Appendix C – OWTS Water Reuse

1.0 Introduction

The Preserve development is located in an area with large amounts of native vegetation with the potential for periodic wildfires. Therefore, the proposed new home lots will be subject to large amounts of fuel modification (fuel mod) vegetation management for fire protection. The fuel mod plan requires a minimum 150-foot “wet zone” (fuel mod zone B) of permanently irrigated planting surrounding the building pads.

No recycled water source is available for irrigating fuel mod areas, so potable water sources must be used. The output from the onsite wastewater treatment systems (OWTS) will be utilized to irrigate portions of the fuel mod planting in zone B, thus reducing the amount of potable water needed for this purpose. Technically, the water generated by the OWTS is not Title 22 recycled or reclaimed water, it is effluent treated to a high standard.

Due to the unique aspects of the development, its location, and the OWTS, the developer, water engineer, and the County have agreed it is acceptable to reuse the treated effluent for irrigation. All irrigation systems connected to OWTS will be marked as non-potable using standard purple-colored components for recycled water irrigation systems. All dispersal field irrigation equipment will be operated and maintained by qualified personnel, not by individual homeowners.

2.0 OWTS Dispersal Irrigation Design

OWTS dispersal systems will be designed and installed to meet the standards of the California State Water Resources Control Board resolution no. 2012-0032 - "OWTS Policy", including setbacks (section 7.5) and burial depth (section 8.1.4).

The output from each treatment system will be connected to a subsurface dripline dispersal system adjacent to the lot. Dispersal irrigation fields will be placed on fill slopes and natural areas. Placement on cut slopes will be avoided. Irrigation fields will primarily be at the same or lower elevations than the lot they serve. OWTS dispersal fields will be sized to provide all the daily needs of water for the plants in fuel mod zone B in the month of January.

The area needed for each lot’s irrigation field has been calculated as follows: County of Orange Ordinance No. 09-010 *Landscape Irrigation Code* sets forth formulas to use to calculate the Maximum Applied Water Allowance (MAWA) and the Estimated Applied Water Use (EAWU) for all new landscape and irrigation installations within the unincorporated areas of the County. The County formula for Estimated Applied Water Use (EAWU) is:

EAWU = (ETo) x (KL) x (LA) x (0.62) ÷ (IE) = Gallons per year

where:

ETo	=	Reference Evapotranspiration (inches per year)
KL	=	Landscape Coefficient
LA	=	Landscaped Area (square feet)
0.62	=	Conversion factor (to gallons per square foot)
IE	=	Irrigation Efficiency

ETo is an estimate of the amount of moisture needed to be replaced in plants due to the action of evapotranspiration, and is primarily influenced by solar exposure and prevailing temperatures. Historically in Orange County, January is the month with the lowest ETo rate, that is, the month in which plants need the least amount of water lost to evapotranspiration to be replaced. Appendix C in the Landscape Irrigation Code dictates a Reference ETo of 2.20” for all areas in Orange County for January. Placing this value in the EAWU formula results in the following:

*EAWU = **(2.20 ÷ 31)** x (KL) x (LA) x (0.62) ÷ (IE) = Gallons per **day (in January)***
*EAWU = **(0.071)** x (KL) x (LA) x (0.62) ÷ (IE) = Gallons per day (in January)*

Landscape Coefficient (KL) values are derived from WUCOLS, the *Water Use Classification of Landscape Species*, a publication produced by the California Department of Water Resources. Within WUCOLS, landscape plants are assigned a Landscape Coefficient by plant species and region of California. Generally speaking, the major classifications of landscape plants are high, moderate, and low water use, and they are given the following KL values:

High water use plant species	0.7 - 0.9
Moderate water use plant species	0.4 - 0.6
Low water use plant species	0.1 - 0.3

Within the irrigation field areas of fuel mod zone B, the planting design will use moderate water use landscape species. This will result in the irrigation fields being significantly smaller than if these areas were planted with low water use species. Our estimate for the KL value of moderate water use species on OCFA's approved list for fuel mod zone B is 0.5.

The OWTS Policy does not allow water to be dispersed through overhead spray equipment, it must be delivered below the soil surface (section 8.1.4). The Landscape Irrigation Code provides an assumed Irrigation Efficiency (IE) value of 90% for subsurface irrigation. (Ord. 09-010 Appendix A 2.5(a)(1)(k)).

Inserting the values detailed above in the EAWU formula results in the following:

*EAWU = (0.071) x **(0.5)** x (LA) x (0.62) ÷ **(0.90)** = Gallons per day (in January)*

Each home is projected to produce up to 320 gallons of reclaimed water per day. We can place this value in the formula:

*EAWU = (0.071) x (0.5) x (LA) x (0.62) ÷ (0.90) = **320** Gallons per day (in January*

And then solve for LA, the amount of landscape area needed to use 320 gallons in one day in January to irrigate fuel mod planting:

*EAWU = (0.071) x (0.5) x (LA) x (0.62) = (320) **x (0.90)***
*EAWU = (**0.022**) x (LA)) = **288***
***LA** = (288) ÷ (0.022) = square feet per day (in January)*
LA = 13,091 square feet per day (in January)

Each lot will need to have 13,100 square feet of moderate water use fuel mod planting adjacent to it, irrigated with a subsurface drip system, in order to disperse 320 gallons per day of OWTS treated effluent, while satisfying the plants' water needs in an average January without supplemental watering.

The irrigation field control valves will be connected to controllers separate from the H.O.A.'s overhead spray system controllers. Both will be managed by qualified personnel, not homeowners. A potable water supplement line to the effluent pump station will insure the availability of 320 gallons per day of water from each OWTS when output is low, or even if a home is vacant.

Using subsurface dripline with 0.5 gallon-per-hour in-line emitters at 18" on center, and installing the driplines 18" apart, a typical irrigation field for each lot will have 3-4 zones running at 13-17 gallons-per-minute and require approximately 18-24 minutes of total run time per day (6 minutes per zone). This equals a precipitation rate of 0.04" of water **per day**. We believe a precipitation rate this low will have no adverse effect on soil saturation conditions, even during times of significant rainfall. Also, generally speaking, most plants will tolerate much more water than their WUCOLS classification might indicate.

The WUCOLS classifications are meant to be a guideline for the minimum percentage of ETo that plants need to survive and be healthy, since WUCOLS has been developed as a water conservation tool.

3.0 Fuel Mod Irrigation Design

In months other than January, or when January is abnormally warm, the irrigation field areas will be supplemented with a separate H.O.A. overhead spray irrigation system. Irrigation zones watering over the irrigation fields will be separated from the zones watering the rest of fuel mod zone B. This will allow these zones to be separately scheduled to compensate for the treated effluent irrigation and the higher water requirement plants used in the dispersal field areas. This separation will also allow for periodic leaching of salts in the irrigation fields, which result from both the use of treated effluent water and subsurface drip irrigation technology.

The fuel mod irrigation systems will be designed to comply with the Landscape Irrigation Code, including the use of controllers which utilize evapotranspiration data for varying schedules. The typical irrigation systems for fuel mod irrigation will consist of a dedicated 2" potable water service, buried PVC main lines, electric control valves, and UV-resistant PVC lateral lines installed on grade. Overhead spray rotor sprinkler heads will be used wherever possible to efficiently and effectively irrigate the fuel mod planting. Irrigation zones will be further divided into south/west and north/east solar exposures to accommodate their differing water needs. A typical irrigation zone will run at 50-60 gallons-per-minute and have a precipitation rate of 0.50"-1.50" of water per hour.

4.0 Fuel Mod Planting Design

Fuel mod zone B extends a minimum of 150 feet from zone A, and shall be cleared of all undesirable plant species, irrigated, and planted with species from the OCFA approved plant list. Fuel mod planting will be designed and installed to comply with the Orange County Fire Authority (OCFA), including the spacing between shrub and tree masses.

Fuel mod zone B will be separated into two planting areas: The upper area adjacent to fuel mod zone A will consist of 'moderate' water use plants, and shall be partially irrigated with treated effluent from the adjoining residential lot. The remaining portion of fuel mod zone B will consist of 'low' water use plant material, and shall be watered with an irrigation system connected to the domestic water system.

5.0 OWTS Policy excerpts *(State Water Resources Control Board resolution no. 2012-0032)*

7.5 Minimum horizontal setbacks from any OWTS treatment component and dispersal systems shall be as follows:

7.5.1 5 feet from parcel property lines and structures.

7.5.2 100 feet from water wells and monitoring wells, unless regulatory or legitimate data requirements necessitate that monitoring wells be located closer.

7.5.3 100 feet from any unstable land mass or any areas subject to earth slides identified by a registered engineer or registered geologist; other setback distance are allowed, if recommended by a geotechnical report prepared by a qualified professional.

7.5.4 100 feet from springs and flowing surface water bodies where the edge of that water body is the natural or levied bank for creeks and rivers, or may be less where site conditions prevent migration of wastewater to the water body.

7.5.5 200 feet from vernal pools, wetlands, lakes, ponds, or other surface water bodies where the edge of that water body is the high water mark for lakes and reservoirs, and the mean high tide line for tidally influenced water bodies.

7.5.6 150 feet from a public water well where the depth of the effluent dispersal system does not exceed 10 feet.

8.1 OWTS Design Requirements

8.1.4 All dispersal systems shall have at least twelve (12) inches of soil cover, except for pressure distribution systems, which must have at least six (6) inches of soil cover.

6.0 OWTS Policy Final Substitute Environmental Document excerpts *(State Water Resources Control Board resolution no. 2012-0032)*

4.5.4.3 Shallow Dispersal

The most biologically active area in a soil column is the aerobic environment at or near the ground surface. An aerobic environment (oxygen rich) is desired for most wastewater treatment and dispersal systems. Aerobic decomposition of wastewater solids is significantly faster and more complete. Maximum delivery of oxygen to the infiltration zone is most likely to occur when dispersal systems are shallow (USEPA 2002).

Shallow dispersal methods, primarily drip distribution, which was derived from drip irrigation technology, is a method of pressure-dosed distribution capable of delivering small, precise volumes of wastewater effluent to the infiltrative surface. It is the most efficient of the distribution methods, and although it requires supplemental treatment, it is well suited for all types of dispersal system applications.

A drip line pressure network consists of several components:

- *dose tank,*
- *pump,*
- *pre-filter,*
- *supply manifold,*
- *pressure regulator (when turbulent, flow emitters are used),*
- *drip line,*
- *emitters,*
- *vacuum release valve,*
- *return manifold,*
- *flush valve, and*
- *controller.*

The drip line is normally a flexible polyethylene tube that is a half-inch in diameter with emitters attached to the inside wall spaced 1–2 feet apart along its length. Because the emitter passageways are small, friction losses are large and the rate of discharge is low (typically from 0.5 to nearly 2 gallons per hour). Usually, the drip line is installed in shallow (less than 1 foot deep), narrow trenches 1–2 feet apart and only as wide as necessary to insert the drip line using a trenching machine or vibratory plow. The trench is backfilled without any porous medium so that the emitter orifices are in direct contact with the soil. The distal ends of each drip line are connected to a return manifold. The return manifold is used to regularly flush the drip line.

Because of the unique construction of drip distribution systems, they cause less site disruption during installation, are adaptable to irregularly shaped lots or other difficult site constraints, and use more of the soil mantle and take advantage of plant uptake (absorption into the roots of plants) for treatment because of their shallow placement in the ground.

Reference:

California Department of Water Resources (August 2000). "*A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California – The Landscape Coefficient Method and WUCOLS III*".

California State Water Resources Control Board (June 19, 2012). Resolution No. 2012-0032 "OWTS Policy – Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems".

California State Water Resources Control Board (June 19, 2012). Resolution No. 2012-0032 "Onsite Wastewater Treatment System Policy Final Substitute Environmental Document".

County of Orange California (December 15, 2009). Ordinance No. 09-010 "*Landscape Irrigation Code*".

Orange County Fire Authority Planning & Development Services Section (January 1, 2008). "*Guidelines for Fuel Management Plans and Maintenance Program*".

Orange County Public Works (November 2009). "*Guidelines (Appendix A) for Implementation of the County of Orange Landscape Irrigation Code*".