



June 4, 2021

VIA EMAIL

Mauricio E. Guardado, Jr., General Manager
United Water Conservation District
1701 Lombard St, 2nd Floor
Oxnard, CA 93030

RE: Stratecon Analysis of the structure of United Water Conservation District's Water Groundwater Extraction Charges for FY 2021-2022

Dear Mr. Guardado:

You requested that Stratecon Inc. prepare an economic analysis regarding the structure of United Water Conservation District's ("United Water") Groundwater Extraction Charges for FY 2021-2022. I present the approach Stratecon developed, discuss how that approach is consistent with allocated costs bearing a fair or reasonable relationship to groundwater pumpers burdens on, or benefits received from, United Water's replenishment activities, and present a reasonable range of the ratio of municipal & industrial groundwater extraction charges to agricultural groundwater extraction charges.

Based on the economic principles, information and analysis presented below, I conclude that reasonable range for the ratio of the Municipal & Industrial rate per acre-foot of groundwater pumped to the Agricultural rate per acre-foot of groundwater pumped between 2.5 and 4.7 reasonably reflect the quantitative differences between the hydrological impact of municipal & industrial pumping and land use versus agricultural pumping and land use in the eight interconnected basins within United Water's jurisdictional boundaries.

STRATECON APPROACH

A reasonable rate structure considers the impact of pumping on the demand for United Water's replenishment projects and activities and the relative contribution of different types of land use decisions on direct recharge on overlying lands.

Figure 1 illustrates the relation between United Water’s Objective (addressing groundwater overdraft and ensuring reliable groundwater supplies) and undertaking replenishment activity within the context of groundwater pumping and land uses. Groundwater pumping generates revenues to cover United Water’s cost of replenishment activity. Groundwater pumping also contributes to groundwater overdraft, although the quantitative impact depends on the portion of applied groundwater that does not return as beneficial recharge to United’s basins. Natural recharge offsets groundwater overdraft from two sources:

- recharge from streams and undeveloped lands, and
- recharge from overlying lands.

The change in groundwater overdraft reflects the balance between the impact of groundwater pumping (adjusted for the return of applied groundwater to the basins) versus the impact of recharge from streams and undeveloped lands and from overlying lands.

In Stratecon’s opinion, a reasonable rate design incorporates three principles.

Principle 1: Fee for a water user class is the sum of a variable cost component and a fixed cost component.

$$\text{Fee} = \text{Variable Cost Component} + \text{Fixed Cost Component}$$

Variable costs are the portion of replenishment costs that vary with the volume of replenishment water. Fixed costs are the portion of replenishment costs that do not vary with the volume of replenishment water.

The cost structure for United Water’s replenishment activities is predominately, if not exclusively, independent of the annual pumping of groundwater within the eight interconnected basins within United Water’s jurisdictional boundaries. Electricity is the major cost incurred by United Water that depends on the scale of United’s activities. However, those variable costs are recovered in the pipeline charges for surface water delivered through the Oxnard-Hueneme, Pleasant Valley, Pumping Trough pipelines. Treatment costs incurred by United Water, a portion of which depends on the volume of United’s activities, are also included in pipeline charges. The costs incurred by United Water’s State Water Project Table A contract is paid by property taxes. United’s acquisition of supplemental water supplies is financed by a supply surcharge, not revenues generated by groundwater extraction charges. Debt service, another large component of United Water’s annual cost of service, does not depend on annual groundwater pumping. The cost of supply and services (professional fees, legal etc.) are also independent of annual groundwater pumping. The operations of the Freeman Diversion project are driven by the availability of surface water for recharge generally available in wet years, when groundwater pumping within United Water’s jurisdictional boundaries is lower due to above average rainfall.

The analysis below assumes that 90% of United Water’s costs are fixed.¹ Assuming a higher share of United Water’s costs is fixed slightly increases the range for the reasonable ratio of Municipal & Industrial groundwater rates to Agricultural groundwater extraction charges (see below).

The next two principles apportion the variable and fixed components of United Water’s Revenue Requirement for Groundwater Extraction Fees by the hydrological impacts of groundwater pumping and land use (see Figure 2).

Principle 2: Variable cost component is based on the variable cost of replenishment to offset the impact of an acre-foot of groundwater pumping on groundwater overdraft.

$$\text{Variable Cost Component} = v \cdot (1-r)$$

where v = variable cost of United’s replenishment per acre-foot of groundwater pumped adjusted for reuse

r = portion of groundwater pumping available for reuse

Principle 3: Fixed cost is apportioned by adjusted by a credit based on the differential contribution of a groundwater pumping class to recharge on overlying lands.

$$\text{Fixed Cost Component} = \{S_i \cdot F - d_i \cdot A_i \cdot V\} / G_i$$

where S_i = groundwater pumper class’s share of groundwater usage adjusted for reuse

F = United Water’s fixed cost of replenishment

d_i = difference in average direct rainfall and runoff per acre of groundwater pumping class and average direct rainfall and runoff per acre districtwide beneficially recharging the basin

A_i = acres in groundwater pumping class

V = United Water’s fixed cost of replenishment per acre foot of the amount of total groundwater pumping exceeds annual safe yield

G_i = groundwater pumping by groundwater pumper class “i”

United Water’s fixed cost is the joint responsibility of all groundwater users. The fundamental principle is that a reasonable allocation of fixed cost among classes of groundwater users reflects two factors: (i) the benefits from United Water’s replenishment activities addressing groundwater overdraft in the basin (measured by the share of groundwater pumping adjusted for reuse)—the first term in the fixed cost component, and (ii) the differential contribution of overlying lands to beneficially recharging the basin—second term in the fixed cost component.

Stratecon’s approach uses different valuations for the allocation of the fixed cost

¹ United Water Conservation District, Resolution 2020-11, June 24, 2020, additional finding 15 at p. 4 (unnumbered).

components of United Water’s Revenue Requirements for Groundwater Extraction Fees. In the first term, Stratecon apportions United Water’s fixed costs by the share of groundwater pumping adjusted for reuse reflecting the impact of groundwater use on groundwater conditions. In the second term, Stratecon values the differential natural recharge of overlying lands by groundwater pumper classes by United Water’s fixed costs per acre foot of the amount total groundwater pumping exceeds safe yield, reflecting the impact of land use on groundwater conditions. By undertaking activities to address groundwater overdraft, the amount groundwater pumping exceeds safe yield is a key driver of the need for United Water’s replenishment activities.

Reasonable Relationship to Groundwater Pumpers Burdens on and Benefits from United Water’s Replenishment Activities

Stratecon’s approach conforms with the California Constitution, which requires:²

“The local government bears the burden of proving by a preponderance of the evidence that . . . the amount [of the non-tax charge] 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.”

United Water is not a water utility. Instead, it undertakes projects to mitigate the effects of groundwater overdraft. For a parcel, the demand for United Water’s services reflects water use and land use decisions. By incorporating the impact of water use and land use decisions on groundwater overdraft, Stratecon’s approach quantifies the burdens on, and benefits received by agricultural and municipal/industrial groundwater pumpers from United Water’s replenishment projects and programs.

REASONABLE RATIO OF MUNICIPAL & INDUSTRIAL TO AGRICULTURAL WATER GROUNDWATER EXTRACTION FEES

Stratecon’s model for calculation of the ratio of Municipal & Industrial to Agricultural Water Conservation groundwater extraction fees requires four types of information: (1) the revenue requirement for groundwater extraction fees, (2) groundwater pumping, (3) hydrologic conditions and (4) land use. I present the key information used in the Stratecon model.

- Revenue Requirement:³ \$15,844,482
- Share Fixed Costs:⁴ 90%

² Cal. Const. art. 13C, § 1

³ Data from Spreadsheet “FY 21-22 Total Revenues” provided by United Water staff (hereinafter cited as “Data Spreadsheet”). The revenue requirement is for districtwide Zone A and Zone B charges, calculated as the sum of cells G29 through G34.

⁴ See text discussion above of fixed versus variable costs.

- Groundwater Pumping:
 - Groundwater pumpers: agricultural (118,505 acre-feet) and municipal & industrial (25,047 acre-feet), for a total of 143,552⁵
 - United Water (for pipeline deliveries): agricultural (7,175 acre-feet) and municipal & industrial (10,480 acre-feet) for a total of 17,655 acre-feet
- Hydrologic Conditions:⁶
 - Reuse of groundwater by agricultural water users: 24.1%
 - Reuse of groundwater by municipal & industrial water users: 14.8%
 - Rainfall and runoff on overlying agricultural lands: 0.65 acre-feet per acre
 - Rainfall and runoff on overlying non-agricultural lands: 0.35 acre-feet per acre
 - Proportion of rainfall and runoff on overlying lands beneficially recharging the basins: ranging from 50% to 95%⁷
 - Annual Safe Yield:⁸ 140,000 acre-feet
- Land Use
 - Lands in agricultural use: 80,078 acres
 - Lands in municipal & industrial use: 40,918 acres

Under the assumptions for groundwater pumping, United Water’s Revenue requirements and safe yield, United Water’s fixed cost of replenishment per acre foot of the amount of total groundwater pumping exceeds annual safe yield equals \$672 per acre-foot.⁹

Table 1 presents United Water’s groundwater extraction charges consistent with Stratecon’s principles under the alternative assumptions about the proportion of rainfall and runoff on overlying lands beneficially recharging the basins (“proportion beneficially recharging

⁵ Data Spreadsheet, calculations based on estimated pumping of Agricultural and Municipal & Industrial pumpers found in cells F29 through F32.

⁶ *Supplemental Technical Memorandum to Infiltration Potential of Precipitation Fall on Developed Lands and the Fate of Applied Groundwater within UWCD*, Staff, May 23, 2014. For reuse of groundwater, see Table B-5. Overlying recharge of lands calculated from infiltration of agricultural and urban lands (p. 12) divided by acreage (Table 2).

⁷ United Staff lacked information to quantify the proportion of rainfall and runoff on overlying lands beneficially recharging groundwater basins. The alternative assumptions used demonstrate how United’s rate structure consistent with Stratecon’s principles varies with the proportion of rainfall and runoff on overlying lands beneficially recharging the eight interconnected basins in United Water.

⁸ United Water Conservation District, Resolution 2020-11, June 24, 2020, additional finding 21 at p. 4 (unnumbered).

⁹ $\$672 = 90\% \bullet \$15,844,482 / (143,552 + 17,655 - 140,000)$

basins”).¹⁰ Depending on the proportion of recharge from overlying lands beneficially recharging basins, the ratio of municipal & industrial to agricultural groundwater extraction charges ranges from 2.5 to 4.3.

Table 1
United Water’s Groundwater Extraction Charges under
Alternative Assumptions for the Proportion of Beneficial Recharge on Overlying Lands

<i>Proportion Beneficially Recharging Basins</i>	<i>Municipal & Industrial- Charge</i>	<i>Agricultural Charge</i>	<i>Ratio</i>
50%	\$184	\$74	2.5
65%	\$207	\$67	3.1
75%	\$223	\$63	3.5
90%	\$246	\$57	4.3

The range of reasonable ratios for municipal & industrial to agricultural groundwater extraction charges is robust to higher assumptions regarding the share of United Water costs that are fixed (see Table 2).¹¹ A higher fixed cost share results in a greater fixed cost of replenishment per acre foot of the amount of total groundwater pumping exceeds annual safe yield, which increases the credit for the impact of land use decisions on the direct rainfall and runoff beneficially recharging the basin. The impact on the reasonable ratio of groundwater extraction charges is small, although increases with the amount of direct rainfall and runoff beneficially recharging basins.

Table 2
Reasonable Ratios of United Water’s Groundwater Extraction Charges for Municipal & Industrial to Agricultural Groundwater Pumping by Assumptions for the Proportion of Beneficial Recharge on Overlying Lands and United Water’s Fixed Cost Share

<i>Proportion Beneficially Recharging Basins</i>	<i>95% Fixed Cost</i>	<i>90% Fixed Cost</i>	<i>Difference</i>
50%	2.6	2.5	0.1
65%	3.2	3.1	0.1
75%	3.7	3.5	0.2
90%	4.7	4.3	0.4

¹⁰ See Attachment A for specifics of the calculations.

¹¹ *Ibid.*

The range for reasonable ratios of municipal & industrial to agricultural groundwater extraction charges is below the range in Stratecon’s opinion for earlier fiscal years. Stratecon used the United Water’s the economic cost of replenishment activities and programs to apportion the fixed cost portion cost-of-service among customer classes (agricultural versus municipal/industrial). This approach is consistent with the use of the marginal cost method by the Department of Los Angeles Water and Power (“LADWP”) to apportion the cost of service among customer classes.¹² Rates are not based on marginal cost. Instead, marginal costs are used to apportion the fixed cost of replenishment among customer classes.

Table 3 shows the range of reasonable ratios using the Fox Canyon Groundwater Management Agency’s surcharge to value the differential recharge of overlying lands in agriculture versus municipal & industrial land uses.¹³ Fox Canyon sets its surcharge “to eliminate overdraft caused by excess pumping from the aquifer systems within the Agency and to bring the groundwater basins within the Agency to safe yield.”¹⁴ Like LADWP, Stratecon’s prior method used information about the economic incentives to control overdraft to apportion the fixed cost component of United Water’s Revenue Requirement for Groundwater Extraction Charges. The groundwater extraction charges reflect United Water’s cost of service.

Table 3
United Water’s Groundwater Extraction Charges under
Alternative Assumptions for the Proportion of Beneficial Recharge on Overlying Lands
Using Fox Canyon’s Surcharge to Value the Impact of Land Uses on Beneficial Recharge
from Overlying Lands

<i>Proportion Beneficially Recharging Basins</i>	<i>Municipal & Industrial- Charge</i>	<i>Agricultural Charge</i>	<i>Ratio</i>
50%	\$342	\$29	11.6
65%	\$412	\$10	42.9
75%	\$412	\$10	43.1
90%	\$412	\$10	43.1

¹² Los Angeles Department of Water & Power, *2014 Water Service Cost of Service Study*, July 2015, pp. 4-8 and balance of the study for more detail.

¹³ Calculations uses Fox Canyon’s surcharge (\$2,409 per acre foot for FY 2021-2022) in place of United Water’s Fixed Cost per acre-foot of the amount groundwater pumping exceeds safe yield (\$672 per acre-foot) in the rate structure mechanics discussed in Attachment A.

¹⁴ See Resolution 2013-03 of the Fox Canyon Groundwater Management Agency, “A Resolution Adopting Tiered Groundwater Extraction Surcharge Rates,” p. 1.

CONCLUSION

United Water undertakes replenishment projects and activities to address the groundwater overdraft within its jurisdiction. The scale of replenishment projects and activities needed depend on the amount of groundwater pumping, the opportunities for reuse of pumped groundwater and land use decisions that impact the amount of potential rainfall and runoff that recharges the interconnected basins within United Water. Stratecon's analysis of the reasonable ratio of municipal & industrial water extraction fees per acre-foot of groundwater pumped to agricultural water extraction fees per acre-foot of groundwater pumped incorporates key conditions that impact the scale of replenishment activity United Water must undertake to address groundwater overdraft. Relative to its opinion in earlier years, Stratecon's apportionment of fixed costs reflecting the impact of land use decisions on beneficial recharge using United Water fixed costs results in a lower range for the reasonable ratio of groundwater extraction charges of 2.5 to 4.7.

Thank you for the opportunity to work with United Water. We find the district and its staff first rate and extremely knowledgeable about the hydrology of the area. If you have any questions regarding our work or have any additional information, we should consider in reaching our opinion, we will be delighted to accommodate your requests.

Sincerely,

A handwritten signature in black ink, appearing to read "Rodney T. Smith". The signature is fluid and cursive, with a large initial "R" and a long horizontal stroke at the end.

Rodney T. Smith,
Ph.D. President

Figure 1
United Water's Objective and Sources of Revenues and Costs

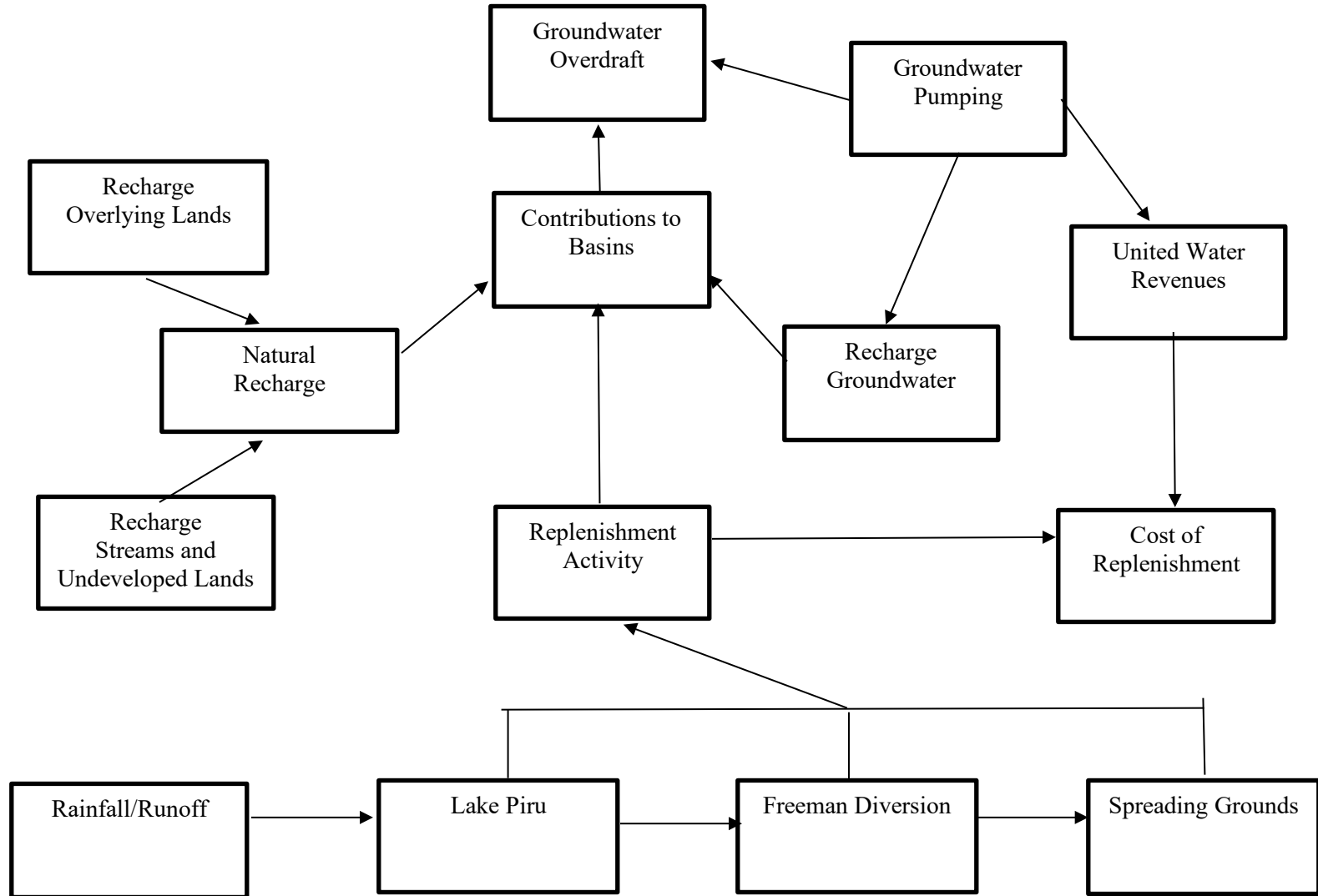
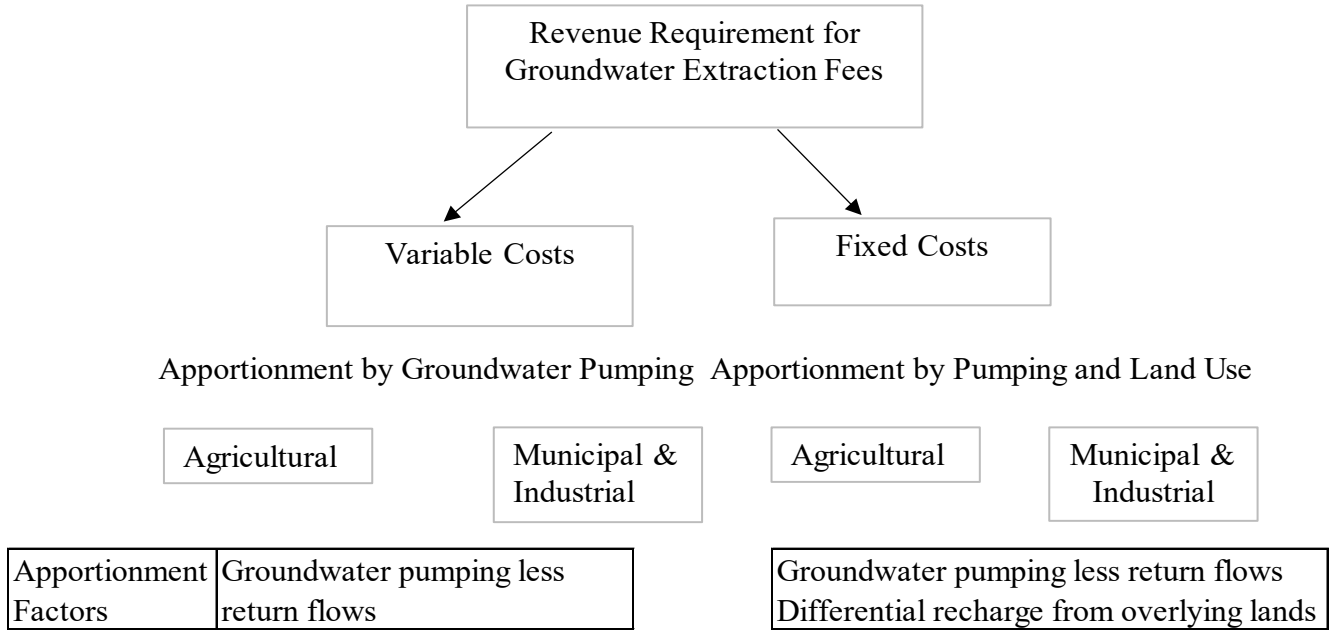


Figure 2
Apportionment of Variable and Fixed Cost Components of Revenue Requirement
for Groundwater Extraction Fees



Attachment A
Calculations of United Water’s Groundwater Extraction Charges

This attachment presents the calculations underlying Table 1 and Table 2. As discussed in the text, United Water’s rate structure is determined for four assumptions for the proportion of rainfall and runoff on overlying lands beneficially reaching United’s eight interconnected basins: 50%, 65%, 75% and 90%.

Rate Structure Mathematics

As discussed in the text, a groundwater extraction rate is the sum of a variable cost component and a fixed cost component:

$$\text{Variable Cost Component} = v \bullet (1-r)$$

where v = variable cost of United’s replenishment per acre-foot of groundwater usage adjusted for reuse

r = portion of groundwater pumping available for reuse

Total variable costs equal the portion of total requirement requirements for FY 2021-2022 (\$15,844,482) that are not fixed costs (10% or 5%), \$1,584,448 or \$792,224. Total groundwater pumping adjusted for reuse equals 125,660 acre-feet (see Table A-1). Therefore, the variable cost of United’s replenishment per acre-foot of groundwater usage adjusted for reuse (“v”) equals \$12.61 per acre foot if 90% of United Water’s replenishment cost are fixed and \$6.31 per acre foot if 95% of United Water’s replenishment costs are fixed.¹⁵ The variable cost charge equals \$9.57 and \$10.74 per acre foot, respectively, for agricultural and municipal & industrial groundwater users if 90% of United Water’s replenishment costs are fixed, and \$4.79 and \$5.37 per acre foot if 95% of United Water’s replenishment costs are fixed.¹⁶

Table A-1
Projected Groundwater Pumping by Water User Group, FY 2021-2022

<i>Groundwater User Class</i>	<i>Groundwater Users</i>	<i>United Water for Pipelines</i>	<i>Total</i>	<i>Adjusted Pumping</i>
Agricultural	118,505	7,175	125,680	95,391
Municipal & Industrial	25,047	10,480	35,527	30,269
Total	143,552	17,655	161,207	125,660

¹⁵ \$12.61 = \$1,584,448/125,660; \$6.31 = \$792,224/125,660

¹⁶ \$9.54 = \$12.61*(1-.241) and \$10.74 = \$12.61*(1-.148).
 \$4.79= \$6.31*(1-.241) and \$5.37 = \$6.31*(1-.148).

* adjusted pumping equals pumping multiplied by (1-r), where r equals 24.1% for agricultural groundwater use and 14.8% for municipal & industrial groundwater users.

$$\text{Fixed Cost Component} = \{S_i \cdot F - d_i \cdot A_i \cdot V\} / G_i$$

where S_i = groundwater pumping class's share of groundwater usage adjusted for reuse

F = United Water's fixed cost of replenishment

d_i = difference in average direct rainfall and runoff per acre of groundwater pumping class and average direct rainfall and runoff per acre districtwide beneficially recharging the basin (see Table A-2)

A_i = acres in groundwater pumping class

V = United Water's fixed cost of replenishment per acre foot of the amount of total groundwater pumping exceeds annual safe yield

G_i = groundwater pumping class "i"

**Table A-2
Direct Rainfall and Runoff on Overlying Lands**

<i>Groundwater User Group</i>	<i>Acres</i>	<i>Rainfall Runoff/Acre*</i>	<i>Differential/Acre**</i>
Agricultural	80,078	0.65	0.10·s
Non-Agricultural	40,918	0.35	-0.20·s
Total/Average	120,996	0.55	0.0

*Average is acreage-weighted average of rainfall runoff/acre for groundwater user groups.

** s = share of recharge on overlying lands beneficially recharging United's eight interconnected basins. Total of differential recharge equals acreage-weighted average of differential recharge of water user groups.

Calculation of United Water's Rate Structure under Different Assumptions for Proportion of Rainfall and Runoff on Overlying Lands Beneficially Recharging Basins

The calculations use four assumptions of the proportion of rainfall and runoff on overlying lands beneficially recharging basins (50%, 65% 75% and 90%) and two assumptions about the share of United Water's replenishment costs are fixed (90% and 95%).

Four scenarios when 90% United Water's replenishment costs are fixed (Table 1 in text).

Scenario 1: 50% of rainfall and runoff on overlying lands beneficially recharge basins.

The groundwater extraction charge would be \$73.97 and \$184.31, respectively, for agricultural and municipal & industrial groundwater extractions (see Table A-3). The ratio of the municipal & industrial groundwater extraction charge to agricultural groundwater extraction charge would be 2.5. Given the projected amount of pumping in Table A-1, the projected revenues of this rate structure would equal the revenue requirement for groundwater extraction charges (\$15,844,482).

**Table A-3
Groundwater Extraction Charges for Agricultural and Non-Agricultural
Groundwater Extraction**

<i>Groundwater Group</i>	<i>Variable Charge</i>	<i>Fixed Charge</i>	<i>Total</i>	<i>Revenues</i>
Agricultural	\$9.57	\$64.40	\$73.97	\$9,296,455
Municipal & Industrial	\$10.74	\$173.53	\$184.31	\$6,548,027
Total				\$15,844,482

The fixed cost charge reflects the allocation of fixed costs between the groundwater user groups based on the respective share of adjusted groundwater pumping less a credit for differential recharge from overlying lands (see Table A-4). Fixed costs (\$14,260,034) are apportioned by the share of adjusted groundwater pumping plus a credit equaling United Water’s fixed cost per acre foot of the amount groundwater pumping exceeds safe yield (\$672 per acre-foot),¹⁷ multiplied by the acreage of the groundwater group (Table A-2) and multiplied by the differential recharge per acre (Table A-2 where s = .50). The total fixed cost component equals the share of fixed cost plus the credit divided by total groundwater pumping.

**Table A-4
Calculation of Fixed Cost Component**

<i>Groundwater Group</i>	<i>Apportioned Share</i>	<i>Credit</i>	<i>Total</i>	<i>Total/AF</i>
Agricultural	\$10,825,052	(\$2,731,381)	\$8,093,671	\$64.40
Municipal & Industrial	\$3,434,982	\$2,731,381	\$6,450,773	\$173.53

Scenario 2: 65% of rainfall and runoff on overlying lands beneficially recharge basins.

The groundwater extraction charge would be \$67.45 and \$207.37, respectively, for agricultural and municipal & industrial groundwater extractions (see Table A-5). The ratio of the non-agricultural groundwater extraction charge to agricultural groundwater extraction charge would be 3.1. Given the projected amount of pumping in Table A-1, the projected revenues of this rate structure would equal the revenue requirement for groundwater extraction charges (\$15,844,482).

**Table A-5
Groundwater Extraction Charges for Agricultural and Non-Agricultural
Groundwater Extraction**

<i>Groundwater User Group</i>	<i>Variable Charge</i>	<i>Fixed Charge</i>	<i>Total</i>	<i>Revenues</i>
Agricultural	\$9.57	\$57.88	\$67.45	\$8,477,040
Non-Agricultural	\$10.74	\$196.63	\$207.37	\$7,367,442
Total				\$15,844,482

¹⁷ \$672 = 90%* \$15,844,482/(143,552 + 17,655 – 140,000, United Water’s Revenue Requirement divided by amount of groundwater pumping exceeds annual safe yield.

The fixed cost charge reflects the allocation of fixed costs between the groundwater user groups based on the respective share of adjusted groundwater pumping less a credit for differential recharge from overlying lands (see Table A-6). Fixed costs (\$14,260,034) are apportioned by the share of adjusted groundwater pumping plus a credit equaling United Water’s fixed cost per acre foot of the amount groundwater pumping exceeds safe yield (\$672 per acre-foot), multiplied by the acreage of the groundwater group (Table A-2) and multiplied by the differential recharge per acre (Table A-2 where $s = .65$). The total fixed cost component equals the share of fixed cost plus the credit divided by total groundwater pumping.

**Table A-6
Calculation of Fixed Cost Component**

<i>Groundwater Group</i>	<i>Apportioned Share</i>	<i>Credit</i>	<i>Total</i>	<i>Total/AF</i>
Agricultural	\$10,825,052	(\$3,550,795)	\$7,274,257	\$57.88
Municipal & Industrial	\$3,434,982	\$3,550,795	\$7,355,510	\$196.63

Scenario 3: 75% of rainfall and runoff on overlying lands beneficially recharge basins.

The groundwater extraction charge would be \$63.10 and \$222.75, respectively, for agricultural and municipal & industrial groundwater extractions (see Table A-7). The ratio of the municipal & industrial groundwater extraction charge to agricultural groundwater extraction charge would be 3.5. Given the projected amount of pumping in Table A-1, the projected revenues of this rate structure would equal the revenue requirement for groundwater extraction charges (\$15,884,482).

**Table A-7
Groundwater Extraction Charges for Agricultural and Non-Agricultural
Groundwater Extraction**

<i>Groundwater User Group</i>	<i>Variable Charge</i>	<i>Fixed Charge</i>	<i>Total</i>	<i>Revenues</i>
Agricultural	\$9.57	\$53.53	\$63.10	\$7,930,764
Non-Agricultural	\$10.74	\$212.01	\$222.75	\$7,913,718
Total				\$15,844,482

The fixed cost charge reflects the allocation of fixed costs between the groundwater user groups based on the respective share of adjusted groundwater pumping less a credit for differential recharge from overlying lands (see Table A-8). Fixed costs (\$14,260,034) are apportioned by the share of adjusted groundwater pumping plus a credit equaling United Water’s fixed cost per acre foot of the amount groundwater pumping exceeds safe yield (\$672 per acre-foot), multiplied by the acreage of the groundwater group (Table A-2) and multiplied by the differential recharge per acre (Table A-2 where $s = .75$). The total fixed cost component equals the share of fixed cost plus the credit divided by total groundwater pumping.

**Table A-8
Calculation of Fixed Cost Component**

<i>Groundwater Group</i>	<i>Apportioned Share</i>	<i>Credit</i>	<i>Total</i>	<i>Total/AF</i>
Agricultural	\$10,825,052	(\$4,097,071)	\$6,727,981	\$53.53
Municipal & Industrial	\$3,434,982	\$4,097,071	\$7,532,053	\$212.01

Scenario 4: 90% of rainfall and runoff on overlying lands beneficially recharge basins.

The groundwater extraction charge would be \$56.58 and \$245.81, respectively, for agricultural and municipal & industrial groundwater extractions (see Table A-9). The ratio of the municipal & industrial groundwater extraction charge to agricultural groundwater extraction charge would be 4.3. Given the projected amount of pumping in Table A-1, the projected revenues of this rate structure would equal the revenue requirement for groundwater extraction charges (\$15,884,482).

**Table A-9
Groundwater Extraction Charges for Agricultural and Non-Agricultural
Groundwater Extraction**

<i>Groundwater User Group</i>	<i>Variable Charge</i>	<i>Fixed Charge</i>	<i>Total</i>	<i>Revenues</i>
Agricultural	\$9.57	\$47.01	\$56.58	\$7,111,350
Non-Agricultural	\$10.74	\$235.07	\$245.81	\$8,733,132
Total				\$15,844,482

The fixed cost charge reflects the allocation of fixed costs between the groundwater user groups based on the respective share of adjusted groundwater pumping less a credit for differential recharge from overlying lands (see Table A-10). Fixed costs (\$14,260,034) are apportioned by the share of adjusted groundwater pumping plus a credit equaling United Water's fixed cost per acre foot of the amount groundwater pumping exceeds safe yield (\$672 per acre-foot), multiplied by the acreage of the groundwater group (Table A-2) and multiplied by the differential recharge per acre (Table A-2 where $s = .90$). The total fixed cost component equals the share of fixed cost plus the credit divided by total groundwater pumping.

**Table A-10
Calculation of Fixed Cost Component**

<i>Groundwater Group</i>	<i>Apportioned Share</i>	<i>Credit</i>	<i>Total</i>	<i>Total/AF</i>
Agricultural	\$10,825,052	(\$4,916,485)	\$5,908,567	\$47.01
Municipal & Industrial	\$3,434,982	\$4,916,485	\$8,351,467	\$235.07

Four scenarios when 95% United Water’s replenishment costs are fixed (Table 2 in text).

Scenario 5: 50% of rainfall and runoff on overlying lands beneficially recharge basins.

The groundwater extraction charge would be \$72.76 and \$188.58, respectively, for agricultural and municipal & industrial groundwater extractions (see Table A-11). The ratio of the municipal & industrial groundwater extraction charge to agricultural groundwater extraction charge would be 2.6. Given the projected amount of pumping in Table A-1, the projected revenues of this rate structure would equal the revenue requirement for groundwater extraction charges (\$15,844,482).

**Table A-11
Groundwater Extraction Charges for Agricultural and Non-Agricultural
Groundwater Extraction**

<i>Groundwater Group</i>	<i>Variable Charge</i>	<i>Fixed Charge</i>	<i>Total</i>	<i>Revenues</i>
Agricultural	\$4.79	\$67.98	\$72.76	\$9,144,711
Municipal & Industrial	\$5.37	\$183.21	\$188.58	\$6,699,771
Total				\$15,844,482

The fixed cost charge reflects the allocation of fixed costs between the groundwater user groups based on the respective share of adjusted groundwater pumping less a credit for differential recharge from overlying lands (see Table A-12). Fixed costs (\$15,052,258) are apportioned by the share of adjusted groundwater pumping plus a credit equaling United Water’s fixed cost per acre foot of the amount groundwater pumping exceeds safe yield (\$710 per acre-foot), multiplied by the acreage of the groundwater group (Table A-2) and multiplied by the differential recharge per acre (Table A-2 where $s = .50$). The total fixed cost component equals the share of fixed cost plus the credit divided by total groundwater pumping.

**Table A-12
Calculation of Fixed Cost Component**

<i>Groundwater Group</i>	<i>Apportioned Share</i>	<i>Credit</i>	<i>Total</i>	<i>Total/AF</i>
Agricultural	\$11,426,443	(\$2,883,124)	\$8,543,320	\$72.76
Municipal & Industrial	\$3,625,814	\$2,883,124	\$6,508,938	\$188.56

Scenario 6: 65% of rainfall and runoff on overlying lands beneficially recharge basins.

The groundwater extraction charge would be \$65.88 and \$212.93, respectively, for agricultural and municipal & industrial groundwater extractions (see Table A-13). The ratio of the non-agricultural groundwater extraction charge to agricultural groundwater extraction charge would be 3.2. Given the projected amount of pumping in Table A-1, the projected revenues of this rate structure would equal the revenue requirement for groundwater extraction charges (\$15,844,482).

Table A-13
Groundwater Extraction Charges for Agricultural and Non-Agricultural
Groundwater Extraction

<i>Groundwater User Group</i>	<i>Variable Charge</i>	<i>Fixed Charge</i>	<i>Total</i>	<i>Revenues</i>
Agricultural	\$4.79	\$61.09	\$65.88	\$8,279,774
Non-Agricultural	\$5.37	\$207.55	\$212.93	\$7,564,708
Total				\$15,844,482

The fixed cost charge reflects the allocation of fixed costs between the groundwater user groups based on the respective share of adjusted groundwater pumping less a credit for differential recharge from overlying lands (see Table A-14). Fixed costs (\$15,052,258) are apportioned by the share of adjusted groundwater pumping plus a credit equaling United Water’s fixed cost per acre foot of the amount groundwater pumping exceeds safe yield (\$710 per acre-foot),¹⁸ multiplied by the acreage of the groundwater group (Table A-2) and multiplied by the differential recharge per acre (Table A-2 where $s = .65$). The total fixed cost component equals the share of fixed cost plus the credit divided by total groundwater pumping.

Table A-14
Calculation of Fixed Cost Component

<i>Groundwater Group</i>	<i>Apportioned Share</i>	<i>Credit</i>	<i>Total</i>	<i>Total/AF</i>
Agricultural	\$11,426,443	(\$3,748,061)	\$7,678,382	\$61.08
Municipal & Industrial	\$3,625,814	\$3,748,061	\$7,373,876	\$207.55

Scenario 7: 75% of rainfall and runoff on overlying lands beneficially recharge basins.

The groundwater extraction charge would be \$61.29 and \$229.16, respectively, for agricultural and municipal & industrial groundwater extractions (see Table A-15). The ratio of the municipal & industrial groundwater extraction charge to agricultural groundwater extraction charge would be 3.7. Given the projected amount of pumping in Table A-1, the projected revenues of this rate structure would equal the revenue requirement for groundwater extraction charges (\$15,884,482).

¹⁸ $\$710 = 95\% * \$15,844,482 / ((143,552 + 17,655 - 140,000), \text{United Water's Revenue Requirement divided by amount of groundwater pumping exceeds annual safe yield.}$

Table A-15
Groundwater Extraction Charges for Agricultural and Non-Agricultural
Groundwater Extraction

<i>Groundwater User Group</i>	<i>Variable Charge</i>	<i>Fixed Charge</i>	<i>Total</i>	<i>Revenues</i>
Agricultural	\$4.79	\$56.51	\$61.29	\$7,703,149
Non-Agricultural	\$5.37	\$223.79	\$229.16	\$8,141,333
Total				\$15,844,482

The fixed cost charge reflects the allocation of fixed costs between the groundwater user groups based on the respective share of adjusted groundwater pumping less a credit for differential recharge from overlying lands (see Table A-16). Fixed costs (\$15,052,258) are apportioned by the share of adjusted groundwater pumping plus a credit equaling United Water’s fixed cost per acre foot of the amount groundwater pumping exceeds safe yield (\$710 per acre-foot), multiplied by the acreage of the groundwater group (Table A-2) and multiplied by the differential recharge per acre (Table A-2 where $s = .75$). The total fixed cost component equals the share of fixed cost plus the credit divided by total groundwater pumping.

Table A-16
Calculation of Fixed Cost Component

<i>Groundwater Group</i>	<i>Apportioned Share</i>	<i>Credit</i>	<i>Total</i>	<i>Total/AF</i>
Agricultural	\$11,426,443	(\$4,324,686)	\$7,101,758	\$56.51
Municipal & Industrial	\$3,625,814	\$4,324,686	\$7,950,500	\$223.79

Scenario 8: 90% of rainfall and runoff on overlying lands beneficially recharge basins.

The groundwater extraction charge would be \$54.41 and \$253.50, respectively, for agricultural and municipal & industrial groundwater extractions (see Table A-17). The ratio of the municipal & industrial groundwater extraction charge to agricultural groundwater extraction charge would be 4.7. Given the projected amount of pumping in Table A-1, the projected revenues of this rate structure would equal the revenue requirement for groundwater extraction charges (\$15,884,482).

Table A-17
Groundwater Extraction Charges for Agricultural and Non-Agricultural
Groundwater Extraction

<i>Groundwater User Group</i>	<i>Variable Charge</i>	<i>Fixed Charge</i>	<i>Total</i>	<i>Revenues</i>
Agricultural	\$4.79	\$49.62	\$54.41	\$6,838,212
Non-Agricultural	\$5.37	\$248.13	\$253.50	\$9,006,270
Total				\$15,844,482

The fixed cost charge reflects the allocation of fixed costs between the groundwater user groups based on the respective share of adjusted groundwater pumping less a credit for differential recharge from

overlying lands (see Table A-18). Fixed costs (\$15,052,258) are apportioned by the share of adjusted groundwater pumping plus a credit equaling United Water’s fixed cost per acre foot of the amount groundwater pumping exceeds safe yield (\$710 per acre-foot), multiplied by the acreage of the groundwater group (Table A-2) and multiplied by the differential recharge per acre (Table A-2 where $s = .90$). The total fixed cost component equals the share of fixed cost plus the credit divided by total groundwater pumping.

Table A-18
Calculation of Fixed Cost Component

<i>Groundwater Group</i>	<i>Apportioned Share</i>	<i>Credit</i>	<i>Total</i>	<i>Total/AF</i>
Agricultural	\$11,825,052	(\$5,189,623)	\$6,236,820	\$49.62
Municipal & Industrial	\$3,625,814	\$5,189,623	\$8,815,438	\$248.13