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Date 4/3/46

Copy No. 1
F. R. Ward

Subject Suggested Tolerance Level for
Activated Water Discharged into Clinch River

By Karl Z. Morgan

To Frank Ward

Before reading this document, sign and date below:

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CLASSIFICATION CANCELLED

DATE 9/10/67

For The Atomic Energy Commission 4/3/46

To: F. R. Ward

H. P. Canale
Chief, Declassification Branch

From: K. Z. Morgan

In Re: Suggested Tolerance Level for Activated Water Discharged into Clinch River

I have made a somewhat more careful study of the tolerance value of "once through the pile" water when discharged into the Clinch river, and the tentative value of 0.5 $\mu\text{c}/\text{l}$ which I suggested at the meeting on March 26, 1946, seems to be the correct value. This value is the submersion tolerance for Na^{24} . The ingestion tolerance of Na^{24} going to the lungs is 17 $\mu\text{c}/\text{l}$ and to the blood is 5 $\mu\text{c}/\text{l}$. The tolerance value to the bone of 180 day Ca^{45} is 0.16 $\mu\text{c}/\text{l}$ and of 8.5 day Ca^{41} is 2.5 $\mu\text{c}/\text{l}$. However, we do not need to consider Ca^{45} because its parent, Ca^{44} comprises only 2% of normal calcium and of course neither Ca^{40} or Ca^{44} would pick up much activity in a "once through the pile" operation due to the small value of t/T. Chlorine is less harmful than sodium and oxygen, aluminum, magnesium, copper and manganese can be neglected after one hour cooling.

From the standpoint of Health Physics ease and accuracy of monitoring, I would prefer having the water from the new pile run directly to the Clinch river by pipe instead of mixing it with the F.P.'s in White Oak Creek. There would be some advantage in entering this water into Clinch river at a point of at least 1/4 mile above or below the mouth of White Oak Creek. There are many obvious advantages in eliminating settling ponds and holdup lakes if possible. If this water should enter the river with an activity $> 0.5 \mu\text{c}/\text{l}$, a small fish trap could be built around its outlet so that fish could not reach the above tolerance water. It is recommended, however, that there be sufficient water holdup or dilution (or both) so that the water does not enter the Clinch River with activity $> 0.5 \mu\text{c}/\text{l}$ because the "streaming effect" in the river may not always permit proper mixing. This value of 0.5 $\mu\text{c}/\text{l}$ is subject to confirmation or rejection by the Clinton Laboratories directors. The chemical waste water would be expected to be discharged by way of tanks and a holding pond into White Oak Creek.

In answer to your other questions I would state that the highest activity measured in the Clinch River below White Oak Creek mouth is $\sim 10^{-2} \mu\text{c}/\text{l}$. The highest activity measured in White Oak Lake is about 0.2 $\mu\text{c}/\text{l}$. This latter value of 0.2 $\mu\text{c}/\text{l}$ was approximately the ingestion tolerance value of water in White Oak Creek at the time due to the presence of a large percent of strontium.

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Karl Z. Morgan
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