

Municipal and Commercial Equipment Assets and their Use in a Radiological Response and Recovery Event

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MUNICIPAL AND COMMERCIAL EQUIPMENT FOR RADIOLOGICAL RESPONSE AND RECOVERY

- Compressing the recovery timeline through the use of municipal and commercial equipment
 - To support specific goals associated with radiological response and remediation.
- In order to facilitate the development of ideas and methods for the use of such equipment, we developed example scenarios for five “Support Goals.”
- All scenarios under the Support Goals ask the same question –

What types of municipal and commercial equipment can be used to complete the scenario activity and do we have sufficient data to recommend their use and predicted efficacy?



<http://cambusinesssolutions.com/best-practices/disaster-recovery-is-not-optional-anymore/>

MUNICIPAL AND COMMERCIAL EQUIPMENT FOR RADIOLOGICAL RESPONSE AND RECOVERY (cont.)

- The common initial state for all scenarios is that contamination has been spread over a wide area of the city.
- First responders have identified the presence of radioactive contamination and have completed their response protocols to provide a preliminary assessment of the radioactivity levels.
- Life-saving operations have been completed.



MUNICIPAL AND COMMERCIAL EQUIPMENT FOR RADIOLOGICAL RESPONSE AND RECOVERY (cont.)

At this stage, we expect the following activities in the impacted area:

1. People, vehicles, and objects have moved and are moving in and out of the contaminated areas,
2. Precipitation has occurred, increasing the spread of contaminants beyond the original release points,
3. Urgent remediation is needed for critical infrastructure (e.g., water utility, energy utility, transportation, medical, fire stations, government facilities, etc.),
4. Regular activities (e.g., business, school, etc.) in the non-evacuated but contaminated area,
5. Identification and remediation of hotspots, and
6. Development of remediation strategies for the evacuated area.

Support Goals

- Survey and monitoring: Monitor the contamination levels in affected areas for an extended period to understand the dose to workers and residents and maintain transparency to concerned citizens.
- Mitigation of received dose to first responders: Reduce the radiation dose burden to response and recovery personnel.
- Decontamination (gross and final): Decontamination methods can be more effective if implemented within days of a release rather than waiting months or years for the contamination to evolve chemically and physically, rendering it more difficult to remove.
- Waste management: Large amount of contaminated, solid waste will be generated over a wide area from businesses and residences. This waste should be collected for staging and disposal.
- Containment of wastewater: Water will likely be used by first responders to extinguish fires that may be generated during a radioactive release. It may also be used to reduce radiation levels to early responders and subsequent response teams. How do we collect or divert water for proper treatment and disposal?



Approach

- To develop a list of answers to the scenarios posed:
 - We solicited responses from various subject matter experts across the country and the United Kingdom.
 - We reviewed citywide all-hazards response documents and radiologically-specific response documents.
 - Distributed a survey to local and regional emergency management and response personnel from around U.S.
 - Held workshops with various national and local SMEs at Argonne and New York.
 - Held teleconferences and meetings to brainstorm and discuss potential options and identify gaps in our approach.
- This information was collected in the form of a list of tools.
 - Contains a description of the equipment and its potential use,
 - The primary advantages and limitations, and
 - Opportunities for gathering additional data on its efficacy.
 - We will report on the technologies ranked according to their potential impact



Survey and monitoring

- Monitor the contamination levels in affected areas for an extended period to understand the dose to workers and residents.
- We assume traditional survey monitoring equipment such as film badges, portable survey monitors, gamma-ray spectrometers already in place.
- What types of municipal and commercial equipment can be used to enhance the survey and monitoring of contamination?
- Examples: air filters from garbage trucks and delivery trucks, personal cell phones.



Mitigation of Received Dose to First Responders

- Reduce the radiation dose burden to response personnel.
- What types of municipal and commercial equipment can be used to carry out gross decontamination and to contain and prevent the resuspension and tracking of contamination?
- Examples: Fireboats to knock down radioactivity levels near the shore; dump trucks, and bobcats to spread mulch and gravel across roadways.



Decontamination (gross & final)

- Decontamination methods can be more effective if implemented within days of a release rather than waiting months or years for the contamination to evolve chemically and physically, rendering it more difficult to remove.
- What types of municipal and commercial equipment can be used to carry out gross or final decontamination of contaminated surfaces?
- Examples: Street sweepers to remove particles, asphalt-milling machines to remove the top layer of road surfaces, bobcats to remove the top layer of vegetation.



Containment of water and wastewater

- Water will likely be used by first responders to extinguish fires that may be generated during a radioactive release.
- Water may also be used to reduce radiation levels to early responders and subsequent response teams.
- How do we collect or divert water for proper treatment and disposal?
- What types of equipment can be used to collect, contain, and transport liquid wastes.
- Examples: portable tanks and storage bladders, barges, storm sewers, and reservoirs.



Waste Management

- Contaminated, solid waste will be generated over a wide area from businesses and residences.
- Solid, radioactive waste should be collected for staging and disposal.
- What types of municipal and commercial equipment can be used to stabilize, contain, store, and transport the radioactive solid waste generated during mitigation and decontamination operations?
- Examples: Municipal waste garbage trucks to pick up garbage and collect in interim locations.



Ranked technology priorities

- Small vehicle with gamma rope detector (no commercial rope detectors)
- **Problems with smart phone-based gamma detectors**
- **MIRION Tech USB type dosimeters**
- Removing filters from home and vehicles for counting
- Monitor taxis, buses, etc. with well-defined routes
- Rad speedbump
- Portal monitor for vehicles
- **Street sweeper with on board monitoring of rad. Perhaps include water recycle trailer.**
- Salt being spread, water truck spraying street to produce runoff that is vacuumed by street sweeper, water recycle trailer behind
- **Chip sealer distributor**
- IBC with polymer sprayer to cover streets



Ranked technology priorities

- **Mobile pressurized spray unit spraying down surface**
- Soil stabilizer sprays
- Drone mounted detectors
- **Automated window building washers**
- Use of drain covers to divert flow and flood control barriers to collect water
- Sewer lines can be monitored for flow and activity
- Procedure for qualifying freight container for rail or semi transport
- Means of transferring water from sewer lines to container truck on rail (Canadian rail volunteered)
- Setting up ad hoc piping and pumps to transfer liquids from reservoir to rail tankers (Canadian rail volunteered).
- Train wash units (Canadian rail volunteered)
- **Best practices from hospitals and power plants**



Next Steps

- Set to publish two reports on the data gathered at each of the workshops at Argonne and New York.
- Set to publish report summarizing our findings and first order recommendations for use of specific municipal and commercial equipment for specific Support Goals.
- Expect to publish peer review document mid-summer summarizing our findings and recommendations for R&D related to municipal and commercial equipment.
- Publish development of surrogate fall-out for decon-type contaminations
 - and strippable paint vs soap and tap wash for military vehicles
- Publish look-up tables of ad hoc filtration beds for rads
- Best Practices documents for use of municipal equipment favored by responders.

Scene setting for demonstration

- *Goal:* Several equipment options and techniques ranked highly in our surveys and can be demonstrated live as a single storyline.
- *Mock setting (see adjacent Figure):* Radiation survey station location for vehicles along egress route from a restricted contamination zone. Contains gamma-ray monitoring station, vehicle wash station adjacent to the survey station, and mobile IWATERS-Separmatic water recycle trailer.
- *Storyline:* Municipal or contract vehicles are passing through one of several monitoring stations set up at the boundary of an exclusion or limited access zone that has been characterized by higher radiation and contamination levels. The monitoring station would scan vehicles. Contaminated vehicles are routed to a decontamination station before leaving the restricted zone. Limited water is required due to on site water recycle system using COTS equipment.



Meet in outside courtyard and walk as a group to South Parking lot.



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High pressure wash

- Comparing washed surfaces to blank controls to understand removal rates and penetration depths
- What are practical aspects of washing?

