



# Area IV – SSFL Follow up on SEC-00235 on Am/Th and Air Data

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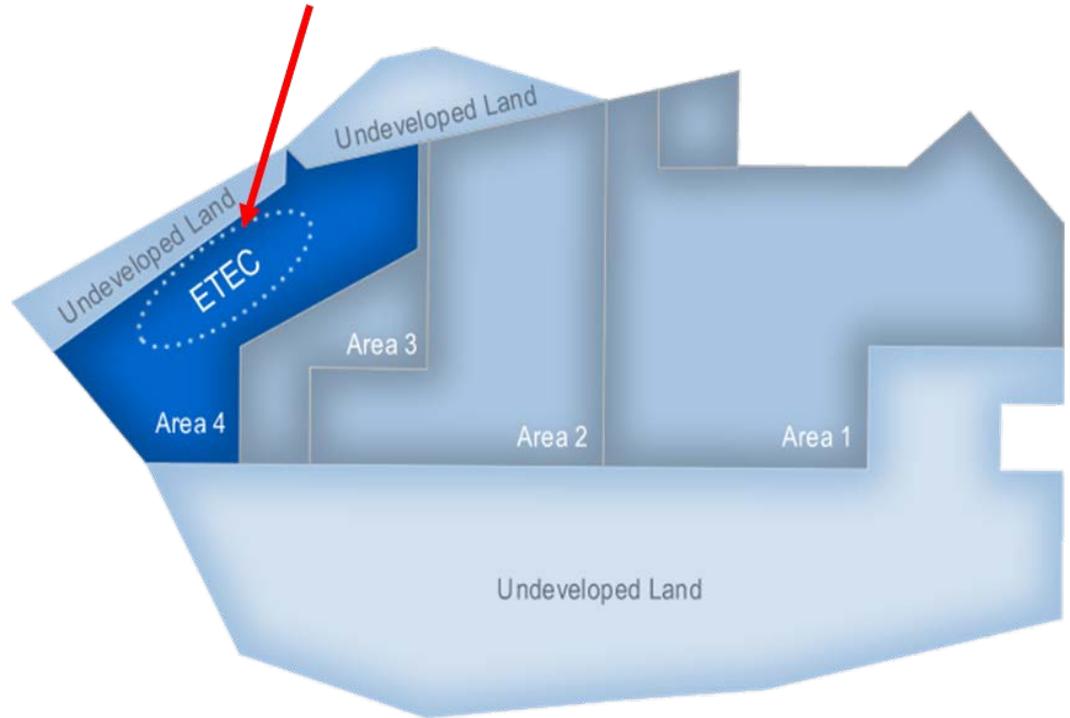
**Division of Compensation Analysis and Support**

Advisory Board on Radiation and Worker Health, 126<sup>th</sup> Meeting  
Redondo Beach, CA

December 12, 2018

# Area IV SSFL

- 290 Acres, Ventura County, 30 miles NW of Los Angeles
- Covered period (DOE):
  - 1955-1988
  - 1988-present (remediation)



# SEC Classes for Area IV SSFL

Petition Number	NIOSH recommended SEC class
SEG00093	All covered employees, all areas of Area IV SSFL, Jan. 1, 1955-Dec. 31, 1958 - based on lack of internal monitoring pre -1959
SEG00156	All covered employees, all areas of Area IV SSFL, Jan. 1, 1959–Dec. 31, 1964 - based incomplete bioassay data available to NIOSH pre -1965
SEG00234	All covered employees, all areas of Area IV, SSFL, Jan. 1, 1965-Dec. 31, 1988 - based on insufficient data to assess intakes from thorium and americium
SEG00235	None – class evaluated: Aug. 1, 1991 through June 30, 1993

# BACKGROUND

- SEC-00235 petition for Area IV SSFL for period after 1988 (remediation period)
- Qualified for evaluation for Aug. 1, 1991 – June 30, 1993, CEP period
- NIOSH evaluation to Board in August 2017, no class recommended
- Evaluation discussed with Area IV SSFL Work Group on Dec. 4, 2017
- WG requested additional work on two issues:
  - Status of Thorium and Americium operations post-1988 (in light of SEC-00234)
  - Evaluate available air sample data during the CEP period (when in vitro bioassay data are invalid)
- 2 White Papers issued by NIOSH in November 2018

## Area IV SSFL status after 1988

- Three facilities are main focus from exposure standpoint
  - Hot Lab (Building 20)
  - RMDF
  - SNAP reactor facility
- Main radionuclides of concern during D&D are
  - Fission Products, mostly Cs-137 and Sr-90
  - Residual alpha activity in Hot Lab is Pu-239
  - Activation Product in SNAP reactor facility is Co-60

# Status of Operations with Th and Am after 1988

- All reactor operations ended by 1980
- Nuclear support operations ended by 1988
- Thorium source term pre-1988:
  - Reactor fuel component of SRE and ATR
  - Nuclear support operations of this fuel
- Americium source term pre-1988:
  - Transuranic in all used reactor fuel
  - Sealed sources

# Thorium

- SRE Core II in operation 1960-1964 – Th-232 and EU alloy
  - Core II fuel assembled in Engineering Test Building
  - SRE Core II fuel stored in RMDF after removal from Reactor, 1964
  - Core II fuel disassembled in Hot Lab starting in 1974
  - Shipped off site in 1977
  - Engineering Test Building released for unrestricted use in 1985
- AETR operated from 1960-1974, fuel fabricated at reactor building in 1959
  - AETR building released for unrestricted use in 1980
- No incidents involving Th listed

# Americium

- All reactor fuel was removed from site by 1988
- Transuranic Management by Pyropartitioning Separation program used Americium and other isotopes, but program never started, materials were in storage only
- Incidents mentioning Am only before 1988
- Hot Lab and RMDF have potential for some residual contamination from transuranics
- Review of decommissioning and quarterly review reports do not indicate any evidence that Am or Th were encountered at the operational facilities

# Conclusion on Th and Am status

- The major source term for Am and Th had been removed from site by 1988 (nuclear reactor fuel)
- Detailed review of facilities during the remediation period do not indicate a sustained radiation exposure similar to operational period
- D&D could produce unpredictable exposures, but site had an internal exposure monitoring program driven by air sampling
- NIOSH does not find that the exposure potential from the operational period continued into the remediation period

# Air Sampling Background

- General Air sampling (GA): fixed location sampling, weekly results averaged over quarter (13 weekly results)
- Breathing Zone air sampling (BZ): worn by worker during jobs
- Results compared to max permitted air concentration (MPC) for radionuclides of concern:
  - Sr-90 (beta):  $1\text{E-}09$   $\mu\text{Ci/mL}$
  - Pu-239 (alpha):  $2\text{E-}12$   $\mu\text{Ci/mL}$
- BZ compared to MPC-hr limit of 2000/yr or 520/quarter
- Full face and air line respirators in use
- Until 1992 air sampling was the primary exposure assessment method, bioassay was backup

# Operations and Data Summary – SNAP (T-059)

- Air data available for 1991 (4 quarters)
- Facility is undergoing D&D, Co-60 is main contaminant
- Structural steel and irradiated concrete are reduced in size and sent to RMDF for interim storage until shipped off-site
- Airborne radionuclides observed during removal of old NaK lines
- Workers wore BZ samplers during operations causing airborne contamination
- No GA samplers in SNAP area

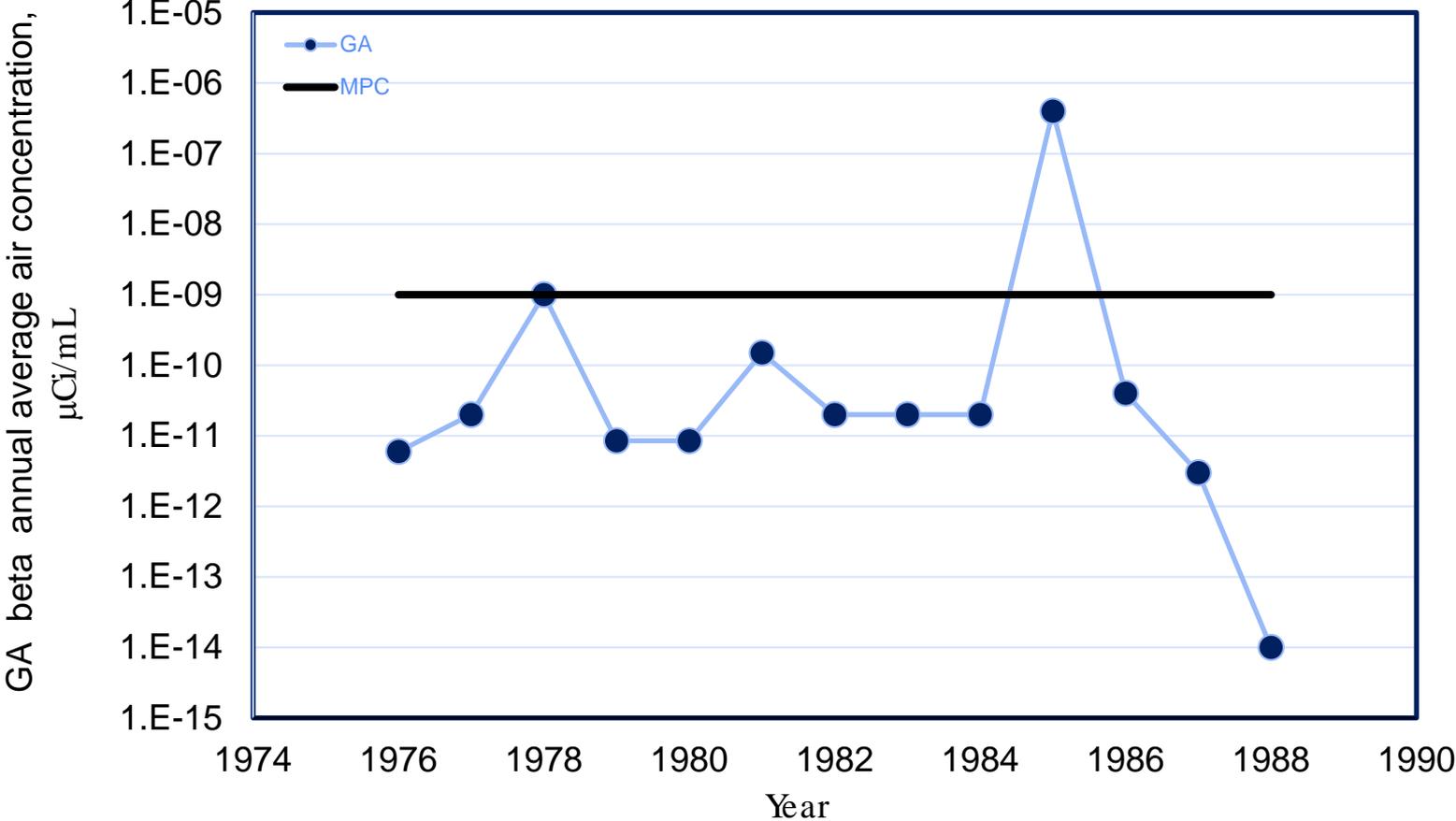
# Operations and Data Summary – Hot Lab

- Air data available for 1990-1993 (15 quarters)
- 28 GA samplers recorded air data every quarter
- Workers with potential for intakes wore BZ and respirators if needed
- Facility with largest amount of BZ data available
- D&D operations mainly removal of cell liners and drain pipes
- Some incident reports indicate small events of contamination
- Period in 1993 showed some elevated GA data points
- Any potential intakes could be assessed

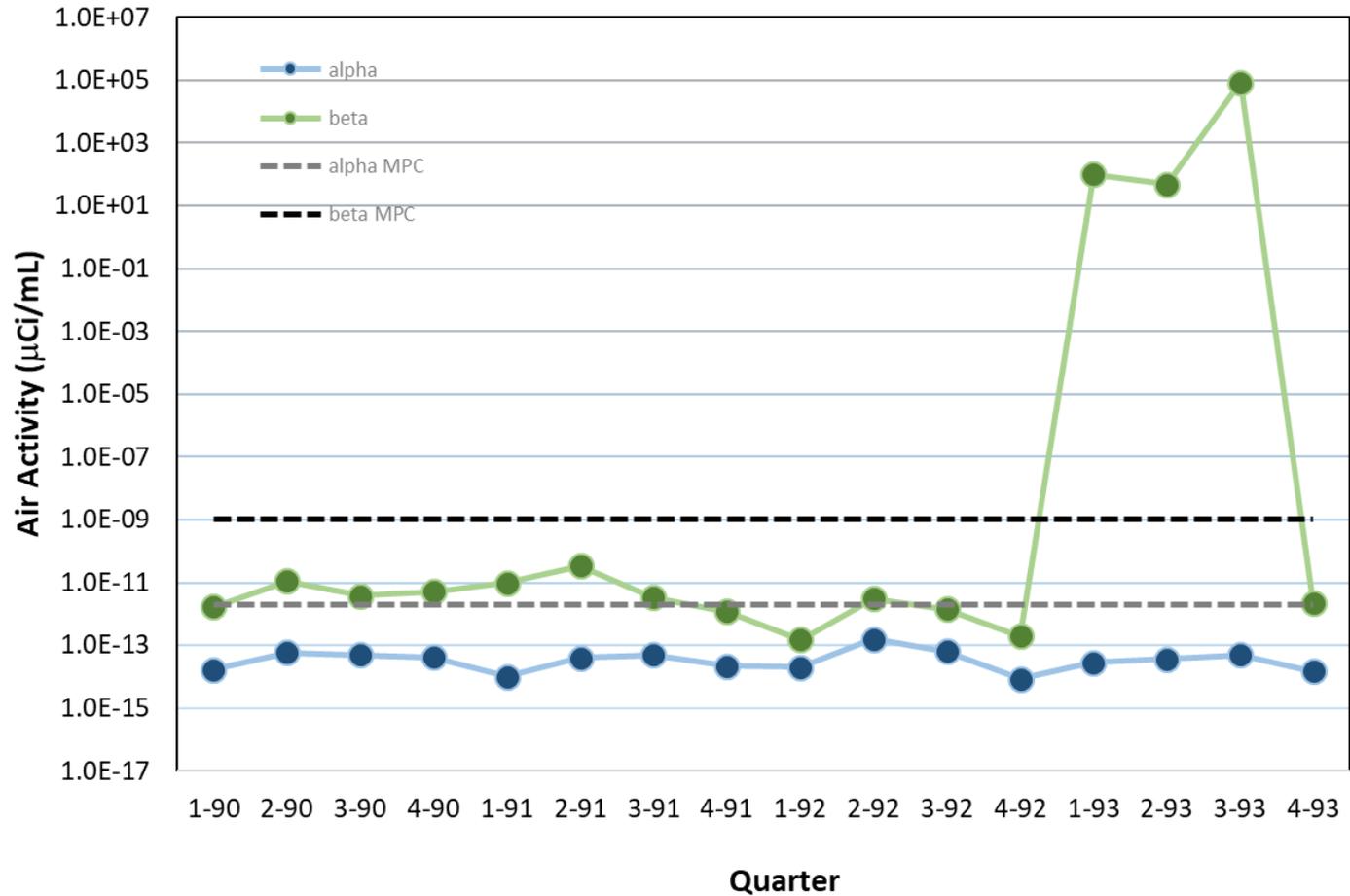
# Operations and Data Summary – RMDF

- Air data available for 1990-1991, one quarter missing
- Seven fixed GA air samples
- BZ data for up to 10 workers available
- Only facility that was not in D&D mode
- Receiving material from other areas at Area IV
- Size reduction, packaging, storing and shipment of materials off-site

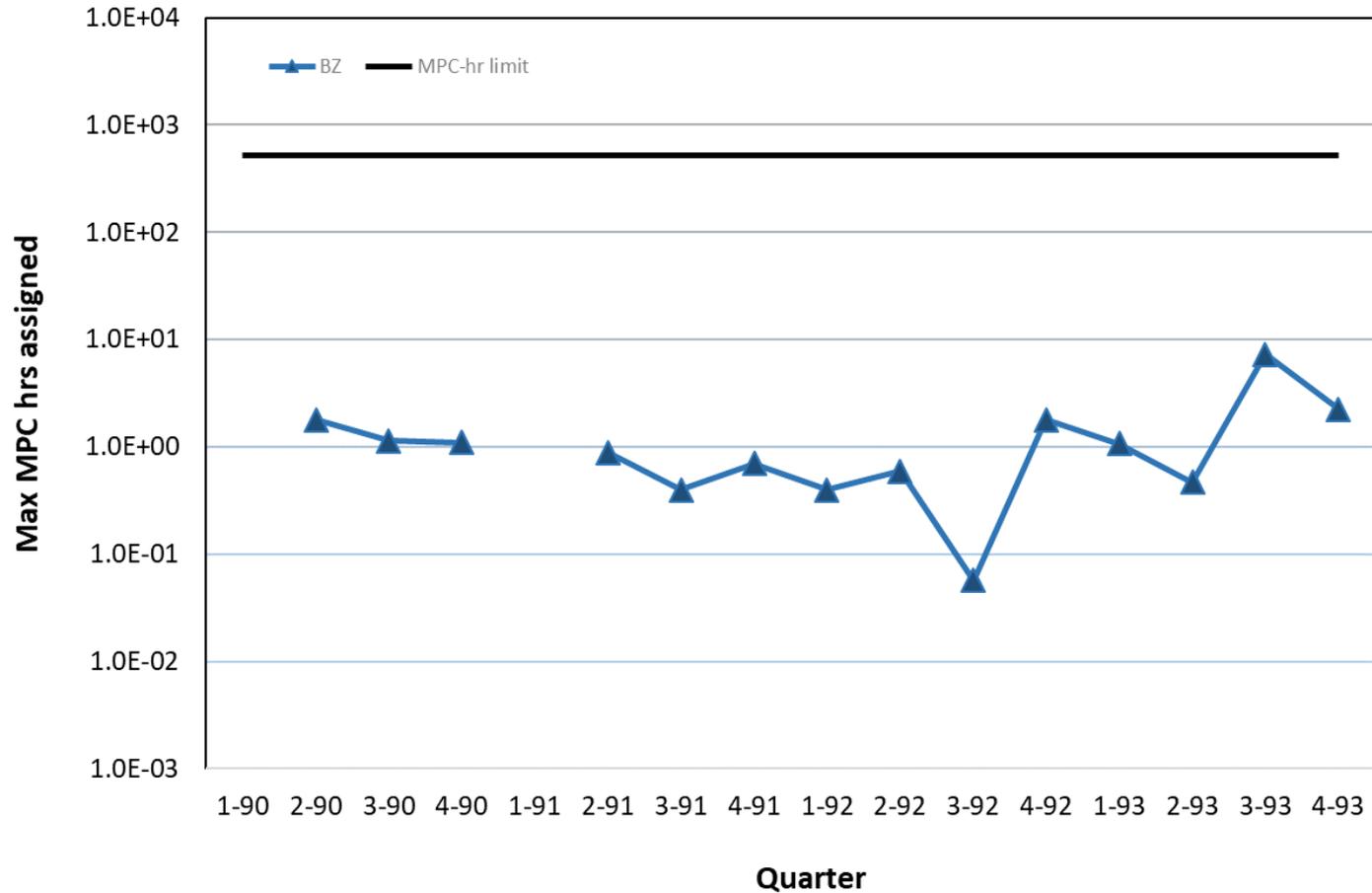
# Hot Lab Beta GA Max. Average - Operational Period



# GA Max Quarterly Averages – Remediation Period



# Max BZ per Quarter– Remediation Period



# Hot Lab Elevated Data

- Quarters 1 – 3 had elevated quarterly results in three locations
  - Service Gallery: staging area behind hot cells
  - Basement: not generally occupied, except when work is done, such as removal of contaminated drain lines
- Worker BZ data remained below regulation level
- Workers' WBC data was reviewed, some had small readings of Cs-137
- New bioassay contractor available starting third quarter 1993, would have picked up potential worker intakes

# Air Data Conclusion

- GA and BZ data are available, but some quarters and some facilities are not currently available to NIOSH
- Raw data/logbooks potentially available
- It is not clear if this data is available and how easily it could be collected
- Hot Lab data set is most complete and believed to be bounding
- Elevated samples are unusually high, but elevated samples in general would be in line with disruptive operations during D&D
- Despite these type of operations, no significant worker intakes observed
- NIOSH believes that the available information is sufficient to bound doses from D&D operations during the CEP period

For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

