

Bruce Restart

Unit 1

Feeder Decontamination

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January 11, 2011

Bruce Site Background

- 8 reactors
 - 4 at each Station BA & BB
- BA reactors shutdown in 1995 and 1997
- Bruce Power took over the site in 2001
 - Restarted Units 3 & 4 in 2003-4
 - Announced Unit 1 & 2 Restart Project in 2004
 - Restart work started in 2005



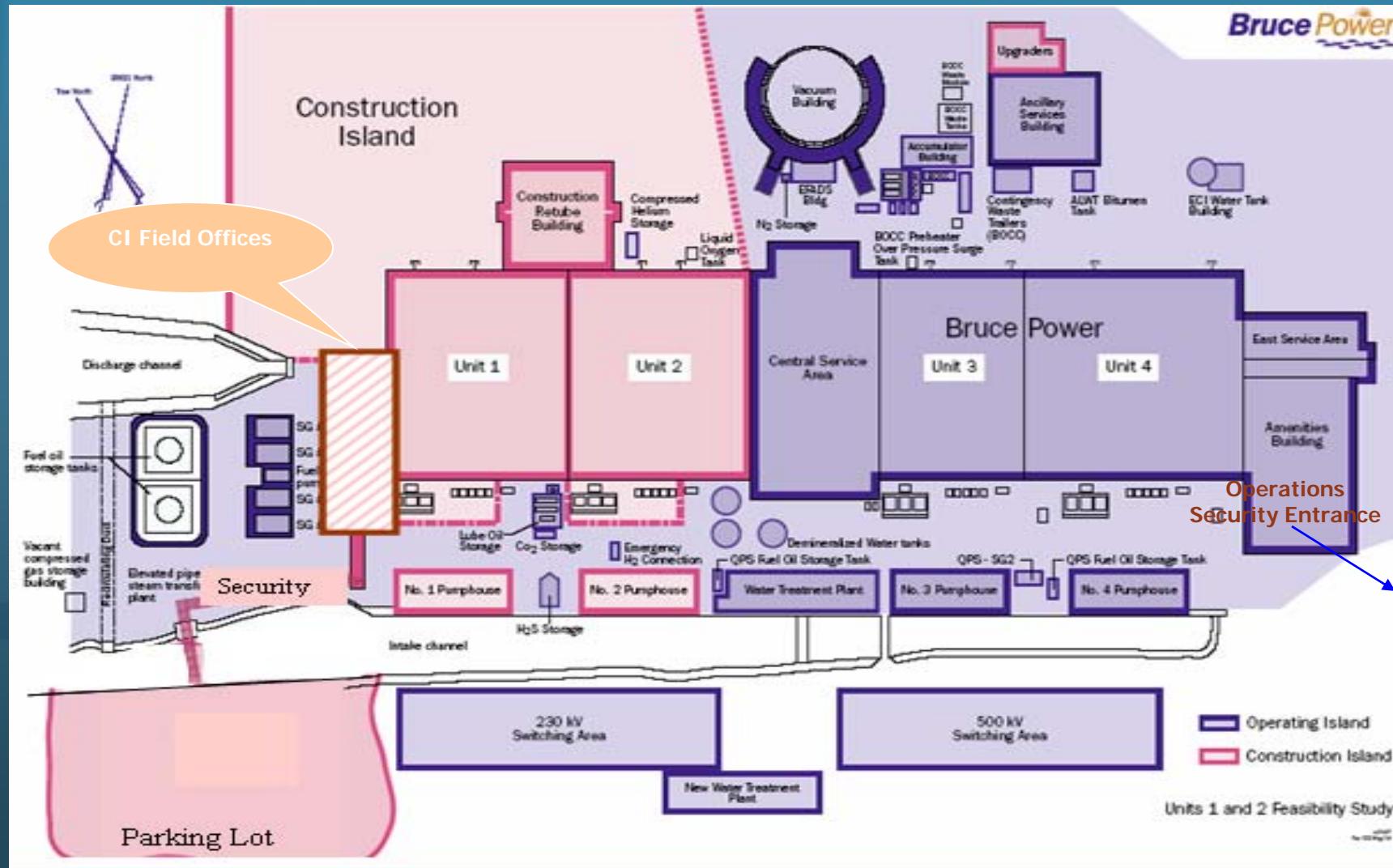


Morning Commute To Work at The Bruce

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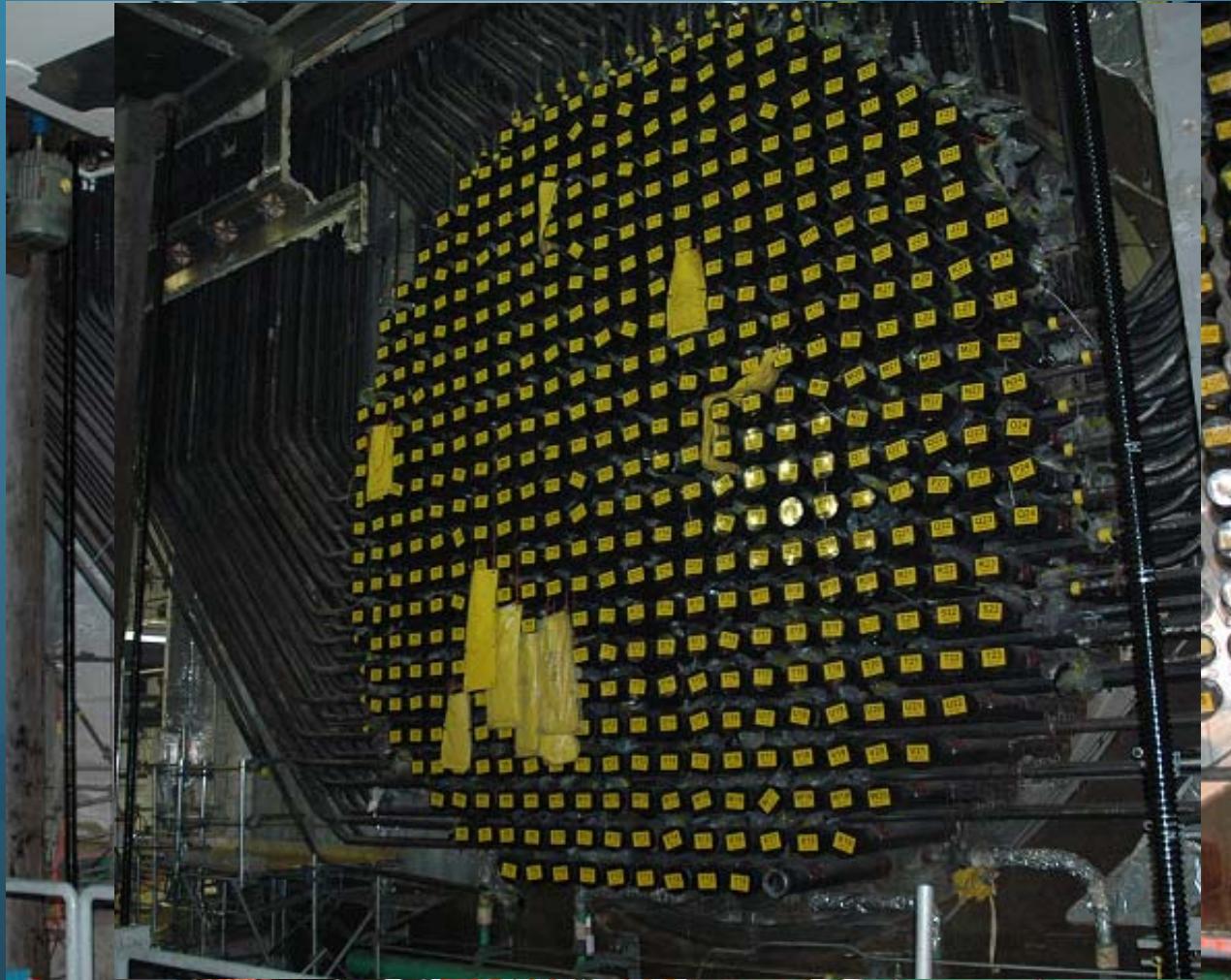
Construction Island



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Feeder Installation Challenge

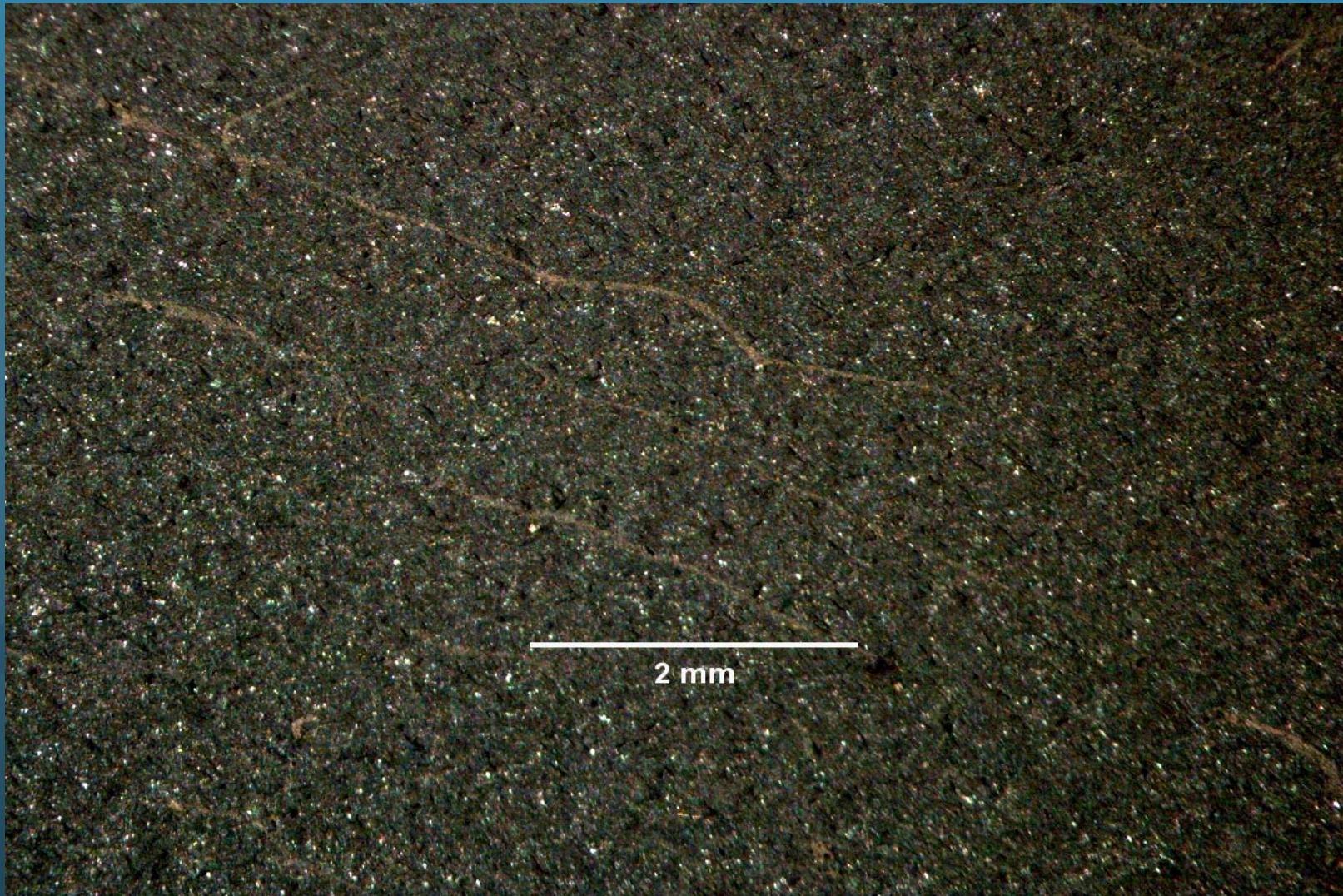
- Duration of 110 days per unit
 - 960 Feeders, some up to 40' in length
 - Assumes PAUT vs Radiography
- Detailed dose estimate
 - 240 Rem for Unit 2
 - 450 Rem for Unit 1
- Both units in same calendar year
 - Insufficient Labour Force

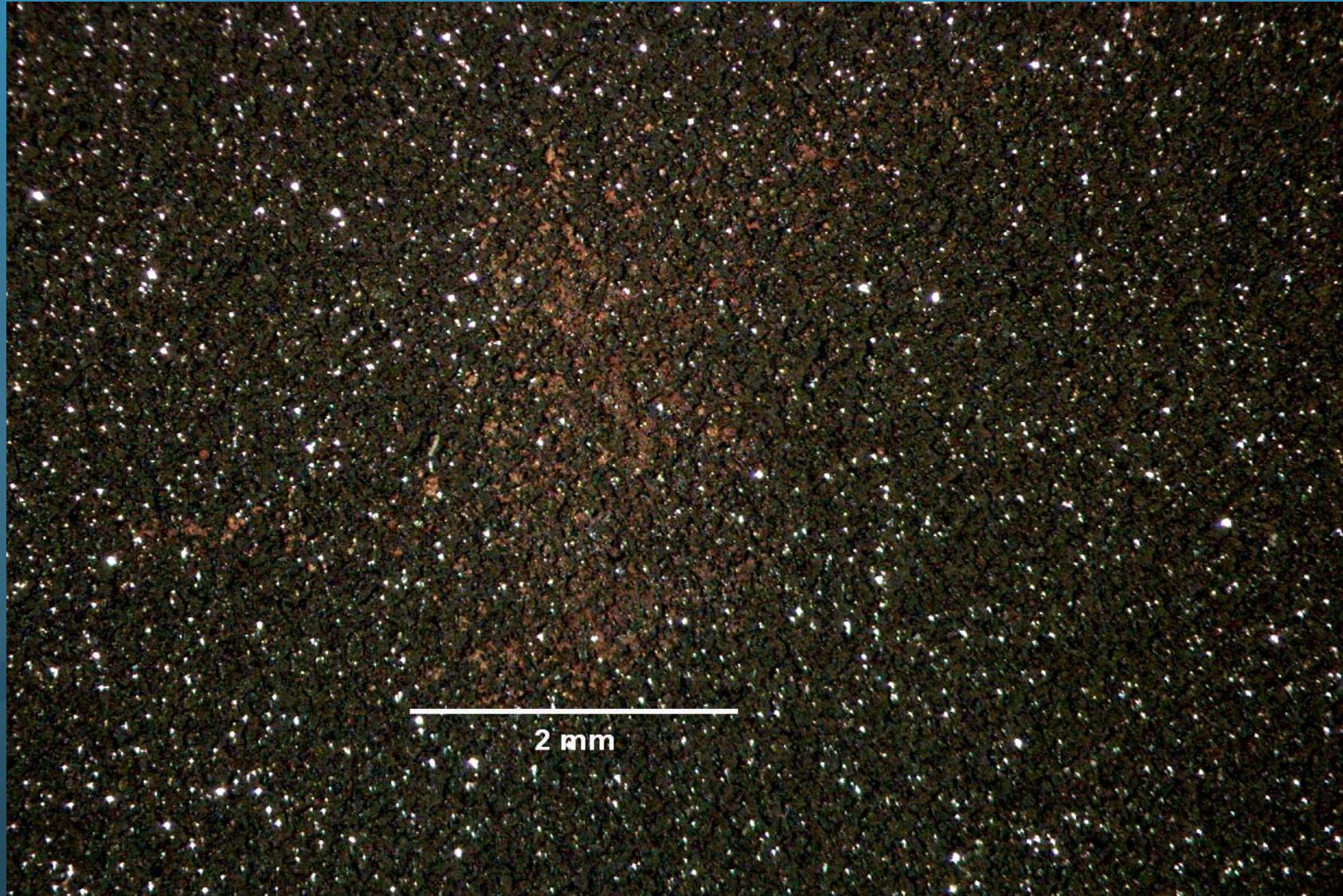
Feeder Installation Risks

- Very high collective doses but low dose rates
- High levels of contamination
 - High Alpha content, 1000's of dpm per smear
 - High risk of airborne
 - Ratio 1:1
 - ~150 microns thick in Unit 1
 - ~60 microns in Unit 2, outlets <10 microns
- ALARA Initiative to remove oxide from Unit 1
 - Need to preserve base metal



09/03/2009

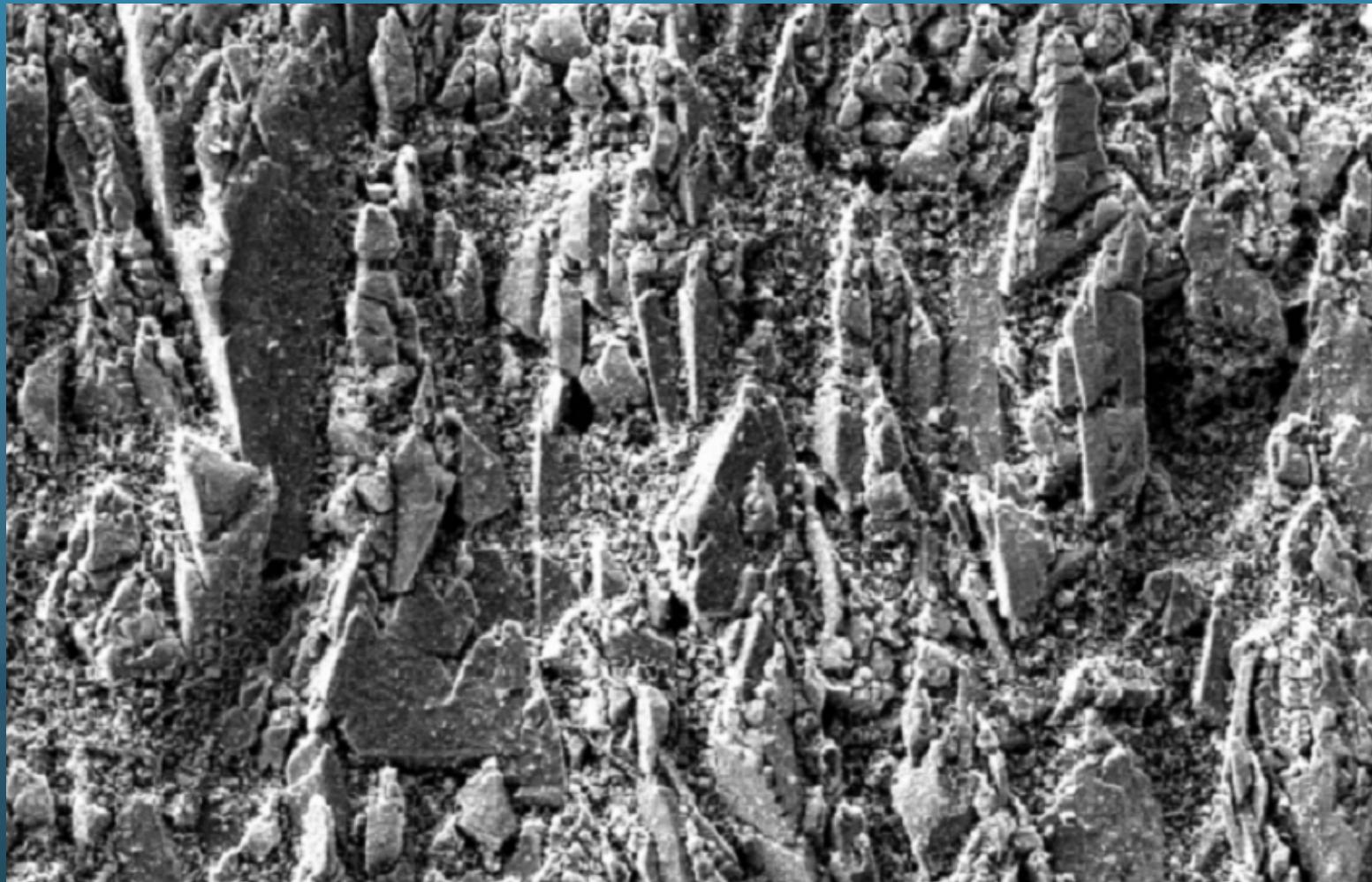




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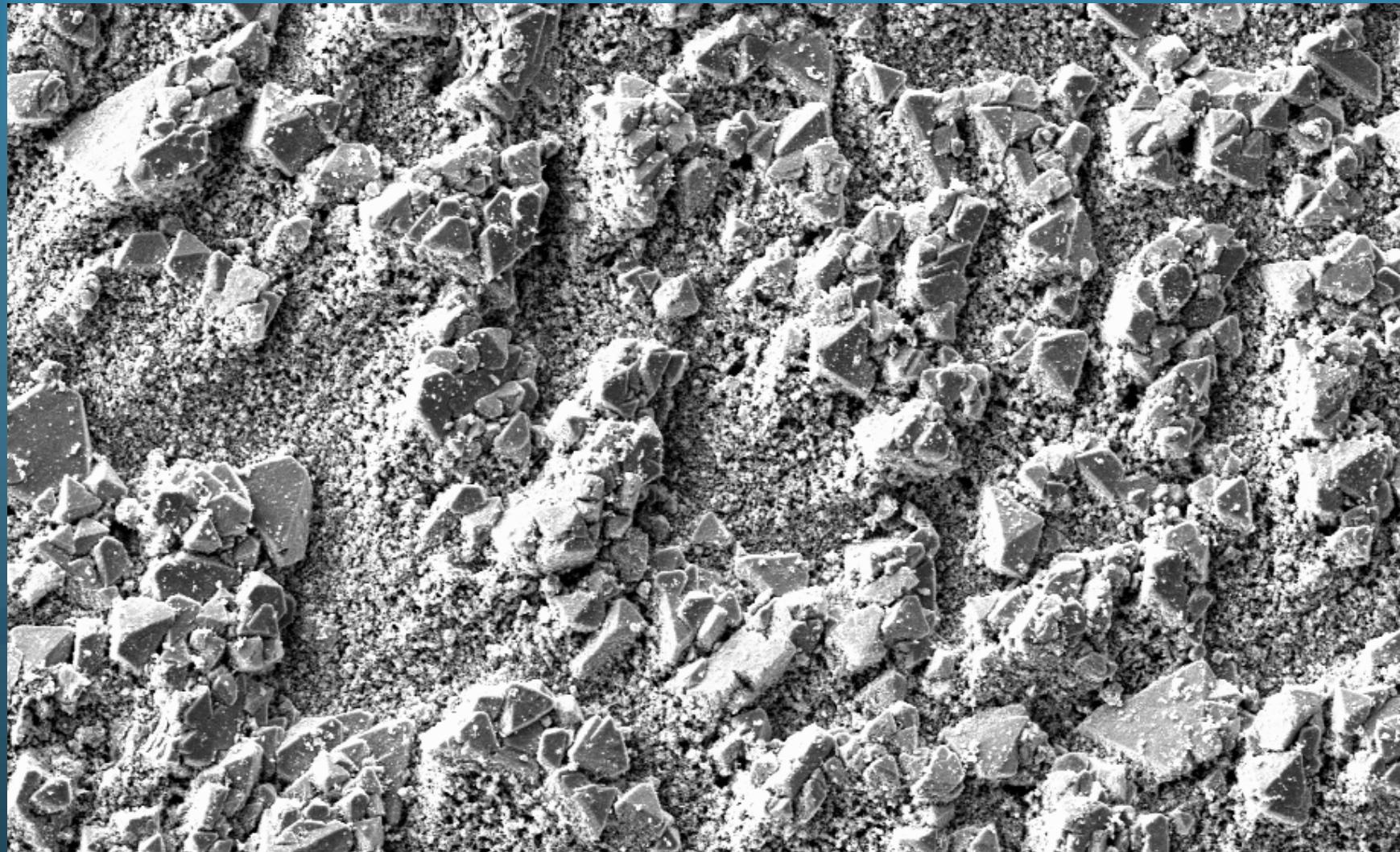
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Sample Designation	Gamma Activities Detected				Oxide Thickness (microns)
	Co-60 (Bq/cm ²)	Nb-94 (Bq/cm ²)	Cs-137 (Bq/cm ²)	Am-241 (Bq/cm ²)	
Unit 1 B12	11,400	102	526	3050	112
Unit 1 C18	11,300	103	671	5560	120
Unit 1 E22	11,700	79	793	5950	150
Unit 2 Y17	2060	26	81	347	60

Schedule

- Evaluated several methods remove oxide
 - Extensive analysis on physical and chemical form
- Developed a business case
 - Engineering evaluation and approval
- Waste container design and shielding
- Training plan, mock-up and Resource planning
- ALARA Plan & Procedure development
- Testing for method optimization
- Procurement of materials

Decontamination Process

- Install custom glove bag over each feeder
 - Each bag pre-assembled with all supplies needed
- System connected to large vacuum system and waste flask
 - Estimated mass 635 kg of oxide
- Pneumatically driven rotary tool driven up each inlet feeder
 - 3000 rpm at 2 inches per sec

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Critical Steps - Decontamination

INLETS

- Glove Bag installation
- FME Cap removal
 - Watch for debris build-up
- Mechanical clean
 - Cable management
- Cleaning Tool “End Effector”
FME check/change
 - Sharp, can puncture glove bag
- Glove bag removal
 - Purge dam in
 - Feeder surface wiped

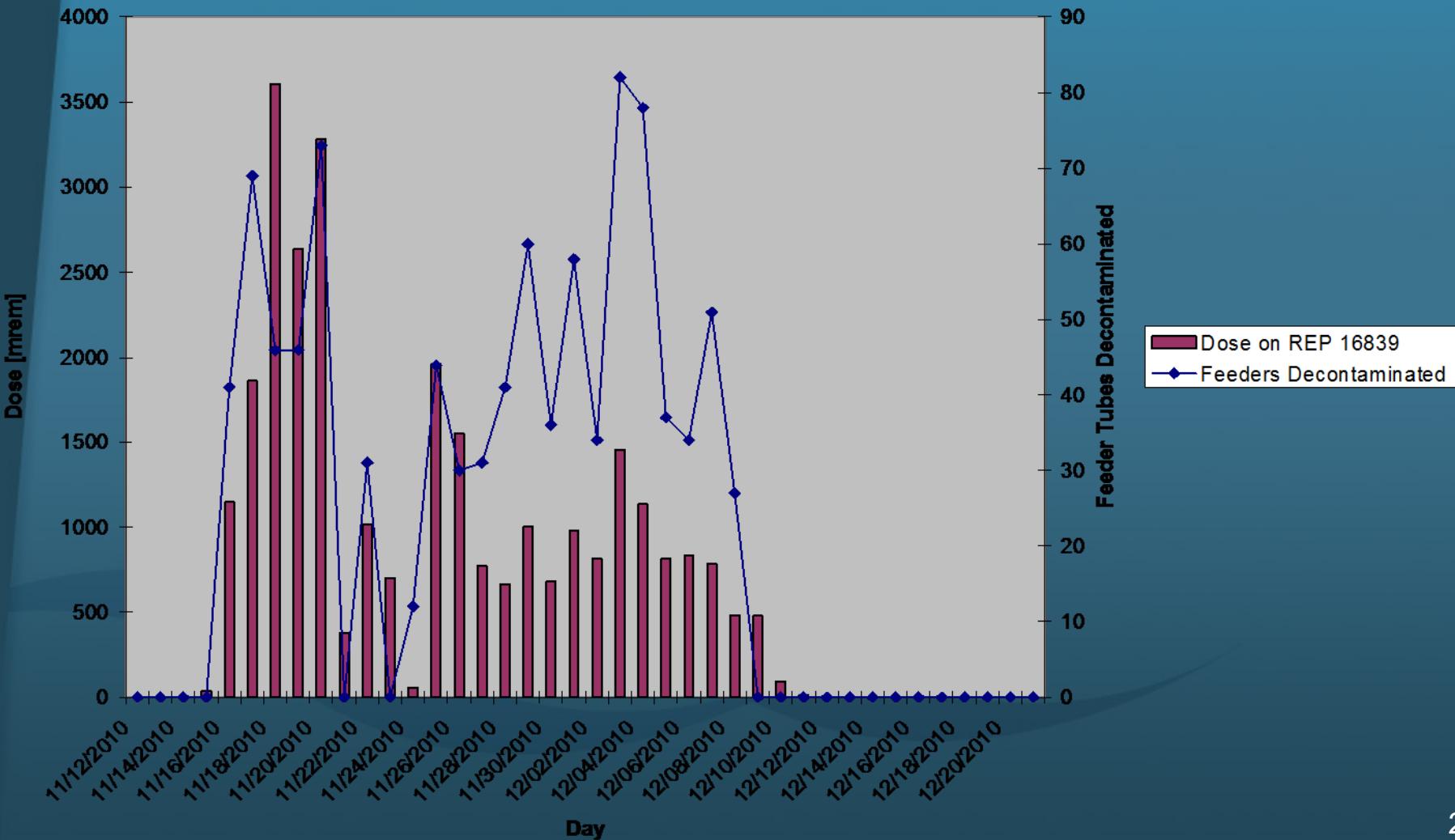
OUTLETS

- Glove Bag installation
- FME Cap removal
 - Watch for debris build-up
- Glove bag removal
 - Purge dam in
 - Feeder surface wiped

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Production and Dose by Day





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BAU1-L93-W-25

12/06/2010

9:08:28 AM

New Slide

DEC 06. 2010 11:08:57

20分 4分 ↑

Results

GOAL

- Collective Dose 38.8 Rem
- Zero PCEs
- Zero Airborne
- Reduce contact dose rates by 75-85%
- Reduce working distance dose rates by 40-50%
- Collect 550 kg oxide
- Perform in 20 days

RESULT

- Actual Dose 52 Rem
 - Low productivity due to heat stress
- Zero PCEs
- 2 iCAM alarms
 - Equipment move
 - Vacuum disconnected
- Contact rates down 70-75%
- Working distance rates down 30-40%
- Collected 405 kg
- 28 days