

Lawrence Livermore National Laboratory

LLNL – All Things Beryllium



Steven Lee and Reggie Gaylord
November 3, 2010

“Ensuring safe and secure operations within the Laboratory is the No. 1 priority.”

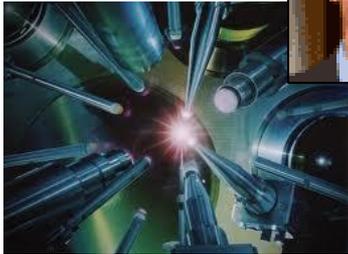


The Lab has accelerated its beryllium sampling and awareness campaigns in response to “a troubling increase in the number of Lab employees that have been shown to be sensitized to beryllium, starting in 2006.” [2008]

“We are putting controls in place for work in buildings known or suspected to contain beryllium, are providing additional training for workers and supervisors and we are bringing in nationally recognized experts to help us,” Miller said.

“While we have a comprehensive safety program in place, we take this input from NNSA very seriously,” Miller said. The Lab is voluntarily taking the safety pause to further evaluate work controls, procedures and training, and will work “diligently with the Livermore Site Office and NNSA on additional ways to improve its program.” [2009]

“It is an unending task, requiring constant vigilance and continued questioning.”

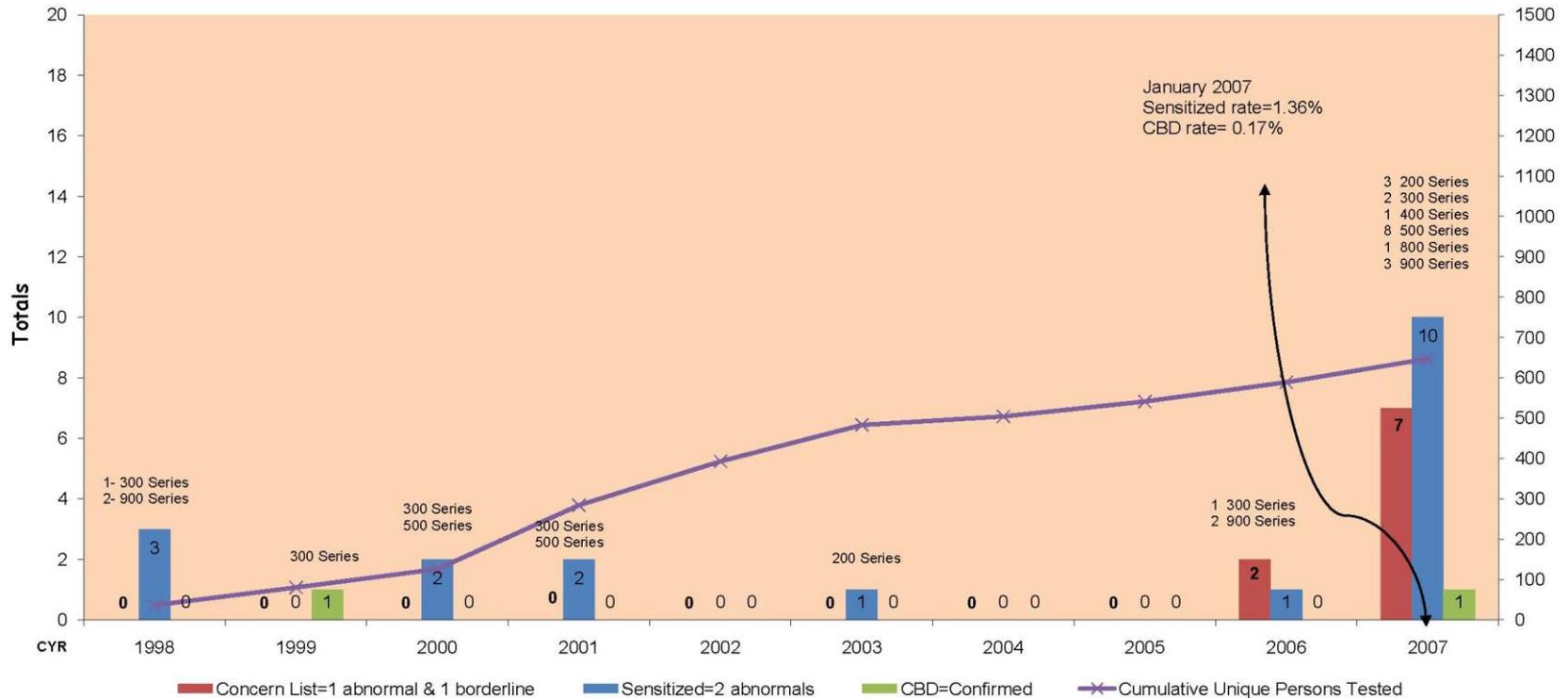


Prior to 2006/7 Medical surveillance population was predominantly hands on workers such as machinists – 1.28% sensitization

Total HSD Beryllium Workforce Concern/Sensitized/CBD 1998-2007

N=647 Concern List=9 Sensitized=19 CBD=2

Sensitized Rate=2.94% CBD Rate=0.31%



Exposure monitoring data did not indicate uncontrolled or unidentified activities

- In 1998, 5 personal air samples collected
 - 4 Non-detect and below AL
 - 1 detect and below AL
 - 0 at or above AL but below PEL

- FY2007, 548 personal air samples collected
 - 510 Non-detect and below AL
 - 38 detect and below AL
 - 0 at or above AL but below PEL



Three things hit us in 2007 - 2008

- An unexpected change in our medical surveillance trends
 - More sensitized workers
 - Sensitization in work groups where we didn't expect it
- Off-normal events
 - Discovery of beryllium surface contamination outside of posted work areas
 - Many pointed out work control issues
- Internal and external reviews
 - NNSA Independent Review in Fall of 2008

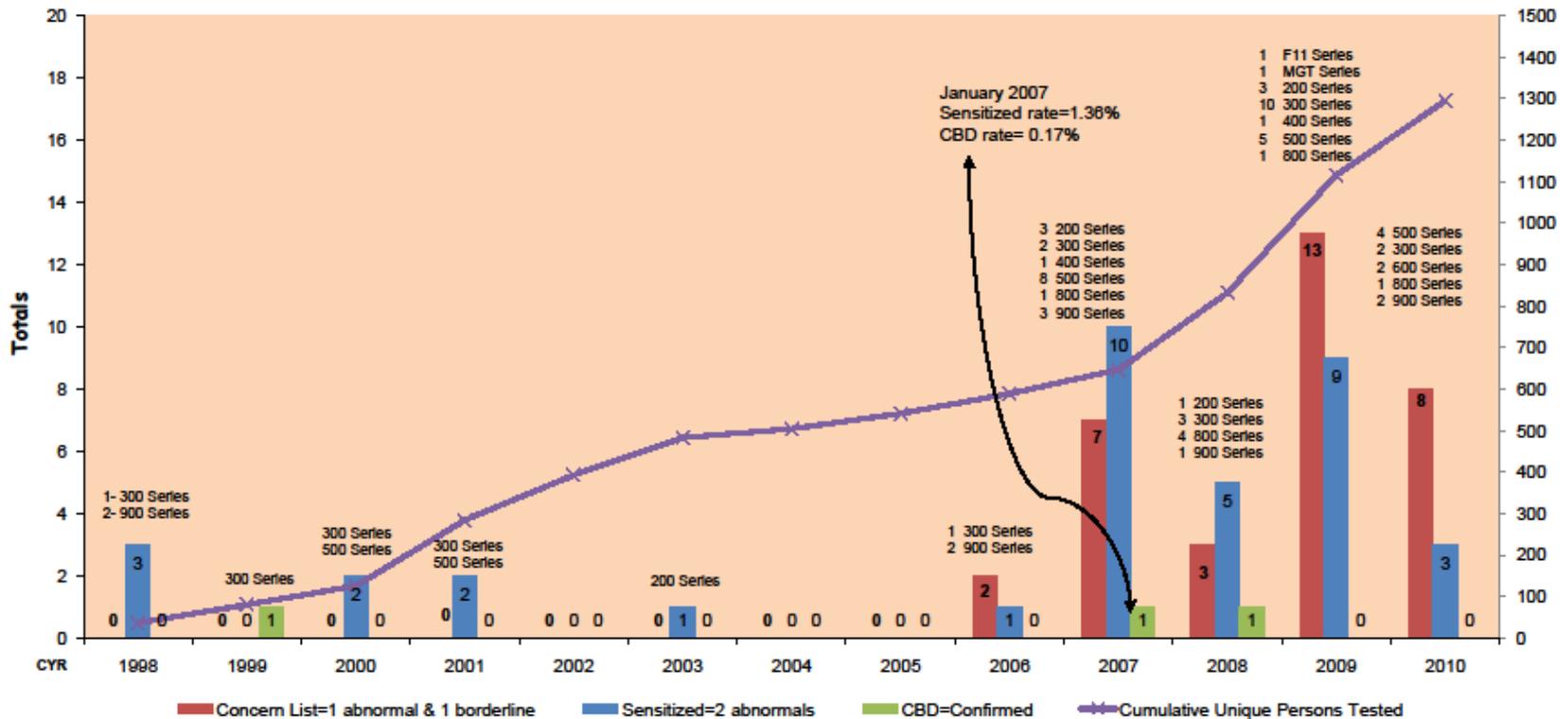


LLNL Medical Surveillance trends show increased rates of Be-affected workers

Total HSD Beryllium Workforce Concern/Sensitized/CBD 1998-9/30/2010

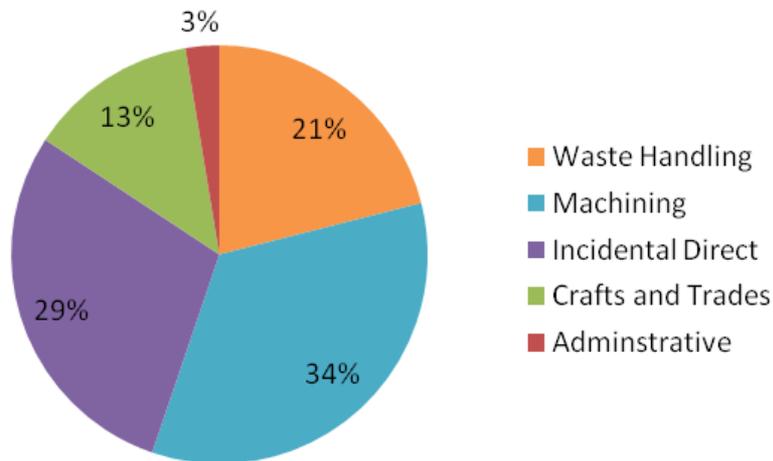
N=1295 Concern List=33 Sensitized=36 CBD=3

Sensitized Rate=2.78% CBD Rate=0.23%



Descriptive analysis of LLNL Be sensitivity

Sensitized/concern Cases by Job Function



- Vast majority of sensitized individuals have a history of working with or around beryllium
- While largest single group is involved in working with Be in dust-producing activities, there are other exposed individuals:
 - Waste technicians and D&D workers
 - Individuals who frequently visit Be work areas (incidental direct)
 - Crafts and trades who work in Be facilities
- The facilities of concern are the ones with histories of extensive Be work



[mid-2009] LLNL has had 12 occurrences or non-compliances in multiple organizations and facilities in the past 18 months

Event	Occurrence report	Noncompliance report	Principle Directorate
"Legacy Beryllium Contamination in Building 321C" (discovery June 12, 2007, reported to ORPS October 15, 2007)	2007-0046	No NC reported	S&T/ Engineering
Medical Surveillance and Removal of the Chronic Beryllium Disease Prevention Program is LTA (discovery, September 12, 2007, reported to NTS October 10, 2007)	Not an occurrence	2007-0022	DO/ ESH&Q
"Unexpected Beryllium Contamination and Associated Ducting, Building 695" (discovery December 3, 2007, reported to ORPS December 18, 2007, reported to NTS Jan. 15, 2008)	2007-0059	2008-0002	W&CI
"Implementation of the CBDPP is inadequate – Uncontrolled Be Work Performed" (discovery 11/15/2007, reported to NTS February 21, 2008)	Not an occurrence	2008-0005	DO/ ESH&Q
"Beryllium and Lead Found in Bulk Samples From Building 298 Yard Bead Blaster Unit" (discovery August 5, 2008, reported to ORPS August 6, 2008)	2008-0030	pending	NIF&PS
"Building 321C Worker's Air Monitor Indicates Action-Level Airborne Beryllium" (discovery April 14, 2008, reported to ORPS October 15, 2008)	2008-0046	No NC reported	S&T/ Engineering
"Unexpected Beryllium Contamination Found in Building 298 Beryllium Work Area" (discovery October 22, 2008, reported to ORPS October 23, 2008)	2008-0051	pending	NIF&PS
The NNSA Independent Review of the CBDPP stated that the LLNL CBDPP did not Adequately Address Certain Requirements of 10 CFR 850 (discovery November 12, 2008, reported to NTS November 18, 2008)	Not an occurrence	2008-0020	DO/ ESH&Q
"Legacy Beryllium Contamination Discovered Inside Toolbox In Building 321A" (discovery January 23, 2009, reported to ORPS January 26, 2009)	2009-0003	TBD	S&T/ Engineering
"Building 298 Yard Bead Blaster Unit Footprint Contamination" (discovery January 28, 2009, reported to ORPS January 29, 2009)	2009-0004	pending	NIF&PS
"Items Labeled "Contains Beryllium" Improperly Disposed" (discovery January 29, 2009, reported to ORPS January 29, 2009, site-reported in ITS February 17, 2009)	2009-0005	Not reported using NTS Site-reported ITS #27164.1	NIF&PS
"Beryllium Contamination Found in Newly Commissioned Bead Blaster in Building 298" (discovery Feb 13, 2009, reported to ORPS Feb 17, 2009, site-reported only ITS Feb 17, 2009)	2009-0011	27261.1	NIF&PS



These Be events shared similar attributes

- Poorly characterized legacy facilities
 - Elevated strata
 - Equipment footprints
- Having non-Be workers in Be Work Areas
 - Inadequate process for “release”
 - “Released” does not mean 0% probability of encountering beryllium contamination!
- Inadequate work control
 - Process for identifying facility area hazards was not robust
 - Poorly defined scope
 - Inconsistent controls for different organizations performing the same work
- Subcontractors exposed to un-identified hazards

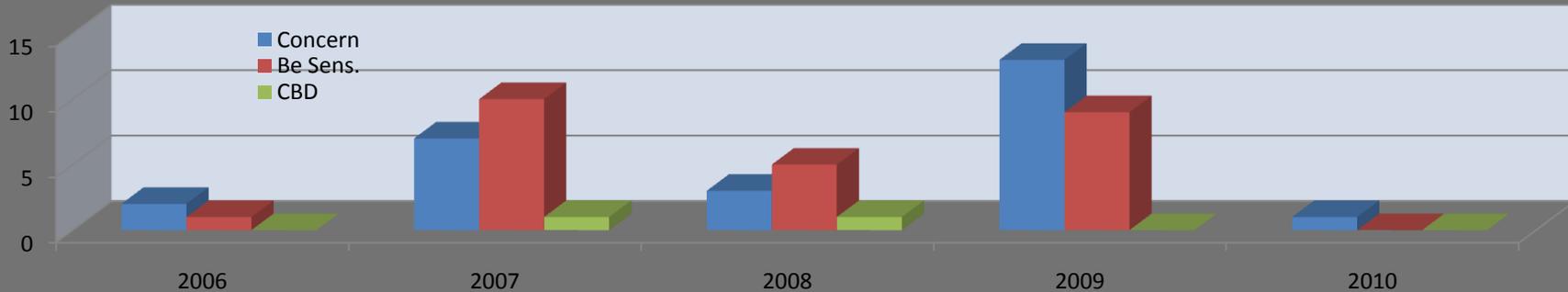


NNSA had significant concerns with our performance

- NNSA conducted an independent review of the LLNL Chronic Beryllium Disease Prevention Program (CBDPP) in September of 2008
- Final report received November 12, 2008
 - 9 findings
 - 32 observations
 - Findings include: CBDPP document did not address several sections of the Rule, Baseline inventory was LTA, Communication was LTA, Conduct of IH was LTA, Conduct of assessments was LTA
- **The Human Performance issue of *performance feedback***



Med Surveillance



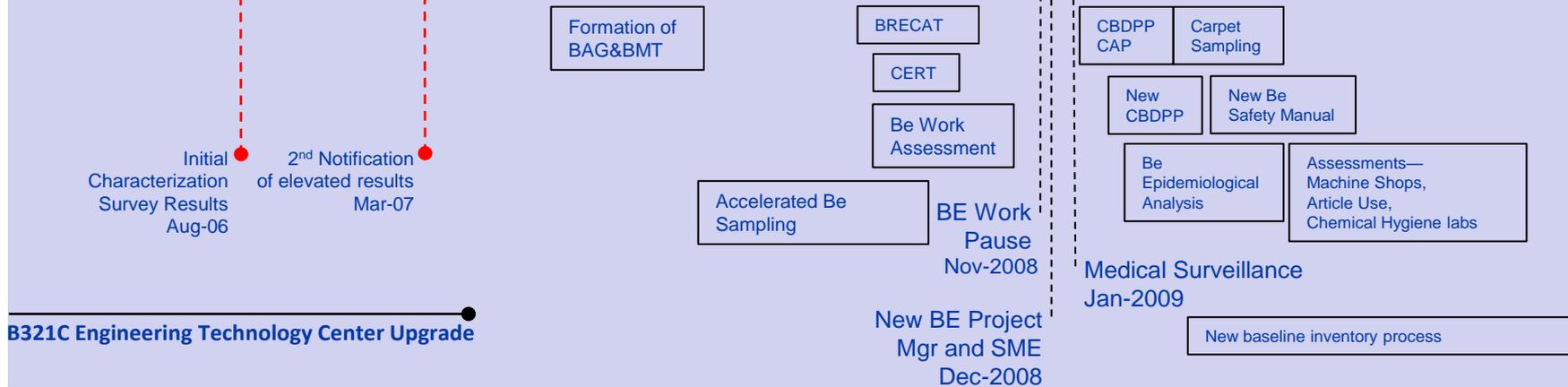
Events



DOE Actions



LLNL Responses



A Causal Analysis was performed in November and December of 2008

- Team consisted of experts in assurances and analysis, ES&H, Facilities and Programs
- Team developed both 11 issue statements, and 7 overarching causes
- Overarching causes
 1. Management historically failed to appreciate the true scope and implications of development and implementation of the CBDPP.
 2. Decisions on the development and implementation of the CBDPP have been handled in the context of an individual discipline assignment, rather than managed as a project.



A Causal Analysis was performed in November and December of 2008

- Overarching causes cont.
 - 3.. The annual customer (LSO) review/comment/approval has resulted in an over-reliance on the customer for program compliance verification *in lieu* of implementing a rigorous internal process.
 4. Due to the informality and ambiguity of communications giving direction, organizations and individuals have not followed-up to the level expected
 5. Institutional procedures have been written broadly to allow for operational flexibility, which has resulted in inconsistent implementation of work-control requirements.
 6. LLNL has a poorly understood mechanism to communicate and track implementation of internal directives from non-line organizations
 7. Feedback regarding beryllium safety has not been incorporated into ongoing processes due to a lack of an established systematic CBDPP approach.



LLNL has undertaken a comprehensive Corrective Action Plan (CAP) for the CBDPP

- During Jan and Feb of 2009, LLNL developed a CAP that addressed multiple Be program deficiencies and weaknesses
- The CAP is meant to “wrap up” all the corrective actions from incidents and reviews, including:
 - The NNSA Independent Review of the CBDPP – Nov. 2008
 - The CBDPP Effectiveness Review Team (CERT) – Aug 2008
 - The Be-Related Events Causal Analysis Team (BRECAT) – July 2008
 - Open corrective actions from 5 Be-related occurrences and non-conformances (2006 – 2008)
- There are 94 total actions, extending for 3 ½ years (until 2012)
- Major topics include the Be program (structure, management, documentation), baseline inventory (gathering historical data, performing hazard analysis, communicating to affected workers), exposure analysis of our Be-affected workforce, strengthening work control (previous commitment of LLNL), industrial hygiene practices, and strengthening operations governance

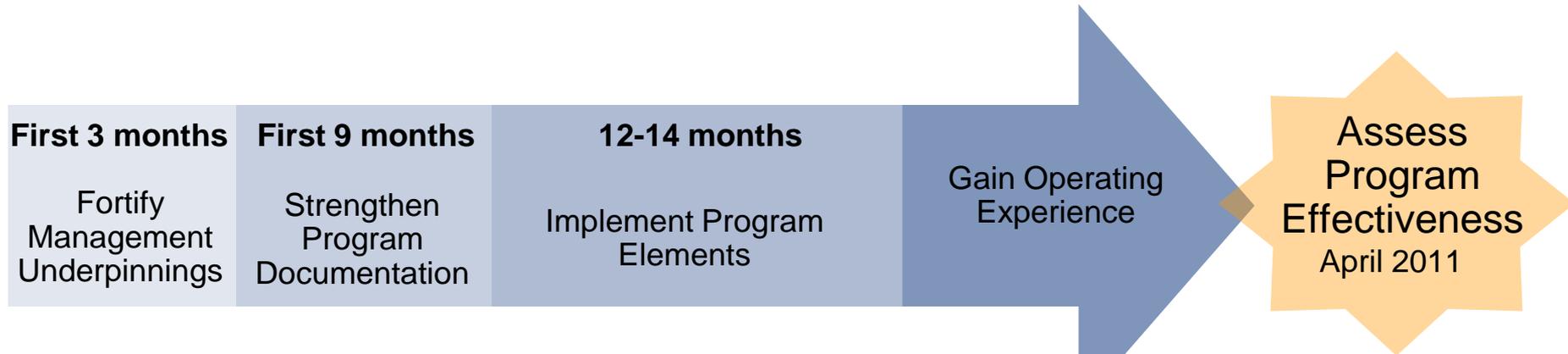


Keys to success for an effort like this

- High level senior management support
 - Be project manager reporting directly to LLNL Deputy Director
 - Resources available quickly
 - Immediate briefings to each organization
- Interdisciplinary group formed “Beryllium Advisory Group”
 - Chaired by LLNL Deputy Director
 - Membership from ES&H, Medical, Legal, Human Resources, Public Affairs, and major impacted programs
 - Met weekly for 2 years
- Project planning discipline
 - There is an end to the project
 - Milestones and deliverables continually communicated
- Build bridges to the NNSA customer
 - Continual communication



Timeline of corrective actions



- ✓ Project Manager
- ✓ Project Plan
- ✓ Communications Plan
- ✓ Increase reporting level of SME
- ✓ Clarify R2A2s for Be-related positions
- ✓ Ensure regular briefings to senior mgmt.
- ✓ IWWC Process
- ✓ EMOD Process

- ✓ CBDPP
 - ES&H Manual Doc. 14.4
 - IH PIMs
- ✓ Baseline Inventory process
- ✓ Characterization Summary
- ✓ Training Strategy

- ✓ Epidemiological Studies
 - Baseline Inventory
 - ✓ Statistical Analysis
 - ✓ Carpet Sampling
 - ✓ Website
 - Additional Sampling
 - Assessments
 - Articles
 - Machine Tools
 - Chemical Hygiene labs
 - Revise training courses
 - Implement new areas posting and labeling



In the first 3 months, we focused on Management Underpinnings

- Beryllium Project Manager and new Beryllium SME
 - Elevation of reporting levels
- Project Plan
- Communications Plan
- Work Control System
- Executive Management Operational Directive – a process to drive immediate, consistent implementation



Communications

- Development of communications plan
 - Identified audience, medium, frequency, and key messages
 - Continuously updated
- Beryllium road-show to every major program at LLNL
- Facility briefings
- Letters and web-site in response to unfettered access
- Communications with subcontractors



We've completely rewritten our program plan and implementation procedures

- CBDPP Program Plan
 - Rev. 6 – Approved June 2009
 - Utilized extensive benchmarking across the complex
- ES&H Manual – the implementation of our CBDPP
 - Utilized significant worker input
- Industrial Hygiene procedures and implementation manuals
- Health Services procedures and implementation manuals
- Communications tools – websites and “1-pagers”



Our new baseline inventory is integrated with work control

Pre-9/2009 Inventory

- Very wide net cast (any facility that ever had a metals sample taken)—160? facilities
- Sampling at a variety of sampling densities
- Green, Yellow, Orange construct not well correlated with exposure risk
- No process to downgrade a facility
- Not well integrated with how we do work control
- Not well understood by our workers

Post-9/2009 Inventory

- Facilities with active beryllium work identified
- Facilities with legacy contamination identified
- Facilities with characterization still in progress
- Characterization results in one of 3 final fates: Active work, legacy contamination, released
- Integrated with work control
- Web-site designed for ease of communication



We're in the middle of our longer-term actions

- ✓ Medical Outcomes Studies
 - ✓ Performed by Bill Stange
- Baseline Inventory
 - ✓ Statistical Analysis
 - ✓ Carpet Sampling
 - ✓ Website
 - ✓ Additional Sampling
- Assessments
 - ✓ Articles
 - ✓ Tool boxes
 - ✓ Machine Tools
 - ✓ Chemical Hygiene labs
- Revise training courses
- Implement new area posting and labeling



Implementation of the CBDPP Corrective Action Plan remains on schedule

- October 23rd marks 19 months since approval of the CBDPP CAP
 - The CAP contains a total of 97 actions, spanning 3 ½ years
- As of today, we have completed 89 actions (92%)
 - What's left
 - Finalized facility inventory – November 2010
 - Revisions to training courses – Summer of 2011
 - Effectiveness review – April 2011
 - Final implementation of new work control system – mid-2012
 - Assess consistency of IWWC system – after above



What did we learn?

- Plan for short-term successes
 - More short-term, well-scoped projects with defined purposes and resources
 - Labeling campaigns, swiping campaigns, new training courses, localized D&D
- Identify the important stakeholders quickly, and make a communications plan that is continually updated
 - Internal stakeholders
 - Be-affected workforce
 - All workers
 - Selected work groups
 - Senior management
 - External stakeholders
 - NNSA, OE, the Public
- Interdisciplinary working group
- Single Point of Contact

