

Significant Figures, etc...

Paul W. Locke
MassDEP BWSC
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ALL I REALLY
NEED TO KNOW
I LEARNED IN
10TH GRADE
CHEMISTRY

32nd
ANNIVERSARY
EDITION

RECONSIDERED,
REVISED & EXPANDED,
WITH TWENTY-FIVE
NEW ESSAYS

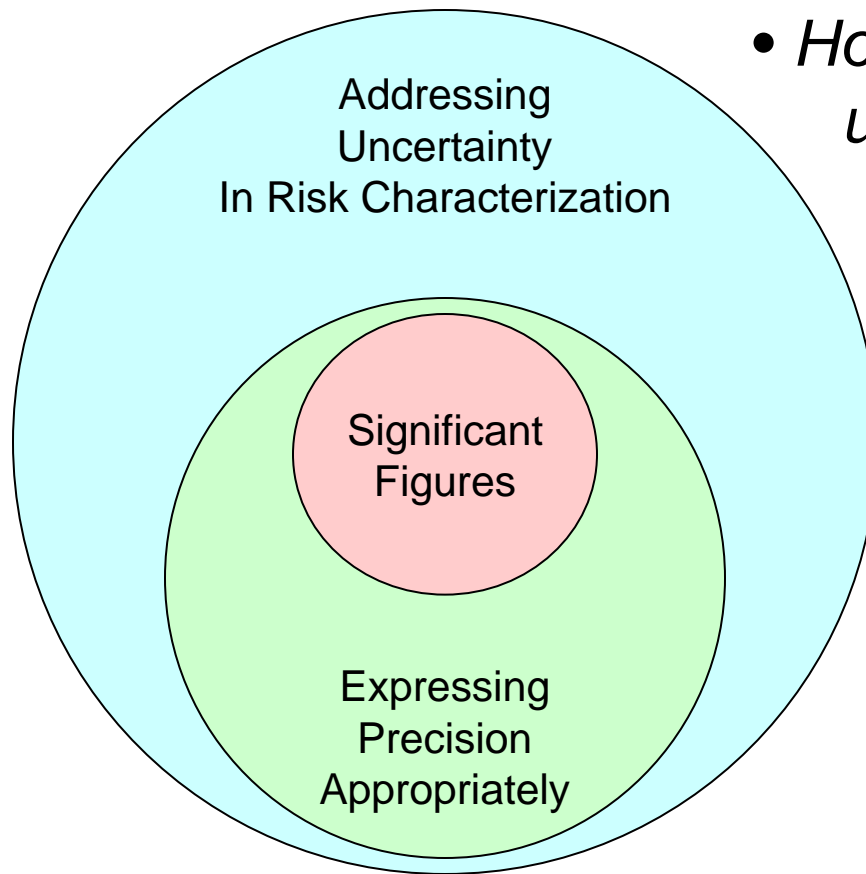
MR. SNOW



Massachusetts Department
of
ENVIRONMENTAL PROTECTION



What is the Right Question?



- *How to appropriately address the uncertainty in site- and risk-assessments?*
- *How many significant figures are appropriate?*
- *How to appropriately present precision?*



MCP Issues

- (some) Method 1 Standards were rounded to 1 digit
- NSR defined to be no exposures greater than standard or risk limit
- 310 CMR 40.0926(3) requires conservative estimate of EPC



Rounding & Significant Figures

there is no one single approach

- Variety of rounding rules
- Variety of method to determine significant figures
- ASTM E29-06b identifies *Absolute Method* and *Rounding Method...* stresses that the applicable Method be specified in the criteria – cannot be inferred from criteria



Recommended Approach

- Short-term:
 - **Presumptive Certainty:** Use 2 or more digits
Otherwise
 - **Method 3:** Risk estimates should be presented as 1 significant figure (*but risk assessor should confirm*)
 - **Method 1 or 2:** if 1 significant figure, round up to provide conservative estimate



Recommended Approach

- Long-term: MassDEP should consider changes to MCP
 - Specify *Absolute* or *Rounding Method* in regulation for clarity
 - Eliminate non-conservative bias in the “*greater than*” language
 - Reassess rounding used in Method 1 Standards

