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# ENVIRONMENT & WATER

PARTNERING TO PROVIDE SUSTAINABLE SOLUTIONS

RPIC FEDERAL CONTAMINATED SITES REGIONAL WORKSHOP  
“INCORPORATING ATLANTIC RBCA VERSION 3  
INTO FEDERAL CONTAMINATED SITES DECISION MAKING”

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HALIFAX, NOVA SCOTIA



# **INCORPORATING ATLANTIC RBCA VERSION 3 INTO FEDERAL CONTAMINATED SITES DECISION MAKING**

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# Atlantic RBCA Tool Kit and adapting it for federal sites

## Atlantic RBCA Spreadsheet Tool Kit

- **Committee: Industry + Consultants + Public Sector (NS, NB, NL, PE (for Version 1) + (HC and) EC after 2000)**
- **Locally adapted, broadly used technical tool from US**
- **First to use TPH fractions as a group (up to C32)**
- **Used cumulative target risk ( $10E-5$ ) + hazard (1.0) goals**
- **Easy to use spreadsheet for 1 compound – 1 exposure route combination; and combinations of many compounds – many exposure routes that are active at the same time**

# Atlantic RBCA Tool Kit and adapting it for federal sites

Some federal documents that are used on federal sites

- Health Canada: PQRA Preliminary Quantitative Risk Assessment (1 compound at a time; no mixtures - TPH)
- Health Canada: DQRA Detailed Quantitative Risk Assessment for Chemical
- CCME: Canada Wide Standards for Petroleum Hydrocarbons (TPH Fractions in soil only)
- CCME guidelines for individual PAH's, VOC's, metals
- Canadian Drinking Water Guidelines / Marine Sediments

# Atlantic RBCA Tool Kit and adapting it - HC PQRA

## Adapting Atlantic RBCA for a PQRA application

- Atlantic RBCA default parameters for site characteristics and receptors are harmonized with CCME CWS PHC
- Atlantic RBCA default parameters can be changed to be consistent with other documents and highlighted (e.g. Site Attenuation Factor)
- Equations used for calculating risks and hazards in PQRA are also in Atlantic RBCA (in different forms)
- Atlantic RBCA can be throttled to calculate 1 compound – 1 exposure route evaluations used in PQRA, while also adjusting to apply a Target Hazard Quotient of 0.2

# Atlantic RBCA Tool Kit and adapting it - HC DQRA

## Adapting Atlantic RBCA for a DQRA application

- DQRA scope is broader (e.g. incl. full probabilistic option) than RBCA spreadsheet (some prob. options)
- Atlantic RBCA default parameters are similar to DQRA examples, and can be changed for consistency
- Equations used for calculating risks and hazards in DQRA are also in Atlantic RBCA (in different forms)
- DQRA (Section 6.3.3 Exposure to Mixtures) uses a cumulative calculation (similarly acting compounds and exposure routes) and target risk or hazard (e.g. 1.0)

# Atlantic RBCA Tool Kit and adapting it - HC DQRA

Indoor Inhalation of Contaminant Vapours:

$$\text{Dose (mg/kg/d)} = \frac{C_{ia} \times IRA \times RA_{Inh} \times ET}{BW}$$

Dermal Contact with Contaminated Soil:

$$\text{Dose (mg/kg/d)} = \frac{CS \times \sum (SA_i \times SL_i) \times RA_{Skin} \times EF \times ET}{BW}$$

Inadvertent Ingestion of Contaminated Soil:

$$\text{Dose (mg/kg/d)} = \frac{C_s \times IR_s \times RA_{GIT} \times ET}{BW}$$

Equation examples from DQRA; and also in Atlantic RBCA

# Atlantic RBCA Tool Kit and adapting – CCME CWS PHC

Adapting Atlantic RBCA for a CCME CWS PHC application

- Atlantic RBCA default parameters for site characteristics and receptors are harmonized with CCME CWS PHC
- Equations used for calculating risks and hazards in CCME CWS PHC are also in Atlantic RBCA
- CCME CWS PHC is for distinct groups of TPH fractions bundled as F1, F2, and F3. F4 is hot extractable >C32-50
- Atlantic RBCA can be throttled to calculate for a portion of applicable TPH fractions (e.g. F3 mixture only, from soil only, while also adjusting to apply a Target Hazard Quotient of 0.5) . . . other similarly acting compounds?



# Atlantic RBCA Tool Kit and adapting it – PAH, VOC, etc.

## Adapting Atlantic RBCA for other individual compounds

- Atlantic RBCA default parameters for site characteristics and receptors are harmonized with CCME CWS PHC and can be adjusted for other documents (CEPA, CCME, etc.)
- Atlantic RBCA compound database for PAH, VOC and other compounds has physical, chemical, and toxicological parameter values that can be adjusted.
- Atlantic RBCA can calculate a cumulative hazard for concurrently and similarly acting compounds and mixes vs the same body organ (e.g. TEX + TPH fractions + Naphthalene PAH), over many exposure routes

# Atlantic RBCA Tool Kit and adapting it – Drinking Water

## Adapting Atlantic RBCA for Drinking Water Guidelines

- Atlantic RBCA default parameters for site characteristics and receptors are harmonized with CCME CWS PHC and can optionally be used with some Canadian Drinking Water Guidelines aesthetic and health goals.
- Atlantic RBCA default parameters and equations, when the drinking water guideline setting is active, is consistent for health (B) and aesthetic (TEX) goals
- Atlantic RBCA Target Risk can be adjusted to  $10E-06$  for a single compound – single exposure route (e.g. ingestion of dissolved benzene in drinking water)

# Atlantic RBCA Tool Kit and adapting it – Limitations

Atlantic RBCA is not all things to all circumstances

- Spreadsheet does not account for ecological receptors
- Spreadsheet does not account for non-human health based reasons for goals used in federal documents
- Background concentration assumptions are included for some compounds and mixtures, but not many
- Regulatory Policy in a particular jurisdiction
- Add the F4 Fraction to calculations where applicable
- Add an independent Peer Review, similar to the Health Canada Part III Peer Review document

# Atlantic RBCA Tool Kit and adapting it – Good News

Atlantic RBCA can be adjusted for some applications:

- Health Canada: PQRA Preliminary Quantitative Risk Assessment (1 compound at a time; no mixtures - TPH)
- Health Canada: DQRA Detailed Quantitative Risk Assessment for Chemical
- CCME: Canada Wide Standards for Petroleum Hydrocarbons (TPH Fractions in soil only)
- CCME guidelines for individual PAH's, VOC's, metals
- Canadian Drinking Water Guidelines

# Multiple compound, Matrix, & Exposure Route Scenario

Scenario - For a BTEX+TPH+PAH+VOC+metals site:

- HC PQRA (or DQRA) for BTEX compounds in soil (0.2 THQ for each compound exposure route combination)
- CCME CWS PHC's for TPH Fractions in soil (0.5 THQ or others for each fraction exposure route combination)
- CCME guidelines for PAH's, VOC's and metals (1.0 THQ for each compound exposure route combination?)
- Canadian Drinking Water Guidelines (no TPH Fractions)
- For cumulative sum of compounds, mixes, exposure routes, in soil & water: What might be the Total Hazard?

# Multiple compound, Matrix, & Exposure Route Scenario

Scenario - For a BTEX+TPH+PAH+VOC+metals site:

- Option 1 – Evaluate and calculate each compound – exposure route individually to the indicated THQ or TR (might have concentrations where sum of THQ's > 1.0)
- Option 2 – Evaluate and calculate for the perceived major or dominant compound – exposure route combination (might have uncounted hazards from other similar combinations whose sum of THQ's would > 1.0)
- Option 3 – Be consistent with DQRA, and add incremental Hazards or Risks from concurrent and similarly acting compound – exp route combinations

# Multiple compound, Matrix, & Exposure Route Scenario

Atlantic RBCA Option for BTEX+TPH+PAH+VOC+metals:

- Achieve similar intended protection to human health (not to exceed  $10E-05$  risk, 1.0 hazard, and applicable BTEX drinking water goals) with less opportunity to allow circumstances where cumulative THQ  $> 1.0$
- Consider more compound exposure route combinations (e.g. TPH Fractions in water)
- Achieve goals in a more resource efficient way (less opportunity for total Hazard to be well less than  $< 1.0$ )
- Need to also account for other items (e.g. Peer Review?)

# Caution and Opportunities

## Opportunity for Atlantic RBCA 3:

- Option to calculate similar PQRA, CWS and other values
- Option to more easily account for multiple compound – exposure route combinations, where applicable
- Option to support more resource efficient decision making
- Option is available as consultants on Standing Offers typically have capability of providing these services

## Caution for Atlantic RBCA 3:

- It can be inadvertently used so that similarly acting compounds and exposure routes exceed the target risk and hazard goals.





# QUESTIONS

**Thank you RPIC for this opportunity.**

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**WE CARE** embodies SNC-Lavalin's key corporate values and beliefs. It is the cornerstone of everything we do as a company. **Health and safety, employees, the environment, communities and quality:** these values all influence the decisions we make every day. And importantly, they guide us in how we serve our clients and therefore affect how we are perceived by our external partners. **WE CARE** is integral to the way we perform on a daily basis. It is both a responsibility and a source of satisfaction and pride by providing such important standards to all we do.



**WE CARE** about the health and safety of our employees, of those who work under our care, and of the people our projects serve.



**WE CARE** about our employees, their personal growth, career development and general well-being.



**WE CARE** about the communities where we live and work and their sustainable development, and we commit to fulfilling our responsibilities as a global citizen.



**WE CARE** about the environment and about conducting our business in an environmentally responsible manner.



**WE CARE** about the quality of our work.