DoD Emerging Contaminants Program

Environmental Monitoring & Data Quality Workshop

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Chemical & Material Risk Management
Office of the Secretary of Defense
### Report Documentation Page

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*Standard Form 298 (Rev. 8-98)*  
Prescribed by ANSI Std Z39-18
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

\(^1\) 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

Over -the- horizon

Review literature, periodicals, regulatory communications, etc.

Possible DoD impacts

Monitor events; Conduct Phase I qualitative impact assessment

Probable high DoD impacts

Conduct Phase II quantitative impact assessment; develop & rank RMOs*

Phase I Assessment

Phase II Assessment

Risk Management Options (RMOs) to ECGC

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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<tr>
<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

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

Likelihood of Toxicity Value/
Regulatory Change

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<th>Timeframe</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
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

![Likelihood of Toxicity Value/Regulatory Change Diagram]

- **H**: High
- **M**: Medium
- **L**: Low

**Probability**
- **2-3 yrs**

**Severity of Impact**
- **ES&H**
- **Training & Readiness**
- **Acquisition/RDT&E**
- **PO&MD of Assets**
- **Cleanup**
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)

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\(^1\) Perchlorate was original EC — no Phase II assessment but RMOs developed and approved by ECGC

\(^2\) A defense related explosive compound
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 (Cr\(^{6+}\))**
  – 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-CR\(^{6+}\) 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
2010 ECGC Decisions

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