Dragon, Karen E. (CDC/NIOSH/EID)

From: DanMcKeel2
Sent: Friday, June 07, 2013 1:50 AM
To: Katz, Ted (CDC/NIOSH/OD); pl.ziemer@comcast.net; Ziemer, Paul (CDC/NIOSH/OD)
Cc: danmckeel2@aol.com; NIOSH Docket Office (CDC)
Subject: McKeel analysis of Adley et al 1952 Report and the GSI AWE site
Attachments: McKeel_AdleyFE_MeltPlantBld.pdf

Dear Ted and Paul and the NIOSH Docket Office,

Attachment: <McKeel_AdleyFE_MeltPlantBld.pdf> 2.3 MB

The attached PDF file is my analysis of the Adley *et al.* 1952 report on the Hanford Melt Plant as it pertains to the GSI AWE site in Granite City, IL. This key report was not referenced in Battelle TBD-6000 Rev 0 (2006), GSI Appendix BB Rev 0 (2007) of it, or in the NIOSH SEC-00105 evaluation report (2008). Later technical reports, TBD-6000 Rev 1 (2011) and SC&A reviews (Thurber May 13, 2014), for example, have included this reference that I therefore assume will be a key citation in a revised Appendix BB Rev 1. This analysis pertains directly to finalizing airborne uranium intake radiation doses at GSI during both the operational (10/1/1952 - 6/30/66), and residual periods (7/1/66 - 12/31/1992).

Ted Katz, please distribute this paper to all ABRWH members and to the Board, NIOSH and SC&A members of the TBD-6000 work group and others as appropriate.

NIOSH Docket Office, please consider posting this paper as a discussion paper for the 6/20/13 TBD-6000 work group meeting and as a paper under GSI Docket 140. Please use the title: Daniel W. McKeel, Jr., MD "Analysis of the Adley *et al.* 1952 Hanford Melt Plant technical report."

Thank all of you for your consideration of these requests.

Sincerely,

- Dan McKeel June 7, 2013

Daniel W. McKeel, Jr., MD
SINEW co-founder
GSI SEC-00105 co-petitioner

Review of: Adley FE, Gill WE, and RH Scott,
"Study of Atmospheric Contamination in the Melt Plant Building,"
Hanford Works, Richland, Washington (HW-23352[Rev.])
April 4, 1952

Daniel W. McKeel, Jr., MD
GSI SEC-00105 Co-petitioner
-- June 6, 2013 --

Cover Page 1: This document is marked "**UNCLASSIFIED**" on each page.

Page 0 is a legal disclaimer

Page 00 is a disclaimer about possible illegible pages

Page 000 states "declassified December 1, 1955" and has another Legal Notice. "AEC, Oak Ridge, Tenn." is written in the lower right of this page.

Page 1/2 is the formal Title page with the three authors, title, date and publication information listed for this report. The report was issued by the Biophysics Section, Radiological Sciences Department, Hanford Works, Richland, WA. An added note states: "Operated for the Atomic Energy Commission by the General Electric Company under Contract # W-31-109-ENG-52" The page number is typed as -1-2- at bottom page center, and a handwritten "2" is written at the top of the page.

Page 3 contains the **Preface**. The following passage is a quote:

> The following report discusses the findings of a study of atmospheric contamination by uranium fume and dust in the Melt Plant Building.
>
> Coincidental with the processing and handling of uranium metal are numerous opportunities for the workroom atmosphere to become contaminated with its oxides. This problem has been recognized generally as being omnipresent wherever uranium is processed due to this metal's chemical and physical properties which readily predispose to atmospheric contamination.

> Routine monitoring of the building atmosphere has been conducted by what was formerly known as the Operational Division of the Health Instrument Divisions. Data compiled from February, 1947 to May, 1951

Page 4 -- Is the Table of Contents. Major section headings included: Preface, Summary, Environment, Method of Study, Findings, Conclusions, Recommendations, and Appendix.

Page 5 header: "**STUDY OF ATMOSPHERIC CONTAMINATION IN THE MELT PLANT BUILDING, SUMMARY**"

• "*Oxide-**handling**, machining operations, burnout, and rod-**handling** were the chief contributors to atmospheric dust and fumes...*" (emphasis added)

• **McKeel Comment**: NIOSH and SC&A have minimized the contribution of "cold uranium handling" to uranium intakes at General Steel Industries in Appendix BB and SEC-00105. Both entities have flagged simple handling of uranium as the scenario with the least internal radiation exposure. The above passage indicates otherwise.

• The following passage is the most relevant to GSI, however, and has been omitted from their technical analyses of the Adley *et al* 1952 technical report to date:

• "*Weighted daily exposures at rod-handling showed an exposure **2 1/2 'times the MPC.***" (bolding emphasis in the original paper; underline emphasis added).

• **McKeel Comment**: Because simple handling of uranium metal rods causes 2.5-fold elevations above acceptable limits, the GSI petitioners contend that similar elevated doses could have affected any worker in the uranium handling path at GSI who handed or transported or weighed the 3300 pound MCW uranium ingots and dingots, and the billets and Betatron slices described in MCW site profile documents. When trucks or rail cars carrying MCW uranium were logged into or out of the GSI plant, weighing personnel were required to remove tarps and inspect and identify and record each piece of inventory. Chain men handled the chains that chafed against the uranium, causing airborne uranium particles to flake off. Workers riding the rail transfer cars carrying MCW AEC uranium from and to the loading dock, storage areas (*one of them is now known by affidavits to have been in Building 5 in a locked metal cage. We have photos of this structure in 2013*), and Betatron buildings at GSI were exposed to airborne dust and fumes. None of these personnel were ever badged 1952 to June 1966 during the AEC-MCW contract period; all should have been badged. NIOSH has not bounded uranium intakes for these GSI workers along the long MCW uranium transport path that winds through buildings 5, 6, 7, 8, 9 and 10 and the rail tracks in the two GSI Betatrons.

Page 6. Drawing Process and Equipment Layout of Melt Plant Building

Page 7. "*The wearing of respirators is required...but degree of protection is uncertain.*" "*... recommendations are presented for improved general ventilation, for extending the application of local exhaust to all of the principal dust- and fume-producing operations, and for meticulous housekeeping through widespread use of vacuum-cleaning.*"

McKeel Comment: GSI never employed respirators or local exhaust control for any personnel, including the workers who handled MCW uranium metal. The only attempt at GSI to maintain housekeeping in the production areas was the use of a Tennant (now marketed by Grainger Co.) industrial vacuum sweeper that was used in the New Betatron Building. GSI worker testimony states the New Betatron facility (constructed in 1963) was kept cleaner than the Old Betatron facility (constructed in 1951-52) because more plant visitors went into and scrutinized the newer facility. A photograph of the Tennant sweeper is shown on p. 10.

ENVIRONMENT

Description of Operations:

"The activities that comprise the remelt processes are ***weighing****, melting, and pouring of scrap metal, sawing and lathing of uranium billets, trimming samples on the grinding wheel, and related* ***handling*** *of metal."* (emphasis added) [**McKeel note**: Weighing and handling of uranium ingots, dingots, billets and Betatron slices took place at GSI from October 1, 1952 through June 30, 1966, during the AEC operational (contract) period. Although all remelted Hanford uranium metal had once had once been subjected to heat, some of the time the "handled" Hanford metal was used, and during the freight car unloading procedures, as described in Adley *et al* 1952, the metal was "cold" at Hanford in the same sense as Dave Allen described GSI uranium metal from MCW as being "cold uranium." McKeel has mentioned that 24-25 Mev Betatron NDT x-ray inspection causes molecular/physical damage and slight internal heating in many materials, including uranium metal, as has been established by DOE Oak Ridge research over the past decades. Dave Allen and DCAS, and the TBD-6000 work group and the ABRWH, have chosen to ignore this well documented information.]

Page 8.

(1) 1 Remelting and recovery of metal and oxides

(2) Rod-straightening and related operations

(3) Autoclaving

The sequences of operations in these three categories are outlined in the "flow sheets" which follow. Opposite each step in the process is listed the potential it has for creating atmospheric contamination. Potentials for contamination were estimated from preliminary survey of the operations. Similar operations occurred at MCW, not at GSI.

Page 9. The Adley *et al* 1952 critique narrative continues on page [4] of this paper. Dan McKeel's main thesis for this paper is developed. That is, that both NIOSH and SC&A's interpretations of the Adley 1952 report were extremely biased and therefore scientifically unsound in not only using selected Adley 1952 data, but in failing to emphasize other aspects of the paper. The Adley *et al* 1952 report is an excellent example of how uranium rod and billet handling steps, including **unloading from railroad freight cars** and **sweeping**, caused major airborne uranium dust levels elevations above the then "maximum permissible concentrations (MPC). Also, workers at the Hanford Melt Building were required to wear respirators, whereas GSI workers never wore them according to information NIOSH and SC&A have developed and presented on the record.

(2)

ROD-STRAIGHTENING AND RELATED PROCEDURES

Flow of Operations	Potential for Producing Atmospheric Dust or Fume
(1) Unloading rods from freight cars. Done at siding away from the building.	Dust dislodged in quantities from heavily oxidized surfaces of rods.
(2) Stacking unstraightened rods in storage bay. Also unstacking them and transporting to rod straightener.	Some dust shaken from rods. Dust stirred from floor by activity of fork lift trucks.
(3) Loading table at feed end of rod straightener.	Very dusty when rods slid from forks onto table.
(4) Operating rod straightener.	Sliding rods across table and banging of rods against channel guides while being fed into machine created dust. Dust and fume created in large quantities within machine.
(5) Removing rods from offtake table to storage bay.	Fork lift truck stirs up dust.
(6) Transporting rods from storage bay to the Slug-Machining and-Canning Building.	Same condition as above.

Personnel: Rod straightening and the attendant duties of rod-handling in the storage bay are normally handled by two men from the Material-Handling Group. Each man is limited to 16 hours per week at this work and crews are rotated periodically.

Unloading rods from a freight car requires the services of seven men: two carry rods from the car to the scales; two weigh rods and record the data; two carry rods from the scale to a truck; and one man drives the truck. The two men weighing and recording are from the Material-Handling Group; the other five are from Transportation Section. When two cars are unloaded simultaneously, twice as many men are needed. Any worker's exposure is limited to 4 hours per day at this task.

McKeel comment on previous page 5 of this document. The ROD STRAIGHTENING AND RELATED PROCEDURES largely recapitulated operations that were performed at GSI while handling MCW Uranium Division uranium metal during the operational period. These data should have been emphasized by NIOSH and SC&A to the TBD-6000 work group and the full Board in meetings prior to the final SEC-00105 vote on December 11, 2012.

The "PERSONNEL" footnote is perhaps most illuminating in giving the numbers of people and the tasks they actually perform in "simple" unloading of freight cars:

First of all, seven men are required to unload one freight car. NIOSH and GSI workers do acknowledge that rail (and truck) transport was the most likely way that St. Louis-based MCW uranium metal was transported across the Mississippi River to Granite City, IL, to GSI for Betatron NDT x-ray inspection. No MCW (MO) to/from GSI (IL) shipping records are extant, however. Yet neither NIOSH nor SC&A emphasized this highly relevant part of the Adley 1952 report in their work group and full Board presentations;

Second, workers from two separate Hanford departments, Material-Handling Group and Transportation, were involved;

Third, workers from both Hanford departments were limited to "***4 hours per day***" shifts. The context of the footnote makes it clear the reason work periods were limited is because of the high measured uranium dust levels. Such dust levels from any step(s) in the handling of MCW uranium metal were never measured at GSI in Illinois.

Dave Allen's and NIOSH's GSI thesis, emphasized to the WG and full Board, that the dust levels from handling "cold uranium" were low, just the opposite of Adley 1952.

The GSI petitioners believe the citing of all the relevant data in Adley *et al* 1952, including these listed freight car unloading activities, as surrogate data on which to base a GSI air intake of uranium model, would have produced inhalation intake doses for uranium far higher than were assigned in the extant NIOSH and SC&A models. We assert that both NIOSH and SC&A misrepresented the facts and some of the most relevant data to GSI uranium operations in their analyses of Adley *et al* 1952.

The dust and fume arising from Operation D represents the greatest contribution to atmospheric contamination in the furnace room. This condition exists while the furnace lid is being lifted, the crucibles are being removed, and the billets are being pulled. Such contamination occurs despite the purging effect of the fan that pulls air downward through the furnace and the manhole. Air turbulence at the time the furnace lid and manhole cover are removed could possibly account for the escape of dust or fume into the atmosphere of the furnace room. Also the fine particles of oxide may continue to be dislodged from surfaces of the crucibles molds, and holders after they have been removed from the furnace and manhole.

Except for their locations, Operation B and Operation C are nearly identical, both involving the handling of briquettes*, rod ends, rejected slugs, and other scrap. When these materials are handled outside the furnace room (Operation C), the higher concentrations may be due partly to cross-contamination from other processes - rod-straightening, for example. Directly charging crucibles with this scrap (Operation B) produces concentration sometimes below, sometimes in excess of the permissible level.

Miscellaneous cleanup activities, such as brushing and dusting inside the furnace (HV-28 and HV-43 under Part F), also contribute significantly to atmospheric contamination, but vacuum-cleaning (HV-117) is an exception.

The lowest concentrations were found in the furnace room during normal operation of the furnace (Operation A), but concentrations above the permissible level were often detected. As it is felt that the furnace during a melting cycle can contribute no dust or fume to the atmosphere, the observed concentrations must arise in part from cross-contamination

*Briquettes are uranium chips and lathe turnings hydraulically compressed into cylindrical cakes about 5 inches in diameter and 4 inches thick.

<u>McKeel comment on page 23 of the Adley 1952 report</u>. We include this page to balance this paper and acknowledge that operations involving active heating of uranium did pose the greatest exposures to workers at the Hanford, WA, remelt plant. GSI did not heat treat MCW uranium as far as the author is currently aware (June 2013).

This page is also important in stressing the point that cross-contamination of the furnace room with respirable uranium dust occurred from other areas of the Hanford remelt plant. At GSI, buildings 5 through 10 by necessity were wide open to each other and to large sections of the foundry. There is voluminous testimony these buildings, like the Old Betatron facility in particular, were so dusty that overhead cranes with magnets were used to clean the larger metal scraps embedded in the dust. NIOSH has ignored this plant uranium contamination totally during both the operational and residual periods even thjough they are aware through worker testimony about the extremely dusty atmosphere that existed at the GSI 1417 State Street "South Plant" from 1952 through 1993. NIOSH is also aware, through petitioner, site expert and worker testimony that numerous documented companies ran steel operation businesses within the leased GSI complex of buildings 5 through 10 throughout the entire GSI residual period from July1, 1966 though December 31, 1992.

This page also shows that uranium airborne dust data published in Adley et al 1952 for the Hanford Melt Plant must be used extremely judiciously as surrogate data for the GSI 1417 State Street plant in Granite City, IL. While some operations were similar at Hanford and at GSI in IL. For example, the following uranium handling operations occurred at both sites: (a) unloading uranium metal from freight cars, (b) weighing, (c) stacking and unstacking, (d) cleaning the beds of uranium transport trucks (Hanford) and railroad flatcars and rail transfer cars at GSI (that might have involved chipping and grinding operations as was documented in Adley 1952), and (e) sweeping, Other processes described in Adley et al 1952 at Hanford did not occur with MCW uranium metal at GSI: (a) heat treating, (b) rolling, (c) autoclaving and other uranium operations that uniquely occurred at the Hanford site in Washington State.

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Under Operation D, samples HV-82, CI-2, and HV-130 show that atmospheres around the oxide furnace during burnout contain only a small fraction of the amount of U_3O_8 that was found in the atmosphere of the original burnout room. During other oxide-burning operations (see HV-73), concentrations are found similar to those in the samples just cited.

The general atmosphere in the vicinity of the oxide furnace remains contaminated even when no production activities are under way as shown by samples HV-20 and HV-34 under Part E. This suggests that dust and fume particles from oxide-handling and other operations remain suspended in the air for long periods and that atmospheric concentrations are not sufficiently reduced by general ventilation. These factors are discussed in subsequent sections of this report.

Sample HV-54, included in Part E, shows that concentrations in excess of the MPC can exist during sweeping operations, even when a sweeping compound is used.

Atmospheric concentrations in the old oxide burner room were very high as shown under Operation F. This operation is now abandoned.

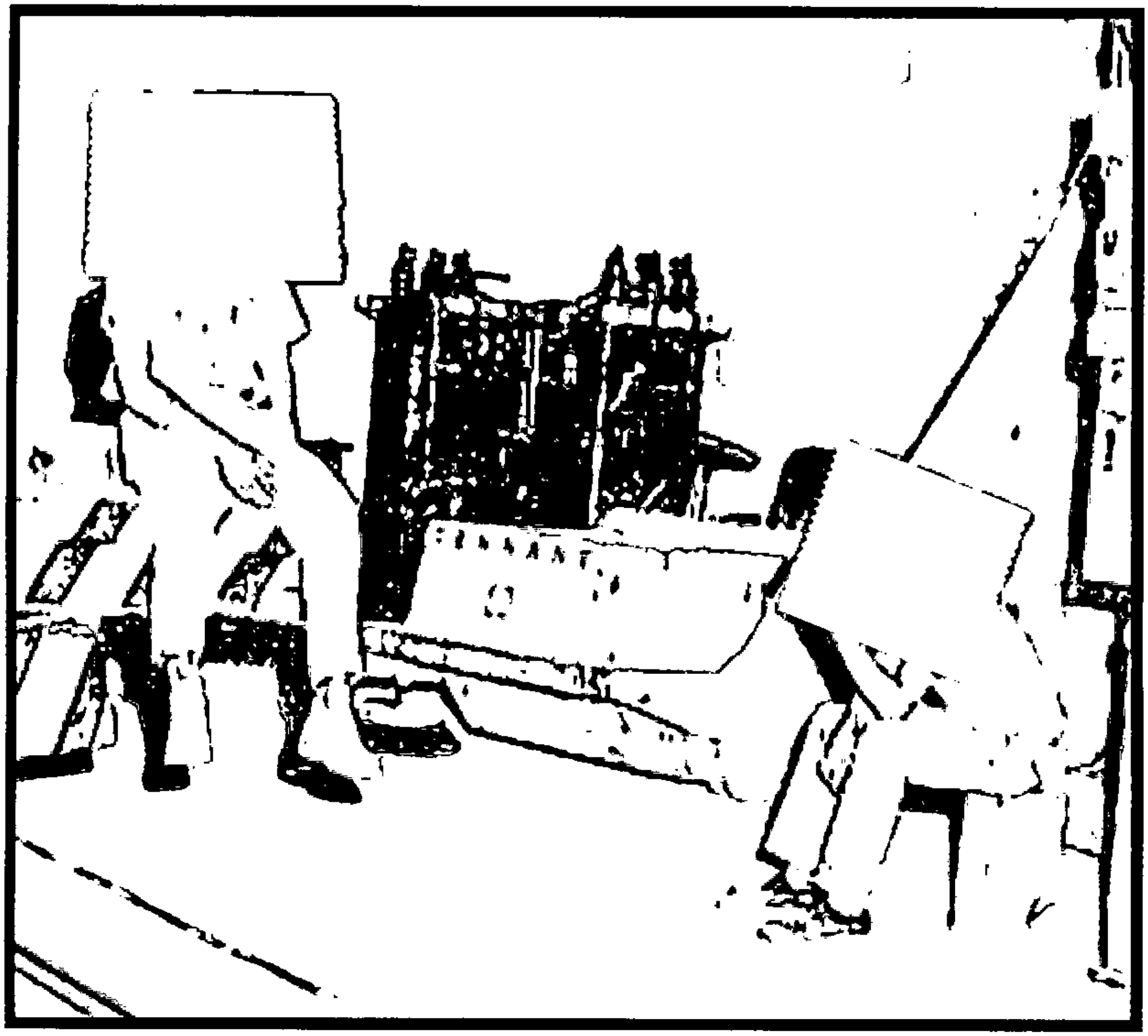
For further detail regarding the above findings, reference may be made to Table VI in the Appendix.

McKeel comment on page 32: Two points deserve special emphasis and consideration with respect to modeling GSI uranium intakes during the operational and residual periods.

First, samples HV20 and HV-34 under Part E showed that uranium dust levels "remained elevated for long periods" even when production had stopped. Again, GSI had no such measured levels. sweeping and elevated.

Second, Very importantly, sample HV-54 showed that "sweeping operations can exist, even when a sweeping compound is used." Site expert Ramspott has photos showing a GSI Betatron operator sitting next to a large TENNANT industrial sweeper.

Adley Melt Plant Building (Hanford) 1952



Legend. This photograph was sent to NIOSH, the Board and SC&A in 2007. It shows two General Steel Industries (GSI), 1417 State Street, Granite City, IL, workers sitting by a Tennant industrial sweeper in the New Betatron building. Note the railroad tracks in the foreground that were used to bring MCW uranium and steel castings into the facility for NDT x-ray inspection with the Allis-Chalmers 25 Mev electron particle accelerator operating in x-ray mode. A much smaller industrial vacuum found in the Old Betatron shooting room at GSI to be contaminated with uranium dust during the DOE/FUSRAP cleanup in 1992. Uranium related alpha radioactivity was also found embedded in the floor of the GSI Old Betatron building during the same DOE cleanup operation. No uranium residuum was found in the new Betatron building by DOE in 1992/3 because it had been kept cleaner initially, power washed and renovated in the GSI residual period.

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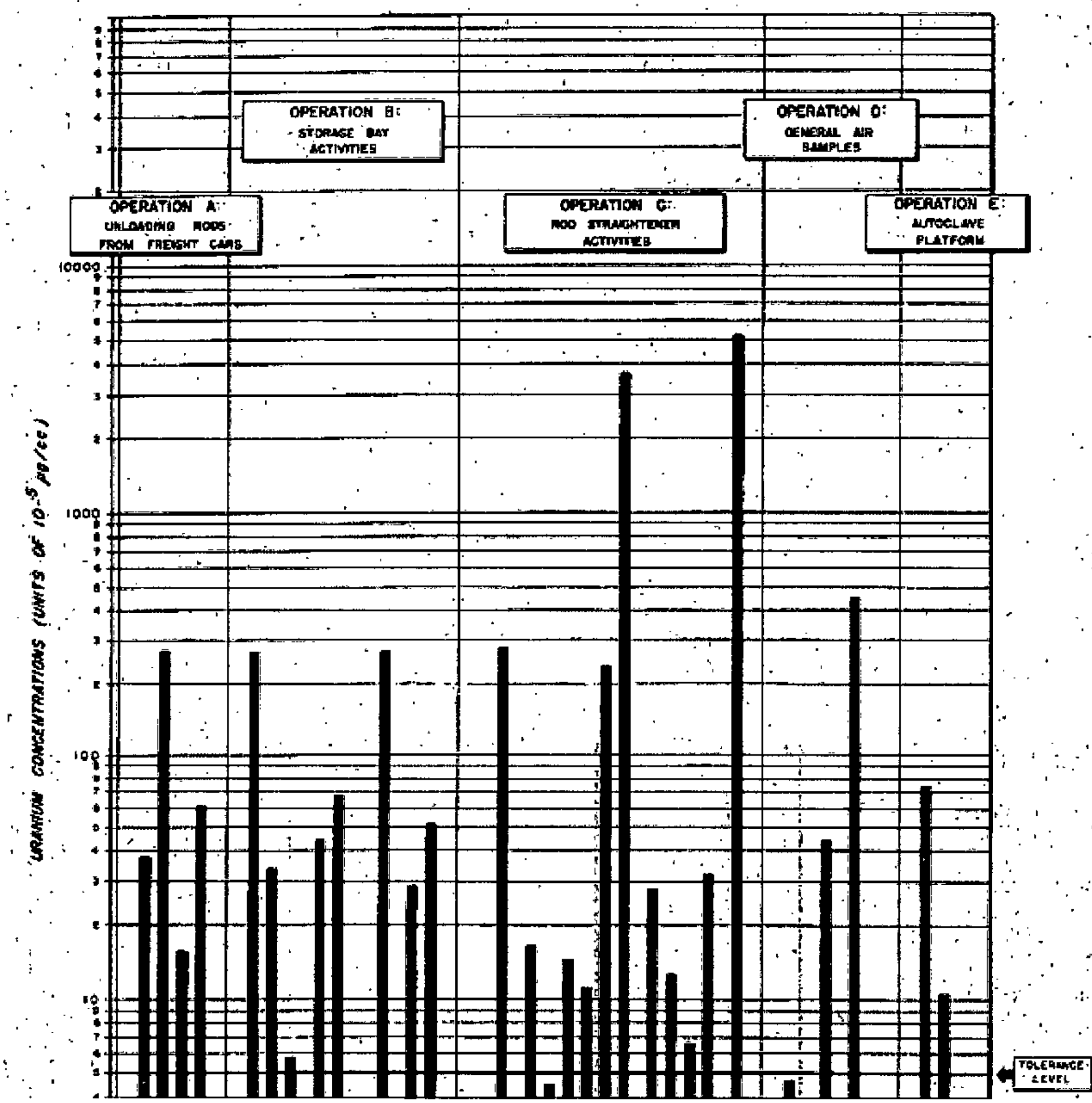
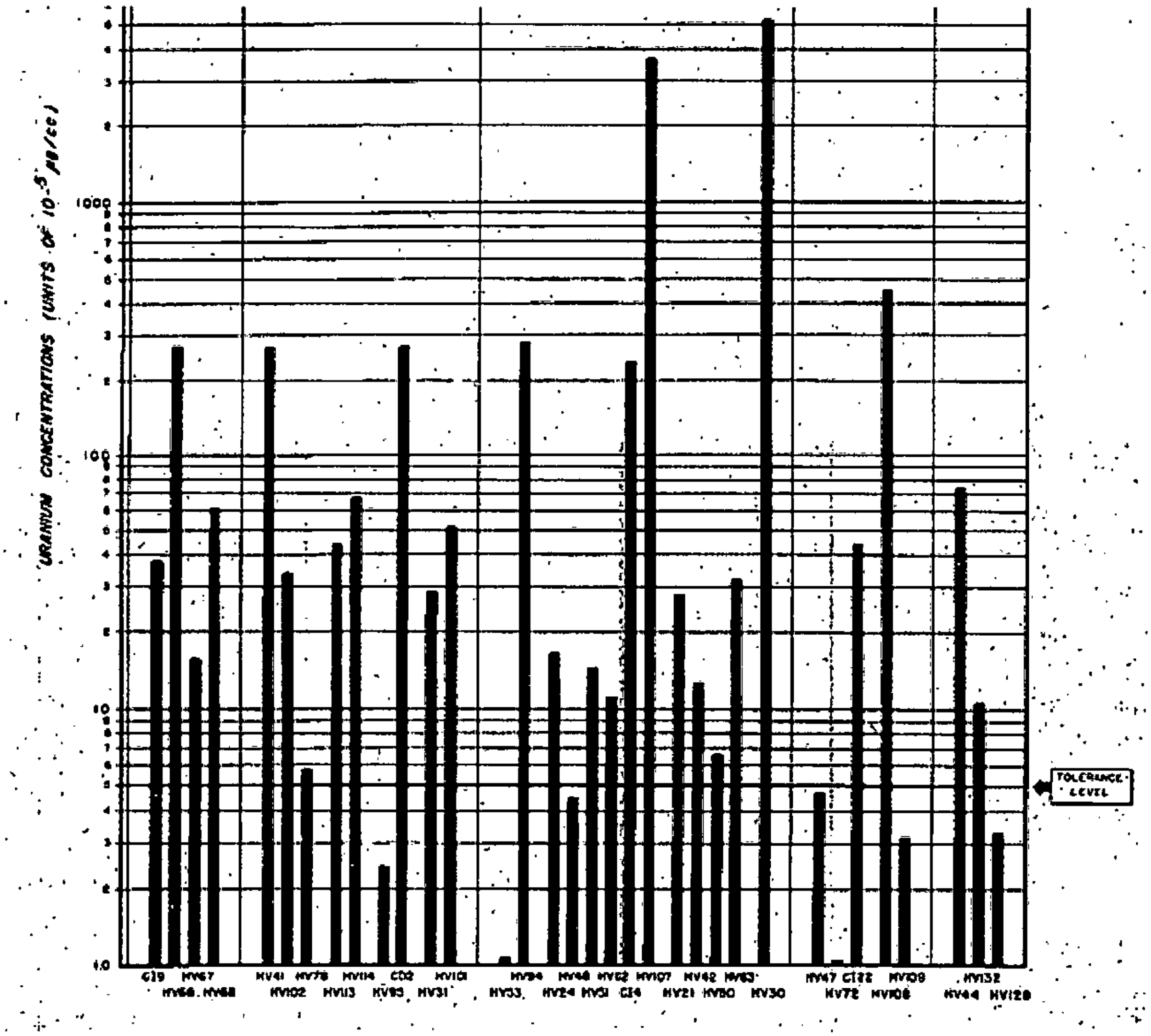
ATMOSPHERIC CONCENTRATIONS OF URANIUM AT ROD HANDLING OPERATIONS (INCLUDING AUTOCLAVE OPERATIONS)

FIGURE VII



The lower part of this graph appears on the following page with McKeel comment.



<u>McKeel comment on page 3 rod handling graph</u>. Activity A, unloading rods from freight cars, was also done at GSI for MCW uranium ingots, dingots, billets and Betatron slides. The MAC dust level exposures at the Hanford Melt Plant were <u>very high</u>, even though this activity *a priori* was simple "cold" uranium handling. Neither NIOSH nor SC&A stressed this point about the Adley *et al* 1952 Hanford Melt Plant report in reference to GSI uranium operations, a major oversight.

Contributions of Rod-Handling Activities (Including Autoclave Activities)

In Figure VII opposite, the atmospheric concentrations of U_3O_8 average highest at Operation A, which consists in unloading rods from freight cars. These procedures, however, do not contribute to the contamination within the Melt Plant Building as this work is performed out-of-doors about 400 feet from the building.

Nearly all activities under Operation B contributed concentrations in excess of the MPC. In these storage bay operations, the first set of 3 samples represents air conditions during stacking and unstacking rods with a forklift truck. Probably the stirring of dust from the floor is the chief cause of atmospheric dustiness during such activity. The next two samples (HV-113 and HV-114) were taken to demonstrate the effect that exhaust gases from a forklift truck have in stirring dust from the floor.

Included under Operation B is a pair of samples (HV-95 and CI-12) taken during a non-routine procedure in the storage bay. These were obtained while a crew of three men were decontaminating the chassis of a truck used to carry rods from the railroad spur to the Melt Plant Building. The decontamination was done by filing, wire-brushing, and grinding with a portable grinder.

The final two samples in Part B (HV-31 and HV-101) are examples of the atmospheric dust load that arises from sweeping operations in the storage bay. A sawdust sweeping compound was used, but concentrations still exceeded the MPC.

The groupings under Operation C, rod-straightening, consist of 2 samples taken while loading the table with rods, 6 at the feed end of rod straightener during operation, 4 at the offtake end, and 1 within the cabinet of the rod straightener while it was being cleaned. All these activities were heavy contributors to general air contamination, except the last (HV-30), which had the benefit of exhaust ventilation within the cabinet, and did not represent a contribution to the dust load of the general plant air.

<u>McKeel comment on page 34</u>. This entire page is perhaps the most important with respect to relevance to GSI operations.

First, highest uranium air concentration was caused by unloading freight cars;

Second, in the storage bay, fork lift stacking and unstacking of uranium rods and forklift exhaust gases both stirred up uranium dust on the floor and caused uranium elevations above the maximal permissible concentration (MPC);

Third, two samples showed elevation of uranium air concentration while three men were decontaminating the chassis of a truck used to carry uranium rods from the railroad spur to the storage area, an activity that also had to be done at GSI. The GSI 1957 engineering drawing provided by GSI site expert showed in detail the massive system of rail tracks on the GSI grounds and inside buildings that were used to transport MCW uranium metal from/back to the weigh stations, storage areas and freight cars. Two types of rail cars—"transfer cars propelled by an electric motor—and regular flat cars moved by a diesel engine, transported uranium metal to the New and Old Betatron facilities, respectively. The at GSI (provided affidavit testimony to the Board, NIOSH and SC&A that the transfer cars were cleaned only twice per year. The Adley reports that cleaning the truck chassis uranium deposits involved "filing. wire-brushing, and grinding with a portable grinder." Although we have as yet no direct testimony at GSI as to how the RR transfer and flat cars were cleaned, it is likely that similar types of methods would have to be used to remove tightly embedded uranium from the transfer and RR flat car beds.

Fourth, Operation C, which also involved handling uranium by loading the rod-straightening table, caused uranium elevations above the MPC. The text does not say whether the handled rods at the Melt Plant had been heated.

These data from the Melt Plant indicated that similar uranium handling doses need to be bounded with sufficient accuracy at GSI along the entire uranium transport as Dan McKeel has called for, on the record, in previous white papers he has presented to the TBD-6000 work group, the full Board, and to NIOSH Docket 140 (GSI). The MCW uranium handling processes that need to be modeled at GSI include: (a) unloading ingots, dingots, billets and Betatron slices from freight cars, (b) transport from the freight cars to the loading dock, (c) handling during weighing using either a crane and chains or a fork lift, (d) unloading and loading Ur metal at the Bldg 5 and other GSI storage sites, (e) placement on transfer cars and flatcars, (f) cleaning the beds of RR transfer and flatcars using abrasive mechanical methods, (g) unloading/reloading in the Betatron control room, and (h) sweeping along the entire transport pathway. NIOSH has done none of this analysis.

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Non-Production Areas

None of the data in Figure VIII opposite represent operations that contribute to atmospheric contamination. The consistent presence of uranium in these areas is significant, and the samples illustrate the extent of cross-contamination from production activities. One sample, taken in the toilet at the end of the work day, showed a concentration above the MPC.

Figure VIII corresponds to Table VIII in the Appendix, where more complete details of these samples may be found.

From the preceding figures (or from their corresponding tables), the operations in the Melt Plant Building may be rated in the approximate order of their contributions to the atmospheric dust and fume within the

McKeel page 36 Adley 1952 comment. The measured uranium in non-production areas due to dust cross-contamination was revealing. It proves that a priori assumptions that GSI office/administrative workers were not exposed to radioactivity are not only naive, but also not consistent with real measured data such as the Adley 1952 report contains. (See McKeel Discussion paper on this topic submitted 6/5/13 to the TBD-6000 work group and the GSI Docket 140 for its 6/20/13 meeting.

The first four operators in Table IX are the only ones having 8-hour-per-day exposures. Of these, the first is a steady occupation

performed by one operator. His daily exposure is about 40 times the weighted tolerance level of 40.

The next three duties are rotated from day to day among the other three regular operators in the Remelt Plant. Hence, over a long period the average weighted exposure of any of these three men may be assumed to be a simple mean of the three totals listed. This value is 3,134 or 78 times the weighted MPC.

Rod-handling in 314 Building is limited to 16 hours per week per man, but the exposure is still excessive.

Autoclave operation requires about 1 1/2 hours per day and the weighted exposure is below the permissible level.

Those engaged in unloading rods from freight cars are restricted to 4 hours per day and this work is done only a few days each month. Despite the limited exposure time, however, one 4-hour exposure of

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performed by one operator. His daily exposure is about 40 times the weighted tolerance level of 40.

The next three duties are rotated from day to day among the other three regular operators in the Remelt Plant. Hence, over a long period the average weighted exposure of any of these three men may be assumed to be a simple mean of the three totals listed. This value is 3,134 or 78 times the weighted MPC.

Rod-handling in 314 Building is limited to 16 hours per week per man, but the exposure is still excessive.

Autoclave operation requires about 1 1/2 hours per day and the weighted exposure is below the permissible level.

Those engaged in unloading rods from freight cars are restricted to 4 hours per day and this work is done only a few days each month. Despite the limited exposure time, however, one 4-hour exposure of a man unloading cars is equivalent to a 14-day exposure at the weighted MPC.

__McKeel comment on page 38-39 of Adley 1952__. The Melt Plant administrators limited worker exposure sharply because the measured data showed that numerous uranium handling operations elevated air concentrations above the MPC (see last sentence). __McKeel comment on graph on page 17 (following graph) of Adley 1952__. The bar related to "rod receiving-unloading cars and loading trucks" is also revealingly high, with doses being recorded above autoclave operators and above the maximum tolerance level. MCW uranium ingots, dingots, billets and betatron slices came from MCW in St. Louis to GSI by rail and truck. To my knowledge, neither NIOSH not SC&A have attempted to calculate the load/unload truck and freight car doses at GSI.

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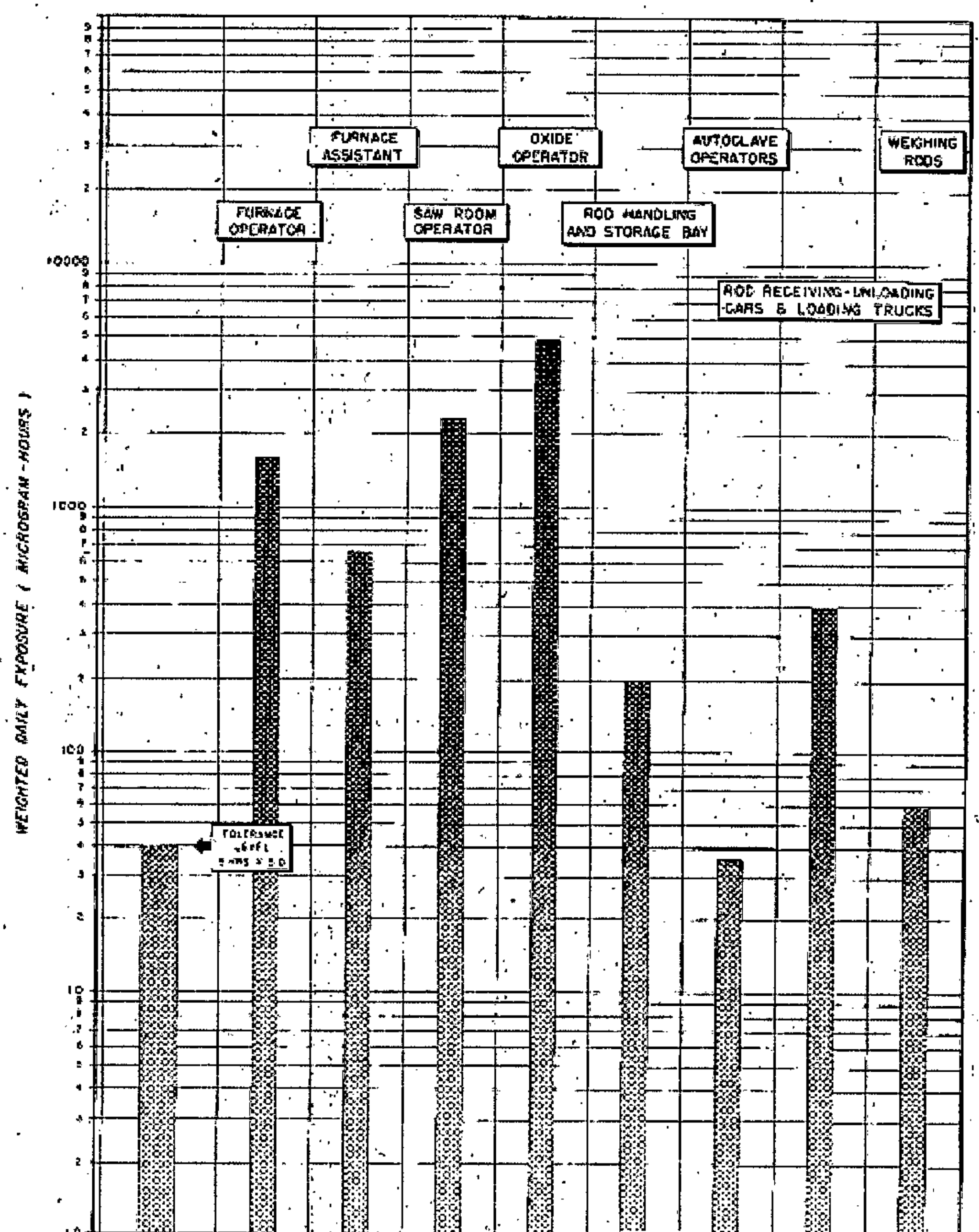
WEIGHTED DAILY EXPOSURES OF WORKERS COMPARED TO DAILY TOLERANCE LEVEL – MELT PLANT BUILDING AND RELATED OPERATIONS

FIGURE IX



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Since completion of the field work in this study, three changes in production activity have been effected:

1. In April of 1951, the Melt Plant crew started working a six-day week, thus increasing their weekly exposure by 20%.
2. On October 8, 1951, production was increased from 1 to 1 1/2 furnaces per day.
3. On January 7, 1952, activity was expanded to 2 shifts per day. The increase in personnel has provided a rise in production to 3 furnaces per day with even higher production anticipated soon.

These increases in melting operations will unavoidably result in greater production of dust and fume in the atmosphere of the Melt Plant Building. The exposures of workers will have risen correspondingly.

The weighted exposures just discussed are based on the concentrations of dust and fume that would be inhaled by workers <u>if they did not wear respirators</u>. However, in all production areas of the building, except in the furnace room during the normal remelt process, workers are required to wear respirators. Full reliance cannot, however, be placed on such equipment as a satisfactory protective measure for the following reasons:

1. Even with best cooperation by the operators, respirators are not worn 100% of the time. Respirators are uncomfortable to wear and the workers remove them occasionally to relieve the discomfort. At or near some dusty operation such as oxide-shovelling, a quantity greater than the maximum permissible daily quantity could be inhaled in less than one minute without a respirator.
2. Filters in the respirators are not 100% efficient. Even if 99% efficient, there would be many instances at operations in the Melt Plant Building when the 1% penetrating the filter would greatly exceed the tolerance level.
3. Respirators are not always fitted perfectly to facial contours; hence contaminated air may leak around the edges of the mask.

McKeel comment on page 44 of Adley 1952. The Melt Plant work load changed significantly over time. Most of the workers tested wore respirators. **To my knowledge, no GSI workers were ever required to wear respirators**. NIOSH and SC&A failed to take this factor into account when strictly comparing Adley 1952 and GSI intake data.

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Bioassay Results

In the course of the environmental study, the results of which are tabulated in Table IX, several operators in the Melt Plant rotated periodically from one series of operations to another. This minimized the chances of any operator being exposed to elevated concentrations for extended periods.

The "weighted" exposures calculated for each operator indicate the levels of contamination which were encountered for each process involved. To facilitate correlation of these environmental exposures with bioassay findings, two operators working without respirators in the Machining and Canning Building at a relatively constant level, approximately the maximum permissible concentration, were studied carefully for a one week period. Sufficient air samples were collected to permit satisfactory evaluation of exposures, and urine samples were collected at the beginning and end of each shift. Urinalyses were conducted by the Bioassay Laboratory of the Radiological Sciences Department. This investigation showed that the average exposure was 7×10^{-5} µg U/cc air and the average uranium excretion was at a level of 8.7 µg/liter. Using this data as a basis for appraising the relationship between exposures and excretion of metal, the environmental data obtained in the Melt Plant during approximately six months of study were correlated with the results of routine uranalyses. Over this period the furnace room operator was exposed to an average concentration of 40 times the MPC. Assuming that a total of 5% of the atmospheric dust and fume penetrated the filter of the respirator and/or leaks around the edges of the facepiece,

McKeel comment. There was no urinary uranium bioassay data measured at GSI.

McKeel Summary Conclusions and Comment on the Adley *et al* 1952 Report

The science methodology based on Hanford Melt Plant carefully measured uranium intake data reported in this Adley *et al* 1952 paper differs significantly from any GSI practices. GSI did not employ best radiation safety practices to protect its workers.

External doses at GSI. The 1962 Konneker/NCC radiation survey of the GSI Building 6 radiography facility, and the GSI survey of the New Betatron building using a Co-60 source in 1971, were concerned only with external photon doses. Beta doses and neutron external doses were not measured for any of the many GSI radiation source terms. Not validated by measured data computer models, very limited and decisively unrepresentative film badge data (on a single worker 1957-1962), back extrapolation of uranium purchase orders to years before 1958 when there were none, letters from GSI administrators citing adherence to AEC exposure limits we believe is “evidence” that is unsupported by any other hard evidence (such as a second set of film badge reports or named badge vendors) as having been the actual situation at GSI, belt object photos the petitioners have challenged as being GSI ID badges rather than film badges, surrogate data the SEC-00105 petitioners have vigorously challenged, were all used to assign external doses at GSI. Appendix BB Rev 0 appeared in June 2007 before NIOSH had obtained any film badge data.

Internal doses at GSI. There were no bioassay or air samples (breathing zone, ambient air, or process samples as defined by HASL taken, ever, at GSI during the operational period of October 1, 1952, through June 30, 1966, as far as is presently known. The measurements DOE/ORNL made during the 1992 GSI residual period cleanup in the Old Betatron Building in a small industrial vacuum cleaner have been discredited because the petitioners proved the Old and New Betatron buildings had been repeatedly power washed and renovated during the residual contamination period 1966 through 1993.

- As this is written, NIOSH and SC&A, unable to agree on an intake model for 1952-1962 at GSI after 5 attempts by NIOSH, considered a brand new "square wave" distribution to bound GSI intakes at a 5/28/13 technical call meeting the GSI co-petitioner and site expert were prohibited from participating in as silent observers. Two days later he was sent an anonymously authored 2/3 page technical call summary that did not indicate a resolution of the intake model had been achieved. Nor were final quantitative bounding inhalation intake doses for GSI for 1952-1962 provided. It is thus unknown whether or not OTIB-070 or the Adley *et al* 1952 report (as surrogate data for GSI) were discussed at this secretive technical call meeting.
- Data from Adley *et al* 1952 was **not cited** by NIOSH in TBD-6000 Rev 0, in GSI Appendix BB Rev 0, or in the GSI SEC-00105 evaluation report by NIOSH. It **was referenced** in TBD-6000 Rev 1 (12/11/06) and was the focus of a May 13, 2013 white paper by SC&A (source reference 2 this page). Full analysis of Adley 1952 as is done in this report is now thus of paramount importance to revising GSI Appendix BB Rev 1.

- Internet primary source reference 1: OSTI document found at URL:

http://www.osti.gov/bridge/product.biblio.jsp?osti_id=4338717;

Adley, F.E. ; Gill, W.E. ; Scott, R.H. Study of Atmospheric Contamination in the Melt Plant Building. Report: HW-23352(Rev.). OSTI ID: 4338717. April 1, 1952. 94 pages.

- Source reference 2. **Thurber, W.C. (SC&A): Supplementary comments on Revision 01 of Battelle-TBD-6000. May 13, 2013. 34 pages.**

Respectfully submitted,

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