

# M&C Work Group Review of SEC-Related Issues

Meeting of the Advisory Board on Radiation and Worker  
Health, M&C Work Group

July 13, 2023

Josie Beach, Chairperson

# Background

- M&C Work Group tasked SC&A to review remaining lines of inquiry or outstanding issues relevant to Work Group's review of SEC-00236 evaluation report (ER).
- SC&A issued "Supplemental Review of M&C Work Group Issues" on August 22, 2022.
- NIOSH responded on January 13, 2023, and SC&A on April 25, 2023.
- M&C Work Group met on May 12, 2023. SC&A presented its supplemental report and NIOSH presented its response.

# SEC issues for M&C: Work Group perspective

- No monitoring data for residual period at M&C, 1968–1997. NIOSH considers 1995 pre-D&D drainage pipe sediment concentrations as “relevant source term” data for bounding purposes.
- NIOSH bounding approach:
  - Back-applies 95th percentile of 1995 pre-D&D Priority 1 pipe sediment measurements to bound potential “inside subsurface” exposures for M&C maintenance workers.
  - Compares M&C maintenance activities to other AWE sites (non-SEC).
  - Applies “extreme conservatism” to account for “intrusive activities, high exposure conditions, uncertain facility activities, or unknown contamination sources” (NIOSH, 2023a).
- The question is whether the 1995 pre-D&D survey measurements are sufficiently informative about exposures during the M&C residual period to support NIOSH’s bounding approach as being sufficiently accurate under EEOICPA and 42 CFR Part 83.

# NIOSH “inside subsurface” bounding exposure model

- NIOSH applies highest Building 10 subsurface drain line sediment concentration of total uranium and calculates 95th percentile of 6,887 pCi/g for bounding uranium in M&C subsurface maintenance activities, concluding that these Priority 1 drain lines contained the “highest subsurface radioactive material concentrations to which workers were exposed” (NIOSH, 2018).
- Assumes dust loading equal to 95th percentile of Mound project air sampling and worker occupancy of 2 months.
- Intrusiveness of activities is seen by NIOSH as comparable to other AWE facilities (non-SEC), with D&D worker handling of pipe removal similar to that of M&C maintenance workers.

# SC&A supplemental review: Inside subsurface

- SC&A finds that unaddressed and uncertain source terms and elevated exposure pathways may have been present during M&C residual period:
  - Elevated workplace airborne contamination due to confined spaces
  - Cutting of pipe containing contaminated scale leading to airborne release
  - Concentration of pipe sediment due to discharge of coagulant
- SC&A concludes that the back application of a high 1995 sediment survey result to bound inside subsurface activities may not be adequately supported by information for M&C worker activities from the earlier residual period.
- **Work Group concern:** Insufficient information exists to address these uncertainties, and reliance on “extreme conservatism” to bound potentially higher or unknown exposures is not a plausible approach to compensate for inadequate or insufficient information.

# AWE comparability

- NIOSH's original ER position: M&C had passive exposures consistent with ORAUT-OTIB-0070 and Battelle-TBD-6000 models. Compares well with other AWEs (non-SEC).
- Revised position:
  - Workers identified intrusive activities for which six exposure models and bounding values developed.
  - “Extreme conservatism” applied for M&C models to account for intrusive activities, high exposure conditions, uncertain facility activities, or unknown contamination sources (NIOSH, 2023a).
- SC&A finds M&C to be comparable to facilities with more intrusive activities; for example, those related to facility renovation as defined by NRC and found at Linde.

# Linde precedent: SC&A and NIOSH positions

- SC&A (2022) views Linde precedent as having two precepts, based on deliberations by Linde and SEC Work Groups at the time:
  1. “Less precision or technical accuracy can be tolerated if the exposure of a worker cohort is relatively low.”
  2. “The use of a high exposure or concentration values based on these data to bound or represent that of other workers in a facility or on a site for long time periods would not be appropriate if their exposure potential could be higher, conditions were different, or if there is lack of information upon which to make those judgments.”
- NIOSH disagrees that second precept also applies to M&C: Linde exposures were higher and there are more relevant source term data for M&C.

# Linde precedent: SC&A response

- SC&A's (2023) response to NIOSH finds:
  - Information is lacking on newly identified exposure concerns.
  - D&D era source terms and conditions not clearly reflective of entire M&C residual period.
  - Radiological controls were not in place for M&C workers, as they were for D&D-era workers.
  - Potential exposure levels may have been relatively higher at Linde, but SEC question is sufficient accuracy of proposed bounding level.
  - Reliance on “extreme conservatism” to compensate for inadequate or insufficient information may not be plausible and appropriate.

# Exposure potential: Confined spaces

- SC&A:
  - Confined space work at M&C not reflected in exposure modeling. Leads to increased dust loading and resuspension of contaminant particulates and aerosols.
  - Surrogate use of Mound project data used for M&C dust loading factor does not account for confined space effects.
- NIOSH acknowledges that “potential particulate enhancement in confined space[s]” represents new information but is not a source term issue (NIOSH, 2023b).
- This issue is unresolved.

# Exposure potential: Contaminated scale

- Accumulation of contaminated scale on inside of piping confirmed, with one survey exceeding 1,000,000 dpm/100 cm<sup>2</sup> for a 4-inch mainline drain being cut and removed (source of contaminated scale unknown – may be covered or uncovered).
- Drain pipes were frequently cut and cleaned out with power tools and cutting torches.
- **SC&A:** Such pipe cutting may have released fine aerosols that would have been concentrated by confined spaces (trenches, pits).
- **NIOSH:** Responds that such contamination would have constituted “isolated hot spots” and not a systemic condition.
- Work Group finds this exposure potential remains uncertain and unresolved.

# Exposure potential: Coagulants

- Mineral oil used for drawing wire in Building 10 had properties of coagulant. Upon discharge to drainage system, M&C workers found it would frequently “plug up the drains” (NIOSH, 2017). May have concentrated existing drain pipe sediments, including uranium and thorium.
- **NIOSH (2023a):** SC&A’s premise is “inaccurate” in that HFIR operations had not introduced higher concentrations of “*covered* uranium and thorium from AWE operations” and “wire operations during the residual period did not process radioactive materials.”
- **SC&A:** Releases of nonradioactive coagulant oil to drain lines was done separately from any HFIR operational radioactive releases and may have influenced how AWE-related uranium and thorium contamination already in piping would have concentrated over the years.
- Work Group finds increased exposure potential associated with higher source term concentrations of AWE contaminants in drainage pipes remains uncertain and unresolved.

# Comparability of D&D and M&C work activity: Drain line removal

- NIOSH finds M&C maintenance workers used “common practices similar to those used by D&D workers to remove Priority 1 drain lines (e.g., pipe removal versus cleanout)” (NIOSH, 2023a).
- SC&A found from interviews that M&C maintenance workers likely handled pipe cleaning more intrusively than did D&D workers for pipe removal. Key difference were the “controlled” radiological work procedures employed in D&D compared with none for M&C maintenance workers.
- Are M&C inside subsurface exposures sufficiently different from other AWEs and D&D-related activities that normal models do not apply?

# Comparability of M&C maintenance to D&D and other AWE sites

- Additional Petitioner comments submitted to the Work Group Chair May 27, 2023:
  - “D&D workers were simply cutting out the drain lines whole and intact, sealed prior to removal, and under carefully controlled conditions.”
  - M&C maintenance workers would “clear the lines using conventional plumbing methods, and only after those efforts failed, would they cut out the closed section of the drain as a last resort, and even then, it was done without sealing the removed line to prevent release of any contaminants it might have contained.”
- Work Group finds that while pipe removal by M&C maintenance workers as compared with D&D era workers had some analogous steps, the former would have likely been more intrusive with no radiological controls.

# Summary concerns on the subsurface model

- Intrusive work activities by maintenance workers at M&C during the residual period led to potential exposures for which there are no available monitoring data.
- NIOSH applies 1995 D&D survey data as basis for an upper bound for residual period exposure. For radiological data from one time period to be considered informative about exposures during another time period, there should be sufficient similarity of conditions and processes between the two periods.
- Although NIOSH has proposed a claimant-favorable “inside subsurface” bounding concentration (6,887 pCi/g), there remains uncertainty about source terms and exposure pathways during the residual period, 1968–1997.
- There is insufficient information available to account for the exposure contribution of confined spaces, pipe scale releases, and released coagulants in a workplace not controlled as a radiation environment, unlike that of the later D&D era at M&C from which NIOSH draws its data.
- The application of “extreme conservatism” in formulating the proposed upper bound concentration to account for “intrusive activities, high exposure conditions, uncertain facility activities, or unknown contamination sources” is not a plausible approach to compensate for inadequate or insufficient information.

# Proposed Work Group conclusion

- Because of the identified differences between the two periods (residual vs. D&D era), there is insufficient basis to conclude that radiological data from D&D efforts (including pre-D&D surveys) are sufficiently informative about exposures arising during the entirety of the M&C residual period to be applied in the manner proposed by NIOSH.

# References

National Institute for Occupational Safety and Health. (2017). Documented communication SEC-00236 with [Former Worker #7] on Metals and Controls Corp October 25, 2017. SRDB Ref. ID 169938

National Institute for Occupational Safety and Health. (2018). *Metals and Control Corp. maintenance exposure model* [White paper]. <https://www.cdc.gov/niosh/ocas/pdfs/dps/dc-metcontmaintwem-102418-508.pdf>

National Institute for Occupational Safety and Health. (2023a). *NIOSH response to SC&A's supplemental review of M&C Work Group issues* [Response paper]. <https://www.cdc.gov/niosh/ocas/pdfs/dps/dc-sca-mcwgissues-508.pdf>

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Petitioner. (2023, May 27). *Special Exposure Cohort Petition SEC00236* [Written comments to Josie Beach, M&C Work Group Chair, following May 12, 2023, M&C Work Group meeting].

SC&A, Inc. (2022). *Supplemental review of M&C Work Group issues* (SC&A-TR-2022-SEC002, rev. 0). <https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-metcontwgissues-508.pdf>

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