Summary
Ecology's 2002 Proposal for Ranking and Prioritizing PBT Chemicals

1 Overview

The 2002 Response to Comments document included a two-step process[1] for ranking and prioritizing the chemicals appearing on the PBT Working List. The ranking/prioritization framework was designed to address two fundamental questions:

1. Ranking: Ecology proposed to rank the chemicals based on PBT Characteristics, Environmental Presence and Source Releases. The ranking was designed to provide a rough ordering of the seriousness of the hazards posed by these chemicals in Washington State (e.g. what are the biggest problems?); and
2. Prioritization: Ecology proposed to prioritize the chemicals based on the chemical rankings, opportunities for reductions, costs and other factors. The prioritization framework was designed to provide a rough guide for resource allocation decisions (e.g. how much more or less desirable is it to allocate resources to one chemical or the other?).

This summary was prepared after the September 29th PBT Advisory Committee meeting. There are four important underlying assumptions that shaped the decision to prepare this paper:

- The draft approach developed by Ecology in 2002 includes a number of the concepts discussed by the Advisory Committee at the September 29th meeting and, consequently, provides a mechanism for exploring those concepts in greater detail.
- The phased approach included in Ecology's 2002 proposal is consistent with the PBT Advisory Committee's suggestions for a phased approach that were discussed at the September 29th meeting.
- The draft approach has several shortcomings and does not address all of the factors identified by the Advisory Committee at the September 29th meeting. Consequently, it only provides a starting point for discussions – not an ending point.
- The draft approach illustrates some of the issues and challenges associated with developing a useful approach for ranking and prioritizing PBT chemicals.

This discussion paper is divided into five sections:

- **Section 2** provides a description of the ranking framework developed for PBT chemicals. The section describes the factors considered in the framework, sources of information and the initial test results where Ecology used readily available information to rank the 22 chemicals and chemical groups that appeared on the PBT Working List.[2]
- **Section 3** identifies several issues related to ranking discussed at the September 29th Advisory Committee meeting or identified in public comments received in 2001.

[1] The proposed ranking framework represents a modified version of the chemical ranking methodology (RTI, 1998) prepared as part of EPA's efforts to implement the Waste Minimization National Plan (EPA, 1995b).
[2] The PBT Working List included several registered pesticides that are excluded from consideration during the current rulemaking process. However, the results for those chemicals are included in order to provide additional perspective on how a ranking and prioritization system might work and issues associated with developing and implementing such a system. Ecology does not intend to apply future versions of a ranking/prioritization system to registered pesticides.

- **Section 4** summarizes the factors that Ecology proposed in 2002 to consider when prioritizing chemicals for action. In the 2002 Ecology proposal, action was defined broadly and included (1) chemical action plans, (2) information collection, and (3) other activities.
- **Section 5** identifies several issues related to prioritization that were identified in public comments received in 2001 and 2002 and/or discussed at the September 29th Advisory Committee meeting.

2 Ecology's 2002 Proposal for Ranking Chemicals and Chemical Groups

Range of Factors Considered in the Ranking Framework: Ecology proposed to rank the chemicals on the PBT Working List based on three factors:

- PBT characteristics;
- Environmental presence; and
- Source releases.

Approach for Assigning Ranking Scores Based on PBT Characteristics: Ecology used a scoring system for PBT characteristics that is similar to the methodology used by EPA to develop the original PBT scores. Assigning points to individual chemicals/chemical groups involved the following steps:

- Data Compilation: The available information for persistence (regional half-life), bioaccumulation potential (BAF/BCF values), non-cancer[3] human health effects (oral reference dose) and ecological toxicity for each of the 22 chemicals /chemical groups included on the PBT Working List was compiled and entered into a spreadsheet table;

- Assigning Points: Ecology used the data table to create four ranked-order lists (i.e. one for persistence, one for bioaccumulation, one for human toxicity (based on non-cancer health effects) and one for ecological toxicity). For example, the list based on BAF and BCF listed toxaphene first (BAF = 4×10^7), PCBs second (BAF = 2.7×10^6), mercury third (BAF = 6.8×10^6), and so on. The four-rank ordered lists were then used to assign points for persistence, bioaccumulation potential, human health toxicity and ecological toxicity. For each chemical or chemical group, scores of 1, 2 or 3 were assigned for each of the four factors using a 1:1:1 scoring distribution. For example, the chemicals with BAF or BCF values in the upper third of the distribution of BAF and BCF values were assigned 3 points for bioaccumulation, the chemicals with bioaccumulation factors in the middle third were assigned 2 points for bioaccumulation and the chemicals in the lower third were assigned 1 point for bioaccumulation.

- Human Health Scores: For each chemical or chemical group, a human health point total was calculated by summing the points for persistence,

[3] Ecology decided to assign points for human health toxicity based on non-cancer effects. Reference dose values (or surrogate measures) were available for all of the chemicals/chemical groups appearing on the PBT Working List. In contrast, cancer slope factors were available for only eight of the chemicals/chemical groups appearing on the list. It does not appear that consideration of cancer risks would significantly alter the modified PBT point totals because (1) many of the chemicals with published slope factors already were assigned 3 points for human health impacts based on consideration of non-cancer health effects and/or (2) ecological toxicity was a more sensitive indicator.

bioaccumulation and human health toxicity. As shown in Table 2, point totals for human health ranged from 3 to 9 points.

- Ecological Toxicity Scores: For each chemical or chemical group, an ecological toxicity point total was calculated by summing the points for persistence, bioaccumulation and ecological toxicity. As shown in Table 2, point totals for ecological toxicity ranged from 3 to 9 points.

Approach for Assigning Ranking Scores Based on Environmental Presence: Ecology proposed to consider five "measures" or "indicators" that a chemical was present in the Washington environment: (1) number of fish consumption advisories for each chemical; (2) relative frequency with which a chemical is found in fish tissue samples collected in Washington waters; (3) relative frequency that a chemical is detected in Washington sediments; (4) relative frequency with which a chemical is reported at National Priority List (NPL) sites in Washington; and (5) relative frequency with which a chemical is shown as responsible for placing waterbodies on the Water Quality 303(d) list (excluding listings based on sediment contamination). Assigning points to individual chemicals/chemical groups involved the following steps:

- Data Compilation: The available information on each of the five measures was compiled and entered into a spreadsheet. Table 3 summarizes the readily available information (as of 2001) on the various chemicals and chemical groups;

- Assigning Points: Ecology used the data table to create five-rank ordered lists that were then used to assign points for each factor using an approach similar to that used for bioaccumulation, persistence and toxicity. For each chemical or chemical group, scores of 1, 2 or 3 were assigned for each of the five factors using a 1:1:1 scoring distribution. For example, the chemicals that had detection frequencies at NPL sites in the upper third of the distribution of values were assigned 3 points for persistence, the chemicals with detection frequencies in the middle third of the distribution were assigned 2 points and the chemicals in the lower third of the distribution were assigned 1 point. Chemicals with no information were assigned zero points. Table 4 provides an example of this approach using information on 303(d) listings (as of early 2001).

- Environmental Presence Score: For each chemical or chemical group, a environmental presence point total was calculated by summing the points for each of the five factors. Point totals for environmental presence ranged from 5 to 15 points.

Approach for Assigning Ranking Scores Based on Source Releases: Ecology proposed to consider four measures or indicators that a chemical was being used or released by sources in Washington state: (1) Quantity of each chemical being discharged to water and land (as reported in the Toxics Release Inventory); (2) Number of sources discharging to water and land (as reported in the Toxics Release Inventory); (3) Quantity of each chemical released into the air (as reported in the National Toxics Inventory); and (4) Number of sources (as reported in the National Toxics Inventory). Assigning points to individual chemicals/chemical groups involved the following steps:

- Data Compilation: The available information on each of the four measures was compiled and entered into a spreadsheet format (e.g. quantity of chemicals released). Readily available data (as of early 2001) are summarized in Table 3;

- Assigning Points: Ecology used the data table to create rank ordered lists that were then used to assign points for each factor using an approach similar to that used for bioaccumulation, persistence and toxicity. For purposes of the test ranking, Ecology used information from only two of the data sources (TRI air releases and National Toxics Inventory emissions) because of the limited information available on most chemicals from other data sources. For each chemical or chemical group, scores of 1, 2 or 3 were assigned for each of the two factors using a 1:1:1 scoring distribution.

- Source Release Score: For each chemical or chemical group, a source release point total was calculated by summing the points for each of the two factors. Point totals for source releases ranged from 2 to 6 points.

Relative Weights Assigned to Each Factor: Ecology normalized the scores for the three factors (PBT characteristics, environmental presence and source releases) and then assigned weights to the various factors that are designed to reflect the relative importance of each factor. One of the main issues raised in public comments received in 2001 was the weight assigned to PBT characteristics. In preparing responses to those comments, Ecology evaluated the implications of using different weighting factors (33%, 50%, 67% and 100%) for PBT characteristics (See Table 5). Ecology decided to use the following weighting factors because such a proposal is consistent with the general relationship between risks, hazards and exposure underlying current approaches for evaluating hazardous substances (i.e. risk = hazard x exposure):

- PBT Characteristics (50%);
- Environmental Presence (25%); and
- Source Releases (25%).

Results of Chemical Ranking Test: When developing the proposed framework, Ecology tested the approach using information on the 22 chemicals/chemical groups included on the PBT Working List. The ranking results were used to place the chemicals/chemical groups into one of three categories[4] (i.e. high, mid-range and low) corresponding to their relative rankings. The test results are summarized in Table 1. As noted above, Table 5 provides a comparison of the relative rankings (high, mid-range and low) with different weights assigned to PBT characteristics.

[4] Ecology concluded that it would be inappropriate to make fine distinctions in the rankings for individual chemicals given the existence of large data gaps for some chemicals and some ranking factors. Consequently, Ecology elected to divide the chemicals into three groups that roughly correspond to how frequently the chemical has been found in Washington's environment and/or released by Washington sources. The seven chemicals or chemical groups included in high frequency group appear near the top of the ranked list independent of the relative weights assigned to PBT characteristics, environmental presence and source releases. In addition, mercury was generally the highest ranked chemical independent of the relative weights assigned to the three main ranking factors.

3 Issues Associated With Ranking PBT Chemicals

The PBT Advisory Committee identified several issues related to ranking and prioritizing PBT chemicals during the September 29th meeting. In addition, the public provided numerous comments on the proposed ranking/prioritization frameworks in 2001 and 2002. Issues include:

- Two-Step Process: Does it make sense to focus the ranking process on the problems (e.g. risks) hazard and the prioritization process on ability to deal with the problem?
- Range of Factors Used to Rank Chemicals: The Ecology proposal considers three factors when ranking chemicals (PBT characteristics, environmental presences, source releases).
  - Does the Ecology proposal include a reasonable range of factors? If no, what factors should be added or subtracted from the current process?
  - Does the Ecology proposal include a reasonable approach for characterizing PBT characteristics? What are the strengths and weaknesses of available data sources? What other sources of information might be used to characterize persistence, bioaccumulation and toxicity of individual chemicals or groups of chemicals?
  - Does the Ecology proposal include a reasonable approach for characterizing environmental presence? What are the strengths and weaknesses of available data sources? What other sources of information might be used to characterize environmental presence?
  - Does the draft approach include a reasonable approach for characterizing source releases? What are the strengths and shortcomings of available data sources? What other sources of information might be used to characterize source releases? How could Ecology better incorporate information on (1) chemical uses and (2) releases from sources other than industrial point sources?
  - Should Ecology attempt to develop quantitative measures for costs, technical feasibility, opportunities for reduction, etc. If so, how should that be done? If not, what qualitative measures might be useful? Does the Advisory Committee have suggestions for a transparent way to integrate the quantitative and qualitative measures?
- Relative Weights: The draft ranking approach assigns greater weight to PBT characteristics than environmental presence and source releases. Does the Advisory Committee believe the relative weights assigned to the three ranking factors are reasonable? If not, what alternatives should Ecology consider? The draft approach is silent on the relative weights assigned to the various prioritization factors. How should Ecology address this issue?
- Data Quality and Data Gaps: There are wide variations in the quantity and quality of data available for individual chemicals. The draft approach penalizes (or - depending on your perspective – rewards) chemicals that have more information on environmental concentrations and releases. How should Ecology handle data gaps? The committee discussed the possibility of separate ranking schemes for (1) information collection and (2) actions to reduce or phase-out chemical uses, releases etc. How would that look?

- Categories: The PBT Advisory Committee appeared to agree that it made sense to create ranking categories (high, medium, low) instead of individual rankings (e.g. 1 through X). Is the draft approach summarized in Sections 2 and 3 consistent with the category concept discussed at the September 29th meeting?

4 Ecology 2002 Proposal for Prioritizing Chemicals/Chemical Groups

Ecology proposed to consider several factors when establishing priorities for actions. However, the Department has not developed a detailed proposal for prioritization similar to that for ranking chemicals and chemical groups. Factors identified in the January 2001 and June 2002 proposals include:

- Chemical ranking results;
- Opportunities for reducing and phasing-out uses and releases;
- Costs and technical feasibility of options for reducing and phasing out releases;
- Priorities of individual Ecology programs

5 Issues Associated With Ranking and Prioritizing PBT Chemicals

The PBT Advisory Committee identified several issues related to prioritizing PBT chemicals during the September 29th meeting. In particular, the Committee recommended that Ecology consider costs, technical feasibility, opportunities for reductions, etc. As note above, the Department has not developed a detailed framework that incorporates these factors. Ecology is currently reviewing approaches for considering cost and technical feasibility as part of chemical ranking, prioritization and chemical action plan preparation. Issues include:

- Should Ecology attempt to develop quantitative or semi-quantitative measures for costs, technical feasibility, opportunities for reduction, etc.
- What level of analysis and information will be needed to develop such measures?
- What qualitative measures might be used to characterize costs, technical feasibility, opportunities for reduction, etc.?
- What approaches are available for integrating (in a transparent way)quantitative and qualitative measures?
- How should Ecology weight the different factors when setting priorities?

Table 1
PBT Chemical Ranking – Test Results
(Listed in Alphabetical Order by Category)

High	Mid-Range	Low
Cadmium	Aldrin/Dieldrin	Dicofol
Dioxins/Furans	DDT/DDE/DDD	Endosulfan (alpha/beta)
Hexachlorobenzene	Chlordane	Methoxychlor
Lead	Heptachlor epoxide	Pentabromo diphenyl ether
Mercury	Hexachlorobutadiene	Pendimethalin
Polynuclear Aromatic Hydrocarbon (PAH) Compounds	Hexachlorocyclohexane (Lindane)	1,2,4,5 Tetrachlorobenzene
Polychlorinated Biphenyls (PCBs)	Pentachlorobenzene / Pentachloronitrobenzene	Toxaphene
	Trifluralin	

Table 2
PBT Characteristic Scores Used in Ranking Model

Chemical	Regional Half Life (Hours)	Persistence Score	BAF/BCF Value	Basis	Ranking Score	Reference Dose (mg/kg/day)	Ranking Score	Basis	Ecological Toxicity Value (mg/L)	Ranking Score	Basis	Human Health Score	Ecological Score
DDT (total)	36422	3	29512	SRC	3	0.0005	2	IRIS	1E-06	3	FCV	8	9
Toxaphene	39526	3	4E 07	HWIR	3	0.0012	1	NAS	2E-07	3	FCV	7	9
Dioxins and Furans	10986	3	5754	SRC	2	1E-09	3	MRL	0.025	1	AQU	8	6
Heptachlor epoxide	2545	2	14454	SRC	3	1.3E-05	3	IRIS	4E-06	3	FCV	8	8
Chlordane	6682	2	21877	SRC	3	0.00006	3	IRIS	4E-05	3	FCV	8	8
Polychlorinated biphenyls	2578	2	2.9E 07	HWIR	3	0.00007	3	IRIS	1E-05	3	FCV	8	8
Mercury	M	3	6.8E 06	Hg Rpt	3	0.0003	2	IRIS	9E-04	2	FCV	8	8
Hexachlorobenzene	18757	3	18620	SRC	3	0.0008	2	IRIS	0.016	1	AQU	8	7
Lead	M	3	1700	AWQC	1	0.00006	3	Prop.	0.0025	1	FCV	7	5
Hexachlorobutadiene	4506	2	6918	SRC	2	0.0002	3	HEA	0.009	1	AQU	7	5
Lindane	2330	1	32600	HWIR	3	0.0003	2	IRIS	2E-06	3	FCV	6	7
PAHs	10000	2	5000	SRC	2	0.0005	2	IRIS	1E-06	3	FCV	6	7
Cadmium	M	3	4190	AWQC	1	0.0005	2	IRIS	0.001	2	FCV	6	6
Pentachlorobenzene	3656	2	8314	SRC	2	0.0008	2	IRIS	0.005	2	SCV	6	6
Pentabromo diphenyl ether	2724	2	8128	BCFWin	2	0.002	1	IRIS	6E-05	2	ECOSAR	5	6
Endosulfan (a and b)	1027	1	10964	SRC	2	0.006	1	IRIS	9E-06	3	FCV	4	6
Aldrin	2532	1	3715	SRC	1	3E-05	3	IRIS	3E-05	2	SCV	5	4
Dieldrin	1366	1	4466	SRC	1	3E-05	3	IRIS	6E-05	2	FCV	5	4
Methoxychlor	2192	1	8128	SRC	2	0.005	1	IRIS	3E-05	2	FCV	4	5
Pendimethalin	10825	3	1949	BCFWin	1	0.04	1	IRIS	0.016	1	AQU	5	5
1,2,4,5-Tetrachlorobenzene	2393	1	4073	SRC	1	0.0003	2	IRIS	0.001	1	AQU	4	3
Pentachloronitrobenzene	6654	2	1122	SRC	1	0.003	1	IRIS	0.001	1	AQU	4	4
Dicofol (kelthane)	1292	1	12302	SRC	2	0.004	1	HIARC	0.016	1	AQU	4	4
Trifluralin	1635	1	4168	SRC	1	0.0075	1	IRIS	0.001	1	AQU	3	3

Acronyms for Table 2
SRC = Syracuse Research Corporation ISIS BCF File. Values are reported in EPA (1998b).
HWIR = Hazardous Waste Identification Rule Technical Support Document (EPA, 1995).
Hg Rept = Mercury Study Report to Congress (EPA, 1997). Values are reported in EPA (1998b).
AWQC = Ambient Water Quality Criteria Documents (EPA, 1980, 1984, 1987). Values are reported in EPA (1998b).
BCFWin = Bioconcentration Factor Estimation Program. Predicted values are reported in EPA (1998b).
IRIS = Integrated Risk Information System. Values are published online (EPA 2001a).
NAS = National Academy of Sciences (Drinking Water and Health (NAS, 1977).
MRL = Minimal Risk Level published by the Agency for Toxic Substances and Disease Registry (ATSDR, 2001).
HEA = Health Effects Assessment Summary Table published by the Environmental Protection Agency.
Prop = Surrogate reference dose estimated by comparing MTCA Lead Cleanup Standard with cleanup levels for other chemicals and then interpolating the results of other chemicals to predict a reference dose that would result in a lead cleanup standard between 250 and 350 ppm.
HIARC = Hazard Identification Assessment Review Committee recommendations on Reference Doses to implement the Food Quality Protection Act.
FCV (I, S) = Final Chronic Value developed by EPA. Values reported in EPA (1998b).
AQU = Aquatic Information Retrieval system. Values reported in EPA (1998b).
SCV = Secondary Chronic Value developed by EPA. Values reported in EPA (1998b)
ECOSAR = ECOSAR Class program developed by Syracuse Research Corporation. Values reported in EPA (1998b).

Table 3: Data Summary

Chemical	CAS	Number of Fish Tissue Advisories (DOH)	SEDQUAL Tissue Detection Frequency	EIM Tissue Detection Frequency	WDFW Tissue Detection Frequency	SEDQUAL - Marine Sediment Detect. Freq.	EIM - Marine Sediment Detect. Freq.	EIM - Freshwater Sediment Detect. Freq.	ATSDR Hazdat - Detection Freq. (# of sites)	EIM Detection Freq (% all samples)	303(d) List - Detection Frequency	Toxic Release Inventory - Releases (lbs/year)	National Toxics Inventory (lbs/year)
Aldrin	309002	0	3.7	50.0	6.1	6.1	0.0	0.0	11	50.0	26	NA	NA
4-Bromophenyl phenyl ether	101553	0	NA	NA	0.0	0.4	4.9	0.0	0	15.0	0	NA	NA
Cadmium	7440439		68.7	41.7	NA	67.1	0.0	67.0	36	40.0	20	22	15675
Chlordane	57749	0	0.0	35.7	19.0	9.8	NA	9.5	4	53.8	2	NA	0.003
DDT (total)	50293/72548/72559	1	23.3	72.3	69.6	6.4	100.0	20.6	11	64.9	18	NA	NA
Dicofol (kelthane)	115322	0	NA	5.2	NA	NA	NA	0.0	1	14.3	0	NA	NA
Dieldrin	60571												
Dioxins and Furans (by CAS)	1746016	3	46.7	37.5	NA	38.2	NA	50.0	3	50.0	0	NA	0.0179
Endosulfan (a and b)	959988/33213659	0	0.7	4.8	0.1	0.0	0.0	0.0	2	14.3	6	NA	NA
Heptachlor epoxide	1024573		0.0	15.3	0.0	0.7	0.0	0.0	7	29.6	3	NA	NA
Hexachlorobenzene (HCB)	118741	0	16.7	55.6	4.2	7.8	4.4	3.8	2	38.3	3	NA	424.6
Hexachlorobutadiene	87683		1.8	NA	0.0	4.0	4.4	4.0	2	13.6	0	NA	2.1
Hexachlorocyclohexane (g) (Lindane)	58899		1.2	16.9	1.4	4.2	0.0	3.0	0	35.7	0	NA	NA
Lead	7439921	2	75.5	51.9	9.5	84.0	100.0	96.4	59	88.9	24	1018	284981
Mercury	7439976	4	85.2	100.0	99.9	71.7	92.7	88.4	24	86.7	41	1183	70456

Chemical	CAS		Number of Fish Tissue Advisories (DOH)	SEDQUAL Tissue Detection Frequency	EIM Tissue Detection Frequency	WDFW Tissue Detection Frequency		SEDQUAL - Marine Sediment Detect. Freq.	EIM - Marine Sediment Detect. Freq.	EIM - Freshwater Sediment Detect. Freq.		ATSDR Hazdat - Detection Freq. (# of sites)	EIM Detection Freq (% all samples)	303(d) List - Detection Frequency		Toxic Release Inventory - Releases (lbs/year)	National Toxics Inventory (lbs/year)
Methoxychlor	72435		0	4.1	4.0	0.0		0.5	#####	0.0		2	18.2	0		NA	NA
Pendamethalin																	
Pentabromo diphenyl ether																	
Pentachlorobenzene																	
Pentachloronitrobenzene	82688		0	NA	NA	NA		NA	NA	NA		0	NA	0		NA	0.0374
Polyaromatic hydrocarbons (PAHs)			2	0.0	35.7	0.0		55.9	0.0	78.4		19	85.7	21		50110	221938
Polychlorinated biphenyls	1336363		4	93.8	81.7	84.2		35.8	76.1	60.0		30	73.1	80		NA	24
1,2,4,5-Tetrachlorobenzene	95943		0	NA	NA	NA		4.0	NA	4.0		0	NA	0		NA	NA
Toxaphene	8001352		0	0.0	4.0	NA		0.0	NA	0.0		0	11.1	0		NA	NA
Trifluralin	1582098		0	NA	30.2	NA		NA	NA	0.0		0	18.2	0		NA	0.0005

Table 4: Example of Approach Used to Assign Scores for Environmental Presence Factors (Number of 303(d) Listings)				
CAS Number	**Chemical**	**303(d)**	**Score one-one-one**	**Score one-two-one**
1336363	Polychlorinated biphenyls	80	3	3
7439976	Mercury	41	3	3
309002/60571	Aldrin/Dieldrin	26	3	3
7439921	Lead	24	3	2
	Polyaromatic hydrocarbons	21	3	2
7440439	Cadmium	20	2	2
50293	DDT	18	2	2
	Endosulfan	6	2	2
1024573	Heptachlor epoxide	3	1	1
118741	Hexachlorobenzene	3	1	1
57749	Chlordane	2	1	1
95943	1,2,4,5-Tetrachlorobenzene		0	0
115322	Dicofol		0	0
1746016	Dioxins & Furans (by CAS)		0	0
58899	gamma-hexachlorocyclohexane (Lindane)		0	0
87683	Hexachlorobutadiene		0	0
72435	Methoxychlor		0	0
82688	Pentachloronitrobenzene		0	0
8001352	Toxaphene		0	0
	Pendimethalin		0	0
	Pentabromo diphenyl ether		0	0
	Pentachlorobenzene		0	0
1582098	Trifluralin		0	0

Table 5
Comparison of Relative Rankings With Different Weights For PBT Characteristics

33% Weight	50% Weight	67% Weight	100% Weight
Mercury	Mercury	Mercury	DDT (Total)
Lead	Lead	Lead	Toxaphene
PCBs	PCBs	PCBs	Dioxins/Furans
PAHs	Dioxins/Furans	PAHs	Heptachlor epoxide
Cadmium	PAHs	Dioxins/Furans	Chlordane
Dioxins/Furans	Cadmium	Hexachlorobenzene	PCBs
Hexachlorobenzene	Hexachlorobenzene	Cadmium	Mercury
			Hexachlorobenzene
Chlordane	DDT (total)	DDT (Total)	Lead
DDT (total)	Chlordane	Chlordane	Hexachlorobutadiene
Hexachlorobutadiene	Lindane	Heptachlor Epoxide	Lindane
Aldrin/Dieldrin	Hexachlorobutadiene	Toxaphene	PAHs
Heptachlor epoxide	Toxaphene	Hexachlorobutadiene	Cadmium
Toxaphene	Heptachlor epoxide	Lindane	Pentachlorobenzene/PCNB
Pentachlorobenzene/PCNB	Aldrin/Dieldrin	Aldrin/Dieldrin	Pentabromo diphenyl ether
Lindane	Pentachlorobenzene/PCNB	Pentachlorobenzene/PCNB	
Endosulfan	Pentabromo diphenyl ether	Endosulfan	Endosulfan
Trifluralin	Endosulfan	Pentabromo diphenyl ether	Aldrin/Dieldrin
Pentabromo diphenyl ether	Trifluralin	Methoxychlor	Methoxychlor
Methoxychlor	Methoxychlor	Pendimethalin	Pendimethalin
Dicofol	Pendimethalin	Trifluralin	1,2,4,5 Tetrachlorobenzene
Pendimethalin	1,2,4,5 Tetrachlorobenzene	Dicofol	Dicofol
1,2,4,5 Tetrachlorobenzene	Dicofol	1,2,4,5 Tetrachlorobenzene	Trifluralin