STANFORD
UNIVERSITY

May 26, 2009

Ms. Jeanine Townsend
Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Re: Draft Landscape Irrigation General Permit

Dear Ms. Townsend:

Stanford University would like to reiterate its written comments dated May 18, 2009 and its oral comments presented at the May 19 public hearing on the State Water Board's proposed General Permit for landscape irrigation uses of recycled water. Stanford is concerned about the deleterious effects on plants and trees resulting from the use of high salinity irrigation water. As Stanford has documented to the Board, numerous scientific studies demonstrate that the use of recycled water for irrigation can have serious negative effects on coastal redwoods and other species that are sensitive to salts. These effects are particularly problematic where soil conditions do not allow for adequate drainage.

Stanford accordingly requests that the Board modify the General Permit to ensure that there is a rigorous site-specific analysis of soil conditions and potential salinity effects, before recycled water is allowed for irrigation use, at sites where salt-sensitive species such as redwoods are present. The Permit should be drafted to require a specific showing that salinity in the irrigation water will be reduced to levels that avoid adverse effects on such species. Stanford also requests that the Board modify the General Permit to include the prior provisions of the draft Permit, which were deleted in the May 7 draft, which had specifically recognized the potentially harmful effects from salinity, especially on plants.

The General Permit needs to recognize the factors which are relevant to irrigation with recycled water. The response of an existing landscape to irrigation with recycled water depends on the degree to which soil will become affected and the tolerance of plant materials to salts and specific ions. Evaluation of sites for irrigation with recycled water must consider water, plant, and site factors as well as irrigation management. Key factors to consider when evaluating site suitability for irrigation with recycled water:

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Salt-sensitivity of plants in the landscape. Plants vary widely in their tolerance to salts. Salt-sensitive and boron-sensitive plants have less tolerance to use of recycled water than do more salt/boron tolerant species.

Water quality – The poorer quality the water (i.e., the higher the salt concentration), the more likely plants will be injured and soils will be degraded.

Soil characteristics – As a rooting environment, the soil holds the water and elements for root uptake. Some constituents in recycled water, such as sodium, can have negative effects on the soil as they concentrate over time. The soil characteristics of key importance include:

Chemical characteristics – Soils with low concentrations of salts or low pH can accumulate more salts from the water before salt concentrations cause plant damage.

Texture of the soil - Clay (fine-textured) soils are more quickly degraded by excess sodium than sandy (coarse-textured) soils.

Soil profile – The vertical gradation or layering with soil depth affects water percolation, salt accumulation and plant rooting patterns.

Soil drainage - Soils with poor drainage characteristics accumulate salts and cannot be easily leached, thus, better quality water is required.

Irrigation methods and schedules can result in added impacts to landscape, as plants are more sensitive to sodium and chloride toxicity when water is applied to the foliage as opposed to the soil. Therefore sensitive plantings irrigated by sprinklers require water lower in sodium and chloride. Drip irrigation emitters can become clogged by calcium carbonate precipitates and suspended solids in the water in the water.

If an inventory of the plant species at a particular site shows that the landscape has a low tolerance (high sensitivity) to sodium, chloride, or boron, then the General Permit should require a site evaluation. The following are the basic components of a site analysis that should be performed before recycled water is introduced to the landscape. The results of these analyses are key to evaluating the impacts a given recycled water will have on the function and environmental benefits provided by the landscape, and the data will inform future landscape management activities.

1. Review Soil Conservation Service Soil Maps of the area.
2. Determine quality of water to be applied: Maximum, minimum and average annual values for electrical conductivity, chloride, sodium, boron, bicarbonate, SAR.

3. Identify locations for soil sampling and provide the following at each:
   a. Inspect and describe soil profile within root area. Characterize soil texture, structure, layers, water table depth, redoxomorphic features, drainage class, etc.
   b. Collect and analyze soil samples at each sampling location from surface and subsurface. Analyze for pH, Ec_e, NO_3, NH_4, P, K, Ca, Mg, B, Cl, Na, SAR, mechanical analysis (texture).
4. Identify any constraints the plant palette, current plant condition, and/or soil characteristics may have on successful use of recycled water for irrigation.
5. Describe the short-term and long-term effects irrigation with recycled water at the site are likely to have on landscape appearance, health and function.

Stanford's goal is to support the continued beneficial use of recycled water for irrigation, while ensuring that the health, function and appearance of existing landscaping is maintained and harmful impacts are avoided. We appreciate your consideration and look forward to the revised draft of the General Permit.

Sincerely yours,

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