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COST OF SERVICE STUDY

JUNE 2015

Irvine Ranch Water District

The mission of Irvine Ranch Water District is to provide high quality water and sewer services in an efficient, cost effective, and environmentally sensitive manner which produces a high level of customer satisfaction.

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FIGURES

GLOSSARY

TERM	DESCRIPTION
AF	Acre foot / Acre feet, 1 AF = 435.6 ccf, 326,000 gallons
AWWA	American Water Works Association
Carollo	Carollo Engineers, Inc.
ccf	hundred cubic feet, 1 ccf = 748 gallons
CII	Commercial, Industrial, and Institutional customer class
CIP	Capital Improvement Projects
CY	Calendar Year
Domestic	Potable Water
ET	EvapoTranspiration (ETo) – represents plant water loss through evaporation and transpiration for a reference crop of cool-season turf grass. It is a measure of the amount of water that needs to be replaced to maintain plant health.
ETAF	ET Adjustment Factor – a coefficient that adjusts ET values from reference ETo based on different crop coefficients (Kc) and irrigation efficiency (IE) factors. ETAF = Kc/IE.
F&P	Finance and Personnel Committee
Fixed Costs	Expenses that are not dependent on the level of water production or water sold.
FY	Fiscal Year
GPCD	Gallons per capita per day
GPD	Gallons per day
IRWD	Irvine Ranch Water District
LA	The square footage of landscaped area
LAWRP	Los Alisos Water Recycling Plant
M1 Manual	"Principles of Water Rates, Fees, and Charges: Manual of Water Supply Practices M1" published by AWWA
MGD	Million gallons per day
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
MWRP	Michelson Water Recycling Plant
Non-Domestic	Non-Potable Water or Recycled Water
NTS	Natural Treatment System
O&M	Operations and Maintenance
OCSD	Orange County Sanitation District
OCWD	Orange County Water District

TERM	DESCRIPTION
Offsetting Revenue	Includes service contract revenue not included in service charges and non-rate generated revenue.
OPA	Orange Park Acres
Over-Allocation	Water demands in excess of the base-allocation
Over-Allocation Funds	Revenues generated from over-allocation water sales
PAYGO	Pay-As-You-Go
Potable Water	Water suitable to be consumed for drinking and other uses.
Raw Water	Water in its natural state, prior to any treatment for drinking.
Recycled Water	Sewage that is treated to remove solids and impurities, and used for non-potable irrigation and commercial and industrial water needs.
R-GPCD	Residential gallons per capita per day
Semi-Variable	An expense which contains both a fixed-cost component and a variable-cost component. The fixed cost element shall be a part of the cost that needs to be paid irrespective of the level of activity achieved by the entity. On the other hand the variable component of the cost is payable proportionate to the level of activity.
SOCWA	South Orange County Wastewater Authority
Sq. Ft.	Square feet
SWRCB	State Water Resources Control Board
Variable Cost	Costs that change in proportion to volume of water sold or produced
WEF	Water Environment Federation
WRMP	Water Resources Master Plan

EXECUTIVE SUMMARY

Irvine Ranch Water District (IRWD) engaged Carollo Engineers, Inc. (Carollo) to perform an independent technical cost-of-service evaluation to assess the District's water, recycled water, and sewer rate setting methodology. In meeting this scope, Carollo developed an independent rate model to review and evaluate the District's internal cost of service methodology for compliance with American Water Works Association (AWWA) and Water Environment Federation (WEF) cost-of-service standards, industry best practices, Board policies, and other cost of service requirements unique to California. Together, these establish the cost-of-service standard that is referenced throughout this report.

Overview

Irvine Ranch Water District was established in 1961 as a California Water District under the provisions of the California Water Code. As a special district, IRWD focuses on four primary services – providing potable water, collecting sewage, producing and distributing recycled and other non-potable water, and operating urban runoff source control and treatment programs. The District serves a 181 square mile area, which includes all of the City of Irvine and portions of the cities of Tustin, Newport Beach, Costa Mesa, Orange, and Lake Forest, as well as certain unincorporated areas of Orange County.

The sewer system was initially constructed in the 1960s and currently consists of nearly 1,000 miles of sewer pipelines and lift stations. IRWD has two recycled water treatment plants, Michelson Water Recycling Plant in Irvine and Los Alisos Water Recycling Plant in Lake Forest. Sewage treated at these facilities supplies the majority of the recycled water system maintained by IRWD.

Since 1991, IRWD has used an allocation-based, conservation rate structure to encourage water use efficiency and increase conservation. This structure uses property-specific water allocations and tiered pricing to provide customers with an economic incentive to use water efficiently. Each customer receives a base allocation of water that provides a reasonable quantity to meet their needs, and may be adjusted by customer requested variances to address specific needs. Water bills are calculated based upon how much water is used relative to the base allocation for that account. As customers increase their water usage relative to their base allocation, water is billed at increasingly higher rates based on increased costs of service. Revenue generated from these higher billing tiers is used to fund expenses associated with the purchase of additional expensive imported water, urban runoff treatment, targeted water conservation programs, and other costs of water supply and consumption associated with higher levels of demand.

This rate structure is critical to the District meeting its long-term conservation goals, especially in the face of California's current unprecedented drought. In April 2015, the Governor issued an Executive Order to direct the State Water Resources Control Board (SWRCB) to adopt a regulation to achieve an aggregate statewide 25 percent reduction in potable urban water use through February 2016. The required reductions for each water provider were based on the average residential gallons per capita per day (R-GPCD) from July to August 2014. Based on IRWD's 91.7 R-GPCD, the SWRCB required

IRWD to achieve a 16 percent reduction in potable usage from June 2015- February 2016 compared with 2013 levels. The state mandate has resulted in proposed reductions to the customer water allocations and has been incorporated into the proposed Fiscal Year (FY) 2015-16 rates.

Cost of Service Requirements

In California, water and sewer rates must adhere to cost of service principles. The District's rate setting process conforms to cost of service standards set by the AWWA and the WEF for water and sewer respectively. Those standards are as follows:

- In providing adequate service to its customers, each utility must receive sufficient total revenue to ensure proper operation and maintenance, development and perpetuation of the system, and preservation of the utility's financial integrity;
- Development of the general rate structure should recover the cost of providing the service to various classes of customers in an equitable manner; and
- When diverse and competing objectives are well understood and evaluated, a utility has the opportunity to design a rate structure that achieves multiple objectives.

In advance of setting proposed FY 2015-16 rates and this cost of service analysis, the District outlined the following objectives to accommodate the District's cost of service requirements and policy determinations. Within the broader cost of service approach and legal requirements, the District's policy determinations form the basis of the detailed rate structure design elements that are distinct to the District and the community.

The objective of the cost of service analysis is to establish rates which:

- Are cost-based and set at a level that provides funding to meet the District's revenue requirements;
- Are built upon an equitable and reasonable foundation;
- Proportionately allocate the costs of providing service among the customer classes and, for water and recycled water rates, among the tiers;
- Promote water use efficiency through an allocation-based conservation rate structure;
- Are relatively easy to understand and administer; and
- Provide stability, in both the ability to provide adequate revenues to meet financial requirements, and overall rates from year-to-year.

In parallel with each annual budgeting and rate setting process, the District conducts an internal analysis of its revenue requirements and cost of service which is consistent with industry accepted cost of service principles and legal requirements.

Results and Recommendations

Based on our independent analysis and evaluation, Carollo has determined that IRWD's budget and rate setting process provides a reasonable forecast of revenues to be generated through the District's proposed water, recycled water, and sewer rates. Furthermore, the costs allocated to the District's customers bear a fair, reasonable, and logical relationship to the customers' burdens placed on, and benefits received from the District's services, thus complying with cost-of-service standards, industry best practices, IRWD Board policies, and other requirements as discussed in this report.

This analysis confirms the appropriateness of the District's cost of service framework and annual rate setting process. While this analysis is focused on the FY 2015-16 rate setting process, the review also validates the internal rate setting framework for future rate setting process.

As part of this review, Carollo developed rate structure refinements for the District's consideration. Several of these policy considerations were prioritized and brought to the District's Finance and Personnel Committee (F&P), which consists of two members of the IRWD Board. Carollo presented several policy considerations to F&P, of which three (Service Charge for Low Volume Users, Revisions to Sewer Discharge Methodology, and Recycled Water Decoupling) were presented for consideration to the IRWD Board. These policy considerations are further detailed with relevant figures and data in this report. The remaining proposed policy considerations are described in Appendix D: Additional Considerations. Implementation of the remaining considerations will depend on factors such as timing of availability of data or studies necessary for implementation, projected effectiveness in achieving the above-listed objectives, and feasibility and cost of implementation and administration. These policy considerations are refinements at a detail level, and are not required for meeting the cost of service standard or ensuring that the rates proportionately allocate the costs of providing service among the customer classes and water pricing tiers.

1 INTRODUCTION

1.1 STUDY PURPOSE

Each year, as part of its annual budget and rate-setting process, the District conducts an internal analysis of its revenue requirements and cost of service methodology in order to determine the District's continued compliance with industry-accepted cost of service principles and State law requirements. In October 2014, Irvine Ranch Water District (IRWD) retained Carollo Engineers to conduct a cost of service review and rate study (Study) of IRWD's water, sewer, and recycled water rates. Carollo has conducted a comprehensive cost of service and rate design review of IRWD's rates and charges, as well as an independent evaluation of the underlying assumptions, inputs, and outputs. Carollo's analysis initially was intended to evaluate the IRWD cost of service methodology for fiscal year (FY) 2014-15. In light of the extraordinary actions taken at the state level to respond to the drought, IRWD asked that Carollo's analysis evaluate the cost of service methodology used by IRWD to develop proposed rates for FY 2015-16. To accommodate this timing, the evaluation was conducted in parallel with the IRWD internal analysis.

IRWD and Carollo worked to review the District's rate and financial assumptions and projections. A key component of the District's efforts has been the use of an allocation-based conservation water rate structure, which discourages wasteful use through meaningful tiered pricing for any inefficient water use. This cost-based rate structure, implemented in 1991 in response to drought conditions, has been an integral component of the District's water conservation program, and has resulted in a 25 percent reduction in per capita water use for residential customers since adoption. The structure has been designed by the District for use on an ongoing basis, as part of it long-term, sustained approach to promoting water use efficiency and financial stability. As the State continues to be in a prolonged drought, and with periodic adjustments as needed to reflect regional and State water availability conditions, this rate structure will be critical in encouraging continued water conservation efforts.

1.2 IRWD BACKGROUND

IRWD provides high-quality drinking water, reliable sewer collection and treatment, recycled water programs, and environmentally sound urban runoff treatment to more than 370,000 residents in Irvine and other nearby surrounding communities.

IRWD's potable water system is forecasted to deliver approximately 50,000 acre-feet in FY 2015-16. Untreated water demand is forecasted to reach approximately 2,000 AF, while sales through the recycled water system are projected at nearly 33,000 AF (including supplemental water from the untreated system and non-potable groundwater). The Natural Treatment System (NTS) is a cost-effective, environmentally sound method for treating dry weather runoff. Treating urban runoff is one of IRWD's core responsibilities. As dry-weather runoff is a direct result of over-watering, the cost to provide this service is allocated within the water system.

107,000 Service connections (October 2014)	**987** Miles of Sewage Collection Pipelines	**1,516** Miles of Drinking Water Pipeline	**23** Natural Treatment System - Urban Runoff Sites
27 Drinking Water Wells	**487** Miles of Recycled Water Pipelines	**36** Drinking Water Reservoirs	**2** Recycled Water Treatment Plants

In addition to providing potable and non-potable water service, IRWD also provides sewer service. The IRWD sewer system was initially constructed in the 1960s and currently includes nearly 1,000 miles of sewer pipelines and lift stations, which convey sewage to the Michelson Water Recycling Plant (MWRP) in Irvine (28 million gallons per day (MGD) capacity), the Los Alisos Water Recycling Plant (LAWRP) in Lake Forest (7.5 MGD capacity) or to the Orange County Sanitation District (OCSD). Sewage treated at the MWRP and LAWRP facilities supplies IRWD's recycled water system. To accommodate the seasonal fluctuations in IRWD's demands and storage capacity for recycled water, MWRP sewer flows can be diverted to OCSD facilities; treated flows from LAWRP that are not recycled are discharged to an ocean outfall operated by the South Orange County Wastewater Authority (SOCWA).

IRWD's future planned water supply sources and demand forecasts are identified in the Water Resources Master Plan (WRMP), a comprehensive planning document. The WRMP incorporates planned growth through build-out in 2035, and provides that IRWD will be able to meet future demands with a reliable water supply. Each year new growth is accounted for in the demand forecast developed as part of the rate-setting process. The IRWD Capital Program supports the needs identified in the WRMP and includes more than 500 active and planned projects with expenditures totaling more than $800 million over the next 30 years. The District has clearly defined sources for funding new capital (connection fees and ad valorem property taxes used to pay debt service on general obligation bonds) and capital enhancements (user replacement and enhancement fees which are part of the monthly fixed service charges).

Given the complexity of the District's system and California's cost of service laws, the analytical process provides an in-depth review of the District's revenue needs, customer usage characteristics, replacement and enhancement capital needs, and other future cost drivers. This report documents the methodology, policies, and assumptions used to develop the District's rates.

1.3 ALLOCATION-BASED CONSERVATION RATE STRUCTURE

Since 1991, IRWD customer potable water and recycled water bills have been calculated using an allocation-based, conservation rate structure that uses property-specific water allocations and tiered pricing. The rate structure was instituted to promote the efficient use of water, and is designed to provide customers with a cost based, economic incentive to not exceed the reasonable amount of water

required to serve indoor, landscape, commercial/industrial and institutional demands. This is accomplished by setting an allocation for each customer account that is based upon a variety of factors such as: irrigated area, daily weather characteristics, assumed number of residents, business type, and other more unique characteristics such as the presence of a pool, livestock or specialized industrial equipment. Any customer with greater needs can apply for a variance for both indoor and outdoor allocation in accordance with the District's Rules and Regulations. Specific details on the allocations are provided in Appendix C: Basis for Tiers FY 2015-16.

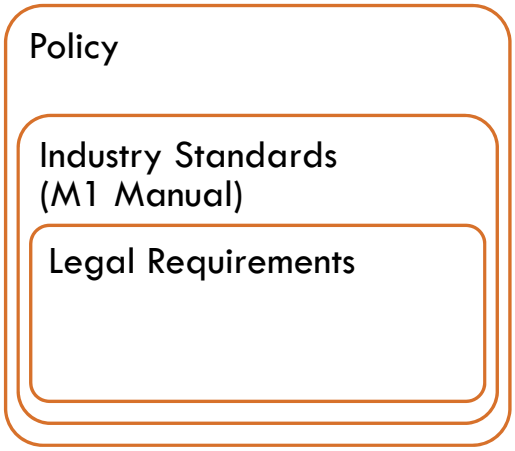
Water bills are calculated based upon how much water is used relative to the individual allocation for that account. As customers increase their water usage in excess of their allocation, water is billed at increasingly higher rates, reflecting the increasing costs to produce more and more water. Revenue generated from these higher billing tiers is considered over-allocation and is used for expenses associated with the purchase of additional imported water (currently the most expensive type of water for IRWD), urban runoff programs, targeted water conservation programs, and other costs of water supply and consumption associated with higher levels of demand. As a result of the allocation-based conservation rate structure and its conservation programs, IRWD has been able to reduce its residential demands by 25 percent and irrigation demands by 50 percent, resulting in lower rates than would otherwise be available.

2 STUDY OBJECTIVES

IRWD retained Carollo Engineers to perform an independent analysis and evaluation of the existing rate setting and methodology for cost recovery, allocations and calculations, and to make recommendations as to any refinements that might meet the objectives. The goal of this analysis is to evaluate the rate setting process. The primary objectives of the study include the following:

1. Confirm the appropriateness of existing financial plans for the water (includes the natural treatment system), recycled water, and sewer enterprises to provide financial sufficiency, meet operation and maintenance (O&M) costs and capital replacement and enhancement (R&E) needs;
2. Review of existing cost-of-service practices for the water, recycled water, and sewer enterprises;
3. Evaluate and develop policy considerations to existing water, recycled water, and sewer rate methodology to achieve the goals and objectives of the District, including ease of understanding, promoting water use efficiency/conservation and continued compliance with cost of service requirements;
4. Calculate and document the functionalization, classification, and allocation of costs, including capital reserves, among appropriate customer classes consistent with industry standards and cost of service requirements; and
5. Provide a rate design framework that proportionately aligns demands, allocations, and costs associated with the operations of the District, with service classes and pricing tiers.

2.1.1 Comprehensive Rate Design



Rates are typically designed to achieve multiple objectives. While industry standards provide a basis for testing reasonableness (governed by or being in accordance with reason or sound thinking; being within the bounds of common sense; not excessive or extreme)[1], this basis does not on its own meet legal requirements – specifically those in California. Within the cost of service approach and legal requirements, a utility agency's policy determinations form the basis of the detailed rate structure design elements that are distinct to the utility and the community. Within the IRWD rate structure, these policies encompass the entire structure including the selection of rate design (allocation-based for water and recycled water, sewage discharge-based block rates for sewer), methodology for allotting the amount of water use within customer allocations and the over-

[1] reasonableness. (n.d.) American Heritage® Dictionary of the English Language, Fifth Edition. (2011).

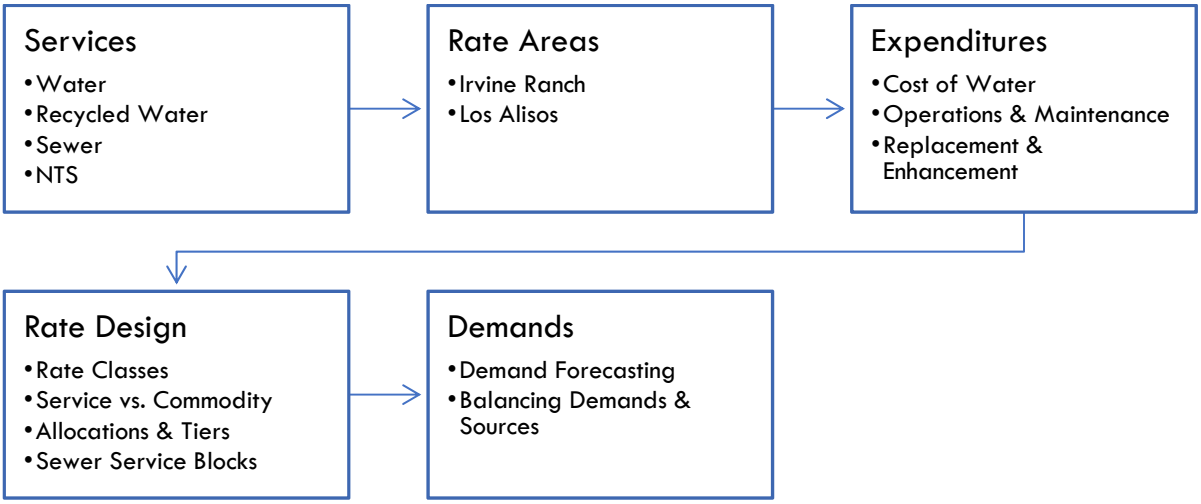
allocation tiers, and how over-allocation costs are budgeted to target water waste. With its rate structure, the District is able to satisfy its policy objectives and cost-of-service requirements.

2.2 FORWARD-LOOKING STATEMENT

The calculations and forecasts of this analysis are based on the reasonable projection of existing service costs, water demands, and system operations with information available, and on existing legal requirements. Significant changes in the District's operations, changes occurring in California water law, or further regulatory actions by the Governor or the SWRCB in regard to water use may require the District to revisit the cost of service analysis.

3 OVERVIEW OF IRWD SERVICES & RATES

Below is an overview of the system services and rate setting process. Although shown as a linear sequence, this is an iterative process to balance revenues, expenditures, demands, and rate design.



The rate setting process begins with an estimate of the costs necessary to provide services at the District's existing levels and an estimate of revenue based on current rates. The estimated costs are scrutinized first by senior staff and then by the Finance and Personnel Committee and the Board of Directors. The revenue estimate considers both fixed and variable revenue sources. The fixed service charge is based on customer counts with estimated growth and capacity demands. The variable component is based on projected usage for both the water and sewer systems.

Estimated expenditures are separated by system, process, and service area to align expenses with revenue requirements. The associated expenses are assumed to be covered by current and projected revenues and any necessary rate increases so that the costs and revenues balance.

The overview will summarize and provide a guide for the detailed discussion of the cost of service evaluation that follows in Section 4.

3.1 SERVICES

IRWD provides water service, including potable (drinking water), untreated (used primarily for irrigation and agriculture), recycled water (sewer flows treated for defined non-potable water uses, primarily irrigation), the natural treatment system (used to treat urban runoff), and sewer service (collection and treatment of sewer flows).

3.2 RATE AREAS

Effective July 1, 2015, IRWD will have two rate areas: the Irvine Ranch rate area, which covers the majority of accounts and the Los Alisos rate area. (A third rate area, the Orange Park Acres rate area, will be merged into the Irvine Ranch rate area effective July 1, 2015.)

Over the last two decades, IRWD has consolidated with five retail water service providers. The integrated services of IRWD allow for reduced overhead and administrative costs and lower rates and charges to customers of the consolidated district. When considering consolidation requests, the District looks for increased efficiencies through economies of scale and mutual benefits from combined expertise and resources. Following each consolidation, a unique rate structure has been created to fund any amount necessary to bring the new system to the same level of service as the existing area, such as supply sources, and as provided in any applicable requirements of the consolidation. Once this equitable consideration has been achieved, the unique rate structure is transitioned to the Irvine Ranch rate area's water and sewer rate structures, including the allocation based water conservation rate structure. Any future consolidations will be handled in a similar manner.

3.2.1 Los Alisos Rate Area

In September 2000, the Orange County Local Area Formation Commission approved the consolidation between IRWD and the Los Alisos Water District. The current allocation-based conservation rate structure for the Los Alisos rate area is similar to the IRWD rate structure, but the apportionment of cost takes into account that this part of the service area does not have a major source of local groundwater. Los Alisos is almost wholly dependent upon more expensive imported water purchased from the Metropolitan Water District of Southern California (MWD).

While the Los Alisos rate area has already transitioned to an allocation-based conservation rate structure that encourages efficient water use, it will not have the same water commodity charge as customers in the Irvine Ranch rate area until the Los Alisos rate area has contributed sufficient funds to pay for its fair share of the groundwater infrastructure equivalent to that of customers of the Irvine Ranch rate area. It is anticipated that these funds will be generated from the future sale of a property that was an asset of the former Los Alisos Water District.

3.2.2 Orange Park Acres Rate Area

In 2008, the merger between the Orange Park Acres (OPA) Mutual Water Company and IRWD was approved. Since then, the OPA portion of the District's service area has seen a number of significant improvements to its water infrastructure which will ultimately bring the system up to contemporary standards, including replacement of the substandard 1929 steel pipe utilized throughout the system. The system improvements were financed by IRWD and, pursuant to contractual requirements implemented in the merger, OPA rate area customers paid for the improvements through a "water rate differential" which was the difference between the water rate charged to the former customers of OPA (with a 20 percent rate decrease) and the water rates for IRWD customers. The payment for these improvements will be completed effective July 1, 2015 and IRWD will transition its customers in the OPA area to the

IRWD allocation-based conservation rate structure effective on that date. Most customers in the OPA area use septic systems to treat their sewage.

3.3 EXPENDITURES

3.3.1 Expenditures

In order to provide its services, the District incurs costs on both a fixed and variable basis. Variable costs are those that vary with the amount of water used or purchased. These variable costs are directly tied to the commodity cost of water and vary with demand and source of supply. Alternatively, fixed costs are operation and maintenance costs that do not vary with changes in demand.

Variable Costs

Cost of Water

The cost of water includes all costs necessary to supply water to the end-user. This includes costs associated with producing, purchasing, and delivering the various sources of the supply (i.e. labor, materials, chemicals, treatment, and energy). This also includes an allocable portion of overhead expenses.

Fixed Costs

Operations & Maintenance

These are the routine fixed costs to provide daily operations and maintenance of the various systems. These costs are not directly dependent on the volume of water delivered. This also includes an allocable portion of overhead expenses.

Replacement & Enhancement

These are the costs associated with the future replacement and enhancement of the existing infrastructure. Setting this money aside in advance helps stabilize rates and avoids significant potential future rate fluctuations.

Sewer Treatment & Recycled Water Production

These are costs to maintain and operate the District's extensive network of gravity sewer, force mains, sewage lift stations, and siphons that convey sewage to the two District-owned treatment plants or to OCSD. The District treats sewage to provide recycled water for irrigation and industrial purposes which reduces its reliance on the more expensive sources of supply. Costs to deliver a portion of the sewage to the regional facilities of the Orange County Sanitation District are also included. Sewage treatment costs are considered "semi-variable" as a majority of the costs incurred are associated with the infrastructure and not incremental flows. They also include an allocable portion of overhead expenses.

3.4 RATE DESIGN

3.4.1 Rate Classes

The District maintains various rate classes to reflect both the type of service and type of use. In general, the significant rate classes are defined as: residential (attached, detached and apartments), CII (commercial, industrial, and institutional), irrigation and agriculture.

3.4.2 Service vs. Commodity

The District's rate structure for water use is separated into a commodity charge component and a service charge component. The commodity charges generally fund the cost of the District's water supplies while the service charges fund the fixed operating and maintenance expenses of the District.

Fixed Service Charges

Fixed service charge revenue is generated to cover the cost of operating, maintaining, repairing, and refurbishing the water and sewer systems. Water and sewer fixed service charges include a component for the future funding of replacement and enhancement of infrastructure. Historically, fixed service charges account for approximately 40 percent of IRWD's water rate revenues. The fixed service charges proportionally allocate costs based on meter hydraulic capacity ratios.

Commodity Rates

The commodity rates reflect the costs of the District's various sources of supplies and conservation efforts. In the recycled water system, the commodity rates also fund a portion of the fixed costs.

3.4.3 Allocation & Tiers

To reflect the costs of the District's various sources of supplies and conservation efforts, and to provide an economic incentive to conserve water, water consumption is billed based on an allocation-based conservation rate structure. Water usage at or below a customer allocation is billed at a lower cost, while water consumption exceeding the customer allocation is billed at a higher cost to recover the additional incremental cost to the District of providing this water. Depending on the customer class, the District has up to four tiers. A base use allocation is defined for each customer class that provides an amount of water as determined to meet the needs of the property. Any use in excess of the base use allocation is considered over-allocation. This structure aligns directly to the costs of service within each tier and promotes conservation. Specific allocation methodologies, as well as the methodology for the determination of tier consumption levels, are detailed further in Section 4.4 and Appendix C: Basis for Tiers FY 2015-16.

3.4.4 Sewer Service Blocks

Unlike water, the costs to provide sewer service are semi-variable. Charges vary based on a volumetric block structure of 5 ccf increments for residential, and both a fixed (for the first 10 ccf) and variable charge (over 10 ccf) for CII customers. There is no sewer service costs associated with irrigation or landscape customers.

3.5 WATER DEMANDS

3.5.1 FY 2015-16 Demand Forecasting

In order to forecast future water demands, the District used actual June 2014 through December 2014 consumption records as a proxy for baseline FY 2015-16 water demands. This time frame, though limited, was chosen to forecast demands as it reflected the District's most recent rate adjustments (changes to both rates and water allocations). Based on these billings, for the full FY baseline 2015/16, total potable water demand in the then 5 tiers was forecasted for sales of 50,305 AF and 7,271 AF in the Irvine Ranch and Los Alisos rate areas respectively.

In May 2015, prior to the District finalizing its FY 2015-16 budget, the SWRCB mandated IRWD to achieve a 16 percent reduction in potable water usage from June 2015-February 2016 compared with 2013 use. For the 2015-16 budget, this equates to a 14 percent reduction from baseline sales. The District believes the reductions can be achieved through a combination of focused conservation messaging and programs as well as a reduction in the base allocations and with price increases. The additional planned conservation efforts will focus on reducing demands within the over-allocation tiers (inefficient and wasteful tiers). Table 3-1 details the baseline FY 2015-16 demands and forecasted FY 2015-16 demands for each rate area. In response to the drought and focused conservation efforts, the proposed FY 2015-16 rates no longer include an Excessive tier as its demand is captured in the Wasteful tier.

TABLE 3-1 FORECASTED POTABLE WATER DEMANDS BY SERVICE AREA

	IRVINE RANCH (AF)			LOS ALISOS (AF)		
TIER	BASELINE SALES	FY 2015-16	FORECASTED REDUCTION	BASELINE SALES	FY 2015-16	FORECASTED REDUCTION
Low Volume	15,761	14,618	-7%	2,988	2,803	-6%
Base Rate	29,603	27,360	-8%	3,464	3,252	-6%
Inefficient	2,462	700	-72%	382	105	-73%
Excessive	961	N/A		164	N/A	
Wasteful	1,518	750	-70%	273	125	-71%
Total	**50,305**	**43,428**	**-14%**	**7,271**	**6,285**	**-14%**

California water agencies that fail to comply with the mandated reduction are expected to be subjected to severe monetary penalties based on the most recent and best information available to the District. The District is unable to predict if any further actions may be taken by the Governor and the SWRCB, to modify or extend the reductions for periods after February 2016, or to impose penalties. Further actions could require the District to make a second-step rate adjustment as described later in this report, or to take other future actions to modify the rate structure as required by the cost of service standard.

Table 3-2 provides the baseline FY 2014-15 demands and forecasted FY 2015-16 demands for the untreated and recycled water systems. Unlike potable water sales, recycled and untreated water are not impacted by the mandated reductions and are forecasted to increase based on higher demands due to drier weather.

TABLE 3-2 FORECASTED RECYCLED AND UNTREATED WATER DEMANDS

	RECYCLED WATER (AF)		UNTREATED (AF)	
TIER	BASELINE SALES	FORECASTED FY 2015-16	BASELINE SALES	FORECASTED FY 2015-16
Low Volume	13,435	15,015		
Base Rate	14,076	15,731		
Inefficient	412	461		
Excessive	263	N/A		
Wasteful	1,180	1,613		
Untreated	13,435		2,151	2,612
Total	**29,367**	**32,819**	**2,580**	**2,612**

3.6 SEWER DEMANDS

For the sewer system, water use and a return to sewer factor is used as a proxy to estimate sewer flows. For FY 2015-16, Residential customers are billed based on their three-lowest water use months in the preceding calendar year. These three minimum months are used as a proxy for indoor domestic water use that will be returned to the sewer system. To account for minimal irrigation and consumptive use, a 90 percent return to sewer factor is assumed. Based on these results, it was assumed that any water usage in excess of 10 ccf was not being contributed to the sewer system.

The residential class is a relatively homogeneous group (needs are relatively uniform) and these assumptions are appropriate and reflect general industry practices. CII customers vary significantly and thus, as described previously, are subject to both a fixed and variable charge. The FY 2015-16 forecasted CII usage and associated sewer flow is 6,060,000 ccf.

3.7 RATE STABILIZATION AND RESERVES

Maintaining rates in accordance with cost of service standards requires an ongoing balancing of demands, expenditures, and appropriate water allocations. As year to year fluctuations are expected as weather is a significantly unpredictable factor, reserves can be utilized and are either added to or reduced based on actual versus forecasted results.

In response to the drought and to encourage further water use efficiency, the District has reduced its water allocations. Given the persistent dry conditions, customers in FY 2014-15 to date have not responded as forecasted by the District. As such, the District has generated revenues in excess of its

formalized budget. These revenues are put into reserves to mitigate potential future revenue shortfalls, increased targeted conservation efforts, and capital replacement.

The District's rate-structuring practice takes into account that, as weather and consumption cannot be predicted, the excess (over allocation) revenue must be considered cyclical for use over a three to five year timeframe. IRWD monitors, evaluates and prioritizes expenditures from the over allocation revenue to ensure its continuing ability to fund the costs of service allocated to the over allocation use in normal, wetter than normal and drier than normal years.

4 COST OF SERVICE REVIEW

4.1 STEP BY STEP APPROACH

Rate analyses are performed by District staff each fiscal year in order to establish the adequacy of the existing cost recovery levels to provide system revenues sufficient to fund utility operations, maintenance, and reserves for future replacement and enhancement capital needs.

To confirm these requirements, Carollo reviewed the District's cost of service rate setting process. The processes presented below are advocated by the American Water Works Association (AWWA) and the Water Environment Federation (WEF) for water and sewer respectively.

While the process is shown in a linear step by step approach, this is really an iterative process where the ultimate objective is to balance revenues with costs.

Revenue Requirement Analysis

- Compares existing revenues of the utility to its operating, capital reserves, and policy driven costs to establish the adequacy of the existing cost recovery levels.

Functional Cost Analysis

- Identifies and apportions annual revenue requirements to functional rate components based on its application of the utility system.

Water Demand Analysis

- Forecasts water sales based on historical billings, modifications to the rate structure, and any regulatory restrictions.

Rate Design Analysis

- Considers both the level and structure of the rate design to collect the distributed revenue requirements from each class of service

4.1.1 Revenue Requirements

The methodology that IRWD applies to establish annual rate revenue needs is consistent with industry standards established by the *Principles of Water Rates, Fees and Charges: Manual of Water Supply Practices M1* (the "M1 Manual"), which is published by the American Water Works Association (AWWA), a national industry trade group that makes recommendations on generally accepted practices in the water and sewer industry. The revenue requirements analysis compares the forecasted revenues of the utility to its forecasted operating and capital reserve costs to determine the adequacy of the existing rates to recover the utility's costs. If any shortfalls exist, rates may need to increase.

4.1.2 Functional Cost Analysis

After determining a utility's revenue requirements, the next step in the analysis is to outline the cost to deliver each unit of water or collect each unit of sewer discharge and to serve each customer. This process takes each item in the District's budget and organizes the items collectively based on what

function is served. For example, some cost items support the ability to deliver additional, expensive water, while other costs are incurred to provide customer service or to fund capital replacement. Organizing the budget in terms of end function allows direct correlation between the budget item and the rate, bridging the cost incurred by the District and the benefit delivered to the customer.

4.1.3 Water Demand Analysis

Forecasting water sales and purchases is a critical component in the rate setting process. As part of the budget process, the District forecasts the expected water usage based on historical demand, proposed changes to rates, regulatory impacts, and weather. These forecasted water demands are then compared against forecasted revenue requirements and rates are developed in order to recover costs. In other words, future demands are based on historic sales and factored for considerations like growth and weather. Rates are then generated so that estimated sales match associated costs.

4.1.4 Rate Design Analysis

The rate design involves developing a rate structure that proportionately recovers costs from customers. For example, in the potable water system, water supply costs are divided by units of water (demand), while service costs are allocated based on number of meter equivalents. This step allows the District to develop unit costs that can then be layered based on requirements to meet customer needs. This is a critical process for establishing tiered rates, as increasing usage incurs additional costs making excess water more expensive to provide.

4.1.5 Rate Calculation

The final part of the analysis is the rate calculation. This provides the nexus between the designed rates, the functional costs and the revenue requirements. This process connects planned expenditures to the designed rates by establishing rates to match the estimated revenue generation with expenditures.

As the following sections will demonstrate, this process creates a fair and equitable foundation for each charge and rate that the District levies.

IRWD Budget Process

The IRWD Operating Budget provides the financial plan required to implement the District's planned operations for the year. After projecting the expected revenues and expenses for the upcoming fiscal year, staff prepares a draft budget for review and comment by the IRWD Board of Directors. Over a three-month period, IRWD considers forecasted growth factors, historical expenditures and revenues, and includes a robust internal vetting process. As part of this process, this budget is discussed and revised in a series of public meetings with the IRWD Board of Directors. These meetings are open to the public and participation is encouraged.

4.2 REVENUE REQUIREMENT ANALYSIS

To recover the costs associated with providing service to its customers, the District derives revenue from a variety of sources, including fixed service charges, commodity charges, pumping surcharges for elevated communities within the District, and other miscellaneous revenues.

In addition, as previously mentioned, the District has a policy and long history of planning for the inevitable replacement or enhancement of capital infrastructure. The revenue requirements include a replacement and enhancement component intended to fund current and future capital costs that provide reliability and redundancy to the District's infrastructure. Setting replacement monies aside in advance helps to stabilize rates and avoids potential significant future rate swings.

As IRWD prepares rates annually, the revenue requirements analysis is performed as part of the budget process. While this study did not prepare a financial forecast, Carollo reviewed the District's expenditures and policies to determine if the identified FY 2015-16 funding needs appear appropriate and reasonable.

The District's expenditures drive the revenue requirement. Some of the most significant expenditures include the cost of providing water, repairs and maintenance of the systems, labor, and general and administrative expense.

4.2.1 Water System Revenue Requirement

Table 4-1 below outlines the forecasted expenditures for FY 2015-16, which serve as the basis for the revenue requirements for the water system.

TABLE 4-1 WATER FORECASTED REVENUE REQUIREMENT SUMMARY – FY 2015-16 ($ IN THOUSANDS)

EXPENDITURES[1]	FY 2015-16 BUDGET
Dyer Road Well Field	$13,079
Treated Groundwater	7,743
Purchased Water	14,586
Untreated Water	2,279
Water Banking	821
General Conservation	1,096
Targeted Conservation/NTS	4,098
Pumping	800
Total Cost of Water Production	**$44,502**
Less use of reserve funds and revenue offsets[2]	(2,046)
Total Cost of Production to be Recovered by Rates	**$42,456**
Service Costs (Fixed)	24,494
Enhancement and Replacement Fund Contribution	5,624
Total Revenue Requirement from Rates	**$72,574**

Notes:

(1) Detailed outline of costs provided in Appendix E: Water Revenue Requirement Detail.
(2) Reserve funds and offsets include contract service agreement revenue and non-rate generated revenue.

4.2.2 Recycled Water System Revenue Requirement

Table 4-2 below outlines the forecasted expenditures for FY 2015-16, which served as the basis of the revenue requirement for the recycled water system.

TABLE 4-2 RECYCLED WATER FORECASTED REVENUE REQUIREMENT SUMMARY – FY 2015-16 ($ IN THOUSANDS)

EXPENDITURES[1]	FY 2015-16 BUDGET[4]
MWRP & LAWRP Treatment[2]	$8,962
Melded Supply (other treatment facilities and purchases)	9,303
Targeted Conservation	3,000
Total Cost of Water Production	**$21,265**
Less use of reserve funds and revenue offsets[3]	$(486)
Total Cost of Production to be Recovered by Rates	**$20,779**
Service (Fixed)	5,434
Total Revenue Requirement from Rates	**$26,213**

Notes:

(1) Detailed outline of costs provided in Appendix E: Water Revenue Requirement Detail
(2) Includes the costs of tertiary treatment expenditures related to the production of recycled water system. These costs have been removed from the sewer revenue requirements.
(3) Reserve funds and offsets include contract service agreement revenue and non-rate generated revenue.
(4) Values presented in thousands of dollars.

4.2.3 Sewer System Revenue Requirement

The table below outlines the forecasted expenditures for FY 2015-16, which served as the basis of the revenue requirement for the sewer system.

TABLE 4-3 SEWER FORECASTED REVENUE REQUIREMENT SUMMARY – FY 2015-16 ($ IN THOUSANDS)

EXPENDITURES[1]	SEWER
Total Cost of Production to be Recovered by Rates	$11,583
Service Cost (Fixed)	17,058
Enhancement and Replacement Fund Contribution	17,506
Total Revenue Requirement[2]	**$46,148**
Offsetting Revenues[3]	($10,091)
Total Revenue Requirement from Rates	**$36,057**

Notes:

(1) Detailed outline of costs provided in Appendix G: Sewer Revenue Requirement Detail
(2) Excludes costs that have previously been allocated to recycled water
(3) Contract service agreements with institutional customers.

4.3 FUNCTIONAL COST ANALYSIS

The purpose of a functional cost analysis is to provide a rational basis for distributing the full costs of IRWD's service to each customer class in proportion to the demands they place on the system. Carollo developed a detailed and independent cost allocation that serves as the basis for the rate structure analysis. The cost-of-service analysis yields an appropriate method for allocating costs, which could be sustained absent substantial changes in cost drivers or customer consumption patterns.

As the first step in the evaluation process, a functional allocation was developed for both the sewer and water funds by analyzing the District's budget on a line-by-line basis, allocating each expenditure to the appropriate functional cost category.

4.3.1 Water System Functional Cost Categories

The potable system revenue requirements, shown above, were allocated to functional cost categories. This was done separately for the Irvine Ranch and Los Alisos rate areas. The following are the primary functional cost categories:

Lowest-Cost Water Source: The District draws water from a number of different sources, including groundwater, imported water, and stored, reservoir water. The District's lowest-cost source of water is from its Dyer Road wells. In order to incentivize conservation, and recognize the basic level of service needed to serve its customers, IRWD separately categorizes this source in order to establish its base demand operating costs. This demand covers meeting customers' minimum operating water needs and provides the basis for the Low Volume rate. The demand is roughly equivalent to half of the groundwater available from the Dyer Road Well Field and the cost includes the replenishment assessment from the Orange County Water District (OCWD), associated labor, energy, and chemicals necessary to make the water available.

Melded Water Costs: Groundwater provides a portion of the demands within the Base tier (representing base allocation demand, described below). To meet the remainder of the Base tier demand not met from the lowest cost source, the District taps into other sources necessary to meet the water demand within the customer basic use allocations. These sources require greater development and treatment, and thus result in higher production costs, or are from imported water purchased at a higher cost. This cost provides the basis for the Base rate. The components included in the base rate include the remaining groundwater basin water (portion unused in Lowest Cost), both clear and treated wells, and then any additional demand is made up from imported supply. As above, all costs associated with making the water available for sale is loaded into the melded rate.

Purchased Water Costs: When usage exceeds the basic use allocations of customers, the District must purchase water to meet excess demand. Purchased imported water is the District's most expensive source of water. As a result, IRWD directly allocates this cost to its users that require this water in the over-allocation tiers.

General Conservation: IRWD maintains substantial conservation programs intended to promote general water use efficiency among all users, regardless of their usage patterns, customer class, or other account characteristics. As a result, these costs are applied to each and every unit of water that the District delivers.

Water Banking: The District's water banking program allows storage of low-cost water supplies during wet periods, and enables withdrawal of this water during dry periods. This source is a cost item that supports over-allocation usage, because without over-allocation usage, the available supplies would be sufficient to support within-allocation demand. Therefore, this cost is allocated to both the inefficient and wasteful tiers.

Targeted Conservation and NTS: In addition to the general conservation programs, the District also funds conservation programs that specifically target wasteful usage. In order to meet the mandatory 2015 water reductions imposed by the State, these enhanced conservation programs will be focused entirely on usage in the Wasteful tier, which represents the greatest potential savings. Additionally, inefficient irrigation practices resulting in over-allocation use in the Wasteful tier result in the creation of urban runoff and thus the cost of the District's Natural Treatment System for treating dry weather runoff is allocated to this tier.

Untreated Water: This reflects the District's costs associated with providing untreated water service including the purchase of untreated water and local untreated supplies.

Pumping: This reflects the additional costs of energy to pump water to higher elevations and provides the basis for the pumping surcharge.

Service: Service costs are fixed expenditures that relate to operational support activities including accounting, billing, customer service, and administrative and technical support. These expenditures are essentially common to all customers and are reasonably uniform across the different customer classes. Service costs also include meter and capacity related costs, such as meter maintenance and peaking charges, that are included based on the meter's hydraulic capacity (measured in gallons per minute).

This functional allocation process provides a reasonable and appropriate basis for distributing costs to system customers based on their usage patterns and is grounded in cost of service standards. IRWD functional allocation methodology adheres to the generally accepted framework of cost of service rate design, as set forth by the M1 Manual.

TABLE 4-4 WATER SYSTEM FUNCTIONAL ALLOCATION CALCULATION ($ IN THOUSANDS)

CATEGORY	IRWD RATE AREA	LOS ALISOS RATE AREA	TOTAL
Lowest-Cost Water Source	$6,828	$2,862	$9,690
Melded Water Costs	17,337	3,320	20,657
General Conservation	946	150	1,096
Purchased Water	2,779	235	3,014
Water Banking	701	121	822
Targeted Conservation & NTS	3,466	632	4,098
Sub-Total Potable Water	**$32,058**	**$7,320**	**$39,377**
Untreated Water	2,279		2,279
Pumping			800
Service			30,118
Total[1]	**$34,337**	**$7,320**	**$72,574**

Notes:

(1) From Table 4-1

(2) Detailed outline of costs provided in Appendix E: Water Revenue Requirement Detail

4.3.2 Recycled Water System Functional Cost Categories

The District's historical practice in setting recycled water rates recognized that the production of recycled water was derived from the processes of collecting and treating sewage. Therefore, the revenue and expenditures for the sewer and recycled water system were consolidated. The recycled water commodity rate was also indexed to the Irvine Ranch potable water rate. The indexing was tested by Carollo and found to closely track an independent cost of service analysis of the recycled water system. As the recycled water system is a self-sustaining entity and cost of service could diverge from the indexing method in the future, the proposed rates are no longer indexed to the potable system and instead are reflective of the separate functional allocation of system costs detailed below. Costs of recycled water production at the MWRP and LAWRP treatment facilities are similar, and the capital cost of constructing the facilities represents an equivalent contribution from both rate areas. Therefore the functional cost allocation for the recycled water system is not separated by rate area.

Service: Service costs are fixed expenditures that relate to operational support activities including accounting, billing, customer service, and administrative and technical support. These expenditures are essentially common to all customers and are reasonably uniform across the different customer classes. Service costs also include meter and capacity related costs, such as meter maintenance and peaking charges, that are included based on the meter's hydraulic capacity (measured in gallons per minute).

Lowest-Cost Water Source: The District's lowest-cost source is from its recycled water treatment plants (MWRP and LAWRP). The cost of treatment allocated to the recycled water system is the additional treatment cost necessary to produce recycled water meeting applicable regulatory requirements ("Title 22") for use, after sewage has been treated to the level necessary for disposal, the cost of

which is functionally allocated to the sewer system. Tertiary treatment costs were allocated to recycled water. In order to incentivize efficiency and recognize the basic level of service, IRWD separately categorizes this source in order to establish its base demand operating needs. This source provides the basis for recycled water's Low Volume rate.

Melded Water Costs: Any production capacity from MWRP and LAWRP remaining after the Low Volume tier allocation is used to meet a customer's full allocation. As there is insufficient recycled water production and storage capacity to meet all seasonally-fluctuating demand, the District is required to supplement recycled water with more expensive untreated water purchased from MWDOC, including the commodity cost and all surcharges added by Metropolitan Water District and MWDOC such as for system access. The melded water cost provides the basis for the recycled water Base tier rate.

Purchased Water Costs: When usage exceeds the basic use allocations of customers, the District must purchase water to meet excess demand. Purchased imported untreated water is the District's most expensive source of water, including the commodity cost and all surcharges added by Metropolitan Water District and MWDOC, such as for system access. As a result, IRWD directly allocates this cost to its users that require this water in the higher tiers.

Targeted Conservation: Funds conservation programs that specifically target wasteful usage.

This functional allocation process provides a clear and reasonable basis for distributing costs to customers based on their use of the system and is consistent with cost of service standards.

TABLE 4-5 RECYCLED WATER SYSTEM FUNCTIONAL ALLOCATION CALCULATION ($ IN THOUSANDS)

CATEGORY	RECYCLED WATER
Lowest-Cost Water Source	$7,018
Melded Water Costs	9,388
Purchased Water	1,373
Targeted Conservation	3,000
Service	5,434
Total	**$26,213**

Notes:

1) From Table 4.2.
2) Refer to Appendix F for details of the Recycled Water Revenue Requirements.

As recycled water is a self-sustaining system, the costs can be borne wholly by recycled users and can be decoupled from the potable rate. Given the unprecedented drought, IRWD is forecasted to purchase roughly double the amount of expensive imported untreated water purchased in FY 2014-15. In order to minimize year to year rate fluctuations based on unpredictable demands and purchases, the recycled water rates are expected to utilize non-operating reserves to offset the short-term shortfall. This functional allocation process provides a reasonable and appropriate basis for distributing costs to

recycled water system customers based on their usage patterns and is grounded in cost of service standards.

4.3.3 Sewer System Functional Cost Categories

The IRWD sewer system collects sewage from homes and businesses within the service area. Sewage travels through the collection system and is conveyed to two treatment plants through nearly 1,000 miles of sewer distribution pipelines. Unlike the water system, there are no separate rate areas for sewer as the Los Alisos rate area has previously contributed its fair share to the sewer system. Costs of sewage treatment at the MWRP and LAWRP treatment facilities, as well as supplemental disposal to OCSD and SOCWA, are similar and the capital cost of constructing the facilities represents an equivalent contribution from both rate areas. Therefore the functional cost allocation for the sewer system is not separated by rate area. The sewer system costs are allocated into the following cost categories:

Sewer – Service: This cost category generally covers the costs associated with the basic level of sewer service as well as replacement and enhancement funding.

Sewer – Commodity: Given the semi-variable nature of incurred sewer expenditures, this cost category is aimed at recovering the remaining cost of operations, including the costs of stages of treatment not functionally allocated to the recycled water system.

Carollo's cost allocation modeling confirms IRWD's functional cost allocation process and is provided in greater detail in Appendix G: Sewer Revenue Requirement Detail. The developed model provides a clear, reasonable, and easily replicable functional cost allocation framework for the cost of service analysis.

TABLE 4-6 SEWER SYSTEM FUNCTIONAL ALLOCATION CALCULATION ($ IN THOUSANDS)

Functional Category	Sewer
Commodity - Non-residential	$12,814
Commodity - Residential	2,599
Service (Fixed)	20,644
Total	**$36,057**

Notes:

(1) Reference Table 4.3
(2) Refer to Appendix G for the Sewer Revenue Requirement.
(3) Table 4.3 identifies revenue requirements (expenses) and 4-6 identifies sources.

4.4 WATER DEMAND ANALYSIS

4.4.1 Demands Within the Allocation-Based Conservation Rate Structure

While forecasted demands were previously outlined in Water Demands, they are a direct result of the District's allocation based rate structure. Forecasted consumption in each tier is a function of the customer's historical usage, forecasted conservation, and overall water allocations.

Allocation Based Conservation Rate Structure

The District's allocation-based conservation rate structure is designed to recover commodity related costs. A base allocation of water is provided to promote conservation and minimize wasteful use. Customers are provided individualized water allocations specific to their defined reasonable indoor and/or outdoor needs. The base allocation method and rate design formulas for each account type are shown in Table 4-7, and are based on typical characteristics.

TABLE 4-7 BASE ALLOCATION METHOD[1]

CUSTOMER CLASS	# OF RESIDENTS	LANDSCAPE AREA (LA)	BASE ALLOCATION INDOOR	BASE ALLOCATION OUTDOOR	TOTAL ALLOCATION
Residential Detached	4	1300 sq. ft. (0.03 acres)	# Residents x 50 GPD[2]	ET[3] x 0.6[4] x LA[5]	(Indoor x # days in bill service period) + Outdoor
Residential Attached	3	435 sq. ft. (0.01 acres)	# Residents x 50 GPD	ET x 0.6 x LA	(Indoor x # days in bill service period) + Outdoor
Apartments[6]	2	N/A	# Residents x 50 GPD		Indoor x # days in bill service period
Potable Irrigation	N/A	Based on irrigated acreage	N/A	ET x 0.6 x LA[7]	Outdoor based on bill service period
Commercial, Industrial, Institutional	N/A	Site specific, based on productivity, employees, water use efficiency practices etc.		Site specific, based on irrigation needs	Site specific, adjusted for # days in bill service period

Notes:

(1) Full detailed description of the allocation methodology is provided in Appendix C: Basis for Tiers FY 2015-16
(2) GPD = gallons per day
(3) ET (evapotranspiration) – from IRWD weather stations located in coastal, central or foothill zones
(4) 0.6 represents drip or otherwise high efficiency irrigation and a crop coefficient for drought tolerant plants
(5) LA = landscape acreage.
(6) For master-metered apartments and condominiums, the base allocation is multiplied by the number of dwelling units.
(7) ETAF for recycled water irrigation use is 0.91, based on efficient irrigation and warm season turf.

Allocations are based on property characteristics and include factors such as number of occupants, size of irrigated area, and local climate data.

- **Residential – Base Allocation Indoor:** IRWD allocates 50 gallons per person per day for indoor usage. This is based on research into efficient indoor water use from the California Residential End Use Study (2009) and IRWD usage data analysis. The daily indoor allocation is adjusted to the number of days in the bill cycle, and a default assumption of number of residents.
- **CII – Base Allocation Indoor:** Indoor allocations for commercial and industrial customers (monthly base index allocations) are based on specific business needs, including, but not limited to number of employees and commercial and industrial process water needs.
- **Base Allocation Outdoor:** Outdoor or landscape allocations are calculated in the same manner for all customer types and water systems, in that they are adjusted for the site specific irrigated area associated with the property. Factors included in the calculation are the type of landscape (drought-tolerant plants or warm-season turf), an adjustment for the efficiency of the irrigation system, a calculation for plant water loss through evaporation and transpiration (ET), and the irrigable area associated with the meter. Daily ET data corresponding to the bill cycle is used to develop the site specific outdoor allocation for customers in each of IRWD's three climate zones (Coastal, Central, and Foothill).
- **Variances:** Adjustments to the default indoor and outdoor allocations can be applied to accommodate special circumstances, such as additional residents, medical needs, and daycare facilities.

In setting rates and allocations, the District has various alternatives available to it to encourage conservation and water use efficiency. Due to the drought conditions over the past several years and the mandated reduction in potable water usage established by the SWRCB, IRWD has elected to adjust its outdoor allocation to redefine outdoor usage based on drought tolerant plants. The crop co-efficient and irrigation efficiencies were adjusted from .65 and .71 respectively, to .50 and .85 respectively in setting proposed rates for 2015-16 for potable irrigation. This equates to a revised outdoor allocation factor for potable irrigation from .91 in FY 2014-15 to .6 in FY 2015-16 as shown in the table above. Recycled water customers continue to be based on warm-season turf and an irrigation efficiency of 0.71.

Carollo has reviewed the District's water allocation methodology and finds that this approach is supported both by cost of service principles and by the need for conservation in the midst of this historic drought in California. From a cost of service standpoint, the allocation-based approach creates a clear nexus between the demand from various customers groups and the increasing marginal costs incurred by the District. As a result, it is sound and prudent that the District has created these allocations for its customers, providing each business and household with a baseline amount of water reasonable to meet its demand within the base commodity rates.

Furthermore, the District's methodology for calculating customer basic water allocations has been calibrated through detailed audits, primarily of CII customers, and a variance system to accurately reflect the needs of each customer. By using basic allocations coupled with higher usage tiers aligned with higher service costs, IRWD has created a structure and process that incentivizes conservation, while also recognizing the varying needs of its typical customer.

From a conservation standpoint, the allocation-based approach is a necessary step taken by IRWD to encourage water efficiency among its customers. IRWD's base allocations recognize this by establishing allocations for the higher priority water needs and charging a rate proportionately aligned with the basic cost of service, and increasing the rate for usage above that amount to recover the incremental increases in the cost of service.

Tiers, Break Points, and Allocations

FY 2015-16 proposes using two to four tiers depending upon the customer class. For each customer class, the District provides an allocation (based on projected usage) for each source of supply. For compliance with the cost of service principles, each tier is closely defined and represents the costs incurred specific to that level of service (demand). The various costs of service incurred by the District are allocated to each tier based on the forecasted demands within each tier using functional and unit cost methodologies.

The low volume tier is based on minimum (health and safety) levels of use, and therefore usage in this tier is allocated water from the lowest cost source of supply. The low volume tier does not apply to CII customers as their allocations are customized, based solely upon the reasonable use amounts required for all of the businesses' needs, and therefore do not factor in a separate health and human safety level of minimum use.

The base tier represents the reasonable use associated with the property and therefore usage in this tier is allocated any remaining lowest cost source of supply. As there are not sufficient supplies at the lowest cost source of water to meet all of the base tier demands, a portion of the base demands are met with the next available source of supply, imported water, resulting in a melded rate.

The melded rate, based on the overall ratio of lowest cost source and imported water cost, is allocated to the base tier. The inefficient tier represents a level of use that is based on an efficient irrigation system but a type of planting with higher irrigation needs than the type of planting used to establish the basic allocation for reasonable use for the property.

The cost of water for the inefficient tier is all imported water, plus a share of the cost of the water banking program since that water is used to meet above allocation demands. The wasteful tier represents a level of use that far exceeds the reasonable use for the property. The cost of service for the wasteful tier includes the imported water cost, a share of the cost of the water banking program, as well as the cost for targeted conservation efforts. These are conservation efforts that are specifically directed at the wasteful tier, and go beyond general conservation outreach and programs that apply to all customers. NTS costs are also allocated to the wasteful tier since a major component of water use is over-irrigation; NTS costs are not allocated to the inefficient tier since the inefficient tier use is

established based on efficient irrigation. This approach is applied to each customer class, tier and source of water to appropriately allocate costs to tiers.

The breakpoints for each of the tiers are based upon the percentage of additional water required for the use in the tier based on an average customer and in an average month. For example, for residential customers the low volume tier is based on basic indoor needs of 30 gallons per person per day. The remainder of the base allocation includes an additional 20 gallons per person per day (for a total indoor allocation of 50 gallons per person per day), plus an allocation for outdoor use based upon drought tolerant plants and efficient irrigation. The total water allocation for a typical residential customer is then calculated. In this example, the low volume indoor is equal to 30 gallons x 4 residents x 30 days and is divided by 748 to convert from gallons to ccf, resulting in a low volume allocation of 4.8 ccf (for billing purposes the low volume allocation is rounded up in the customer's favor to 5 ccf).

The remaining indoor allocation of 20 gallons per person per day is calculated the same way, equal to 20 gallons x 4 residents x 30 days, divided by 748 to convert to ccf, resulting in 3.2 ccf. To obtain the base allocation this is added to the outdoor allocation which is based on a default landscape area of 0.03 acres. Average annual ET for IRWD's service area is 48 inches per year, or 4 inches per month, and the ETAF for FY 2015-16 is 0.6. The conversion factor from acre-inches to ccf is 36.3. The outdoor formula is Landscape Area x ET x ETAF. So on average, the outdoor allocation is 0.03 x 4 inches x 0.6 x 36.3, which equals 2.6 ccf. This is added to the base tier indoor allocation for a total of 5.8 ccf, or 6 ccf when rounded up.

The customer's total allocation based on reasonable use for the property is then 11 ccf (low volume tier of 5 ccf plus base tier of 6 ccf). The low volume allocation of 4.8 ccf is 43 percent of the total allocation of 11 ccf, and so the breakpoint is established at the closest rounded percentage of 40 percent. The remainder of the total allocation is then 60 percent so that the next tier breakpoint is set at 100 percent of allocation.

The inefficient tier is then established by calculating the allocation assuming the outdoor use was based on warm season turf with overhead spray. That requires 30 percent additional water compared with drought tolerant plants and an efficient irrigation system, and so the breakpoint for the inefficient tier is set at 130 percent of allocation. The wasteful tier is then set at 131 percent and above since it represents wasteful use that is greater than irrigating warm season turf with an efficient irrigation system.

This same process is applied to each customer class with the basis for the percent of allocation for each tiers detailed in Appendix C: Basis for the Tiers FY 2015-16.

TABLE 4-8 ALLOCATION DISTRIBUTION ACROSS TIER STRUCTURE

TIER	Residential detached/attached	Apartment	Commercial / Industrial / Institutional	Landscape Potable Irrigation	landscape recycled irrigation
Low Volume	0-40%	0-60%	-	0-60%	0-40%
Base	41-100	61-100	0-100%	61-100	41-100
Inefficient	101-130	101-120	NA	101-160	101-130
Wasteful	131+	121+	101+	161+	131+

The tiers and rates for all classes of customers are structured to proportionately allocate the costs of service, including incremental costs attributed to the increased levels of demand and consumption within each tier, and by structuring in that manner, send a strong over-allocation use signal. For example, the tiers reflect greater variation in residential demands due to indoor and outdoor use being combined on one connection, and the use of default assumptions, although variances can be applied.

IRWD's over-allocation break points are reasonable and necessary to allocate and effectively administer the agency's limited water and conservation resources.

Similarly, the tier break points for landscape customers are structured to proportionately allocate the costs of service. The resulting structure of ascending rates sends a strong over-allocation use signal designed to maximize conservation and minimize urban water runoff from excess irrigation. In the potable system, the Low Volume rate is based on the water needs of native plants, the Base rate is based on drought tolerant plants, and the Inefficient rate is based on cool season turf.

Four tiers are used in the residential and irrigation service classes, and two tiers are used in the commercial, industrial, and institutional (CII) service class. This reflects the District's practice of setting a customized allocation for each customer in the CII class, designed to accommodate all of the customer's business needs, compared with the District's practice of using typical use characteristics in the residential and irrigation classes. As CII users have their water allocation specifically defined according to their needs, they will generally use all of their allocation and a separation of low volume and base use tiers is not necessary. Similarly, because the base allocations in the CII class are customized to provide a sufficient amount for 100 percent of the customer's needs rather than the needs of a typical user, any usage above the base allocation is by definition excessive and considered wasteful, and as a result, only one over-allocation tier is used in this class.

4.5 RATE CALCULATION

The final step to calculate the rates is to spread each cost category across an appropriate component and customer. In order to calculate a rate, two components are necessary: (1) Costs and (2) Demands.

As both of these items are defined above, the rate can be calculated using the functional cost category divided by applicable demand.

4.5.1 Water Fixed Service Charges

The fixed service charge recovers the cost of operating, maintaining and repairing the water system. Additionally, providing and reserving the capacity for each meter based on its potential demand is a fixed expenditure that the District incurs. IRWD must maintain production capacity equal to or greater than the potential demand.

The most common method for levying fixed charges is by meter size. Meter size is used to define the estimated requirement that each customer places on the water system. IRWD defines the base meter as a 5/8-inch meter. To calculate a service charge for different size meters, the AWWA meter capacity ratio between the base meter's maximum flow rate and a larger meter's maximum flow rate is used.

The M1 manual details 13 types of meters that, despite a common size, could have significantly different maximum flow capacities. IRWD goes beyond standard service charge convention by separately calculating charges for different types of meters with the same size.

Realignment of Meter Ratios

As part of a continuous rate review process, prior to setting rates for FY 2014-15, the District conducted a review of the fixed monthly rates charged for domestic water service within the IRWD service area. This review, conducted by AKM Consulting Engineers (AKM), was to determine whether the fixed monthly rates charged by IRWD were sufficient to cover the fixed costs of operating and maintaining the system, and that rates charged to customers were proportional to the system capacity available through each class of meter.

This fixed charge review recommended that the monthly fixed charge be adjusted to better account for the varying peaking demands placed on the system by individual customers' meters. According to the review, the previous fixed charge could be better aligned with peaking demand by using an updated industry standard meter size capacity ratio methodology. Meter size is a reasonable and industry standard metric for this approach; increasing meter size correlates directly with increasing peak demands that could be placed on the system. Larger meters are able to draw more water from the system than smaller meters.

IRWD's calculation of service charges utilized this approach, but industry standards, set by the American Water Works Association, added more nuance to that approach since it was first implemented by IRWD. Following a comparison of the original fixed service charge structure ratios with the latest industry standard ratios, AKM recommended realignments and updates were identified. The recommended adjustments to the meter ratios resulted in increases in the monthly service charges for larger residential meters and decreases in the service charges for large commercial meters. IRWD concurred with AKM's recommendation. Given the magnitude of some of the increases, IRWD implemented a two-year phase-in approach to mitigate this change for some customer classes. In FY 2014-15, 50 percent of the alignment related increase was applied. The remaining 50 percent of the alignment-related increase is included in the proposed FY 2015-16 fixed service charges. The District

used non-operating rate stabilization funds to allow the phase-in and to avoid disproportionately charging other customers during the phase-in period.

A partial table of the meter ratio realignments is provided in below and a full table is provided in Appendix B: Realignment of Meter Ratios.

TABLE 4-9 METER REALIGNMENT RATIOS

METER SIZE	ORIGINAL IRWD FLOW RATE (GPM)	AWWA CAPACITY (GPM)	IRWD % OF AWWA MAX
5/8" Disc	22	20	110%
3/4" Disc	22	30	73%
1" Disc	37	50	74%
1.5" Disc	75	100	75%
2" Disc	120	160	75%
2" Turbo	160	190	84%
3" Turbo	360	435	83%
4" Turbo	1,000	750	133%
6" Turbo	2,000	1,600	125%
8" Turbo	3,500	2,800	125%
10" Turbine	5,500	4,200	131%

After reviewing AKM's analysis and the District's application of the recommended meter size ratio methodology, Carollo supports the realignment to AWWA industry standard meter ratios and the continued implementation process for FY 2015-16. Carollo has reviewed IRWD's changes to its fixed charge structure and finds a clear nexus between the cost to serve each meter at each size and the charges that IRWD levies to provide that service.

Fixed Service Charge Calculation

Developing the monthly fixed service charge is a function of the total budget needed for these costs and the number of meter equivalents in the system. Meter equivalent units (MEUs) calculate a capacity ratio based on the potential demand of a given meter size based on its flow rate and are set relative to the baseline 5/8-inch meter as discussed above. The monthly service charge is calculated by dividing the revenue requirement by the total number of MEUs, and then dividing again by twelve months.

TABLE 4-10 FY 2015-16 MONTHLY FIXED SERVICE CHARGE CALCULATION

Total Revenue Requirement for Service[1] **(A)**	$30,118
Meter Equivalent Units (MEU)[2] **(B)**	243,671
Fixed Charge **(A) ÷ (B) ÷ 12**	$10.30 per MEU per month

Notes

1) From Table 4-4, in thousand dollars
2) Forecasted MEUs for FY 2015-16 as provided by IRWD.
3) See Appendix B.

As discussed previously, in order to scale the fixed charge to larger meter sizes, the base fixed charge is multiplied by the meter's capacity ratio. For example, a 5/8-inch meter has a flow rate of 20 gallons per minute, while a 3/4-inch meter has a flow rate of 30 gallons per minute and therefore has a meter equivalent ratio of 1.5 (or 150 percent of a 5/8-inch meter). These charges are provided in Appendix A: Fixed Service Charge By Meter Size.

Service Charge for Low Volume Users

Based on feedback from ratepayers, a revision to the existing service charge was evaluated for low volume users. Low volume users have a larger percentage of their bill made up of the fixed charge. As with any fixed charge, it reduces the ratepayer's ability to control their own bill. Despite already having a low service charge compared with similar agencies in the region, the District wanted to review possible alternatives to address this. As implemented by other agencies, Carollo presented the concept of providing a "lease-back" conservation credit to those whose use remains in the Low Volume tier, via a fixed service charge reduction.

Most fixed service charges have two components: a customer component that covers costs that are identical for each account, such as reading meters and billing; and a capacity component that covers the reserved capacity in the system that each meter purchases, depending on its size. This second portion goes in large part to the repair and replacement of system infrastructure. The baseline rate is calculated on the meter's maximum flow capacity and thus demand on the system. With a "lease-back" approach, an agency can recognize that a low volume user is not fully using their potential capacity, and therefore, it is reasonable to provide a lease-back credit to users who are underutilizing that flow and effectively "leasing it back" to the system for other users. This prevents the District from having to upsize infrastructure as quickly as capacity is exhausted.

Carollo worked closely with IRWD to structure the proposed low volume lease-back credit, and analyzed the revenue and customer impacts of the various scenarios considered. Initially, the leasing was to be limited to residential customers who stay within their Low Volume tier allocation for the entire preceding twelve months, meaning that just one month into the Base tier would preclude a customer from the credit. After considering factors such as leaks, which would easily send a customer into the Base tier and can often take several months to resolve, it was determined that some allowance for exceeding a

Low Volume would be appropriate. Three months was determined to be reasonable for the typical low volume household to address high use months, either due to a leak or aberrant consumption patterns.

Overall, this lease-back credit would have a limited impact on the District's revenue goals, but from a customer standpoint, this would provide a cost of service based incentive for residents to further conserve, especially if they are close to their Low Volume allocation each month. As this capacity is being utilized by those over their base allocation, their over-allocation revenues pay for leasing this capacity. Based on this recommendation, IRWD is proposing to implement this lease-back credit for its FY 2015-16 rates. Going forward IRWD will continue to monitor the lease-back credit methodology to confirm its ongoing nexus to cost of service.

4.5.2 Potable Water Rates

IRWD employs a unit cost of service based approach to rate setting. Under this methodology, for each rate area, each functional cost is divided by the number of billing units (in ccf) of projected water sales in the tier or tiers to which that functional cost is attributed.

To calculate the costs attributable to each tier, Table 4-11 and Table 4-12 below take the two rate areas commodity charge functional cost components detailed in Table 4-4 and divide them across the projected sales of units of water as shown in the ccf column. Each functional category benefits usage in a specific tier or tiers, and thus, the usage in that tier or tiers forms the denominator for allocating the cost in that category. The unit costs allocated to each tier can then be calculated, arriving at a single unit cost for each functional cost.

TABLE 4-11 FY 2015-16 UNIT COST CALCULATION – IRVINE RANCH RATE AREA

FUNCTIONAL CATEGORY	TIERS BENEFITING	ALLOCATION[1]	APPLICABLE AF[2]	APPLICABLE CCF[3]	UNIT COST ($/CCF)
Lowest Cost Source	Low-Volume	$6,828	14,618	6,367,421	$1.06
Melded - IRWD	Base	18,735	27,360	11,917,958	$1.57
General Conservation	All	946	43,427	18,917,237	$0.05
Purchased Water Costs	Inefficient & Wasteful	1,743	1,450	631,620	$2.76
Water Banking	Inefficient & Wasteful	701	1,450	631,620	$1.11
Targeted Conservation and NTS	Wasteful	3,466	750	326,700	$10.61
Total Rate Revenue		**$32,419**			

Notes:

1) From Table 4-4, in thousand dollars
2) From Table 3-1
3) 1 AF = 435.6 ccf
4) Numbers may vary slightly due to rounding

Similar to the previous table, Table 4-12 shows the unit costs for the Los Alisos rate area, calculated by dividing the commodity charge functional cost components by projected units of water sold in the benefiting tier or tiers.

TABLE 4-12 FY 2015-16 UNIT COST CALCULATION – LOS ALISOS RATE AREA

FUNCTIONAL CATEGORY	TIERS BENEFITING	ALLOCATION[1]	APPLICABLE AF[2]	APPLICABLE CCF[3]	UNIT COST ($/CCF)
Lowest Cost Source	Low-Volume	$1,941	2,804	1,221,399	$1.58
Melded – Los Alisos	Base	3,320	3,252	1,416,395	$2.34
General Conservation	All	150	6,286	2,737,982	$0.05
Purchased Water Costs	Inefficient & Wasteful	235	230	100,188	$2.34
Water Banking	Inefficient & Wasteful	121	230	100,188	$1.21
Targeted Conservation and NTS	Wasteful	632	125	54,450	$11.60
Total		**$6,399**			

Notes:

1) From Table 4-4, in thousand dollars
2) From Table 3-1
3) 1 AF = 435.6 ccf
4) Numbers may vary slightly due to rounding

With the unit costs for each system cost component calculated, the rate for each tier can be developed as a simple layering of costs. The calculation is essentially a sum of the individual cost components for each tier.

Table 4-13 shows the cost layering to define the Irvine Ranch rate area charges.

TABLE 4-13 FY 2015-16 UNIT COSTS BY TIER – IRVINE RANCH RATE AREA				
COST BASIS	LOW-VOLUME	BASE	INEFFICIENT[2]	WASTEFUL[3]
Lowest Cost Water	$1.06			
General Conservation	$0.05	$0.05	$0.05	$0.05
Melded Cost		$1.57		
Purchased Water Cost			$2.76	$2.76
Water Banking			$1.11	$1.11
Targeted Conservation and NTS				$10.61
Rate ($ / ccf)[1]	**$1.11**	**$1.62**	**$3.92**	**$14.53**

Notes:

1) Rate is calculated as sum of above cost components
2) For Tier 3, there is a possible second step increase to $9.30 if targeted SWRCB reductions are not met
3) For Tier 4, there is a possible second step increase to $19.91 if targeted SWRCB reductions are not met

Table 4-14 shows the cost layering to define the Los Alisos rate area charges.

TABLE 4-14 FY 2015-16 UNIT COSTS BY TIER – LOS ALISOS RATE AREA				
TIER	LOW-VOLUME	BASE	INEFFICIENT[3]	WASTEFUL[4]
Lowest Cost Water[2]	$1.58			
General Conservation	$0.05	$0.05	$0.05	$0.05
Melded Cost		$2.34		
Imported Water			$2.34	$2.34
Water Banking			$1.21	$1.21
Targeted Conservation and NTS				$11.60
Rate ($ / ccf)[1]	**$1.64**	**$2.39**	**$3.60**	**$15.20**

Notes:

1) Rate is calculated as sum of above cost components
2) Lowest cost of source water (MWDOC untreated $2.34/ccf) offset by a sinking fund from future proceeds from sale of Los Alisos property. It is anticipated that the sale of the property surrounding the former Los Alisos Water District headquarters in Lake Forest will generate proceeds sufficient to provide necessary contribution to groundwater infrastructure or to fund an ongoing offset of the difference in source water cost, allowing the commodity rates within the Irvine Ranch rate area and Los Alisos rate area to be calculated on the same basis. When the property sale is completed, the Los Alisos rate area will be transitioned into the Irvine Ranch rate area. In anticipation of the sale, IRWD, as a matter of policy, has elected to advance a portion of the anticipated property sale proceeds from non-operating funds to offset the Los Alisos rate area's differential in source water cost in the Low Volume tier. The Los Alisos rate area has previously been transitioned to the Irvine Ranch rate area's sewer rate structure.
3) There is a possible second step increase to $9.42 if targeted SWRCB reductions are not met
4) There is a possible second step increase to $21.01 if targeted SWRCB reductions are not met

4.5.3 Second Step Increase

A second step increase is proposed for the Inefficient and Wasteful tiers, to be applied if customer demands for water in these tiers exceed the SWRCB required reductions, as these demands could require IRWD to pay penalties to the State or other additional costs for not achieving its targeted reduction. In this manner, the penalties are treated as a functional cost that is included in the highest cost of source water. The penalty cost is based on IRWD's most recent information indicating that the SWRCB would impose penalties upon agencies of up to $10,000 per day for failure to meet their mandated reductions. The penalty cost will be evaluated at the time of considering the proposed second step increase, including any updated information available from the SWRCB.

The second step rate component assumes nine months of the potential penalties, or $2.7 million and approximately 75 percent of the remaining over allocation sales. The allocation between the Irvine Ranch and Los Alisos Rate Areas is based on total demand, approximately 85 percent and 15 percent respectively. The formula used to calculate the second step is: Estimated Penalty / Remaining Over Allocation Sales = cost per ccf. If the revenue generated does not provide sufficient offset to any penalties received from the state, the conservation fund will provide for the shortfall.

4.5.4 Untreated Water Rates

IRWD applies a uniform rate for untreated water. The primary use of untreated water is agriculture, which is charged at a uniform rate. All other untreated water users are charged according to the tiered rate structure for recycled water. The proposed rate is based on the allocated costs specifically related to providing untreated water.

TABLE 4-15 FY 2015-16 UNTREATED UNIT COST CALCULATION

FUNCTIONAL CATEGORY	ALLOCATION[1]	AF[2]	CCF[3]	UNIT COST ($/CCF)
Untreated	$1,712	2,612	1,137,787	$1.50

Notes:

1) From Table 4-4, in thousand dollars
2) From Appendix E, Table 6-4
3) 1 AF = 435.6 ccf

4.5.5 Recycled Water Rates

IRWD has developed a significant recycled water program in order to promote conservation and alleviate some of the need to develop potable sources to supply water demands that could otherwise be met with recycled water. Like many agencies, IRWD incentivized the use of its recycled water program due to this system-wide benefit. The District accomplished this by setting recycled water rates at an indexed discounted rate relative to its potable water rates. The indexing was tested by Carollo and found to closely track an independent cost of service analysis of the recycled water system. Since the recycled water system is a self-sustaining entity and cost of service could diverge from the indexing method in the future, the proposed rates are no longer indexed to the potable system and instead are

reflective of a separate functional allocation of system costs. While the proposed decoupled rates remain lower than potable water rates, they provide sufficient revenues to meet the costs of providing recycled water.

Applying the same unit cost approach as outlined in the potable water rates calculation yields the proposed rates for FY 2015-16, summarized in the tables below.

TABLE 4-16 FY 2015-16 UNIT COST CALCULATION – RECYCLED WATER

FUNCTIONAL CATEGORY	TIERS BENEFITING	ALLOCATION[1]	AF	CCF	UNIT COST ($/CCF)
Lowest Cost Water	Low-volume	$7,018	15,015	6,540,534	$1.08
Melded Cost	Base	9,388	15,731	6,852,424	$1.37
Imported Water	Inefficient & Wasteful	1,373	2,074	903,434	$1.52
Targeted Conservation	Wasteful	3,000	1,613	702,623	$4.27
Total		**$20,779**			

Notes:

1) From Table 4-5, in thousand dollars. Also see Table 4-5.

The table below details how these costs are layered to create the basis for each tier.

TABLE 4-17 FY 2015-16 UNIT COSTS BY TIER – RECYCLED WATER (LANDSCAPE)

TIERS	LOW-VOLUME	BASE RATE	INEFFICIENT	WASTEFUL
Lowest Cost Water	$1.08			
Melded Cost		$1.37		
Imported Water			$1.52	$1.52
Targeted Conservation				$4.27
Rate ($ / ccf)	**$1.08**	**$1.37**	**$1.52**	**$5.79**

In analyzing the differences between recycled water customer groups, it was evident that CII users peak dramatically less on the system. To reflect the differences in system use and the added value of utilizing the recycled water system year round (not simply for peak irrigation), a storage credit is applied to CII recycled water customers. This credit is applied to reflect CII customers' reduced benefit of additional storage in the recycled water system.

TABLE 4-18 FY 2015-16 UNIT COSTS BY TIER – RECYCLED WATER (CII)

TIERS	BASE RATE	WASTEFUL
Lowest Cost Water	$1.08	
Storage Credit	(0.11)	
Imported Water		$1.52
Water Banking		$0.00
Targeted Conservation		$4.27
Rate ($ / ccf)	**$0.97**	**$5.79**

4.5.6 Sewer Service Charge

As previously discussed, IRWD's sewer charges include both a fixed and a variable component. The sewer service charge is identified as a volumetric-block rate structure monthly cost for residential customers with the rate tied to the cost of use. All other customer types pay a quantity charge per ccf. Given the homogeneous nature of residential sewer demands, the fixed service charge for residential customers is broken into three volumetric-blocks that are identified by the previous calendar year's average three lowest months of billed potable water demands:

- Homes using 10 or more ccf per month;
- Homes using 5-10 ccf per month; and
- Homes using 5 or less ccf per month.

The volumetric blocks are used to establish the assumed residential indoor average use as the amount of water consumption that returns to the sewer system. As discussed below, Carollo has recommended that the District use the minimum three months concept as a refinement to the previous residential sewer rate methodology of calculating charges based on total annual water usage. The District proposes to implement this change, designed to better align the service charge with the estimated sewer discharges. The proposed FY 2015-16 sewer charges reflect this recommendation.

For non-residential customers, the fixed monthly service charge includes the first 10 ccf of use. Thereafter, all use is charged volumetrically based on billed water use. Quantity charges are based on the assumption that 90 percent of non-residential water consumption returns to the sewer. Adjustments can be applied for landscape irrigation or consumptive usage. As in the water rate structure, this difference in the methodology among service classes reflects each customer classes' characteristics for sewer discharge.

Similar to the water service charge, the fixed service charge is developed by determining the revenue requirement for an equivalent number of Block 1 accounts (0 – 5 ccf). Each incremental block represents a greater level of service and is allotted a higher equivalency. This approach is presented below.

TABLE 4-19 FY 2015-16 FIXED SEWER SERVICE CHARGE CALCULATION

Service Revenue Requirement[1] (A)	$20,644
Monthly accounts subject to charge (B)	92,739
Monthly Rate (A) ÷ (B x 12 months) [1]	**$18.55**

Notes:

1) From Table 4-6, in thousand dollars
2) All accounts pay this base rate. Higher demand accounts are billed a higher rate based on Table 4-20.

TABLE 4-20 FY 2015-16 FIXED SEWER SERVICE CHARGE CALCULATION

	BLOCK 2	BLOCK 3
Usage Level	5.01 – 10.0 ccf/month	10+ ccf/month
Revenue Requirement[1] **(A)**	$1,104	$1,495
Monthly accounts subject to charge **(B)**	27,882	22,659
Peak Cost ($/ccf) **(A) ÷ (B x 12 months)**	$3.30	$5.50
Monthly Rate ($18.55 base rate + peak cost)	**$21.85**	**$24.05**

Notes:

1) From Table 4-6, in thousand dollars

The variable rate is a simple function of the revenue requirement remaining divided by the projected volume above the 10 ccf threshold. This methodology is outlined in Table 4-21.

TABLE 4-21 FY 2015-16 VARIABLE SEWER SERVICE CHARGE CALCULATION

Variable Revenue Requirement[1] (A)	$15,414
Volume subject to charge (ccf)[2] (B)	6,060,000
Unit cost ($/ccf) (A) ÷ (B)	**$2.56**

Notes:

1) From Table 4-6, in thousand dollars
2) Only applies to ccf used in excess of 10 ccf per month for each non-residential account.

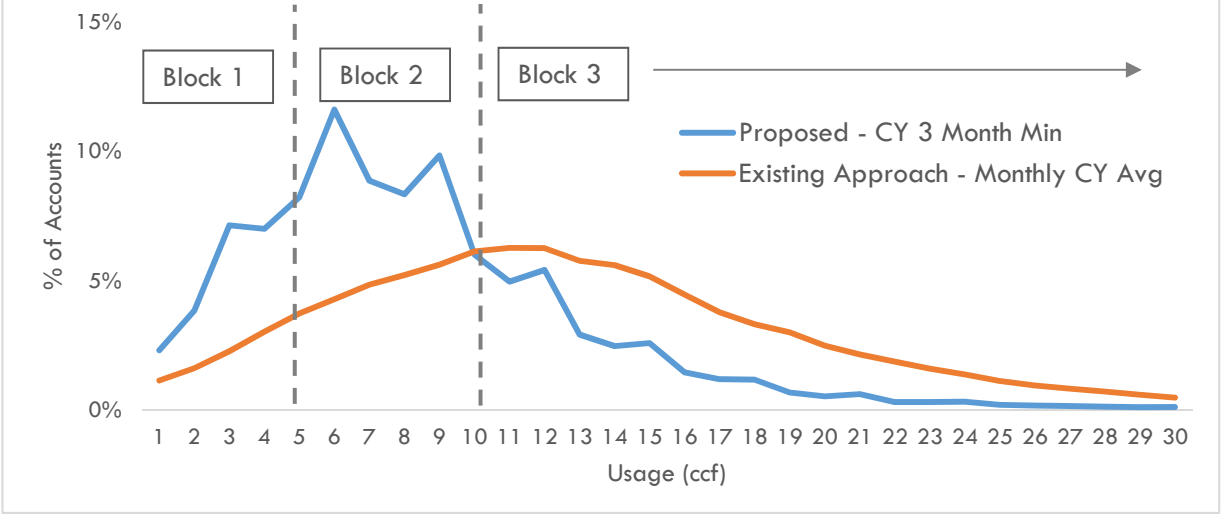
Revisions to Sewer Discharge Methodology

Unlike water, most sewer discharges to the collection system are not metered. As such, there are a variety of methodologies for estimating or forecasting assumed discharge. Because the District must treat this water, regardless of its use, there is a cost associated with each unit of flow received. The District must have a reasonable method to estimate how much water it is receiving and from where. This is a necessary step in order to collect sufficient revenues from everyone using the system.

Currently, for residential accounts, the monthly service charge is based upon actual water meter readings during the twelve month period ending December 31. Customers are then grouped into a low, moderate, or high sewage demand group and charged with the according fixed charge for the year. This is a simplified methodology that uses metered water demands as a proxy for identifying the volume of sewer discharges. This methodology does not account for irrigation needs and other consumptive uses that do not return flow to the sewer system. To account for this, winter month demand—when outside irrigation is at its lowest—is commonly used as a proxy for indoor water usage or assumed discharge. While assumptions have to be made in the absence of sewer meter data, it is believed that this approach provides a more refined proxy for residential sewer rates.

Carollo presented a slight variation of this approach to F&P for input and consideration. Given seasonal variation and to account for monthly anomalies in a ratepayers' water use, Carollo recommended basing assumed flows on the average of the three lowest meter readings during the twelve month period ending December 31. To get to the final assumed sewer return flow, Carollo recommends taking this average and applying a 90 percent return factor, assuming that roughly 1 out of every 10 units of water demand will be for consumptive uses that are not returned to the sewer system at the same connection. The shift in customer profiles is summarized in Figure 4-1

FIGURE 4-1 RESIDENTIAL DISCHARGE CALCULATION METHODS

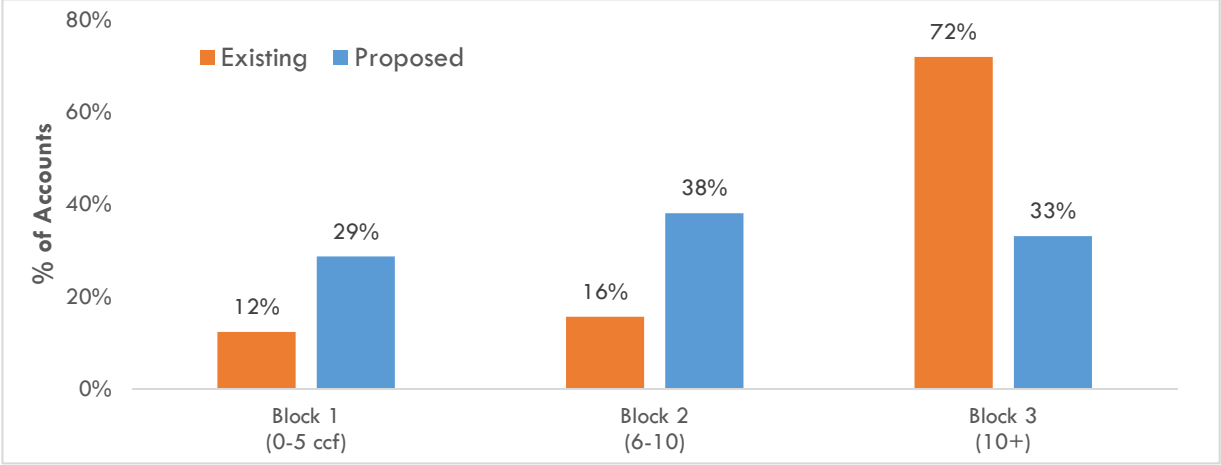


This approach shifts the distribution of customers so that more accounts are at the lower end of the assumed return flow distribution. This method naturally yields lower assumed discharges, because it only accounts for the three lowest demand months for each account, and because it reduces that return flow by 10 percent. As a result, more customers will qualify for the District's low volume tiers, bringing with it a revenue impact without any corresponding change to rates.

This approach has the benefit of smoothing the distribution of customers in each block for the District. Under the current structure, almost three-quarters of all residential accounts are in the high consumption

tiers. Consequently, small shifts in demand can result in large impacts to the District's revenue. If a number of accounts adjust their usage and enter block 2 from block 3, this can have a substantial impact on IRWD's revenue goals. By adjusting the methodology so that the accounts are more uniformly distributed, the District can make its revenue more stable and hedge these revenue shifts.

FIGURE 4-2 RATE IMPACT COMPARISON FOR RESIDENTIAL SEWER ACCOUNTS



5 LEGAL REQUIREMENTS

5.1 INTRODUCTION

Carollo does not opine or provide an opinion on the legality of water rates. Carollo's analysis provides a clear record to illustrate how the District develops rates and evaluates these rates for conformance with cost of service principles. The District, under the guidance of its legal counsel, has provided direction based on the legality of the structure. The discussion below, based on the legal precedent, created the framework by which Carollo evaluated the District's rates.

The District's water, recycled water, sewer rates, and rate setting process must adhere to California constitutional and statutory requirements. Procedural requirements apply to the rate-setting process. The principal substantive requirements governing the rates are that revenues recovered through the rates do not exceed costs, and that costs be recovered proportionally from users. The cost of service principles used for this analysis include these substantive requirements.

The District's water rate structure employs allocation-based conservation pricing, including tiered rates. The use of tiered water rates has been determined to be consistent with constitutional requirements pertaining to proportional cost of service. On April 20, 2015, the California Court of Appeal, Fourth District, issued an opinion in Capistrano Taxpayers Association, Inc. v. City of San Juan Capistrano ("*San Juan*") upholding tiered water rates under California Constitution Article XIII D (enacted by Proposition 218), provided that the tiers correspond to the actual cost of furnishing service at a given level of usage. The opinion was specific to the facts of the case, including a finding that the city did not attempt to calculate the actual costs of providing water at various tier levels. In reaching its conclusions, the *San Juan* Court treated all of the tiers as property-related services subject to Article XIII D, as interpreted by the California Supreme Court in its 2006 decision in *Bighorn-Desert View Water Agency v. Verjil*, 39 Cal. 4th 205 (2006) ("*Bighorn*"), that charges for domestic water delivery are charges for a property-related service. On the facts and arguments presented in San Juan, the Court found no basis for altering its application of Article XIII D in either Article XIII C ("Proposition 26") or Article X, Section 2 ("Article X").

Further judicial and legislative interpretation may provide additional guidance in the use of tiered water rates, including the application of Proposition 26's provisions concerning levies, charges and exactions other than property-related fees and the application of Article X. For the purposes of this cost of service analysis, it has been assumed that the District's tiered water and recycled water rate structures, as well as its sewer rate structure, are to be analyzed under the requirements of Article XIIID and implementing statutory provisions, described below.

5.2 ARTICLE XIII D

In November 1996, California voters approved Proposition 218, which amended the California Constitution by adding Article XIII C and Article XIII D. Article XIII D placed substantive limitations on the

use of the revenue collected from property-related fees and on the amount of the fee that may be imposed on each parcel. The substantive requirements, contained in Article XIII D, Section 6, include that the amount of the fee "shall not exceed the proportional cost of the service attributable to the parcel," and that revenues from the rates "shall not exceed the funds required to provide the service" and "shall not be used for any purpose other than that for which the fee was imposed." Additionally, Proposition 218 established procedural requirements for imposing new, or increasing existing, property-related fees.

Following the passage of Proposition 218, there have been a number of court rulings interpreting and applying its language, and implementing statutes have also been enacted. In *City of Palmdale v. Palmdale Water District*, the court recognized that California Constitution Article X, Section 2 may be harmonized with Article XIII D, section 6 to allow for budget based and tiered rates that promote water conservation, provided conservation is attained in a manner that "shall not exceed the proportional cost of the service attributable to the parcel". As noted in *San Juan*, the 2011 *Palmdale* decision recognized that budget based water rates on their own do not violate Proposition 218. In *Palmdale*, the district failed to demonstrate a basis for the more restrictive tiered budgets and progression through the tiers in the irrigation customer class as compared to the other customer classes.

The *San Juan* decision rejected the argument that for purposes of the proportional cost allocation required by Article XIII D, the agency's calculation is a matter within legislative or quasi-legislative discretion shielded from judicial review. It did recognize some degree of latitude in making such calculations. *San Juan* notes, for example, that it is not necessary to figure a rate for each parcel and it is permissible to allocate cost within tiers, as long as tiers are based on usage and not budgets. The opinion also explains that the time frame for the calculation of true water cost, particularly capital cost, may be long and calculation on a billing-cycle by billing-cycle basis is not required.

Cost and revenue projections are necessarily based on the best available information, and demand and consumption will be affected by weather and other factors that cannot be predicted. See *San Juan*, fn 11 (acknowledging projections of Metropolitan Water District rates as included in rate-setting process). Projections such as this will likely result in operating surplus and carryover, maintaining cost of service standards on a year over year basis through the inclusion of these amounts in subsequent years' budget processes.

5.3 CALIFORNIA ASSEMBLY BILL 2882

Among the legislative enactments implementing Proposition 218 is California Assembly Bill (AB) 2882, which became law at the beginning of 2009. AB 2882 (Sections 370-374 of the California Water Code) defined the elements of allocation-based conservation pricing under Proposition 218, including the appropriate property characteristics (i.e., number of occupants, land use, irrigable area, and local climate data) to establish a reasonable basic use allocation. While rates for all water used within the basic allocation must be established following cost causation principles, AB 2882 provided authority for higher charges on increments of water used in excess of the basic use allocation.

This statute creates a framework under which water agencies may establish cost-of-service based rates while simultaneously allowing for the deterrence of wasteful water use. Under AB 2882, the elements of an allocation-based conservation water rate structure compliant with the mandates of both Article X and Proposition 218 are:

1. Water bills must be based on metered water use.
2. A water allocation of "basic use" must be established, providing a reasonable amount of water for each customer's basic needs based on property characteristics. Allocation factors may include, but are not limited to, number of occupants, type of land use, size of irrigated area, and local climate data.
3. All water used within the basic use allocation must be a basic volumetric unit rate that is established following cost causation principles for the cost of water service.
4. A "conservation charge" can be imposed on all increments of water use in excess of the basic use allocation. The conservation charge must also be a volumetric charge and should be designed to encourage water conservation and efficiency.

The cost of service analysis of the District's water and sewer rate structures is performed within the requirements of Article XIII D. The water rate structure is additionally analyzed within the framework of AB 2882. IRWD's water, recycled water, and sewer service rates are designed to both recover costs proportionally from system users as well as encourage conservation. The District's cost of service approach thereby conforms to the requirements of Article XIII D, and for water and recycled water, AB 2882.

5.4 ARTICLE XIII C

The application of Proposition 26 in the structuring of water rates is presently undetermined. The *San Juan* decision briefly touched upon one aspect of the Article XIII C provisions enacted by Proposition 26, finding that tiered water charges would not appropriately be characterized as penalties. Other aspects of the application of Proposition 26 to tiered rate structures may be addressed in future judicial decisions and legislative enactments.

The voters in the State approved Proposition 26 on November 2, 2010. Proposition 26 amended Article XIII C of the State Constitution to expand the definition of "tax" to include "any levy, charge, or exaction of any kind imposed by a local government" with listed exceptions. By means of these exceptions, Article XIII C classifies several types of charges, in addition to property-related charges, that are not taxes, such as charges for specific services or benefits, regulatory charges and penalties.

Article XIII C's definition of "tax" lists the following exceptions: (1) a charge imposed for a specific benefit conferred or privilege granted directly to the payor that is not provided to those not charged, and which does not exceed the reasonable costs to the local government of conferring the benefit or granting the privilege; (2) a charge imposed for a specific government service or product provided directly to the payor that is not provided to those not charged, and which does not exceed the

reasonable costs to the local government of providing the service or product; (3) a charge imposed for the reasonable regulatory costs to a local government for issuing licenses and permits, performing investigations, inspections, and audits, enforcing agricultural marketing orders, and the administrative enforcement and adjudication thereof; (4) a charge imposed for entrance to or use of local government property, or the purchase, rental, or lease of local government property; (5) a fine, penalty, or other monetary charge imposed by the judicial branch of government or a local government, as a result of a violation of law; (6) a charge imposed as a condition of property development; and (7) assessments and property-related fees imposed in accordance with the provisions of Article XIII D.

Proposition 26 also provides that the local government bears the burden of proving by a preponderance of the evidence that a levy, charge, or other exaction is not a tax, that the amount is no more than necessary to cover the reasonable costs of the governmental activity, and that the manner in which those costs are allocated to a payor bear a fair or reasonable relationship to the payor's burdens on, or benefits received from, the governmental activity. Like the proportionality requirements of Article XIII D, assessment of rates under these requirements, if applicable, would be supported by the cost of service approach.

5.5 ARTICLE X

Article X, enacted as an amendment to the California Constitution in 1928 pursuant to an electoral initiative, provides that:

> *"It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare."*

Article X conveys further that the right to water does not "extend to the waste or unreasonable use" of water. California Water Code Section 100 restates the policy that the waste of water shall be prevented. As indicated above, judicial interpretation in the *Palmdale* and *San Juan* decisions analyzed tiered water rates as property-related charges and, as such, found them to be compliant with Article XIII D provided that the tiers correspond to the actual cost of furnishing service at a given level of usage. Pricing signal was assumed to result from this manner of design. The use of tiered structures in compliance with Article XIII D restrictions was found to work in harmony with Article X. Further refinement through judicial and legislative interpretation may provide more specific guidance in this area, such as on the use of pricing signals.

6 APPENDIX

6.1 APPENDIX A: FIXED SERVICE CHARGE BY METER SIZE

TABLE 6-1 FY 2015-16 FIXED SERVICE CHARGES

METER SIZE	FLOW CAPACITY (GPM)	CAPACITY RATIO	MONTHLY CHARGE
5/8" Disc	20	1.0	$10.30
3/4" Disc	30	1.5	15.45
1" Disc	50	2.5	25.75
1 1/2" Disc	100	5.0	51.50
2" Disc	160	8.0	82.40
2" Turbo	190	9.5	108.15
3" Turbo	435	21.75	247.20
4" Compound	500	25.0	309.00
6" Compound	1,000	50.0	515.00
4" Turbo	750	37.5	515.00
8" Compound	1,600	80.0	991.40
6" Turbo	1,600	80.0	1,030.00
8" Turbo	2,800	140.0	1,802.50
10" Turbo	4,200	210.0	2,163.00

6.2 APPENDIX B: REALIGNMENT OF METER RATIOS

TABLE 6-2 REALIGNMENT OF METER RATIOS

METER SIZE	METER COUNT	IRWD CAPACITY (GPM)	AWWA CAPACITY (GPM)	IRWD % OF AWWA MAX
5/8" Disc	79,117	22	20	110%
3/4" Disc	3,587	22	30	73%
1" Disc	13,516	37	50	74%
1.5" Disc	2,198	75	100	75%
2" Disc	1,587	120	160	75%
3" Compound	0	280	320	88%
4" Compound	0	450	500	90%
6" Compound	0	750	1,000	75%
8" Compound	0	1,450	1,600	91%
10" Compound	0	1,600	N/A	N/A
14" Compound	0	3,500	N/A	N/A
2" Turbo	163	160	190	84%
3" Turbo	68	360	435	83%
4" Turbo	32	1,000	750	133%
6" Turbo	5	2,000	1,600	125%
8" Turbo	0	3,500	2,800	125%
10" Turbine	0	5,500	4,200	131%
2" Mag*	5	280	311	90%
4" Mag*	0	1,000	1,243	80%
6" Mag*	0	2,000	2,797	72%
8" Mag*	0	3,500	4,974	70%
6" Prop	0	1,450	1,350	107%
8" Prop	0	1,600	1,800	89%
10" Prop	0	2,000	2,400	83%
12" Prop	0	3,500	3,375	104%
16" Prop	0	5,500	5,700	96%

6.3 APPENDIX C: BASIS FOR TIERS FY 2015-16

California is facing an unprecedented drought and a statewide mandate to reduce urban water use by 25 percent. IRWD's mandated potable water savings reduction is 16 percent from 2013 levels. In order to meet its target, IRWD will need to save approximately 8,000 acre-feet, and will focus on reducing discretionary water use. This requires that the District reduce wasteful use from leaks as well as outdoor water use.

Outdoor Allocation

Potable Water

Outdoor water use need is based on the amount of water plants lose from evaporation and transpiration or evapotranspiration (ET). IRWD maintains three weather stations that provide daily ET data in representative coastal, central and foothill climate zones. ET changes over the course of a year, generally increasing when it is hotter and dropping when it is cooler. Reference ET is based on cool-season turf grass, usually the most water thirsty plant in a landscape. The water needs of other plant types can be adjusted by changing the relative crop-coefficient, as well as factoring in the efficiency of the application of water by the irrigation system (irrigation efficiency). Crop-coefficients are based on data from the California Department of Water Resources Guide to Estimating Irrigation Water Needs of Landscape Plantings in California, August 2000 and irrigation efficiencies are based on data from the Irrigation Association.

Given the mandated requirement to significantly reduce potable water use, IRWD's outdoor allocation is based on drought tolerant plants (crop co-efficient of 0.5) and a highly efficient irrigation system (irrigation efficiency of 0.85). Drought tolerant plants use up to 50 percent less water than cool-season turf. The resulting evapotranspiration adjustment factor (ETAF) is 0.5/0.85 = 0.6. This is a measure of the relative amount of water that drought tolerant plants with an efficient irrigation system need compared with cool-season turf grass.

The actual formula used to calculate the potable water outdoor allocation is:

Landscape area (acres) x sum of ET for the days in the billing cycle x ETAF

OR

Landscape area (acres) x sum of ET for the days in the billing cycle x 0.6

Recycled Water

Since the mandated reduction applies only to potable water, and since recycled water is a more "drought-proof" source of supply, the allocation for recycled water customers is based upon warm-season turf grass. Warm-season turf uses up to 30 percent less water than cool season turf, and has a crop-coefficient of approximately 0.65. Overhead irrigation is typically used for turf and is not as efficient so an irrigation efficiency of 0.71 is used consistent with the 2009 Model Water Efficient Landscape Ordinance, resulting in an ETAF of 0.91.

Sites with functional turf such as sports fields that are irrigated with potable water may request a variance. If at IRWD's discretion, the variance is granted, the associated irrigated area will receive the same allocation formula, based on warm season turf, as recycled water irrigation with an ETAF of 0.91.

Indoor Allocation

The indoor allocation of 50 gallons per person per day is based on a customer with efficient indoor use, no leaks and plumbing fixtures that meet current codes and standards. In 2009, the California legislature established a standard for efficient indoor use of 55 gallons per day. IRWD adopted its indoor standard of 50 gallons per person per day effective July 1, 2014 following the Governor's 2014 Executive Order requesting a voluntary statewide reduction of 20 percent in potable water use. Health and safety levels are generally considered to range from 20 to 30 gallons per capita per day.

Residential Allocations and Tiers

Residential- Detached and Attached

Residential customers with landscape (single family, town homes and condos) are allocated based on the following water budget:

Base Allocation:

Indoor

- 50 gallons per person per day
- Default number of residents is 4 for single family and 3 for condos/townhomes

Outdoor (Potable) Irrigation

- Landscape area (acres) x sum of ET for the days in the billing cycle x 0.6

Residential Tiers

Tiers for residential customers are set using the following assumptions based on a typical customer in IRWD's service area, with the default number of single family residents, irrigated landscape area of 1300 square feet. Customers with additional residents, livestock, additional landscape area and medical needs, for example, may request a variance to provide additional allocation for the property-related water needs.

TIER	PERCENT OF ALLOCATION	BASIS	AVERAGE CCF PER MONTH*
Low volume	0-40%	Assumes health and safety level of use of 30 gallons per person per day	5
Base	41-100%	Provides additional 20 gallons per person per day, a measure of efficient indoor use plus the outdoor allocation based on drought tolerant plants and efficient irrigation	6
Inefficient	101-130%	Based on irrigating warm season turf with overhead spray. Requires approximately 40% more outdoor use than drought tolerant plants and efficient irrigation. Also incorporates leaks.	4
Wasteful	131%+	Represents wasteful use. More water than needed for irrigating cool season turf and typical leaks.	All use above 15 ccf

**Allocations are rounded to next whole ccf in the customer's favor.*

Apartments

Residential customers with no landscape, apartments, are allocated based on the following water budget: Most apartments in IRWD's service area have separately metered outdoor use. If outdoor use is on the same meter as the indoor potable water, it will be allocated using the formula for drought tolerant plants and efficient irrigation. In those instances, the outdoor allocation will be added to the indoor allocation.

Base Allocation:

Indoor

- 50 gallons per person per day
- Default number of residents per unit is 2. A variance can be requested for additional residents.

TIER	PERCENT OF ALLOCATION	BASIS	AVERAGE CCF PER MONTH*
Low volume	0-60%	Assumes health and safety level of use of 30 gallons per person per day	3
Base	61-100%	Provides additional 20 gallons per person per day, a measure of efficient indoor use plus the outdoor allocation based on drought tolerant plants and efficient irrigation	2
Inefficient	101-120%	Based on studies indicating that leaks can account for up to 17% of use.	2
Wasteful	121%+	Represents wasteful use. More water than needed even beyond typical leak rates.	All use above 7 ccf

**Allocations are rounded to next whole ccf in the customer's favor.*

Non Residential Allocations and Tiers

Potable Irrigation

Potable irrigation accounts are allocated on the same basis as residential customers, using drought tolerant plants and efficient irrigation with an ETAF of 0.6 in order to encourage reduced discretionary outdoor use, so that IRWD can meet its state mandated reduction target. Tiers for potable irrigation customers are based as follows:

TIER	PERCENT OF ALLOCATION	BASIS
Low volume	0-60%	Assumes native plants with a crop co-efficient of 0.3 and an irrigation efficiency of 0.85, giving an ETAF of approximately 0.4. Once established, native plants have minimal supplemental watering requirements.
Base	61-100%	Based on drought tolerant plants and efficient irrigation with an ETAF of 0.6
Inefficient	101-160%	Based on cool season turf and an irrigation efficiency of 0.85, resulting in an ETAF of 1.0, or 60% more water than drought tolerant.
Wasteful	161%+	Represents use that is greater than the requirement for cool-season turf, and an efficient irrigation system.

Recycled Water Irrigation

Since recycled water is a more "drought-proof" source of supply, the allocation for recycled water customers is based upon warm-season turf grass. Tiers for recycled water irrigation customers are based as follows:

TIER	PERCENT OF ALLOCATION	BASIS
Low volume	0-40%	Based on drought tolerant plants and efficient irrigation with an ETAF of 0.6 that is approximately 40% of the watering requirement of cool-season turf.
Base	61-100%	Based warm season turf with an ETAF of 0.91
Inefficient	101-130%	Based on cool season turf with an ETAF of 1.2, or approximately 30% more water than warm-season turf.
Wasteful	131%+	Represents use that is greater than the requirement for cool-season turf.

Commercial, Industrial and Institutional

IRWD establishes customized allocations (base indices) for all other non-residential customers based upon the property related needs, including specific business water process requirements, number of employees, customers, business type and seasonal uses. As such, each non-residential customer, commercial, industrial and institutional (CII) is allocated based on efficient use specific to their need. Non-residential customers may request allocation reviews at any time, which include an on-site visit by IRWD staff, in order to accommodate business growth and other needs. Therefore, any use above the allocation is considered wasteful.

TIER	PERCENT OF ALLOCATION	BASIS
Base	0-100%	Based on providing the water required for the specific business need. As a result there is no low-volume tier.
Wasteful	101%+	Use in excess of the business related need is wasteful.

6.4 APPENDIX D: ADDITIONAL CONSIDERATIONS

In addition to replicating the steps of the District's cost of service process in order to evaluate their validity, Carollo engaged the District in a challenging and thought provoking discussion process. The purpose of this process was to further test the validity of the existing rate design and internal cost of service process, identifying potential limitations or disadvantages in its structure. Based on this process, Carollo found that the existing rates provide a strong cost of service basis, with a clearly identifiable methodology for how costs are incurred and recovered and a demonstrated nexus between the rates and the cost of providing service within the systems, rate areas, service classes, and tiers.

While the existing structure is sound, the independent review did yield a variety of policy considerations and adjustments for consideration by the District. These refinements provide alternative methodologies and policy considerations to align expenditures with rates into the future.

The reviewed refinements were determined based on discussions with IRWD staff to address any ratepayer input as well as any cost of service matters presented by Carollo. Once identified, these refinements were evaluated against several policy-driven questions:

- Are there concerns with legal compliance?
- Is it easy to communicate and to understand?
- What is the cost of implementation?
- Does it achieve the stated objective?

Of the considerations Carollo discussed with staff, three were prioritized to bring to the District's Finance and Personnel Committee (F&P). Carollo presented eight policy considerations to F&P:

1. Service charge for low volume users
2. Decoupling of recycled water
3. Seasonal Rates for recycled water
4. Modification to recycled water service charge
5. Revision to sewer discharge methodology
6. Review of pumping charges
7. Multi-Year (Prop. 218 Notice) rate policy
8. Drought planning considerations

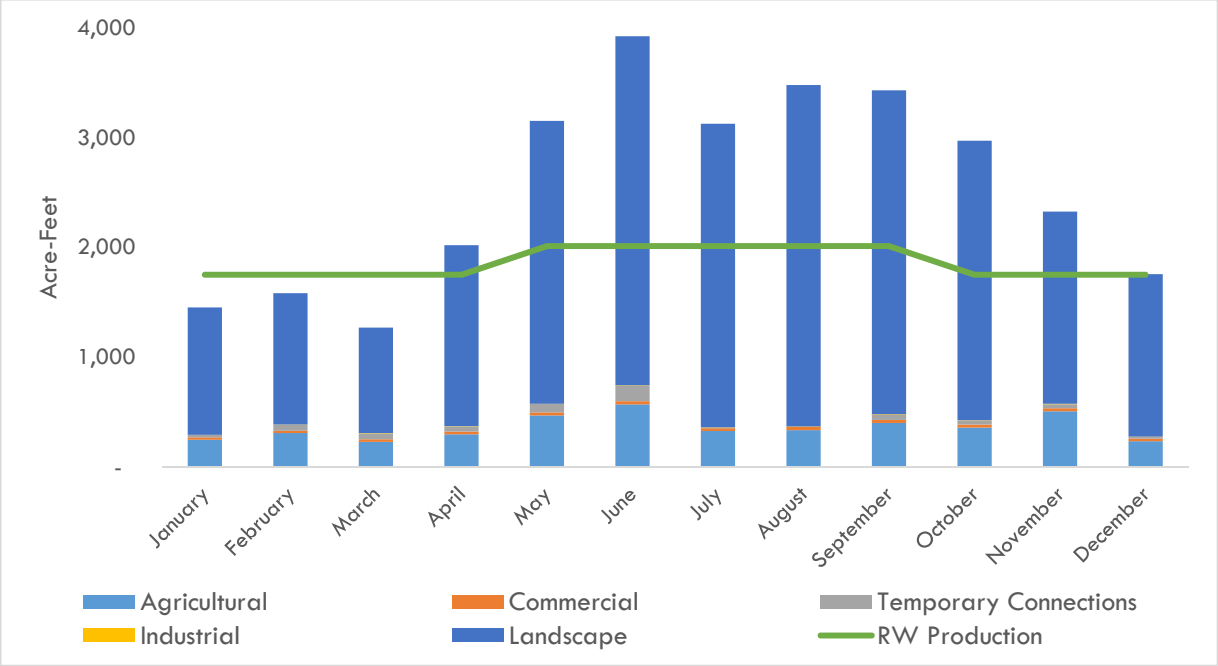
6.4.1 Focus Points for Review

Seasonal Rates for Recycled Water

Many alternatives were reviewed that explored the ability to further encourage recycled water use. Seasonal rates were examined as a possible solution. Seasonal pricing is aimed at aligning price to reflect the cost of peaking on the system. Recycled water demands are highest in the summer and lowest in the winter. At times, recycled water usage is so low that agencies cease production for part of the

year. IRWD has historically shut down production of recycled water at LAWRP as demand falls in the winter.

FIGURE 6-1 RECYCLED WATER DEMANDS & PRODUCTION - FY 2013-14



The premise behind seasonal pricing for recycled water is to incentivize use during the winter months. Upon closer examination, the makeup of the District's recycled water users and existing rate structure would add unnecessary complexity and would likely produce undesirable results. Staff indicated that a lower recycled water rate in winter would likely produce waste and excess runoff, which would be in violation of their regulation. The existing structure better encourages efficient use of recycled water, rather than incentivizing greater use. Furthermore, IRWD uses excess recycled water production in the winter months to refill storage at its storage facilities, such as Syphon Reservoir for usage in summer months. With a lower commodity rate in the winter, recycled water could increase, causing a drop in the volume of water available for storage, and ultimately, for use in the hotter summer months when demand is more urgent. In the end, there are substantial trade-offs involved with this proposal, and the District should carefully scrutinize the costs and benefits against policy priorities prior to implementation.

Allocation of Recycled Water Benefits

In addition to evaluating existing costs, as recycled water is a product of water and sewer usage, its costs are often partially shared or allocated to either water or sewer, Carollo prepared an objective functional allocation of recycled water. Recycled water and Sewer share a common budget, thus expenditures have to be apportioned between the two unique services. Expenditures were allocated on a line-item (function) basis. In order to approximately distribute between the two primary functions,

allocation bases were created. The results of this analysis reveal that in aggregate, existing recycled water rates generate sufficient revenues to cover identified expenditures.

Understanding that there are many shared costs and benefits of recycled water, Carollo's analysis presented potential allocation methodologies to reduce the cost of recycled water. To identify the recycled water's benefit to the water system, Carollo analyzed and presented a cost of water alternative based on two illustrative systems. The first was the total cost of water with the recycled water system. This is how the system operates today. The second was an illustrative, "without" recycled water alternative.

As shown in below, if IRWD was not able to produce 21,000 AF from recycled water, it would necessitate the pumping of groundwater and the purchase of over 15,000 AF of imported water.

TABLE 6-3 ILLUSTRATIVE BENEFIT OF RECYCLED WATER TO THE WATER SYSTEM

SOURCE OF SUPPLY (AF)	WITH RECYCLED WATER	WITHOUT RECYCLED WATER
Ground Water	54,157	54,157
Imported and other Local Sources	23,366	23,366
Recycled Water	21,038	
Additional Ground Water Supply		5,867
Additional Imported Supply		15,171
Total (AF)	**98,561**	**98,561**

Financial Impact	**$(in Thousands)**
Additional Ground Water Supply (RA & Energy)	$2,001
Additional Imported Supply (MWDOC)	10,620
Total Additional Cost of Water	12,620
Total Additional Revenue	11,057
Variance	**$1,564**

Following discussions with F&P, it was decided that this methodology, while understandable, should not be implemented. Based on the understanding that recycled water is now a self-sufficient program, it was F&P's position that recycled water should not be further incentivized as recycled water demand already outstrips production during peak summer periods.

As recycled water is a direct by-product of the sewer treatment process, a direct relationship between sewer and recycled water exists. Multiple approaches are reasonable for allocating sewer treatment costs between sewer and recycled water customers. For the District's program, it is assumed that all treatment through secondary treatment is a cost to clean sewage in order to meet the District's permit requirements. Tertiary treatment provides a final level of treatment in order to meet Title 22 (recycled

water usage) standards and is therefore primarily allocated to recycled water customers. Based on discussions with the District, 75 percent of tertiary treatment costs were allocated to recycled water. Additionally, Carollo worked with IRWD staff to identify possible avoided costs or savings related to the production of recycled water over discharging additional flows to OCSD. While these avenues were explored, no policy considerations were presented to F&P. There are trade-offs involved with this proposal, and the District should carefully scrutinize the costs and benefits against policy priorities prior to implementation.

Modifications to Recycled Water Service Charge

Rather than changing the recycled water commodity charges, modifications to the recycled water service charge were also considered. Primarily, the District wished to examine common costs charged through the monthly service charge that could be reduced if a customer has two meters. While some shared costs could be identified, the necessary data analysis and implementation issues were too difficult to overcome and the potential benefit to the end customer was not material.

Review of Pumping Charges

The District currently has 9 potable pumping charges and 3 recycled water pumping charges. Carollo and IRWD staff prepared a preliminary analysis to determine cost recovery and appropriateness of existing rates. In meeting with staff, it was communicated that the existing system (9 zones) was overly complicated and that rates should be revisited. The existing rates were determined to be reasonable and based on a detailed spreadsheet prepared annually by agency staff as part of the budgeting process for electrical purchases.

As the District is currently undergoing an Embedded Energy Plan to evaluate the District's energy usage throughout the service area, Staff and F&P recommended delaying any changes to pumping rates until the Embedded Energy Plan is completed. Therefore, Carollo has not prepared any recommendations at this time.

Multi-Year Rate Policy

Currently, the District analyzes rates annually as part of the budget process. Each time the rates are adjusted upward, it triggers the noticing requirements of Proposition 218. While this provides that rates are revisited each year, it is a costly and laborious effort. Many agencies have elected to calculate rates once every three to five years and some even have noticed rates for up to ten years. When rates are noticed for future years, it sets a ceiling (maximum) for that rate. The rates do not have to increase to that amount, but they cannot exceed the rates that had been noticed for that year.

A similar approach was discussed with staff and presented to F&P. The cost and labor effort benefits were discussed; however, that cost was offset by the flexibility the annual rate setting process affords. As the District adjusted rates and budget allocations last year, foreseeable changes to customer behavior, and the perpetual threat of worsening drought, it was advised that any consideration of a multiple year rate notice be deferred until better forecasting is available.

Drought Plan Considerations

In response to an August, 2014 Executive Order from the Governor, the State Water Resources Control Board enacted Emergency Regulations due to the severe ongoing drought conditions throughout the state. These regulations prohibited certain outdoor water uses and required urban water providers to do one of the following:

> Implement mandatory outdoor water use restrictions that restrict outdoor watering to two days a week or implement outdoor water restrictions as dictated by their water shortage contingency plans
>
> OR -
>
> In lieu of the first option, agencies like IRWD that have an allocation-based rate structure may submit an alternate plan that shows that the level of water conserved due to the rate structure and other conservation programs is superior to that achieved by restricting outside watering to two days a week.

Although the State Water Resource Control Board approved IRWD's alternate conservation plan for compliance with the State Board's Drought Emergency Water Conservation Regulation, worsening drought conditions caused the State to further modify its Drought Regulations in April 2015.

IRWD's allocation-based rate structures are currently the foundation of the District's Water Shortage Contingency Plan. The structure enables IRWD to effectively use price signals to encourage a quick conservation response from ratepayers. The District is currently updating its Plan in light of the latest events.

As part of the rate and cost of service review, Carollo offered a few additional mechanisms to further and equitably suppress demands in case of worsening or extreme drought conditions. These policies are presented below.

- **Adjustment of Landscape Area:** As a majority of residential accounts have the default outdoor allotments, evaluate impact using calculated landscape area based on aerial or GIS analysis, including non-residential accounts. Should IRWD need to further curtail outdoor allotments, this data could provide an enhanced calculation of reasonable use.
- **Adjustment Crop Coefficient (Kc) or Irrigation Efficiency (IE):** Grass is the highest water-using plant in a landscape. IRWD's FY 2014-15 allocation formula is based on the relative amount of water needed for warm-season turf (Kc, which averages 0.65). Trees and shrubs use far less water than grass – but IRWD's allocation assumes the entire landscape is covered with grass. This allocation provides more than enough water to meet the demands of a majority of landscapes. Additionally, the FY 2014-15 allocation formula is based on an IE of 71 percent to account for inefficiencies in irrigation systems. Adjusting these could further incentivize use of drought tolerant plants and/or more efficient irrigation systems.

6.5 APPENDIX E: WATER REVENUE REQUIREMENT DETAIL

TABLE 6-4 FY 2015-16 DETAILED REVENUE REQUIREMENT FOR IRVINE RANCH RATE AREA

RATE COMPONENT	TIER	ACRE FEET	COST OF WATER[1]	LABOR	MATERIALS & SUPPLIES	GENERAL & ADMINISTRATIVE	TOTAL EXPENDITURES	RESERVES & OFFSETTING REVENUES[3]	TOTAL RATE REVENUE REQUIREMENT
Lowest Cost Source									
Dyer Road Well Field	Low Volume	14,618	$ 6,020	$ 191	$ 258	$ 359	$ 6,828	$ -	**$ 6,828**
Melded Supply									
Dyer Road Well Field	Base	13,382	5,511	175	236	329	6,251		
Treated Groundwater[2]	Base	11,790	5,650	397	950	746	7,743		
Purchased water	Base	2,187	5,011	-	-	-	5,216		
Total Melded Supply		27,360	16,172	572	1,186	1,075	19,210	(475)	**18,735**
Imported Supply									
Purchased water	Inefficient & Wasteful	1,450	2,935	-	16	-	2,952	(1,209)	**1,743**
Untreated									
Untreated	Untreated	2,612	1,859	77	205	139	2,279	(567)	**1,712**
Total Water Supply Costs			**$ 25,963**	**$ 840**	**$ 1,664**	**$ 1,573**	**$ 31,269**	**$ (2,251)**	**$ 29,018**
Water Banking	Inefficient & Wasteful	1,450					701		**701**
General Conservation	All	43,427					946		**946**
Conservation/NTS/Marsh	Wasteful	750					3,466		**3,466**
Total Commodity Revenue Requirement							**$ 36,383**	**$ (2,251)**	**$ 34,131**

Notes

(1) Dollar figures in thousands.

(2) Includes Deep Aquifer Treatment System (8,000 AF), Irvine Desalter Project (2,890 AF), and other District groundwater sources (900 AF).

(3) Revenue offsets include contract service agreement revenue and non rate generated revenue.

TABLE 6-5 FY 2015-16 DETAILED REVENUE REQUIREMENT FOR LOS ALISOS RATE AREA

RATE COMPONENT	TIER	ACRE FEET	COST OF WATER[1]	LABOR	MATERIALS & SUPPLIES	GENERAL & ADMINISTRATIVE	TOTAL EXPENDITURES	RESERVES & OFFSETTING REVENUES[2]	TOTAL RATE REVENUE REQUIREMENT
Lowest Cost Source									
Purchased water	Low Volume	2,804	$ 2,831	$ -	$ 31	$ -	$ 2,862	$ (921)	**$ 1,941**
Melded Supply									
Purchased water	Base	3,252	3,283	-	36	-	3,319	1	**3,320**
Imported Supply									
Purchased water	Inefficient & Wasteful	230	232	-	3	-	235		**235**
Total Water Supply Costs		**6,286**	**$ 6,347**	**$ -**	**$ 69**	**$ -**	**$ 6,417**	**$ (921)**	**$ 5,496**
Water Banking	Inefficient & Wasteful	230					121	1	**121**
General Conservation	All	6,286					150		**150**
Conservation/NTS/Marsh	Wasteful	125					632		**632**
Total Commodity Revenue Requirement							**$ 7,320**	**$ (920)**	**$ 6,399**

Notes

(1) Dollar figures in thousands.

(2) Lowest cost of source water (MWDOC untreated $2.34/ccf) offset by a sinking fund from future proceeds from sale of Los Alisos property. It is anticipated that the sale of the property surrounding the former Los Alisos Water District headquarters in Lake Forest will generate proceeds sufficient to provide necessary contribution or to fund an ongoing offset of the difference in source water cost, allowing the commodity rates within the Irvine Ranch rate area and Los Alisos rate area to be calculated on the same basis. When the property sale is completed, the Los Alisos rate area will be transitioned into the Irvine Ranch rate area. In anticipation of the sale, IRWD, as a matter of policy, has elected to advance a portion of the anticipated property sale proceeds from non-operating funds to offset the Los Alisos rate area's differential in source water cost in the Low Volume and Base tiers.. The Los Alisos rate area has previously been transitioned to the Irvine Ranch rate area's sewer rate structure.

TABLE 6-6 FY 2015-16 DETAILED REVENUE REQUIREMENT FOR WATER SERVICE CHARGE

Appendix -- Detailed Water Service Revenue Requirement

BUDGET ITEM	FY 2015-16 PROJECTED
Labor	$ 5,623
Materials & Supplies	9,684
General & Administrative	10,571
General Plant	592
System Replacement Funding	5,815
Less Included Variable Costs	(2,167)
Total	**$ 30,118**

Notes

(1) Dollar figures in thousands.

6.6 APPENDIX F: RECYCLED REVENUE REQUIREMENT DETAIL

TABLE 6-7 FY 2015-16 DETAILED REVENUE REQUIREMENT FOR RECYCLED WATER

RATE COMPONENT	TIER	ACRE FEET	COST OF WATER[1]	LABOR	MATERIALS & SUPPLIES	GENERAL & ADMINISTRATIVE	CUSTOMER SERVICE, FLEET SERVICE, & GENERAL PLANT	TOTAL EXPENDITURES	RESERVES AND OFFSETTING REVENUES	TOTAL RATE REVENUE REQUIREMENT
Lowest Cost Source										
MWRP & LAWRP[2]	Low Volume	15,015	$ 1,905	$ 626	$ 1,266	$ 1,148	$ 1,783	$ 6,728	$ 289	**7,018**
Melded Supply										
MWRP & LAWRP	Base	4,985	633	208	420	381	592	2,234		
Purchased Water	Base	10,746	6,780	275	340	535	-	7,930		
Total Melded Supply		15,731	7,413	483	760	916	592	10,164	(776)	**9,388**
Imported Supply										
Purchased Water	Inefficent & Wasteful	2,074	1,373					1,373	-	**1,373**
Total Water Supply Costs		**32,820**	**$ 10,692**	**$ 1,109**	**$ 2,026**	**$ 2,063**	**$ 2,376**	**$ 18,265**	**$ (486)**	**$ 17,779**
Conservation/NTS/Marsh		1,613						3,000		**3,000**
Total Commodity Revenue Reqirement								**$ 21,265**		**$ 20,779**

Notes

(1) Dollar figures in thousands

(2) Michelson and Los Alisos Water Reclamation Plants

6.7 APPENDIX G: SEWER REVENUE REQUIREMENT DETAIL

TABLE 6-8 FY 2015-16 DETAILED REVENUE REQUIREMENT FOR SEWER

BUDGET ITEM	COST OF WATER[1]	LABOR	MATERIALS & SUPPLIES	GENERAL & ADMINISTRATIVE	OTHER EXPENSES	TOTAL EXPENDITURES
VARIABLE REVENUE REQUIREMENT						
Primary Treatment Michelson	$ 169	$ 501	$ 314	$ 933		**$ 1,916**
Secondary Treatment Michelson	926	598	387	1,098		**3,010**
Secondary Treatment Los Alisos	1	12	0	23		**37**
Collection OC Sanitation District	-	0	4,490	0		**4,491**
Treatment and Disposal OCSD	4	20	70	37		**131**
Secondary Treatment Los Alisos	812	381	93	714		**1,999**
Total Variable Cost	**$ 1,912**	**$ 1,512**	**$ 5,354**	**$ 2,806**		**$ 11,583**
Reserves and offsetting revenues						**6,530**
Total Variable Rate Revenue Requirement						**$ 18,113**
FIXED REVENUE REQUIREMENT						
Sewage Collection Michelson	$ 134	$ 1,315	$ 1,638	$ 2,471		**$ 5,558**
Sewage Collection FOG Program	-	24	-	46		**70**
Sewage Treatment Michelson Generator Facility	8	54	42	101		**205**
Ocean Disposal Los Alisos	40	20	256	38		**355**
Biosolids Disposal Michelson	-	-	7	-		**7**
Biosolids Disposal OC Sanitation District	-	5	8,403	10		**8,419**
Biosolids Thickening Michelson	70	-	-	-		**70**
Customer Services					1,397	**1,397**
Fleet Services					518	**518**
General Plant					461	**461**
Total Fixed Cost	**$ 252**	**$ 1,419**	**$ 10,346**	**$ 2,667**	**$ 2,376**	**$ 17,058**
Reserves and offsetting revenues						**3,585**
Total Fixed Rate Revenue Requirement						**$ 20,644**
Additional Replacement & Enhancement Funding						**$ 7,391**
Other Offsetting Revenues						**(10,091)**
Total Sewer Revenue Requirement						**$ 36,057**

Notes

(1) Dollar figures in thousands