26 April 2007

Technical Memorandum

To: Dan Pfeifer, City of San Buenaventura

From: Patrick Huston, Kennedy/Jenks Consultants

Subject: City of San Buenaventura Recycled Water Market Assessment
Kennedy/Jenks Consultants Project No. 0689017

Introduction

In accordance with our March 5, 2007 proposal and scope of work, Kennedy/Jenks Consultants (K/J) has completed an evaluation of potential recycled water markets within the City. This technical memorandum summarizes the methodologies used to quantify potential recycled water demands and the resultant estimates, including:

- Summary of existing recycled water usage
- Estimate of potential recycled water usage
- Delineation of existing and potential recycled water customer locations

For the purposes of this study existing recycled water customers represent current recycled reclaimed water service accounts within the City. Potential recycled water customers represent existing potable water customers within the city whose meter account type (i.e. irrigation) and/or landuse type (i.e. park) suggest that they may be able to utilize recycled water.

For the purposes of this study, the Ventura Water Reclamation Facility (VWRF) tertiary treated effluent is considered the source for recycled water. The VWRF has a capacity to 14 million gallons per day (mgd) annual average flow (AAF) of tertiary treated effluent. The VWRF is currently required to discharge a minimum of 5.6 mgd to the Santa Clara River. In addition, recycled water is currently provided for landscape irrigation to the City's Olivas Park Golf Courses, Marina Park, the Olivas Adobe, the Four Points Hotel Sheraton, the Ventura Port District and the LA Times Building, near the Buenaventura Golf Course.

The purpose of this study is to quantify the market potential for additional recycled water use within the City based on an assessment of current potable water usage. This assessment is based solely on analysis of demand potential. This assessment does not take into account the cost of service, and it is likely that such considerations will determine that some of the potential users identified in this study cannot be economically served. Therefore the recycled market assessment results presented herein likely represent the upper limit of the recycled water demand potential within the City given the recycled water usage types and source waters considered.

Recycled Water Market Assessment

Recycled Water Uses

As detailed in Title 22 of the California Code of Regulations, disinfected tertiary recycled water can be used for the following applications:

- Irrigation of the following:
  - Food crops, including all edible root crops, where the recycled water comes into contact with the edible portion of the crop
  - Parks and playgrounds
  - School yards
  - Residential landscaping
  - Restricted and unrestricted access golf courses
  - Cemeteries
  - Freeway landscaping
  - Ornamental nursery stock and sod farms where access by the general public is not restricted
  - Pasture for animals producing milk for human consumption
- Source of water supply for restricted or non-restricted recreational impoundments
- Industrial or commercial cooling or air conditioning that does or does not involve the use of a cooling tower, evaporative condenser, spraying or any mechanism that creates a mist
- Flushing toilets and urinals
- Priming drain traps
- Industrial process water that may come into contact with workers
- Structural or nonstructural fire fighting
- Decorative fountains
- Commercial laundries
- Consolidation of backfill around potable and non-potable pipelines
- Artificial snow making for commercial outdoor use
- Commercial car washes, including hand washes if the recycled water is not heated, where the general public is excluded from the washing process
- Industrial boiler feed
- Soil compaction
- Mixing concrete
- Dust control on roads and streets
- Cleaning roads, sidewalks and outdoor work areas

Recycled Water Customer Demand Estimates

Recycled water uses included in the evaluation represent landscape irrigation for parks, schools, greenbelts, streetscapes and other related uses.

Estimates of existing and potential recycled water usage were derived from the City's water billing records. These water billing records represent the same data set used for the City's

Water and Wastewater Master Plans, currently being developed. Using this data set offers the City a consistent baseline of water demand/wastewater flow information when comparing the Water Master Plan, Wastewater Master Plan, and the results of this recycled water market assessment.

The City's water meter billing records were reviewed for the time period of January 2004 to February 2006. These two years of data were analyzed to compute water for each of the City's water meter accounts. Bi-monthly water billing data for each account were averaged over the two-year period to arrive at the average annual water usage over the study period.

Existing recycled water customers are specifically identified in the water billing records. The estimate of existing recycled water customer usage represents the average demands of the 12 existing customers over the two-year study period.

Potential new recycled water customers were identified based on a combination of data, including the water billing account type and the customer landuse type. The water meter billing records specifically identify irrigation accounts. For the purposes of this study, all irrigation accounts are assumed to be potential recycled water customers, given the non-potable usage implication of the account type. Accounts identified as irrigation/domestic are assumed to have a combination of potable and non-potable uses, therefore potential recycled water demands for these meter types are estimated to be 50 percent of the measured water usage for each of these account types.

Other potential recycled water users were identified based on the identified landuse of each meter account/parcel. This study assumed that all parks can be converted to recycled water usage. Recycled water demands for parks are estimated to be 90 percent of the identified potable water demands, with the balance of their water usage being potable water for restroom facilities, drinking fountains and other potable water uses. Schools are assumed to use recycled water at a rate of 50 percent of their identified potable water demands. All streetscape landuses are assumed to be converted to recycled water usage, with their recycled water usage estimated at 100 percent of the identified potable water demand.

Agricultural land uses were evaluated for potential use of recycled water. Much of the local agricultural consists of berry crops. The sensitivity of these crops to water quality variations suggests that these agricultural areas are not candidates for recycled water use. This was further confirmed through conversations with local food growers. Furthermore, many of the local growers own agricultural wells and/or have water exchange agreements. Such growers can be expected to be reluctant to use recycled water.

One agricultural land use that may be receptive to recycled water is citrus crop. For the purposes of this study, citrus crop land uses are assumed to utilize recycled water at 50 percent of the identified potable water demand. The 50 percent usage factor anticipates that recycled water use may need to be supplemented with potable water to meet water quality and production requirements for these crops

Industrial customers were reviewed for potential use of recycled water. However the major water users categorized as industrial land uses are food processors, such as lemon processing and bean packing. Their water quality requirements precluded use of recycled water. Within

the City of Ventura, there are no identified industrial land uses using cooling water or large quantities of process water. Based on a review of the City's industrial customer base, there does not appear to be a recycled water market for this customer category. Therefore, industrial customers are assumed to remain on potable water for the purposes of this study.

Demand Assumptions

A summary of the planning assumptions used for the purposes estimating potential recycled water demands within the City is provided below:

- All Irrigation meter accounts are assumed to be converted to recycled water usage at a rate of 100% of the identified potable water demand.
- All Irrigation/Domestic meter accounts are assumed to be converted to recycled water usage at a rate of 50% of the identified potable water demand.
- All Parks are assumed to be converted to recycled water usage at a rate of 90% of the identified potable water demand.
- All Schools are assumed to be converted to recycled water usage at a rate of 50% of the identified potable water demand.
- All Streetscapes are assumed to be converted to recycled water usage at a rate of 100% of the identified potable water demand.
- Identified Agricultural citrus crops are assumed to be converted to recycled water usage at a rate of 50% of the identified potable water demand.

The above-stated assumptions are believed to be reasonable for planning level purposes taking into account the recycled water usage patterns of other similar recycled water systems and the water quality requirements for various customer and land use types relative to the tertiary treated effluent quality from the VWRF.

Market Assessment Results

Table 1 provides a summary of recycled water usage for existing and potential customers relative to their account and landuse type.

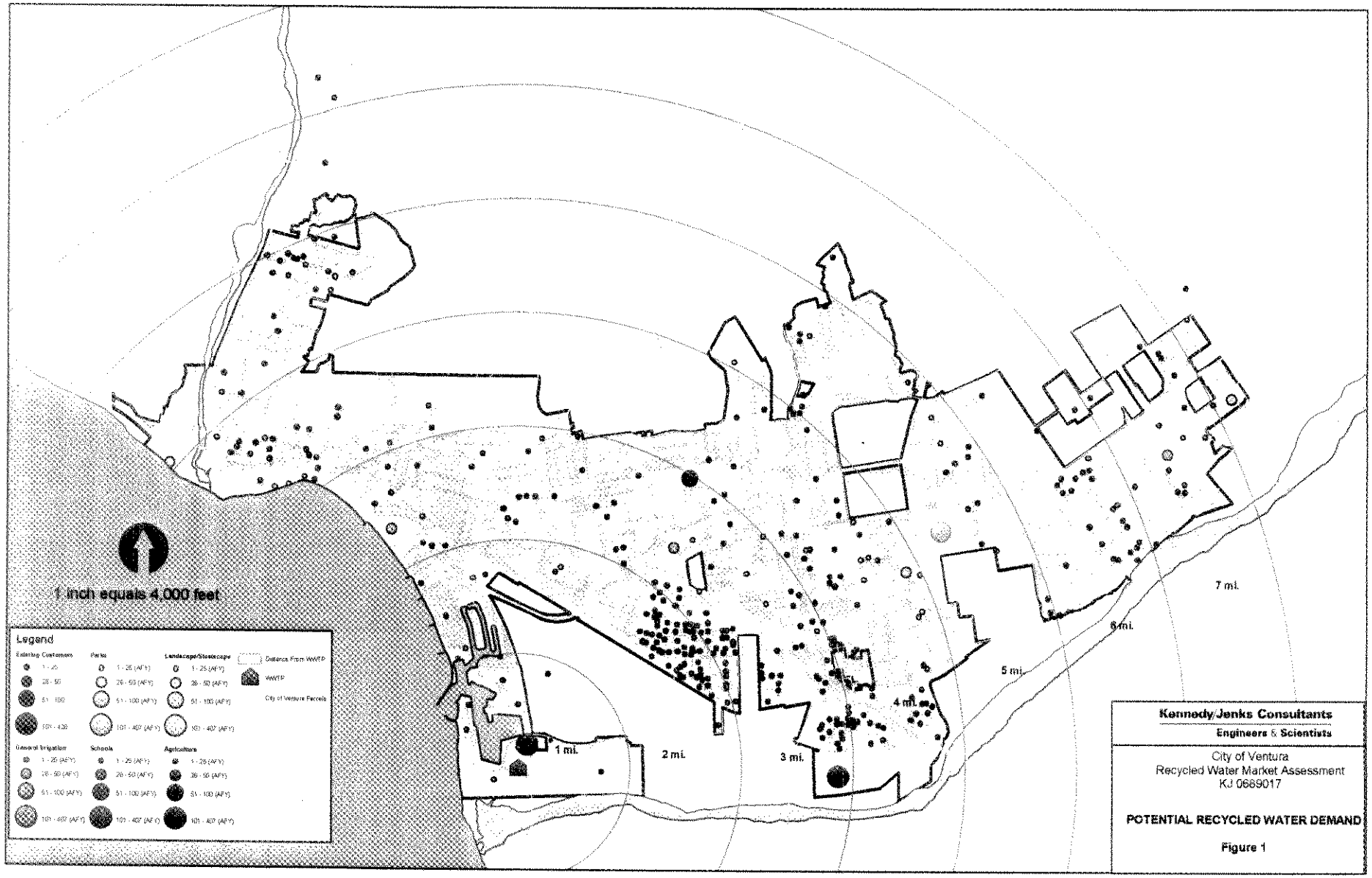
Table 1
City of San Buenaventura
Recycled Water Supply Assessment
Summary of Recycled Water Usage

Distance from WWTP (mile)	Potential Customer Usage: Irrigation Usage Category Breakdown in AFY				Agricultural Usage (AFY/mgd)
	Irrigation and Irr./Dom.	Parks	Schools	Streetscapes	
<1	25	0	0	2	0
<2	161	4	5	6	0
<3	363	82	104	14	0
<4	557	115	144	61	0
<5	671	332	170	68	8
<6	757	337	176	69	9
<7	801	377	185	73	49
>7	815	377	188	110	50
Total		**1,490**			**50**
Total Potential Customer Usage					1,540 AFY, 1.37 mgd
Total Existing Customer Usage					644 AFY, 0.57 mgd
Total Existing + Potential Usage					2,184 AFY, 1.94 mgd

Notes:
1. Assumed irrigation meter demands are 100% converted to recycled water.
2. Irrigation/Domestic assume 50% usage.
3. Assumed 90% of park demand is converted to recycled water.
4. Assumed 50% of school use is supplied with recycled water.
5. Assumed 100% of streetscape demand is converted to recycled water.
6. Assumed 50% of agricultural citrus crop is supplied with recycled water.
7. Industrial, Residential, and other land use are assumed to use 0% recycled water.

Other potential forms of recycled water usage such as groundwater injection and seawater intrusion have not been considered as part of study. The potential to expand recycled water usage through advanced treatment processes, such as reverse osmosis and AOP also has not been considered as part of this study.

The spatial distribution of the water meter accounts was determined through cross reference of the water meter accounts with assessor parcel maps using a geographic information system (GIS). Figure 1 identifies the locations of the existing and potential recycled water customers relative to the City's service area and the VWRF.



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City of Ventura
Recycled Water Market Assessment
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POTENTIAL RECYCLED WATER DEMAND

Figure 1

Demand and Supply Variations

The City is currently developing a wastewater system master plan. This master plan's Technical Memorandum No. 1 dated July 27, 2006 identifies existing and ultimate wastewater flows under average dry weather, peak dry weather and peak wet weather flow conditions. Table 2 summarizes these projected flow rates.

The projected recycled water demands presented in Table 1 represent average annual demands. Recycled water usage will exhibit significant daily and seasonal fluctuations due to time of use considerations and weather variability. The Goleta Water District operates a recycled water system of similar size and under similar climatic conditions as the City. A reclaimed water project study prepared for the Goleta Water District's system in 1999 identified the following demand factors for its recycled water system:

- Maximum day demand factor: 3.3
- Maximum month demand factor (August): 2.2
- Minimum month demand factor (February): 0.02

The City's recycled water system can be expected to exhibit similar seasonal demand variations. Table 2 identifies estimated maximum day, maximum month and minimum month demands using the above-mentioned demand factors for comparison with the projected VWRF flows.

Table 2
City of San Buenaventura
Recycled Water Market Assessment
Comparison of VWRF Flows and Recycled Water Demands

VWRF Flows			
Development Condition	**Average Annual Flow (mgd)**	**Peak Dry Weather Flow (mgd)**	**Peak Wet Weather Flow (mgd)**
Existing	9.3	17.4	22.4
Ultimate	12.0	22.3	27.5
Recycled Water Demands			
Development Condition	**Average Annual Demand (mgd)**	**Maximum Day Demand (mgd)**	**Minimum Month Demand (mgd)**
Existing	0.57	1.9	0.01
Existing + Potential	1.9	6.4	0.04

Summary and Conclusions

A review of water usage and landuse information within the City suggests that there is a potential to increase recycled water usage from an existing usage of about 0.6 mgd to about 1.9 mgd if the system were expanded to include all potential irrigation customers.

The comparison of recycled water demands and VWRF wastewater flows presented in Table 2 indicates that treated effluent quantities exceed the City's recycled water demand potential. Consideration of seasonal recycled water demand variations and wastewater flow peaks (i.e. minimum month demands vs. peak wet weather flows) demonstrates that the City's VWRF treated effluent flows will exceed the demands of its recycled water system under all daily/seasonal wastewater flow and recycled water usage combinations.