Miller, Diane M. (CDC/NIOSH/EID)

From: DanMcKeel2@aol.com
Sent: Thursday, July 26, 2012 9:04 AM
To: Katz, Ted (CDC/NIOSH/OD); NIOSH Docket Office (CDC)
Cc: danmckeel2@aol.com; Kinman, Josh (CDC/NIOSH/DCAS); Ziemer, Paul (CDC/NIOSH/OD); pl.ziemer@comcast.net
Subject: New Board and Docket 140 submission
Attachments: DWM_comment_7.25.12app.pdf

July 26, 2012 Thursday

Ted Katz, ABRWH DFO
NIOSH Docket 140 (GSI)

Attachment <DWM_comment_7.25.12app.pdf> 250 Kb

Dear Ted and NIOSH Docket Office,

To Ted Katz: Please distribute this transmittal message and the attached 13 page PDF file to all members of the TBD-6000 work group and staff and to all members of the full ABRWH. The document is intended to be an August 28, 2012, TBD-6000 work group Discussion paper that is my reply to the SC&A Bob Anigstein report dated 7.16.12 on surrogate data use at GSI. My paper contains two Appendices that summarize (a) reasons why I believe that SEC-00105 merits an approval vote by the full Board at the September Denver meeting, and (b) a listing of 30 items of missing GSI data that is known to have existed at one time but has never been recovered by NIOSH, SC&A or the Board.

To the NIOSH Docket Office: Please consider this submission (transmittal letter and PDF attachment) for posting under DOCKET 140 (GSI). The document directly addresses an important set of SC&A findings related to NIOSH's use of TBD-6000 slug facility surrogate intake data from an unnamed slug facility to bound internal intake photon doses at GSI with sufficient accuracy. The two Appendices are relevant to revision of Appendix BB and the appropriate GSI SEC-00105 recommendation to HHS.

Thanks in advance to you both.

Sincerely,

-- Dan McKeel

Daniel W. McKeel, Jr., MD
GSI SEC-00105 co-petitioner
Phone: 573-323-8897
Fax: 573-323-0043
E-mail: danmckeel2@aol.com
US Mail: P.O. Box 15, Van Buren, MO 63965-0015

Daniel W. McKeel, Jr., M.D. GSI Co-Petitioner
Comment on SC&A White Paper Dated 7.16.12
"Review of the use of surrogate Data for estimating intakes of uranium at General Steel Industries"
(July 25, 2012)

The purposes of this analysis are three-fold: (1) to comment on the findings of the draft white paper on the SC&A surrogate data (SD) use at GSI dated 7/16/12 by Dr. Robert Anigstein; (2) to review the real measured Appendix BB and SEC-00105 data that currently exists for the GSI site; and (3) to encourage the TBD-6000 work group to complete their work on Appendix BB issues so that (4) the sorely out of date Rev 0 (June 2007) technical document can be revised by NIOSH. Director Stuart Hinnefeld of the Division of Compensation Analysis and Support (DCAS) has indicated that resolution of all SC&A findings with NIOSH is a requisite to revising Appendix BB to TBD-6000, the GSI AWE site profile main documents.

Part 1. The 7/16/12 SC&A White Paper on SD Criteria Use at GSI

McKeel summary of key findings: SC&A found broadly that NIOSH use of SD at GSI had failed to meet Advisory Board's five SD criteria in some major aspects, including plausibility. SC&A recommended that NIOSH develop methods for calculating intakes that did not depend on SD. Co-petitioner McKeel believes that NIOSH has been allotted another 21 months to develop new dosimetry methods since the advent of David Allen's "Path Forward for GSI" white paper in October 2010. It is unreasonable to allow a third chance. The correct action would be for NIOSH to rewrite its SEC-00105 evaluation report to now recommend that an SEC be approved for GSI for the entire covered and residual periods.

Dr. Paul Ziemer, acting for the TBD-6000 work group, at the June 19-21 face meeting of the Advisory Board on Radiation and Worker Health ("Advisory Board") narrowly tasked SC&A to review the use of the slug facility monitoring data from TBD-6000 to calculate intakes doses at GSI during both the covered period years (1953-June 1966) and the residual contamination period years (July 1, 1966 to 1993) at GSI.

Co-petitioner McKeel beginning in 2008 had questioned the appropriateness of using TBD-6000 slug facility data at GSI. Work group member Josie Beach filed two motions to perform this SD review at the June 14, 2012, TBD-6000 work group meeting. Work group member John Poston seconded both motions, and the vote was 3 to 1 in favor of both motions. Member Paul Ziemer voted yes to both motions and work group member Wanda Munn voted no to both motions.

McKeel then filed a request to the Advisory Board to extend the scope of SC&A's review of Board SD criteria to all the many uses of SD at GSI, including the various working computer-based models for calculating external and internal dosimetry data. This request was not responded to.

Dr. Anigstein and SC&A then released the white paper on SD use at GSI dated 7/16/12 and presumably copies went to all Board members, as had been requested by Advisory Board chair Dr. James Melius during the July 19-21 ABRWH meeting. John Stiver was the project manager for this SC&A white paper. John Mauro and Bill Thurber were the SC&A reviewers.

DCAS/NIOSH and David Allen replied through NIOSH SEC Counselor Josh Kinman shortly before the 7/16/12 release date that he was not sure whether NIOSH would respond to the SC&A 7/16/12 white paper on SD use at GSI.

Detailed Analysis of the Anigstein SC&A White Paper Dated 7.16.12

The white paper systematically applies each of the Advisory Board SD criteria to evaluate the appropriateness of using slug facility intake data at GSI.

Following is a statement of each of the five SD criteria that was applied, the SC&A finding, and Dan McKeel's comment on the SC&A finding.

2.1 **SD criterion 1. Hierarchy of Data.** (pages 3 and 4 including subsections)

• Subsection 2.1.1 SC&A Evaluation of Hierarchy of Data. (page 4)

SC&A findings:

"Thus, we conclude that the use of surrogate data does not strictly conform to the hierarchy of data."

• Subsection 2.1.2. SC&A Evaluation of Appropriate Adjustments to Surrogate Data. (pages 4-5)

SC&A findings:

"Using the actual measured air concentration reported by Harris and Kingsley would lead to an increase of X2.9 over the value employed by Allen and Glover. We conclude that "appropriate adjustments" were not made to these surrogate data. We find that Criterion 1 is not fully satisfied by the use of the slug stamping scenario presented by Allen (2011)."

McKeel comment on subsections 2.1.1 and 2.1.2 of SD criterion 1: SC&A in the preceding section invalidates the use of slug facility data as being appropriate and valid. The conclusion for 2.1.2, with which McKeel concurs, is therefore rendered moot.

2.2 SD criterion 2. Exclusivity Constraints. (page 5)

SC&A findings:

"We do not agree that the use of the surrogate data was stringently justified. We find that Criterion 2 is not satisfied."

McKeel comment on SD criterion 2: The SC&A finding, with which co-petitioner McKeel of course agrees wholeheartedly, supports exactly what Dan McKeel has been saying since 2008 that "stringent comparability" of the slug facility and GSI data was not even seriously attempted by NIOSH. The SC&A conclusion is welcome but long overdue.

2.3 SD criterion 3. Site or Process Similarities. (pages 5-6)

SC&A findings:

SC&A poses 4 bulleted questions that must be considered. They conclude that (1) slugs and dingots are not comparable, both in physical characteristics, which is obvious, but setup for the two types of uranium objects would be different. Both observations fully support McKeel's long time contention that NIOSH has ignored; (2) the OCAS director in 2005 told a GSI site expert and Dan McKeel that "GSI was a unique site" that presumably was based on knowledge of the GSI site profile and its uniqueness among all other covered sites. None of them performed NDT work on uranium metal in the same way that was done

for 13 years at GSI; (3) the specific slug facility work site is not mentioned; (4) *"we conclude that the surrogate data do not reflect the types of operations and work practices used at GSI."*

The overall SC&A conclusion was that:

> *"We find that the use of slug stamping as a surrogate for the handling of uranium at GSI does not fulfill Criterion 3."*

McKeel comment on SD criterion 3: SC&A concludes and supports McKeels testimony to the TBD-6000 work group and full Board from 2005 until the present time, which he reinforced at the March 15 and 28 and June 14, 2012 TBD-6000 work group meetings, that slug facility intake data of TBD-6000 was used inappropriately by NIOSH. Thus, the SC&A conclusion in agreement with McKeel's position is welcome but is long overdue. NIOSH now needs to admit they cannot reconstruct intake does at GSI with sufficient accuracy. Co-petitioner McKeel feels strongly that NIOSH should not be allowed additional time to develop another methodology for performing this task. Appendix BB Rev 0 was released in June 2007 and NIOSH has been using this surrogate data source inappropriately ever since for all but four GSI individual dose reconstructions (refer to GSI PER-24).

2.4 SD criterion 4. Temporal Considerations. (page 7)

SC&A findings on SD criterion 4: SC&A observes that the Harris and Kingsley data on which NIOSH relies was published in 1958 and may apply to a period before the onset of the GSI AEC contract with Mallinckrodt Chemical Works Uranium Division. They conclude Harris and Kingsley thus does not meet the shared temporal data criterion 4. The conclusion is stated as follows:

> *"According to Rolfes et al. (2008): "[I]t is likely that the data [presented by Harris and Kingsley (1959)] were collected before 1957 and perhaps as early as the late 1940s." We note that the report was submitted for publication on June 6, 1958. Thus, the measurement of uranium air concentration cited by Allen and Glover (2007) may have been made 10–20 years prior to the end of the period of AEC operations at GSI (1953 to mid-1966). Allen and Glover need to justify the application of this measurement to the entire period of operations at GSI."*

McKeel comment on SD criterion 4: SC&A has heretofore in many TBD-6000 work group meetings *lauded* Harris and Kingsley (1959) as a good TBD-6000 uranium metals

reference source of information. I can't remember any negative comment about the Harris-Kingsley data not being temporally divergent from GSI AEC-MCW uranium NDT operations. Again, this conclusion is welcome, and McKeel does concur. Also, TBD-6000 and Harris and Kingsley (1959) does not address 24-25 Mev Betatron nondestructive testing of uranium metals *per se*. That is the largest issue of plausibility.

However, the observation reinforces McKeel's concern that this SD analysis at GSI comes very late in the Appendix BB and SEC consideration process after ample time has passed to flag all these examples of inappropriate use of SD data at GSI by NIOSH. Nor has the TBD-6000 work group made any of these observations or questioned whether Board SD criteria were met at GSI. This is the first time that SC&A has been tasked to review SD data use at GSI. The tasking was very narrow and encompassed only an important aspect of dosimetry (uranium intakes) that is, however, only a small fraction of the total use of SD at GSI. The GSI SD usage analysis needs to be expanded in scope to all types of SD that NIOSH and SC&A have used at GSI.

2.5 **SD criterion 5. Plausibility.** (pages 7- 9 including subsections)

• Subsection 2.5.1. Evaluation of Scientific Plausibility. (pages 7-8)

"Allen and Glover (2007) assumed that the surficial contamination level from July 1, 1961, until the end of the residual period was equal to the total uranium deposition during that 12-month period, with no removal but also no contribution from deposition that occurred before or after that period. A more realistic model would assume continuous buildup of the surficial contamination, based on the periods of uranium handling operations, together with continuous or intermittent removal. The authors need to demonstrate that the assumed one-year period of accumulation is scientifically plausible."

• Subsection 2.5.2. Evaluation of Workplace Plausibility. (pages 8-9)

SC&A findings:

"We thus find that the calculation of surficial uranium concentrations described by Allen and Glover does not meet the criterion of workplace plausibility."

McKeel comment on SD criterion 5: The SC&A finding of workplace implausibility again supports McKeel, site expert and former worker affidavit contentions and testimony given since 2005. Specifically, the GSI building complex, and especially both Betatron buildings, had high (not low) dust levels. The floors had inches of "dust," clearly shown in

site photos, that was composed of uranium ingot and dingot flaked off (abraded by chains) magnesium fluoride residual "bomb" crust (with trace radioactive contaminants) and uranium oxides intermixed with Magnaflux powder, and steel shavings that were loosely adherent to castings and came off during crane operations inside the shooting room of the Betatron facility. Workers boots undoubtedly tracked this dust throughout the control room, offices and film badge storage areas. Heavy duty industrial vacuums were frequently used to attempt to control the high Betatron facility dust levels.

2.6 Summary of Findings (pages 9 and 10)

SC&A findings:

"We find that the use of uranium air concentrations based on measured on measurements made during the stamping of uranium slugs as a surrogate for uranium air concentrations at GSI does not meet the five ABRWH criteria for the use of surrogate data. Our findings with respect to these criteria are summarized as follows:

Criterion 1. Hierarchy of Data

- *Data from the 1993 FUSRAP survey (Murray and Brown 1994), that could help estimate levels of contamination on the floor of the Old Betatron Building, were not utilized by NIOSH.*
- *Adjustments to the measurement reported by Kingsley and Harris (1959), described by Allen (2011) and utilized by Allen and Glover (2007), are not appropriate to the uranium handling scenario at GSI.*

***Criterion 2. Exclusivity Constraints**: The use of the surrogate data was not stringently justified.*

Criterion 3. Site or Process Similarities

- *Neither the form of the uranium metal (slugs produced by powder metallurgy vs. recast ingots or direct reduced dingots), nor the processes (stamping numbers on slugs vs. transporting uranium objects and positioning them for radiography) are sufficiently similar to justify the use of the surrogate data.*
- *Alternate sources of surrogate data (e.g., the 124 work sites for which NIOSH has collected information) were not evaluated.*
- *There are insufficient data regarding the characteristics of the surrogate site to support the use of the surrogate data for GSI.*

***Criterion 4. Temporal Considerations**: The Kingsley and Harris (1959) data were most likely collected between the late 1940s and ca. 1957. The measurement used as a surrogate at GSI could thus precede the end of the covered the period by 10–20 years. The application of these data for the 1953-1966 period of AEC operations needs to be justified by Allen and Glover (2007).*

Criterion 5. Plausibility

- *The methodology of calculating surface contamination levels based on the assumed uranium aerosol concentration is not scientifically plausible."*
- The assumption that the surface contamination levels result only from the deposition of aerosols during the uranium handling operations does not satisfy the criterion of workplace plausibility."

McKeel comment on SC&A overall findings:

SC&A makes several recommendations about actions that NIOSH needs to take regarding the SC&A SD findings. NIOSH needs to indicate (a) if it plans to do so, and (b) what the timeline might be. The NIOSH response should be delivered *prior to* the 8/28/12 TBD-6000 work group meeting.

SC&A summarizes that none of the Board's own surrogate data criteria are met and 100% fulfilled. That is, the slug facility uranium intake data usage based on TBD-6000 is judged by SC&A to be wholly inappropriate. Co-petitioner McKeel agrees with this conclusion. He asks the TBD-6000 work group and full ABRWH also accept these SC&A findings and recommend that Appendix BB be revised immediately and that NIOSH change its recommendation for SEC-00105 from deny to approve based on the now demonstrated fact, after two prolonged attempts to do so, they cannot estimate uranium intakes with sufficient accuracy based on use of surrogate data. Under no circumstances will it be fair of claimant favorable if NIOSH is allowed more time to attempt to develop new methodology as they were given after the David Allen "Path Forward for GSI" initiative was instituted in October 2010. The present findings show this second methodological attempt by NIOSH was not successful.

It is worth noting that, in fact, the 124 other mainly AWE sites that SC&A mentions, were in fact examined for comparability with respect to the amount of dosimetry data. McKeel previous public comments have highlighted two unreleased surveys that ORAU and Battelle made for OCAS on the amount of AWE site dosimetry records. These two reports, according to former OCAS Director Elliott as told in person to a GSI expert, a US senator's staff person, and to Dan McKeel, were never released because they were "technically flawed." Other knowledgeable advocates have suggested the true reason was that NIOSH did not want to disclose that many of the AWE sites lacked any or insufficient radiation monitoring data, and might therefore qualify for 83.14 NIOSH-initiated SECs.

I should note that NIOSH has never applied its own surrogate data criteria (OCAS-IG-004) to GSI. This is a serious oversight that should be addressed.

Co-petitioner McKeel again requests the scope of SD use at GSI in both Appendix BB and the NIOSH evaluation report of SEC-00105 be expanded to include all other surrogate data uses at GSI. As is outlined in other portions of this paper, there is an extreme paucity of any real, measured, validated pedigree GSI external or internal individual or facility dosimetry monitoring data.

3. Use of Alternate Scenarios. (Page 10).

SC&A findings: SC&A took it upon itself to examine "five other uranium metal working scenarios" and concluded that "*None of these operations satisfy the surrogate data criteria any better than the slug stamping scenario.*" They then turned to Adley (1952) as possible SD source data for GSI, and concluded they still had reservations of using these data as appropriate surrogate data at GSI appropriate with respect to Criteria 5, Plausibility, with lesser concerns expressed about Criteria 3 and 4.

McKeel comment: This latter finding further undermines NIOSH's claim that it can bound with sufficient accuracy intake data at GSI during the covered and residual periods based on TBD-6000 reference data. This finding adds to the imperative for NIOSH to reverse its recommendation to deny SEC-00105, and to immediately revise Appendix BB based on the totality of relevant data that now exists pertaining to dose reconstructions at GSI.

4. Recommendations. (Pages 10 and 11)

SC&A findings:

"SC&A recommends that NIOSH develop a methodology for estimating uranium intakes at GSI that does not rely on surrogate data. We suggest a model that uses the exponential source-term depletion rate recommended in OTIB-0070 (Sharfi 2012). The contamination levels on the floor of the Old Betatron Building at the time of the 1993 cleanup, reported by Murray and Brown (1994), together with the depletion rate and the varying hours of uranium handling operations at GSI, could be used to calculate the average surficial uranium concentrations during each year of the operational and residual periods."

McKeel comment on SC&A overall recommendations:

Co-petitioner McKeel strongly disagrees with the feasibility, scientific soundness and defensibility, appropriateness, and claimant favorability of this recommendation. I state the following reasons for my opposition for the TBD-6000 work group and full ABRWH accepting these recommendations made by SC&A.

1. NIOSH has had since June 2007, or five years and one month, to develop valid and scientifically defensible bounding intake methods for GSI that fail to meet the Board SD criteria or the standards in EEOICPA for dose determination with sufficient accuracy. They have steadfastly relied on TBD-6000, Harris and Kingsley (1959) and to a lesser extent on Adley (1952) that SC&A have now soundly been deemed inappropriate SD sources for use at GSI. Dan McKeel has championed this position, and heartily concurs with the main SC&A findings in this white paper.

2. NIOSH has failed in two attempts to develop intake assessment methods that it has failed to be able to do on two attempts. There is no reason to expect that new methods could be developed that do not depend on surrogate data because there is nothing but SD. There is no (zero) real measured monitoring data at GSI on which to base new methods. This should be obvious by now.

3. SC&A should be evaluating NIOSH methods, and the petitioner cannot see that it is proper for SC&A to be advocating a specific newly introduced and unproven method (Sharfi MM, 2012) that co-petitioner McKeel has already critiqued and stated to be unsound. The author of that reference attended a recent TBD-6000 work group and was asked no questions and gave no defense of his new method that purports to be able to derive, from a single measured dose, the air intake dose midway in the time period of a residual period that spans many years. Again, this is a derivative surrogate method that depends purely on calculated modeled data distributions. Further, the Sharfi method advocated by Dr. Anigstein and SC&A not to my knowledge been scientifically validated using real measured data that has passed the SD criteria for GSI use. Thus, employing the Sharfi method would not provide any advance over the present situation. I contend the Sharfi method would not meet Board SD criteria, either.

4. Most of all, any recommendation to further prolong the already too long deliberation period for Appendix BB revision and SEC-00105, is inherently claimant adverse. The Board should not allow this to happen in the co-petitioner's view. GSI

claimants deserve to have favorable amendments made to Appendix BB right away. And they need to have SEC-00105 approved by the TBD-6000 work group at the August 28, 2012, meeting, and by the full Advisory Board at the September meeting in Denver.

References (page 12).

SC&A findings: SC&A lists 11 pertinent reference citations.

McKeel comment on References: None

McKeel Appendices

I have appended two listings of (1) existing real (measured) GSI dosimetry data, and (2) missing GSI data that is known to have existed based on site documentation, including NRC FOIA 2010-0012. This material is offered to summarize for the full Board the true paucity real data and the enormous extent of missing data compared to other AWE sites that have been awarded 83.14 and 83.13 SECs. GSI is at the very low end of the "have real dosimetry data" spectrum when compared to all other AWE covered sites. These lists need to be considered as a vote on SEC-00105 approaches.

Respectfully Submitted:

Daniel W. McKeel, Jr.

Daniel W. McKeel, Jr., MD July 25, 2012

Mail: P.O. Box 15 / #7 CR 301A
Van Buren, MO 63965-0015 USA
Phone: 573-323-8897
Fax: 573-323-0043
E-mail: danmckeel2@aol.com

APPENDIX A

Points in Favor of Approving SEC-00105 for GSI from 1953 to 1993: Real Measured Data at General Steel Industries (Docket 140)

1. No GSI uranium source data 1953-1957 (i.e., no MCW purchase orders AEC contract);
2. No data on percentage of uranium NDT radiography done in Old versus New Betatrons 1963-mid 1966 when there were two Betatrons at GSI;
3. No data on MCW mix (percentages shipped) of Ur-238 ingots, dingots, billets, and Betatron slices that do have different chemical & physical characteristics;
4. No uranium urine bioassay data 1953-1993;
5. 100% of work force no badge data 1953-1962; 1974-1993;
6. • Only 3% (n=108 total workers) of workforce, male isotope & Betatron operators only, badged w/data 1963-1973 only photons were monitored (data not representative of the entire GSI SEC class that numbered at least 3,000 workers);
7. • *Corollary*: 97% of workforce, all other jobs, <u>not</u> badged 1953-1993;
8. No Betatron radiation survey data 1953-June 1966 (or in literature, either);
9. No measurements of neutrons 1953-1993 (Betatrons and other sources);
10. No measurements of [2] Ra-226 sources 1953-1962;
11. No measurements of [2] 250 Kvp industrial X-ray sources 1953 to mid-1966;
12. NCC one-time survey (1962) of [2] 0.25 Ci Co-60 sources in Bldg. 6 radiography facility only (photons only measured; done outside the AEC contract period);

13a. 1971 one-time measurement of 80 Ci Co-60 source in New Betatron building only

13b. No large GSI 80 Ci Co-60 source measurements 1963-66 (6 worker affidavits indicate that GSI owned this source; TBD-6000 work group chair states that is possible from his own experience [work group meeting transcript]);

14. No GSI Ir-192 source measurements 1957-1962 (5 worker affidavits GSI owned this source);
15. No St. Louis Testing Company Ir-192 source measurements or license information;
16. No St. Louis Testing Company Co-60 source measurements or license information;
17. No general radiation survey of the entire GSI building complex 1953-1993;
18. ORNL/DOE one-time (1 week) radiation survey of Old and New Betatron facilities 1989 as prelude to uranium cleanup limited to Old Betatron facility;
19. No GSI breathing zone inhalation measurements 1953-1993;
20. No general air radiation measurements at GSI 1953-1993;
21. SC&A (7/16/12 report) indicates that TBD-6000 slug facility surrogate data (SD) used by NIOSH for calculating intake doses at GSI is not scientifically valid or appropriate when Board SD criteria are applied.

<u>McKeel Data Summary</u>: Only items (6), (12), (13a) and (18) represent monitoring data gathered at the GSI site itself. SC&A (item 21) indicates that NIOSH intake dose methodology for GSI fails to meet all five Advisory Board surrogate data criteria.

APPENDIX B

Missing Known to Have Existed Data at General Steel Industries (Docket 140)

1. Betatron shot records;
2. Survey instrument maintenance (parts such as donut tubes, labor) and calibration test results;
3. Source term leak test results;
4. Shipping records that show (a) uranium being transported to/from MCW and GSI and show (b) manifests that detail exactly what forms or uranium metal were shipped from MCW-Destrehan Street and from Weldon Spring Uranium Feed Materials Plant in St. Charles county as ingots, dingots, billets, and "Betatron slices." Should include truck and rail (Terminal Railway was mentioned on some MCW purchase orders) shipping manifests. There should be record at both MCW and GSI showing the uranium materials that were received at GSI and returned to MCW;
5. GSI x-ray results check lists and exposed x-ray film mentioned by supervisors and "film readers" as having been routinely generated as a record of NDT operations and given to MCW.
6. Pocket dosimeter monitoring log books.
7. AEC technical reports about the GSI NDT campaigns (both Destrehan Street and Weldon Spring generated a plethora of such reports; 18,000 are filed at the Washington University, St. Louis Olin Library Annex). Dan McKeel has urged many times these key reports be searched for ardently;
8. MCW (AEC contract) purchase orders 1953-1957;
9. Original Allis-Chalmers 1952 GSI and Eddystone Division Betatron facility radiation surveys made on all new Betatron installations;
10. Picker X-ray Betatron service records;
11. Jack Schuetz GSI Betatron service records (invoices, paid receipts);
12. Old Betatron operating manuals, US Government procurement records, blueprints, exact construction dates, construction "as built" plans, construction cost analysis records...;
13. New Betatron operating manuals, US Government procurement records, blueprints, exact construction dates, construction "as built" plans, construction cost analysis records...;
14. NCC (Nuclear Consultants Corp.) AEC by-products license(s) for its Co-60 source;
15. St. Louis Testing Company by-products materials license for its Ir-192 and Co-60 sources;
16. Film badge log books showing weekly shipments and receipts of FB to and from RS Landauer;
17. Correspondence between RS Landauer and GSI showing when film badge program 2084 was set up and contracted for;
18. Documentation of high film badge readings and personnel actions related thereto;
19. GSI incident reports;
20. GSI incident reports to the AEC;

21. GSI employee medical records of in house and external examinations, lab test results, x-rays, and medical charts;
22. GSI source term records (calibrations, purchase orders, paid receipts, use records, shot log books, incident reports, maintenance and repair records, calibration records, leak test records: 2 Betatron 24-25 Mev, 3 Co-60 sources, 1 Ir-192 source, 2 industrial portable 250 Kvp x-ray machines, 2 ra-226 sources);
23. A complete listing of actual radiation safety program written tests being given, employee scores, employee safety counseling records, feedback letters to the AEC;
24. OSHA incident reports;
25. AEC incident reports;
26. Patient medical referral records to and from local Granite City hospitals where employees were known to have been sent following incidents and accidents;
27. Letters mentioned in GSI Board minutes at MO Historical Society, Skinker Blvd, St. Louis, MO, for 1951-52 that document US government offer to sell the Old Betatron machine and building back to GSI, an offer that GSI management refused to accept. (see item 28);
28. Correspondence between US Government and Eddystone Division of GSI in Pennsylvania that was also the recipient of US government largesse as listed in the same GSI Board minutes at MO Historical Society, Skinker Blvd, St. Louis, MO, for 1951-52 that are referenced in item 27;
29. A GSI AEC license renewal document in FOIA 2010-0012 mentioned "this site was licensed for **iridium** (emphasis added) and cobalt sources." The referenced iridium AEC license has not been located or sought by NIOSH to my knowledge;
30. Six GSI former workers signed an affidavit attesting to their personal use and knowledge of an 80 curie large Co-60 source being owned by and used at GSI State Street between 1964 and 1966.

McKeel Summary: The aggregate impact of information summarized in Appendix A and Appendix B argues persuasively that the GSI site (NIOSH Docket 140) merits a recommendation from the full ABRWH Board to approve GSI SEC-00105 for the full covered and residual contamination periods from 1953 to 1993.

Extensive use has been made by both NIOSH and SC&A of computer modeling surrogate data at the GSI site to substitute for very substantial missing real measured monitoring data that is needed to bound internal and external photon, beta and neutron doses. The petitioners believe that MCNPX, Attila, TKSolver and all other computer-based models require both *validation* and *verification*. The latter criterion has been fulfilled for MCNPX, but this code has not been validated, for example, for operating 24 and 25 Mev Betatrons at GSI 1953 to mid-1966 when the AEC contract NDT work was done with MCW. Those necessary validating data simply either do not exist, or they have not been found.