Memorandum

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From: Jeffrey Peters, Questa Engineering

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Re: Hydrologic and Water Quality Impacts from Urban Irrigation Component

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BACKGROUND

This memorandum addresses potential hydrologic and water quality impacts from implementation of the urban irrigation component of the Long Range Wastewater Plan. Several project components include urban irrigation with reclaimed water. Likely kinds of project facilities are golf courses, schools and park sites, and large industrial parks with extensive landscaping. Some of these are part of the interim plan. Potential impacts were outlined in the Urban Irrigation Management Guidelines (UIMG) which identified possible:

1. Hydrologic impacts including summer stream flow increases and groundwater mounding from excessive or over-irrigation; and,

2. Water quality impacts, including:

    a. Primary impacts from nutrients and metals in reclaimed water; and,

    b. Secondary impacts from irrigation water transport of landscape chemicals, pesticides and fertilizers.

The UIMG provides a basis for control or mitigation of such impacts by requiring large reclaimed water users to prepare and adopt a plan for Best Management Practices (BMPs) which focuses on:

1. Good landscape irrigation design and water management to control over-irrigation for all new facilities.

2. Sound landscape maintenance practices that use pesticides and fertilizers appropriately, for all new facilities.

Design guidelines, construction requirements and references for development and implementation of landscape BMPs are also contained in the UIMG.

HYDROLOGIC IMPACTS

For purposes of evaluating hydrologic and water quality impacts, it should be remembered that initially nearly all urban reclaimed water users will consist of existing facilities presently utilizing either on-site well water or, for some interim projects, municipal water. Therefore, hydrologic and water quality impacts must be judged from the reference point that the urban irrigation project component represents a substitution of water sources. Hydrologic impacts could result from either increased irrigation, and/or irrigation in excess of plant requirements or soil infiltration rates which would cause subsurface groundwater mounding or runoff. This likely would occur only if current facilities under-irrigate landscape areas either because of water shortages or poor management practices.

Under this reasoning, net hydrologic benefits would result if current facilities which would substitute municipal or groundwater with reclaimed water do not now manage their irrigation optimally (wisely from a water conservation perspective).[1] From a stand point of hydrologic impacts, there likely would be no net change for facilities which currently conserve water in their landscape irrigation practices. Significant impacts potentially would only occur from facilities which grossly over-irrigate in violation of the UIMG.

Potentially the two largest urban users of project reclaimed water (Bennett Valley Golf Court and Fountain Grove Country Club Golf Course) were contacted to determine their landscape irrigation water use characteristics. These water use characteristics (average use rates) were then compared with theoretical turf irrigation water use rates to compute an irrigation application efficiency.

The Fountain Grove Golf Course on average uses 110 million gallons of water annually to irrigate their 150-acre facility.[2] This is about 338 acre-feet per year, or about 27 inches per acre. Depending on the mix between cool-season and warm-season turfgrasses, the annual consumptive water for turfgrasses in the Santa Rosa area ranges between 25.6 and 34.2 inches. The 27-inch application rate represents a well managed system, considering typical irrigation efficiencies of 80 percent.[3]

The Bennet Valley Golf Course uses on average 125 million gallons of water annually to irrigate their 165 acre facility. This 28 inch application rate also indicates a well managed irrigation system, with an irrigation efficiency.

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1 Impacts to groundwater resources would be beneficial if reclaimed water is substituted for well water, reducing groundwater withdrawal.

2 Personal communication, January 26, 1996, Rick Bennett, Fountain Grove Golf Course.

3 Synder, R.L. and M. Harivandi (1992). Turfgrass Evapotranspiration Map of Central Coastal California, University of California Cooperative Extension Leaflet 21491.

WATER QUALITY IMPACTS

In order for the reclaimed water and its inherent constituents (nitrates and metals) or transported constituents (landscape chemicals) to have an impact on surface and groundwater quality, hydrologic impacts normally will need to occur. The reclaimed water must reach Bennett Valley or Mark West Creek in significant quantities, either as runoff through the storm drain system or as subflow. Considering the relatively small sizes of the golf courses relative to the watershed area and the watershed soils and drainage characteristics, it appears that in order to have measurable water quality impacts:

1. Gross over-irrigation would be necessary;

2. The reclaimed water would need to be substantially different in quality than the existing water sources for which it substitutes; and,

3. Fertilizer and herbicide/pesticide landscape management practices would need to change substantially.

The soils in the golf course areas are deep and moderately permeable. They generally lack shallow subsurface restrictive layers necessary for shallow subflow water movement to surface drainages.[4]

Compared to the existing source groundwater, the reclaimed water is believed to be similar in quality. It is relatively low in soluble salts, nitrates and metals, and use of the reclaimed water normally will not require excessive water leaching applications to control salt build-up in the soil. (See Irrigation Water Quality and Salt Management/Leaching Requirement Technical Report, Questa Engineering, December 1995.) The UIMG will insure that sound landscape irrigation and maintenance practices are implemented.

[4] Based on field reconnaissance and review of Hoffman and Armstrong (1980) Geology for Planning in Sonoma County, California Division of Mines and Geology, Special Report 120, and USDA Soil Conservation Service (1973) Soil Survey of Sonoma County, California.