From: Drabek.John@epamail.epa.gov
Sent: Monday, March 02, 2009 4:00 PM
To: Moore, Sonya L
Subject: Additional Language for Outfall 004

Sonya,

I have two items on the NPDES final permit.

Hanford comments No. 8 on the NPDES permit regarding the need to raise the nitrite limits.

"What does not appear to be understood when the limit was determined was that the UV light also causes the reduction of nitrate present in the water to form nitrite. It is well documented that reduction of nitrate in UV reactors can produce a significant level of nitrite in water. "

"The UV oxidation unit parameters are currently being set in an effort to minimize the amount of nitrite added to the wastewater and not driven by treatment of organic constituents as is the intended function of the treatment operation. This means the facility is using significantly more hydrogen peroxide and electrical power than would be necessary for the treatment of the organics in the wastestream."

So does this mean the oxidation reactions are achieved through the synergistic action of high intensity UV light in combination with hydrogen peroxide treatment to generate highly reactive hydroxyl radicals(OH•) that react with and destroy most organic chemical compounds. If complete mineralization is achieved in the reaction, the final products of the process are carbon dioxide, water and salts. And if UV is reduced hydrogen peroxide is increased?

Put another way does this mean through direct photolysis, the UV light reacts with the H2O2 to generate hydroxyl radicals (OH•), which are highly reactive. The hydroxyl radicals then attack the organic molecules resulting in the destruction of organic compounds. The reaction is aided by the direct photolysis of the organic molecule by the UV light which can break or activate certain atomic bonds making the molecule more susceptible to oxidation.

Is Hanford increasing the concentration of H2O2 to compensate for a reduction in or to maintain UV photolysis?

If so this article states hydrogen peroxide increases nitrite in drinking water.

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One concern with UV disinfection of water is the production of nitrite when polychromatic UV sources are utilized. Based on previous work, it was hypothesized that a small addition of hydrogen peroxide (H(2)O(2)) may be useful in controlling nitrite during UV disinfection. However, it was found that H(2)O(2) addition (5 or 10mg/L) during polychromatic UV irradiation of drinking water at doses used for disinfection significantly increases the levels of nitrite produced relative to solutions without H(2)O(2). Enhancement rates ranged from approximately 15% to 40% depending upon pH and H(2)O(2) concentration; the relative increase in the NO(2)(-) yield was greater at pH 6.5 than at pH 8.3.
The observed effects are tentatively ascribed to a combination of enhanced superoxide production and increased hydroxyl radical scavenging when H(2)O(2)

is added. These results indicate that H(2)O(2) cannot be used to control nitrite production during UV disinfection and that enhanced nitrite formation will occur if H(2)O(2) is added during UV water treatment to achieve advanced oxidation of contaminants.

http://www.ncbi.nlm.nih.gov/pubmed/14568060?dopt=Abstract

Please explain the impacts of the increased addition of H2O2 on nitrite levels at TEDF.

2. These are the reasons reported from Hanford for the recent increase in radionuclide discharges through Outfall 004.

"One immediate action has been to uncover and expose a pipe that may have carried contaminated suppression water from substructure demolition efforts to the outfall where the AEA radionuclides have been found."

"CH2M HILL restricted all 100K East Basin Deactivation and Decommissioning activities that required an extensive use of water (e.g., water for dust control during demolition) in case those activities are contributing to the discharge.

CH2M HILL has also increased the frequency of discharge monitoring. While the contaminants are at very low levels and are not expected to have an impact on the Columbia River, as a precaution, water samples will be taken from the river upstream and downstream of the outfall pipe this week.

Leading candidates for the radionuclide source are the KE Basin floor drain lines that were previously plugged with grout that may have been disturbed or broken during KE Basin substructure demolition. These floor drains all flow into a collection box (a cement septic tank like cube) which is located about 25 feet below grade (to the NW of KE Basin) and then into a line leading to the outfall. CH2M HILL is investigating plugging the KE collection box to seal this pathway."

These sources are process wastewater from CERCLA Cleanup actions.

This language will be added to the final permit as agreed during our conference call.

"Discharges of process water such as dust suppression water and stormwater from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Cleanup actions are prohibited from Outfall 004."

This allows the discharge from areas within the cleanup footprint that have not yet begun cleanup.

Also, Ecology will ask for additional monitoring for radionuclides discharged from Outfall 004.