

Please distribute the following summary to the Weldon Spring WG, and others as you deem appropriate.

Thanks,
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The following is a draft of SC&A's evaluation of the six documents (1 earlier and 5 recent) the petitioner (name redacted) provided to (name redacted)/Ted concerning the potential that raffinate from the pits was recycled at the Weldon Spring plant to extract thorium. [SC&A's paraphrased summary of the contents of each article is in blue.](#)

Petitioner's five documents of 3/22/2012

1) April 1, 1958 "Process Development Quarterly Report - Part I Laboratory Work"

This 1958 article discusses the demonstration of a process for the recovery of nitrate values from raffinate on a laboratory scale, and states that thorium concentrations must be considered if this method is used, especially if high-thorium Canadian refinery feed is used.

2) May 8, 1979 "Weldon Spring Site Background Report"

This 1979 article states that the Weldon Spring Plant processed uranium ore concentrates and recycled scrap, and that "Some processing of *thorium residues* was also performed."

3) April 1984 "Engineering Evaluation of Alternatives for the Disposition of the Weldon Spring Raffinate Pits Site."

This 1984 article discusses the types of waste at the pits site, to include "Neutralized raffinates from uranium refining operations, washed slag residues from uranium metal production operations, and raffinate solids from the processing of *thorium recycle materials*."

4) May 27, 1988 "Raffinate Pit Sampling Plan"

This 1988 article states that the pits contain "... raffinate solids from the processing of *thorium recycle materials*;" and that "During the hot, dry summer months, the surface water in Pits 1 and 2 often evaporated, leaving the raffinate sludge with a dry and cracked surface."

5) September 1989 "EPA Environmental Impact Statement"

This 1989 article states Pits 1 and 2 contain residues and waste from uranium mining operations and washed slag residue from uranium metal production, while Pits 3 and 4 contained "...similar waste plus thorium-contaminated raffinate solids from processing *thorium recycled products*. Surface water covers pits three and four continuously, but pits one and two may be occasionally exposed due to seasonal evaporation."

Petitioner's one document of 3/13/2012 - SRDB Ref ID #11664

1) *pg 6 is a table showing Raffinate Processing conducted at Weldon Spring the entire operational period.*

Figure III-1 page 6 (pdf. 12) shows that WS processed only ore concentrates (top arrow). It indicates that the Raffinate Processing (following that line over) was done in Plt. 7E during 1955~58. This analysis is confirmed in Figure III-2 on page 7 (pdf. 13) where the xxx's show that the Raffinate Process was limited to PLANT 7E during 1955~58.

2) *pg 8 is a table showing exposures-note exposure to raffinate chemicals is also at Weldon Spring the entire operational period. A footnote, of Raffinate process chemicals it also states Th-230 was recovered.This would corroborate the Ingle 1991 and Ingle 1998 documents.*

Figure III-3 page 8 (pdf. 14), last line in table, shows that Thorium processing (ThO₂) was conducted during 1964-66, which agrees with past info. The line labeled "Raffinate Chemicals++" that shows the workers were exposed to chemical agents in the raffinate is also true, because the chemicals were used in the uranium separation process. The ++ footnote to this table lists the raffinate chemicals and states "*Th-230 was recovered*" (which appears to apply to the raffinate chemicals for the period 1947-1966); this does not match the info in Figure III-1 and III-2, that shows raffinate was not reprocessed for Th-230 at WS. This 1984 document was a chemical exposure study, and as such did not appear to concentrate on the radioactive details of the materials.

3) pg 9-10 (last paragraph on pg 9 and 1st paragraph on pg 10) shows solid residues (raffinate) was processed for recovery of ionium (thorium-230).

"During some periods (after 1947)..." This statement is true for Plant 7E for 1955~1958, as verified in Figures III-1 and III-2, but does not appear to apply to WS from the info. in this document.

SC&A's Summary

Evaluating these five articles as a whole indicates that the term "thorium recycled materials" or products/residues refers to the Th-232 production process that took place during the 1963-1966 period, not to the recycling of pit raffinate material for the recovery of thorium (Th-230). The one article describes the processing of raffinate material on a lab scale, and points out that thorium needs to be concentrated if this process was used.

However, it has been assumed that the Th-232 activity at the Weldon Spring site consisted of processing natural thorium in a nitrate or an oxide form (TKBS-0028-2, page 23), and that the process did not contain *recycled, residue, or scrap* thorium. The processing of the latter forms of thorium may have exposed workers to radioactive materials not considered in natural thorium ore processing at Weldon. The definition, contents, time period, amounts, and hazards associated with use of *recycled, residue, and scrap* thorium at Weldon needs to be determined.

Two of the above articles (1988 and 1989) make reference to fact that Pits 1 and 2 sometimes becoming dry in hot summer months; while two articles found on the SRBD (Ref ID #3583 in 1977 and 3576 in 1981) state that even during prolong dry periods the inherent consistence of the raffinate residue preclude the drying out of the surfaces of the pits. If conditions did exist where the pits surface did dry out and the dust became airborne, this could create an environmental intake of radioactive materials that would not be readily related to uranium bioassay, or air sample results, by using a ratio method.