# Report as of FY2006 for 2006CA171B: "Diuron in Californias Water Supply:"

## Publications

Project 2006CA171B has resulted in no reported publications as of FY2006.

## Report Follows

## ***Project Summary***

Diuron is the third most used herbicide in California (over 1.5 million pounds annual usage in 2005). Nearly all applications (95%) are in late fall through early spring. Diuron has been frequently detected between 1992 and 2002 during spot surface water monitoring conducted by the Department of Pesticide Regulation. The Department of Water Resources has also monitored various organic compounds for the state water project two or three times a year, and diuron is frequently detected.

The primary reason for concern about diuron in source waters is the chance of forming carcinogens, such as N-nitrosodimethylamine (NDMA), from diuron directly or from its breakdown product, dimethylamine (DMA). In addition, the formation of other byproducts besides NDMA, such as

chlorinated anilines, may also impart unacceptable risks. The objectives of the project are to:

1. Determine the kinetics of toxic byproduct formation during chlorination or chloramination of diuron containing waters supplied by the California Aqueduct.
2. Assess the human exposure to diuron's byproducts via treated waters derived from the California Aqueduct through a combination of field sampling and modeling.

The first phase of the project is to test the potential for NDMA formation during chlorination of diuron. Reactions are performed in 1 L mixed batch reactors shielded from light. Diuron of 20 mg/L concentration (the highest observed diuron concentration in California source waters is 20 ug/L) is mixed with deionized water. The pH of samples is adjusted at 8. Sodium hypochlorite (3.45 mM as $Cl_2$) was injected to simulate the disinfection process. The concentration of NDMA in samples was measured using GC-MS analysis after solid phase extraction. Total chlorine is determined by DPD ferrous titrimetric method at the end of each reaction. The results acquired support the hypothesis that appreciable amount of NDMA can be produced from the chlorination of diuron (Figure 1). Similar experiments were also conducted to investigate the effects of different initial diuron concentrations and pH values. Results indicate that lower concentrations of diuron produced lower concentrations of NDMA at the end of experiments (Figure 2), and the optimal pH range of NDMA formation from diuron is 6 to 10, which is similar to the proposed optimal pH range of NDMA formation from DMA (Figure 3).

Work during the next year of the project will elucidate the formation kinetics of NDMA and other toxic byproducts during chlorination and chloramination of diuron, which is essential to determine the risk posed by diuron in any location where it is a contaminant of concern. Estimates of human exposure to diuron and its byproducts in drinking water will allow identification of specific regions in the California Aqueduct, if any, where the treatment plants should be modified.