DoD Emerging Contaminants Program

Environmental Monitoring & Data Quality Workshop

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Office of the Secretary of Defense
Operating Environment & Trends

• **Use of Precautionary Principle**
  – We must understand health & environmental effects before using chemicals

• **Biomonitoring — What’s showing up in humans?**
  – Centers for Disease Control’s national biomonitoring & California voluntary program

• **Evolving Risk Assessment Science & Process**

• **Strict Chemical Management & Green Chemistry**
  – Cradle to grave management

• **International, Federal, & State Toxic Substances Laws**
  – EPA’s Chemical Actions Plans & “Chemical Safety for Sustainability”
    • Restrictions or banning of chemicals/materials
  – California Green Chemistry Law
  – European Union’s “REACH” regulation for chemical management
  – Pending TSCA$^1$ reform

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$^1$ Toxic Substances Control Act
What is an Emerging Contaminant?

• Chemicals & materials that have pathways to enter the environment and present potential unacceptable human health or environmental risks…

  and either

• do not have peer-reviewed human health standards

  or

• Standards/regulations are evolving due to new science, detection capabilities, or pathways.
How Can ECs Affect DoD?

- **Cause adverse health effects on operating forces, DoD employees, and/or public**
  - Human health protection paramount
- **Reduce training/readiness**
  - Restrictions on use of ranges
- **Restrict availability and/or cost of materials or chemicals**
  - Adverse impact on mission-critical applications & industrial base community
- **Increase O&M and/or cleanup costs**
  - Resource drain from mission needs
EC Examples – Past & Present

- Ozone Depleting Substances – Refrigerants, fire suppressants, solvents...phased out of production
- Perchlorate – Munitions/propellant oxidizer...highly water soluble...affects thyroid function...intense Congressional interest regarding DoD releases
- Hexavalent Chromium – Heavy metal used in weapons systems/platforms...revised 10-fold reduction in Permissible Exposure Level (PEL)
- PFOA – Used to make fire retardant/high performance materials...bio-persistent...95% phase-out by 2010...100% by 2016
- Naphthalene – Component of JP-8/fuels used throughout DoD. Proposed “carcinogenicity” listing by EPA. New toxicity levels could have major impacts
- Sulfur Hexafluoride – Global warming gas used in essential applications
EC “Scan-Watch-Action” Process

Acquisition, Technology and Logistics

- **Scan**: Review literature, periodicals, regulatory communications, etc.
- **Watch**: Monitor events; Conduct Phase I qualitative impact assessment
- **Action**: Conduct Phase II quantitative impact assessment; develop & rank RMOs*

Over-the-horizon

Possible DoD impacts

Probable high DoD impacts

EC News

Phase I Assessment

Phase II Assessment

Risk Management Options (RMOs) to ECGC

Approved RMOs become Risk Management Actions (RMAs)
### Phase I Impact Assessment Process

#### Acquisition, Technology and Logistics

1. **Likelihood of Toxicity**
   - Value/Regulatory Change

2. **Scoping and Data Collection**

3. **Impact on DoD Functional Areas**

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<th>ES&amp;H</th>
<th>Training &amp; Readiness</th>
<th>Acquisition/ RDT&amp;E</th>
<th>POMD of DoD Assets</th>
<th>Cleanup</th>
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**Results:**
- Recommendation – Move to Action List?
- Initial Risk Management Options
Sulfur Hexafluoride (SF6) Background

- A non-flammable, non-toxic gas – no human health concerns
- Extremely stable, with excellent dielectric properties (electrical insulation and arc-quenching)
- A high global warming potential – 22,800 times more potent than carbon dioxide (CO₂) – long lasting in the atmosphere
- Average global SF6 concentration has increased by about 7 percent per year during the 1980s and 1990s
SF6 Commercial Uses

- High-voltage electrical switchgear & transformers
- High-energy imaging equipment
- Research — atomic particle tandem accelerators
SF6 Phase I Impact Assessment
Completed January 2008
Acquisition, Technology and Logistics

Likelihood of Toxicity Value/Regulatory Change

1. Probability that Greenhouse Gas emission initiatives will restrict use/availability of SF6

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<th>Probability</th>
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SF6 Military Uses

• Pressurization/dielectric for aircraft targeting pods/avionics — Airborne Warning and Control System (AWACS) radar (e.g., E-3 Aircraft)
• Waveguide pressurization for shipboard targeting radar (e.g., MK 92 Fire Control System)
• Comprehensive Nuclear Test Ban Treaty monitoring and nuclear event detection
SF6 Phase I Impact Assessment
Completed January 2008

Sulfur Hexafluoride (SF6) is used in radar systems (e.g., AWACS aircraft); helicopter rotor-blade leak tests; discharge testing in fire suppression systems; electrical switch gear; and propulsion systems for specific weapons (e.g., MK-50 torpedo) in service and under design.

Likelihood of Toxicity Value/
Regulatory Change

1. Probability that Greenhouse Gas emission initiatives will restrict use/availability of SF6

Probability of Occurrence

Severity of Impact

ES&H
Training & Readiness
Acquisition/RDT&E

PO&MD of Assets
Cleanup

ES&H

Training & Readiness

Acquisition/RDT&E

PO&MD of Assets
Cleanup

Completed January 2008
EC Action List — Jan 2011

✓ Royal Demolition eXplosive (RDX)
  • Cyclotrimethylenetrinitramine
✓ Hexavalent Chromium (Cr6+)
✓ Naphthalene...pending downgrade to watch list
✓ Beryllium (Be)
✓ Sulfur Hexafluoride (SF6)
✓ Lead

✓ Phase II Impact Assessment completed.
EC Watch List – Jan 2011

- Tungsten alloys
- Sodium tungstate
- 1,4-dioxane*
- Nanomaterials
- Perfluorooctyl sulfonate (PFOS)
- Di-nitrotoluenes (DNT)
- Nickel
- Cadmium
- Manganese
- Cerium
- Cobalt
- Antimony
- Perfluorooctanoic acid (PFOA)
- Phthalates ...recently added
- Diisocyanates ...recently added
- TCE ...moved from action list
- Perchlorate ...moved from action list

- Phase I Impact Assessment completed
  * To be re-assessed
Lead — Why on the Action List?

• Evolving science & regulations pose a risk to range operations…most munitions contain lead

• Lead-free electronics pose a risk to DoD supply chain…short-circuiting in components
EC Program Scorecard

• Screened 413 potential ECs
• Completed 25 Phase I Impact Assessments
• Completed 7 Phase II Impact Assessments
  – Beryllium, lead, sulfur hexafluoride (SF6), hexavalent chromium, naphthalene, trichloroethylene (TCE), perchlorate\(^1\), & RDX\(^2\)
• 54 Risk Management Options (RMOs) developed & turned into Risk Management Actions (RMAs)
  – 39 in-progress, 11 completed, 3 pending, 1 deferred (low risk)

\(^1\) Perchlorate was original EC — no Phase II assessment but RMOs developed and approved by ECGC
\(^2\) A defense related explosive compound
Department of Defense Emerging Contaminants Program

Harvard University – Ash Institute for Democratic Governance & Innovation
Questions & Discussion

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Back-up Slides
Planned FY-11/12 Phase I Impact Assessments

- Nanomaterials…partially completed Nov 2010
- Diisocyanates…completed February 2011
- Phthalates…next
- Cobalt
- Antimony
Latest Risk Management Actions

- **Naphthalene**
  - Real-time dosimeter developed via SBIRP\(^1\)…new technology
  - Multi-agency funding approved…awaiting FY-11 OSD funding for approved human exposure testing
  - WET Center will independently test dosimeter accuracy

- **Hexavalent chromium (Cr6+)**
  - DFAR rule at OMB for review prior to FR publication
  - Accelerated corrosion testing protocol being developed by SERDP
  - Project underway by CTC on minimizing legacy uses
    - Work with specification owners to specify suitable substitutes
  - SERDP conference session show-cased successful substitute process projects including “project of the year”
    - Medium caliber gun barrels non-CR6+ process

\(^1\) Small Business Innovative Research Project
Latest Risk Management Actions

• **SF6**
  – Recovery/recycling policy memo signed 20 OCT by PD-USD(AT&L)
  – AF RDT&E
    • Infrared leak detection
    • SF6 substitutes for AWACs radar wave guide system

• **Beryllium**
  – Life-cycle study underway by CTC focusing on maintenance activity exposures and end-of-life
  – Visit to Hill AFB completed…interesting results

• **Perchlorate**
  – Field guide for use of isotopic analysis to be completed soon
  – Primary researcher and DoD-EDQWG collaborating
1. Downgrade Perchlorate & TCE to EC Watch List
2. Endorse* RDX RMOs
3. Endorse* Lead RMOs
4. Terminate Tungsten work group
   – Nanomaterials work group to continue

*Note: “Endorse” means there is consensus within the Governance Council that the recommended actions are worthwhile. Individual OSD and Component Program Managers will make decisions on whether to fund & implement the actions in consideration of other program priorities. CMRM staff will track implementation progress and risk reduction.
Downgrading Perchlorate to Watch List

• Risk Management Actions have reduced risk
  – Latest (April 2009) DoD Policy in a series ensures releases are addressed
    • Sampling database with over 50,000 samples
    • Releases mainly contained on installations & remedial actions underway/completed
  – DoD R&D played a key role…Isotopic analysis technique differentiates between natural & man-made sources
  – Congressional, press, and EPA briefings to dispel perchlorate myths
    • Main message: DoD not the major source of drinking water contamination
  – Army R&D on perchlorate substitutes paying dividends
    • New ground burst simulators being deployed

• GAO Review on perchlorate contamination in U.S. completed July 2010
  – No recommendations…implies that DoD releases under control…notes non-DoD sources (e.g., fertilizer) contributing to contamination
Downgrading TCE to Watch List

• **Risks to Cleanup Program Costs**
  – DoD & EPA developed interim toxicity levels to avoid regional inconsistencies & disputes
  – Final EPA risk assessment supersedes interim levels but are about the same
  – Cleanups handled routinely by DERP\(^1\)
  – Vapor intrusion issues remain…RMAs underway to address

• **Risks Related to Continued Use**
  – About 80% of DoD use at Anniston Army Depot (ANAD)
  – Major projects underway at ANAD to develop cleaning processes with substitutes

\(^1\) Defense Environmental Restoration Program
How to Handle ECs Under DERP

Key Factors to Consider Before Actions

• Is there exposure or potential for exposure?
  – What are pathways and receptors?
• What’s the status of toxicity values?
  – IRIS, PPRTVs, Other (state)
• Are other non-ECs present?
• Will the proposed treatment also remediate ECs?
• What are the potential risk management options?
  – Watchful waiting (monitoring only)
  – Halt the plume
  – Remediation