APPENDIX D. Risk Quotient (RQ) Methods and Levels of Concern (LOC)

The Risk Quotient Method is the means used by the Office of Pesticide Programs (OPP), Environmental Fate and Effects Division (EFED) integrates the results of exposure and ecotoxicity data. For this method, Risk Quotients (RQs) are calculated by dividing exposure estimates by the acute and chronic ecotoxicity values (*i.e.*, RQ = EXPOSURE/TOXICITY). These RQs are then compared to OPP's levels of concern (LOCs) (see **Table D.1**). These LOCs are criteria used by OPP to indicate potential risk to non-target organisms and the need to consider regulatory action. EFED has defined LOCs for acute risk, potential restricted use classification, and for endangered species.

The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on non-target organisms. LOCs currently address the following risk presumption categories:

(1) **Acute** - there is a potential for acute risk; regulatory action may be warranted in addition to restricted use classification;

(2) **Acute restricted use** - the potential for acute risk is high, but this may be mitigated through restricted use classification;

(3) **Acute endangered species** – there is a potential for acute risk to endangered species, regulatory action may be warranted; and

(4) **Chronic risk** – there is a potential for chronic risk, regulatory action may be warranted.

Table D.1. Level of concern (LOC) by risk presumption category (EPA, 2004).

Risk Presumption	RQ	LOC
Mammals and Birds		
Acute Risk[a]	EEC[b]/LC_{50} or LD_{50}/sqft[c] or LD_{50}/day[d]	0.5
Acute Restricted Use[e]	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day (or LD_{50} <50 mg/kg)	0.2
Acute Listed Species[f]	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day	0.1
Chronic Risk	EEC/NOEC	1
Terrestrial Invertebrates		
Interim Acute Listed Species[i]	EEC[j]/ LD_{50}[k]	0.05
Aquatic Animals		
Acute Risk	EEC[g]/LC_{50} or EC_{50}	0.5
Acute Restricted Use	EEC/LC_{50} or EC_{50}	0.1
Acute Listed Species	EEC/LC_{50} or EC_{50}	0.05
Chronic Risk	EEC/NOEC	1

Table D.1. Level of concern (LOC) by risk presumption category (EPA, 2004).		
Risk Presumption	**RQ**	**LOC**
Terrestrial Plants and Terrestrial Plants in Semi-Aquatic Areas Plants		
Acute Risk	EEC/EC_{25}	1
Acute Listed Species	EEC/EC_{05} or NOEC	1
Aquatic Plants		
Acute Risk	EEC^{h}/EC_{50}	1
Acute Listed Species	EEC^{g}/EC_{05} or NOEC	1

[a]Potential for acute toxicity for receptor species if RQ > LOC (EPA, 2004).
[b]Estimated environmental concentration (ppm) on avian/mammalian food items.
[c]mg/ft^2
[d]mg of toxicant consumed per day
[e]Potential for acute toxicity for receptor species, even considering restricted use classification, if RQ > LOC (EPA, 2004).
[f]Potential for acute toxicity for listed species of receptor species if RQ > LOC (EPA, 2004).
[g]EEC = ppb or ppm in water
[h]EEC = lbs a.i./A
[i] Potential for acute toxicity for listed species of receptor species if RQ > LOC (EPA, 2007).
[j] Estimated environmental concentration (ppm) calculated by T-REX for small or large insects.
[k] The toxicity value for terrestrial invertebrates is typically calculated by multiplying the lowest available acute contact LD_{50} for honey bees by 1 bee/0.128g (which is based on the weight of an adult honey bee) to convert units to µg a.i./g of bee.

Literature Cited

U.S. EPA. 2004. U.S. Environmental Protection Agency. Overview of the Ecological Risk Assessment Process in the Office of Pesticide Programs, U.S. Environmental Protection Agency: Endangered and Threatened Species Effects Determinations. Office of Prevention, Pesticide, and Toxic Substances. January 23.

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