

Beryllium Legacy Issues at the Nevada Test Site

Presented by:

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Sampling Strategies

- Surface sampling of facility components and equipment
- Bulk sampling of carpets, soils, debris/dirt
- Air sampling of employees with the potential for exposure
- General air sampling to verify IAQ

Legacy Be Site

- Facility or area where Be was used or buried, based on a historical review of archived records
 - Sample data
 - Historical documents
 - Personal Recollections

HIGH SAMPLING PRIORITY

- G Tunnel – U12 g (18.0)
- 25-3900 EMAD (15.5)
- 26-2201, Pluto Disassembly Facility (15.0)
- 26-2105, Outfall and Decon Pad (15.0)
- 25-Test Cell C, Contaminated Wash, (14.5)
- 25-Test Cell C, Building 3210 (14.0)
- 25-Test Cell A, Buildings 3113 & 3113A (14.0)
- 26-2201, Radioactive Contaminated Filters (13.5)
- 26-2201, Vehicle Washdown Station (13.5)
- 25-RMAD Waste Dump (13.0)
- 25-EMAD Facility, Train Decon Area (13.0)
- 25-3124, TTF, Contaminated Soil (13.0)
- 25-Reactor Control Point, Vehicle Washdown (13.0)
- 25-Radioactive Materials Yard (13.0)
- 25-NRDS Contaminated Bunker, RMSF (13.0)
- 25-YMP Sample Mgmt. Facility (13.0)
- 12-G Tunnel Portal (12.5)
- 12-G Tunnel, Waste Disposal Site (12.5)
- 25-Radioactive Material Storage (12.5)
- 25-EMAD, Building 3901 Outfall, Train Shed (12.5)
- 25-ETS #1, Motor Drive/Gear Bunker (12.5)
- U4q, Contaminated Trench/Berm (12.5)

HIGH SAMPLING PRIORITY

- 25-ETS #1, Motor Drive/Gear Bunker (12.5)
- U4q, Contaminated Trench/Berm (12.5)
- 25-Test Cell C, Contaminated Materials (11.0)
- CP-2 Decon Pad, Discharge Pipe (11.0)
- 25-RMAD, Building 3110 (10.5)
- 27-Super Kukla Reactor, Bldg. 5400 & 5400A (10.5)
- 25-TTF, Lab Radioactive Contamination (10.5)
- U3gi, Waste Disposal Site (10.5)
- Bunker 7-800 Contaminated Mound (9.5)
- 26-Pluto Hot Box (9.5)
- 5-WMD Retired Waste Pits (9.0)
- 25-Radioactive Leachfield, CAS 25-05-08 (9.0)
- 25-Leachfield, CAS 25-05-03 (8.0)
- 25-Leachfield, CAS 25-05-05 (8.0)
- 26-2201/2202 Radioactive Leachfield (8.0)
- 25-EMAD Facility, Underground Storage Tank (8.0)
- 25-Leachfield, CAS 25-05-06 (8.0)
- 26-Horn Silver Mine, Waste Dump #1 (8.0)
- 25-3126 Leachfield (7.5)
- 25-RMAD, Waste Dump NE of RMAD (7.5)

Medium Sampling Priority

- A Tunnel - U16a (15.50)
- TTR: Test Area JTA-W79 (15.0)
- TTR: Test Area for XM785 (15.0)
- Area 5, Sugar Bunker (14.5)
- Area 5, Kay Blockhouse (14.5)
- CP-6 Decon Pad and Wastewater Catch (12.5)
- 23-7 Warehouse (8.0)

Beryllium Characterization

- A significant effort by BN to characterize each facility associated with operations at NTS was implemented.
- Each facility is sampled in accordance with a statistical sampling plan for the presence of beryllium. Sampling includes surface areas, air and carpet.

Characterization Sampling Plan

- Random, statistically-based sampling plan after MARSSIM model for buildings;
- 20-foot grid sampling for trailers, transportainers, sheds, boxcars, etc.;
- When results exceed 0.1 ug/100 cm², additional sampling at closer spacings (5-foot grid);
- Facilities with carpet, collect bulk vacuum carpet samples.

BN ASSUMPTIONS

- Draft NNSA report cites tracking of beryllium from a forward site as principle cause of sensitization cases in “B” Complex.
- NTS projects, including shots, involved use of beryllium that was deposited on site based on historical review by subcontractor.
- Be and radiological contamination are strongly associated based on historical review by subcontractor. Therefore rad measurements can be used as a screening tool.
- Areas not identified as Be legacy sites are not contaminated.
- BN EHS will continue to characterize the facilities of NTS to ascertain beryllium exposure hazard based on prioritized sampling plan.

Types of Characterization Samples

- Swipes (wet, ghost)--compare with 0.2 ug/100 cm²
- Ambient air (high volume)—screening
- Personal air—compare with 0.2 ug/m³
- Bulk carpet vacuum samples—compare with 0.2 ug/100 cm²
- Bulk Soil (geologists collect, evaluate)—compare with national averages

Analysis

- Swipe, bulk carpet, soil and air samples analyzed by ICP-AES
- NIOSH 7300 Method

Be Sample Types & Methods

Surface

Swipes (dry, wet, ghost wipe)

NIOSH 7300; OSHA ID-125G; ASTM E1728-02

Bulk carpet vacuum samples

ASTM D5438-00

Air

BZA (0.8 MCEF) NIOSH 7300;

OSHA ID-125G

Ambient or general area

NIOSH 7300



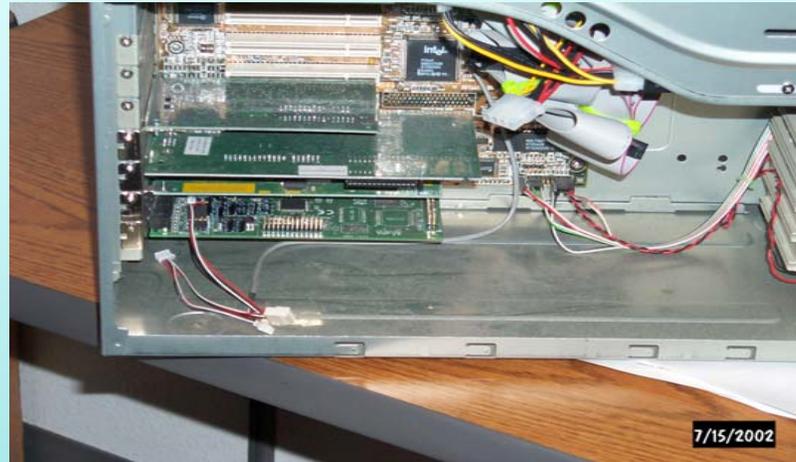
Surface Sampling: Facility components & equipment

Initial sampling to assess housekeeping and facility hygiene

Follow-up/periodic monitoring to verify facility hygiene



Surface Sampling: Computers



Surface Sampling: Copiers



Bulk Carpet Sampling



- ASTM Method D-5438-00 Collection of Floor Dust for Chemical Analysis

Sampling Concerns



**Swipes should be collected from clean surfaces
Inactive facilities had excessive dust loading,
making comparison with standards difficult.**

Air Sampling



Identify activities where there is the potential for Be exposures

- Initial and periodic monitoring
- Exposure Reduction Plan to maintain exposures below action level
- Beryllium Registry reporting (DOE)

Activities with Potential Beryllium Exposure

- **Machining Be-Cu Alloys**
 - Machine using immersion/flood to control exposure
- **Shaker/Aggregate/Concrete Operations**
 - Dust suppression reduces exposure
 - PPE controls skin contact during concrete pouring/finishing
- **Crushing Fluorescent Light Bulbs**
 - Local exhaust ventilation removes airborne Be oxides
- **Environmental Restoration; D&D; Reactivation in “Legacy” Areas**
 - “Legacy” means areas with elevated environmental levels
 - Dust suppression reduces exposure
- **Aerospace/Weapons/Nuclear Manufacture & Testing, including Pulsed Power**
 - Dust suppression reduces exposure
 - PPE may be needed to manage skin and inhalation exposures

NTS BZA Sampling Status

- **143 Personal Air Samples during ER and D&D Ops in High/Med Risk Areas**
 - Equipment Operators, Spotters (laborers), Craft employees
 - May 03– October 2004
 - High sample – 9.635 ug/m³* (**one time**)
 - All other results less than the DOE std (0.2 ug/m³)

* Back-hoe operator was wearing prescribed PPE (including respirator) which protected him from the exposure. Investigation by BN IH revealed that their were concerns with controlling dust. Additional controls put into place include the use of an enclosed cab, improved dust suppression techniques, and full-face respirators for the laborers.

BN INTERIM CONTROLS

- Training
 - All IDPs will include Be awareness training.
 - Personnel working “Medium or High” Risk projects – Be Worker training is required. HAZWOPER training will be updated to include Be.
- Surveillance
 - High Priority – WPs to be reviewed by IH. Sampling (personal, area (air, soil)) to be conducted during operation per approved project sampling plan. These areas are in RCAs.
 - Medium Priority – WPs be reviewed by IH. Initial personal, area (air, soil) sampling for negative determination.
- Distribute Approach
 - Develop & provide risk communication briefing to tenants & customers to include process flow sheet, list of Be legacy sites and their responsibility to inform subcontractors under their purview.
- Medical Surveillance
 - Offered voluntary to all Be Workers.
 - BN/DOE have discussed expanding Be surveillance to all employees.

BN Sampling Priority

Sampling Priority

HIGH^{2,4}:
RCA+JT
List/Buried Be
Waste

Disturb Soil³

Follow RWP
requirements

During Ops
conduct Air
Sampling for
personnel &
general area.

See Note 5
> 0.1 ug/m³ Be

Upgrade to
respirator, TYVEK,
gloves, booties

Decon equip
using appropriate
controls

See Note 5
< 0.1 ug/m³ Be

Continue to follow RWP
requirements.

Non-Disturb Soil³

No additional
controls required. ²

Conduct personal air
samples if appropriate per
review of WP.

NON-RAD

MEDIUM⁴:
List of Be Legacy
Sites

Disturb Soil³

During Ops conduct
Air Sampling for
personnel & general
area.

See Note 5
> 0.1 ug/m³ Be

Upgrade PPE level
to include respirator,
TYVEK, gloves,
booties

See Note 5
< 0.1 ug/m³ Be

No additional
controls required.

Non-Disturb Soil³

No additional controls
required.

LOW: No
evidence of
Legacy hazards

Disturb Soil³

Traditional
controls to be
applied.

Non-Disturb Soil³

- Note 1:** Beryllium awareness training to be included in IDPs or provided during employee orientation training.
Note 2: In High Risk Areas employees must follow applicable RWP.
Note 3: Removal of >0.25 ft³ of soil during any single operational event or act is defined as "Disturbing Soil".
Note 4: IH approval of Work Packages & HASPs and/or SSHASPs is required.
Note 5: IH will compare sample results to background levels and/or regulatory requirements and/or historical information and apply controls as needed.

BN Characterization Status

- 326 of 673 Total Facilities (48%), 227 of 359 Operating Facilities (63%),
- **ALL OCCUPIED FACILITIES COMPLETED.** An additional 78 bldgs slated in fwd areas completed.
 - **12997 Swipes**
 - Avg – 0.0064 ug/100cm²
 - 53 samples above 0.2 ug/100cm²*
 - **368 Ambient Air samples**
 - Avg - 0.00190 ug/m³
 - no samples above 0.1 ug/m³
 - **636 Bulk Carpet samples**
 - Avg – 0.019 ug/100cm²
 - no samples above 0.2 ug/100cm²
- **60 other Bulk Samples (including Vehicles)**
 - No samples above 0.2 ug/100cm²
- **117 Bulk Soil Samples in High/Med Risk Areas**
 - Avg – 0.742 ppm
 - High – 4.22 ppm
 - Background 3-5ppm
 - Includes 11 samples from CAUs currently being worked.
- * **33 samples in 16 bldgs slated for D&D – see next slide**
 - 14 samples in 6 bldgs in legacy areas**
 - 6 samples in 5 other bldgs**

High dust loading on swipes caused abnormally high readings but were normal compared to background levels.

BN Characterization Status

D&D Bldgs

- **99 buildings slated for D&D completed.**
 - Most are in the high and medium priority areas.
 - High dust loading on swipes causes abnormally high readings.
 - 520 Swipes
 - High - 2.0 ug/100cm²
 - Avg – 0.090 ug/100cm²
 - 33 Swipes above 0.2 ug/100cm² in 16 bldgs
 - Area 1 – Shaker Plant – Control Tower (pit)(2) & Sand Bay bldg(2)
 - Area 5 – RadSaf bldg(1)
 - Area 6 – Machine shop (1), Decon Facility(7), Decon Laundry(4)
 - Area 12 – 7 bldgs(9)
 - Area 23 – Q-33(1)
- **Other Legacy Metals**
 - **Lead**
 - High – 8070 ug/100cm², Avg – 12.9 ug/100cm², 123 samples above BN Admin Limit (50)
 - 123 samples above BN Admin Limit
 - **Cadmium**
 - High – 401 ug/100cm², Avg – 1.02 ug/100cm², 78 samples above BN Admin Limit (10)
 - **Chromium**
 - High – 1800 ug/100cm², Avg – 2.83 ug/100cm², 28 samples above BN Admin Limit (50)
 - **Arsenic**
 - High – 33 ug/100cm², Avg – <1.0 ug/100cm², 3 samples above BN Admin Limit (10)

"B Complex" Be Investigation Total # of Be Samples

	Air	Swipe	Bulk*	Total
B-1	265	1202	414	1881
B-2	14	193	67	274
B-3	177	1179	248	1604
B-4	26	62	0	88
A-1	239	1948	126	2313
Total	721	4584	855	6160

★ Includes 275 bulk carpet samples. 20 above the DOE std 0.2 ug/100cm²

NTS Characterization Results

- 113 / 12,997 (0.87%) of swipes exceeded 0.2 ug/100 cm², indicating the need for housekeeping in localized areas.
- All facilities cleared for occupancy.
- Graded approach to controls in legacy areas is effective in controlling exposure.