

Considerations in Developing Emergency Exercises for Containment Facilities

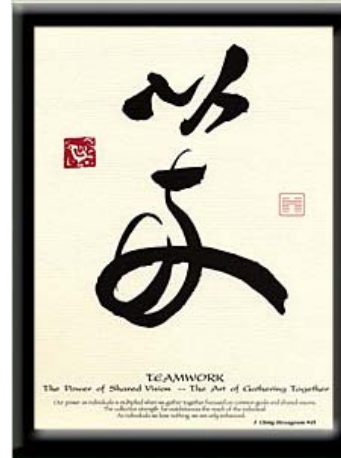
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Fellow

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Division of Occupational Health & Safety
Office of Research Services
National Institutes of Health
Department of Health & Human Services



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Team Work



- Our powers as individuals are multiplied when we gather together focused on common goals, and shared visions. The collective strength far outdistances the reach of the individual. As individuals we lose nothing, we are only enhanced.



Rocky Mountain Laboratories

- NIAID/DIR
- Best known for its research into vector-borne diseases
- Integrated Research Facility (IRF)



Developmental Assignment

1. HazMat Response to a leak in the Effluent Decontamination System (EDS)
2. Emergency Extraction from BSL-4 Containment



Methodology – “Keep it Simple”

1. Review & Assess Existing Plan
2. Plan
3. Table Top Exercise
4. Revisit Plan
5. Functional Exercise
6. Revisit Plan



<http://www.fema.gov/prepared/index.shtm>

What Needs to be Reviewed?

- Review Regulations
- Review Incident Response Plan (IRP)
- Review Institutional Policies
- Review Standard Operating Procedures
- Review Organizational Structure and Resources
- Review Physical Infrastructure
- Review Internal/External Communication Processes



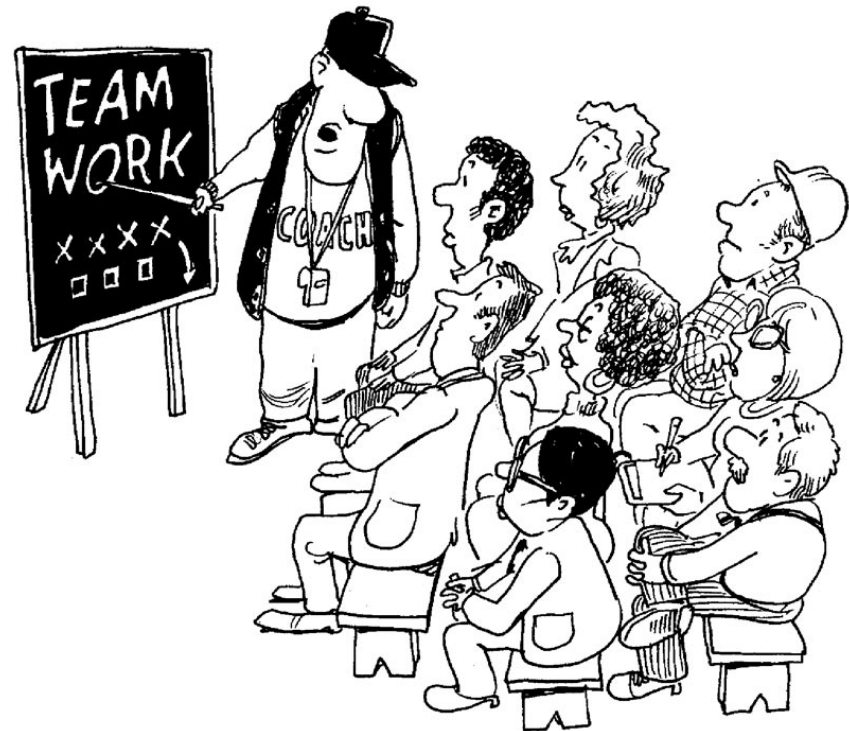
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Planning: Who Do You Invite?



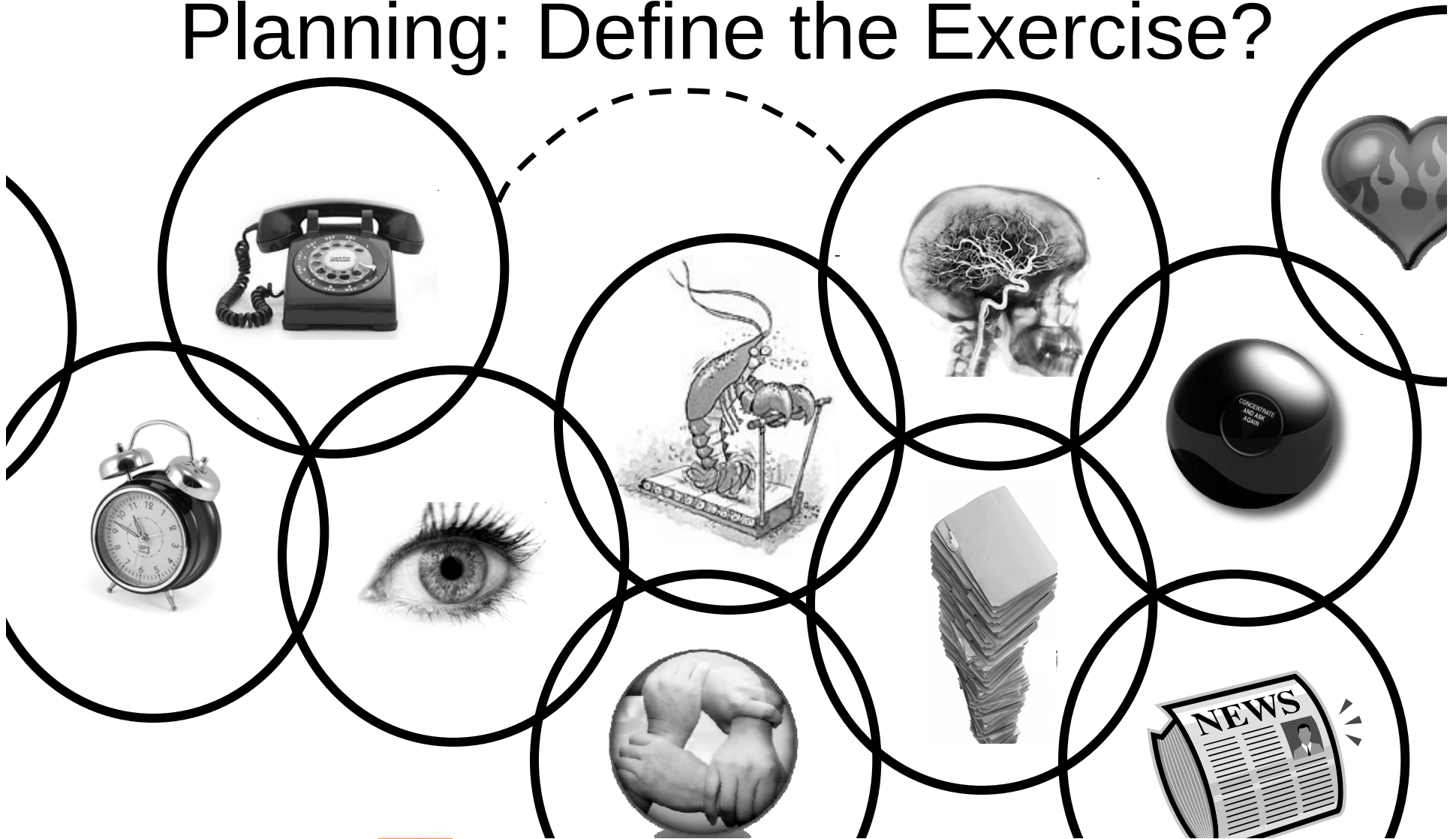
Planning Committee

- Biosafety
- Containment Specialist
- Emergency Response Coordinator
- Facilities/Engineer
- Occupational Medicine
- Research
- Security
- Public Information Officer



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Planning: Define the Exercise?



Planning: Objectives

- Fulfill emergency exercise requirements of Select Agent regulations
- Notification System will be utilized to initiate response
- Proper organization of Incident Command System (ICS)
- ICS will implement IRF's IRP
- ICS will practice developing an Incident Action Plan (IAP) and establish roles and responsibilities
- Responder(s) will respond and address emergency
- Responder(s) will identify continuous improvement opportunities



Planning: Evaluation Criteria

- Were objectives met?
- Are additional resources necessary?
- Are parts of the plan in need of revision?
- Is additional training required?
- Are staffing levels adequate?
- Is the communication system vulnerable to overload?
- Can first responder units communicate with each other?



Why Bother with the Table Top?

- Identify additional considerations for
 - Training
 - Resources
 - Education (Clarification)
 - Safety
 - Cohesive Strategy
 - Partnerships
 - Alternatives scenarios & idea sharing
- Note: The primary purpose of the exercise is not meant as an education tool but as opportunity to develop buy in and partnerships in a non-stressful environment



Functional Exercise: Components

- Planning meeting
- Simulated Incident
- Evaluators
- Incident Command System
- Incident Action Plan (Detection, Response, Mitigation)
- Researchers
- Emergency responders
- Security personnel
- IRF operations staff
- Infectious Disease Consultant
- Virtual participants
- Termination activities

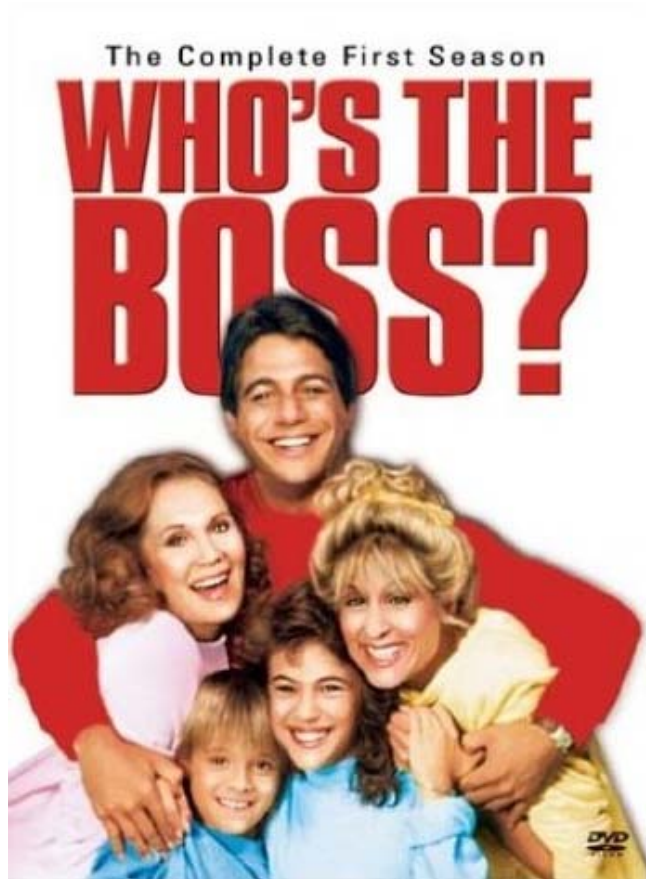


Potential Challenges

- Effectiveness of the Incident Command System
- Vague Incident Response Plan that does not provide sufficient guidance in dealing with hazard identification, assessment, and communication.
- Resource utilization and training
- Preexisting sentiments



Organizational Structure

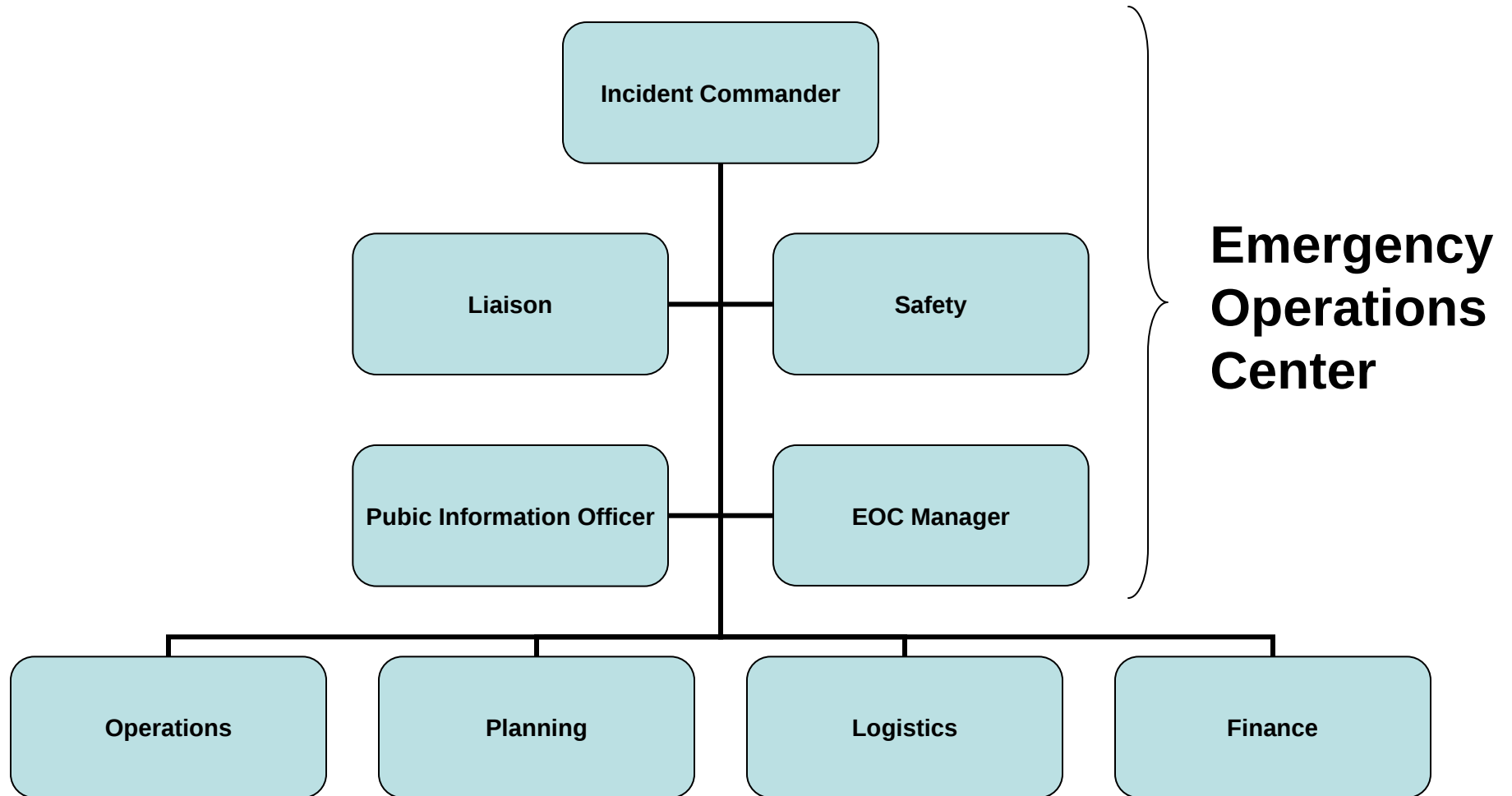


Sony Pictures Entertainment, TV Productions

- Are all positions accounted for?
- Are there people assigned with multiple roles?
- Are there alternates?
- Is the command structure flexible?

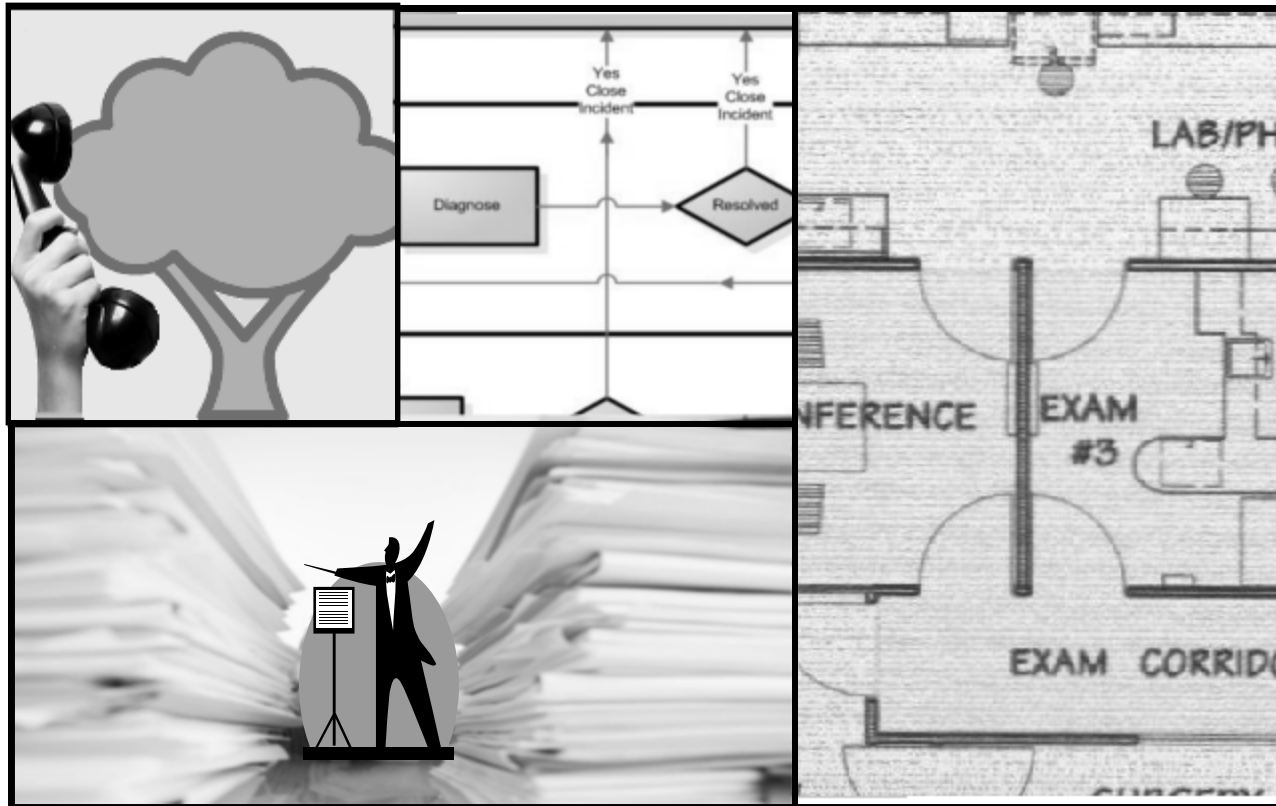


Incident Command System



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Risk Communication



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Reference Resources

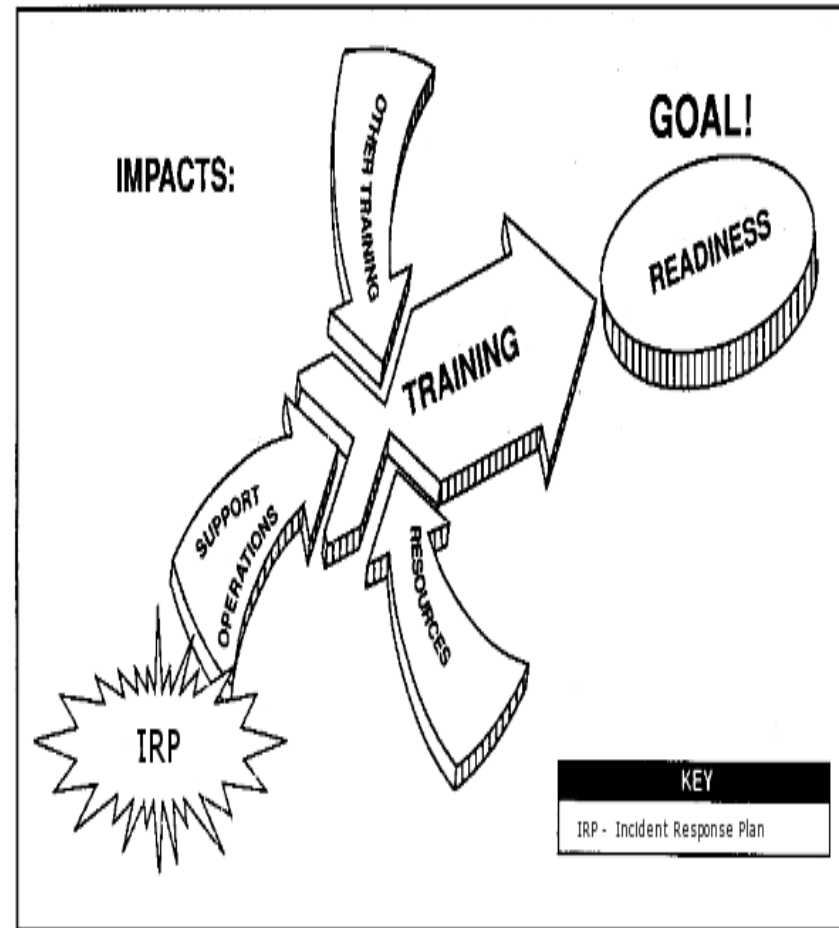
- FEMA Learning Resource Center - www.lrc.fema.gov/index.html
- National Incident Command System Forms - www.nimsonline.com/download_center/index.htm#forms
- Continuity of Operations Programs (COOP) - www.fema.gov/government/coop/index.shtm#2
- HazMat 101 - www.hazmat101.com
- HazMat Safety Community - www.phmsa.dot.gov/hazmat
- Crisis Emergency & Risk Communication - <http://www.bt.cdc.gov/cerc/CEROnline/index.html>
- Human Accountability Metrics - www.opm.gov/hcaaf_resource_center
- Plan to Stay in Business - www.ready.gov/business/index.html



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Before you start...

- Do you have the necessary IRP and policies in place?
- Do you have adequate training and equipment?
- Do you have enough resources?
- Is everyone on board?



http://www.fas.org/irp/doddir/army/fm100-19/fm100-19_9.html



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HazMat Response to a leak in the Effluent Decontamination System (EDS)



Effluent Decontamination Process



<http://www.pri-bio.com/thermobatch.php>

- Three ThermoBatch Thermal Reactors alternate in fill, treatment and standby cycles
- Alarm activated system repeat/shutdown with parameter failures
- Automatic valve isolation for mechanical failures
- pH/Cooling (140 °F) collection tank prior to disposal



Considerations

- Scenario Selection
- Hazard Identification
- Notification System
- Responses
 - Security
 - HazMat
 - Medical
 - Engineering
 - PPE
 - Decon & Clean Up
- ICS Organizational Structure
- Communication
- Hazard Control Zones
- Suspend/or limit laboratory activities
- Evacuate or shelter in place
- Regulatory Requirements
- Public Relations
- Termination Activities
- Air/surface sampling
- Benchmarks



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Exercise

- Event 0: Drill Preparation
- Event 1: Leak Identification
- Event 2: Biosafety/Engineer Initiates Risk Assessment & Mitigation
- Event 3: Incident Command System Initiates Incident Action Plan
- Event 4: NIH Police and Security Response
- Event 5: Comprehensive HazMat Response
- Event 6: Termination Activities
- Event 7: Additional Measures



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- Event 0: Drill Preparation
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- Event 3: Incident Command System Initiates Incident Action Plan
- Event 4: NIH Police and Security Response
- **Event 5: Comprehensive HazMat Response**
- Event 6: Termination Activities
- Event 7: Additional Measures



Evaluators

- Four evaluators were assigned to observe different components of the response
 - Incident Command
 - Security
 - HazMat
 - Medical + Other
- Activity Log: The information obtained from the table top exercise allowed us to develop a checklist of expected actions and benchmarks for the evaluators to track



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Event 0: Drill Preparation

EVENT 0: Drill Preparation

Expected Actions:

- Evaluators are briefed on scenario, assignments and evaluation criteria

Yes	No	N/A	Expected Actions	Comments
☒	☐	☐	Set up of mock leak	Description: Set up by Thomas Arminio and Kevin Mora. A 10-15 gallon leak simulation was set up in the EWS room. The leak originates from a valve in a pipe going into the tank A.
☒	☐	☐	Evaluators briefed on assignments and scenario as well as observing the following indicators: - Are additional resources necessary? - Are parts of the plan in need of revision? - Is additional training required? - Are staffing level adequate? - Is the communication system vulnerable to overload? - Can first responder units communicate with each other?	Time: 8:00am Description: Evaluators met in room in IRF conference room - EOC: Hao Vu - HazMat: Dan Long - Security: Joe Ward - Occupational Exposure: Alexis Them Note: Need to have evaluator(s) for - Facilities Operations - Biosafety
☒	☐	☐	Campus broadcast of the initiation of drill - Address time period and location - Address procedures to account for genuine emergencies	Time: 7:48am Description: A campus wide email was sent out by Nancy Hoe notifying all personnel to be aware of the drill in progress in building 28. All genuine emergency notifications by the institution will be appropriately distinguished from drill driven activities. All incoming genuine emergency notifications to the security control room must also be appropriately identified as not being associated with the drill.

- Drill Preparation
- Prepare incident
- Brief evaluators
- Campus wide notification



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Event 1: Leak Identification



- Leak Identification
- Initial response including notification



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Event 2: Initial RA & Mitigation



- Risk assessment (RA)
- Initiate ICS
- Initial occupational health considerations

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Event 3: ICS develops IAP



- Organize ICS
- Incident Action Plan (IAP)
- Consider external notification/resources



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Event 4: Police & Security Response



- Notification system
- Risk assessment & communication
- Perimeter and access control
- Hazard communication

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Event 5: HazMat Response



- Organize team
- Risk communication
- Checklists
- Risk assessment
- Risk communication
- Coordinate plan
- Hazard control zones
- Response: Recon, Entry/Reentry, Decon



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Event 5: HazMat Response



Divert Flow



Shut of Valve



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Event 5: HazMat Response



Simulated suit tear



Exit



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Event 5: HazMat Response



Post-decon reporting



Risk Assessment/Communication



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Event 5: HazMat Response



Reporting to HazMat Leader



Medical Assessment



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Event 5: HazMat Response



Isolation room: Potential exposure education and debriefing

Event 6: Termination Activities



- Risk communication
- Branch/Section debriefing
- Finalize IAP
- Terminate ICS

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Event 7: Additional Measures

NIH News Release

NATIONAL INSTITUTES OF HEALTH

National Institute of Allergy
and Infectious Diseases

FOR IMMEDIATE RELEASE
Tuesday, January 27, 2009

Contact: [REDACTED]
40 [REDACTED]

Rocky Mountain Laboratories Responds to Leak

Rocky Mountain Laboratories confirmed that Tuesday morning a small leak in a decontamination tank was contained. During the daily safety inspection, liquid was noticed in the contamination area where the decontamination tanks are located. Following standard procedures security was notified and the RML Hazmat team was called to the scene. The area of the building was immediately blocked off.

The RML emergency plan was activated to ensure the safety of all employees, animals, responders and the public.

The RML Hazmat team diverted the leak to another decontamination tank. Chemical disinfection of the fluid was used as an added precaution. All liquid waste from the level four area is decontaminated before it enters the drain area. There was no threat to the public.

NIAID conducts and supports research—at NIH, throughout the United States, and worldwide—to study the causes of infectious and immune-mediated diseases, and to develop better means of preventing, diagnosing and treating these illnesses. News releases, fact sheets and other NIAID-related materials are available on the NIAID Web site at <http://www.niaid.nih.gov>.

The National Institutes of Health (NIH)—The Nation's Medical Research Agency—includes 27 Institutes and Centers and is a component of the U. S. Department of Health and Human Services. It is the primary federal agency for conducting and supporting basic, clinical and translational medical research, and it investigates the causes, treatments and cures for both common and rare diseases. For more information about NIH and its programs, visit <http://www.nih.gov>.

Event 7

- Continuation of medical care
- Continuation of public relations
- Notification of NIH offices
- Notification of state, local, or federal agencies
- Prepared public statement
- Resume normal activities



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Evaluation



After Action Meeting



Lessons Learned

- Revise response plan
- Activate all resources of the ICS
- Acquire more resources
- Maintain equipment
- Train, train, train
- Communicate, communicate, communicate
- Document, document, document
- Synchronize time
- Termination activities are crucial



Emergency BSL4 Extraction

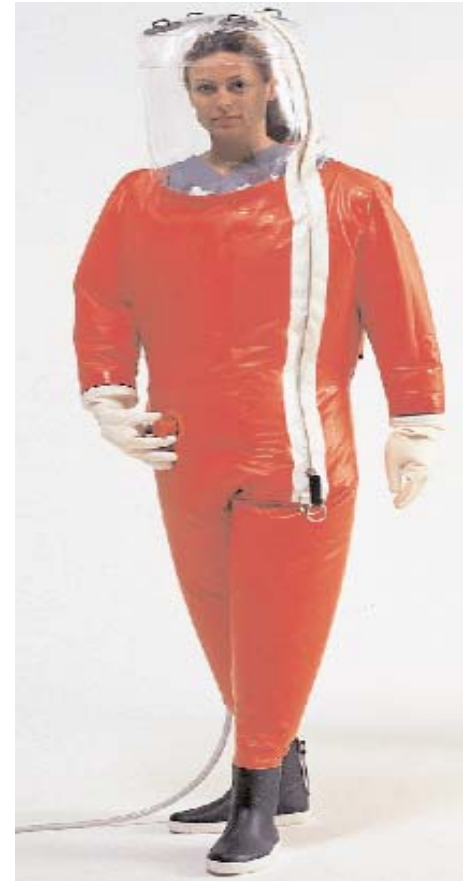


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Positive Pressured Suits



Dover

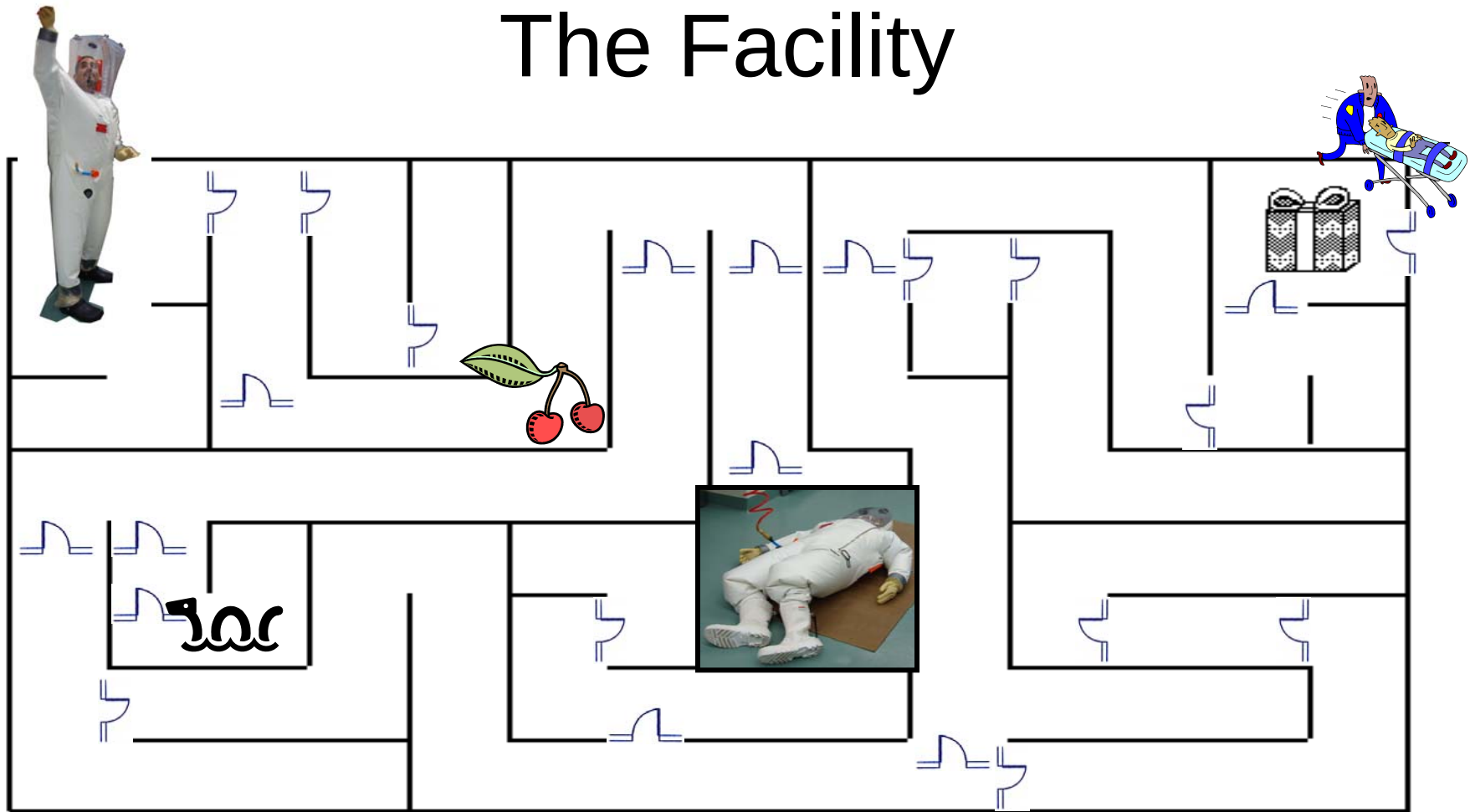


Sperian Delta Protection



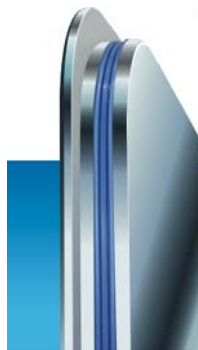
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The Facility



Things you need to know

- Air line drops strategically located throughout facility
- APR (Air Pressure Resistant) door access
 - Security Device = 15 seconds
 - Override Button = 13 seconds
 - Requires sustained engagement of the button in addition to physically securing the door in place



Considerations

- Scenario Selection
- Hazard Identification
- Notification System
- Responses
 - Security
 - Inside/Outside Buddy
 - Medical
 - PPE
 - Decon
 - Transportation
- Video Monitoring
- Unauthorized Access
- Regulatory Requirements
- Occupational Health Concerns
- Containment Practices
- The APR doors
- Public Relations
- Benchmarks



Considerations

- Scenario Selection
- Hazard Identification
- **Notification System**
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 - **Decon**
 - Transportation
- Video Monitoring
- **Unauthorized Access**
- **Regulatory Requirements**
- **Occupational Health Concerns**
- **Containment Practices**
- **APR doors**
- Public Relations
- Benchmarks



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Which Way Out?



Scenario Selection

1. Parenteral Exposure
2. Semi-ambulatory, Unaccompanied, Rescue Extraction
3. Incapacitated, Accompanied, Rescue Extraction



Scenario Selection

1. Parenteral Exposure
2. Semi-ambulatory, Unaccompanied, Rescue Extraction
- 3. Incapacitated, Accompanied, Rescue Extraction**



Evaluators

- Three evaluators were assigned to observe different components of the response
 - Inside buddy
 - Outside buddy
 - Victim
 - Security (not exercised)
 - Emergency Medical Responders (not exercised)
 - Fire Department (not exercised)
- Activity Log: The information obtained from the rehearsal exercise allowed us to develop a checklist of expected actions and benchmarks for the evaluators to track



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Scenario 3

SCENARIO 3A: Incapacitated, Accompanied, Rescue Extraction

Expected Actions:

- Check, Call, Care.
- Initiation of incident notification system as described in the emergency response plan (Section 10).
- Use of Inside/Outside Buddy.
- Decontamination with appropriate disinfectant
- Appropriate exit Procedures followed

	Name	Name
Victim		
Inside Buddy		
Outside Buddy		

Yes	No	N/A	Expected Actions	Comments
☒	☐	☐	Check: Inside buddy discovers of incapacitated personnel.	Time: 0' 11" Description: Inside buddy discovers unconscious personnel in the BSL4 laboratory suite C.
☒	☐	☐	Call: Immediately dial "0" and report description of accident and location.	Time: 0' 15" Description: Reports name, location, and brief incident.
☐	☐	☒	Initiation of incident notification system as described in the emergency response plan (Section 10).	Time: Description: Virtual notification initiated.
☒	☐	☐	Inside buddy checks area and address decontamination issues	Time: Description: Inside buddy performs a thorough check for hazards Atrline (Rescuer):
☐	☐	☐	Transport victim • Creeper • Other mode	Time: 0' 41" Description: Transfers victim onto creeper. Unzips victim's suit about 6 inches. Atrline (Victim): Unhook Atrline (Rescuer): Hook

- Check, Call, Care.
- Initiation of incident notification system as described in the IRP and ERP.
- Use of Inside/Outside Buddy.
- Decontaminate with appropriate disinfectant
- Appropriate exit Procedures followed
- OMS
- Reporting system



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Scenario 3



Pre-Drill Planning



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Scenario 3



CHECK, CALL, CARE



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Scenario 3



Security Device Access

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Scenario 3



Door Override Access



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Scenario 3



Victim Extraction



Lessons Learned

- Revise response plan
- Keep it simple
- Train, train, train
- Need to include the security and medical component
- Synchronize time
- Open forum discussions although tedious provides a healthy discourse that fosters development of new ideas as well as a worthwhile investment in cooperative ownership
- Spirit of competition can prove useful.



Lessons Learned (cont'd)

- Emergency responders will not enter containment space
- Minimize use of Airline whenever possible
- Use of AED and premature initiation of life saving measures may interfere with extraction process
- Strategic use of security door access devices can save time
- Preliminary findings suggest a normal healthy person may have sufficient breathing air for the duration of at least 2-3 minutes before CO₂ levels exceed 24,000 ppm. Further studies needed.



Lessons Learned (cont'd)

- Security video monitoring and on-site security management of unauthorized personnel is highly essential
- Development of predetermined emergency hand signals or gestures for notification may provide an alternative measure for reporting.
- Predetermined scripts for the notification of medical incidents can save valuable seconds
- Notification system and reporting procedures should be drilled into memory



Lessons Learned (cont'd)

- Determining the details of inside/outside buddy system provides clarity to the response procedures
- Predetermining decontamination strategies (shower/deluge/pump spray) for scenarios reduces extraction time
- Provision of an emergency extraction kit should include PPE, utility scissors (2 pairs), and betadine scrub.



Conclusion

Emergency Response Exercise



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Summary

- Emergency drills are an opportunity to improve performance and collaboration amongst stakeholders to include administration, biosafety, facilities, engineering, security, occupational health, public relations and emergency responders.
- Results suggest that a comprehensive training effort beyond the immediate responders is a key element in identifying improvements and informed decision making.
- **IRP is a living document.**



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Acknowledgements

HazMat Response Drill

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- Angela Reagan
- NIH Safety Engineering Activities Group
- RML HazMat Team
- NIH Police/Security
- Participants
- Maryland Fire & Rescue Institute

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- Megan Morgan
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Questions?

“What we know about individuals, no matter how rich the details, will never give us the ability to predict how they will behave as a system. Once individuals link together they become something different ... Relationships change us, reveal us, evoke more from us. Only when we join with others do our gifts become visible, even to ourselves.”

- Margaret Wheatley and Myron Kellner-Rogers

