



# Washington Group International

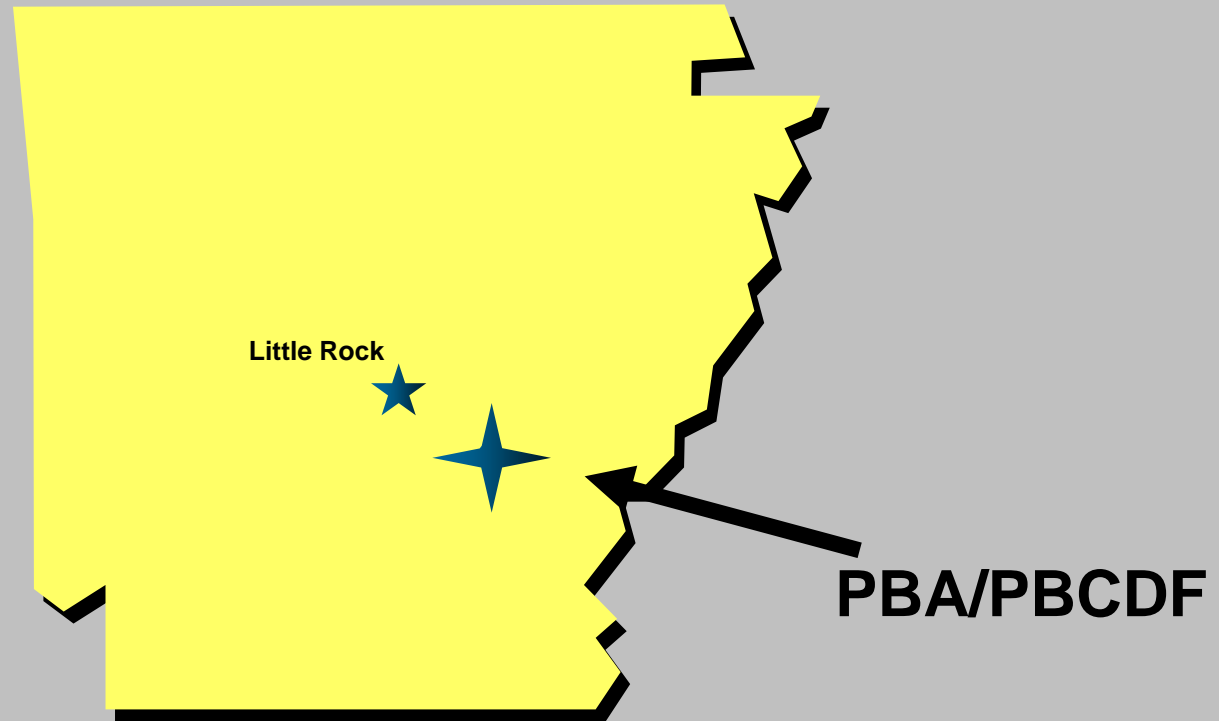
Integrated Engineering, Construction, and Management Solutions

## Safety Basis Development/Implementation for “Limited Life” Facilities

Raymond S. Jasniecki



# Pine Bluff Arsenal/Pine Bluff Chemical Disposal Facility

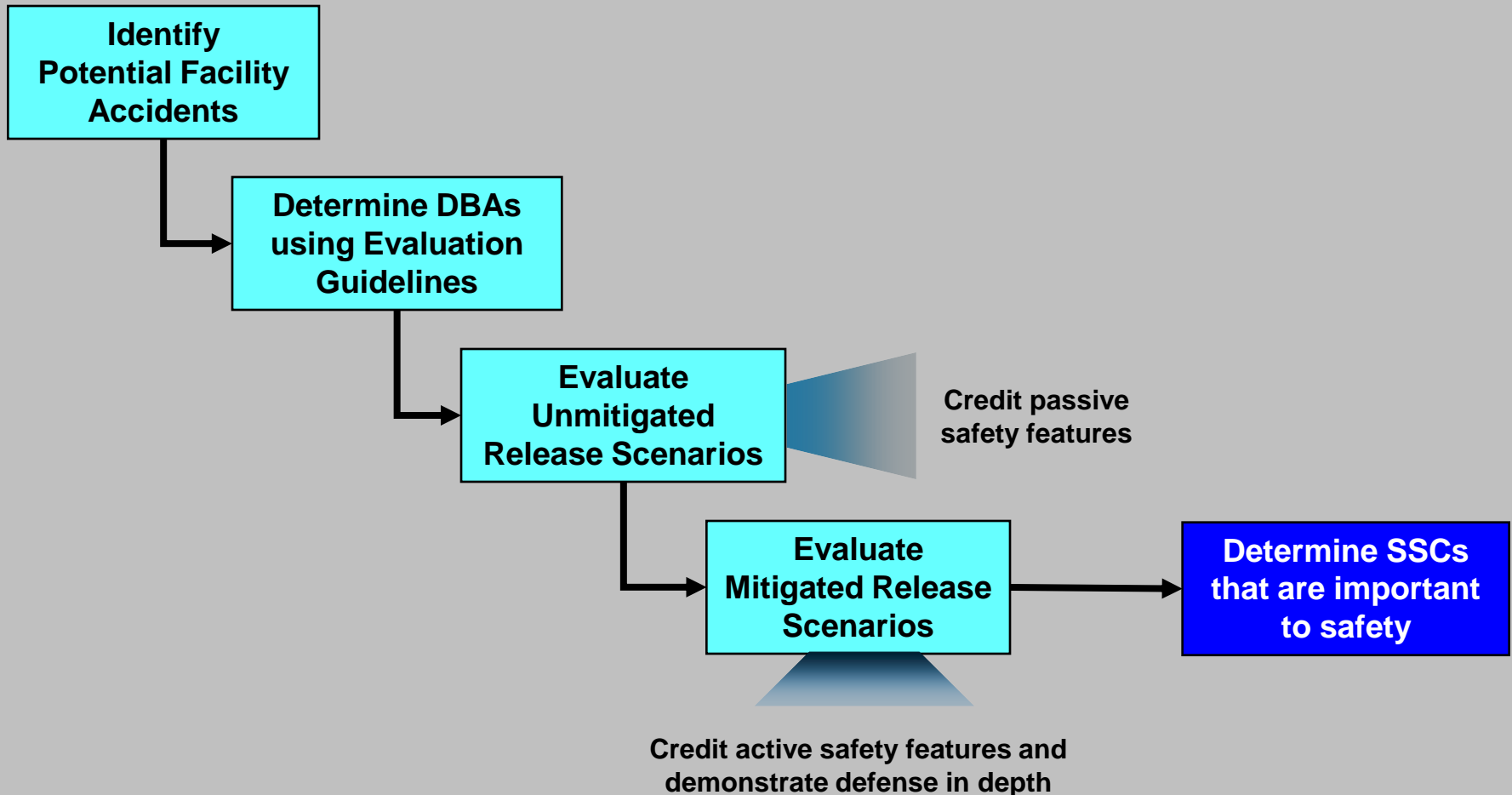


# Pine Bluff Chemical Disposal Facility (PBCDF)



- ◆ PBA Originally Contained 12% of the US Chemical Stockpile
- ◆ Nerve Agents (GB and VX) and Blister Agents (HD/HT)
- ◆ Stored in Rockets, Mines, and Bulk containers
- ◆ Chemical Agent Disposal Operations Began March 2005
- ◆ Disposal Technology: Incineration
- ◆ Current Planned Operational Life: 65 Months

# Safety Basis Development



# Safety Basis Development

- **Basic elements of Safety Basis Document (SBD) development process include:**
  - 1. Establish Evaluation Guidelines (EGs),**
  - 2. Screen the QRA and identify accidents,**
  - 3. Select controls to reduce consequences below EGs, and**
  - 4. Preserve controls in the Limiting Conditions for Operations (LCOs).**
- **Decision made to use the Quantitative Risk Assessment (QRA) to define the risk to the Public and Co-located Worker associated with chemical agent operations.**

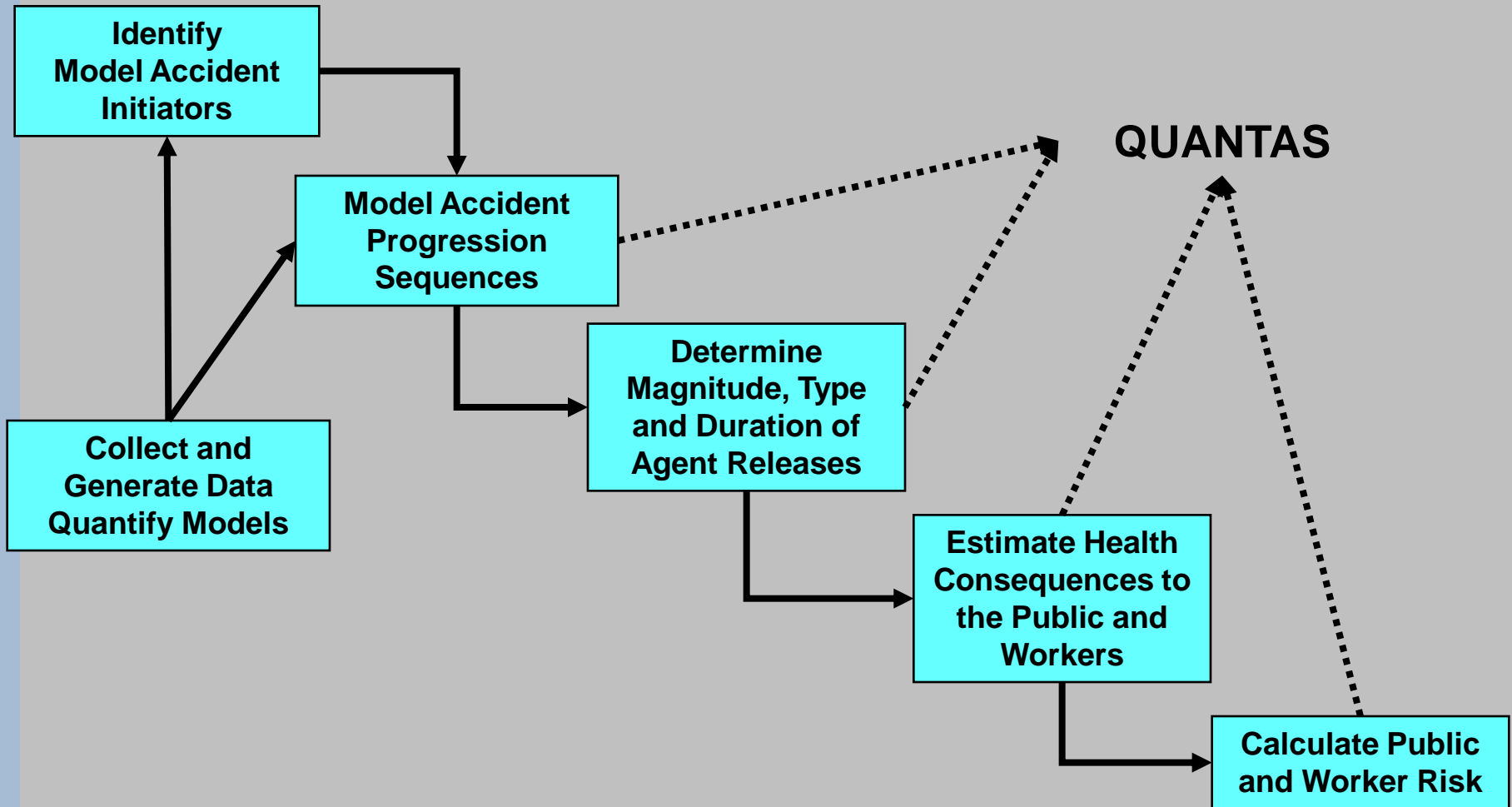
# QRA

- ◆ **The QRA is a comprehensive analysis developed by SAIC to exam risks to the Public and Collocated Workers associated with potential accidental releases of agent during Demilitarization Operations and Continued Stockpile Storage**
- ◆ **The QRA identifies all agent related risk contributors (Internal and External Events)**
- ◆ **Accident Frequencies and Source Terms are readily available**
- ◆ **The Analysis was thoroughly reviewed and sanctioned by the National Research Council**

# QRA Objectives

- ◆ **Provide a basis for Risk Management**
  - Identify Agent-Related Risk Contributors (Internal and External Events)
  - Assure Design minimizes potential for agent release
  - Identify Operational Improvements
- ◆ **Allow Comparison of Disposal Operations versus continued storage risks**
- ◆ **Allow Comparison of Facility Operation risks to other lifetime risks**
- ◆ **Develop scenarios for emergency preparedness planning**
  - Natural phenomena (earthquake, tornado, etc.)
  - Manmade (aircraft, wildfires, etc.)

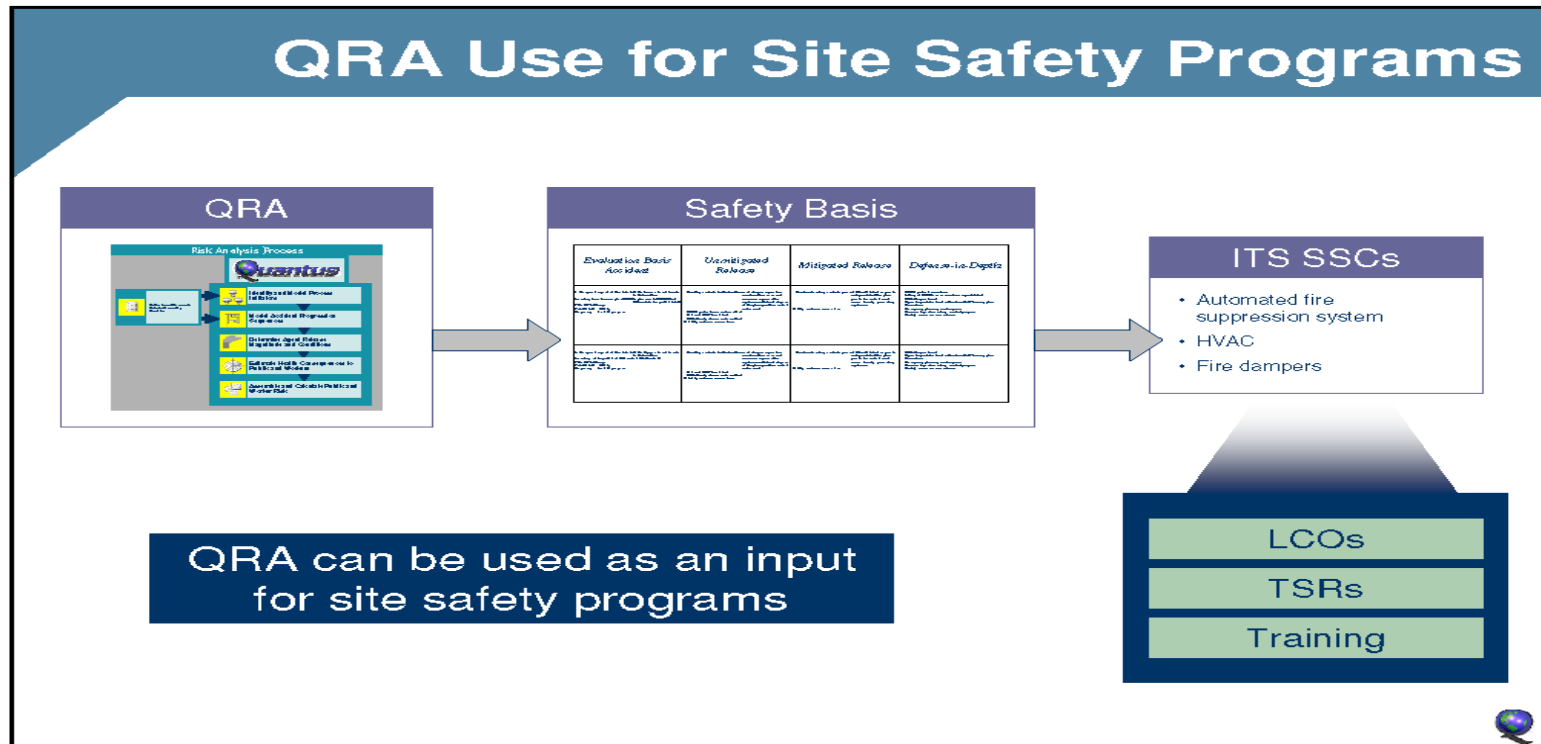
# QRA Process



# Safety Basis Development Process

- ◆ Accident frequency was based on a review of the Site specific Quantitative Risk Assessment
- ◆ Site specific EGs determined
- ◆ If accident frequency determined “Credible” OR If the release had the potential to challenge/exceed the EGs, THEN accident was classified as an EBA
- ◆ An interdisciplinary team of SAIC, PBCDF Technical Personnel, and PFO representatives was assigned to further evaluate the designated EBAs
- ◆ Goal to demonstrate, through realistic assumptions and conservative accident analysis, that releases following an EBA will NOT challenge/exceed the EGs through application of layers of controls “Defense in Depth”.

# Putting It All Together



# LCO Development

- ◆ **The LCOs are strictly based on Quantitative Risk/Accident Analyses.**
- ◆ **LCO Format was benchmarked from Government Owned Contractor Operated DOE Facilities and Commercial Nuclear/Power Industries**
- ◆ **The LCOs protect the SSCs, Equipment, Design features, and Administrative Controls that are “Important to Safety”.**
- ◆ **If the LCO Limits are exceeded the direct result could be failure of the barriers that prevent uncontrolled releases of agent, with potential consequences to the Public above the Evaluation Guidelines**

# LCO Compliance

- ◆ **Compliance with LCOs is verified on continuous basis and prior to Mode Changes (e.g., Shutdown to Standby to Operation).**
- ◆ **LCO Compliance is demonstrated by:**
  - **Operating within ranges or setpoints specified by approved SOPs when applicable (Normal Operations)**
  - **Operating within the Required Actions of the LCOs**
  - **Performing all Surveillance Requirements when required (Surveillance Requirements constitute OPERABILITY)**
  - **Maintaining/Controlling the configuration of Design Features**
  - **Establishing, Implementing Administrative Controls**
- ◆ **Operations tracks noncompliant LCO CONDITIONS, Required Actions, and Compensatory Measures**
- ◆ **Facility report was developed to assist Operators with LCO Compliance decisions**

# LCO Compliance

2.1.1		RED									
Para.	Sch Date	Reg		Date Due	Tag Number	PM Number	PM Title / Work Order Number and Title		Status		
LCO 2.1.1	4/28/07	N	90	5/13/07	30272-EONC-224	PME-QU-245	MA-0000065087-000_ENHANCED ONSITE CONTAINERS ANNUAL		GREEN		
LCO 2.1.1	4/29/07	N	90	5/14/07	35360-EONC-198	PME-QU-245	MA-0000068163-000_EONC SEMI-ANNUAL		GREEN		
LCO 2.1.1	5/4/07	N	90	5/19/07	35359-EONC-197	PME-QU-245	MA-0000068162-000_EONC SEMI-ANNUAL		GREEN		
LCO 2.1.1	4/29/07	N	90	5/14/07	19618-EONC-222	PME-QU-245	MA-0000065084-000_ENHANCED ONSITE CONTAINERS ANNUAL		GREEN		
LCO 2.1.1	3/30/07	N	90	4/14/07	19617-EONC-221	PME-QU-245	MA-0000068245-000_EONC QUARTERLY		GREEN		
LCO 2.1.1	3/20/07	N	90	4/4/07	19613-EONC-220	PME-QU-245	MA-0000068244-000_EONC QUARTERLY *VAL*		YELLOW		
LCO 2.1.1	4/18/07	N	90	5/3/07	19612-EONC-219	PME-QU-245	MA-0000065081-000_ENHANCED ONSITE CONTAINERS ANNUAL		GREEN		
LCO 2.1.1	4/18/07	N	90	5/3/07	18319-EONC-218	PME-QU-245	MA-0000065078-000_ENHANCED ONSITE CONTAINERS ANNUAL *VAL*		GREEN		
LCO 2.1.1	4/11/07	N	90	4/26/07	18318-EONC-217	PME-QU-245	MA-0000068164-000_EONC SEMI-ANNUAL *VAL*		GREEN		
LCO 2.1.1	6/5/07	N	90	6/20/07	35358-EONC-133	PME-QU-245	MA-0000068161-000_EONC SEMI-ANNUAL		GREEN		
LCO 2.1.1	6/6/07	N	90	6/21/07	35357-EONC-167	PME-QU-245	MA-0000067353-000_ENHANCED ONSITE CONTAINERS ANNUAL		GREEN		
LCO 2.1.1	6/5/07	N	90	6/20/07	35356-EONC-168	PME-QU-245	MA-0000068160-000_EONC SEMI-ANNUAL		GREEN		
LCO 2.1.1	6/5/07	N	90	6/20/07	35355-EONC-115	PME-QU-245	MA-0000068159-000_EONC SEMI-ANNUAL		GREEN		
LCO 2.1.1	5/28/07	N	90	6/12/07	MMS-CNVM-103	PME-QU-184	MA-0000067184-000_MUNITIONS CONVEYORS		GREEN		
LCO 2.1.1	5/17/07	N	90	6/1/07	MMS-CNVM-104	PME-QU-184	MA-0000067185-000_MUNITIONS CONVEYORS		GREEN		
LCO 2.1.1	4/25/07	N	90	5/10/07	MMS-CNVM-102	PME-QU-184	MA-0000067183-000_MUNITIONS CONVEYORS		GREEN		
LCO 2.1.1	4/28/07	N	90	5/13/07	30273-EONC-223	PME-QU-245	MA-0000065652-000_ENHANCED ONSITE CONTAINERS ANNUAL		GREEN		
LCO 2.1.1	4/25/07	N	90	5/10/07	MMS-CNVM-101	PME-QU-184	MA-0000067182-000_MUNITIONS CONVEYORS *VAL*		GREEN		
LCO 2.1.1		N	0		UPA-MONO-401	PME-MO-133	Campaign Change Over Only		GREEN		
LCO 2.1.1	3/29/07	N	30	4/5/07	MMS-CNVP-135	PME-MO-187	MA-0000069024-000_TRAY CONVEYORS		GREEN		
LCO 2.1.1	3/29/07	N	30	4/5/07	MMS-CNVP-134	PME-MO-187	MA-0000069027-000_TRAY CONVEYORS		GREEN		
LCO 2.1.1	3/29/07	N	30	4/5/07	MMS-CNVP-111	PME-MO-187	MA-0000069026-000_TRAY CONVEYORS		GREEN		
LCO 2.1.1	3/24/07	N	30	3/31/07	MMS-CNVP-107	PME-MO-187	MA-0000068895-000_TRAY CONVEYORS		YELLOW		
LCO 2.1.1	3/26/07	N	30	4/2/07	MMS-CNVP-105	PME-MO-187	MA-0000069025-000_TRAY CONVEYORS		YELLOW		
LCO 2.1.1	2/28/07	N	30	3/7/07	MMS-CNVP-103	PME-MO-187	MA-0000068546-000_TRAY CONVEYORS		RED		
LCO 2.1.1	3/30/07	N	30	4/6/07	UPA-CNVP-108	PME-MO-158	MA-0000069022-000_SCISSOR LIFT CONVEYOR		GREEN		
LCO 2.1.1		N	0		UPA-CRAN-401	PME-MO-134	Campaign Change Over Only		GREEN		
LCO 2.1.1		N	0		TMA-CRAN-401	PME-MO-134	Campaign Change Over Only		GREEN		
LCO 2.1.1	4/5/07	N	30	4/12/07	CHB-CRAN-402	PME-MO-134	MA-0000069120-000_BRIDGE CRANE AND TROLLEY HOIST		GREEN		
LCO 2.1.1	4/5/07	N	30	4/12/07	CHB-CRAN-403	PME-MO-134	MA-0000069120-000_BRIDGE CRANE AND TROLLEY HOIST		GREEN		
LCO 2.1.1		N	0		CHB-MONO-409	PME-MO-133	Campaign Change Over Only		GREEN		
LCO 2.1.1		N	0		COR-MONO-404	PME-MO-133	Campaign Change Over Only		GREEN		
LCO 2.1.1		N	0		ECV-MONO-401	PME-MO-133	Campaign Change Over Only		GREEN		
LCO 2.1.1		N	0		ECV-MONO-402	PME-MO-133	Campaign Change Over Only		GREEN		
LCO 2.1.1	5/13/07	N	90	5/28/07	30275-EONC-225	PME-QU-245	MA-0000065653-000_ENHANCED ONSITE CONTAINERS ANNUAL		GREEN		
LCO 2.1.1	5/4/07	N	90	5/19/07	30291-EONC-227	PME-QU-245	MA-0000065654-000_ENHANCED ONSITE CONTAINERS ANNUAL		GREEN		

# LCO Verification

- ◆ **LCO Compliance established by observing normal operations as part of the CON Supervisor/Plant Shift Manager Turnover Process (Management by Exception)**
- ◆ **Methods to Verify LCO compliance include:**
  - **Routine Operator Surveillances as required by Standing Operating Procedures IAW CONOPS**
  - **Direct Observation on the Integrated Control System Screen or Panel**
  - **Information recorded on an Operator Reading Sheet**
  - **Information recorded on a Logbook or Turnover Checklist**
  - **Information recorded on Inspection Sheets**
  - **Information recorded in a standard report supplied by Technical Support Personnel**
  - **Repetitive Operation Activity Log (ROAL)**
  - **TRAC Database and Crystal Report**

# LCO Verification

- ◆ **Non-compliance with an LCO occurs as a result of:**
  - **Failure to complete a Required Action within the specified Completion Time following failure to comply with an LCO**
  - **Failure to perform a Surveillance Requirement (SR) within the required periodicity**
  - **Failure to comply with an Administrative Control**
  - **Failure to maintain a Design Feature**

# LCO Verification

- ◆ **Oncoming/Off-going Personnel shall conduct a comprehensive review of the following documents prior to transfer of responsibility:**
  - **Logbooks to understand Facility Tasks/Evolutions completed, in progress, and planned as well as general information Lockout/Tagouts in place to identify abnormal valve/switch alignments that could impact Safety-Related equipment**
  - **Operator Round/Reading Sheets**
  - **Equipment Status Logs/Boards**
  - **LCO Tracking Log- Review open noncompliant LCO Conditions to determine if Required Actions are coming due during the oncoming shift**
  - **Temporary Modification Logs**

# LCO Verification

- ◆ **Oncoming Plant shift Manager shall ensure :**
  - **Minimum Shift Crew Composition is sufficient to meet anticipated Operational demands (e.g., sufficient HAZMAT Team Personnel are available)**
  - **Operations personnel are “Fit For Duty”**
  - **Operations personnel are certified/qualified (as required) to perform assigned duties**
  - **Oncoming Operations personnel are cognizant of current LCO status**
  - **Chemical Agent Inventory does not exceed MAR Limits**
  - **All repairs/corrective maintenance on Safety-Related Equipment/support equipment completed, equipment tested and returned to normal operations per the associated SOP.**
  - **No active alarms exist on Safety-Related Equipment/support equipment**

# LCO Verification

- ◆ **A well documented Shift Turnover will establish LCO compliance and authorize continued operation**

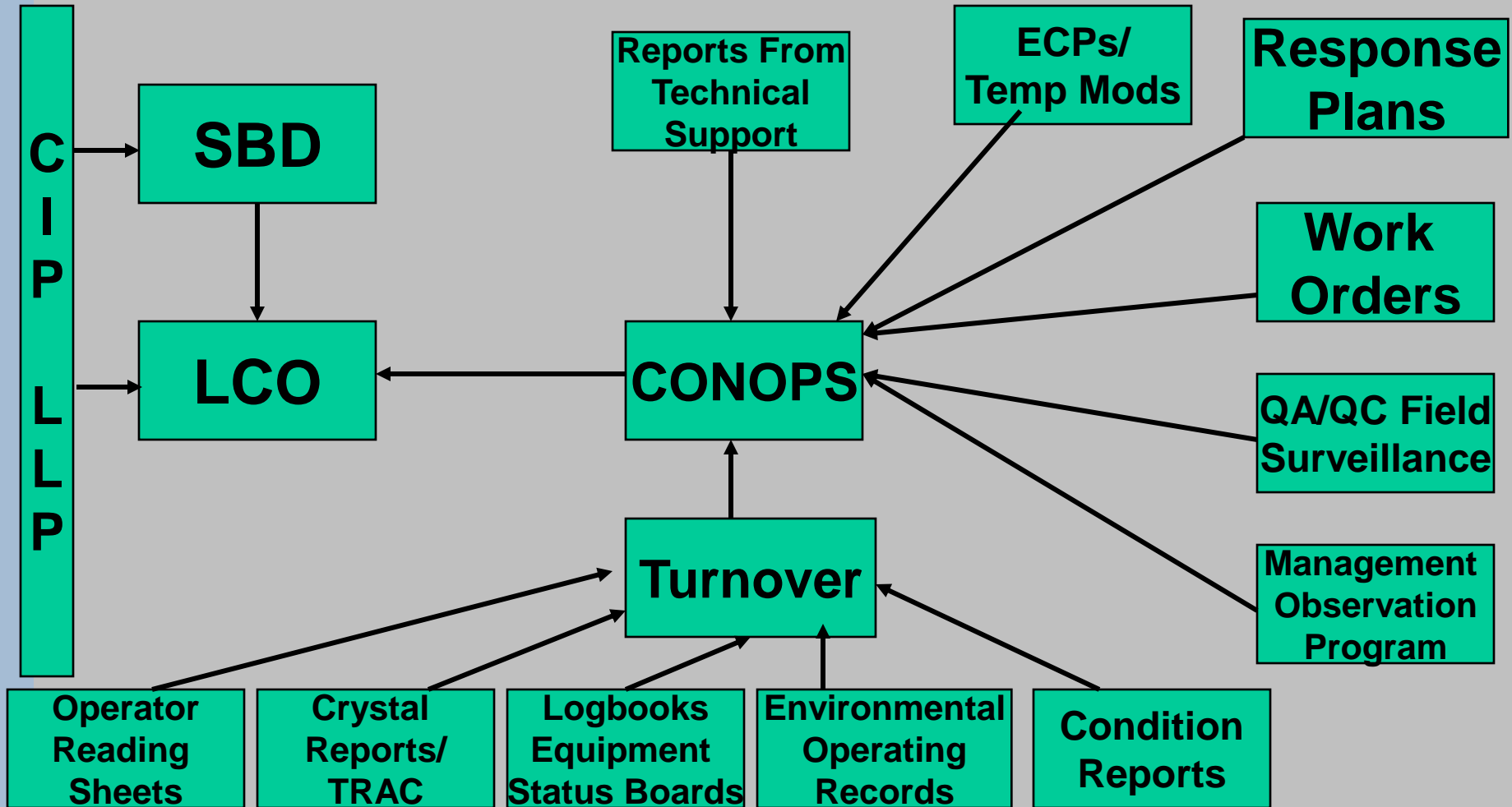
# LCO Process Summary

- ◆ **LCO Requirements are based on Safety/ Risk Criteria**
- ◆ **A separate document was developed to address Regulatory and DA Regulations/ Guidelines.**
- ◆ **LCO Requirements are incorporated into approved Facility Plans, Procedures, and Work Instructions (e.g., PMEs)**
- ◆ **LCO Controls are “Flagged” in applicable Facility Documents**

# LCO Process Summary

- ◆ **LCO Compliance is established by observing Normal Operations (CONOPS)**
- ◆ **A good Operational Turnover is Crucial to Verifying LCO Compliance**
- ◆ **Deviations to LCO Requirements are NOT permitted.**
- ◆ **Operations will track entry into LCO Conditions, exit from LCO Conditions, and Required Actions/Compensatory Measures as required by CONOPS.**

# LCO Process Summary



# Lessons Learned

- ◆ **Greatest risk to the Public and Collocated Workers results from Continued Stockpile Storage**
- ◆ **Accident Analysis sufficiently conservative to demonstrate that chemical agent releases following an EBA will not exceed Evaluation Guidelines. This was accomplished by incorporating “Safety Margin”**
- ◆ **Use of “Mass Based” Evaluation Guidelines, which eliminate the need to justify precise release mechanisms, times, and meteorological conditions simplifies the analysis**
- ◆ **Since many of the EBA were Low Frequency/High Consequence, probability and frequency served a limited role in the analysis.**
- ◆ **The LCO Compliance process built upon and complemented existing Preventive Maintenance/Operator Doctrine (e.g. CONOPS) where possible rather than establishing additional workloads**
- ◆ **Use of existing Safety Management Programs to satisfy Safety Basis commitments has proven to be very effective.**

# Results



- ◆ **PBCDF startup declared “Safest and Most Efficient Startup in Assembled Chemical Warfare History”**
- ◆ **Facility recently celebrated 2 years of successful chemical weapons disposal operations**
- ◆ **More than 900,000 lbs of Chemical Agent has been eliminated**
- ◆ **Programmatic Storage Risk has been reduced by 75 %. PBA Storage Risk has been reduced by 63 %.**
- ◆ **Accomplished with SAFETY as the number one priority.**