Environmental Health Training in Emergency Response (EHTER) - Awareness Level

Mission, Kansas-September 17-20, 2012

Sponsored By
U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Center for Environmental Health
Division of Emergency and Environmental Health Services
Environmental Health Services Branch

and

Mid-America Regional Council

Produced in Cooperation with the Regional Homeland Security Coordinating Committee, with funding from the U.S. Department of Homeland Security’s Urban Area Security Initiative

Views expressed are those of the presenters and do not necessarily represent the views of the National Environmental Health Association or official policies or procedures of the Centers for Disease Control and Prevention.

Use of trade names is for identification only and does not imply endorsement by the Centers for Disease Control and Prevention.

Wastewater
Wastewater

Sewage overflow occurring in Roswell, Georgia, just alongside the Chattahoochee River
Courtesy USGS

Objectives

- Explain the Environmental Health role in wastewater issues
- Describe onsite (septic) and public sewer wastewater systems
- Discuss system vulnerabilities, failures and recovery considerations
- Identify alternative means of treating wastewater
- Explain assessment and response to wastewater spills
- Identify areas to improve wastewater preparedness
Role of Environmental Health

- Ensure proper wastewater treatment and disposal is provided
- Prevent diseases caused by wastewater
- Prevent contamination of water
- Provide emergency information on wastewater treatment and handling
- Conduct interventions needed to protect the public from wastewater in food service and other industries

Role of Environmental Health

Why Wastewater

Wastewater pathogens
- **Bacteria** – E. Coli, Salmonella, Typhoid fever, and Cholera
- **Viruses** – Hepatitis A
- **Fungi** – Aspergillus
- **Parasites** – Roundworms, Cryptosporidium, Giardia

E. Coli 157:H7
Courtesy CDC

Responders, New York
Courtesy FEMA
Role of Environmental Health

Disease transmission

- Spills are a point source for disease transmission
- Pathogens can be transported far away from the point source
- Transported by flies, roaches, people and animals
- Pathogens introduced into living and food service areas
- Spills may not have recognizable odor or appearance

Role of Environmental Health

Reasons for Concern

- Aging infrastructure
- Population growth
- Frequency of natural disasters
- Reduced funding
- Exceeded safety designs
- Raw sewage releases
- Climate change possibly facilitating disease agent migrations

Wastewater
Role of Environmental Health
Safety Is Job #1

- Personal Safety – buddy system
- Personal protective equipment: use it!
- Hand washing in the field
- Physical Injury from damaged systems
- Demeanor of the public
- Confined spaces: must be trained
- Decontamination of footwear

Responders in the field, New Orleans
Courtesy FEMA

Role of Environmental Health
Response Nexus

- Assessment
- Consultation
- Monitoring environment
- Public information
- Preparing Planning
- Leadership
- Support activities
- Liaison activities

State Department of Health
Environmental Health
Dept of Environmental Protection
Wastewater Utilities

Wastewater
Environmental Health Training in Emergency Response (EHTER) - Awareness Level

Role of Environmental Health
Key Partners – Introduce yourself before a disaster

- State and local departments
- Portable sanitation industry
- Septage and sewage haulers
- Industry
- Media
- Emergency management agency
- Volunteer and community organizations
- Public works and wastewater utilities
- Emergency Support Functions (ESF)

System Overview - Public Sewer Systems

- Wastewater treated on a large scale
- Treated/reclaimed water discharged back into the environment
- Plants require onsite manpower to operate
- Power dependent systems
Environmental Health Training in Emergency Response (EHTER) - Awareness Level

Public Sewer Systems

Hurricane Katrina Operational Assessment
U.S. Food and Drug Administration

Public Sewer Systems

Wastewater
System Overview - Public Sewer Systems
Sewage Lift Stations and the Collection System

- Series/chain of hundreds of manholes and lift stations
- Collection systems run for miles
- Engineered safety holding capacity (free air space)
- Redundant and alternating pumps
- Back up power supplies
- Power dependent systems

System Overview – Onsite Systems

Basic components:

- The tank
- Connected by D-box, pump tank or header pipe to...
- The Drainfield

Wastewater
System Overview – Onsite Systems

Alternative systems
- Mounded drainfield
- Aerobic treatment tanks
- Drip or spray irrigation
- Time or volume dosed drainfield
- Artificial media filters
- Chlorinated effluent
- Sand filters
- Combination of advanced system components

Advanced components:
- Aerobic tank
- Effluent sand filters

* Power Dependent systems

System Vulnerabilities, Failures and Considerations

Natural disasters
- Physical damage
  - Treatment plants
  - Collection pipes
  - Onsite systems; septic tanks
- Loss-of-power effects
- Workforce affected

Wastewater
System Vulnerabilities, Failures and Considerations
Acts of terrorism – man made events

- Fires – treatment plant targets
- Explosions – critical infrastructure disrupted
- Cyber attacks – intentional black outs
- Biological attacks -loss of utility staff
- Damage affects similar to natural disasters
- Need for increase in wastewater system resiliency –
  - Preparedness, Response, Recovery, Mitigation

Collection Systems

- Collection can be quickly overloaded by flood waters
- Flood waters enter through damaged collection system pipes and low manholes
- Flood waters sent directly to the treatment plant

Pictures courtesy FEMA

Wastewater
System Vulnerabilities, Failures and Considerations
Collection Systems (continued)

- Flood water can lessen treatment plant capacity quickly
- Flood water can introduce saltwater into the treatment plant
- Intruding saltwater can corrode system components
- Damaged collection pipes can isolate service areas
- Power dependent components

Out of site…out of mind

- Damaged onsite systems can short circuit proper treatment and contaminate water supplies
- Damage caused by:
  - Saturated conditions (atypical ground water levels).
  - Physical damage from earthquakes, uprooted trees, and storm surge.

Wastewater
System Vulnerabilities, Failures and Considerations

- Onsite systems will not work when underwater
- May be able to occupy a structure but not have proper wastewater disposal
- Homeowners may try to divert water away from their home

System Vulnerabilities, Failures and Considerations

- Identify vulnerable areas
- Locate systems and components away from hazards
- Stabilize system areas with soil and vegetation, bulk heads or bladders
- Educate system owners on component location
- Facilitate the expansion of public sewer to vulnerable areas

Wastewater
System Vulnerabilities, Failures and Considerations

- Septic tanks can float
- Septic tanks can collapse
- Consider pumping tank half way
- Wait until saturated conditions subside
- Installation methodologies to prevent floating
- Products available to prevent floating - anchors

Onsite System Damage

Hurricane Katrina Operational Assessment
U.S. Food and Drug Administration

Wastewater
System Vulnerabilities, Failures and Considerations

- Educate owners on their system and component location
- Evaluate vulnerable power supply lines to system components
- Consider system and component damage from falling trees
- Proactively relocate systems or cut trees

Wastewater
System Vulnerabilities, Failures and Considerations

Rural Wastewater systems

Municipal Wastewater systems

Alternative means of treating Wastewater

When normal wastewater systems are out

- Estimate wastewater volume
- Determine number of fixtures needed
- Consider the population served
- Ensure adequate service frequency
- Coordinate location for holding device(s)
Alternative means of treating Wastewater

Holding Containers

Pictures courtesy FEMA

Alternative means of treating Wastewater

Septage and Sewage Disposal Options

- Disposal in a sewage treatment plant
- Temporary storage in a tank (holding tank)
- Lime stabilization with land application
- Drying beds
- Composting
- Landfill burial
- Transporting out of disaster affected area

Service truck at Atlanta Sewer Plant
Courtesy FEMA

Wastewater
Alternative means of treating Wastewater

Emergency Facilities at Home - Options

- Modify an existing toilet:
  - Flush until the bowl has no water
  - Line with heavy-duty trash bags and disinfect with chlorine bleach after each use
  - When full, tie shut and remove to an outside location
  - Use campers/motor home holding tanks
Alternative means of treating Wastewater

Emergency Facilities at Home –(continued)

Create a homemade port-a-john:
- Use 5-gallon buckets lined with heavy-duty plastic garbage bags
- Add deodorizer such as lime, household bleach or kitty litter
- Keep buckets in a cool, dark place, tight lid
- Do not throw human waste in regular trash
- Dispose of waste by flushing down the toilet when services are restored or bury
- Clean and disinfect buckets

Bucket lined with bag, Florida
Courtesy CDC

Alternative means of treating Wastewater

Exercise

A school gymnasium is to be used as a shelter for 1000 people. After review of the floor plan. Determine the number of additional portable toilets and hand washing stations that would be needed for the facility.

- Number of toilets
- Number of showers
- Number of hand wash stations

Note: For this exercise, use California Manual ratios -1 toilet per 20 people, 1 shower per 15 people and 1 hand sink per 15 people

Shelter, North Dakota
Courtesy FEMA

Wastewater
Responding to Wastewater Spills

Outdoor spills

- Contain the spill – shut off the source (water supply)
- Determine the volume of the spill
- Determine the limits of the spill
- Determine if sewer drains are affected
- Are the drains combined sewer, storm sewer and/or sanitary sewer
- Block drains – parapets or sandbags
- Use PPE and mark affected area off with caution tape or other signage

Outdoor spills continued next slide

Responding to Wastewater Spills

Outdoor spills (continued)

- Pump sewage off of the ground
- Spread powdered lime over the entire spill area and/or
- Treat hard surfaces with HTH or a bleach/water solution
- Remove material such as playground sand
- Allow a day to air dry
- Rake up excess and place in heavy garbage bags
- Revegetate / restabilize area

Flooding manhole
Courtesy USGS

Flooding manhole
Courtesy USGS

Flooded area, Wisconsin
Courtesy FEMA

CDC

FEMA

Wastewater
**Sewage Spill Protocol**

**Florida's Northwest District Spill Response Plan**

<table>
<thead>
<tr>
<th>Record Important Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Caller’s Name</td>
</tr>
<tr>
<td>2. Associated Facility</td>
</tr>
<tr>
<td>3. Amount of Spill (if ≥ 1,000 gallons, State Warning Point (SWP) called)</td>
</tr>
<tr>
<td>4. Location</td>
</tr>
<tr>
<td>5. Start/Stop Date/Time</td>
</tr>
<tr>
<td>6. Cause of the Spill</td>
</tr>
<tr>
<td>7. Was the sewage contained / removed?</td>
</tr>
</tbody>
</table>

**Yes**

- Area should be disinfected with lime to water’s edge.
- Request sampling for fecal coliform until results of #2 and #3 (below) are ≤ 800 / 100 ml.
- *Sampling should include: 1. Background 2. Point of Entry 3. Downstream*

**No**

- Any solids should be removed from area.
- Area should be disinfected with HTH or Lime.
- *HTH advised for roads or areas with foot traffic.
- *Use lime on grassy areas near surface water.*

- Was surface water affected?

- Request follow-up support within 7 days

---

**Responding to Wastewater Spills**

**Recommended treatment procedures**

- Hydrated lime for grassy areas – how does it work?
- Bleach/ HTH for hard surface areas – how does it work
- Confusing public health lingo “use lime”
- Lime – alkaline compound that raises pH to greater than 12
- High pH destroys pathogen cell membranes

Responders distribute lime to residents, Virginia Courtesy FEMA
Responding to Wastewater Spills
Indoor cleanup of Sewage spill

- Wear rubber boots and gloves
- Clean and disinfect contaminated surfaces
- Saturated wall-to-wall carpeting (and the pad) usually cannot be adequately cleaned
- Remove and discard porous materials
- Disinfect clean-up mops, brooms, and brushes with the bleach solution

Clean up, Puerto Rico
Courtesy FEMA

From Kingcounty.gov, Washington State Department of Health

1. What should you do if there is sewage in your home?
   - Limit access to the area.
   - Keep everyone, especially children and pets out of all wet areas in your home.
   - After the sewage is no longer backing up, clean all areas thoroughly, this includes but is not limited to carpets, sheetrock, drywall, and baseboards.
   - If your entire home has sewage in it, you may need to leave until all areas have been cleaned.

2. If you have a septic tank:
   - Limit the use of water in your home as much as possible.
   - The dosing tank will not operate without electricity.
   - Flood prone areas and areas filled with water will not allow the septic tank to operate properly until the drainfield dries out.

3. What can you do to prevent illness?
   - If you come in contact with the sewage, wash your hands thoroughly with soap and water.
   - Wash clothes that come in to contact with sewage in hot water, and dry them on high heat. Discard them if they are heavily soiled.
   - If you become ill with symptoms such as diarrhea or vomiting, see your doctor.

4. If you have city or municipal sewage:
   - Contact your utility company to let them know you are having problems.
   - If you do not know who your utility company is, contact the citizen's information line at (XXX) XXX-XXXX.

Main Message
The County Health Department is concerned about your health and the spread of disease, keeping pets, children and others out of areas that are contaminated with sewage, will help prevent disease from spreading.
Responding to Wastewater Spills
Recreational Surface Water Sampling

- Determine applicable rules for your jurisdiction
- Common bacteriological indicators
  - Fecal coliform
    - E. Coli
    - enterococci
- Bacteria sample density methodology
- Single sample
- Geometric mean (over 30 days)

Responding to Wastewater Spills
Recreational Surface Water Sampling (continued)

- Determine spill volume
- Volume of spill that entered the surface water body
- Consider current, wind, and tides for spill migration
- Develop effective means to advise the public
- Minimum three (3) sample points: point of entry, upstream and downstream
Responding to Wastewater Spills
Flooded Outdoor areas

- Flood waters and standing waters pose various risks
  - Infectious diseases – diarrheal diseases
  - Chemical hazards – utilize DOT guidebook and NIOSH pocket guide
  - Physical Injuries – drowning, animal and insect bites, electrical hazards and wounds

Responding to Wastewater Spills - Flooded Outdoor areas (cont.)

1. Hazard Identification

| Identify potential sources of contamination (e.g., wastewater treatment plants, waste systems, agricultural operations) | Determine likelihood of microorganisms in flood waters |

2. Dose-Response Assessment

| Estimate concentration of microorganisms and their ability to cause illness | Consider the extent of flooding and effects on surrounding areas |
| Consider the location of contamination sources and proximity to flooded areas |

3. Exposure Assessment

| Consider environmental conditions (e.g., soil desiccation, sunlight, temperature) | Conduct site assessment to determine degree of soil saturation, debris, etc. |
| Determine who may be exposed and to what degree, and the route, duration, and frequency of exposure |

4. Risk Characterization

| Consider all information gathered in previous steps and determine magnitude of the public health problem |

Decision and Actions / Interventions

Determine whether to allow occupancy of flooded areas and if intervention/precautionary actions are necessary (i.e., promote personal hygiene, signage, remedial actions, etc.)

From - Microbial Contamination in Previously Flooded Outdoor Areas, Courtesy CDC

Residents in flood water, Iowa
Courtesy FEMA

Wastewater
Responding to Wastewater Spills

Assessment Process

- Community wide impact on systems
- Individual and municipal system assessment
- More detailed assessments as needed
- Identify a universal assessment form
- Cameras for documentation
- Determine how imminent health hazards will be prioritized

Survey of damage
Courtesy FEMA

Responding to Wastewater Spills

Exercise

During a major blackout over 4 days, your county has lost power. The treatment plant is still operational however, lift station backup generators have begun to run out of diesel fuel and fuel suppliers have been affected by the blackout.

It is a Saturday evening and a call comes into ESF-8. A major lift station shut down and has overflowed approximately 14,500 gallons of sewage. The sewage has flowed over a Elementary school yard (grass and asphalt areas). Two (2) drains have been affected. Both drains are storm drains and flow directly into Swimmy Lake. The School Superintendent has announced that all schools in the county will be open Monday morning.

- In your group, discuss and list the steps of a comprehensive Environmental Health Response to this spill and situation.

Survey of damage
Courtesy FEMA
Wastewater Preparedness
Preventing Backup – Sewur Valve (original Elder Valve)

- Reduces possibility of backup
- Allows fluids to pass until the line sees solids
- After solids present, provides 100% shutoff
- Disconnection of the sewer line in low lying areas prone to flooding

Wastewater Preparedness
Preventing Backup - Full-Port Backwater Valve

- Prevents sewage backflow
- Removable cover for cleanout
- Transparent cover for inspection
- Installed inline with existing plumbing

Wastewater
Wastewater Preparedness
Resiliency for Power Dependent components

- Determine lift stations of priority
- Utility maps with lift station and drainage area identification
- Provide permanent back up generators
- Ensure mobile generators have a universal connection

Utility Map with delineated drainage areas
Courtesy City of West Lafayette, IN

Wastewater Preparedness
Helping Sewer connected Owners - Educate before the Disaster

- Know location of sewer service connection components
- Understanding the connection component responsibility – utility or homeowner
- Evaluate pump canister holding capacity
- Consider backup power for service connection pumps
- Evaluate need for backflow device in plumbing

FEMA helping homeowners, Montana
Courtesy FEMA

Sewer ejector pump, 30 gallon basin
Courtesy Pentair/Flotec

Wastewater
Wastewater Preparedness
Helping Onsite System Owners - Educate before the Disaster

- Properly maintained onsite systems are more resilient
- Know location of septic system - as built sketches
- Understanding how the onsite system works
- Backup power for onsite components

Wastewater Preparedness
Helping Onsite and Sewer connected owners

- Provide information through
  - Department websites
  - Radio blurbs
  - Community centers
  - FEMA help stations
  - Information phone lines
- Provide lists of:
  - Portable toilet companies
  - Septic tank service companies
Wastewater Preparedness
Lessons Learned by Public Wastewater Utilities

- Smart utilities: join WARN
- Local utility agreements
- Utility personnel planning
- Identify areas of priority
- Provide permanent backup generators
- Establish contracts with private septage pumping/hauling companies

Flooded treatment plant, Atlanta
Courtesy FEMA

Wastewater Preparedness
Lessons Learned (continued)

- Listing of treatment plants
- List of RV parks with sewage dump stations
- Printed list of septage and portable toilet companies
- Maintained list of key contacts
- Knowledge of community wastewater operations

Temporary housing being plumbed, Louisiana
Courtesy FEMA

Wastewater
# Wastewater Preparedness Exercise

Your County Administration is working on a disaster preparedness campaign for the general public. She has asked that the Health Department develop key bullet points for a Public Service Announcement (PSA) on Wastewater issues. The PSA should include how to prevent and deal with wastewater issues.

- What items of information should you include in this PSA
  - Group A focus: Onsite Systems owners
  - Group B focus: Sewer System users

---

**Sponsored By**

U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention  
National Center for Environmental Health  
Division of Emergency and Environmental Health Services  
Environmental Health Services Branch  
and  
Mid-America Regional Council

*Produced in Cooperation with the Regional Homeland Security Coordinating Committee, with funding from the U.S. Department of Homeland Security’s Urban Area Security Initiative*

Produced by:  
Center for Environmental Research and Technology, Inc.

Filmed on location at:  

---

Wastewater