

# Sheboygan Harbor & River Superfund Site, Former Tecumseh Plant, Preliminary Remediation Goal for Polychlorinated Biphenyls in Recreational Soil

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OCH JV evaluated the suitability of 25 milligrams per kilogram (mg/kg) as a preliminary remediation goal (PRG) for soil at the former Tecumseh Products Company Site. Based on the *Third Five-Year Review Report* (EPA, 2020), the City of Sheboygan Falls has expressed interest in expanding the adjacent Rochester Park to include the former Tecumseh property. Therefore, current features of the park were evaluated to identify how the park is currently used, the age groups that may be present at the park, and potential exposure times at the park.

Based on information available on local recreational websites<sup>1</sup>, Rochester Park is a 10-acre community park that is open from 7 AM to 11 PM daily and is lit from 4 PM to 11 PM daily. It provides a venue for various sports and activities including:

- Lighted baseball diamond
- Soccer field
- Tennis courts
- Volleyball court
- Basketball court
- Pickleball
- Playground equipment
- Restroom facilities/shelter
- Grills
- Sledding hills
- Dog Park
- Bike riding
- Picnicking

Based on the soil samples collected from 16 locations in Rochester Park in October 2021, the PCB Aroclors detected are Aroclor 1248, Aroclor 1254, and Aroclor 1260. These are the same Aroclors detected at the Tecumseh property. Therefore, PRGs were calculated for those three Aroclors.

The EPA Regional Screening Level (RSL) Calculator<sup>2</sup> was used to calculate the PRGs (Attachment 1). The Recreator scenario was selected for calculation of soil PRGs based on chronic effects.

The following exposure assumptions were used in the calculation of PRGs:

- Climate zone: Minneapolis, MN (the closest zone available for selection in the RSL Calculator drop-down menu)
- Depth of source: 0.01 m (0.4 inches; PCBs were present in soil collected from depths of 0-6 inches)
- Acreage: 10 acres (assumes a 10-acre area covered with grass/dirt)

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<sup>1</sup> <https://sheboyganfalls.org/sheboygan-falls-parks-and-trails/>

<sup>2</sup> [https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search)

- Exposure frequency: 100 days/year (3 days/week for 8 months/year)
- Exposure time: 3 hours/event (conservative value between the 50<sup>th</sup> and 75<sup>th</sup> percentiles for ages 0-6 based on Table 16-20 of EPA's *Exposure Factors Handbook*<sup>3</sup>)
- Target hazard quotient: 1
- Target risk: 1.0E-05
- All other default parameters in the RSL Calculator were used.

The RSL Calculator uses the same cancer toxicity value for all three Aroclors; however, a noncancer toxicity value is used only for Aroclor 1254.

The calculations yield PRGs of 8.7 mg/kg for Aroclors 1248 and 1260, but a PRG of 4.1 mg/kg for Aroclor 1254. It is recommended that the lowest calculated PRG (4.1 mg/kg) be used for a recreational scenario to account for potential noncancer effects of PCBs in soil.

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<sup>3</sup> <https://www.epa.gov/expobox/about-exposure-factors-handbook>

Attachment 1

# Site-specific Recreator Soil Inputs

Variable	Recreator Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	16.2302
A (VF Dispersion Constant)	11.911	16.2302
A (VF Dispersion Constant - mass limit)	11.911	16.2302
B (PEF Dispersion Constant)	18.7762	18.7762
B (VF Dispersion Constant)	18.4385	18.7762
B (VF Dispersion Constant - mass limit)	18.4385	18.7762
City (PEF Climate Zone) Selection	Default	Minneapolis, MN
City (VF Climate Zone) Selection	Default	Minneapolis, MN
C (PEF Dispersion Constant)	216.108	216.108
C (VF Dispersion Constant)	209.7845	216.108
C (VF Dispersion Constant - mass limit)	209.7845	216.108
$d_s$ (depth of source) m	.	.01
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on $U_{crit}/U_s$ ) unitless	0.194	0.194
n (total soil porosity) $L_{pore}/L_{crit}$	0.43396	0.43396
$\rho_b$ (dry soil bulk density) g/cm <sup>3</sup>	1.5	1.5
$\rho_b$ (dry soil bulk density - mass limit) g/cm <sup>3</sup>	1.5	1.5
PEF (particulate emission factor) m <sup>3</sup> /kg	1359344438	825929431.69201
$\rho_p$ (soil particle density) g/cm <sup>3</sup>	2.65	2.65
$Q/C_{wind}$ (g/m <sup>2</sup> -s per kg/m <sup>3</sup> )	93.77	56.976258165320
$Q/C_{vnl}$ (g/m <sup>2</sup> -s per kg/m <sup>3</sup> )	68.18	56.976258165320
$Q/C_{vnl}$ (g/m <sup>2</sup> -s per kg/m <sup>3</sup> - mass limit)	68.18	56.976258165320
$A_s$ (PEF acres)	0.5	10
$A_s$ (VF acres)	0.5	10
$A_s$ (VF mass-limit acres)	0.5	10
$AF_{n-7}$ (skin adherence factor) mg/cm <sup>2</sup>	0.2	0.2
$AF_{7-6}$ (skin adherence factor) mg/cm <sup>2</sup>	0.2	0.2
$AF_{6-16}$ (skin adherence factor) mg/cm <sup>2</sup>	0.07	0.07
$AF_{16-20}$ (skin adherence factor) mg/cm <sup>2</sup>	0.07	0.07
$AF_{rec-a}$ (skin adherence factor - adult) mg/cm <sup>2</sup>	0.07	0.07
$AF_{rec-c}$ (skin adherence factor - child) mg/cm <sup>2</sup>	0.2	0.2

# Site-specific Recreator Soil Inputs

Variable	Recreator Soil Default Value	Form-input Value
AT <sub>rec</sub> (averaging time)	365	365
BW <sub>n,c</sub> (body weight) kg	15	15
BW <sub>γ,c</sub> (body weight) kg	15	15
BW <sub>6-16</sub> (body weight) kg	80	80
BW <sub>16-20</sub> (body weight) kg	80	80
BW <sub>rec-a</sub> (body weight - adult) kg	80	80
BW <sub>rec-c</sub> (body weight - child) kg	15	15
DFS <sub>rec-adj</sub> (age-adjusted soil dermal factor) mg/kg	.	29540
DFS <sub>M</sub> <sub>rec-adj</sub> (mutagenic age-adjusted soil dermal factor) mg/kg	.	122360
ED <sub>rec</sub> (exposure duration - recreator) years	26	26
ED <sub>n,c</sub> (exposure duration) year	2	2
ED <sub>γ,c</sub> (exposure duration) year	4	4
ED <sub>6-16</sub> (exposure duration) year	10	10
ED <sub>16-20</sub> (exposure duration) year	10	10
ED <sub>rec-c</sub> (exposure duration - child) years	6	6
EF <sub>rec</sub> (exposure frequency) days/year	.	100
EF <sub>n,c</sub> (exposure frequency) days/year	.	100
EF <sub>γ,c</sub> (exposure frequency) days/year	.	100
EF <sub>6-16</sub> (exposure frequency) days/year	.	100
EF <sub>16-20</sub> (exposure frequency) days/year	.	100
EF <sub>rec-a</sub> (exposure frequency - adult) days/year	.	100
EF <sub>rec-c</sub> (exposure frequency - child) days/year	.	100
ET <sub>rec</sub> (exposure time - recreator) hours/day	.	3
ET <sub>n,c</sub> (exposure time) hours/day	.	3
ET <sub>γ,c</sub> (exposure time) hours/day	.	3
ET <sub>6-16</sub> (exposure time) hours/day	.	3
ET <sub>16-20</sub> (exposure time) hours/day	.	3
ET <sub>rec-a</sub> (adult exposure time) hours/day	.	3
ET <sub>rec-c</sub> (child exposure time) hours/day	.	3
THQ (target hazard quotient) unitless	0.1	1
IFS <sub>rec-adj</sub> (age-adjusted soil ingestion factor) mg/kg	.	10500

# Site-specific Recreator Soil Inputs

Variable	Recreator Soil Default Value	Form-input Value
IFSM <sub>recreator</sub> (mutagenic age-adjusted soil ingestion factor) mg/kg	.	47666.667
IRS <sub>n,c</sub> (soil intake rate) mg/day	200	200
IRS <sub>γ,c</sub> (soil intake rate) mg/day	200	200
IRS <sub>6-16</sub> (soil intake rate) mg/day	100	100
IRS <sub>16-20</sub> (soil intake rate) mg/day	100	100
IRS <sub>recreator</sub> (soil intake rate - adult) mg/day	100	100
IRS <sub>recreator</sub> (soil intake rate - child) mg/day	200	200
LT (lifetime - recreator) years	70	70
SA <sub>n,c</sub> (skin surface area) cm <sup>2</sup> /day	2373	2373
SA <sub>γ,c</sub> (skin surface area) cm <sup>2</sup> /day	2373	2373
SA <sub>6-16</sub> (skin surface area) cm <sup>2</sup> /day	6032	6032
SA <sub>16-20</sub> (skin surface area) cm <sup>2</sup> /day	6032	6032
SA <sub>recreator</sub> (skin surface area - adult) cm <sup>2</sup> /day	6032	6032
SA <sub>recreator</sub> (skin surface area - child) cm <sup>2</sup> /day	2373	2373
TR (target risk) unitless	1.0E-06	1.0E-05
T <sub>w</sub> (groundwater temperature) Celsius	25	25
Theta <sub>a</sub> (air-filled soil porosity) L <sub>air</sub> /L <sub>soil</sub>	0.28396	0.28396
Theta <sub>w</sub> (water-filled soil porosity) L <sub>water</sub> /L <sub>soil</sub>	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U <sub>m</sub> (mean annual wind speed) m/s	4.69	4.69
U <sub>t</sub> (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5
VF <sub>ml</sub> (volitization factor - mass limit) m <sup>3</sup> /kg	.	3114459.0143360

# Site-specific

## Recreator Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; \* = where: nc SL < 100X ca SL; \*\* = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF <sub>o</sub> (mg/kg-day) <sup>-1</sup>	SF <sub>o</sub> Ref	IUR (ug/m <sup>3</sup> ) <sup>-1</sup>	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m <sup>3</sup> )	RfC Ref	GIABS	ABS
Aroclor 1248	12672-29-6	No	Yes	Organics	2.00E+00	G	5.71E-04	G	-		-		1	0.14
Aroclor 1254	11097-69-1	No	Yes	Organics	2.00E+00	G	5.71E-04	G	2.00E-05	I	-		1	0.14
Aroclor 1260	11096-82-5	No	Yes	Organics	2.00E+00	G	5.71E-04	G	-		-		1	0.14

# Site-specific

## Recreator Regional Screening Levels (RSL) for Soil

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RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)	$K_{oc}$ (cm <sup>3</sup> /g)	$K_d$ (cm <sup>3</sup> /g)	HLC (atm-m <sup>3</sup> /mole)	Henry's Law Constant Used in Calcs (unitless)	H <sup>c</sup> and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T <sub>c</sub> (K)	T <sub>c</sub> Ref
1	-	1.00E-01	7.65E+04	4.59E+02	4.40E-04	1.80E-02	PHYSPROP	613.15	EPI	919.725	Approx. from Tcrit=1.5xTBoil
1	-	4.30E-02	1.31E+05	7.83E+02	2.83E-04	1.16E-02	PHYSPROP	651.36	EPI	957.225	Approx. from Tcrit=1.5xTBoil
1	-	1.44E-02	3.50E+05	2.10E+03	3.36E-04	1.37E-02	PHYSPROP	688.75	EPI	987.225	Approx. from Tcrit=1.5xTBoil



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Chemical Type	D <sub>ia</sub> \ (cm <sup>2</sup> /s)	D <sub>iw</sub> \ (cm <sup>2</sup> /s)	D <sub>A</sub> \ (cm <sup>2</sup> /s)	Particulate Emission Factor (m <sup>3</sup> /kg)	Volatilization		Volatilization Factor Mass Limit (m <sup>3</sup> /kg)	Volatilization Factor Selected (m <sup>3</sup> /kg)	Ingestion SL TR=1E-05 (mg/kg)	Dermal SL TR=1E-05 (mg/kg)	Inhalation SL TR=1E-05 (mg/kg)
					Factor Unlimited Reservoir (m <sup>3</sup> /kg)	Factor					
PCB	2.41E-02	6.18E-06	5.03E-08	8.26E+08	4.30E+05		3.11E+06	3.11E+06	1.22E+01	3.09E+01	4.27E+03
PCB	2.37E-02	6.10E-06	1.87E-08	8.26E+08	7.04E+05		3.11E+06	3.11E+06	1.22E+01	3.09E+01	4.27E+03
PCB	2.20E-02	5.61E-06	7.70E-09	8.26E+08	1.10E+06		3.11E+06	3.11E+06	1.22E+01	3.09E+01	4.27E+03

# Site-specific

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Carcinogenic SL TR=1E-05 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
8.71E+00	-	-	-	-	-	-	-	-	8.71E+00 ca
8.71E+00	5.48E+00	1.65E+01	-	4.11E+00	5.84E+01	9.88E+01	-	3.67E+01	4.11E+00 nc
8.71E+00	-	-	-	-	-	-	-	-	8.71E+00 ca