Updates to Approaches for Developing PCLs for Dioxins, Furans, and Dioxin-like PCBs

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2025 Trade Fair

San Antonio, Texas

Part One - TRRP Amendment

- TRRP changes related to *dioxin** data and approaches for dioxin Protective Concentration Levels (PCLs)
- Overview of pre-TRRP & post-TRRP amendment

Part Two - Overview of *Dioxins* & Toxicity Equivalency

- Background: dioxin origins, exposure pathways, and health effects.
- Common toxicity of specific molecules from different chemical classes.
- Dioxin data evaluation as a *mixture* using toxicity equivalency factors (TEFs)
- Examples calculations of toxicity equivalency quotients (TEQs)

"Dioxin" hereinafter refers to the "toxic" 2,3,7,8-chloro-substituted dibenzo-p-dioxins, 2,3,7,8-chloro-substituted dibenzofurans, and dioxin-like PCBs described in TRRP.

Recent TRRP Updates

- Sections 350.76(d) and (e) were amended in 2025.
  - 350.76(d) – Dioxin-like PCBs *
  - 350.76(e) – Dioxins/Furans
- Effective February 6, 2025.
- Publication of Regulatory Guidance Document (RG-648)

https://www.tceq.texas.gov/downloads/remediation/trrp/rg-648-dioxinfuranpcbguidance-awr-final.pdf.

*PCB = polychlorinated biphenyl

What Was Amended in TRRP?

1. The critical human health PCLs for dioxins/furans and dioxin-like PCBs.

2. The TEFs for dioxins/furans, and dioxin-like PCBs.

Amended Critical Human Health PCLs

Prior to rule amendment

- Critical soil PCLs ($^{Tot}Soil_{Comb}$) were specified in rule.
  - Res = 0.001 mg/kg (1,000 ng/kg)
  - C/I = 0.005 mg/kg (5,000 ng/kg)

After rule amendment

- Rule directs persons to calculate the critical soil PCLs according to the equations and rule provisions in Section 350.75.
  - Res = 0.000053 mg/kg (53 ng/kg)
  - C/I = 0.00062 mg/kg (620 ng/kg)

Amended TEFs

Prior to rule amendment

- Congeners and TEFs were specified in a table in the rule and were based on the 1998 World Health Organization (WHO) values.

After rule amendment

- The table of congeners and TEFs from 1998 has been removed from TRRP rule.
- TRRP rule now directs persons to use the list (congeners and TEFs) established by WHO in 2005.
- Persons may use a more recent list established by a scientifically valid source (approved by Executive Director).

Dioxin Guidance Document

- New regulatory guidance document (RG-648).
- Provides information on how to evaluate dioxins/furans and dioxin-like PCBs.
- Information is presented in a Q&A format.
- Provides TCEQ-approved TEFs (2005 WHO values).
- Provides several examples, including the use of a new TEQ Calculator.

https://www.tceq.texas.gov/downloads/remediation/trrp/teq-calculator.xlsx

Part Two - Overview of *Dioxins* & Toxicity Equivalency

- Background: dioxin origins, exposure pathways, and health effects.
- Molecular characteristics associated with toxicity.
- TEFs in a complex mixture.
- Evaluating dioxin data; calculating a TEQ.
  - Handling *non-detected* data
  - Reporting - dioxin (as 2,3,7,8-TCDD)
- Example calculation

TCDD = Tetrachlorodibenzo-p-dioxin

Dioxin Sources

Primary source; by-product from incomplete combustion

Forest fires

Landfill, Industrial, & Medical Waste

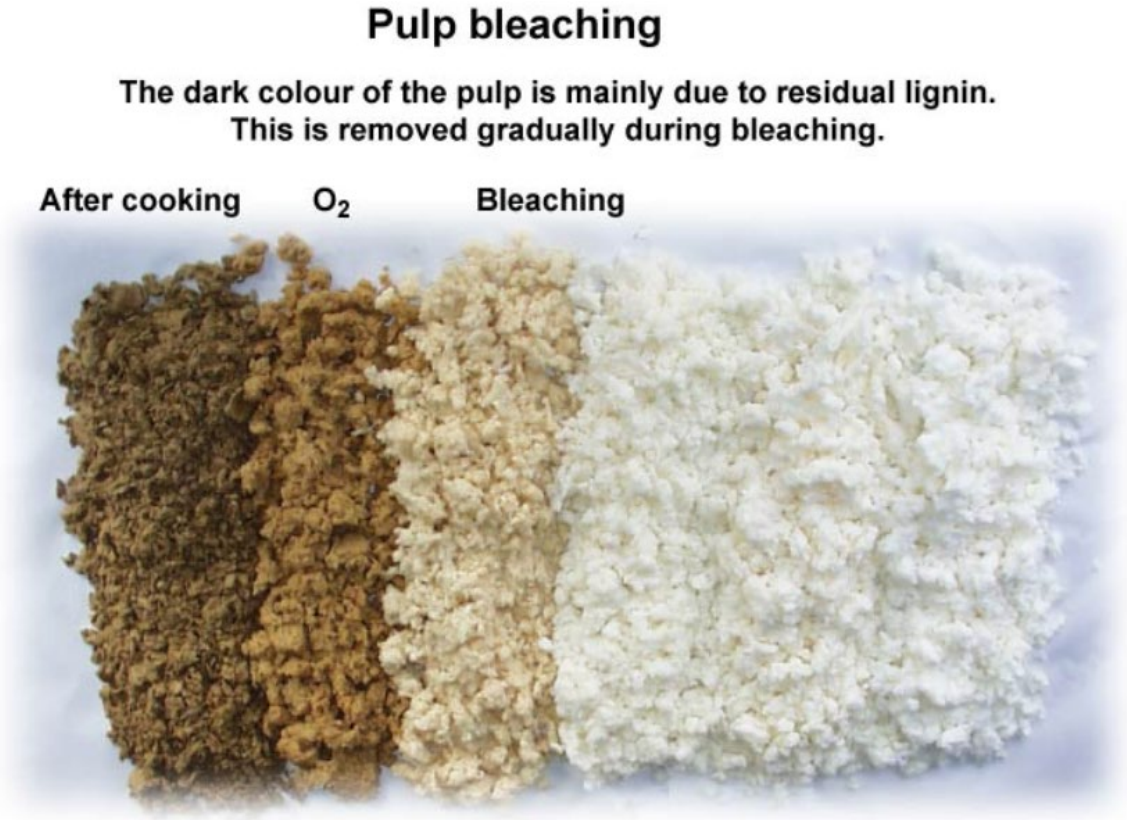
Backyard burning

Note: Polychlorinated dibenzodioxins (PCDDs) & dibenzofurans (PCDFs) are not manufactured. However, PCBs were manufactured for many years, but manufacturing is now banned or heavily restricted.

Dioxin Sources (continued)

Certain herbicide & pesticide manufacturing

(e.g., 2,4-D, 2,4,5-T, 2,3,5-TP etc.)



Bleached pulp/paper products

chlorination of naturally occurring phenolic compounds in wood pulp).

Industrial by-products

Properties of *Dioxin* and Behaviors in the Environment

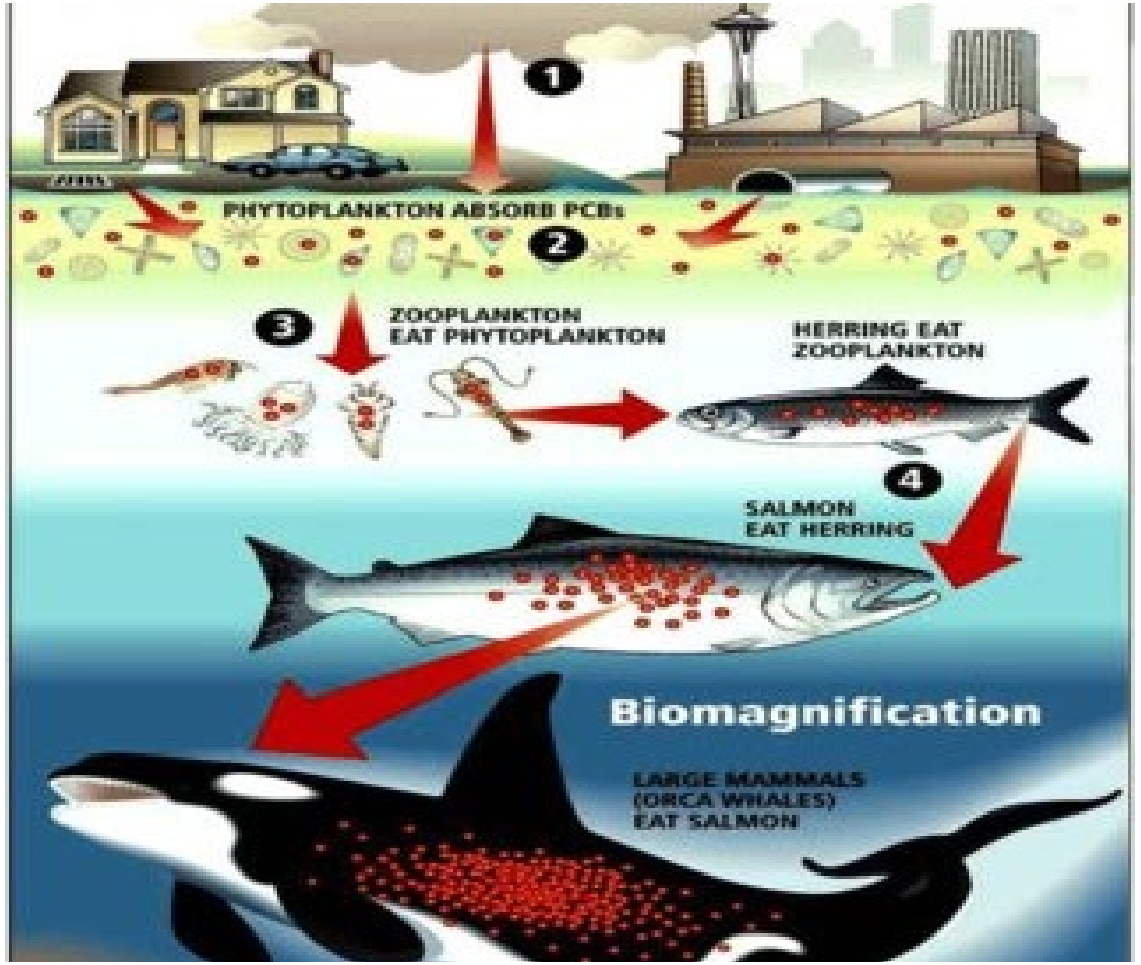
- Stable; slow biodegradation (half-life in soil is 25-100 yrs); however, half-life on soil surface by *photolysis* (of TDDD) is 9-15 yrs; half-life in the body can range from months to decades.
- Highly hydrophobic (high octanol/water coefficient (log Kow)); Dioxins are not expected to be freely dissolved in water, propensity to attach to organic matter in soils/sediments.
- Highly lipophilic (high log Kow); bioaccumulate and biomagnify in the food chain.
- Non-volatile (low vapor pressure); however, dioxins will travel >100 miles on dust particles.

Note: The largest source of dioxin is from incomplete combustion. Dioxins are distributed through air emissions; result in world-wide deposition to land and surface water; end up in sediment from runoff.

Key Point: Dioxins are primarily distributed via **air** from combustion sources…. people are primarily exposed by ingesting contaminated food - particularly meat, dairy, and fish/shellfish.

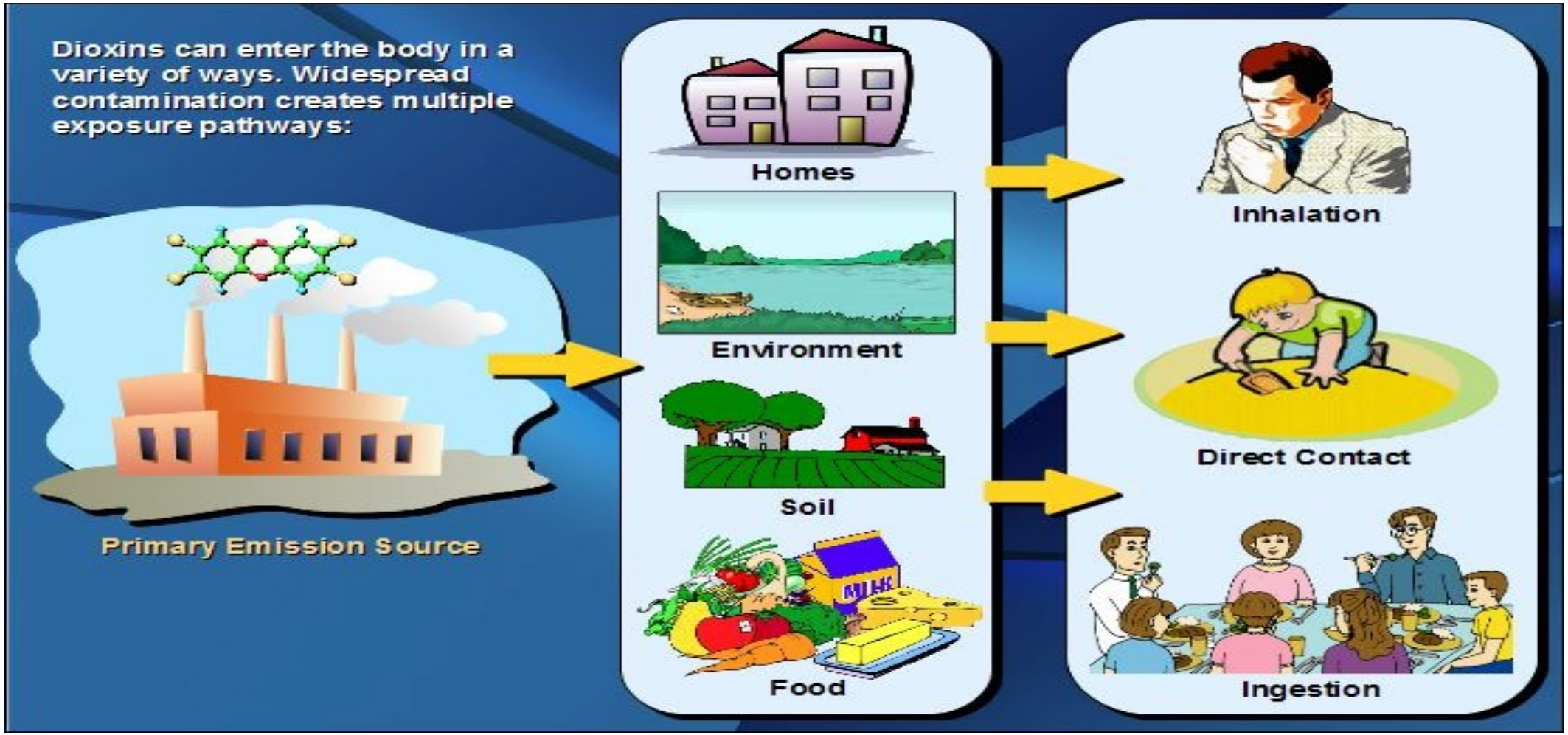
Dioxin Bioaccumulation and Biomagnification

- Dioxins in soil accumulate into plants/grass for grazing animals.
- *Aquatic sediments* - the ultimate environmental sink (e.g., fish and invertebrate concentrations higher than those in the water column.)
- Dioxins/PCBs are fat soluble & accumulate in the food chain.
- Higher amounts found in fish/shellfish, eggs, meat, and dairy.



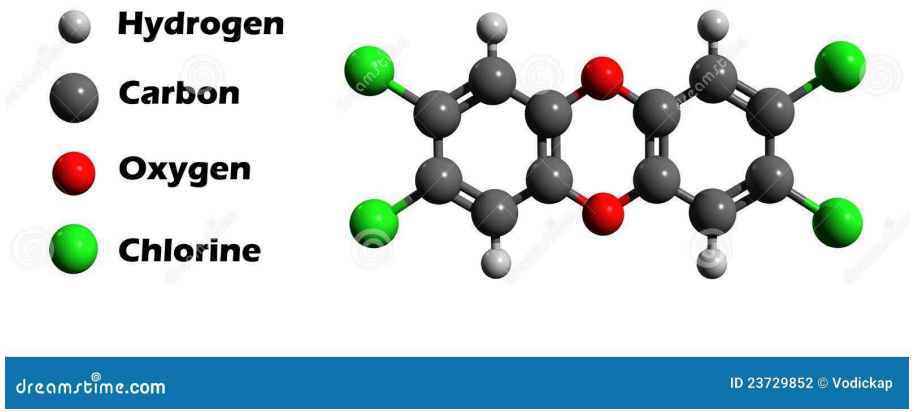
Source: blue-growth.org

Dioxin Exposure Pathways

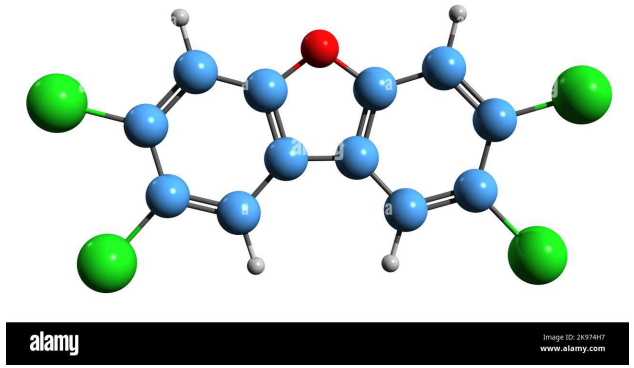


Source: experttoxicologist.com

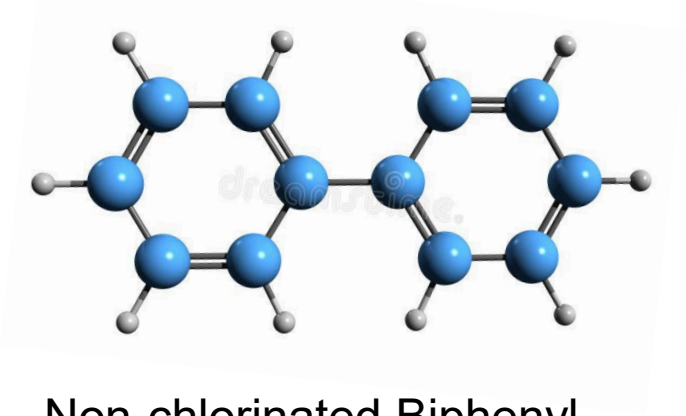
Models of Dioxins and “dioxin like” Compounds



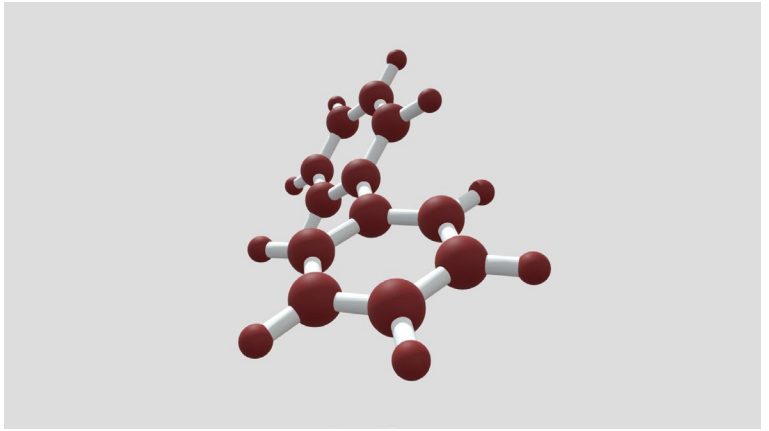
Chlorinated dibenzo-p-dioxin - “rigid & planar”



Chlorinated dibenzofuran - “rigid & planar”



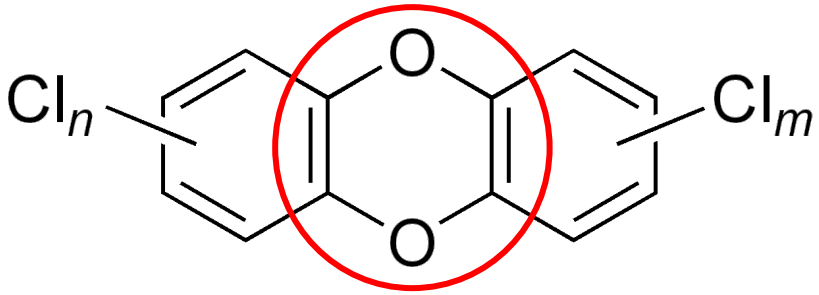
Non-chlorinated Biphenyl
“**planar**” configuration



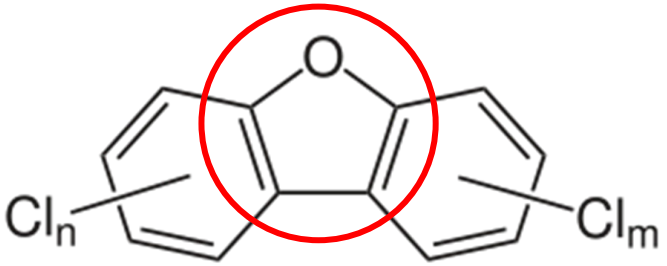
Non-chlorinated Biphenyl
“**non-planar**” configuration

Similarities of Dioxins and Common Toxic Responses

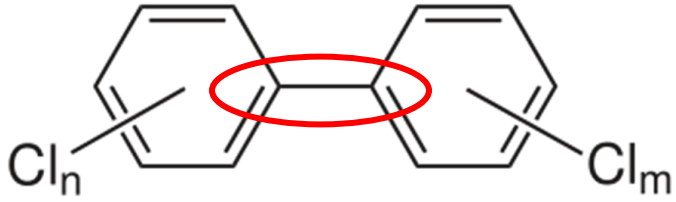
Dioxins and ***dioxin-like*** compounds - refer to a family of closely related chemicals that share a common toxic mechanism. These unique "chlorinated" chemicals; dibenzo-p-dioxins, dibenzofurans, and Biphenyls (aka **PCBs**) share a similar molecular structure.



Dibenzo-*p*-dioxin backbone;
2 benzene rings linked by 2 oxygen atoms "dioxin".



Dibenzofuran backbone;
2 benzene rings linked by 1 oxygen atoms in pentagon shape called "furan".

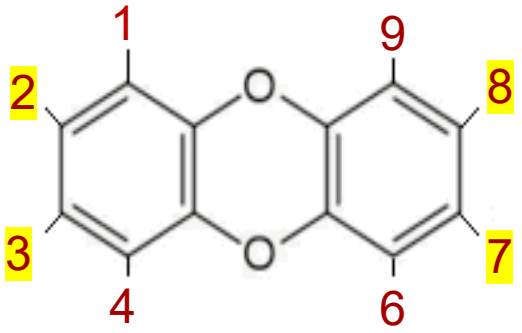


"Biphenyl" backbone;
2 benzene rings linked together.

Toxicity corresponds with the "co-planar" configuration of these structures and the number and position of chlorine atoms on the benzene rings.

Molecular Similarities and Uniqueness of the 12 DL-PCBs

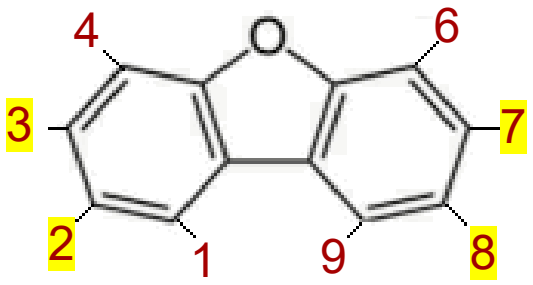
- Chlorine atoms can attach to carbon atoms at the numbered positions on the benzene rings. Note: It is understood that hydrogen atoms are attached to all carbons that are attached to chlorine.
- **Congener** - a unique number & arrangement of chlorine atoms within a chemical family (e.g., dibenzofuran).



Dibenzo-*p*-dioxin backbone

75 chlorinated dioxin congeners

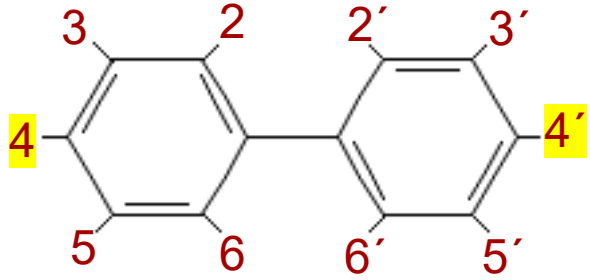
7 toxic dioxin congeners



Dibenzofuran backbone

135 chlorinated furan congeners

10 toxic furan congeners



"Biphenyl" backbone

209 PCB congeners

12 toxic DL-PCB congeners

DL-PCB Descriptors: 1. CP0/CP1 (1 or less Cl in 2,2',6,6' positions) **2.** PP Cl in both 4 & 4' positions **3.** 4Cl 4 or more Cl total **4.** 2M (2 or more Cl in 3,3',5,5' positions.

Naming Chlorinated Dioxins and PCBs

Use the “prefix” (or initial) that corresponds to the number of chlorine atoms on each congener:

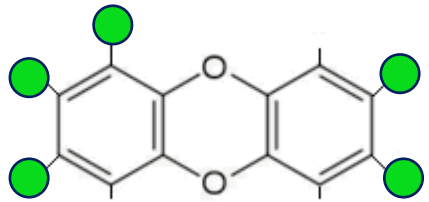
2 chlorines - “di” or D
3 chlorines - “tri” or Tr
4 chlorines - “tetra” or T
5 chlorines - “penta” or Pe
6 chlorines - “hexa” or Hx
7 chlorines - “hepta” or Hp
8 chlorines - “octa” or O
9 chlorines - “nona” (for PCBs)
10 chlorines - “deca” (for PCBs)

Step 1 Number the chlorine position(s).

Step 2 Write the “prefix” followed by “chloro” or prefix initial followed by “C” for chloro.

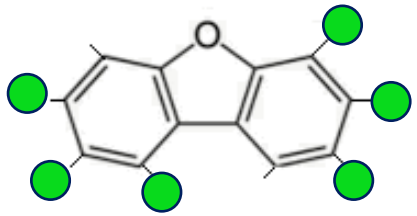
Step 3 Write the chemical class (or initial); “dibenzo-p-dioxin” (DD), “dibenzofuran” (DF), or “biphenyl” (B)

Example # 1:



1,2,3,7,8 - Pentachloro dibenzo-p-dioxin; or 1,2,3,7,8-PeCDD

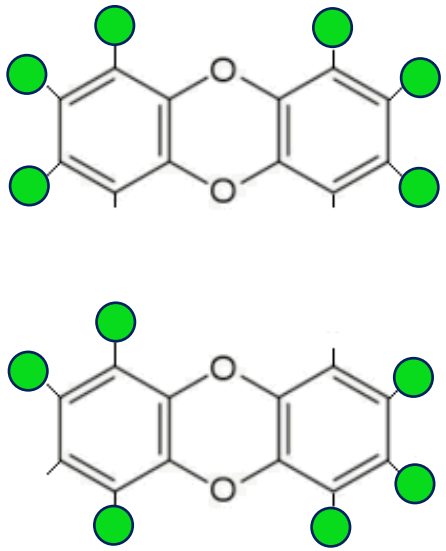
Example # 2:



1,2,3,6,7,8-Hexachlorodibenzofuran or 1,2,3,6,7,8-HxCDF

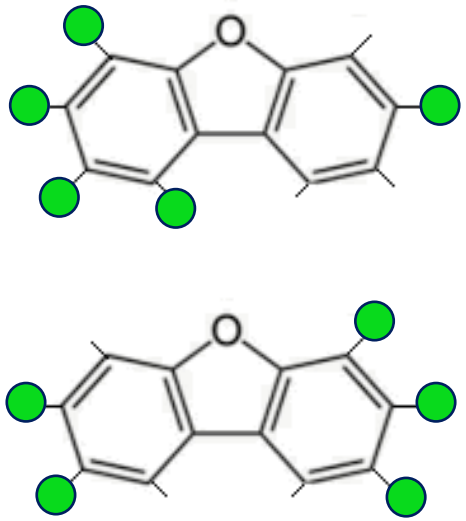
Molecular Homologues

- **Homologue** - a congener with the same total number of chlorine atoms regardless of position. *For example,* all dibenzo-p-dioxin congeners with **six** attached chlorine atoms comprise **hexa**chlorodibenzo-p-dioxin homologues.



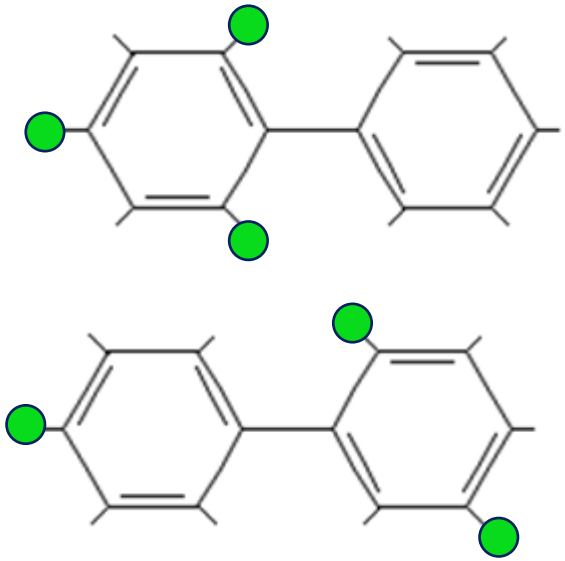
Hexa-chlorodibenzo-*p*-dioxin Homologues

10 hexa-chlorinated homologues
3 are toxic



Penta-chlorodibenzofuran Homologues

28 penta-chlorinated homologues
2 are toxic



Tri-chlorobiphenyl Homologues

24 tri-chlorinated homologues
None are toxic

Toxicity Equivalency Factors (TEFs) and Toxicity Equivalency Quotients (TEQs)

- All **2**,**3**,**7**,**8**-substituted dibenzo-*dioxins and* -furans and all twelve DL-PCBs elicit the same biochemical/toxic response, mediated through the aryl hydrocarbon receptor (AhR) except each varies in *toxic potency*.
- Therefore, each congener result is *weighted* on the same scale by multiplying the assigned TEF to derive a TEQ concentration. The most toxic congener, 2,3,7,8-TCDD, is arbitrarily assigned a TEF value of one (1) and the others assigned a proportional TEF value.
- The TEQ concentrations for each congener are then summed to yield a total TEQ *of the dioxin mixture.* The total TEQ is expressed as 2,3,7,8-TCDD and compared to the action level (e.g., TRRP PCL for "dioxin" (as 2,3,7,8-TCDD) or EPA's MCL).

EXAMPLE:	Analytes measured	Lab Results (ng/Kg)	TEF	TEQ conc. (ng/Kg)	Report *dioxin* (as 2,3,7,8- TCDD)
Dioxin mixture from a soil matrix sample	1,2,3,7,8-PeCDD	6.84	1	6.84	0.0000168 mg/Kg 1.68 x10^{-5} mg/Kg
	1,2,3,7,8,9-HxCDD	50.7	0.1	5.07	
	2,3,4,7,8-PeCDF	5.96	0.5	2.98	
	3,3',4,4',5-DL-PCB (PCB 126)	19.3	0.1	1.93	

Total TEQ = 16.82 ng/kg

Toxicity Equivalency Factors (TEFs)

Replaced TEF values for Figure: 30 TAC 350.76(d)(2)(B) - [Subchapter D, page 76]

2,3,7,8-Substituted *PCDDs	WHO 2005 TEF
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1
1,2,3,7,8-Pentachlorodibenzodioxin	1
1,2,3,4,7,8-Hexachlorodibenzodioxin	0.1
1,2,3,6,7,8-Hexachlorodibenzodioxin	0.1
1,2,3,7,8,9-Hexachlorodibenzodioxin	0.1
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	0.01
Octachlorodibenzodioxin	**0.0003**

2,3,7,8-Substituted *PCDFs	WHO 2005 TEF
2,3,7,8-Tetrachlorodibenzofuran	0.1
1,2,3,7,8-Pentachlorodibenzofuran	**0.03**
2,3,4,7,8-Pentachlorodibenzofuran	**0.3**
1,2,3,4,7,8-Hexachlorodibenzofurans	0.1
1,2,3,6,7,8-Hexachlorodibenzofurans	0.1
1,2,3,7,8,9-Hexachlorodibenzofurans	0.1
2,3,4,6,7,8-Hexachlorodibenzofurans	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofurans	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofurans	0.01
Octachlorodibenzofuran	**0.0003**

Note: The dark blue TEF values are different from the original (WHO 1998) TRRP TEFs.

***PCDDs** = Polychlorinated dibenzo-para-dioxins **PCDFs** = Polychlorinated dibenzofurans

Toxicity Equivalency Factors (TEFs)

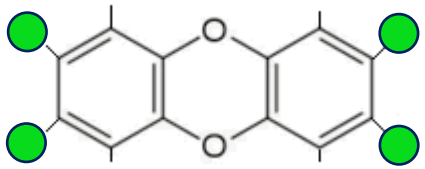
Replaced TEF values from Figure: 30 TAC 350.76(d)(2)(B) - [Subchapter D, page 76]

Dioxin-Like PCBs	WHO 2005 TEF	Dioxin-Like PCBs	WHO 2005 TEF
3,3',4,4'-TCB (77)	0.0001	2,3',4,4',5-PeCB (118)	**0.00003**
3,4,4',5-TCB (81)	**0.0003**	2',3,4,4',5-PeCB (123)	**0.00003**
3,3',4,4',5-PeCB (126)	0.1	2,3,3',4,4',5-HxCB (156)	**0.00003**
3,3',4,4',5,5'-HxCB (169)	**0.03**	2,3,3',4,4',5'-HxCB (157)	**0.00003**
2,3,3',4,4'-PeCB (105)	**0.00003**	2,3',4,4',5,5'-HxCB (167)	**0.00003**
2,3,4,4',5-PeCB (114)	**0.00003**	2,3,3',4,4',5,5'-HpCB (189)	**0.00003**

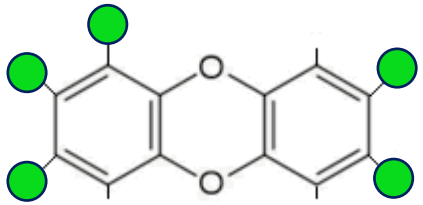
Note: The dark bolded blue TEF values are different from the original (WHO 1998) TRRP TEFs.

7 toxic Polychlorinated Dibenzo-p-dioxins (PCDDs)

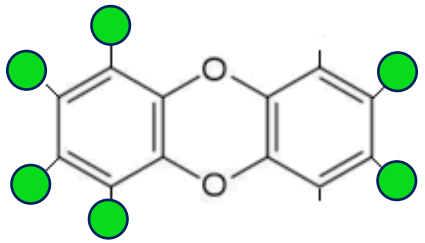
TEF values highlighted



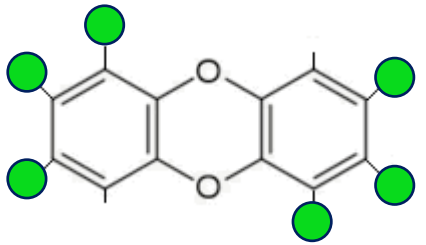
2,3,7,8-TCDD (1)



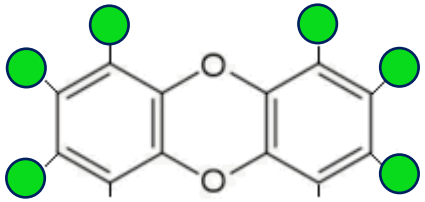
1,2,3,7,8-PeCDD (1)



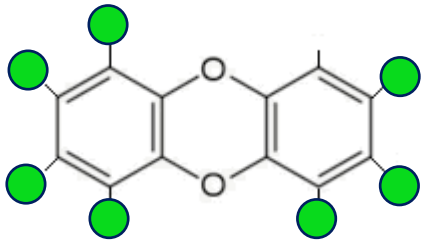
1,2,3,4,7,8-HxCDD (0.1)



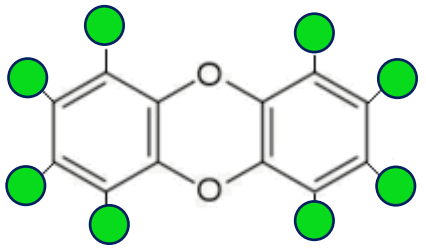
1,2,3,6,7,8-HxCDD (0.1)



1,2,3,7,8,9-HxCDD (0.1)



1,2,3,4,6,7,8-HpCDD (0.01)

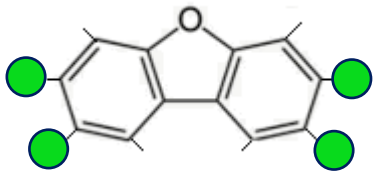


OCDD (0.0003)

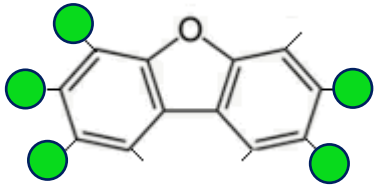
Key Point: All seven (7) toxic dibenzo-p-dioxin congeners have chlorine atoms in the 2,3,7,8 positions.

10 toxic "dioxin-like" Polychlorinated Dibenzofurans (PCDFs)

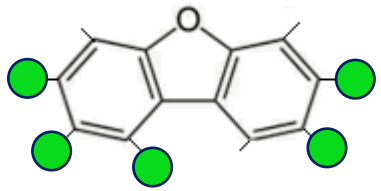
TEF values highlighted



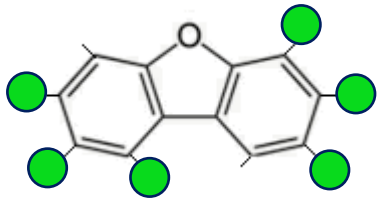
2,3,7,8-TCDF (0.1)



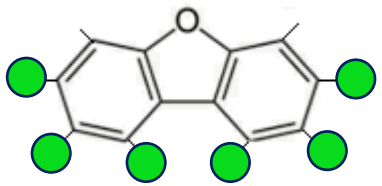
2,3,4,7,8-PeCDF (**0.3**)



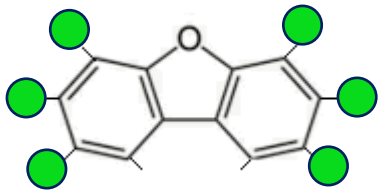
1,2,3,7,8-PeCDF (**0.03**)



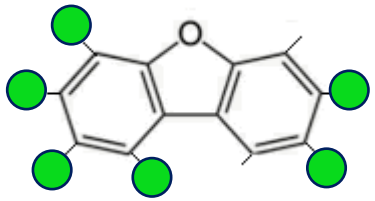
1,2,3,6,7,8-HxCDF (0.1)



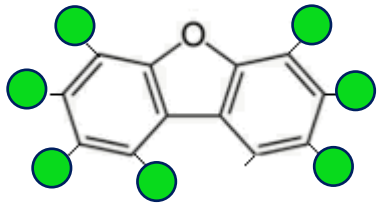
1,2,3,7,8,9-HxCDF (0.1)



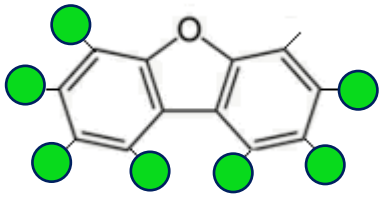
2,3,4,6,7,8-HxCDF (0.1)



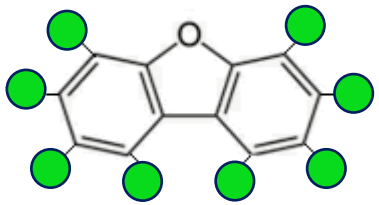
1,2,3,4,7,8-HxCDF (0.1)



1,2,3,4,6,7,8-HpCDF (0.01)



1,2,3,4,7,8,9-HpCDF (0.01)



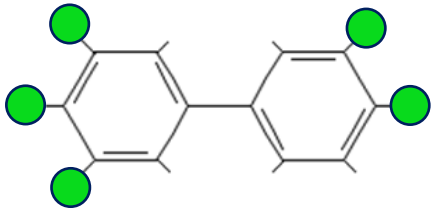
OCDF (0.0003)

Note:. See TRRP 350.76(e)(1)(B)

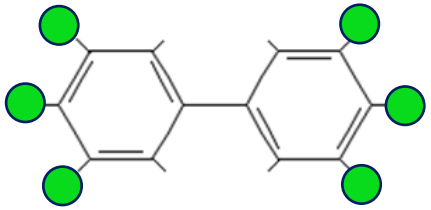
TEFs for penta-chloro-dibenzofuran homologues differ by a factor of ten. For homologue data, the Person shall use the "higher" TEF value.

12 toxic "dioxin-like" Polychlorinated Biphenyls (DL-PCBs)

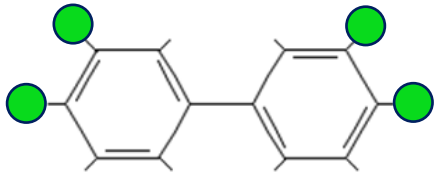
TEF values highlighted



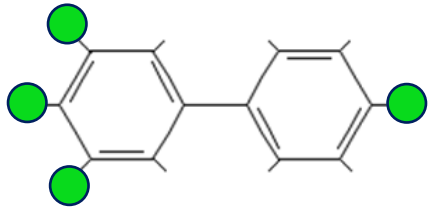
3,4,5,3',4'-PeCB (0.1)
PCB 126



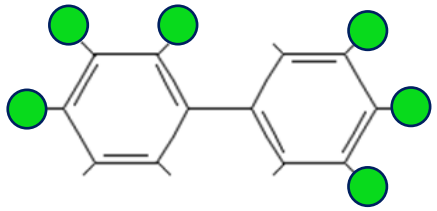
3,4,5,3',4',5'-HxCB (0.03)
PCB 169



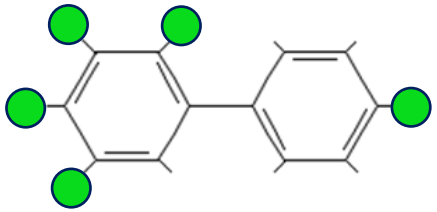
3,4,3',4'-TCB (0.0001)
PCB 77



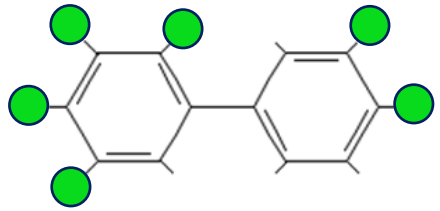
3,4,5,4'-TCB (0.0003)
PCB 81



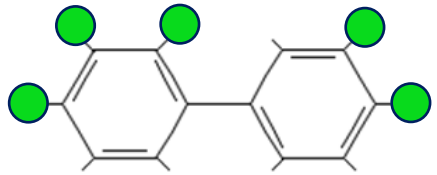
2,3,4,3',4',5'-HxCB (0.00003)
PCB 157



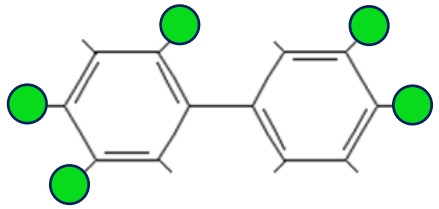
2,3,4,5,4'-PeCB (0.00003)
PCB 114



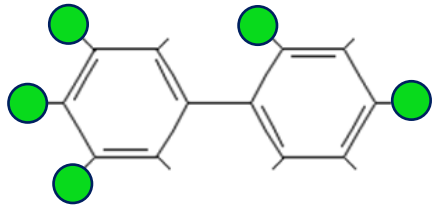
2,3,4,5,3',4'-HxCB (0.00003)
PCB 156



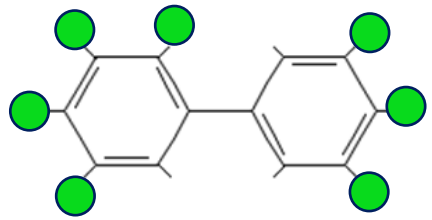
2,3,4,3',4'-PeCB (0.00003)
PCB 105



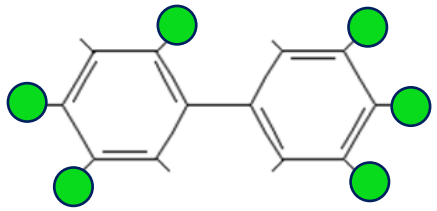
2,4,5,3',4'-PeCB (0.00003)
PCB 118



3,4,5,2',4'-PeCB (0.00003)
PCB 123



2,3,4,5,3',4',5'-HpCB (0.00003)
PCB 189



2,4,5,3',4',5'-HxCB (0.00003)
PCB 167

How to Handle Non-Detected Results

for Dibenzo-*Dioxins & Dioxin-Like Congeners*

- Non-detected (ND) results ≠ chemical(s) not present. (ND) means the concentration(s) could be present between zero and just below the detection limit.

- *When congeners comprise a complex* chemical mixture and all share a common mechanism of action, the toxicity/potency can produce a joint effect that is "dose additive". Therefore, all congener concentrations, including NDs, should be evaluated for calculating each congener's TEQ concentration that contributes to the total TEQ value, representing the *total potency of the mixture*.

- Refer to TRRP Section 350.51(n) and examples provided in the Regulatory Guidance RG-648 for evaluating non-detected (ND) results and using appropriate proxy values.

- There are typically three (3) options when selecting a proxy value for **ND dibenzo-dioxin / -furan results**; (1) **full value** of the "detection limit" (DL), (2) **half value** of the DL, or (3) **zero**. This is based on available information to determine if PCDDs/PCDFs are likely to be present in the sample.

Considerations for Assigning ND Proxy Values

In determining the proxy value for ND results, the data user must first show that PCDDs/PCDFs are *likely or not likely present* based on available data. The data user should consider:

1. Chemical evidence suggesting presence or absence of PCDDs/PCDFs in a sample.
    a. 2,3,7,8-Hepta and -Octa-CDDs/CDFs are ubiquitous at low levels; known release is doubtful.
    b. PCDDs/PCDFs travel in groups, so when only 2,3,7,8-Hepta and -Octa-congeners present at concentrations near DL, they should not be used to document release from known source.
    c. If 2,3,7,8-TCDD or -PeCDD are present, release is likely.
2. The location of sampling point relative to suspected release (if known). The closer the sampling point to a known release, the more likely PCDDs/PCDFs are to be present.
3. The potential for PCDDs/PCDFs to migrate based mobility (dictated by chem/phys parameters). They have low water solubility so when released to soil, they reside in soil but move toward sediment with run-off. When released to water they migrate into air or soil/sediment PCDDs/PCDFs have higher mobility in sand than clay.

Assigning ND Proxy Values (continued)

Consider using full value of the "detection limit" (DL), if 2,3,7,8-TCDD is detected or when PCDDs & PCDFs are "very likely" present (e.g., when "several" 2,3,7,8-PCDDs/PCDFs are detected at concentrations greater than the quantitation limits).

Consider using half of the DL value when PCDDs/PCDFs are "likely" present (e.g.., no 2,3,7,8-TCDD detected but several 2,3,7,8-PCDDs/PCDFs, other than 2,3,7,8-Hepta and -Octa CDD/Fs are detected).

Consider using zero when PCDDs/PCDFs are "not likely" present (e.g., only 2,3,7,8-Hepta and -Octa CDD/Fs are detected at ***low*** concentrations).

For DL-PCBs, the decision for selecting a proxy value is usually based on whether DL-PCBs are detected in other samples at the site:

1. Use a proxy value of half of the DL value when DL-PCBs are detected in other site-samples.
2. Use a proxy of zero when DL-PCBs are not detected in other site-samples

Important: When using the TEQ Calculator, the value(s) entered for *half of the DL* must be input manually, to calculate each congener's TEQ concentration for a ND result.

Example: 2,3,7,8-chlorinated dibenzo-dioxins & -furans (no PCBs)

This is a soil sample from a site with a known release of dioxins/furans where 2,3,7,8-TCDD is detected, with no PCBs present.

The non-detect proxy values for dioxins/furans would be the full value of the detection limit, and for dioxin-like PCBs would be zero.

Sample results are reported in ng/kg (ppt). A "U" flag means the congener was ND at the detection limit (*EDL) and a "J" flag means the congener was detected and measured at the concentration indicated, but the value is an estimate because it is measured above the EDL but below the "quantitation limit" (**LMCL).

*EDL - The minimum analytical signal that distinguishes a specific *dioxin* from background signal levels. It compares to the TRRP sample detection limit (SDL) and used as a proxy for non-detected *dioxin* data.

**LMCL - (also minimum level of quantitation (ML) in Method 1668C) is the lowest calibration standard concentration. It compares to the TRRP defined method quantitation limit (MQL).

Lab Results 2,3,7,8-chlorinated dibenzo-dioxins & -furans (no PCBs)

TEQ Calculator

TCEQ has developed a TEQ calculator to facilitate the calculation of 2,3,7,8-TCDD TEQs for comparison to the appropriate critical 2,3,7,8-TCDD PCLs.

https://www.tceq.texas.gov/downloads/remediation/trrp/teq-calculator.xlsx

Dioxin	*Result (ng/kg) (ppt)*	*Furan*	*Result (ng/kg) (ppt)*
2,3,7,8-TCDD	2.1	2,3,7,8-TCDF	0.01 U
1,2,3,7,8-PeCDD	0.51	1,2,3,7,8-PeCDF	0.01 U
1,2,3,4,7,8-HxCDD	1.1	2,3,4,7,8-PeCDF	0.27
1,2,3,6,7,8-HxCDD	20.3	1,2,3,4,7,8-HxCDF	0.01 U
1,2,3,7,8,9-HxCDD	15.8	1,2,3,6,7,8-HxCDF	3.3
1,2,3,4,6,7,8-HpCDD	32.0	1,2,3,7,8,9-HxCDF	15.9
OCDD	439	2,3,4,6,7,8-HxCDF	0.09 J
		1,2,3,4,6,7,8-HpCDF	0.9
		1,2,3,4,7,8,9-HpCDF	25.9
		OCDF	200

Ex. 1 (TEQ Calculator) 2,3,7,8-chlorinated dibenzo-dioxins & -furans

Dioxin Congener	Lab Results in parts per trillion (ppt)	TCEQ Approved TEFs	2,3,7,8-TCDD TEQ conc. (ppt)
Dioxins			
2,3,7,8-TCDD	2.1	**1**	2.1
1,2,3,7,8-PeCDD	0.51	**1**	0.51
1,2,3,4,7,8-HxCDD	1.1	**0.1**	0.11
1,2,3,6,7,8-HxCDD	20.3	**0.1**	2.03
1,2,3,7,8,9-HxCDD	15.8	**0.1**	1.58
1,2,3,4,6,7,8-HpCDD	32	**0.01**	0.32
OCDD	439	**0.0003**	0.1317

Dioxin-Like Congener	Lab Results in parts per trillion (ppt)	TCEQ Approved TEFs	2,3,7,8-TCDD TEQ conc. (ppt)
Furans			
2,3,7,8-TCDF	0.01	**0.1**	0.001
1,2,3,7,8-PeCDF	0.01	**0.03**	0.0003
2,3,4,7,8-PeCDF	0.27	**0.3**	0.081
1,2,3,4,7,8-HxCDF	0.01	**0.1**	0.001
1,2,3,6,7,8-HxCDF	3.3	**0.1**	0.33
1,2,3,7,8,9-HxCDF	15.9	**0.1**	1.59
2,3,4,6,7,8-HxCDF	0.09	**0.1**	0.009
1,2,3,4,6,7,8-HpCDF	0.9	**0.01**	0.009
1,2,3,4,7,8,9-HpCDF	25.9	**0.01**	0.259
OCDF	200	**0.0003**	0.06
2,3,7,8-TCDD TEQ in ppt for Dioxins/Furans			**9.1**

Ex. 1 (TEQ Calculator) Dioxin-Like Polychlorined biphenyls (DL-PCBs)

Dioxin-Like Congener	Lab Results in parts per trillion (ppt)	TCEQ Approved TEFs	2,3,7,8-TCDD TEQ conc. (ppt)
Dioxin-like PCBs			
PCB 77	0	0.0001	0
PCB 81	0	0.0003	0
PCB 126	0	0.1	0
PCB 169	0	0.03	0
PCB 105	0	0.00003	0
PCB 114	0	0.00003	0
PCB 118	0	0.00003	0
PCB 123	0	0.00003	0
PCB 156	0	0.00003	0
PCB 157	0	0.00003	0
PCB 167	0	0.00003	0
PCB 189	0	0.00003	0
2,3,7,8-TCDD TEQ in ppt for Dioxin-Like PCBs			**0.0**

2,3,7,8-TCDD TEQ in ppt for Dioxins/Furans plus DL PCBs	**9.1**

QUESTIONS?

techsup@tceq.texas.gov