Non Potable Water Substitution and Reuse in the Field

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Surface Water and Wastewater
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Standard Form 298 (Rev. 8-98)  Prescribed by ANSI Std Z39-18
Water Cost

- bottled water, transported - Iraq
- bulk water, transported - Iraq
- bulk water produced - Iraq
- bottled water - US
- municipal supply - US
Potable Water

Water that is safe to drink
Insufficient Amount of Potable Water

• Replace potable water with non potable water in those applications that don’t require potable water quality

  – Water Substitution

  – Water Reuse
Considerations for Non Potable Water Substitution / Reuse

• Type of Source Water
• Quality of Source Water
• Application & Requirements
Source Waters

• Local Waters
  – Local water supplies
  – Ground water
  – Surface water

• Army Generated
  – Filtered water
  – ROWPU brine
  – Gray water
  – Treated wastewater
Source Water Quality

• What needs to be measured?
• What can be measured?

• Microbial quality
  – total coliforms, E. coli
    • IDEXX’s Colilert, Quanti-Tray
Source Water Quality (II)

• Turbidity
  – Measurement for physical quality
  – Correlates well with disinfection requirements
Applications for Substitution and Reuse

• Divided into two broad categories
  – Unrestricted use (high quality)
    • Minimal bacterial contamination
    • Body contact allowed
      – e.g., showering
  – Restricted/industrial use (lower quality)
    • Some bacterial contamination
    • Limited body contact/public exposure
      – e.g., construction activities
Guidelines for Water Substitution and Reuse
Guideline Classification

1. Ground water
2. Surface Water
   • To include filtered water and ROWPU brine
3. Treated Wastewater
   • To include gray water
Water Substitution Guidance – Ground Water

• Ground Water
  – Extremely low turbidity and bacterial contamination
  – Can be used directly for all non potable water applications
  – Exception: ground water under the direct influence of surface water
# Surface Waters

## EPA Criteria* for Bacteria in Recreational Fresh Water#

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Geometric Mean Density^</th>
<th>Single Sample Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterococi</td>
<td>33</td>
<td>62</td>
</tr>
<tr>
<td>E. coli</td>
<td>126</td>
<td>235</td>
</tr>
</tbody>
</table>

*Measured as bacterial densities (colony forming units) per 100 ml
#Based on an acceptable gastrointestinal illness rate of 8 per 1000 swimmers.
^Calculated with a minimum of five samples collected over a 30-day period.
Water Substitution Guidance – Surface Water

• Deployment situations
  – Surface waters
    • More heavily polluted
    • Sometimes open sewers

• Guidance

<table>
<thead>
<tr>
<th>Application</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestricted Use with Body Contact</td>
<td>Disinfect and use</td>
</tr>
<tr>
<td>Industrial / Restricted Use</td>
<td>Use directly</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Acceptable Activities</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
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<tr>
<td>Disinfected Fresh Water</td>
<td>Centralized hygiene such as field showers</td>
</tr>
<tr>
<td></td>
<td>Decontamination of personnel</td>
</tr>
<tr>
<td></td>
<td>Retrograde cargo washing</td>
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<tr>
<td></td>
<td>Heat casualty body cooling</td>
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<td></td>
<td>Graves registration personnel sanitation</td>
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<tr>
<td></td>
<td>Well development</td>
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<tr>
<td>Fresh Water</td>
<td>Vehicle coolant</td>
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<td></td>
<td>Aircraft washing</td>
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<td></td>
<td>Pest control</td>
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<td></td>
<td>Field laundry</td>
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<td></td>
<td>Concrete construction</td>
</tr>
<tr>
<td></td>
<td>Well drilling</td>
</tr>
<tr>
<td>Brackish and Seawater</td>
<td>Vehicle washing</td>
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<tr>
<td></td>
<td>Electrical grounding</td>
</tr>
<tr>
<td></td>
<td>Fire fighting</td>
</tr>
<tr>
<td></td>
<td>CBRNE decontamination of materials</td>
</tr>
</tbody>
</table>
Treated Wastewater

• Significant bacterial contamination
• Federal and State reuse classifications
  – Level of treatment
  – Water quality standards
  – Monitoring schedule
  – Setback distance
Water Reuse Guidance – Treated Wastewater

- **Guidance**

<table>
<thead>
<tr>
<th>Category</th>
<th>Wastewater Treatment</th>
<th>Turbidity (NTU)</th>
<th>E. coli (#/100 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>median value</td>
<td>single sample max</td>
</tr>
<tr>
<td>Unrestricted/Body Contact</td>
<td>Tertiary</td>
<td>≤2</td>
<td>≤5</td>
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<td>≤10</td>
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<td>Restricted/Industrial</td>
<td>Secondary</td>
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<td>≤150</td>
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<td>≤600</td>
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</table>
Final Thought

• Goal......

Produce comprehensive Army Policy for Water Substitution and Reuse in the Field