7440-42-8				**Boron**	1.6E+04	nc	1.0E+05	max	2.1E+01	nc	7.3E+03	nc		
						2.0E-04	h	0		7637-07-2				Boron trifluoride					7.3E-01	nc				
		4.00E-03	I							15541-45-4				**Bromate**	3.1E+02	nc	4.1E+03	nc	0.0E+00		1.5E+02	nc		
		2.0E-02	n			2.9E-03	n	1		108-86-1				Bromobenzene	2.8E+01	nc	9.2E+01	nc	1.0E+01	nc	2.0E+01	nc		
6.2E-02	I	2.0E-02	I	6.2E-02	r	2.0E-02	r	1		75-27-4				Bromodichloromethane	8.2E-01	ca	1.8E+00	ca	1.1E-01	ca	1.8E-01	ca	6.0E-01	3.0E-02

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+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
7.9E-03	i	2.0E-02	i	3.9E-03	i	2.0E-02	r	O	0.10	75-25-2	Bromoform (tribromomethane)	6.2E+01	ca*	2.2E+02	ca*	1.7E+00	ca*	8.5E+00	ca*	8.0E-01	4.0E-02
		1.4E-03	i			1.4E-03	i	1		74-83-9	Bromomethane (Methyl bromide)	3.9E+00	nc	1.3E+01	nc	5.2E+00	nc	8.7E+00	nc	2.0E-01	1.0E-02
		5.0E-03	h			5.0E-03	r	0	0.10	2104-96-3	Bromophos	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	i			2.0E-02	r	O	0.10	1689-84-5	Bromoxynil	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	i			2.0E-02	r	0	0.10	1689-99-2	Bromoxynil octanoate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
9.8E-01	r			9.8E-01	i			1		106-99-0	1,3-Butadiene	6.5E-03	ca	1.4E-02	ca	6.9E-03	ca	1.1E-02	ca		
		1.0E-01	i			2.6E-03	n	0	0.10	71-36-3	1-Butanol	6.1E+03	nc	6.1E+04	nc	9.5E+00	nc	3.6E+03	nc	1.7E+01	9.0E-01
		5.0E-02	i			5.0E-02	r	0	0.10	2008-41-5	Butylate	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.00E-02	n			4.00E-02	r	1		104-51-8	n-Butylbenzene	2.4E+02	sat	2.4E+02	sat	1.5E+02	nc	2.4E+02	nc		
		4.00E-02	n			4.00E-02	r	1		135-9-88	sec-Butylbenzene	2.2E+02	sat	2.2E+02	sat	1.5E+02	nc	2.4E+02	nc		
		4.00E-02	n			4.00E-02	r	1		98-06-6	tert-Butylbenzene	3.9E+02	sat	3.9E+02	sat	1.5E+02	nc	2.4E+02	nc		
		2.0E-01	i			2.0E-01	r	O	0.10	85-68-7	Butyl benzyl phthalate	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc	9.3E+02	8.1E+02
		1.0E+00	i			1.0E+00	r	0	0.10	85-70-1	Butylphthalyl butylglycolate	6.1E+04	nc	1.0E+05	max	3.7E+03	nc	3.6E+04	nc		
2.5E-01	h	3.0E-04	h	2.5E-01	r	3.0E-04	r	0	0.10	75-60-5	Cacodylic acid	1.9E+00	ca**	6.9E+00	ca*	2.7E-02	ca*	2.7E-01	ca*		
		5.0E-04	i	6.3E+00	i			0	0.001	7440-43-9	Cadmium and compounds	3.7E+01	nc	4.5E+02	nc	1.1E-03	ca	1.8E+01	nc	8.0E+00	4.0E-01
		5.0E-01	i			5.0E-01	r	0	0.10	105-60-2	Caprolactam	3.1E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
8.6E-03	h	2.0E-03	i	8.6E-03	r	2.0E-03	r	O	0.10	2425-06-1	Captafol	5.7E+01	ca**	2.0E+02	ca**	7.8E-01	ca**	7.8E+00	ca**		
3.5E-03	h	1.3E-01	i	3.5E-03	r	1.3E-01	r	0	0.10	133-06-2	Captan	1.4E+02	ca*	4.9E+02	ca	1.9E+00	ca	1.9E+01	ca		
		1.0E-01	i			1.1E-01	r	0	0.10	63-25-2	Carbaryl	6.1E+03	nc	6.2E+04	nc	4.0E+02	nc	3.6E+03	nc		
2.0E-02	h			2.0E-02	r			O	0.10	86-74-8	Carbazole	2.4E+01	ca	8.6E+01	ca	3.4E-01	ca	3.4E+00	ca	6.0E-01	3.0E-02
		5.0E-03	i			5.0E-03	r	0	0.10	1563-66-2	Carbofuran	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		1.0E-01	i			2.0E-01	i	1		75-15-0	Carbon disulfide	3.6E+02	nc	7.2E+02	sat	7.3E+02	nc	1.0E+03	nc	3.2E+01	2.0E+00
1.3E-01	i	7.0E-04	i	5.3E-02	i	7.0E-04	r	1		56-23-5	Carbon tetrachloride	2.5E-01	ca**	5.5E-01	ca*	1.3E-01	ca*	1.7E-01	ca*	7.0E-02	3.0E-03
		1.0E-02	i			1.0E-02	r	0	0.10	55285-14-8	Carbosulfan	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	5234-68-4	Carboxin	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		1.5E-02	i			1.5E-02	r	0	0.10	133-90-4	Chloramben	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
4.0E-01	h			4.0E-01	r			0	0.10	118-75-2	Chloranil	1.2E+00	ca	4.3E+00	ca	1.7E-02	ca	1.7E-01	ca		
3.5E-01	i	5.0E-04	i	3.5E-01	i	2.0E-04	i	O	0.04	12789-03-6	Chlordane	1.6E+00	ca*	6.5E+00	ca*	1.9E-02	ca*	1.9E-01	ca*	1.0E+01	5.0E-01
		2.0E-02	i			2.0E-02	r	0	0.10	90982-32-4	Chlorimuron-ethyl	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			5.71E-05	n			7782-50-5	Chlorine					2.1E-01	nc				
						5.7E-05	i			10049-04-4	Chlorine dioxide					2.1E-01	nc				
		2.0E-03	h			2.0E-03	r	0	0.10	79-11-8	Chloroacetic acid	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		8.6E-06	r			8.6E-06	i	1		532-27-4	2-Chloroacetophenone	3.3E-02	nc	1.1E-01	nc	3.1E-02	nc	5.2E-02	nc		
		4.0E-03	i			4.0E-03	r	0	0.10	106-47-8	4-Chloroaniline	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc	7.0E-01	3.0E-02
		2.0E-02	i			1.7E-02	n	1		108-90-7	Chlorobenzene	1.5E+02	nc	5.3E+02	nc	6.2E+01	nc	1.1E+02	nc	1.0E+00	7.0E-02

Key : SFo,I=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation I=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca** (where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
2.7E-01	h	2.0E-02	I	2.7E-01	h	2.0E-02	r	0	0.10	510-15-6	Chlorobenzilate	1.8E+00	ca	6.4E+00	ca	2.5E-02	ca	2.5E-01	ca		
		2.0E-01	h			2.0E-01	r	0	0.10	74-11-3	p-Chlorobenzoic acid	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	h			2.0E-02	r	0	0.10	98-56-6	4-Chlorobenzotrifluoride	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	h			2.0E-03	h	1		126-99-8	2-Chloro-1,3-butadiene	3.6E+00	nc	1.2E+01	nc	7.3E+00	nc	1.4E+01	nc		
		4.0E-01	h			4.0E-01	r	1		109-69-3	1-Chlorobutane	4.8E+02	sat	4.8E+02	sat	1.5E+03	nc	2.4E+03	nc		
		1.4E+01	r			1.4E+01	I	1		75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)	3.4E+02	sat	3.4E+02	sat	5.2E+04	nc	8.7E+04	nc		
		1.4E+01	r			1.4E+01	I	1		75-45-6	Chlorodifluoromethane	3.4E+02	sat	3.4E+02	sat	5.1E+04	nc	8.5E+04	nc		
2.9E-03	n	4.0E-01	n	2.9E-03	r	2.9E+00	I	1		75-00-3	Chloroethane	3.0E+00	ca	6.5E+00	ca	2.3E+00	ca	4.6E+00	ca		
		1.0E-02	I			8.6E-04	n	1		67-66-3	**Chloroform**	3.6E+00	ca/nc	1.2E+01	ca/nc	3.1E+00	ca/nc	6.2E+00	ca/nc	6.0E-01	3.0E-02
3.1E-02				1.9E-02				1			**Chloroform "CAL-Modified PRG"**	9.4E-01	ca	2.0E+00	ca	3.5E-01	ca	5.3E-01	ca		
1.3E-02	h			6.3E-03	h	8.6E-02	n	1		74-87-3	Chloromethane	1.2E+00	ca	2.6E+00	ca	1.1E+00	ca	1.5E+00	ca		
5.8E-01	h			5.8E-01	r			0	0.10	95-69-2	4-Chloro-2-methylaniline	8.4E-01	ca	3.0E+00	ca	1.2E-02	ca	1.2E-01	ca		
4.6E-01	h			4.6E-01	r			0	0.10	3165-93-3	4-Chloro-2-methylaniline hydrochloride	1.1E+00	ca	3.7E+00	ca	1.5E-02	ca	1.5E-01	ca		
		8.0E-02	I			8.0E-02	r	1		91-58-7	beta-Chloronaphthalene	4.9E+03	nc	2.3E+04	nc	2.9E+02	nc	4.9E+02	nc		
9.7E-03	h	1.0E-03	h	9.7E-03	r	2.0E-05	h	1		88-73-3	**o-Chloronitrobenzene**	1.4E+00	nc**	4.5E+00	nc**	7.3E-02	nc**	1.5E-01	nc**		
6.7E-03	h	1.0E-03	h	6.7E-03	r	1.7E-04	h	1		100-00-5	**p-Chloronitrobenzene**	1.0E+01	nc**	3.7E+01	nc**	6.2E-01	nc**	1.2E+00	nc**		
		5.0E-03	I			5.0E-03	r	1		95-57-8	2-Chlorophenol	6.3E+01	nc	2.4E+02	nc	1.8E+01	nc	3.0E+01	nc	4.0E+00	2.0E-01
		2.9E-02	r			2.9E-02	h	1		75-29-6	2-Chloropropane	1.7E+02	nc	5.9E+02	nc	1.0E+02	nc	1.7E+02	nc		
1.1E-02	h	1.5E-02	I	1.1E-02	r	1.5E-02	r	0	0.10	1897-45-6	Chlorothalonil	4.4E+01	ca*	1.6E+02	ca*	6.1E-01	ca*	6.1E+00	ca*		
		2.0E-02	I			2.0E-02	r	1		95-49-8	o-Chlorotoluene	1.6E+02	nc	5.6E+02	nc	7.3E+01	nc	1.2E+02	nc		
		2.0E-01	I			2.0E-01	r	0	0.10	101-21-3	Chlorpropham	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		3.0E-03	I			3.0E-03	r	0	0.10	2921-88-2	Chlorpyrifos	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		1.0E-02	h			1.0E-02	r	0	0.10	5598-13-0	Chlorpyrifos-methyl	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-02	I			5.0E-02	r	0	0.10	64902-72-3	Chlorsulfuron	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		8.0E-04	h			8.0E-04	r	0	0.10	60238-56-4	Chlorthiophos	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
				4.2E+01	I			0			Total Chromium (1:6 ratio Cr VI:Cr III)+++	2.1E+02	ca	4.5E+02	ca	1.6E-04	ca			3.8E+01	2.0E+00
		1.5E+00	I							16065-83-1	Chromium III	1.0E+05	max	1.0E+05	max	0.0E+00		5.5E+04	nc		
		3.0E-03	I	2.9E+02	I	2.2E-06	I	0		18540-29-9	Chromium VI+++	3.0E+01	ca**	6.4E+01	ca	2.3E-05	ca	1.1E+02	nc	3.8E+01	2.0E+00
		2.00E-02	n	9.8E+00	n	5.7E-06	n			7440-48-4	**Cobalt**	9.0E+02	ca**	1.9E+03	ca*	6.9E-04	ca*	7.3E+02	nc		
				2.2E+00	I			0		8007-45-2	Coke Oven Emissions					3.1E-03	ca				
		4.00E-02	h					0		7440-50-8	Copper and compounds	3.1E+03	nc	4.1E+04	nc			1.5E+03	nc		
1.9E+00	h			1.9E+00	r			1		123-73-9	Crotonaldehyde	5.3E-03	ca	1.1E-02	ca	3.5E-03	ca	5.9E-03	ca		
		1.0E-01	I			1.1E-01	I	1		98-82-8	Cumene (isopropylbenzene)	5.7E+02	nc	2.0E+03	nc	4.0E+02	nc	6.6E+02	nc		
8.4E-01	h	2.0E-03	h	8.4E-01	r	2.0E-03	r	0	0.10	21725-46-2	Cyanazine	5.8E-01	ca	2.1E+00	ca	8.0E-03	ca	8.0E-02	ca		
		2.0E-02	I					0	0.10	57-12-5	Cyanide (free)	1.2E+03	nc	1.2E+04	nc			7.3E+02	nc		
		2.0E-02	I			8.6E-04	I	1		74-90-8	Cyanide (hydrogen)	1.1E+01	nc	3.5E+01	nc	3.1E+00	nc	6.2E+00	nc		

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TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		4.0E-02	I			4.0E-02	r	1		460-19-5	Cyanogen	1.3E+02	nc	4.3E+02	nc	1.5E+02	nc	2.4E+02	nc		
		9.0E-02	I			9.0E-02	r	1		506-68-3	Cyanogen bromide	2.9E+02	nc	9.7E+02	nc	3.3E+02	nc	5.5E+02	nc		
		5.0E-02	I			5.0E-02	r	1		506-77-4	Cyanogen chloride	1.6E+02	nc	5.4E+02	nc	1.8E+02	nc	3.0E+02	nc		
		5.7E+00	r			5.7E+00	n	1		110-82-7	Cyclohexane	1.4E+02	sat	1.4E+02	sat	2.1E+04	nc	3.5E+04	nc		
		5.0E+00	I			5.0E+00	r	0	0.10	108-94-1	Cyclohexanone	1.0E+05	max	1.0E+05	max	1.8E+04	nc	1.8E+05	nc		
		2.0E-01	I			2.0E-01	r	0	0.10	108-91-8	Cyclohexylamine	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		5.0E-03	I			5.0E-03	r	0	0.10	68085-85-8	Cyhalothrin/Karate	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	52315-07-8	Cypermethrin	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		7.5E-03	I			7.5E-03	r	0	0.10	66215-27-8	Cyromazine	4.6E+02	nc	4.6E+03	nc	2.7E+01	nc	2.7E+02	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	1861-32-1	Dacthal	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		3.0E-02	I			3.0E-02	r	0	0.10	75-99-0	Dalapon	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	39515-41-8	Danitol	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
2.4E-01	I			2.4E-01	r			0	0.03	72-54-8	DDD	2.4E+00	ca	1.0E+01	ca	2.8E-02	ca	2.8E-01	ca	1.6E+01	8.0E-01
3.4E-01	I			3.4E-01	r			0	0.03	72-55-9	DDE	1.7E+00	ca	7.0E+00	ca	2.0E-02	ca	2.0E-01	ca	5.4E+01	3.0E+00
3.4E-01	I	5.0E-04	I	3.4E-01	I	5.0E-04	r	0	0.03	50-29-3	DDT	1.7E+00	ca*	7.0E+00	ca*	2.0E-02	ca*	2.0E-01	ca*	3.2E+01	2.0E+00
		1.0E-02	I			1.0E-02	r	0	0.10	1163-19-5	Decabromodiphenyl ether	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		4.0E-05	I			4.0E-05	r	0	0.10	8065-48-3	Demeton	2.4E+00	nc	2.5E+01	nc	1.5E-01	nc	1.5E+00	nc		
6.1E-02	h			6.1E-02	r			0	0.10	2303-16-4	Diallate	8.0E+00	ca	2.8E+01	ca	1.1E-01	ca	1.1E+00	ca		
		9.0E-04	h			9.0E-04	r	0	0.10	333-41-5	Diazinon	5.5E+01	nc	5.5E+02	nc	3.3E+00	nc	3.3E+01	nc		
		4.0E-03	n			4.0E-03	r	1		132-64-9	Dibenzofuran	2.9E+02	nc	3.1E+03	nc	1.5E+01	nc	2.4E+01	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	106-37-6	1,4-Dibromobenzene	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
8.4E-02	I	2.0E-02	I	8.4E-02	r	2.0E-02	r	1		124-48-1	Dibromochloromethane	1.1E+00	ca	2.6E+00	ca	8.0E-02	ca	1.3E-01	ca	4.0E-01	2.0E-02
1.4E+00	h	5.7E-05	r	2.4E-03	x	5.7E-05	I	1		96-12-8	1,2-Dibromo-3-chloropropane	4.5E-01	ca**	2.0E+00	ca**	2.1E-01	nc	4.8E-02	ca**		
7.0E+00				7.0E+00				1		96-12-8	"CAL-Modified PRG"	1.9E-02	ca	4.6E-02	ca	9.6E-04	ca	1.6E-03	ca		
8.5E+01	I	5.7E-05	r	7.7E-01	I	5.7E-05	h	1		106-93-4	1,2-Dibromoethane	6.9E-03	ca	2.8E-02	ca*	8.7E-03	ca*	7.6E-04	ca		
		1.0E-01	I			1.0E-01	r	0	0.10	84-74-2	Dibutyl phthalate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc	2.3E+03	2.7E+02
		3.0E-02	I			3.0E-02	r	0	0.10	1918-00-9	Dicamba	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		9.0E-02	I			5.7E-02	h	1		95-50-1	1,2-Dichlorobenzene	3.7E+02	sat	3.7E+02	sat	2.1E+02	nc	3.7E+02	nc	1.7E+01	9.0E-01
		9.00E-04	n			9.00E-04	r	1		541-73-1	1,3-Dichlorobenzene	1.6E+01	nc	6.3E+01	nc	3.3E+00	nc	5.5E+00	nc		
2.4E-02	h	3.00E-02	n	2.2E-02	n	3.00E-02	I	1		106-46-7	1,4-Dichlorobenzene	3.4E+00	ca	7.9E+00	ca	3.1E-01	ca	5.0E-01	ca	2.0E+00	1.0E-01
4.5E-01	I			4.5E-01	r			0	0.10	91-94-1	3,3-Dichlorobenzidine	1.1E+00	ca	3.8E+00	ca	1.5E-02	ca	1.5E-01	ca	7.0E-03	3.0E-04
		3.00E-02	n			3.00E-02	r		0.10	90-98-2	4,4'-Dichlorobenzophenone	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
9.3E+00	r			9.3E+00	h			1		764-41-0	1,4-Dichloro-2-butene	7.9E-03	ca	1.8E-02	ca	7.2E-04	ca	1.2E-03	ca		
		2.0E-01	I			5.7E-02	h	1		75-71-8	Dichlorodifluoromethane	9.4E+01	nc	3.1E+02	nc	2.1E+02	nc	3.9E+02	nc		
		1.0E-01	h			1.4E-01	h	1		75-34-3	1,1-Dichloroethane	5.1E+02	nc	1.7E+03	nc	5.2E+02	nc	8.1E+02	nc	2.3E+01	1.0E+00
5.7E-03				5.7E-03				1			"CAL-Modified PRG"	2.8E+00	ca	6.0E+00	ca	1.2E+00	ca	2.0E+00	ca		

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TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
9.1E-02	I	3.0E-02	n	9.1E-02	I	1.4E-03	n	1		107-06-2	1,2-Dichloroethane (EDC)	2.8E-01	ca*	6.0E-01	ca*	7.4E-02	ca*	1.2E-01	ca*	2.0E-02	1.0E-03
		5.0E-02	I			5.7E-02	I	1		75-35-4	**1,1-Dichloroethylene**	1.2E+02	nc	4.1E+02	nc	2.1E+02	nc	3.4E+02	nc	6.0E-02	3.0E-03
		1.0E-02	h			1.0E-02	r	1		156-59-2	1,2-Dichloroethylene (cis)	4.3E+01	nc	1.5E+02	nc	3.7E+01	nc	6.1E+01	nc	4.0E-01	2.0E-02
		2.0E-02	I			2.0E-02	r	1		156-60-5	1,2-Dichloroethylene (trans)	6.9E+01	nc	2.3E+02	nc	7.3E+01	nc	1.2E+02	nc	7.0E-01	3.0E-02
		3.0E-03	I			3.0E-03	r	0	0.10	120-83-2	2,4-Dichlorophenol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc	1.0E+00	5.0E-02
		8.0E-03	I			8.0E-03	r	0	0.10	94-82-6	4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		1.0E-02	I			1.0E-02	r	0	0.05	94-75-7	2,4-Dichlorophenoxyacetic Acid (2,4-D)	6.9E+02	nc	7.7E+03	nc	3.7E+01	nc	3.6E+02	nc		
6.8E-02	h	1.1E-03	r	6.8E-02	r	1.1E-03	I	1		78-87-5	1,2-Dichloropropane	3.4E-01	ca*	7.4E-01	ca*	9.9E-02	ca*	1.6E-01	ca*	3.0E-02	1.0E-03
1.0E-01	I	3.00E-02	I	1.4E-02	I	5.7E-03	I	1		542-75-6	1,3-Dichloropropene	7.8E-01	ca	1.8E+00	ca	4.8E-01	ca	4.0E-01	ca	4.0E-03	2.0E-04
		3.0E-03	I			3.0E-03	r	0	0.10	616-23-9	2,3-Dichloropropanol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
2.9E-01	I	5.0E-04	I	2.9E-01	r	1.4E-04	I	0	0.10	62-73-7	Dichlorvos	1.7E+00	ca*	5.9E+00	ca*	2.3E-02	ca*	2.3E-01	ca*		
4.4E-01	x			4.4E-01	r			O	0.10	115-32-2	Dicofol	1.1E+00	ca	3.9E+00	ca	1.5E-02	ca	1.5E-01	ca		
		3.0E-02	h			5.7E-05	x	1		77-73-6	Dicyclopentadiene	5.4E-01	nc	1.8E+00	nc	2.1E-01	nc	4.2E-01	nc		
1.6E+01	I	5.0E-05	I	1.6E+01	I	5.0E-05	r	0	0.10	60-57-1	Dieldrin	3.0E-02	ca	1.1E-01	ca	4.2E-04	ca	4.2E-03	ca	4.0E-03	2.0E-04
		1.0E-02	h			5.7E-03	h	0	0.10	112-34-5	**Diethylene glycol, monobutyl ether**	6.1E+02	nc	6.2E+03	nc	2.1E+01	nc	3.6E+02	nc		
		6.0E-02	h			8.6E-04	h	0	0.10	111-90-0	**Diethylene glycol, monomethyl ether**	3.7E+03	nc	3.7E+04	nc	3.1E+00	nc	2.2E+03	nc		
		4.0E-03	h			4.0E-03	r	O	0.10	617-84-5	**Diethylformamide**	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
1.2E-03	I	6.0E-01	I	1.2E-03	r	6.0E-01	r	0	0.10	103-23-1	Di(2-ethylhexyl)adipate	4.1E+02	ca	1.4E+03	ca	5.6E+00	ca	5.6E+01	ca		
		8.0E-01	I			8.0E-01	r	0	0.10	84-66-2	Diethyl phthalate	4.9E+04	nc	1.0E+05	max	2.9E+03	nc	2.9E+04	nc		
4.7E+03	h			4.7E+03	r			O	0.10	56-53-1	Diethylstilbestrol	1.0E-04	ca	3.7E-04	ca	1.4E-06	ca	1.4E-05	ca		
		8.0E-02	I			8.0E-02	r	0	0.10	43222-48-6	Difenzoquat (Avenge)	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	I			2.0E-02	r	0	0.10	35367-38-5	Diflubenzuron	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.1E+01	r			1.1E+01	I	1		75-37-6	1,1-Difluoroethane					4.2E+04	nc	6.9E+04	nc		
		2.00E-02	n			2.00E-02	r		0.10	28553-12-0	Diisononyl phthalate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		8.0E-02	I			8.0E-02	r	0	0.10	1445-75-6	Diisopropyl methylphosphonate	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	I			2.0E-02	r	0	0.10	55290-64-7	Dimethipin	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-04	I			2.0E-04	r	0	0.10	60-51-5	Dimethoate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
1.4E-02	h			1.4E-02	r			O	0.10	119-90-4	3,3'-Dimethoxybenzidine	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		5.7E-06	r			5.7E-06	x	1		124-40-3	Dimethylamine	6.7E-02	nc	2.5E-01	nc	2.1E-02	nc	3.5E-02	nc		
		2.0E-03	I			2.0E-03	r	0	0.10	121-69-7	N-N-Dimethylaniline	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
7.5E-01	h			7.5E-01	r			O	0.10	95-68-1	2,4-Dimethylaniline	6.5E-01	ca	2.3E+00	ca	9.0E-03	ca	9.0E-02	ca		
5.8E-01	h			5.8E-01	r			0	0.10	21436-96-4	2,4-Dimethylaniline hydrochloride	8.4E-01	ca	3.0E+00	ca	1.2E-02	ca	1.2E-01	ca		
9.2E+00	h			9.2E+00	r			0	0.10	119-93-7	3,3'-Dimethylbenzidine	5.3E-02	ca	1.9E-01	ca	7.3E-04	ca	7.3E-03	ca		
		1.0E-01	h			8.6E-03	I	0	0.10	68-12-2	N,N-Dimethylformamide	6.1E+03	nc	6.2E+04	nc	3.1E+01	nc	3.6E+03	nc		
		1.0E-03	n			1.0E-03	r	0	0.10	122-09-8	Dimethylphenethylamine	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.0E-02	I			2.0E-02	r	O	0.10	105-67-9	2,4-Dimethylphenol	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc	9.0E+00	4.0E-01

Key : SFo,I=Cancer Slope Factor oral, inhalation RfDo,I=Reference Dose oral, inhalation I=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca** (where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION										CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		6.0E-04	I			6.0E-04	r	0	0.10	576-26-1	2,6-Dimethylphenol	3.7E+01	nc	3.7E+02	nc	2.2E+00	nc	2.2E+01	nc		
		1.0E-03	I			1.0E-03	r	0	0.10	95-65-8	3,4-Dimethylphenol	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E+01	h			1.0E+01	r	0	0.10	131-11-3	Dimethyl phthalate	1.0E+05	max	1.0E+05	max	3.7E+04	nc	3.6E+05	nc		
		1.0E-01	I			1.0E-01	r	0	0.10	120-61-6	Dimethyl terephthalate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-03	I			2.0E-03	r	0	0.10	131-89-5	4,6-Dinitro-o-cyclohexyl phenol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.0E-04	h			1.0E-04	r	0	0.10	528-29-0	**1,2-Dinitrobenzene**	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.0E-04	I			1.0E-04	r	0	0.10	99-65-0	1,3-Dinitrobenzene	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.0E-04	h			1.0E-04	r	0	0.10	100-25-4	**1,4-Dinitrobenzene**	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		2.0E-03	I			2.0E-03	r	0	0.10	51-28-5	2,4-Dinitrophenol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc	3.0E-01	1.0E-02
6.8E-01	I			6.8E-01	r			0	0.10	25321-14-6	Dinitrotoluene mixture	7.2E-01	ca	2.5E+00	ca	9.9E-03	ca	9.9E-02	ca	8.0E-04	4.0E-05
		2.0E-03	I			2.0E-03	r	0	0.10	121-14-2	2,4-Dinitrotoluene (see DNT mixture for "ca")	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc	8.0E-04	4.0E-05
		1.0E-03	h			1.0E-03	r	0	0.10	606-20-2	2,6-Dinitrotoluene (see DNT mixture for "ca")	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc	7.0E-04	3.0E-05
		1.0E-03	I			1.0E-03	r	0	0.10	88-85-7	Dinoseb	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		4.0E-02	h			4.0E-02	r	0	0.10	117-84-0	**di-n-Octyl phthalate**	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc	1.0E+04	1.0E+04
1.1E-02	I			1.1E-02	r			0	0.10	123-91-1	1,4-Dioxane	4.4E+01	ca	1.6E+02	ca	6.1E-01	ca	6.1E+00	ca		
1.5E+05	h			1.5E+05	h			0	0.03	1746-01-6	Dioxin (2,3,7,8-TCDD)	3.9E-06	ca	1.6E-05	ca	4.5E-08	ca	4.5E-07	ca		
		3.0E-02	I			3.0E-02	r	0	0.10	957-51-7	Diphenamid	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	122-39-4	Diphenylamine	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.00E-04	n			3.00E-04	r		0.10	74-31-7	N,N-Diphenyl-1,4 benzenediamine (DPPD)	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
8.0E-01	I			7.7E-01	I			0	0.10	122-66-7	1,2-Diphenylhydrazine	6.1E-01	ca	2.2E+00	ca	8.7E-03	ca	8.4E-02	ca		
		3.0E-03	n			3.0E-03	r	0	0.10	127-63-9	**Diphenyl sulfone**	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.2E-03	I			2.2E-03	r	0	0.10	85-00-7	Diquat	1.3E+02	nc	1.4E+03	nc	8.0E+00	nc	8.0E+01	nc		
8.6E+00	h			8.6E+00	r			0	0.10	1937-37-7	Direct black 38	5.7E-02	ca	2.0E-01	ca	7.8E-04	ca	7.8E-03	ca		
8.1E+00	h			8.1E+00	r			0	0.10	2602-46-2	Direct blue 6	6.0E-02	ca	2.1E-01	ca	8.3E-04	ca	8.3E-03	ca		
9.3E+00	h			9.3E+00	r			0	0.10	16071-86-6	Direct brown 95	5.2E-02	ca	1.9E-01	ca	7.2E-04	ca	7.2E-03	ca		
		4.0E-05	I			4.0E-05	r	0	0.10	298-04-4	Disulfoton	2.4E+00	nc	2.5E+01	nc	1.5E-01	nc	1.5E+00	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	505-29-3	1,4-Dithiane	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		2.0E-03	I			2.0E-03	r	0	0.10	330-54-1	Diuron	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		4.0E-03	I			4.0E-03	r	0	0.10	2439-10-3	Dodine	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		2.0E-01	n							7429-91-6	Dysprosium	1.6E+04	nc	1.0E+05	max			7.3E+03	nc		
		6.0E-03	I			6.0E-03	r	0	0.10	115-29-7	Endosulfan	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc	1.8E+01	9.0E-01
		2.0E-02	I			2.0E-02	r	0	0.10	145-73-3	Endothall	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		3.0E-04	I			3.0E-04	r	0	0.10	72-20-8	Endrin	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc	1.0E+00	5.0E-02
9.9E-03	I	2.0E-03	h	4.2E-03	h	2.9E-04	I	1		106-89-8	Epichlorohydrin	7.6E+00	nc	2.6E+01	nc	1.0E+00	nc	2.0E+00	nc		
		5.7E-03	r			5.7E-03	I	0	0.10	106-88-7	1,2-Epoxybutane	3.5E+02	nc	3.5E+03	nc	2.1E+01	nc	2.1E+02	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	759-94-4	EPTC (S-Ethyl dipropylthiocarbamate)	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		

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TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.			Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		5.0E-03	I			5.0E-03	r	0	0.10	16672-87-0		Ethephon (2-chloroethyl phosphonic acid)	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		5.0E-04	I			5.0E-04	r	0	0.10	563-12-2		Ethion	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
		4.0E-01	h			5.7E-02	I	0	0.10	110-80-5		2-Ethoxyethanol	2.4E+04	nc	1.0E+05	max	2.1E+02	nc	1.5E+04	nc		
		3.0E-01	h			3.0E-01	r	0	0.10	111-15-9		2-Ethoxyethanol acetate	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		9.0E-01	I			9.0E-01	r	1		141-78-6		Ethyl acetate	1.9E+04	nc	3.7E+04	sat	3.3E+03	nc	5.5E+03	nc		
4.8E-02	h			4.8E-02	r			1		140-88-5		Ethyl acrylate	2.1E-01	ca	4.5E-01	ca	1.4E-01	ca	2.3E-01	ca		
3.85E-03	r	1.0E-01	I	3.85E-03	n	2.9E-01	I	1		100-41-4		**Ethylbenzene**	8.9E+00	ca	2.0E+01	ca	1.7E+00	ca	2.9E+00	ca	1.3E+01	7.0E-01
2.9E-03	n	4.0E-01	n	2.9E-03	r	2.9E+00	I	1		75-00-3		Ethyl chloride	3.0E+00	ca	6.5E+00	ca	2.3E+00	ca	4.6E+00	ca		
		3.0E-01	h			3.0E-01	r	0	0.10	109-78-4		Ethylene cyanohydrin	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		2.0E-02	h			2.0E-02	r	0	0.10	107-15-3		Ethylene diamine	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E+00	I			2.0E+00	r	0	0.10	107-21-1		Ethylene glycol	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
		5.0E-01	I			3.7E+00	I	0	0.10	111-76-2		Ethylene glycol, monobutyl ether	3.1E+04	nc	1.0E+05	max	1.4E+04	nc	1.8E+04	nc		
1.0E+00	h			3.5E-01	h			1		75-21-8		Ethylene oxide	1.4E-01	ca	3.4E-01	ca	1.9E-02	ca	2.4E-02	ca		
1.1E-01	h	8.0E-05	I	1.1E-01	r	8.0E-05	r	0	0.10	96-45-7		Ethylene thiourea (ETU)	4.4E+00	ca**	1.6E+01	ca**	6.1E-02	ca**	6.1E-01	ca**		
		2.0E-01	I			2.0E-01	r	1		60-29-7		Ethyl ether	1.8E+03	sat	1.8E+03	sat	7.3E+02	nc	1.2E+03	nc		
		9.0E-02	h			9.0E-02	r	1		97-63-2		Ethyl methacrylate	1.4E+02	sat	1.4E+02	sat	3.3E+02	nc	5.5E+02	nc		
		1.0E-05	I			1.0E-05	r	0	0.10	2104-64-5		Ethyl p-nitrophenyl phenylphosphorothioate	6.1E-01	nc	6.2E+00	nc	3.7E-02	nc	3.6E-01	nc		
		3.0E+00	I			3.0E+00	r	0	0.10	84-72-0		Ethylphthalyl ethyl glycolate	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
		8.0E-03	I			8.0E-03	r	0	0.10	101200-48-0		Express	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		2.5E-04	I			2.5E-04	r	0	0.10	22224-92-6		Fenamiphos	1.5E+01	nc	1.5E+02	nc	9.1E-01	nc	9.1E+00	nc		
		1.3E-02	I			1.3E-02	r	0	0.10	2164-17-2		Fluometuron	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		6.0E-02	I					0	0.10	16984-48-8		Flouride	3.7E+03	nc	3.7E+04	nc			2.2E+03	nc		
		8.0E-02	I			8.0E-02	r	0	0.10	59756-60-4		Fluoridone	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	I			2.0E-02	r	0	0.10	56425-91-3		Flurprimidol	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-02	I			6.0E-02	r	0	0.10	66332-96-5		Flutolanil	3.7E+03	nc	3.7E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	69409-94-5		Fluvalinate	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
3.5E-03	I	1.0E-01	I	3.5E-03	r	1.0E-01	r	0	0.10	133-07-3		Folpet	1.4E+02	ca*	4.9E+02	ca	1.9E+00	ca	1.9E+01	ca		
1.9E-01	I			1.9E-01	r			0	0.10	72178-02-0		Fomesafen	2.6E+00	ca	9.1E+00	ca	3.5E-02	ca	3.5E-01	ca		
		2.0E-03	I			2.0E-03	r	0	0.10	944-22-9		Fonofos	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.5E-01	I	4.6E-02	I			0	0.10	50-00-0		Formaldehyde	9.2E+03	nc	1.0E+05	nc	1.5E-01	ca	5.5E+03	nc		
		2.0E+00	h			2.0E+00	r	0	0.10	64-18-6		Formic Acid	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
		3.0E+00	I			3.0E+00	r	0	0.10	39148-24-8		Fosetyl-al	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
		3.0E+01	I			8.6E+00	h	1		76-13-1		Freon 113	5.6E+03	sat	5.6E+03	sat	3.1E+04	nc	5.9E+04	nc		
		1.0E-03	I			1.0E-03	r	1		110-00-9		Furan	2.5E+00	nc	8.5E+00	nc	3.7E+00	nc	6.1E+00	nc		
3.8E+00	h			3.8E+00	r			0	0.10	67-45-8		Furazolidone	1.3E-01	ca	4.5E-01	ca	1.8E-03	ca	1.8E-02	ca		
		3.0E-03	I			1.4E-02	h	0	0.10	98-01-1		Furfural	1.8E+02	nc	1.8E+03	nc	5.2E+01	nc	1.1E+02	nc		

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++++=Non-Standard Method Applied (See Section 2.3 of the 'Region 9 PRGs Table User's Guide') sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
5.0E+01	h			5.0E+01	r			0	0.10	531-82-8	Furium	9.7E-03	ca	3.4E-02	ca	1.3E-04	ca	1.3E-03	ca		
3.0E-02	i			3.0E-02	r			0	0.10	60568-05-0	Furmecyclox	1.6E+01	ca	5.7E+01	ca	2.2E-01	ca	2.2E+00	ca		
		4.0E-04	i			4.0E-04	r	0	0.10	77182-82-2	Glufosinate-ammonium	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
		4.0E-04	i			2.9E-04	h	0	0.10	765-34-4	Glycidaldehyde	2.4E+01	nc	2.5E+02	nc	1.0E+00	nc	1.5E+01	nc		
		1.0E-01	i			1.0E-01	r	0	0.10	1071-83-6	Glyphosate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		5.0E-05	i			5.0E-05	r	0	0.10	69806-40-2	Haloxyfop-methyl	3.1E+00	nc	3.1E+01	nc	1.8E-01	nc	1.8E+00	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	79277-27-3	Harmony	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
4.5E+00	i	5.0E-04	i	4.5E+00	i	5.0E-04	r	0	0.10	76-44-8	Heptachlor	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca	2.3E+01	1.0E+00
9.1E+00	i	1.3E-05	i	9.1E+00	i	1.3E-05	r	0	0.10	1024-57-3	Heptachlor epoxide	5.3E-02	ca*	1.9E-01	ca*	7.4E-04	ca*	7.4E-03	ca*	7.0E-01	3.0E-02
		2.0E-03	i			2.0E-03	r	0	0.10	87-82-1	Hexabromobenzene	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
1.6E+00	i	8.0E-04	i	1.6E+00	i	8.0E-04	r	0	0.10	118-74-1	Hexachlorobenzene	3.0E-01	ca	1.1E+00	ca	4.2E-03	ca	4.2E-02	ca	2.0E+00	1.0E-01
7.8E-02	i	3.00E-04	n	7.8E-02	i	3.00E-04	r	0	0.10	87-68-3	Hexachlorobutadiene	6.2E+00	ca**	2.2E+01	ca**	8.6E-02	ca*	8.6E-01	ca*	2.0E+00	1.0E-01
6.3E+00	i	5.0E-04	n	6.3E+00	i	5.0E-04	r	0	0.04	319-84-6	HCH (alpha)	9.0E-02	ca	3.6E-01	ca	1.1E-03	ca	1.1E-02	ca	5.0E-04	3.0E-05
1.8E+00	i	2.0E-04	n	1.8E+00	i	2.0E-04	r	0	0.04	319-85-7	HCH (beta)	3.2E-01	ca	1.3E+00	ca	3.7E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
1.3E+00	h	3.0E-04	i	1.3E+00	r	3.0E-04	r	0	0.04	58-89-9	HCH (gamma) Lindane	4.4E-01	ca*	1.7E+00	ca	5.2E-03	ca	5.2E-02	ca	9.0E-03	5.0E-04
1.8E+00	i			1.8E+00	i			0	0.04	608-73-1	HCH-technical	3.2E-01	ca	1.3E+00	ca	3.8E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
		6.0E-03	i			5.7E-05	i	0	0.10	77-47-4	Hexachlorocyclopentadiene	3.7E+02	nc	3.7E+03	nc	2.1E-01	nc	2.2E+02	nc	4.0E+02	2.0E+01
1.4E-02	i	1.0E-03	i	1.4E-02	i	1.0E-03	r	0	0.10	67-72-1	Hexachloroethane	3.5E+01	ca**	1.2E+02	ca**	4.8E-01	ca**	4.8E+00	ca**	5.0E-01	2.0E-02
		3.0E-04	i			3.0E-04	r	0	0.10	70-30-4	Hexachlorophene	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
1.1E-01	i	3.0E-03	i	1.1E-01	r	3.0E-03	r	0	0.10	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine	4.4E+00	ca*	1.6E+01	ca	6.1E-02	ca	6.1E-01	ca		
		2.9E-06	r			2.9E-06	i	0	0.10	822-06-0	1,6-Hexamethylene diisocyanate	1.7E-01	nc	1.8E+00	nc	1.0E-02	nc	1.0E-01	nc		
		6.0E-02	h			5.7E-02	i	1		110-54-3	n-Hexane	1.1E+02	sat	1.1E+02	sat	2.1E+02	nc	3.5E+02	nc		
		3.3E-02	i			3.3E-02	r	0	0.10	51235-04-2	Hexazinone	2.0E+03	nc	2.0E+04	nc	1.2E+02	nc	1.2E+03	nc		
3.0E+00	i			1.7E+01	i			0	0.10	302-01-2	Hydrazine, hydrazine sulfate	1.6E-01	ca	5.7E-01	ca	3.9E-04	ca	2.2E-02	ca		
3.0E+00	n			1.7E+01	n				0.10	60-34-4	Hydrazine, monomethyl	1.6E-01	ca	5.7E-01	ca	4.0E-04	ca	2.2E-02	ca		
3.0E+00	n			1.7E+01	n				0.10	57-14-7	Hydrazine, dimethyl	1.6E-01	ca	5.7E-01	ca	4.0E-04	ca	2.2E-02	ca		
						5.7E-03	i			7647-01-0	Hydrogen chloride					2.1E+01	nc				
		2.0E-02	i			8.6E-04	i	1		74-90-8	Hydrogen cyanide	1.1E+01	nc	3.5E+01	nc	3.1E+00	nc	6.2E+00	nc		
		3.0E-03	i			2.9E-04	i			7783-06-4	Hydrogen sulfide					1.0E+00	nc	1.1E+02	nc		
		4.0E-02	h			4.0E-02	r	0	0.10	123-31-9	p-Hydroquinone	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		1.3E-02	i			1.3E-02	r	0	0.10	35554-44-0	Imazalil	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-01	i			2.5E-01	r	0	0.10	81335-37-7	Imazaquin	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		4.0E-02	i			4.0E-02	r	0	0.10	36734-19-7	Iprodione	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		3.0E-01	n					0		7439-89-6	Iron	2.3E+04	nc	1.0E+05	max			1.1E+04	nc		
		3.0E-01	i			3.0E-01	r	1		78-83-1	Isobutanol	1.3E+04	nc	4.0E+04	sat	1.1E+03	nc	1.8E+03	nc		
9.5E-04	i	2.0E-01	i	9.5E-04	r	2.0E-01	r	0	0.10	78-59-1	Isophorone	5.1E+02	ca*	1.8E+03	ca*	7.1E+00	ca	7.1E+01	ca	5.0E-01	3.0E-02

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SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFI 1/(mg/kg-d)		RfDI (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		1.5E-02	I			1.5E-02	r	0	0.10	33820-53-0		Isopropalin	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		1.0E-01	I			1.1E-01	r	0	0.10	1832-54-8		Isopropyl methyl phosphonic acid	6.1E+03	nc	6.2E+04	nc	4.0E+02	nc	3.6E+03	nc		
		5.0E-02	I			5.0E-02	r	0	0.10	82558-50-7		Isoxaben	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
8.0E+00	n	3.0E-04	n	8.0E+00	r	3.0E-04	r	0	0.10	143-50-0		Kepone	6.1E-02	ca	2.2E-01	ca	8.4E-04	ca	8.4E-03	ca		
		2.0E-03	I			2.0E-03	r	0	0.10	77501-63-4		Lactofen	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
For info see: www.epa.gov/oerrpega/superfund/programs/lead/products.htm#guidance										7439-92-1		Lead+++	4.0E+02	nc	7.5E+02	nc						
For info see: www.dtsc.ca.gov/ScienceTechnology/leadspread.html												Lead "CAL-Modified PRG"+++	1.5E+02									
		1.0E-07	I					0	0.10	78-00-2		Lead (tetraethyl)	6.1E-03	nc	6.2E-02	nc			3.6E-03	nc		
		2.0E-03	I			2.0E-03	r	0	0.10	330-55-2		Linuron	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	x					0		7439-93-2		Lithium	1.6E+03	nc	2.0E+04	nc			7.3E+02	nc		
		2.0E-01	I			2.0E-01	r	0	0.10	83055-99-6		Londax	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	I			2.0E-02	r	0	0.10	121-75-5		Malathion	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	I			1.0E-01	r	0	0.10	108-31-6		Maleic anhydride	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		5.0E-01	I			5.0E-01	r	1		123-33-1		Maleic hydrazide	1.7E+03	nc	2.4E+03	sat	1.8E+03	nc	3.0E+03	nc		
		2.0E-05	h			2.0E-05	r	0	0.10	109-77-3		Malononitrile	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		3.0E-02	h			3.0E-02	r	0	0.10	8018-01-7		Mancozeb	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
6.0E-02	o	5.0E-03	I	6.0E-02	r	5.0E-03	r	0	0.10	12427-38-2		Maneb	8.1E+00	ca*	2.9E+01	ca	1.1E-01	ca	1.1E+00	ca		
		2.4E-02	I			1.4E-05	I	0		7439-96-5		Manganese and compounds+++	1.8E+03	nc	1.9E+04	nc	5.1E-02	nc	8.8E+02	nc		
		9.0E-05	h			9.0E-05	r	0	0.10	950-10-7		Mephosfolan	5.5E+00	nc	5.5E+01	nc	3.3E-01	nc	3.3E+00	nc		
		3.0E-02	I			3.0E-02	r	0	0.10	24307-26-4		Mepiquat chloride	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
2.9E-02	n	1.0E-01	n	2.9E-02	r	1.0E-01	r	0	0.10	149-30-4		2-Mercaptobenzothiazole	1.7E+01	ca	5.9E+01	ca	2.3E-01	ca	2.3E+00	ca		
		3.0E-04	I					0		7487-94-7		Mercury and compounds	2.3E+01	nc	3.1E+02	nc			1.1E+01	nc		
						8.6E-05	I			7439-97-6		Mercury (elemental)					3.1E-01	nc				
		1.0E-04	I					0	0.10	22967-92-6		Mercury (methyl)	6.1E+00	nc	6.2E+01	nc			3.6E+00	nc		
		3.0E-05	I			3.0E-05	r	0	0.10	150-50-5		Merphos	1.8E+00	nc	1.8E+01	nc	1.1E-01	nc	1.1E+00	nc		
		3.0E-05	I			3.0E-05	r	0	0.10	78-48-8		Merphos oxide	1.8E+00	nc	1.8E+01	nc	1.1E-01	nc	1.1E+00	nc		
		6.0E-02	I			6.0E-02	r	0	0.10	57837-19-1		Metalaxyl	3.7E+03	nc	3.7E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-04	I			2.0E-04	h	1		126-98-7		Methacrylonitrile	2.1E+00	nc	8.4E+00	nc	7.3E-01	nc	1.0E+00	nc		
		5.0E-05	I			5.0E-05	r	0	0.10	10265-92-6		Methamidophos	3.1E+00	nc	3.1E+01	nc	1.8E-01	nc	1.8E+00	nc		
		5.0E-01	I			5.0E-01	r	0	0.10	67-56-1		Methanol	3.1E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
		1.0E-03	I			1.0E-03	r	0	0.10	950-37-8		Methidathion	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	I			2.5E-02	r	1		16752-77-5		Methomyl	4.4E+01	nc	1.5E+02	nc	9.1E+01	nc	1.5E+02	nc		
		5.0E-03	I			5.0E-03	r	0	0.10	72-43-5		Methoxychlor	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc	1.6E+02	8.0E+00
		1.0E-03	h			5.7E-03	I	0	0.10	109-86-4		2-Methoxyethanol	6.1E+01	nc	6.2E+02	nc	2.1E+01	nc	3.6E+01	nc		
		2.0E-03	h			2.0E-03	r	0	0.10	110-49-6		2-Methoxyethanol acetate	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
4.6E-02	h			4.6E-02	r			0	0.10	99-59-2		2-Methoxy-5-nitroaniline	1.1E+01	ca	3.7E+01	ca	1.5E-01	ca	1.5E+00	ca		

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TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFI 1/(mg/kg-d)		RfDI (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		1.0E+00	h			1.0E+00	r	1		79-20-9	Methyl acetate	2.2E+04	nc	9.2E+04	nc	3.7E+03	nc	6.1E+03	nc		
		3.0E-02	h			3.0E-02	r	1		96-33-3	Methyl acrylate	7.0E+01	nc	2.3E+02	nc	1.1E+02	nc	1.8E+02	nc		
2.4E-01	h			2.4E-01	r			0	0.10	95-53-4	2-Methylaniline (o-toluidine)	2.0E+00	ca	7.2E+00	ca	2.8E-02	ca	2.8E-01	ca		
1.8E-01	h			1.8E-01	r			0	0.10	636-21-5	2-Methylaniline hydrochloride	2.7E+00	ca	9.6E+00	ca	3.7E-02	ca	3.7E-01	ca		
		5.0E-04	I			5.0E-04	r	0	0.10	94-74-6	2-Methyl-4-chlorophenoxyacetic acid	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	94-81-5	4-(2-Methyl-4-chlorophenoxy) butyric acid	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		1.0E-03	I			1.0E-03	r	0	0.10	93-65-2	2-(2-Methyl-4-chlorophenoxy) propionic acid	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E-03	I			1.0E-03	r	0	0.10	16484-77-8	2-(2-Methyl-1,4-chlorophenoxy) propionic acid	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		8.6E-01	r			8.6E-01	h	1		108-87-2	Methylcyclohexane	2.6E+03	nc	8.7E+03	nc	3.1E+03	nc	5.2E+03	nc		
2.5E-01	h			2.5E-01	r			0	0.10	101-77-9	4,4'-Methylenebisbenzeneamine	1.9E+00	ca	6.9E+00	ca	2.7E-02	ca	2.7E-01	ca		
1.3E-01	h	7.0E-04	h	1.3E-01	h	7.0E-04	r	0	0.10	101-14-4	4,4'-Methylene bis(2-chloroaniline)	3.7E+00	ca*	1.3E+01	ca*	5.2E-02	caf	5.2E-01	ca*		
4.6E-02	I			4.6E-02	r			0	0.10	101-61-1	4,4'-Methylene bis(N,N-dimethyl)aniline	1.1E+01	ca	3.7E+01	ca	1.5E-01	ca	1.5E+00	ca		
		1.0E-02	h			1.0E-02	r	1		74-95-3	Methylene bromide	6.7E+01	nc	2.3E+02	nc	3.7E+01	nc	6.1E+01	nc		
7.5E-03	I	6.0E-02	I	1.6E-03	I	8.6E-01	h	1		75-09-2	Methylene chloride	9.1E+00	ca	2.1E+01	ca	4.1E+00	ca	4.3E+00	ca	2.0E-02	1.0E-03
		1.7E-04	r			1.7E-04	I	0	0.10	101-68-8	4,4'-Methylene diphenyl diisocyanate	1.0E+01	nc	1.0E+02	nc	6.2E-01	nc	6.2E+00	nc		
		6.0E-01	I			2.9E-01	I	1		78-93-3	Methyl ethyl ketone	7.3E+03	nc	2.7E+04	nc	1.0E+03	nc	1.9E+03	nc		
		8.0E-02	h			2.3E-02	h	1		108-10-1	Methyl isobutyl ketone	7.9E+02	nc	2.8E+03	nc	8.3E+01	nc	1.6E+02	nc		
		5.7E-04	r			5.7E-04	n	0	0.10	74-93-1	Methyl Mercaptan	3.5E+01	nc	3.5E+02	nc	2.1E+00	nc	2.1E+01	nc		
		1.4E+00	I			2.0E-01	I	1		80-62-6	Methyl methacrylate	2.2E+03	nc	2.7E+03	sat	7.3E+02	nc	1.4E+03	nc		
3.3E-02	h			3.3E-02	r			0	0.10	99-55-8	2-Methyl-5-nitroaniline	1.5E+01	ca	5.2E+01	ca	2.0E-01	ca	2.0E+00	ca		
		2.5E-04	I			2.5E-04	r	0	0.10	298-00-0	Methyl parathion	1.5E+01	nc	1.5E+02	nc	9.1E-01	nc	9.1E+00	nc		
		5.0E-02	I			5.0E-02	r	0	0.10	95-48-7	2-Methylphenol	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc	1.5E+01	8.0E-01
		5.0E-02	I			5.0E-02	r	0	0.10	108-39-4	3-Methylphenol	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	h			5.0E-03	r	0	0.10	106-44-5	4-Methylphenol	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	n			2.0E-02	r	0	0.10	993-13-5	Methyl phosphonic acid	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-03	h			1.1E-02	h	1		25013-15-4	Methyl styrene (mixture)	1.3E+02	nc	5.4E+02	nc	4.2E+01	nc	6.0E+01	nc		
		7.0E-02	h			7.0E-02	r	1		98-83-9	Methyl styrene (alpha)	6.8E+02	sat	6.8E+02	sat	2.6E+02	nc	4.3E+02	nc		
3.3E-03	n	8.6E-01	r	3.5E-04	n	8.6E-01	I	1		1634-04-4	Methyl tertbutyl ether (MTBE)	6.2E+01	ca*	1.6E+02	ca	1.9E+01	ca	1.3E+01	ca		
1.8E-03				1.8E-03				1			"CAL-Modified PRG"	1.7E+01	ca	3.6E+01	ca	3.7E+00	ca	6.2E+00	ca		
		1.5E-01	I			1.5E-01	r	0	0.10	51218-45-2	Metolaclor (Dual)	9.2E+03	nc	9.2E+04	nc	5.5E+02	nc	5.5E+03	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	21087-64-9	Metribuzin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.8E+00	x	2.0E-04	I	1.8E+00	r	2.0E-04	r	0	0.10	2385-85-5	Mirex	2.7E-01	ca*	9.6E-01	ca	3.7E-03	ca	3.7E-02	ca		
		2.0E-03	I			2.0E-03	r	0	0.10	2212-67-1	Molinate	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-03	I					0		7439-98-7	Molybdenum	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc		
		1.0E-01	I			1.0E-01	r	0	0.10	10599-90-3	Monochloramine	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-03	I			2.0E-03	r	0	0.10	300-76-5	Naled	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		

Key : SFo,I=Cancer Slope Factor oral, Inhalation RfDo,I=Reference Dose oral, Inhalation I=IRIS h=HEAST n=NCEA x=Withdrown o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100Xca) ca**(where: nc < 10Xca)
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TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFI 1/(mg/kg-d)		RfDI (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		1.0E-01	I			1.0E-01	r	0	0.10	15299-99-7	Napropamide	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-02	I					0		7440-02-0	Nickel (soluble salts)	1.6E+03	nc	2.0E+04	nc			7.3E+02	nc	1.3E+02	7.0E+00
				8.4E-01	I			0			Nickel refinery dust					8.0E-03	ca				
				1.7E+00	I			0		12035-72-2	Nickel subsulfide			1.1E+04	ca	4.0E-03	ca				
Tap Water PRG Based on Infant NOAEL (see IRIS)										14797-55-8	Nitrate+++							1.0E+04	nc		
Tap Water PRG Based on Infant NOAEL (see IRIS)										14797-65-0	Nitrite+++							1.0E+03	nc		
		2.86E-05	r			2.86E-05	h	0	0.10	88-74-4	2-Nitroaniline	1.7E+00	nc	1.8E+01	nc	1.0E-01	nc	1.0E+00	nc		
		5.0E-04	I			5.7E-04	h	1		98-95-3	Nitrobenzene	2.0E+01	nc	1.0E+02	nc	2.1E+00	nc	3.4E+00	nc	1.0E-01	7.0E-03
		7.0E-02	h			7.0E-02	r	0	0.10	67-20-9	Nitrofurantoin	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
1.5E+00	h			1.5E+00	r			0	0.10	59-87-0	Nitrofurazone	3.2E-01	ca	1.1E+00	ca	4.5E-03	ca	4.5E-02	ca		
1.4E-02	n			1.4E-02	r			0	0.10	55-63-0	Nitroglycerin	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		1.0E-01	I			1.0E-01	r	0	0.10	556-88-7	Nitroguanidine	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
9.4E+00	r	5.7E-03	r	9.4E+00	h	5.7E-03	I	1		79-46-9	2-Nitropropane					7.2E-04	ca	1.2E-03	ca		
5.4E+00	I			5.4E+00	I			1		924-16-3	N-Nitrosodi-n-butylamine	2.4E-02	ca	5.8E-02	ca	1.2E-03	ca	2.0E-03	ca		
2.8E+00	I			2.8E+00	r			0	0.10	1116-54-7	N-Nitrosodiethanolamine	1.7E-01	ca	6.2E-01	ca	2.4E-03	ca	2.4E-02	ca		
1.5E+02	I			1.5E+02	I			0	0.10	55-18-5	N-Nitrosodiethylamine	3.2E-03	ca	1.1E-02	ca	4.5E-05	ca	4.5E-04	ca		
5.1E+01	I			4.9E+01	I			0	0.10	62-75-9	N-Nitrosodimethylamine	9.5E-03	ca	3.4E-02	ca	1.4E-04	ca	1.3E-03	ca		
4.9E-03	I			4.9E-03	r			0	0.10	86-30-6	N-Nitrosodiphenylamine	9.9E+01	ca	3.5E+02	ca	1.4E+00	ca	1.4E+01	ca	1.0E+00	6.0E-02
7.0E+00	I			7.0E+00	r			0	0.10	621-64-7	N-Nitroso di-n-propylamine	6.9E-02	ca	2.5E-01	ca	9.6E-04	ca	9.6E-03	ca	5.0E-05	2.0E-06
2.2E+01	I			2.2E+01	r			0	0.10	10595-95-6	N-Nitroso-N-methylethylamine	2.2E-02	ca	7.8E-02	ca	3.1E-04	ca	3.1E-03	ca		
2.1E+00	I			2.1E+00	I			0	0.10	930-55-2	N-Nitrosopyrrolidine	2.3E-01	ca	8.2E-01	ca	3.1E-03	ca	3.2E-02	ca		
		1.0E-02	h			1.0E-02	r	1		99-08-1	m-Nitrotoluene	3.7E+02	nc	1.0E+03	sat	3.7E+01	nc	6.1E+01	nc		
		1.0E-02	h			1.0E-02	r	1		99-08-1	o-Nitrotoluene	3.7E+02	nc	1.0E+03	sat	3.7E+01	nc	6.1E+01	nc		
		1.0E-02	h			1.0E-02	r	1		99-99-0	p-Nitrotoluene	3.7E+02	nc	1.0E+03	sat	3.7E+01	nc	6.1E+01	nc		
		4.0E-02	I			4.0E-02	r	0	0.10	27314-13-2	Norflurazon	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		7.0E-04	I			7.0E-04	r	0	0.10	85509-19-9	NuStar	4.3E+01	nc	4.3E+02	nc	2.6E+00	nc	2.6E+01	nc		
		3.0E-03	I			3.0E-03	r	0	0.10	32536-52-0	Octabromodiphenyl ether	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		5.0E-02	I			5.0E-02	r	0	0.10	2691-41-0	Octahydro-1357-tetranitro-1357-tetrazocine (HMX)	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.0E-03	h			2.0E-03	r	0	0.10	152-16-9	Octamethylpyrophosphoramide	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-02	I			5.0E-02	r	0	0.10	19044-88-3	Oryzalin	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	I			5.0E-03	r	0	0.10	19666-30-9	Oxadiazon	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	23135-22-0	Oxamyl	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-03	I			3.0E-03	r	0	0.10	42874-03-3	Oxyfluorfen	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		1.3E-02	I			1.3E-02	r	0	0.10	76738-62-0	Paclobutrazol	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		4.5E-03	I			4.5E-03	r	0	0.10	4685-14-7	Paraquat	2.7E+02	nc	2.8E+03	nc	1.6E+01	nc	1.6E+02	nc		
		6.0E-03	h			6.0E-03	r	0	0.10	56-38-2	Parathion	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		

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SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFI 1/(mg/kg-d)		RfDI (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		5.0E-02	h			5.0E-02	r	0	0.10	1114-71-2	Pebulate	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-02	I			4.0E-02	r	0	0.10	40487-42-1	Pendimethalin	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
2.3E-02	h			2.3E-02	r			0	0.10	87-84-3	Pentabromo-6-chloro cyclohexane	2.1E+01	ca	7.5E+01	ca	2.9E-01	ca	2.9E+00	ca		
		2.0E-03	I			2.0E-03	r	0	0.10	32534-81-9	Pentabromodiphenyl ether	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		8.0E-04	I			8.0E-04	r	0	0.10	608-93-5	Pentachlorobenzene	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
2.6E-01	h	3.0E-03	I	2.6E-01	r	3.0E-03	r	0	0.10	82-68-8	Pentachloronitrobenzene	1.9E+00	ca*	6.6E+00	ca	2.6E-02	ca	2.6E-01	ca		
1.2E-01	I	3.0E-02	I	1.2E-01	r	3.0E-02	r	0	0.25	87-86-5	Pentachlorophenol	3.0E+00	ca	9.0E+00	ca	5.6E-02	ca	5.6E-01	ca	3.0E-02	1.0E-03
		1.00E-04	x					0		7601-90-3	Perchlorate	7.8E+00	ca/nc	1.0E+02	ca/nc			3.6E+00	ca/nc		
		5.0E-02	I			5.0E-02	r	0	0.10	52645-53-1	Permethrin	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.5E-01	I			2.5E-01	r	0	0.10	13684-63-4	Phenmedipham	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		6.0E-01	I			6.0E-01	r	0	0.10	108-95-2	Phenol	3.7E+04	nc	1.0E+05	max	2.2E+03	nc	2.2E+04	nc	1.0E+02	5.0E+00
		2.0E-03	n			2.0E-03	r	0	0.10	92-84-2	Phenothiazine	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		6.0E-03	I			6.0E-03	r	0	0.10	108-45-2	m-Phenylenediamine	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
		1.9E-01	h			1.9E-01	r	0	0.10	106-50-3	p-Phenylenediamine	1.2E+04	nc	1.0E+05	max	6.9E+02	nc	6.9E+03	nc		
		8.0E-05	I			8.0E-05	r	0	0.10	62-38-4	Phenylmercuric acetate	4.9E+00	nc	4.9E+01	nc	2.9E-01	nc	2.9E+00	nc		
1.9E-03	h			1.9E-03	r			0	0.10	90-43-7	2-Phenylphenol	2.5E+02	ca	8.9E+02	ca	3.5E+00	ca	3.5E+01	ca		
		2.0E-04	h			2.0E-04	r	0	0.10	298-02-2	Phorate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
		2.0E-02	I			2.0E-02	r	0	0.10	732-11-6	Phosmet	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		3.0E-04	I			8.6E-05	I	0	0.10	7803-51-2	Phosphine	1.8E+01	nc	1.8E+02	nc	3.1E-01	nc	1.1E+01	nc		
						2.9E-03	I			7664-38-2	Phosphoric acid					1.0E+01	nc				
		2.0E-05	I					0		7723-14-0	Phosphorus (white)	1.6E+00	nc	2.0E+01	nc			7.3E-01	nc		
		1.0E+00	h			1.0E+00	r	0	0.10	100-21-0	p-Phthalic acid	6.1E+04	nc	1.0E+05	max	3.7E+03	nc	3.6E+04	nc		
		2.0E+00	I			3.4E-02	h	0	0.10	85-44-9	Phthalic anhydride	1.0E+05	max	1.0E+05	max	1.2E+02	nc	7.3E+04	nc		
		7.0E-02	I			7.0E-02	r	0	0.10	1918-02-1	Picloram	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	29232-93-7	Pirimiphos-methyl	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
8.9E+00	h	7.0E-06	h	8.9E+00	r	7.0E-06	r	0	0.10		Polybrominated biphenyls	5.5E-02	ca**	1.9E-01	ca*	7.6E-04	ca*	7.6E-03	ca*		
2.0E+00	I			2.0E+00	I			0	0.14	1336-36-3	Polychlorinated biphenyls (PCBs)	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
7.0E-02	I	7.0E-05	I	7.0E-02	I	7.0E-05	r	0	0.14	12674-11-2	Aroclor 1016	3.9E+00	nc	2.1E+01	ca**	9.6E-02	ca**	9.6E-01	ca**		
2.0E+00	I			2.0E+00	I			0	0.14	11104-28-2	Aroclor 1221	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
2.0E+00	I			2.0E+00	I			0	0.14	11141-16-5	Aroclor 1232	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
2.0E+00	I			2.0E+00	I			0	0.14	53469-21-9	Aroclor 1242	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
2.0E+00	I			2.0E+00	I			0	0.14	12672-29-6	Aroclor 1248	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		
2.0E+00	I	2.0E-05	I	2.0E+00	I	2.0E-05	r	0	0.14	11097-69-1	Aroclor 1254	2.2E-01	ca**	7.4E-01	ca*	3.4E-03	ca*	3.4E-02	ca*		
2.0E+00	I			2.0E+00	I			0	0.14	11096-82-5	Aroclor 1260	2.2E-01	ca	7.4E-01	ca	3.4E-03	ca	3.4E-02	ca		

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+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
4.5E+00	n			4.5E+00	r				0.10	61788-33-8	Polychlorinated terphenyls	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca		
									0.13		Polynuclear aromatic hydrocarbons (PAHs)										
		6.0E-02	I			6.0E-02	r	1		83-32-9	Acenaphthene	3.7E+03	nc	2.9E+04	nc	2.2E+02	nc	3.7E+02	nc	5.7E+02	2.9E+01
		3.0E-01	I			3.0E-01	r	1		120-12-7	Anthracene	2.2E+04	nc	1.0E+05	max	1.1E+03	nc	1.8E+03	nc	1.2E+04	5.9E+02
7.3E-01	n			7.3E-01	r			0	0.13	56-55-3	Benz[a]anthracene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	2.0E+00	8.0E-02
7.3E-01	n			7.3E-01	r			0	0.13	205-99-2	Benzo[b]fluoranthene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	5.0E+00	2.0E-01
7.3E-02	n			7.3E-02	r			0	0.13	207-08-9	Benzo[k]fluoranthene	6.2E+00	ca	2.1E+01	ca	9.2E-02	ca	9.2E-01	ca	4.9E+01	2.0E+00
1.2E+00				3.9E-01					0.13	207-08-9	"CAL-Modified PRG"	3.8E-01	ca	1.3E+00	ca	1.7E-02	ca	5.6E-02	ca		
7.3E+00	I			7.3E+00	r			0	0.13	50-32-8	Benzo[a]pyrene	6.2E-02	ca	2.1E-01	ca	9.2E-04	ca	9.2E-03	ca	8.0E+00	4.0E-01
7.3E-03	n			7.3E-03	r			0	0.13	218-01-9	Chrysene	6.2E+01	ca	2.1E+02	ca	9.2E-01	ca	9.2E+00	ca	1.6E+02	8.0E+00
1.2E-01				3.9E-02					0.13		"CAL-Modified PRG"	3.8E+00	ca	1.3E+01	ca	1.7E-01	ca	5.6E-01	ca		
7.3E+00	n			7.3E+00	r			0	0.13	53-70-3	Dibenz[ah]anthracene	6.2E-02	ca	2.1E-01	ca	9.2E-04	ca	9.2E-03	ca	2.0E+00	8.0E-02
		4.0E-02	I			4.0E-02	r	0	0.13	206-44-0	Fluoranthene	2.3E+03	nc	2.2E+04	nc	1.5E+02	nc	1.5E+03	nc	4.3E+03	2.1E+02
		4.0E-02	I			4.0E-02	r	1		86-73-7	Fluorene	2.7E+03	nc	2.6E+04	nc	1.5E+02	nc	2.4E+02	nc	5.6E+02	2.8E+01
7.3E-01	n			7.3E-01	r			0	0.13	193-39-5	Indeno[1,2,3-cd]pyrene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	1.4E+01	7.0E-01
		2.0E-02	I			8.6E-04	I	1		91-20-3	Naphthalene	5.6E+01	nc	1.9E+02	nc	3.1E+00	nc	6.2E+00	nc	8.4E+01	4.0E+00
		3.0E-02	I			3.0E-02	r	1		129-00-0	Pyrene	2.3E+03	nc	2.9E+04	nc	1.1E+02	nc	1.8E+02	nc	4.2E+03	2.1E+02
1.5E-01	I	9.0E-03	I	1.5E-01	r	9.0E-03	r	0	0.10	67747-09-5	Prochloraz	3.2E+00	ca	1.1E+01	ca	4.5E-02	ca	4.5E-01	ca		
		6.0E-03	h			6.0E-03	r	0	0.10	26399-36-0	Profluralin	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
		1.5E-02	I			1.5E-02	r	0	0.10	1610-18-0	Prometon	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		4.0E-03	I			4.0E-03	r	0	0.10	7287-19-6	Prometryn	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		7.5E-02	I			7.5E-02	r	0	0.10	23950-58-5	Pronamide	4.6E+03	nc	4.6E+04	nc	2.7E+02	nc	2.7E+03	nc		
		1.3E-02	I			1.3E-02	r	0	0.10	1918-16-7	Propachlor	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		5.0E-03	I			5.0E-03	r	0	0.10	709-98-8	Propanil	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	I			2.0E-02	r	0	0.10	2312-35-8	Propargite	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-03	I			2.0E-03	r	0	0.10	107-19-7	Propargyl alcohol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	I			2.0E-02	r	0	0.10	139-40-2	Propazine	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	I			2.0E-02	r	0	0.10	122-42-9	Propham	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.3E-02	I			1.3E-02	r	0	0.10	60207-90-1	Propiconazole	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		4.00E-02	n			4.00E-02	r	1		103-65-1	n-Propylbenzene	2.4E+02	sat	2.4E+02	sat	1.5E+02	nc	2.4E+02	nc		
		5.0E-01	h			8.6E-04	h	0	0.10	57-55-6	Propylene glycol	3.0E+04	nc	1.0E+05	max	3.1E+00	nc	1.8E+04	nc		
		7.0E-01	h			7.0E-01	r	0	0.10	52125-53-8	Propylene glycol, monoethyl ether	4.3E+04	nc	1.0E+05	max	2.6E+03	nc	2.6E+04	nc		
		7.0E-01	h			5.7E-01	I	0	0.10	107-98-2	Propylene glycol, monomethyl ether	4.3E+04	nc	1.0E+05	max	2.1E+03	nc	2.6E+04	nc		
2.4E-01	I	8.6E-03	r	1.3E-02	I	8.6E-03	I	1		75-56-9	Propylene oxide	1.9E+00	ca*	6.6E+00	ca*	5.2E-01	ca*	2.2E-01	ca		

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SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		2.5E-01	I			2.5E-01	r	0	0.10	81335-77-5	Pursuit	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	51630-58-1	Pydrin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		1.0E-03	I			1.0E-03	r	0	0.10	110-86-1	Pyridine	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		5.0E-04	I			5.0E-04	r	0	0.10	13593-03-8	Quinalphos	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
3.0E+00	I			3.0E+00	r			0	0.10	91-22-5	Quinoline	1.6E-01	ca	5.7E-01	ca	2.2E-03	ca	2.2E-02	ca		
1.1E-01	I	3.0E-03	I	1.1E-01	r	3.0E-03	r	0	0.10	121-82-4	RDX (Cyclonite)	4.4E+00	ca*	1.6E+01	ca	6.1E-02	ca	6.1E-01	ca		
		3.0E-02	I			3.0E-02	r	0	0.10	10453-86-8	Resmethrin	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		5.0E-02	h			5.0E-02	r	0	0.10	299-84-3	Ronnel	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-03	I			4.0E-03	r	0	0.10	83-79-4	Rotenone	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	78587-05-0	Savey	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		5.0E-03	I					0	0.10	7783-00-8	Selenious Acid	3.1E+02	nc	3.1E+03	nc			1.8E+02	nc		
		5.0E-03	I					0		7782-49-2	Selenium	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc	5.0E+00	3.0E-01
		5.0E-03	h					0	0.10	630-10-4	Selenourea	3.1E+02	nc	3.1E+03	nc			1.8E+02	nc		
		9.0E-02	I			9.0E-02	r	0	0.10	74051-80-2	Sethoxydim	5.5E+03	nc	5.5E+04	nc	3.3E+02	nc	3.3E+03	nc		
		5.0E-03	I					0		7440-22-4	Silver and compounds	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc	3.4E+01	2.0E+00
1.2E-01	h	5.0E-03	I	1.2E-01	r	2.0E-03	r	0	0.10	122-34-9	Simazine	4.1E+00	ca*	1.4E+01	ca	5.6E-02	ca	5.6E-01	ca		
		4.0E-03	I							26628-22-8	Sodium azide										
2.7E-01	h	3.0E-02	I	2.7E-01	r	3.0E-02	r	0	0.10	148-18-5	Sodium diethyldithiocarbamate	1.8E+00	ca	6.4E+00	ca	2.5E-02	ca	2.5E-01	ca		
		2.0E-05	I			2.0E-05	r	0	0.10	62-74-8	Sodium fluoroacetate	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		1.0E-03	h			1.0E-03	r	0	0.10	13718-26-8	Sodium metavanadate	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		6.0E-01	I					0		7440-24-6	Strontium, stable	4.7E+04	nc	1.0E+05	max			2.2E+04	nc		
		3.0E-04	I			3.0E-04	r	0	0.10	57-24-9	Strychnine	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		2.0E-01	I			2.9E-01	I	1		100-42-5	Styrene	1.7E+03	sat	1.7E+03	sat	1.1E+03	nc	1.6E+03	nc	4.0E+00	2.0E-01
		1.00E-03	n			1.00E-03	r			80-07-9	1,1'-Sulfonylbis (4-chlorobenzene)	7.8E+01	nc	1.0E+03	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	88671-89-0	Systhane	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.5E+05	h			1.5E+05	h			0	0.03	1746-01-6	2,3,7,8-TCDD (dioxin)	3.9E-06	ca	1.6E-05	ca	4.5E-08	ca	4.5E-07	ca		
		7.0E-02	I			7.0E-02	r	0	0.10	34014-18-1	Tebuthiuron	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-02	h			2.0E-02	r	0	0.10	3383-96-8	Temephos	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.3E-02	I			1.3E-02	r	0	0.10	5902-51-2	Terbacil	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-05	h			2.5E-05	r	0	0.10	13071-79-9	Terbufos	1.5E+00	nc	1.5E+01	nc	9.1E-02	nc	9.1E-01	nc		
		1.0E-03	I			1.0E-03	r	0	0.10	886-50-0	Terbutryn	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		3.0E-04	I			3.0E-04	r	0	0.10	95-94-3	1,2,4,5-Tetrachlorobenzene	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
2.6E-02	I	3.0E-02	I	2.6E-02	I	3.0E-02	r	1		630-20-6	1,1,1,2-Tetrachloroethane	3.2E+00	ca	7.3E+00	ca	2.6E-01	ca	4.3E-01	ca		
2.0E-01	I	6.00E-02	n	2.0E-01	I	6.00E-02	r	1		79-34-5	1,1,2,2-Tetrachloroethane	4.1E-01	ca	9.3E-01	ca	3.3E-02	ca	5.5E-02	ca	3.0E-03	2.0E-04
5.2E-02	n	1.0E-02	I	1.00E-02	n	1.7E-01	n	1		127-18-4	Tetrachloroethylene (PCE)	1.5E+00	ca*	3.4E+00	ca*	6.7E-01	ca	6.6E-01	ca	6.0E-02	3.0E-03
		3.0E-02	I			3.0E-02	r	0	0.10	58-90-2	2,3,4,6-Tetrachlorophenol	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		

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SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.					Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
2.0E+01	h			2.0E+01	r			0	0.10	5216-25-1				p,a,a,a-Tetrachlorotoluene	2.4E-02	ca	8.6E-02	ca	3.4E-04	ca	3.4E-03	ca		
2.4E-02	h	3.0E-02	I	2.4E-02	r	3.0E-02	r	0	0.10	961-11-5				Tetrachlorovinphos	2.0E+01	ca*	7.2E+01	ca	2.8E-01	ca	2.8E+00	ca		
		5.0E-04	I			5.0E-04	r	0	0.10	3689-24-5				Tetraethyldithiopyrophosphate	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
7.6E-03	n	2.1E-01	n	6.8E-03	n	8.6E-02	n	1		109-99-9				Tetrahydrofuran	9.4E+00	ca	2.1E+01	ca	9.9E-01	ca	1.6E+00	ca		
		6.6E-05	I					0		7440-28-0				Thallium and compounds+++	5.2E+00	nc	6.7E+01	nc			2.4E+00	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	28249-77-6				Thiobencarb	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-02	n			5.0E-02	r	0	0.10	N/A				Thiocyanate	3.1E+03	nc	1.0E+05	max	1.8E+02	nc	1.8E+03	nc		
		3.0E-04	h			3.0E-04	r	0	0.10	39196-18-4				Thiofanox	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		8.0E-02	I			8.0E-02	r	0	0.10	23564-05-8				Thiophanate-methyl	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		5.0E-03	I			5.0E-03	r	0	0.10	137-26-8				Thiram	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		6.0E-01	h					0						Tin (inorganic, see tributyltin oxide for organic tin)	4.7E+04	nc	1.0E+05	max			2.2E+04	nc		
		2.0E-01	I			1.1E-01	I	1		108-88-3				Toluene	5.2E+02	sat	5.2E+02	sat	4.0E+02	nc	7.2E+02	nc	1.2E+01	6.0E-01
3.2E+00	h			3.2E+00	r			0	0.10	95-80-7				Toluene-2,4-diamine	1.5E-01	ca	5.4E-01	ca	2.1E-03	ca	2.1E-02	ca		
		6.0E-01	h			6.0E-01	r	0	0.10	95-70-5				Toluene-2,5-diamine	3.7E+04	nc	1.0E+05	max	2.2E+03	nc	2.2E+04	nc		
		2.0E-01	h			2.0E-01	r	0	0.10	823-40-5				Toluene-2,6-diamine	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
2E-01	I			2E-01	r			0	0.10	106-49-0				p-Toluidine	2.6E+00	ca	9.1E+00	ca	3.5E-02	ca	3.5E-01	ca		
1.1E+00	I			1.1E+00	I			0	0.10	8001-35-2				Toxaphene	4.4E-01	ca	1.6E+00	ca	6.0E-03	ca	6.1E-02	ca	3.1E+01	2.0E+00
		7.5E-03	I			7.5E-03	r	0	0.10	66841-25-6				Tralomethrin	4.6E+02	nc	4.6E+03	nc	2.7E+01	nc	2.7E+02	nc		
		1.3E-02	I			1.3E-02	r	0	0.10	2303-17-5				Triallate	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		1.0E-02	I			1.0E-02	r	0	0.10	82097-50-5				Triasulfuron	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-03	I			5.0E-03	r	0	0.10	615-54-3				1,2,4-Tribromobenzene	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		3.0E-04	I					0	0.10	56-35-9				Tributyltin oxide (TBTO)	1.8E+01	nc	1.8E+02	nc			1.1E+01	nc		
3.4E-02	h			3.4E-02	r			0	0.10	634-93-5				2,4,6-Trichloroaniline	1.4E+01	ca	5.1E+01	ca	2.0E-01	ca	2.0E+00	ca		
2.9E-02	h			2.9E-02	r			0	0.10	33663-50-2				2,4,6-Trichloroaniline hydrochloride	1.7E+01	ca	5.9E+01	ca	2.3E-01	ca	2.3E+00	ca		
		1.0E-02	I			5.7E-02	h	1		120-82-1				1,2,4-Trichlorobenzene	6.5E+02	nc	3.0E+03	sat	2.1E+02	nc	1.9E+02	nc	5.0E+00	3.0E-01
		2.8E-01	n			6.3E-01	n	1		71-55-6				1,1,1-Trichloroethane	1.2E+03	sat	1.2E+03	sat	2.3E+03	nc	3.2E+03	nc	2.0E+00	1.0E-01
5.7E-02	I	4.0E-03	I	5.6E-02	I	4.0E-03	r	1		79-00-5				1,1,2-Trichloroethane	7.3E-01	ca*	1.6E+00	ca*	1.2E-01	ca	2.0E-01	ca	2.0E-02	9.0E-04
4.00E-01	n	3.00E-04	n	4.00E-01	n	1.00E-02	n	1		79-01-6				Trichloroethylene (TCE)	5.3E-02	ca	1.1E-01	ca	1.7E-02	ca	2.8E-02	ca	6.0E-02	3.0E-03
		3.0E-01	I			2.0E-01	h	1		75-69-4				Trichlorofluoromethane	3.9E+02	nc	2.0E+03	sat	7.3E+02	nc	1.3E+03	nc		
		1.0E-01	I			1.0E-01	r	0	0.10	95-95-4				2,4,5-Trichlorophenol	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc	2.7E+02	1.4E+01
1.1E-02	I	1.0E-04	n	1.1E-02	I	1.0E-04	r	0	0.10	88-06-2				2,4,6-Trichlorophenol	6.1E+00	nc**	6.2E+01	nc**	3.7E-01	nc**	3.6E+00	nc**	2.0E-01	8.0E-03
7.0E-02				7.0E-02					0.10	88-06-2				"CAL-Modified PRG"	6.9E+00	ca	2.5E+01	ca	9.6E-02	ca	9.6E-01	ca		
		1.0E-02	I			1.0E-02	r	0	0.10	93-76-5				2,4,5-Trichlorophenoxyacetic Acid	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		8.0E-03	I			8.0E-03	r	0	0.10	93-72-1				2-(2,4,5-Trichlorophenoxy) propionic acid	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		5.0E-03	I			5.0E-03	r	1		598-77-6				1,1,2-Trichloropropane	1.5E+01	nc	5.1E+01	nc	1.8E+01	nc	3.0E+01	nc		
2.0E+00	n	6.0E-03	I	2.0E+00	r	1.4E-03	n	1		96-18-4				1,2,3-Trichloropropane	5.0E-03	ca	1.1E-02	ca	3.4E-03	ca	5.6E-03	ca		

Key: SFo,I=Cancer Slope Factor oral, inhalation RfDo,I=Reference Dose oral, inhalation I=IRIS h=HEAST n=NCEA x=Withdrawn o=Other EPA Source r=Route-extrapolation ca=Cancer PRG nc=Noncancer PRG ca* (where: nc < 100X ca) ca**(where: nc < 10X ca)
+++=Non-Standard Method Applied (See Section 2.3 of the "Region 9 PRGs Table User's Guide") sat=Soil Saturation (See Section 4.5) max=Ceiling limit (See Section 2.1) DAF=Dilution Attenuation Factor (See Section 2.5) CAS=Chemical Abstract Services

TOXICITY INFORMATION												CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		VOC	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		5.0E-03	h			5.0E-03	r	1		96-19-5		1,2,3-Trichloropropene	1.2E+01	nc	3.8E+01	nc	1.8E+01	nc	3.0E+01	nc		
		3.0E-03	I			3.0E-03	r	0	0.10	58138-08-2		Tridiphane	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.0E-03	r			2.0E-03	I	1		121-44-8		Triethylamine	2.3E+01	nc	8.6E+01	nc	7.3E+00	nc	1.2E+01	nc		
7.7E-03	I	7.5E-03	I	7.7E-03	r	7.5E-03	r	0	0.10	1582-09-8		Trifluralin	6.3E+01	ca**	2.2E+02	ca*	8.7E-01	ca*	8.7E+00	ca*		
		1.400E-04	r			1.400E-04	n		0.10	552-30-7		Trimellitic Anhydride (TMAN)	8.6E+00	nc	8.6E+01	nc	5.1E-01	nc	5.1E+00			
		5.0E-02	n			1.7E-03	n	1		95-63-6		1,2,4-Trimethylbenzene	5.2E+01	nc	1.7E+02	nc	6.2E+00	nc	1.2E+01	nc		
		5.0E-02	n			1.7E-03	n	1		108-67-8		1,3,5-Trimethylbenzene	2.1E+01	nc	7.0E+01	nc	6.2E+00	nc	1.2E+01	nc		
3.7E-02	h			3.7E-02	r			0	0.10	512-56-1		Trimethyl phosphate	1.3E+01	ca	4.7E+01	ca	1.8E-01	ca	1.8E+00	ca		
		3.0E-02	I			3.0E-02	r	0	0.10	99-35-4		1,3,5-Trinitrobenzene	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		1.0E-02	h			1.0E-02	r	0	0.10	479-45-8		Trinitrophenylmethylnitramine	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
3E-02	I	5.0E-04	I	3E-02	r	5.0E-04	r	0	0.10	118-96-7		2,4,6-Trinitrotoluene	1.6E+01	ca**	5.7E+01	ca**	2.2E-01	ca**	2.2E+00	ca**		
		5.00E-03	n			5.00E-03	r		0.10	791-28-6		Triphenylphosphine oxide	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
3.2E-03	n	1.1E-01	n	3.2E-03	r	1.1E-01	r		0.10	115-96-8		Tris(2-chloroethyl) phosphate	1.5E+02	ca*	5.4E+02	ca	2.1E+00	ca	2.1E+01	ca		
		2.00E-04	n							7440-61-0		Uranium (chemical toxicity only)	1.6E+01	nc	2.0E+02	nc			7.3E+00	nc		
		7.0E-03	h					0		7440-62-2		Vanadium and compounds	5.5E+02	nc	7.2E+03	nc			2.6E+02	nc	6.0E+03	3.0E+02
		1.0E-03	I			1.0E-03	r	0	0.10	1929-77-7		Vernam	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	I			2.5E-02	r	0	0.10	50471-44-8		Vinclozolin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		1.0E+00	h			5.7E-02	I	1		108-05-4		Vinyl acetate	4.3E+02	nc	1.4E+03	nc	2.1E+02	nc	4.1E+02	nc	1.7E+02	8.0E+00
1.1E-01	r	8.6E-04	r	1.1E-01	h	8.6E-04	I	1		593-60-2		Vinyl bromide (bromoethene)	1.9E-01	ca*	4.2E-01	ca*	6.1E-02	ca*	1.0E-01	ca*		
1.5E+00	I	3.00E-03	I	3.1E-02	I	2.86E-02	I	1		75-01-4		Vinyl chloride (child/adult)+++	7.9E-02	ca			1.1E-01	ca	2.0E-02	ca	1.0E-02	7.0E-04
7.5E-01	I	3.00E-03	I	1.6E-02	I	2.86E-02	I	1		75-01-4		Vinyl chloride (adult)			7.5E-01	ca						
		3.0E-04	I			3.0E-04	r	0	0.10	81-81-2		Warfarin	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		7.0E-01	I			2.9E-02	I	1	0.10	1330-20-7		Xylenes	2.7E+02	nc	4.2E+02	sat	1.1E+02	nc	2.1E+02	nc	2.1E+02	1.0E+01
		3.0E-01	I					0		7440-66-6		Zinc	2.3E+04	nc	1.0E+05	max			1.1E+04	nc	1.2E+04	6.2E+02
		3.0E-04	I					0		1314-84-7		Zinc phosphide	2.3E+01	nc	3.1E+02	nc			1.1E+01	nc		
		5.0E-02	I			5.0E-02	r	0	0.10	12122-67-7		Zineb	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		

APPENDIX F

LIST OF
DIVISION OF WASTE MANAGEMENT
REGIONAL OFFICES

LIST OF WASTE MANAGEMENT REGIONAL OFFICES (6/27/08)

Bowling Green Regional Office
1508 Westen Avenue
Bowling Green, KY 42104
(270) 746-7475 FAX (270) 746-7865

Attn: Todd Johnston

Allen	Grayson	Ohio
Barren	Hart	Simpson
Butler	Logan	Warren
Edmonson		

Louisville Regional Office
9116 Leesgate Road
Louisville, KY 40222
(502) 429-7120 FAX (502) 429-7125

Attn: Keith Sims

Breckinridge	Meade
Bullitt	Oldham
Hardin	Shelby
Jefferson	Spencer

Columbia Regional Office
2751 Campbellsville Road
Columbia, KY 42728
(270) 384-4735 FAX (270) 384-5199

Attn: Kerry McDaniel

Adair	Larue	Pulaski
Boyle	Lincoln	Russell
Casey	Marion	Taylor
Clinton	Metcalfe	Washington
Cumberland	Monroe	Wayne
Green	Nelson	

Madisonville Regional Office
625 Hospital Drive
Madisonville, KY 42431
(270) 824-7532 FAX (270) 824-7070

Attn: Larry Tichenor

Caldwell	Hancock	Muhlenberg
Christian	Henderson	Todd
Crittenden	Hopkins	Union
Daviess	McLean	Webster

Florence Regional Office
8020 Veteran Memorial Drive, Suite 110
Florence, KY 41042
(859) 525-4923 FAX (859) 525-4157

Attn: Michael Fant

Boone	Gallatin	Owen
Bracken	Grant	Pendleton
Campbell	Henry	Trimble
Carroll	Kenton	

Morehead Regional Office
525 Hecks Plaza Drive
Morehead, KY 40351
(606) 784-6634 FAX (606) 784-4544

Attn: Karen Hall

Bath	Fleming	Mason
Boyd	Greenup	Menifee
Carter	Lawrence	Montgomery
Elliott	Lewis	Morgan
Rowan		

Frankfort Regional Office
663 Teton Trail
Frankfort, KY 40601
(502) 564-3358 FAX (502) 564-5043

Attn: Lloyd Funkhouser

Anderson	Garrard	Nicholas
Bourbon	Harrison	Powell
Clark	Jessamine	Robertson
Estill	Madison	Scott
Fayette	Mercer	Woodford
Franklin		

Paducah Regional Office
130 Eagle Nest Drive
Paducah, KY 42003
(270) 898-8468 FAX (270) 898-8640

Attn: Margie Williams

Ballard	Graves	McCracken
Calloway	Hickman	Marshall
Carlisle	Livingston	Trigg
Fulton	Lyon	

Hazard Regional Office
233 Birch Street
Hazard, KY 41701
(606) 435-6022 FAX (606) 435-6025

Attn: Robert Stidham

Breathitt	Lee	Martin	Wolfe
Floyd	Leslie	Owsley	
Johnson	Letcher	Perry	
Knott	Magoffin	Pike	

London Regional Office
875 South Main Street
London, KY 40741
(606) 330-2080 FAX (606) 330-2097

Attn: Bill Belcher

Bell	Knox	McCreary
Clay	Laurel	Rockcastle
Harlan	Jackson	Whitley