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DuPont Crop Protection

November 13, 2012

Melissa Dekar
California Regional Water Quality Control Board
Central Valley Region
11020 Sun Center Drive #200
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DuPont comments on the Scope for the Proposed Diuron TMDL and Basin Plan Amendment

Dear Ms. Dekar:

DuPont Crop Protection appreciates the opportunity to comment on the Scope for the Proposed Diuron TMDL and Basin Plan Amendment. DuPont is the lead registrant of diuron in the United States, and we have an interest in the establishment of a TMDL for diuron and the Basin Plan Amendment for diuron specifically and as a precedent for other herbicides.

The Scope of the proposed Basin Plan Amendments states that intent of the project is to establish water quality objectives that apply to all or a subset of the Sacramento and San Joaquin River Basins, establish TMDLs for waters listed as impaired by diuron on the 303d list, and implement a program for achieving the objectives.

The geographic scope of the project includes all waters in the Sacramento and San Joaquin Basins with designated aquatic life beneficial use without exception and without consideration of the potential for attaining the beneficial use by regulation of diuron. The information document notes that the concentrations of the pesticide, diuron, cannot adversely affect the beneficial use. However, if it is not feasible to attain the beneficial use through coordinated, economically viable actions, including regulation of diuron, establishing a stringent water quality criterion for diuron will not contribute to the CVRWQB board of creating habitat consistent with the beneficial use. The current guidance for a diuron water quality criterion and all of the alternatives for a water quality criterion are based on effect levels for sub lethal, reversible effects on growth rate of algae. The laboratory test guidelines for aquatic plant tests require constant exposure for the duration of the experiment giving an exposure that is greater than would be expected from the pulsed dose of realistic exposures. Adoption of any of the proposed alternatives will require control of diuron concentrations in the Basin at levels that produce no change in the growth rate of the most sensitive species of algae. The selection of an objective based solely on toxicity endpoints neglects other considerations such as the species diversity, population density and other measures of the biological integrity of the water body that are relevant to determining whether stringent control of diuron will provide any improvement in habitat that is necessary to protect the beneficial use. The scoping document does not indicate that any factor other than toxicity to sensitive organisms has been considered in selecting the alternatives for the WQO or the water bodies to which the WQO will apply.

There is no indication in the scoping document that the economic impact of any of these over-protective levels of control has been considered in selecting the alternatives. Additional alternatives that will give a WQO that is a more reasonable goal should be considered. Several alternatives have the potential to provide

a target that is consistent with the goal of attaining the beneficial use, but will reduce the economic impact on users who depend on diuron for vegetation management along roadsides, rights of way, and industrial sites; and for weed control in crops. These alternatives take account of the potential for recovery, additional data that was not considered by Fojut *et al.* (2009), and the guidance in internationally accepted guidelines.

Diuron is algistatic/phytostatic to algae and aquatic plants. That is, after being placed into fresh, diuron-free medium, algae and aquatic plants were found to recover. This was observed in regulatory guideline studies with two sensitive species, *Selenastrum capricornutum* and *Lemna gibba*. In one of the tests with *Selenastrum capricornutum* (Douglas and Handley, 1988), a recovery phase determined that diuron was algistatic at test concentrations up to 0.16 mg/L, the highest concentration tested and a concentration that is 100 times the current WQO for diuron. In a test with *Lemna gibba* (Ferrell, 2006), a 14-day recovery period followed by a 7-day exposure period determined that recovery (i.e., growth and reproduction) occurred at test concentrations up to 0.0791 mg/L, the highest concentration tested. These recovery values can therefore be identified as the No Observed Adverse Effect Concentrations (NOAEC) for algae and Lemna. Because both algae and aquatic plants were able to recover after an episodic exposure, the recovery should be taken into consideration when determining the chronic water quality criterion. A criterion based on recovery is a more reasonable target for achieving the beneficial use than the NOEC for the most sensitive algal species. This alternative is not included in the scope and should be added.

DuPont recommends that data used in regulatory decision-making processes be conducted in accordance with Good Laboratory Practice (GLP) and in accordance with internationally accepted test guidelines. Aquatic plant endpoints should be based on measurements of growth or growth rate as recommended by OECD and should consider the potential for recovery. We recommend that the Central Valley Water Quality Control Board select the EC_{50} based on growth rate instead of the NOEC to take account of the type of effects measured in aquatic plant studies. We support the effort by Fojut *et al.* to use data with high relevance and high reliability and recognize the significant effort undertaken by the authors to evaluate the many reports and literature references available for diuron. We note that the studies selected for derivation of the acute and chronic criteria were studies submitted by DuPont to support registration actions of the US EPA and the State of California. As study designs and data quality requirements have changed, DuPont has continued to update the database of ecological effects tests. For the chronic value, the algal data-set used by Fojut *et al.* is not inclusive of all the work that DuPont has conducted with diuron. Fojut *et al.* acknowledged that all data was not available at time of assessment and suggested a review when that data became available. Data from more than 5 tests on algal species are now available, and a re-evaluation of the water quality criterion would be appropriate. Using the full set of data available, DuPont has shown that the HC5 based on NOECs for algae and Lemna was 4.1 µg/L. This HC5,calculated from NOECs that do not include recovery, remains a very protective standard. In Tenbrook *et al.*, 2009, Chapter 2 (Evaluation and Selection Methods), Section 2-2.1.2 (Hypothesis tests vs. regression analysis) "…the MATC is the value used in the new methodology to calculate the chronic criterion." Using the MATC values as recommended by Tenbrook *et al.,* 2009 would give a criterion greater than 4.1 µg/L.

Data is available in Blasberg *et al*. to calculate the EC_{50}, and Tenbrook *et al*. state in Chapter 3, Section 2.1.1.2 that an EC_x may be used for criteria development. Aquatic plant studies are designed to allow determination of the EC_{50}, which is a conservative, robust endpoint. The endpoints measured in aquatic plant studies are sublethal (effects on growth), and the effects are generally reversible. Because algal and aquatic plant studies are based on effects such as population growth rate and not on individual effects such as mortality, the EC_{50} is an appropriate endpoint for establishing a water quality criterion. Alternative 4 in the scoping document, the US EPA aquatic benchmark, is derived from the EC_{50}. Alternative 4 has the advantage of providing consistency with federal guidance, although a WQC based on the EPA benchmark does not include recovery, nor the additional studies submitted by DuPont that could be used to re-evaluate the water quality objective.

The scoping document notes that the water quality objective will apply to all or a subset of the water bodies in the Sacramento and San Joaquin River Basins. The process for determining the water bodies to which the objective will apply is not clear. The statement in the document "there is no indication that the current designations are infeasible" suggests that the CVRWQCB has already made the decision. If so, then a specific list should be available and the beneficial uses and feasibility of attaining the beneficial use should be confirmed prior to completion of the project.

Sincerely,

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Research Fellow
Environmental Safety Assessment

Table 1
Algal and Aquatic Plant Studies

Study	Organism	Code/Lab	Report Date	Biomass Endpoint(s)	Growth Rate Endpoint(s)	GLP
Algal Toxicity	*Selenastrum capricornutum*	Douglas & Handley DPT 171	1988	72 hr EC_{50} – 0.018 mg/L 120 hr NOEC - ~0.01 mg/L	0.022 mg/L (120 hrs) 120 hr NOEC - ~0.08 mg/L	Yes
Algal Toxicity	*Synechococcus leopoliensis*	D. Dengler, DuPont-19438	2006a	0.026 mg/L (72 hr) NOEC – 0.0037 mg/L	0.380 mg/L (72 hr) NOEC – 0.011 mg/L	Yes
Algal Toxicity	*Navicula pelliculosa*	D. Dengler, DuPont-19440	2006b	0.022 mg/L (72 hr) NOEC – 0.011 mg/L	0.065 mg/L (72 hr) NOEC – 0.011 mg/L	Yes
Aquatic Plant	*Lemna gibba* G3	B. Ferrell DuPont-20775 MRID 46996701	2006	0.0144 mg/L (7 day EC_{50}) Based on Biomass Yield NOEC – 0.00247 mg/L	0.0203 mg/L (7 day EC_{50}) Based on Biomass NOEC – 0.00247 mg/L	Yes

References

Dengler. D. (2006a). Testing of Toxic Effects of Diuron Technical on the Blue-Green Alga *Synechococcus leopoliensis*; DuPont 19438, DuPont de Nemours France, S.A.

Dengler. D. (2006b). Testing of Toxic Effects of Diuron Technical on the Diatom *Navicula pelliculosa*; DuPont 19440, DuPont de Nemours France, S.A.

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Ferrell, B.D. (2006). Diuron (DPX-14740) Technical: Static, 7-Day Growth Inhibition Toxicity Test with *Lemna gibba* G3; DuPont 20775; E.I. du Pont de Nemours and Company, Haskell[SM] Laboratory for Health and Environmental Sciences. MRID 46996701.

Fojut, T. L., Palumbo, A. J. and Tjeerdema, R. S. 2009. Diuron Criteria Derivation Draft, Environmental Toxicology Department, University of California – Davis.

Tenbrook, P. L., Palumbo, A. J., Fojut, T. L., Tjeerdema, R. S.; Hann, P.; Karkoski, J. (2009). Methodology for Derivation of Pesticide Water Quality Criteria for the Protection of Aquatic Life in the Sacramento and San Joaquin River Basins. Phase II: Methodology Development and Derivation of Chlorpyrifos Criteria.