DRAFT TECHNICAL MEMORANDUM

South Fork Water Board Water System Master Plan System Development Charge

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1.0 Introduction

South Fork Water Board (SFWB) contracted with CH2M and MWH to update its Water System Master Plan and prepare a system development charge (SDC) study in compliance with Oregon State law. This technical memorandum presents the methodology, underlying assumptions, and proposed findings and recommendations for SFWB's SDC. The SDC analysis and the associated capital improvement plan (CIP) span a 20-year period beginning in year 2016 and ending in year 2036 – hereinafter referred to as the planning period.

2.0 Overview

SFWB is updating it water system master plan to evaluate the water supply system and prepare a 20-year capital improvement plan (CIP). The emphasis of this master plan update is on providing priority upgrades related to system capacity and seismic deficiencies.

Oregon Revised Statutes (ORS) 223.297-223.314 authorizes local governments to assess SDCs for capital improvements to water supply, water treatment, and distribution systems. SDCs can be developed around two concepts: (1) a reimbursement fee, and (2) an improvement fee, or a combination of the two. ORS 223.299 defines a reimbursement fee as "...a fee for costs associated with capital improvements already constructed, or under construction when the fee is established, for which the local government determines that capacity exists." Improvement fees must be based on projects identified in an adopted plan that are needed to increase capacity in the system to meet the demands of new development.

Capital improvements to provide additional capacity in a water system must generally be constructed in large increments; therefore, system expansions are often constructed years in advance of when the added capacity will be fully utilized. SDCs are intended to recover some or all of the cost of these expansions to serve new growth from new connections to the water system.

Revenues generated through the assessment of SDCs are generally used to directly offset the costs of a system expansion. The revenues may also be held to offset the costs of future system expansions. The SDCs calculated herein are designed to recover the investment that has been made

in the existing system to provide capacity to serve new users, as well as recover the portion of the costs of the improvements to be constructed to the water system that will provide capacity to serve new users.

SFWB adopted Resolution Number 94-10 in 1994 to implement statutory authority to impose SDCs, and the methodology used for this update of SDCs is consistent with provisions of that resolution. SDCs are calculated only for Oregon City and West Linn customers in that they are owners of the system.

3.0 Methodology

CH2M evaluated industry-standard impact fee calculation methodologies defined by the American Water Works Association (AWWA) M1 Manual *"Principles of Water Rates, Fees, and Charges"* These methods include:

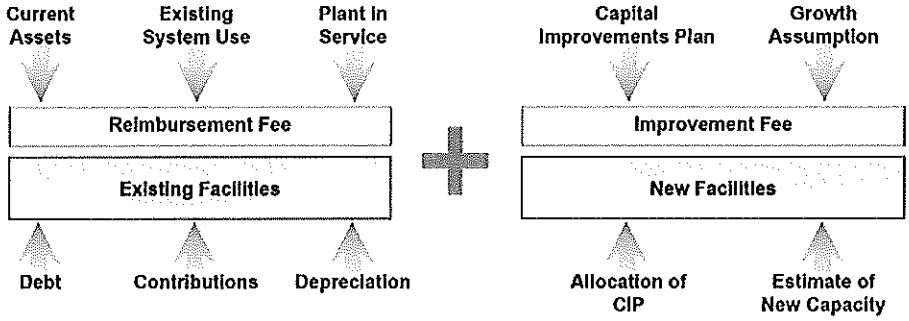
- Equity Buy-In method
- Incremental Cost method
- Hybrid method

The goal of the **equity buy-in method (or Reimbursement Method),** is to achieve an equity position between new and existing customers of the system. This approach is best suited for existing facilities that have been oversized and have excess capacity available. It utilizes the original cost of existing assets, escalated to current value using a standard cost index such as Engineering News-Record Construction Cost Index. When applicable, adjustments are made to account for outstanding debt and developer contributions. The resulting estimate of current system equity is divided by the number of equivalent residential units (ERUs) connected to the system to compute an average cost per ERU. The equity buy-in method is described as the reimbursement fee in ORS.

The **incremental cost method (or Improvement Method),** assigns to new development the incremental cost of system expansion needed to serve new development. This approach is best suited for communities that have limited existing capacity, and have prepared detailed growth-related capital project plans and acquisition plans. The cost of projects proposed over a specified time frame including interest and financing costs, is divided by the number of equivalent customers that will be served by the additional capital projects to compute an average cost per ERU. The incremental cost method is described as the improvement fee in ORS.

Incremental average costs per EDU may be additive for separate infrastructure components or may be combined on a weighted-average basis for similar infrastructure components. The **hybrid method** applies principles from both methods and is appropriate where some existing reserve capacity for growth is available and new capacity is planned. CH2M utilized the incremental cost method to compute SFWB's SDC and included proposed infrastructure projects as the basis for the incremental average cost per ERU calculation. The hybrid method is allowed under ORS.
Exhibit 1 summarizes the Buy-In and Incremental SDC methodologies. The Hybrid methodology combines the Buy-In and Incremental methodologies and is the most representative of the SDC requirements specified in Oregon Revised Statutes (ORS).

EXHIBIT 1
SDC Methodology



For the purposes of this analysis, CH2M assumed SFWB would issue water revenue bonds to fund the infrastructure proposed in the water system plan. Because the revenue bonds would be backed by system water rate revenues, financing costs were not included in the SDC calculation. If SFWB decides to pledge SDC revenues to pay for annual principal and interest payments, financing costs could be incorporated into the SDC. If financing costs are included in the SDC calculations and debt service is backed by water rate revenues, a credit representing the anticipated amount of debt service new users would pay through rates would have to be applied to the SDC to avoid charging new users twice for financing costs. Depending on the financing terms, interest and financing costs would add approximately 60 percent to the cost of the future improvements. Potential impacts to SDC calculations would be verified when a funding strategy is selected and secured.

4.0 Existing System Development Charges

The existing water SDC's are presented in Exhibit 2. The current SDC per equivalent meter (based on a 5/8" x 3/4" meter) is $1,623. SDC rates for larger meter sizes are calculated by multiplying the base fee times the hydraulic equivalency factor for each meter size. The charges were adopted in 2010 and are updated annually based on the Construction Cost Index for Seattle developed by the Engineering News Record (ENR).

EXHIBIT 2
South Fork Water Board Current SDC

Meter Size	Meter Equivalent	SFWB SDC
5/8" x 3/4"	1	$1,623
3/4"	1.5	$2,435
1"	2.5	$4,058
1.5"	5	$8,116
2"	8	$12,986
3"	16	$25,972
4"	25	$40,582
6"	50	$81,163
8"	80	$129,861
10"	115	$186,676

5.0 System Demand

In order to present water demands using a standardized measure of consumption, average consumption attributable to an individual unit of development (calculated pursuant to generally accepted engineering and planning standards) is expressed in terms of Equivalent Residential Unit (ERU). A water utility ERU is represented by a residential customer with a 5/8 x 3/4 inch meter. The equivalent meter capacity requirements were determined based on the estimated 2015 maximum day demand (MDD) for Oregon City and West Linn from the Master Plan (15.8mgd, combined) and the average per capita MDD (265 gallons per day). A review of existing billing data for the communities of Oregon City and West Linn showed the respective water systems served approximately 24,000 ERUs. Based on an examination of historic billing statistics and water system characteristics, SFWB's current average day ERU demand characteristics are approximately 115 gallons per day per capita. Exhibit 3 presents existing population and water system demands in the two cities.

EXHIBIT 3
Existing Population and Water Demand for West Linn and Oregon City, 2015

Estimated Population	59,545
Estimated ERUs	23,771
Average Day Demand (mgd)	6.84
Max Day Demand (mgd)	15.8
Per capita ADD (gallons)	115.0
Per capita MDD (gallons)	265

The projected demand for water from new ERUs in the service area over the 20-year forecast period is provided in Exhibit 4. Based on an average of 2.6 persons per household, the system is expected to serve approximately 36,000 ERUs in 2036. Annual maximum day water demand is forecasted to increase from the current level of approximately 20.6 million gallons to 31.5 million gallons by the end of the study period. The annual growth rate in water system demand averages approximately 2.0 percent over the study period.

EXHIBIT 4
Population Projections and Water Demand Projections for SFWB

Year	Forecasted Population[1]	ERUs	Average ADD (mgd)	Average MDD (mgd)
2016	64,040	23,771	8.8	20.6
2021	71,079	26,309	9.8	22.8
2026	79,111	29,194	10.8	25.3
2031	88,287	32,656	12.1	28.3
2036	98,469	36,348	13.5	31.5

[1] Population forecast includes West Linn and Oregon City.

6.0 Existing Capacity

Current supply capacities for SFWB are summarized in Exhibit 5. Much of the SFWB system was originally configured with a capacity of 20 to 25 mgd. The existing demand is approaching the capacity of many of the supply components, other than the raw water intake and pump station.

EXHIBIT 5
Existing Capacity Evaluation of SFWB System

SFWB Component	Current Capacity	Current Demand	Available Capacity
Supply			
Clackamas River Intake	52 mgd	22 mgd	58%
Transmission			
Raw Water Transmission	22 mgd	22 mgd	0%
Finished Water Transmission—WTP to DSPS	21.9 mgd	20 mgd	9%
Finished Water Transmission – WTP to Hunter Ave PS		0.51 mgd	
Finished Water Transmission—DSPS to Mountain View Reservoir	17.6 mgd	16.9 mgd	4%
Finished Water Transmission—DSPS to Bolton Reservoir	10 mgd	8.1 mgd	19%
Treatment			
WTP—Rapid Mix	22 mgd	22 mgd	0%
WTP—Flocculation and Sedimentation	22 mgd	22 mgd	0%
WTP—Filters	30 mgd	22 mgd	27%
WTP—Clear Wells	52 mgd	22 mgd	58%
Pumping/Storage			
Raw Water Pump Station	30.8 mgd	22 mgd	29%
DSPS	17.6 mgd	17 mgd	0%
Operational Storage	2.8 MG	0.1 MG	
Emergency Storage	2.8 MG	0.4 MG	

7.0 Design Capacity

For the SFWB water system, capacity requirements are generally measured based on maximum day demands measured in millions of gallons per day (mgd). Exhibit 6 shows the existing maximum day demand (MDD) for the system and the projected growth requirements for the planned expansions. A portion of the water system facilities are sized for the ultimate 52 mgd projected need (ultimate supply system capacity), while other facilities are sized for the 40 mgd capacity. As shown in Exhibit 6, the current MDD is about 22.0 mgd.

EXHIBIT 6
Design Capacity

Capacity	Max Day Demand (mgd)	Growth Requirements (mgd)	Growth %
Current Capacity	22.0		
Expanded Capacity to 40 mgd	40.0	18	45.0%
Expanded Capacity to 52 mgd	52.0	30.0	57.7%

For those facilities sized to meet 40 mgd capacity, growth requirements represent approximately 42 percent of the capacity needs. For the 52 mgd capacity facilities, approximately 55 percent of the requirements are for future growth demands.

8.0 System Development Charge Calculation

The SDCs calculated herein consist of a reimbursement fee and an improvement fee. The reimbursement fee is designed to recover the cost of capacity in the existing water system available to serve new users. The improvement fee is designed to recover the cost of capacity in the planned system improvements to serve new users. The sum of the reimbursement fee and improvement fee is the proposed SDC per residential equivalent.

The total capital investment in the water system available to serve new users is divided by the available capacity of the system in terms of its capacity per residential equivalent to derive a unit investment per residential equivalent.

Reimbursement

For this analysis, it was assumed the list of existing system assets developed in the 2010 SDC study were unchanged. The assets and their cost are presented in Exhibit 7. Original costs were inflated by the historic Construction Cost Index to develop an estimate of current value. The list of assets was compared to the assets listed in the available system capacity presented in Exhibit 6 to determine which components have capacity available for growth. These facilities relate to the raw water intake, raw water pumping, and a number of treatment plant components (primarily general system assets and clearwell).

The total replacement value of the facilities shown in Exhibit 7 is estimated to be $23.2 million, based on the original construction costs adjusted for inflation. Available capacity of existing assets was estimated to determine whether the component had no available capacity or could meet future demands (40 mgd or 52 mgd). In order to develop the unit costs, the existing system components with available capacity is allocated to the appropriate capacity category (52 mgd or 40 mgd), and divided over the respective additional capacity units (from Exhibit 6). In this way, the unit costs reflect the total capacity that remains in existing facilities.

The unit cost of capacity is then multiplied by the capacity requirements of an equivalent meter. For this analysis, the capacity requirements for an equivalent meter were estimated by dividing the

2015 MDD for Oregon City and West Linn (15.8 mgd) by the meter equivalents for the two cities (23,771). The equivalent meter MDD requirements are estimated to be 663 gallons per day.

The total available capacity value is estimated to be $11.6 million, and consists of $5.1 million of intake/raw water pumping facilities, $2.4 million of transmission and $4.2 million in treatment facilities.

EXHIBIT 7
SFWB Current Assets

Facility	Year Constructed	Original Cost	Inflation Factor	Inflated Cost	Available Capacity	Growth Amount	GPM
Raw Water Intake							
2004-05 Construction (VFDs)	2005	$812,583	1.39	$1,133,390	29%	$323,826	-
Intake Structure	1996	$4,302,347	1.85	$7,950,653	58%	$4,586,915	52
Raw Water Pipeline	1996	$598,076	1.85	$1,105,233	0%	$0	-
Land	1959	$21,500	13.03	$280,165	58%	$162,496	52
Subtotal		$5,734,506		$10,469,441		$5,073,237	
Transmission							
42" Trans. Line (HOP Water Project	2000	$1,424,520	1.67	$2,378,165	81%	$1,926,314	52
Pipeline "B"	2002	$468,667	1.59	$744,480	58%	$429,508	52
Subtotal		$1,893,187		$3,122,645		$2,355,822	
Treatment							
Shop/Pole Building	1993	$11,593	1.99	$23,110	58%	$13,404	52
Electrical for plant	1997	$29,810	1.78	$53,140	58%	$30,821	52
On-site Hypo Generation	2000	$191,224	1.67	$319,239	58%	$185,159	52
Filter to waste	2001	$179,850	1.64	$294,894	0%	$0	40
Flocculation Improvements	2001	$273,072	1.64	$447,747	0%	$0	-
Backwash/irrigation	2001	$87,650	1.64	$143,717	27%	$38,804	40
Hypo-chlorinator cell	2002	$65,000	1.59	$103,253	27%	$27,878	40
Filter pipe gallery	2003	$784,904	1.55	$1,217,651	0%	$0	40
New Sodium Hypo System	2007	$69,539	1.30	$90,610	58%	$52,554	52
Tracware Software	2005	$24,225	1.39	$33,789	58%	$19,598	52
SCADA system upgrade	2006	$100,000	1.34	$134,019	58%	$77,731	52
2 mgd Clearwell	2007	$69,830	1.30	$90,989	58%	$52,494	52
2 mgd Clearwell	2008	$337,624	1.25	$421,897	58%	$243,402	52
3 mgd Clearwell	2009	$3,808,774	1.21	$4,615,634	58%	$2,662,866	52
Raw Water Flowmeter	2006	$100,000	1.34	$134,019	58%	$77,731	52
Alternate power	1999	$351,202	1.71	$601,991	58%	$349,155	52
Headhouse/filter plant (property)	1958	$48,506	13.68	$663,724	58%	$382,918	40
Subtotal		$6,532,803		$9,389,423		$4,214,513	
Pumping							
Division street pump station	1958	$14,315	13.68	$195,877	0%	$0	-
Division street land	2007	$19,000	1.30	$24,757	0%	$0	-
Subtotal		$33,315		$220,634		$0	
Total		$14,193,811		$23,202,144		$11,643,571	

Exhibit 8 presents a summary of the reimbursement fee calculation for existing assets with available capacity to serve new growth. The reimbursement fee is $257 per equivalent residential unit.

EXHIBIT 8
Reimbursement Fee Calculation

Value of Projects with 40 MGD Capacity	$449,599
Additional Capacity (mg)	18.00
Reimbursement Cost ($/mg)	$24,978
Value of Project with 52 MGD Capacity	$10,870,146
Additional Capacity (mg)	30.00
Reimbursement Cost ($/mg)	$362,338
Total Reimbursement Cost ($/mg)	$387,316
MDD Gal/ERU	663
Total Reimbursement SDC per ERU	**$257**

Improvement Fee

According to ORS 223.309, "Prior to the establishment of a system development charge by ordinance or resolution, a local government shall prepare a capital improvement plan, public facilities plan, master plan or comparable plan that includes a list of the capital improvements that the local government intends to fund, in whole or in part, with revenues from an improvement fee and the estimated cost, timing and percentage of costs eligible to be funded with revenues from the improvement fee for each improvement."

The SDCs calculated herein are based on the capital improvement plan developed as part of the SFWB's Water System's Master Plan. Exhibit 9 presents the proposed project list for the analysis period. The projects have been designated to either serve existing customers, new customers, or both. A portion of the water system facilities are sized for the ultimate 52 mgd projected need (ultimate supply system capacity), while other facilities are sized for the 40 mgd

Total CIP costs over the planning period in 2016 dollars are estimated at $70.4 million. Approximately $60.7 million (86%) is needed to serve new customers; the remaining $9.7 (14%) million is expected to serve existing customers.

EXHIBIT 9

South Fork Water Board Water System Proposed CIP

Project	2016 Cost	% Existing Customers	% Growth	$ Existing Customers	$ Growth	MGD
High Priority Projects	**$13,360,000**			**$8,678,846**	**$5,181,154**	52
New Chemical Building	$2,000,000	42%	58%	$846,154	$1,153,846	52
SCADA Upgrades	$250,000	42%	58%	$105,769	$144,231	40
Pipeline Condition Assessment & Lining	$7,600,000	100%	0%	$7,600,000	$0	52
Raw Water Pipeline	$2,810,000	0%	100%	$0	$2,810,000	
Emergency Treatment Trailers	$300,000	42%	58%	$126,923	$173,077	52
Finished Water Pipeline Bypass to Hunter Ave	$900,000	0%	100%	$0	$900,000	52
30 MGD Expansion	**$35,058,000**			**$568,098**	**$34,489,902**	40
Rapid Mix/Flowmeter Vault (connects to new 42" RW pipe)	$672,000	0%	100%	$0	$672,000	52
30" Coagulated Water pipe to new Floc/Sed Basin	$168,000	0%	100%	$0	$168,000	52
Intermediate Ozonation System (1,000 ppd) incl. contactor and generator/bldg**	$6,748,000	0%	100%	$0	$6,748,000	52
Re-route 8" recycle pipe to upstream of Rapid Mix Vault	$28,000	0%	100%	$0	$28,000	40
Structural/cosmetic improvements to existing floc/sed basins	$168,000	42%	58%	$71,077	$96,923	52
Structural/cosmetic improvements to existing Headhouse	$168,000	42%	58%	$71,077	$96,923	40
New 10 MGD Floc/Sed Basin (with sludge collectors)	$4,634,000	0%	100%	$0	$4,634,000	52
36" Settled Water pipe to filters	$168,000	0%	100%	$0	$168,000	52
Two new filters (896sf each, with GAC/sand dual media + air scour)	$5,488,000	0%	100%	$0	$5,488,000	40
Modify 4 existing filters with GAC/sand dual media + air scour)	$840,000	42%	58%	$355,385	$484,615	40
Modify Headhouse lower level for Workshop and Storage	$168,000	42%	58%	$70,560	$97,440	52
Misc. Yard Piping	$168,000	0%	100%	$0	$168,000	40
Site Work	$168,000	0%	100%	$0	$168,000	52
New Plant Electrical Service (located near New Chemical Building)	$336,000	0%	100%	$0	$336,000	
Electrical and Instrumentation upgrades and modifications	$336,000	0%	100%	$0	$336,000	52
Finished Water Transmission Pine	$14,800,000	0%	100%	$0	$14,800,000	52
Expansion to 40 MGD	**$21,490,000**			**$426,462**	**$21,063,538**	40
Demolish Existing/Older Floc/Sed Basins	$336,000	0%	100%	$0	$336,000	52
36" Coagulated Water pipe to new Floc/Sed Basins	$252,000	0%	100%	$0	$252,000	52
2 New 15 MGD Floc/Sed Basin (with plate settlers and sludge collectors)	$9,702,000	0%	100%	$0	$9,702,000	40
42"" Settled Water pipe to filters	$252,000	0%	100%	$0	$252,000	40

300 kW Diesel Generator (inside bldg) and related electrical modifications	$504,000	42%	58%	$213,231	$290,769	40
Misc. Yard Piping	$168,000	0%	100%	$0	$168,000	52
Site Work	$168,000	0%	100%	$0	$168,000	52
Electrical and Instrumentation upgrades and modifications	$336,000	0%	100%	$0	$336,000	52
Three centrifuges, feed pumps, polymer systems and other mechanical systems	$2,534,000	0%	100%	$0	$2,534,000	52
Two-story centrifuge building (includes HVAC systems, built for addition of future equipment)	$2,534,000	0%	100%	$0	$2,534,000	52
Two 25-foot diameter thickeners	$1,008,000	0%	100%	$0	$1,008,000	52
Thickened sludge pump station	$504,000	0%	100%	$0	$504,000	52
One 100,000-gal thickened solids holding tank, mixers and support systems	$420,000	0%	100%	$0	$420,000	40
Install automated sludge collectors in 2 existing floc/sed basins**	$672,000	0%	100%	$0	$672,000	40
Re-line existing BW ponds and replace transfer pumps	$504,000	42%	58%	$213,231	$290,769	52
Yard Piping	$168,000	0%	100%	$0	$168,000	52
Site Work	$168,000	0%	100%	$0	$168,000	52
Electrical and Instrumentation for mechanical dewatering systems (15%)	$1,260,000	0%	100%	$0	$1,260,000	40
Total	**$70,408,000**			**$9,673,406**	**$60,734,594**	

As indicated previously, the planned improvements do not represent the full costs of meeting the ultimate 52 mgd capacity need; some costs represent only the 40 mgd capacity increment. Therefore, in developing the unit costs, the system value is allocated to the appropriate capacity category (52 mgd or 40 mgd), and divided over the respective additional capacity units (from Exhibit 6). In this way, the unit costs reflect the total capacity that may be served by the improvements.

The unit cost of capacity is then multiplied by the capacity requirements of an equivalent meter. For this analysis, the capacity requirements for an equivalent meter were estimated by dividing the 2015 MDD for Oregon City and West Linn (15.8 mgd) by the meter equivalents for the two cities (23,771). The equivalent meter requirements are estimated to be 663 gallons per day.

As presented in Exhibit 10, the improvement component per EDU is $1,760.

EXHIBIT 10
Improvement Fee Calculation

Value of Projects with 40 MGD Capacity	$28,425,077
Additional Capacity (mgd)	18.00
Improvement Cost ($/mg)	$1,579,171
Value of Projects with 52 MGD Capacity	$32,309,517
Additional Capacity (mgd)	30.00
Improvement Cost ($/mg)	$1,076,984
Total Improvement Cost ($/mg)	$2,656,155
MDD Gal/ERU	663
Total Improvement SDC per ERU	$1,760

Compliance

Oregon Revise Statutes allows the SFWB to include the costs associated with complying with SDC law in the SDC calculation. Exhibit 11 presents a summary of the estimated compliance fee. Compliance costs include the costs associated with administering the SDC, developing the SDC methodology, and developing the project list in the master plan. Only the portion of the master plan effort associated with serving new growth can be included in the SDC. Based on the cost of the CIP attributable to growth, it was assumed that approximately 86 percent of the Master Plan effort was attributable to growth. The compliance charge was assumed to be collected over a 5 year period and is based on the number of new EDUs per year during that period.

EXHIBIT 11
Compliance Fee Calculation

Estimated Master Plan Costs	$130,000
% Allocated to Growth	86%
Growth Related costs	$112,139
Annualized over 5 years	$22,428
Estimated Annual ERUs	508
Compliance Cost	$44

Note: Master Plan costs include fees to updated SDCs.

Debt Service Credit

A portion of the existing system facilities were funded through bond proceeds. The debt service for the outstanding bonds is being repaid through a combination of SDC and other system revenues, including water rates. The last payment of the bond is scheduled for 2018. It is assumed that the last payment will be made from the bond reserve fund and rates. As the bond is expected to be retired in the near future, a debt service credit was not included in this update.

Annual Adjustments

In accordance with Oregon SDC law, the SDC can be adjusted periodically based on a standard inflationary index, and the specific cost index must be published by a recognized organization or agency that is independent of the SDC methodology. SFWB has used the Construction Cost Index for Seattle developed by ENR, and it is recommended that the SFWB continue the practice of making an annual inflationary adjustment as a component of the SDCs.

9.0 Proposed Connection Fees

The proposed water system development charges are presented in Exhibit 12. The SDC includes improvement fee, reimbursement fee, and compliance fee. The total SDC for a 5/8" x 3/4" meter is $2,054. Meter capacity ratios published by AWWA were used to calculate the SDC for meters larger than 5/8" x 3/4" meters.

EXHIBIT 12
Proposed SDC

Meter Size	Meter Equivalent	Reimbursement Fee	Improvement Fee	Compliance Costs	SFWB SDC
5/8" x 3/4"	1	$257	$1,760	$44	$2,061
3/4"	1.5	$385	$2,640	$66	$3,091
1"	2.5	$642	$4,400	$110	$5,152
1.5"	5	$1,283	$8,800	$221	$10,304
2"	8	$2,053	$14,079	$353	$16,486
3"	15	$3,849	$26,399	$663	$30,911
4"	25	$6,416	$43,998	$1,104	$51,518
6"	50	$12,832	$87,997	$2,209	$103,037
8"	80	$20,530	$140,794	$3,534	$164,859
10"	115	$29,512	$202,392	$5,080	$236,984