MEMORANDUM

TO: Blockson Work Group
FROM: SC&A, Inc.
DATE: June 15, 2016
SUBJECT: SC&A Responses to *NIOSH Response to SC&A Findings on SEC-00225 Blockson Chemical Company Residual Contamination Period*, Dated May 23, 2016

1.0 Introduction

SC&A delivered a report to the National Institute for Occupational Safety and Health (NIOSH) and the Advisory Board on Radiation and Worker Health (Advisory Board) on April 25, 2016, SCA-TR-2016-SEC003, *Draft Review of Blockson Chemical Company Residual Period SEC-00225* (SC&A 2016). That review contained five findings and one observation. Note that SC&A believes that all of its findings and its commentary in that report speak to what we often refer to as "site profile issues" and none raise to the level of a Special Exposure Cohort (SEC) issue. In response to SC&A's review, NIOSH delivered *NIOSH Response to SC&A Findings on SEC-00225 Blockson Chemical Company Residual Contamination Period*, dated May 23, 2016 (NIOSH 2016). This memorandum presents SC&A's commentary on NIOSH's May 23, 2016 report.

The backdrop to this process is SEC-00225, which petitions the Advisory Board to extend the SEC time period of coverage into the residual period beginning in July 1960. NIOSH, in its review of the petition, found that it is able to reconstruct doses with sufficient accuracy and recommended denial of the petition (NIOSH 2015).

This memorandum is organized by finding and observation. Each of SC&A's original findings and observation is briefly described, along with NIOSH's response to the finding or observation. This is followed by SC&A's position regarding NIOSH's response.

2.0 Finding 1

This finding has to do with inconsistency between how external exposure rate data (µR/hr) from surface contamination were used at Blockson during the residual period as compared to how the data were used at Simonds Saw & Steel. It seems that the NIOSH approach used at Simonds Saw & Steel was more claimant favorable because it used upper-end measurements of the collected data, while NIOSH used a more central-tendency approach at Blockson. NIOSH explains that there were substantial differences between the data sets at Simonds Saw & Steel and at Blockson that justified the differences in approach. Specifically, because of a paucity of data above background (70 measurements were reported with only 7 above background), NIOSH elected to use the upper end of the background reading observed at Blockson as the median value of a lognormal distribution (0.03 mR/hr) with a geometric standard deviation (GSD) of 3.2, which placed that exposure rate at the upper bound of the 70 readings (i.e., 0.2 mR/hr). Based on this, SC&A concluded that there is a consistency issue, even though both approaches are reasonable, with one more conservative than the other. However, NIOSH further explains in its response that the upper-end value of 80 µR/hr assigned to all workers at Simons Saw & Steel was plausible because it was located where people might have worked for extended periods of time, while it was not plausible for people at Blockson to have spent extended period of time at the 0.2 mR/hr location.

Figure 1 displays the survey map of level one of Building 55 from the FUSRAP survey of Blockson in the late 1970's. As NIOSH indicated in their response, the majority of locations in the main plant area are below the background level of the instruments used (0.03 mR/hr). Five of the seven measurements taken above background were located on concrete spots on the floor as highlighted in the Figure 1. The highest value (0.2 mR/hr) was located on the floor next to "Kelly feed tank #1." If it is indeed implausible that a given worker was in the vicinity of this area for chronic periods of time, then NIOSH's proposed external dose assignment appears reasonable while maintaining claimant favorability. Furthermore, if the characterization of working conditions at Blockson is not reflective of the "area specific" work locations assumed for Simonds, then the potential issue of consistency between the two approaches would be rendered moot.

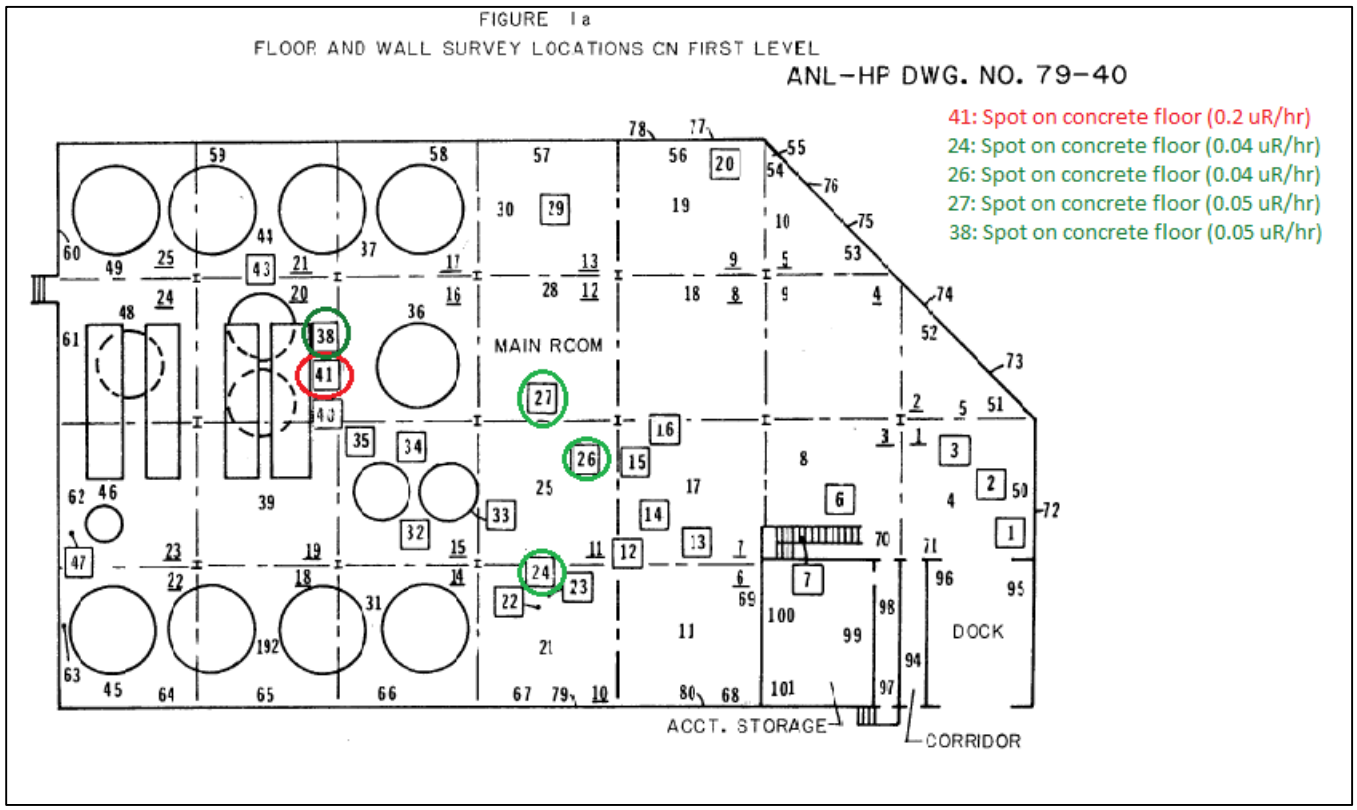

Figure 1. Survey Locations above Background Value of 0.03 µR/hr at Blockson

The second aspect of this finding has to do with inconsistencies between the hours per work year assumed at Blockson (2000 hr/yr) and at Simons Saw & Steel (2500 hr/yr). In its response, it appears that NIOSH couples the assigned external exposure rate distribution with work hour duration. We do not understand this relationship. As indicated in our original review (SC&A 2016), there is abundant evidence in the computer-assisted telephone interviews at Blockson that most workers worked overtime. On this basis, we continue to believe that overtime should be assigned to Blockson workers, and that this aspect of Finding 1 remains in progress.

3.0 Second Part of Finding 2

In our original review of the petition evaluation report (ER), we included, as part of Finding 1, concern that NIOSH did not address external exposures to workers in the vicinity of phosphogypsum stacks. In revisiting this issue, we would like to convert this part of Finding 1 to an observation.

Originally, this part of Finding 1 had to do with the fact that the limiting external exposures at Blockson are based on data collected in Building 55 (median of 0.06 R/yr and GSD of 0.406 R/yr) and did not take into consideration external exposures to scale in the phosphogypsum stacks. NIOSH argues that the external exposure distribution derived for Building 55 is bounding for all workers at Blockson, including workers who might have been located close to the stacks for some period of time. Inspection of Florida Institute of Phosphate Research (FIPR) 1998 reveals that the exposure rate actually experienced by workers at a phosphate plant, including workers who may have been close to the stacks for extended periods of time (such as the payload operators), could not have experienced exposures in excess of 60 mrem/yr. On this basis, we recommend that NIOSH provide some discussion of this matter in the ER, and we would now like to designate this issue as an observation.

4.0 Finding 3

This finding has to do with SC&A's concern that beta exposures to skin are not addressed in the SEC ER. In its response to this issue, NIOSH argues that sufficient conservatism is inherent in the way photon exposures are being assigned (i.e., median of 0.03 mR/hr and GSD of 3.2), which effectively accounts for beta exposures to skin (estimated by SC&A to be 24 mrad/yr). SC&A does not agree with this strategy for accommodating beta exposures. It is clear from a review of the SEC ER and supporting documents in the Site Research Database (SRDB) that the photon exposure rates derived by NIOSH and accepted by SC&A are intended for reconstructing external exposures to penetrating radiation. We do not believe that the assigned photon exposures are so conservative that they could be deemed to account for beta doses also. We do not believe that NIOSH's arguments with regard to this matter represent a scientifically sound and claimant-favorable strategy for accounting for unaccounted for skin dose. SC&A therefore recommends that this finding remain in progress.

5.0 Finding 4

In revisiting this finding, we recommend converting it to an observation because it goes toward improving the ER, but it does not affect how doses might be reconstructed.

This finding has to do with the possibility that workers could have experienced internal exposures associated with the resuspension of particulates from the phosphogypsum stacks. NIOSH explains that the internal dose from the resuspension of particulates in Building 55 is limiting. As indicated in Section 3.2 of our review of the SEC ER, we agree with this conclusion, but the SEC ER would benefit from a discussion of this issue. Therefore, SC&A recommends converting Finding 4 to an observation.

6.0 Finding 5

This finding has to do with NIOSH's assumption that a factor of 5 reduction in the radon exhalation rate from the phosphogypsum stacks should begin in 1960 as opposed to SC&A's position that the reduction should begin in 1991 when the phosphate operations ceased and the stacks began to dry out, form a

crust, and begin the process of reducing the radon exhalation rate. In response to this concern, which is also relevant to our original Observation 1, NIOSH has clarified its perspective on how to address exposures to the stacks produced during the Atomic Weapons Employer (AWE) period. As we understand NIOSH's position, NIOSH is assuming that the AWE stacks, which were produced from 1952 through June 1960, were either located on top of phosphogypsum produced by commercial operations before 1952 or were placed at a location separate from the location of the phosphogypsum produced after the completion of AWE operations.

It is SC&A's opinion that there are essentially three methods, or approaches, to reconstructing radon dose from the residual AWE wastes found in the phosphogypsum pile.

The first approach, and most claimant favorable, is to assume that the AWE radon contribution is indistinguishable from the commercial wastes, and thus the entire phosphogypsum pile and associated radon is attributed to AWE work. Note that this concept appeared to have been the original approach assumed in the ER (ABRWH 2015, pages 28 and 39). This is an extremely improbable assumption because AWE-related wastes would have most likely been covered by commercial waste, which would effectively begin to "trap" the AWE radon within the stack. This significant conservatism was also the subject of our original Observation 1.

A second approach would be to assume that the commercial wastes were piled on top of, and effectively attenuated the radon emanation from, the Atomic Energy Commission wastes. The decrease in the emanation rate in this scenario would be due to the commercial wastes and not the natural crusting effect that occurs with an inactive pile. While likely the most realistic characterization of the AWE radon exposures at Blockson, this approach is likely the least claimant favorable and the also the least feasible to implement.

The third possibility, and what appears to be NIOSH's currently proposed approach, is that either the AWE-related phosphogypsum pile was located in a separate location from commercial wastes produced after 1960 or as located in an area of the main phosphogypsum stack that became inactive as soon as AWE operations ceased. Either situation seems somewhat unlikely, given that it was a commercial plant and the phosphogypsum wastes for AWE and commercial activities are essentially identical. However, if the assumption of a separate, inactive AWE pile or location is deemed acceptable, then the numerical methods contained in the SEC ER to assign radon dose are scientifically accurate while still remaining claimant favorable. If this third approach is deemed acceptable, SC&A believes that Finding 5 should be changed to an observation.

7.0 Observation 1

This observation is related to Finding 5 in that we believe NIOSH overestimated the exposures of workers to phosphogypsum produced by AWE operations by assuming that radon from AWE operations was indistinguishable from commercial operations. It was our understanding at the time of the review of the SEC ER that NIOSH assumed that the phosphogypsum from commercial operations that took place from July 1960 to 1991 was placed on top of the AWE phosphogypsum. Under these conditions, the commercial phosphogypsum would have likely have precluded any exposures to the AWE phosphogypsum at some point during the residual period. However, as described by NIOSH in its response to Finding 5, NIOSH appears to assume that the AWE phosphogypsum was stored at its own location on site, separate from the commercial phosphogypsum produced beginning in July 1960. If this

newer assumption is accepted, then SC&A recommends withdrawing Observation 1 or, alternately, modifying it based on the discussion concerning Finding 5 (see above).

8.0 References

ABRWH 2015. *Transcript of the 108th Meeting of the Advisory Board on Radiation and Worker Health*, Advisory Board on Radiation Worker Health, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention. November 19, 2015.

FIPR 1998. *Evaluation of Exposure to Technically Enhanced Naturally Occurring Radioactive Materials (TENORM) in the Phosphate Industry*, Florida Institute of Phosphate Research. July 1998. [SRDB Ref. ID 18076]

NIOSH 2015. *SEC Petition Evaluation Report, Petition SEC-00225, Blockson Chemical Co. (Building 55 and Related Activities)*, National Institute for Occupational Safety and Health. September 8, 2015.

NIOSH 2016. *NIOSH Response to SC&A Findings on SEC-00225 Blockson Chemical Company Residual Contamination Period*, National Institute for Occupational Safety and Health. May 23, 2016.

SC&A 2016. *Draft Review of Blockson Chemical Company Residual Period SEC-00225*, SCA-TR-2016-SEC003, SC&A, Inc., Vienna, Virginia. April 25, 2016.