

Global RBCA

Setting Safe Levels of Chemicals in Soil and Water

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What's Safe? How Clean is Clean?

- Aiming for Zero... but should consider
 - natural and anthropogenic background levels
 - receptors at site (residential/commercial)
 - exposure pattern at site (frequency/duration)
 - spatial extent (surface/subsurface)
 - practicability of remediation
 - costs
- Must consider human health and the environment
- Florida legislation sets acceptable risk levels for carcinogens as causing no more than a one-in-one-million increased risk for developing cancer in a lifetime (1×10^{-6})



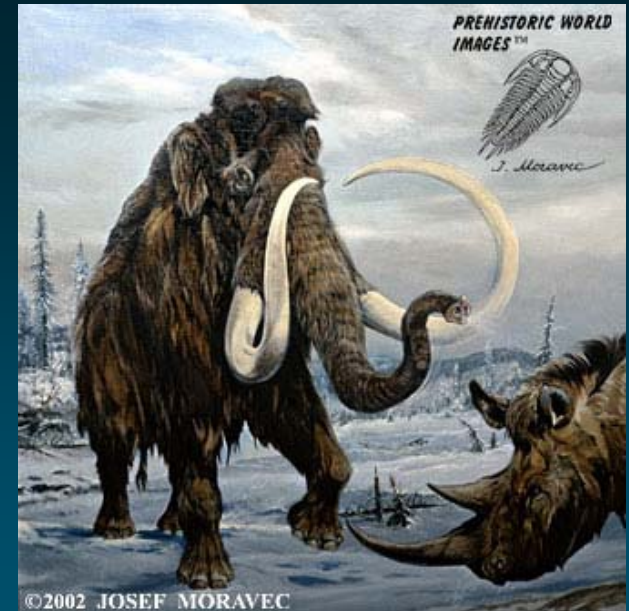
What's a 1×10^{-6} Risk?

- Risk of drowning in tub this year = 1×10^{-5}
- Risk of resident being struck by crashing airplane = 4×10^{-6}
- Risk of mother dying in single childbirth = 6.6×10^{-5}
- Risk of being struck by lightning = 1.1×10^{-4}
- Risk of death by home accident = 1.1×10^{-4}
- Extra risk of death from ingestion of 1 beer a day for 1 year = 2×10^{-5}
- Extra risk of death from living 1 year at elevation of 5000 feet (radiation) = 1×10^{-5}
- Extra risk of death from eating 1 peanut butter sandwich per day for a year = 1×10^{-5}
- Risk of death from natural radiation = 1×10^{-2}
- Risk of death from smoking 1 pack a day for 30 years = 1.08×10^{-1}
- Risk of death from 50 years of driving = 2×10^{-4}
- Risk of lung cancer from asbestos in schools = 5×10^{-6}
- Risk of being selected out of world population = 1.8×10^{-10}
- Risk of death from cancer in lifetime = 2.5×10^{-1}



Source: John Paling – “Up to Your Armpits in Alligators?”

In The Days Before Global RBCA...



- FDEP developed Risk-Based Corrective Action (RBCA – “Rebecca”) Rules to address cleanup at program sites
- Cleanup Target Levels (CTLs) developed that incorporate exposure patterns and land uses as convenient lookup numbers to aid in determining if a site had “negligible” risk
- Rules address sampling requirements, site-specific assessments and methods to determine site-wide exposure concentrations

In The Days Before Global RBCA...



- Non-program sites – clean to zero or background
- In theory –
 - “Except for sites addressed under these chapters, the Chapter 62-777, F.A.C. Cleanup Target Levels (CTLs) may not be imposed by the agency as rule, standards, or to deny permits.”
- In practice –
 - CTLs awfully convenient.....but
 - Couldn't use flexibilities afforded program sites
 - No requirement to notify off-site affected parties

Ch. 2003-173, Laws of Florida (L.F.)

- Legislative authority for “Global” RBCA in Florida
- Prior to 2003, FDEP only had legislative authority to use RBCA at sites in three state-funded programs
 - Petroleum Cleanup (Chapter 62-770)
 - Dry Cleaning (Chapter 62-782)
 - Brownfields (Chapter 62-785)
- Extends Florida’s RBCA process that has historically been applied at program sites to all contaminated sites resulting from a discharge of pollutants or hazardous substances
- Chapter 62-780, F.A.C. adopted in April 2005

Global Risk-Based Corrective Action

Chapter 62-780, F.A.C.

- Phased process that is iterative and that tailors site rehabilitation tasks and cleanup criteria to site-specific conditions and risks
- Goal is protection of human health and the environment
 - Consistent and technically defensible
 - Appropriate and resource-efficient remedies are selected
 - Optimal allocation of limited resources
 - Practical and resource-efficient approach
 - Allow corrective action and redevelopment to proceed together

Cleanup Target Levels (CTLs)

- Risk = (Concentration x Exposure) x Toxicity
- CTLs Combine generic exposure assumptions with toxicity values
- Generic, predetermined concentrations that would be acceptable for given risk criteria (Rule specifies cancer risk level of 1×10^{-6} and HQ of 1.0)
- Essentially a backwards risk assessment
 - With known risk target and exposure factors, can solve for the relevant concentration
 - Receptor & environmental media characteristics, and physicochemical properties chosen conservatively

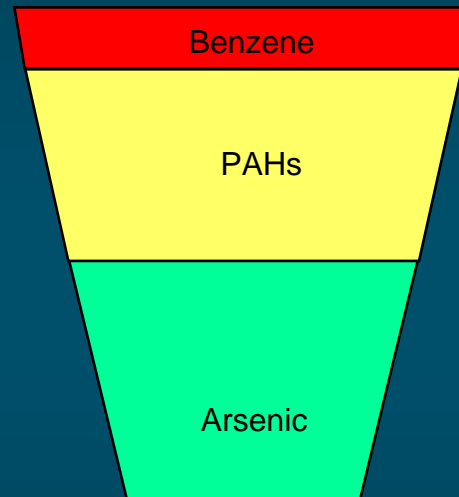
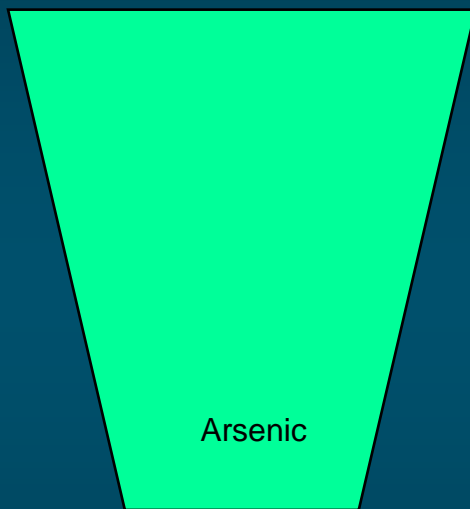
Risk-Based Terminology

- Concentration \neq Risk because...
 - Risk depends upon dose (amount of exposure)
 - Soil exposure highly dependent on conditions
- 1×10^{-6} lifetime excess cancer risk
 - Intake equates to hypothetical additional cancer probability of 1 in 1,000,000 over a lifetime
- Hazard Index of 1
 - Intake could equal dose derived to be safe for sensitive individual (i.e., reference dose)

Global RBCA Terminology

- Additive Effect – The default assumption
 - “A scientific principle that the toxicity that occurs as a result of exposure is the sum of the toxicities of the individual chemicals to which an individual is exposed.”
- Apportionment
 - “The adjustment of the CTLs such that for non-carcinogenic contaminants that affect the same target organ(s), the hazard index (sum of hazard quotients) is 1 or less, and for carcinogens, the cumulative lifetime excess cancer risk level is 1×10^{-6} .”

Apportionment and the "Risk Cup"

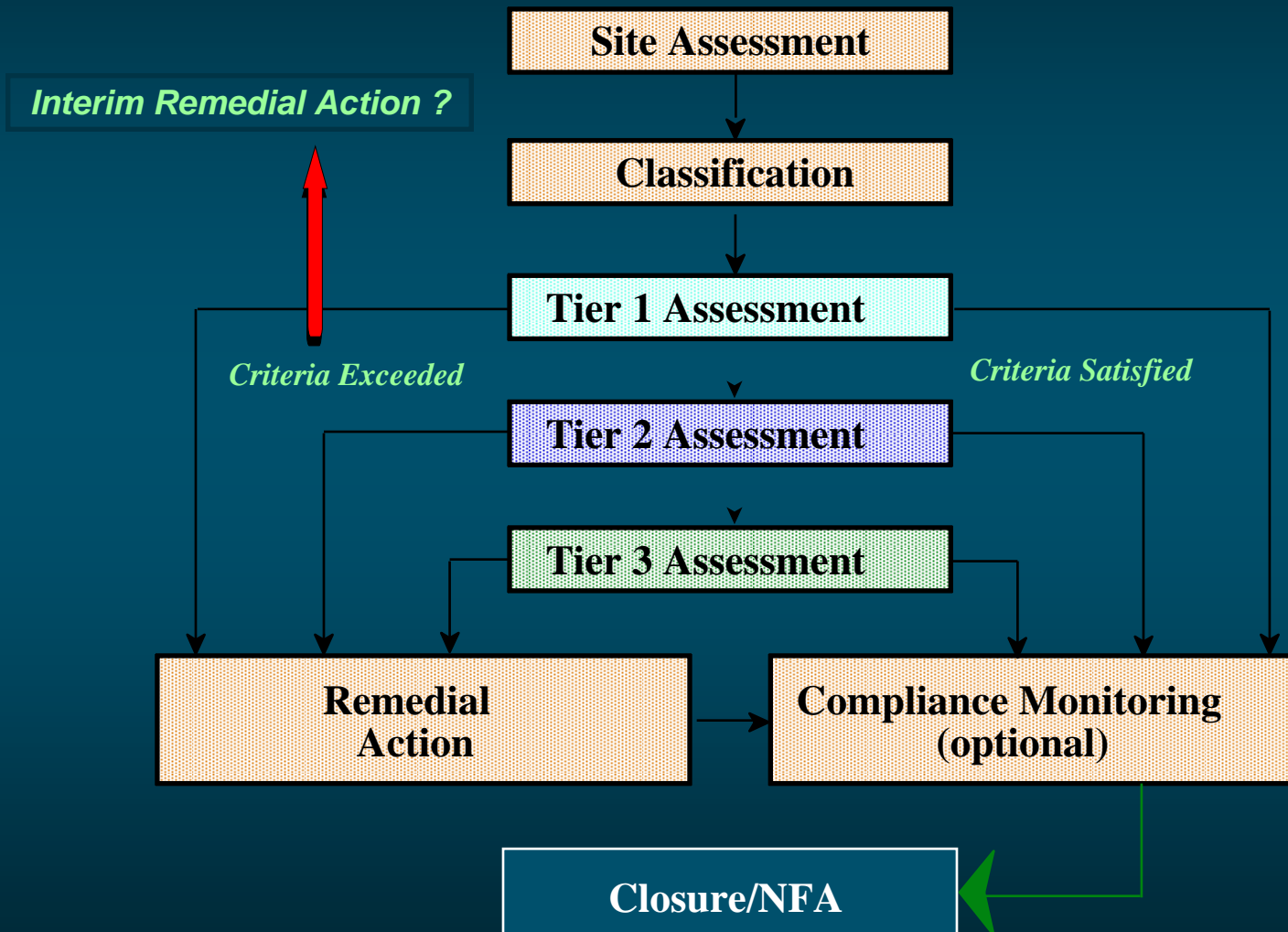


← 1×10^{-6} Risk Level
= One Full Cup

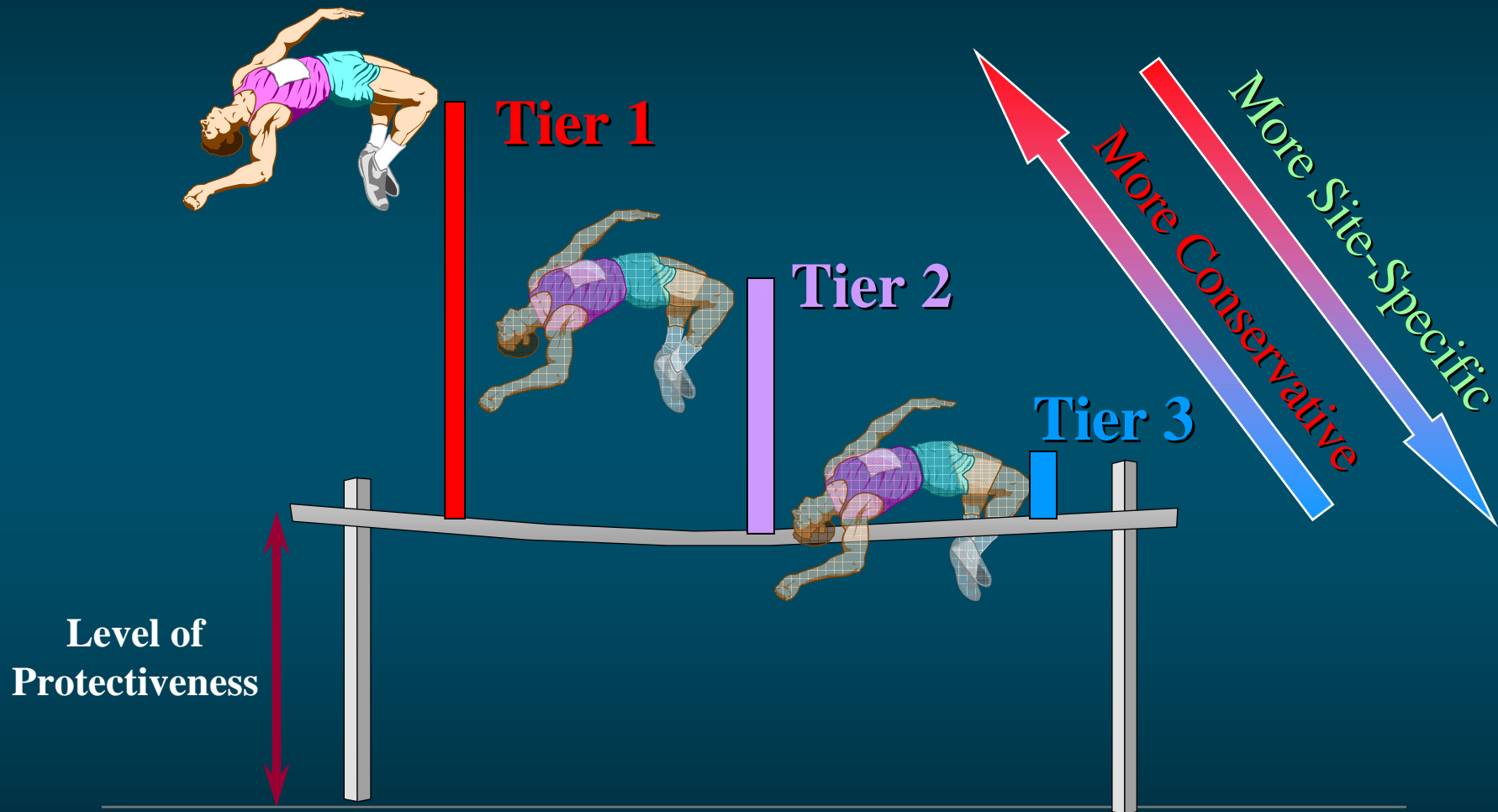
Concentrations adjusted so that the combined risk from all chemicals are less than the acceptable risk level

What about background?

RBCA Flowchart



Why 3 Tiers (Levels) in RBCA?



Every tier achieves the same level of protectiveness

Global RBCA – Applicability

- Apply prospectively and retroactively to sites where legal responsibility for site cleanup exists pursuant to other provisions of Chapters 376 or 403, F.S.
- Does not create or establish any new liability for site cleanup
- The RBCA process is to apply to:
 - voluntary site cleanup
 - site cleanup conducted pursuant to FDEP enforcement actions
 - FDEP state-managed site cleanup

Exceptions to Retroactive Application

- Sites where cleanup target levels have been accepted by FDEP in an approved technical document, current permit, or other written agreement
 - Note: Responsible parties can elect to have the RBCA process apply including the cleanup target levels in lieu of cleanup target levels/ processes existing in an approved technical document, current permit, or other written agreement
- Sites that have received a “No Further Action” Order or a Site Rehabilitation Completion Order from FDEP

RBCA – Flexibility & Responsibility

■ Flexibilities

- Institutional Controls (IC)
 - Restrict future uses to match CTLs (default or alternate)
- Engineering Controls (EC)
 - Cover the soil / Capture the plume
- Alternate Cleanup Target Levels (ACTLs)
- Monitored Natural Attenuation (MNA)
- Temporary Points of Compliance (TPOC)

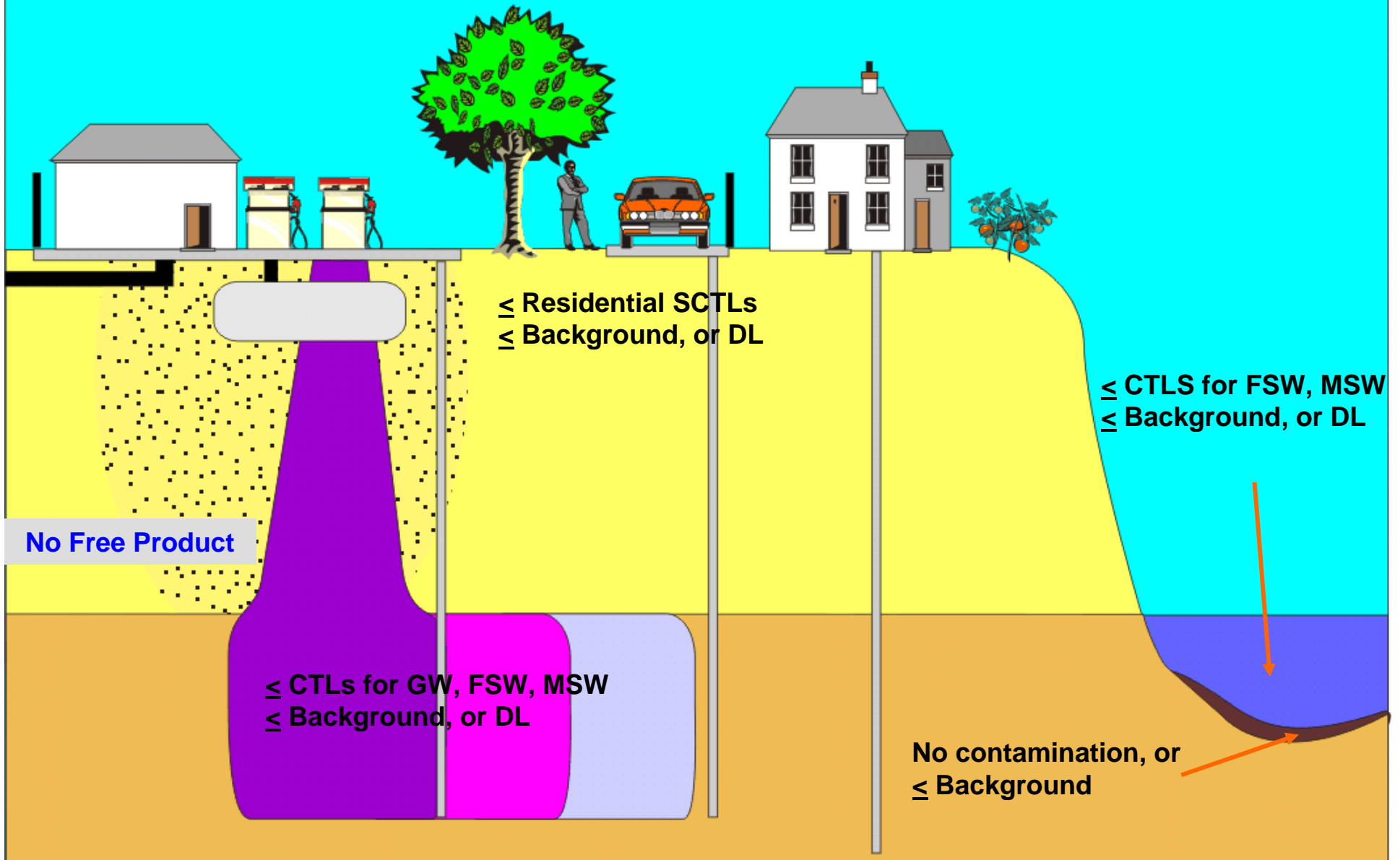
■ Responsibilities

- Maintenance of Long-term Controls
- Notification Requirements
- Long-term Monitoring

Global RBCA Risk Management Options

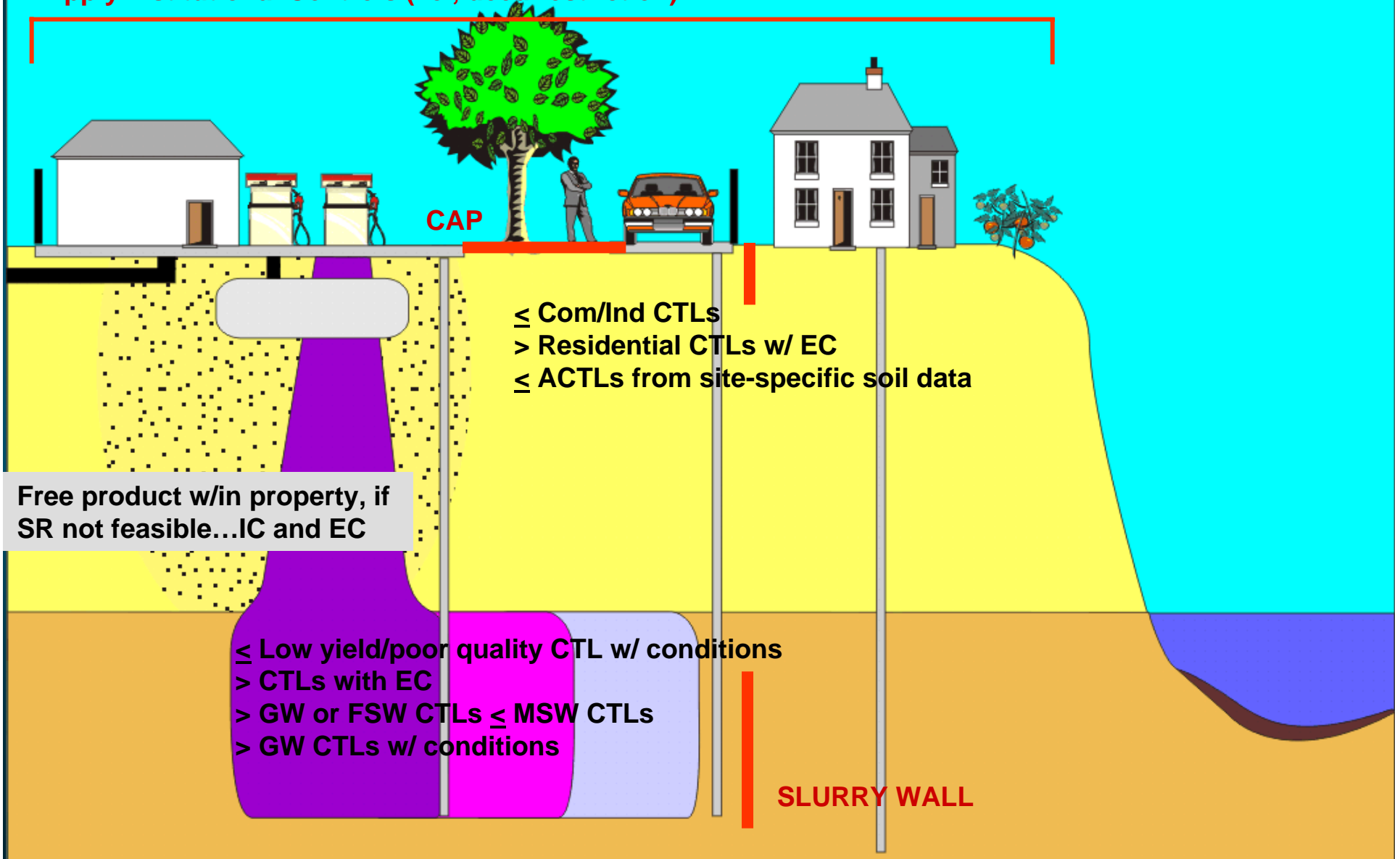
- Level I (unrestricted)
 - Without controls (i.e., residential)
- Level II (industrial)
 - With controls
- Level III (site-specific risk assessment)
 - With controls and alternative CTLs established

No Further Action w/o Controls (LI)



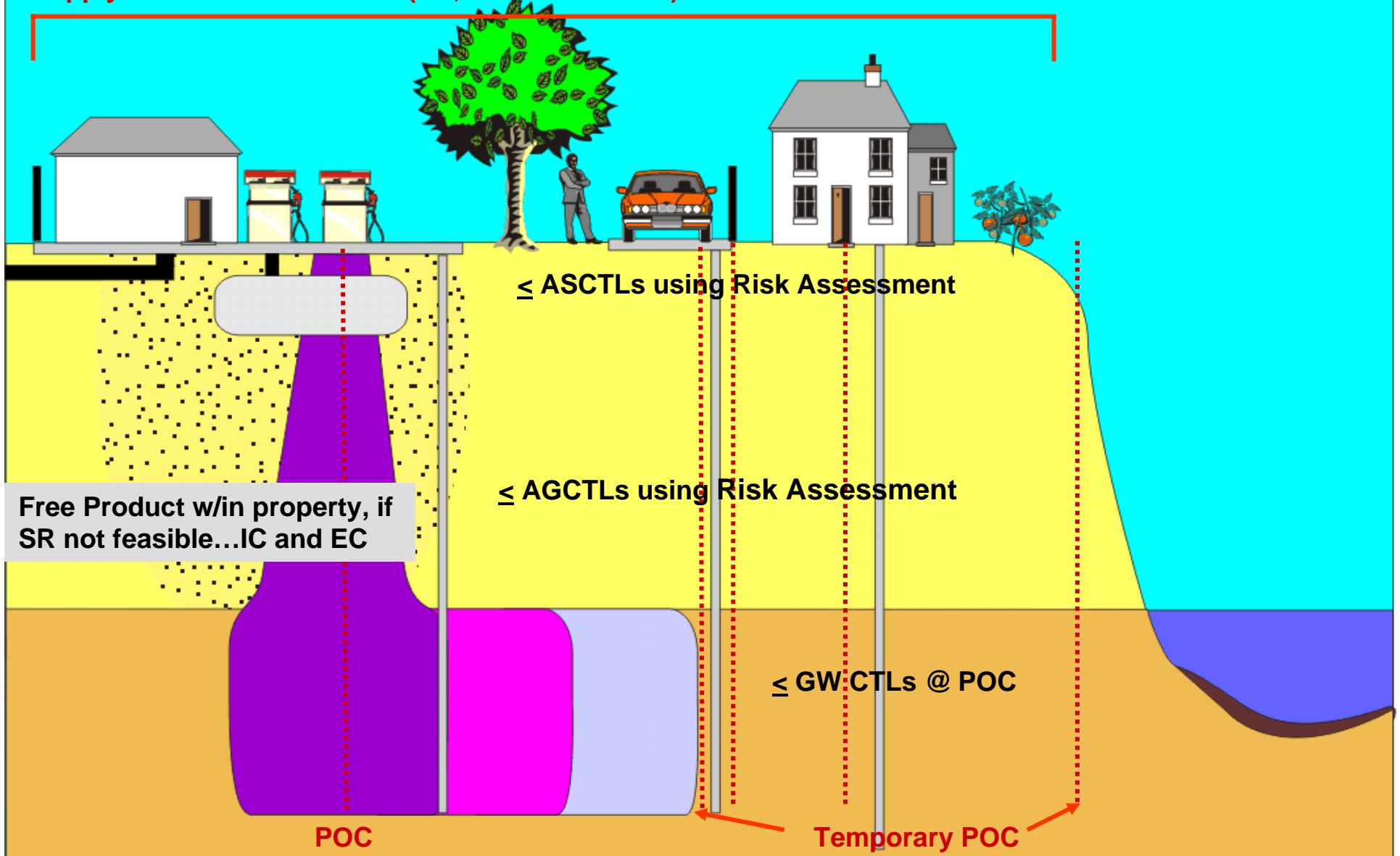
No Further Action with Controls (LII)

Apply Institutional Controls (i.e., deed restriction)



No Further Action with Controls (LIII)

Apply Institutional Controls (i.e., deed restriction)



New Soil Standards?

- Statute clearly states that FDEP cannot make new “standards”
- Implementation memo (J. Ruddell, 9/24/03):
 - Global RBCA **DOES NOT** create soil quality standards
- As passed, FDEP can only force RBCA where there is a cleanup responsibility under existing authority
- The intent is for FDEP to not become the ‘Soil Cops’



Cumulative Risk and Apportionment

- Cumulative (additive) risk is not new
 - Included in Brownfields and Dry Cleaning legislation and rules
 - Loosely implemented and enforced by the Department
 - Under Global RBCA strictly applied - In practice we find it incompatible with rigid 1×10^{-6} risk limit
- Under Risk Management Options I and II
 - Compare max detected concentration to default SCTLs
 - If max < SCTL, life is good
 - If not...Must remediate every exceedence
 - If PRP wants to calculate representative exposure concentration (i.e., 95% UCL), must apportion SCTLs for all detected compounds
- Has resulted in SCTLs used as “de facto” Soil Standards at many sites

Global RBCA Issues

- What about the Environment? Ecological assessment lags behind human health guidance development – Ecological concerns often given inconsistent consideration at sites
- Are background radiation risks really that high? Handling radiation risks within the framework of a 1×10^{-6} cancer risk limit and apportionment unworkable
- Flexibility not an option! Tier III assessment not utilized – Apportionment forces conservative lookup Tables as path of least resistance
- Rebecca is showing up where she is not invited! Use of global RBCA in land transactions becoming increasingly common
- Inconsistent consideration of background for use in apportionment - No guidance from FDEP on developing background values
- Lack of consideration for vapor intrusion from soil into buildings

Questions / Discussion