UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Appendices to the Economic Analysis for Final Ground Water Rule

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Appendix A

Calculations Supporting the Cost of Illness (COI) Analysis

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A.1 Introduction

This appendix presents data and calculations that this Economic Analysis (EA) uses to estimate the monetized morbidity benefits of the Ground Water Rule (GWR). Chapter 5 presents the general methodology for using a cost of illness (COI) approach. This appendix, Appendix A, provides additional detail on the data from other sources that are used to support the analyses and the methodology applied to adapt that data for use in the GWR EA. The approach used to value reductions in nonfatal cases of Type A and Type B viruses combines estimates of the medical costs of illness with estimates of the value of related time losses. Many of the values in the following analysis rely on data collected from a broad and thorough review of the literature concerning the valuation of illnesses.[1]

A.2 Type A and Type B Viruses Cost-Related Data

EPA chose rotavirus to represent Type A viruses and enterovirus (including echovirus and coxsackievirus) to represent Type B viruses. The Agency conducted a literature search focusing on the most recent studies that quantified the direct and/or indirect costs associated with rotavirus and enterovirus. Data for mean values and ranges from more than one study have been combined in some cases to include more information about the range of uncertainty. Where no range data were available, only mean estimates are used.

Type A and Type B viruses can result in a range of illnesses with varying degrees of impacts. Because the effects differ by age, separate age groups were specified. Type A viral illnesses were additionally examined by the health sensitivity of the patient (immunocompromised or healthy). Because of differences in costs and time lost due to an enterovirus (Type B) infection, EPA chose to model these effects with three levels of severity of illness defined by the following requirements: no medical care, doctor's visit, and hospitalization. Data was unavailable to further define Type B viral illnesses with regard to the health sensitivity of the patient as was done with Type A.

A.2.1 Data for Type A Viruses: Rotavirus

Deriving the cost of illness for a case of rotavirus requires both the quantity of various medical services consumed (e.g., number of doctor visits) as well as the cost per unit. Exhibit A.1 presents the former, including the percentages of the ill population that seek outpatient and inpatient care, the duration

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[1] The studies consulted include Anderson et al. (2004), Banyai et al. (2002), Bartlett et al. (1988), Carabin et al. (1999), Cherry (1995), Dormitzer et al. (2005), Ferson (1996), Fletcher et al. (2000), Fruhwirth et al. (2001), Garthright et al. (1988), Glass et al (1996), Grimwood et al. (1988), Grimwood (1983), Haffejee (1991), Hamilton et al. (1999), Heiselman (1997), Jin et al. (1996); Kafetzis et al. (2001), Kapikian (2001), Kapikian and Chanock (1996), Khuffash et al. (1988), Kovacs et al. (1987), Liddle et al. (1997); Lynch et al. (2001), Matson and Estes (1990), Mesa et al. (1996), Miller (1997), Modlin (1995), Nigrovic (2001), Nigrovic and Chiang (2000), O'Ryan et al. (2001), Parashar et al. (1998), Parashar et al. (1999), Parasuraman et al. (2001), Pichichero et al. (1998), Rodriguez et al. (1977), Sawyer (2001), Schumacher et al. (1999), Szucs et al. (1999), Tallett et al. (1977), Ward (2001), Wenman (1979).

of the illness's symptoms, days lost due to the illness, the number of follow-up visits, and the duration of hospital stays. The exhibit also provides data used later for estimating the indirect costs associated with rotavirus.

Valuing illnesses from rotavirus begins by determining what percentage of patients seek outpatient and what percentage of patients seek inpatient medical care. EPA used these percentages, in conjunction with the data associated with outpatient and inpatient care, to create weighted COI estimates. For outpatient care, EPA assumed one initial physician visit and, based on data from recent literature (cited in exhibit A.1 below), the average number of follow-up visits (see row G). For inpatient care, the literature that the Agency examined reported the durations of a hospital stay associated with a case of rotavirus, by age. The data for hospital stays associated with rotavirus come from studies of children under the age of five. Data were not available with regard to hospital stays for older patients, thus no hospital stays were assigned for these age groups. EPA also assumed an initial physician visit once admitted for each person seeking inpatient care and daily follow-up doctor visits thereafter while in the hospital.

Exhibit A.1 Nonmonetary Cost Data, by Age, for Type A Viruses: Rotavirus

Category	Healthy Population					Immunocompromised Population			
	<2	2 to 4	5 to 15	≥ 16 (G2 & G9)	≥16 (All Others)	<2	2 to 4	5 to 15	≥16
Percent seeking outpatient (A)	14%	14%	0.0%	0.0%	0.0%	100%	100%	100%	100%
Percent seeking inpatient (B)	1.4%	1.4%	0.0%	0.0%	0.0%	100%	100%	100%	100%
Duration of symptoms - No Medical Care/ Outpatient (days) (C)	3	3	3	2.5	2.5	N/A	N/A	N/A	N/A
Duration of symptoms - Inpatient (days) (C)	5	5	N/A	N/A	N/A	5	3	3	2.5
Patient days lost to illness: No Medical Care/ Outpatient - (D)	3	3	1.5	1	0	N/A	N/A	N/A	N/A
Patient days lost to illness: Inpatient - (D)	5	5	N/A	N/A	N/A	5	3	3	2.5
Caregiver days lost: No Medical Care/ Outpatient - (E)	3	3	1.5	0	0	N/A	N/A	N/A	N/A
Caregiver days lost: Inpatient - (E)	5	5	1.5	N/A	N/A	5	3	3	0
Lost productivity days (F)	0	0	0	1	1	0	0	0	0
Outpatient data									
Follow-up doctor visits (G)	0.5 (0-9)	0.5 (0-9)	N/A	N/A	N/A	0.5 (0-9)	0.5 (0-9)	0	0
Inpatient data									
Duration of hospital stay (days) (H)	5	5	NA	NA	N/A	5	3	3	2.5
Follow-up doctor visits (I)	4	4	NA	NA	N/A	4	2	2	2

Note: For the healthy population ≥16 years, the severity of symptom manifestation is dependent on the Rotavirus strain and can be divided into two groups. The G2 & G9 strains represent 15.3% of illnesses, while all other strains comprise the remaining 84.7% (Griffin, 2000).

Sources and Derivations: (A) Healthy population: Kapikian (2001) and CDC (1999) for patients <5 years; Glass et al. (1996) for patients 5 years and older; Wenman et al. (1979) for patients 16 and over. Immunocompromised population: Assumed to be 100% for all age categories.

(B) Healthy population: Ward (2001) for patients <5 years; Glass et al. (1996) for patients 5 years and older. Immunocompromised population: Assumed to be 100% for all age categories.

(C) Healthy Immunocompromised populations: Kovacs (1987) and Grimwood (1988) for patients <2 years; (Dormitzer (2005), Rodriguez (1977) Tallett (1977), Haffejee (1991) for patients <16 years; Grimwood (1983) for children >12 years and adults. Immunocompromised population: All cases are assumed to be inpatient.

(D) Healthy population: Assumes lost patient days are equal to illness duration for patients <5 years; assumed equal to the number of bed days per acute intestinal virus infection for patients 5 to 15 years and older (bed days from National Center for Health Statistics (1999). Additional information for adult cases from Grimwood (1983). Immunocompromised population: Assumes lost patient days are equal to illness duration for all patients.

(E) Assumes caregiver days are equal to the number of lost patient days for patients under 16 years of age.

(F) Banyai (2002) and Anderson (2004) for healthy adults and composite review of all ages, respectively. Lost productivity assumed 1/2 of the 2-3 days (0.5 * 2 = 1) of fever/vomiting/diarrhea symptoms. Assumed zero days for all other categories.

(G) Liddle et al. (1997) for patients <4 years. Assumes no follow-up visits for patients 5 years and older.

(H) Hospitalized children data from Khuffash (1988), Mesa (1996), Haffejee (1991), Grimwood (1988), low estimate ranging from 3 to 5.5

(I) Assumes daily follow-up doctor visit after day of admission.

Exhibit A.2 provides unit costs for the medical services listed in Exhibit A.1. These include the costs for an initial physician visit, follow-up visits, and the per-day cost of a hospital stay. All costs are presented in both base year and 2003 dollars. For costing purposes, EPA assumed hospital charges associated with "esophagitis, gastroenteritis, and miscellaneous digestive disorders" for patients under the age of 18 adequately represented the hospital costs of patients of all age groups. Dividing that value by four yielded the per-day cost of a hospital stay.

Exhibit A.2 Unit Cost Data, by Age, for Type A Viruses: Rotavirus

Cost Category	Average Cost per Patient									
	Base Year $				CPI	CPI	2003$			
	<2	2 to 4	5 to 15	≥16	Base	2003	<2	2 to 4	5 to 15	≥16
Outpatient costs										
Initial physician visit (A)	$ 99.58	$ 99.58	$ 99.58	$ 99.58	266.0	306.0	$ 114.55	$ 114.55	$ 114.55	$ 114.55
Cost per follow-up (B)	$ 57.53	$ 57.53	$ 57.53	$ 57.53	266.0	306.0	$ 66.18	$ 66.18	$ 66.18	$ 66.18
Inpatient costs										
Hospital costs (C)	$ 3,512	$ 3,512	$ 3,512	$ 3,512	N/A	N/A	N/A	N./A	N/A	N/A
Hospital costs per day (C)	$ 702	$ 702	$ 702	$ 702	213.4	306.0	$ 1,007	$ 1,007	$ 1,007	$ 1,007
Initial physician visit (D)	$ 132.89	$ 132.89	$ 132.89	$ 132.89	266.0	306.0	$ 152.87	$ 152.87	$ 152.87	$ 152.87
Cost per follow-up (E)	$ 45.42	$ 45.42	$ 45.42	$ 45.42	266.0	306.0	$ 52.25	$ 52.25	$ 52.25	$ 52.25

Notes:	(A, B, D, & E) Updated using CPI-U Medical care services, not seasonally adjusted (Base year: 2000 annual).
	(C) Updated using CPI-U Medical care services, not seasonally adjusted (Base year: 1994 annual).
Sources and Derivations:	(A) CPT-4 Code 99204: Evaluation and Management: Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: a comprehensive history, a comprehensive examination, and medical decision-making of moderate complexity.
	(B) CPT-4 Code 99214: Evaluation and Management: Office or other outpatient visit for the evaluation and management of an established patient, which requires at least two of these three key components: a detailed history, a detailed examination, medical decision-making of moderate complexity.
	(C) Hospital charges associated with "esophagitis, gastroenteritis and miscellaneous digestive disorders" for patients 0-17 years old; from the HCUP-3 Nationwide Inpatient Sample for 1994: Diagnosis=Related Groups (DRG #184). Cost per day based on a 5-day hospital stay (e.g., $702 = $3,512/5).
	(D) CPT-4 Code 99254: Evaluation and Management: Initial inpatient consultation for a new or established patient, which requires three key components: a comprehensive history, a comprehensive examination, and medical decision-making of moderate complexity.
	(E) CPT-4 Code 99262: Evaluation and Management: Follow-up inpatient consultation for an established patient, which requires at least two of these three key components: an expanded problem-focused interval history, an expanded problem-focused examination, and medical decision-making of moderate complexity.

A.2.2 Data for Type B Viruses: Enteroviruses

The methodology described above matches the general process used to model the COI of enteroviruses, although EPA used different illnesses to model the costs of cases defined by the following requirements: no medical care, doctor's visit, and hospitalization. For example, EPA bases most of its estimates for a case of enterovirus that requires no medical care or outpatient care on data for an acute case of intestinal virus infection. However, EPA based its estimate for enterovirus cases requiring hospitalization on "other circulatory system diagnoses without complications or comorbidities." Exhibits A.3 and A.4 display these data.

Exhibit A.3 Non-monetary Cost Data, by Age, for Type B Viruses: Enteroviruses

Category	No Care				Outpatient				Inpatient			
	<1 year	1 to 4	5 to 15	≥16	<1 year	1 to 4	5 to 15	≥16	<1 year	1 to 4	5 to 15	≥16
Percent seeking outpatient (A)	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
Percent seeking inpatient (B)	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%
Duration of symptoms (days) (C)	3 (1-6)	3 (1-6)	3 (1-6)	3 (1-6)	5 (2-12)	5 (2-10)	5 (2-7)	5 (2-9)	7 (2-14)	7 (2-14)	7 (2-14)	7 (2-14)
Patient days lost to illness (D)	3 (1-6)	3 (1-6)	1.5	1.15	5 (2-12)	5 (2-10)	5 (2-7)	5 (2-9)	7 (2-14)	7 (2-14)	7 (2-14)	7 (2-14)
Caregiver days lost (E)	3 (1-6)	3 (1-6)	1.5	0	5 (2-12)	5 (2-10)	5 (2-7)	0	7 (2-14)	7 (2-14)	7 (2-14)	0
Lost productivity days (F)	0	0	0	1.09	0	0	0	0	0	0	0	0
Outpatient data												
Follow-up doctor visits (G)	N/A	N/A	N/A	N/A	1	1	1	1	1	1	1	1
Inpatient data												
Duration of hospital stay (days) (H)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.7	4.7	2.5	2.5
Follow-up doctor visits (I)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	4	2	2

Sources:

(A & B) No care, Outpatient, and Inpatient categorizations established to represent relative severity differences in disease manifestation.

(C) No Care: Cherry (2004) and Modlin and Rotbart (1997) for patients <1 year; Cherry (2004) and Chin (2001) for patients 1 to 4 years; Cherry (2004) for patients 5 to 15 years; for mean for all patients; Cherry (2004) and Modlin and Rotbart (1997) for patients >15 years. Outpatient: Cherry (2004) for patients <1 year; Cherry (2004) and Chin 2001 for patients 1 to 4 years; Cherry (2004) for patients 5 to 15 years; Cherry (2004) and Modlin and Rotbart (1997) for patients >15 years. Inpatient: Modlin and Rotbart (1997), Modlin (2005), Cherry (2004), and Morens et al. (1990) for patients <1 year; Modlin and Rotbart (1997), Modlin (2005), and Cherry (2004) for patients 1 to 4 years; Modlin and Rotbart (1997), Modlin (2005), Cherry (2004), and Chin (2001) for patients >4 years.

(D) No Care: Assumes lost days are equal to illness duration for patients 4 years old and younger. Assumes lost days are equal to number of bed days for acute case of intestinal virus for patients 5-15 years of age (intestinal virus data from National Center for Health Statistics, 1999). Assumed equal to number of bed days per acute case of intestinal virus for patients >15 years (National Center for Health Statistics, 1999). Inpatient & Outpatient: Assumes lost days equal to duration of illness.

(E) No Care, Inpatient, and Outpatient: Assumes caregiver days equal to number of patient days lost for patients under 16 years of age.

(F) No Care: Assumes lost productivity days are equal to the number of restricted activity days (minus bed days) per acute case of intestinal virus infection (intestinal virus data from National Center for Health Statistics (1999)) for healthy patients >15 years. Inpatient & Outpatient: Assumes lost productivity days are equal to zero.

(G) No Care: NA. Outpatient: Miller (1997). Inpatient: Assumes one follow-up visit for all patients.

(H) No Care and Outpatient: NA. Inpatient: Khetsuriani et al. (2003) for patients <5 years; Rice et al. (1995) for patients 5 years and older.

(I) No Care & Outpatient: NA. Inpatient: Assumes daily follow-up doctor visit after day of admission.

Exhibit A.4 Unit Cost Data, by Age, for Type B Viruses: Enteroviruses

Cost Category	Average Cost per Patient									
	Base Year $				CPI Base	CPI-U 2003	2003$			
	<1 Year	1 to 4	5 to 15	≥16			<1 Year	1 to 4	5 to 15	≥16
Outpatient costs										
Initial physician visit (A)	$ 99.58	$ 99.58	$ 99.58	$ 99.58	266.0	306.0	$114.55	$114.55	$114.55	$114.55
Cost per follow-up (B)	$ 57.53	$ 57.53	$ 57.53	$ 57.53	266.0	306.0	$ 66.18	$ 66.18	$ 66.18	$ 66.18
Inpatient costs										
Hospital costs:(C)	$16,981	$ 6,413	$ 6,413	$ 6,413	N/A	N/A	N/A	N/A	N/A	N/A
Hospital costs per day: (D)	$ 3,396	$ 1,283	$ 1,283	$ 1,283	213.4	306.0	$ 4,870	$ 1,839	$ 1,839	$ 1,839
Initial physician visit (E)	$132.89	$132.89	$132.89	$132.89	266.0	306.0	$152.87	$152.87	$152.87	$152.87
Cost per follow-up (F)	$ 45.42	$ 45.42	$ 45.42	$ 45.42	266.0	306.0	$ 52.25	$ 52.25	$ 52.25	$ 52.25

Notes: (A, B, E, & F) Updated using CPI-U Medical care services, not seasonally adjusted (Base year: 2000 annual).

(C & D) Updated using CPI-U Medical care services, not seasonally adjusted (Base year: 1994 annual).

Sources: (A) CPT-4 Code 99204: Evaluation and Management: Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: a comprehensive history, a comprehensive examination, and medical decision-making of moderate complexity.

(B) CPT-4 Code 99214: Evaluation and Management: Office or other outpatient visit for the evaluation and management of an established patient, which requires at least two of these three key components: a detailed history, a detailed examination, medical decision-making of moderate complexity.

(C & D) Hospital charges associated with "other circulatory system diagnoses without complications or comorbidities" from the HCUP-3 Nationwide Inpatient Sample for 1994: Diagnosis=Related Groups (DRG #145). Cost per day based on a 5-day hospital stay.

(E) CPT-4 Code 99254: Evaluation and Management: Initial inpatient consultation for a new or established patient, which requires three key components: a comprehensive history, a comprehensive examination, and medical decision-making of moderate complexity.

(F) CPT-4 Code 99262: Evaluation and Management: Follow-up inpatient consultation for an established patient which requires at least two of these three key components: an expanded problem-focused interval history, an expanded problem-focused examination, medical decision-making of moderate complexity.

A.3 Normal Time Allocation

The U.S. Census Bureau compiles data on weekly hours worked, and loss of work hours is a key loss category used in this analysis. For the year 2002, that figure was 39.2 hours per week for the civilian noninstitutional population 16 years old and over who are working full or part-time.[2] This figure excludes those employed but not working because of vacations, illness, strikes, etc.; noncivilians; institutionalized persons; and those in the labor pool but unemployed. This group of workers is about 60.3 percent of the population in this age range.[3] For an average day for the whole population, the average lost market work hours per day of illness is, therefore, about 3.4 hours.[4]

Another important component of people's lost time that is valued in the calculation of benefits is the time spent performing nonpaid work (e.g., errands, housework, child care). For these estimates, studies of how people allocate their time is helpful. In recent years, a number of research teams have explored the allocation of time across different activities. For example, a recent National Research Council (2000) study lists more than 50 major time-use surveys that have been completed internationally. However, the majority of the studies completed in recent years address countries other than the United States, including Australia, the European Community, Japan, New Zealand, and Canada. The most recent U.S. studies were completed by the University of Michigan in 1981-1982 and by the University of Maryland in 1985; the United States Bureau of Labor Statistics is in the process of developing a new time-use study and expects the results to be available in 2004 (United States Bureau of Labor Statistics, undated).

These studies generally address the allocation of time across a large number of different activities. For example, the proposed U.S. survey may include nine groups (personal care, employment activities, education activities, domestic activities, care for dependent household members, purchasing activities, voluntary work and care, social and community interaction, and recreation and leisure) that are subdivided into 99 subgroups, each of which is further subdivided into a number of discrete categories (National Research Council 2000).[5] For the purpose of analyzing time losses associated with nonfatal

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[2] Based on annual average of monthly figures, U.S. Census Bureau, Statistical Abstract of the United States, 2003, Table No. 602, sourced to U.S. Bureau of Labor Statistics, *Employment and Earnings,* monthly, January 2003 issue, and based on the Current Population Survey.

[3] Derived from the estimate of 131,091 thousand people at work (year 2002, based on annual average of monthly figures, U.S. Census Bureau, Statistical Abstract of the United States, 2003, Table No. 602, sourced to U.S. Bureau of Labor Statistics, Employment and Earnings, monthly, January 2003 issue, and based on the Current Population Survey) of the 217,570 thousand people in this age range (year 2002, based on annual average of monthly figures, U.S. Census Bureau, Statistical Abstract of the United States, 2003, Table No. 587, sourced to U.S. Bureau of Labor Statistics, Bulletin 2307 and *Employment and Earnings*, monthly, January issues; Monthly Labor Review, November 2001; and based on the Current Population Survey). 131,091 thousand/ 217,570 thousand = 60.3 percent.

[4] 39.2 hours/week ÷ 7 days/week x (131,091 thousand/ 217,570 thousand)=3.4 hours/day.

[5] EPA's National Human Activity Pattern Survey, conducted in 1992-1993, also provides data on time use. However, the easily accessible data from this survey focus on time spent in selected activities and micro-environments for the purpose of exposure assessment, and do not provide the comprehensive summary data necessary for this analysis. See USEPA 1997d for more information on this and related exposure studies.

cases of Type A and Type B viruses, the dollar value applied (as discussed below) varies across three larger categories: market work, nonmarket work, and leisure activities, so more aggregate data can be used.

In lieu of a recent United States-based study, assumptions were made about time usage, which were then compared to existing data for reasonableness. Specifically, this economic analysis computes unpaid work time using 40 hours per week and applying it to the 39.7 percent of the population not otherwise employed. While applied to the population of unpaid individuals, this estimate is not an assumption that this entire population is performing full time (although nonmarket) work, because this group includes infants, retired persons, and others. Nor is it an assumption that market workers do not also perform nonmarket work. For an average day for the whole population, the average lost nonmarket work hours per day of illness is about 2.3 hours.[6]

This analysis also assumes that, for the population as a whole, leisure time is the time left after sleep time (which is assumed to be 8 hours) and the time spent in market and nonmarket work. That estimate for leisure time is then about 10.3 hours per day.[7]

These estimates compare reasonably with other studies. For example, a recent Canadian study addresses a different population but has similar results. Exhibit A.5 summarizes the results of the Canadian study, which provides national estimates for individuals ages 15 and older in 1998. The hours per day estimates are based on a 7-day week for all time categories. It seems reasonable to expect that Canadian time-use patterns will be similar to U.S. patterns due to the proximity of the two countries and the extent of interaction between their populations.

Exhibit A.5 Time Allocation Estimates Compared to 1998 Canadian Study (hours)

Time Category	Estimates Used in EA	Canadian Estimates
Market Work	3.4	3.3
Nonmarket Work and Leisure	12.6	12.6
Nonmarket Work	2.3	
Leisure	10.3	
Sleep	8.0	8.1

Note: Market work includes paid work time only. The nonmarket and leisure category includes all other activities except sleep, including unpaid work-related activities such as commuting time. Sleep includes night sleep only.

Source: Canadian data from Statistics Canada 1999 and see text and footnotes.

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[6] 40 hours/week ÷ 7 days/week x (1-131,091 thousand/ 217,570 thousand)= 2.3 hours/day.

[7] 24 hours - 8 hours sleep - 3.4 market work hours - 2.3 nonmarket work hours = 10.3 hours/day.

The time allocation estimates also appear not to be inconsistent with data from other sources. In particular, the estimates of time devoted to night sleep are similar across studies. For the United States, 1985 data indicate that individuals aged 18-64 averaged 7.8 hours of night sleep (USEPA 1997d). A 1998-1999 New Zealand study found that individuals aged 12 years and older devoted 8.6 hours to sleep, but did not distinguish between night sleep and naps (Statistics New Zealand 1999).

A.4 Dollar Value of Time Losses

This analysis uses compensation data to estimate the opportunity costs of lost market work, nonmarket work, and leisure time. There are numerous sources of U.S. compensation data, each of which focuses on somewhat different data elements and uses different approaches to data collection. The estimates developed for this analysis are based on well-established and frequently cited sources of national data, relying largely on year 2002 data included in the *Statistical Abstract of the United States: 2003*.

The starting point for the development of these estimates is median weekly earnings for the year 2002 for full time workers ($609 per week), as reported by the United States Bureau of Labor Statistics (United States Bureau of the Census, 2003, Table 641). This value is derived from the Current Population Survey and includes wages and salaries, but not other costs (e.g., benefits) paid by the employer.

This analysis uses median rather than average earnings as the starting point, consistent with other EPA analyses.[8] The distribution of income in the United States is highly skewed due to the small number of people who are extremely highly compensated, hence mean income is significantly higher than the median. Use of the median reflects the notion that the small fraction of the U.S. population affected by this rulemaking are likely to be better represented by the median of the income distribution than by the mean value, which is closer to the upper tail of the distribution.

The next step is conversion of this value to earnings per hour. According to the Bureau of Labor Statistics, individuals usually working full time averaged 42.9 hours per week at work in 2002 (United States Bureau of the Census, 2003, Table 602). This means that the median earnings per hour averaged $14.20 ($609/42.9).

For market work time, the measure of opportunity costs used in this analysis is total pre-tax compensation from the perspective of the employer. The earnings number reported above does not reflect employer paid benefits. To adjust this estimate upwards to reflect total compensation, the analysis uses the ratio of average wages and salaries to average total compensation, as reported by the Bureau of Labor Statistics for private industry workers for 2002 (United States Bureau of the Census, 2003, Table 646). These data show that total compensation per hour averages 1.41 times wages and salaries for full time workers ($25.37/$18.02 per hour). Using this factor to adjust median hourly earnings (as reported above) leads to an estimate of $20.02 per hour for total compensation. The value is then updated to 2003 dollars ($20.82) using the Employment Cost Index (ECI) (United States Bureau of Labor Statistics, 2004).

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[8] See, for example, *Final Heavy Duty Engine/Fuel Rule: Air Quality Planning and Standards.*

For nonmarket work and leisure time (excluding sleep), the measure of opportunity costs used is post-tax earnings, i.e., the "take home" pay of the median individual. This analysis relies on Current Population Survey data on household income before and after taxes (United States Census Bureau, 2003) to determine the percent of earnings paid as taxes. In 2002, the median before-tax income was $42,409, and median after-tax income was $35,812.[9] After-tax income was 84.4 percent of the pre-tax amount. Applying this factor to median hourly earnings leads to estimated after tax earnings of $11.98 per hour. The value is then updated to 2003 dollars ($12.46) using the ECI. The Traditional COI uses half that amount, or $6.23 per hour. For children under the age of 16 years, The results of these calculations are reported in Exhibit A.6 below.

Exhibit A.7 multiplies these dollar per hour values by the time allocations presented in Exhibit A.5 to determine the weighted average value of time per hour and per day. The exhibit also shows the value of a caregiver day, which is the sum of a weighted market work day, nonmarket work day, and nonmarket leisure day.

Exhibit A.6 Dollar per Hour Values

Time Loss Category	Basis for Estimate of Value	Dollar Value
Market Work Time	Median gross (pre-tax) wage plus benefits	$20.82 per hour
Nonmarket Work Time (Enhanced COI)	Median post-tax wage	$12.46 per hour
Nonmarket Leisure Time (Enhanced COI)	Median post-tax wage	$12.46 per hour
Nonmarket Work Time (Traditional COI)	Half the median post-tax wage	$6.23 per hour

Sources: Derived from U.S. Census Bureau 2002 and 2003.

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[9] This median income estimate differs from the earnings estimates cited earlier because it reflects household income, rather than individual earnings, and relies on a different data source.

Exhibit A.7 Weighted Average Value of Time

Time Loss Category	Hours per Day of Illness	Per Hour Value	Per Day Value (weighted by time)
Enhanced COI			
Market Work Time	3.4	$20.82	$70.79
Nonmarket Work Time	2.3	$12.46	$28.66
Nonmarket Leisure Time	10.3	$12.46	$128.34
Caregiver Day	Sum of weighted lost market work, nonmarket work, and nonmarket leisure days		$227.79[1]
Traditional COI			
Market Work Time	3.4	$20.82	$70.79
Nonmarket Work Time	2.3	$6.23	$14.33
Caregiver Day	Sum of weighted lost market work and nonmarket work days		$85.12[2]

[1] For children under 16 years, the value of a lost day under the Enhanced approach is $199.36 instead of $227.79 (16 hours x $12.46/hour) because it excludes any value for market work time and allocates all lost time to the Nonmarket Work and Nonmarket Leisure categories.
[2] For children under 16 years, the value of a lost day under the Traditional approach is $0.
Sources: Exhibits A.5 and A.6

A.5 Lost Productivity (Enhanced COI Only)

Productivity losses are only included in the Enhanced COI. Time losses associated with nonfatal cases of Type A and Type B viruses may include (1) a *reduction in time* (hours) engaged in normal activities; and (2) an additional *loss of productivity* (or effectiveness) that occurs even when the ill individual continues to engage in normal activities. Reductions in time (or hours) would result, for example, when an ill individual spends time on doctor's visits, bed rest, or in the hospital rather than engaging in normal market work and nonmarket work activities. Additional losses in productivity occur when the individual continues to engage in normal activities, but is less productive or finds them less enjoyable due to illness.

A reasonable estimate for lost productivity assumes that time spent in normal activities is 30 percent less productive than it would be normally, i.e., an individual produces 30 percent less per unit of time engaged in market or nonmarket work, and is 30 percent less effective at leisure activities. Furthermore, a reasonable estimate assumes that the dollar value (i.e., the utility loss, estimated based on opportunity costs) of this reduction is equal to the reduction in productivity multiplied by the relevant dollar per hour value (from Exhibit A.7 above). In other words, the 30 percent productivity loss is multiplied by $20.82 per hour to estimate the value of reduced productivity while at work, and by $12.46 per hour to estimate the value of reduced productivity while engaged in nonmarket work and leisure activities. As noted earlier, the value of sleep time is conservatively estimated as "zero" as the effect of illness on sleep time is not quantified in this analysis.

The 30 percent reduction is based on Harrington et al. (1991), which reports the results of a survey of individuals affected by a 1983 giardiasis outbreak in Luzerne County, Pennsylvania. In addition to asking questions about missed work time, the Harrington et al. survey asks:

> *"If you went to work during this illness, did your illness affect your ability to work as hard as you usually do at your job?"* (Harrington et al. 1991, p. 126)

This discussion was followed by a bounded multiple choice questions regarding the percent decrease in normal capacity while working with the illness. The researchers found that respondents identified as workers reported a 30.4 percent loss, while those identified as homemakers reported a 34 percent loss (Harrington et al. 1991, p 103). For the analysis of Type A and Type B viruses contained in this report, these values are rounded to 30 percent. These losses are to the employer for market work time, and to the individual for nonmarket work and leisure time

In addition to applying this 30 percent rate to market and nonmarket work time, the analysis applies this rate to leisure time. The Harrington et al. survey asked respondents whether their leisure activities changed as a result of the illness, as well as whether the illness required them to change their normal routines. While percentage losses were not requested for time engaged in leisure activities while ill, the survey results make it clear that these activities were altered as a result of the illness. While these changes in leisure activities are partially captured in the analysis of time losses (i.e., decreased hours spent in market work, nonmarket work, and leisure activities), it appears reasonable to assume that the utility or pleasure associated with those leisure activities that are pursued while ill is also reduced as a result of the illness.

The effects of giardiasis are very similar to the effects of Type A and Type B viruses, and a review of the literature failed to identify any other recent U.S. studies that report productivity losses for similar illnesses. The estimate of an approximately 30 percent reduction (based on Harrington et al. 1991) appears reasonable based on review of studies estimating productivity losses due to other illnesses.

A.6 Best Estimates for Cost of Illness

The data discussed throughout this appendix relate to Type A and Type B viruses. The costs, time allocation, weighted average value of time, and loss of productivity estimates have been presented in Exhibits A.1 through A.7. These cost of illness values are later adjusted for income growth in Appendix B and yearly values are used in the model. These yearly values are the basis for the calculations of the COI estimates, as discussed in Chapter 5, section 5.3.1.

Appendix B

Detail of Benefits Valuation Inputs

GWR Benefits Valuation Inputs Model Introduction Sheet

Worksheet	Exhibit No.	Description
Benefits Schedule	B.1	Schedule used to estimate the accumulation of benefits by year.
VSL Valuation Inputs	B.2	Distribution functions for VSL for fatalities.
CPI Proj	B.3	CPI values for all goods (1990 - 2003).
Pop & GDP Proj	B.4	Population projections, real GDP projections, and real per capita income projections from 1990 to 2029 (values from 1990 - 2003 are actual values).
Inc Elasticity Factors	B.5	Factors for incorporation of income elasticity into yearly benefits estimates.
VSL Values by Year	B.6	Projected cost of dying from viral infection years 2005 to 2029.
Type A Base COI	B.7	Mean direct and indirect cost of illness (COI) for Type A illnesses.
Type A COI by Year: Healthy	B.8	COI values by year for Type A illnesses in healthy populations.
Type A COI by Year: Sensitive	B.9	COI values by year for Type A illnesses in immunocompromised populations.
Type B Base COI	B.10	Mean direct and indirect cost of illness (COI) for Type B illnessess.
Type B COI by Year: Mild	B.11	COI values by year for mild cases of Type B illness.
Type B COI by Year: Moderate	B.12	COI values by year for moderate cases of Type B illness.
Type B COI by Year: Severe	B.13	COI values by year for severe cases of Type B illness.
Type A Healthy Illnesses Avoided by GWR	B.14a	Estimated Type A illnesses avoided in the healthy population as a result of the GWR.
Type A Immunocompromised Illnesses Avoided by GWR	B.14b	Estimated Type A illnesses avoided in the immunocompromised population as a result o the GWR.
Mild Type B Illnesses Avoided by GWR	B.15a	Estimated Type B illnesses requiring no medical care avoided as a result of the GWR.
Moderate Type B Illnesses Avoided by GWR	B.15b	Estimated Type B illnesses requiring doctor visit avoided as a result of the GWR.
Severe Type B Illnesses Avoided by GWR	B.15c	Estimated Type B illnesses requiring no hospitalization avoided as a result of the GWR.
Type A Deaths Avoided by GWR	B.16	Estimated Type A deaths avoided as a result of the GWR.
Type B Deaths Avoided by GWR	B.17	Estimated Type B deaths avoided as a result of the GWR.
Water System Violations	B.18	TCR violation data.

Exhibit B.1 Benefits Accumulation Schedule

Year	CWS	NTNCWS	TNCWS
2007	0%	0%	0%
2008	0%	0%	0%
2009	17%	11%	11%
2010	33%	22%	22%
2011	50%	33%	33%
2012	67%	44%	44%
2013	83%	56%	56%
2014	100%	67%	67%
2015	100%	78%	78%
2016	100%	89%	89%
2017	100%	100%	100%
2018	100%	100%	100%
2019	100%	100%	100%
2020	100%	100%	100%
2021	100%	100%	100%
2022	100%	100%	100%
2023	100%	100%	100%
2024	100%	100%	100%
2025	100%	100%	100%
2026	100%	100%	100%
2027	100%	100%	100%
2028	100%	100%	100%
2029	100%	100%	100%
2030	100%	100%	100%
2031	100%	100%	100%

Source: Derived from rule implementation schedule.

Exhibit B.2 Description of VSL Valuation Parameters

VSL

Dist. Type		Weibull	
Parameters		Loc:	0
		Scale:	5.32
		Shape:	1.509588
Simulation Mean	$	4.80	Million (1990$)

Source: Distribution adapted from *The Benefits and Costs of the Clean Air Act, 1970-1990* (USEPA, 1997b)

VSL Income Elasticity

Central Estimate	0.40
Low End	0.08
High End	1.00
Dist. Type	Triangular
Simulation Mean	0.49

Source: Kleckner and Neumann (2000)

Exhibit B.3 CPI Projections

Year	CPI - All Items		
	CPI (Annual Average)	Percent Change	Adjustment Factor (1990 base)
1990	130.7	-	1.00
1991	136.2	4.2%	1.04
1992	140.3	3.0%	1.07
1993	144.5	3.0%	1.11
1994	148.2	2.6%	1.13
1995	152.4	2.8%	1.17
1996	156.9	3.0%	1.20
1997	160.5	2.3%	1.23
1998	163.0	1.6%	1.25
1999	166.6	2.2%	1.27
2000	172.2	3.4%	1.32
2001	177.1	2.8%	1.36
2002	179.9	1.6%	1.38
2003	184.0	2.3%	1.41

Notes: 1990 base factors (all items) used to update VSL values.

Source: 1990-2003 CPI values from Bureau of Labor Statistics.

Exhibit B.4 Population, GDP, and Per Capita Income Projections

	Population		Real GDP		Income (Real GDP per Capita)	
Year	**Estimates/ Projections (Thousands)**	**Percent Change**	**Projection (Billions Chained 2000$)**	**Percent Change**	**Projection (Thousands 2000$)**	**Percent Change**
1990	249,439	-	7,112.5	-	28,514	-
1991	252,127	1.1%	7,100.5	-0.2%	28,162	-1.2%
1992	254,995	1.1%	7,336.6	3.3%	28,772	2.2%
1993	257,746	1.1%	7,532.7	2.7%	29,225	1.6%
1994	260,289	1.0%	7,835.5	4.0%	30,103	3.0%
1995	262,765	1.0%	8,031.7	2.5%	30,566	1.5%
1996	265,190	0.9%	8,328.9	3.7%	31,407	2.8%
1997	267,744	1.0%	8,703.5	4.5%	32,507	3.5%
1998	270,299	1.0%	9,066.9	4.2%	33,544	3.2%
1999	272,820	0.9%	9,470.3	4.4%	34,713	3.5%
2000	275,306	0.9%	9,817.0	3.7%	35,659	2.7%
2001	277,803	0.9%	9,866.6	0.5%	35,517	-0.4%
2002	280,306	0.9%	10,083.0	2.2%	35,971	1.3%
2003	282,798	0.9%	10,398.0	3.1%	36,768	2.2%
2004	285,266	0.9%	10,730.7	3.2%	37,617	2.3%
2005	287,716	0.9%	11,245.8	4.8%	39,086	3.9%
2006	290,153	0.8%	11,718.1	4.2%	40,386	3.3%
2007	292,583	0.8%	12,093.1	3.2%	41,332	2.3%
2008	295,009	0.8%	12,419.6	2.7%	42,099	1.9%
2009	297,436	0.8%	12,767.4	2.8%	42,925	2.0%
2010	299,862	0.8%	13,124.9	2.8%	43,770	2.0%
2011	302,300	0.8%	13,466.1	2.6%	44,546	1.8%
2012	304,764	0.8%	13,802.8	2.5%	45,290	1.7%
2013	307,250	0.8%	14,147.8	2.5%	46,047	1.7%
2014	309,753	0.8%	14,501.5	2.5%	46,816	1.7%
2015	312,268	0.8%	14,864.1	2.5%	47,600	1.7%
2016	314,793	0.8%	15,235.7	2.5%	48,399	1.7%
2017	317,325	0.8%	15,616.6	2.5%	49,213	1.7%
2018	319,860	0.8%	16,007.0	2.5%	50,044	1.7%
2019	322,395	0.8%	16,407.2	2.5%	50,891	1.7%
2020	324,927	0.8%	16,817.3	2.5%	51,757	1.7%
2021	327,468	0.8%	17,237.8	2.5%	52,640	1.7%
2022	330,028	0.8%	17,668.7	2.5%	53,537	1.7%
2023	332,607	0.8%	18,110.4	2.5%	54,450	1.7%
2024	335,202	0.8%	18,563.2	2.5%	55,379	1.7%
2025	337,815	0.8%	19,027.3	2.5%	56,325	1.7%
2026	340,441	0.8%	19,502.9	2.5%	57,287	1.7%
2027	343,078	0.8%	19,990.5	2.5%	58,268	1.7%
2028	345,735	0.8%	20,490.3	2.5%	59,266	1.7%
2029	348,391	0.8%	21,002.5	2.5%	60,284	1.7%

Source: Population projections from US Census Bureau (NP-T1: Middle Series).

1990-2003 real GDP from Bureau of Economic Analysis, all other years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 due to lack of other data.

Income (Real GDP per Capita)=Real GDP/Population

Exhibit B.5 Factors for Incorporation of Income Elasticity into Yearly Benefits Estimates

	Factors for Fatal Illnesses				Real Income Adjustment Factors for Indirect Costs of Illness (Point Estimates)
			90 Percent		
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	
2005	1.169	1.163	1.066	1.295	1.063
2006	1.188	1.181	1.073	1.330	1.098
2007	1.202	1.194	1.078	1.356	1.124
2008	1.213	1.204	1.082	1.376	1.145
2009	1.224	1.215	1.086	1.398	1.167
2010	1.236	1.227	1.090	1.420	1.190
2011	1.247	1.237	1.094	1.441	1.212
2012	1.257	1.246	1.097	1.460	1.232
2013	1.268	1.256	1.101	1.480	1.252
2014	1.278	1.265	1.104	1.500	1.273
2015	1.288	1.275	1.108	1.520	1.295
2016	1.299	1.285	1.111	1.540	1.316
2017	1.310	1.295	1.115	1.561	1.338
2018	1.320	1.304	1.118	1.582	1.361
2019	1.331	1.314	1.122	1.604	1.384
2020	1.342	1.324	1.126	1.625	1.408
2021	1.353	1.335	1.129	1.648	1.432
2022	1.364	1.345	1.133	1.670	1.456
2023	1.376	1.355	1.136	1.692	1.481
2024	1.387	1.365	1.140	1.715	1.506
2025	1.398	1.375	1.143	1.739	1.532
2026	1.410	1.386	1.147	1.762	1.558
2027	1.421	1.396	1.150	1.786	1.585
2028	1.433	1.406	1.154	1.810	1.612
2029	1.445	1.417	1.157	1.834	1.640

Note: Income elasticity factors calculated as $[(eI_1 - eI_2 - I_2 - I_1) / (eI_2 - eI_1 - I_2 - I_1)]$; where e=income elasticity of WTP estimate, and I=income.

Source: Derived using elasticity distributions and per capita GDP projections from Exhibits B.2 and B.4.

Exhibit B.6 Value of VSL Estimates by Year ($Millions) ($2003)

Year	VSL			
	Mean Value	Median Value	90 Percent Confidence Bound	
			Lower (5th %tile)	Upper (95th %tile)
2007	7.4	6.4	1.1	16.8
2008	7.5	6.5	1.2	17.1
2009	7.6	6.6	1.2	17.5
2010	7.7	6.7	1.2	17.7
2011	7.8	6.7	1.2	17.9
2012	7.9	6.8	1.2	18.0
2013	8.0	6.8	1.2	18.1
2014	8.1	6.9	1.2	18.3
2015	8.1	7.0	1.2	18.5
2016	8.2	7.0	1.2	18.7
2017	8.3	7.1	1.2	19.0
2018	8.3	7.1	1.2	19.1
2019	8.4	7.1	1.2	19.3
2020	8.5	7.2	1.3	19.5
2021	8.5	7.2	1.3	19.7
2022	8.6	7.3	1.3	19.9
2023	8.7	7.4	1.3	20.0
2024	8.8	7.5	1.3	20.2
2025	8.8	7.5	1.3	20.4
2026	8.9	7.6	1.3	20.6
2027	9.0	7.6	1.3	20.8
2028	9.1	7.7	1.4	21.1
2029	9.1	7.8	1.4	21.4
2030	9.2	7.8	1.4	21.6
2031	9.3	7.9	1.4	21.9

Source: Derived using data from Exhibits B.2 and B.5.

Exhibit B.7 Description of Rotavirus Valuation Parameters

Cost of Illness for Healthy Populations

Dist. Type Triangular

Age Distribution	< 2 yrs	2 to 4 yrs	5 to 15 yrs	> 15 yrs
Direct Costs				
Mode	$ 97	$ 82	$ -	$ -
Low End	$ 16	$ 16	$ -	$ -
High End	$ 101	$ 99	$ -	$ -
Mean	$ 71	$ 66	$ -	$ -
Indirect Costs				
Mode	$ 1,293	$ 1,293	$ 641	$ 103
Low End	n/a	n/a	n/a	n/a
High End	n/a	n/a	n/a	n/a
Mean	n/a	n/a	n/a	n/a

Cost of Illness for Immunocompromised Populations

Dist. Type Triangular

Age Distribution	< 2 yrs	2 to 4 yrs	5 to 15 yrs	> 15 yrs
Direct Costs				
Mode	$ 4,486	$ 4,486	$ 4,453	$ 4,453
Low End	$ 4,453	$ 4,453	n/a	n/a
High End	$ 5,049	$ 5,049	n/a	n/a
Mean	$ 4,663	$ 4,663	n/a	n/a
Indirect Costs				
Mode	$ 2,136	$ 1,281	$ 1,281	$ 569
Low End	n/a	n/a	n/a	n/a
High End	n/a	n/a	n/a	n/a
Mean	n/a	n/a	n/a	n/a

Note: N/A Designates Point Estimate.

Source: Appendix A, Exhibits A.1and A.2.

Exhibit B.8 Value of COI Increment by Year (Rotavirus, Healthy Populations)

	< 2 Years Old				2 to 4 Years Old				5 to 15 Years Old				> 15 Years Old			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2007	$ 1,410	$ 1,413	$ 1,373	$ 1,435	$ 1,404	$ 1,407	$ 1,371	$ 1,429	$ 663	$ 663	$ 663	$ 663	$ 107	$ 107	$ 107	$ 107
2008	$ 1,441	$ 1,444	$ 1,404	$ 1,466	$ 1,435	$ 1,438	$ 1,402	$ 1,460	$ 679	$ 679	$ 679	$ 679	$ 109	$ 109	$ 109	$ 109
2009	$ 1,494	$ 1,498	$ 1,457	$ 1,520	$ 1,489	$ 1,491	$ 1,455	$ 1,513	$ 705	$ 705	$ 705	$ 705	$ 114	$ 114	$ 114	$ 114
2010	$ 1,542	$ 1,545	$ 1,505	$ 1,567	$ 1,536	$ 1,539	$ 1,503	$ 1,561	$ 729	$ 729	$ 729	$ 729	$ 117	$ 117	$ 117	$ 117
2011	$ 1,576	$ 1,579	$ 1,539	$ 1,602	$ 1,570	$ 1,573	$ 1,537	$ 1,595	$ 746	$ 746	$ 746	$ 746	$ 120	$ 120	$ 120	$ 120
2012	$ 1,604	$ 1,607	$ 1,567	$ 1,629	$ 1,598	$ 1,601	$ 1,565	$ 1,623	$ 759	$ 759	$ 759	$ 759	$ 122	$ 122	$ 122	$ 122
2013	$ 1,634	$ 1,637	$ 1,597	$ 1,660	$ 1,628	$ 1,631	$ 1,595	$ 1,653	$ 774	$ 774	$ 774	$ 774	$ 125	$ 125	$ 125	$ 125
2014	$ 1,665	$ 1,668	$ 1,628	$ 1,690	$ 1,659	$ 1,662	$ 1,626	$ 1,684	$ 790	$ 790	$ 790	$ 790	$ 127	$ 127	$ 127	$ 127
2015	$ 1,693	$ 1,696	$ 1,656	$ 1,719	$ 1,687	$ 1,690	$ 1,654	$ 1,712	$ 804	$ 804	$ 804	$ 804	$ 129	$ 129	$ 129	$ 129
2016	$ 1,720	$ 1,723	$ 1,683	$ 1,746	$ 1,714	$ 1,717	$ 1,681	$ 1,739	$ 817	$ 817	$ 817	$ 817	$ 132	$ 132	$ 132	$ 132
2017	$ 1,748	$ 1,751	$ 1,711	$ 1,773	$ 1,742	$ 1,745	$ 1,709	$ 1,767	$ 831	$ 831	$ 831	$ 831	$ 134	$ 134	$ 134	$ 134
2018	$ 1,776	$ 1,779	$ 1,739	$ 1,801	$ 1,770	$ 1,773	$ 1,737	$ 1,795	$ 845	$ 845	$ 845	$ 845	$ 136	$ 136	$ 136	$ 136
2019	$ 1,804	$ 1,808	$ 1,767	$ 1,830	$ 1,799	$ 1,801	$ 1,765	$ 1,823	$ 859	$ 859	$ 859	$ 859	$ 138	$ 138	$ 138	$ 138
2020	$ 1,833	$ 1,837	$ 1,796	$ 1,859	$ 1,828	$ 1,830	$ 1,794	$ 1,853	$ 873	$ 873	$ 873	$ 873	$ 141	$ 141	$ 141	$ 141
2021	$ 1,863	$ 1,866	$ 1,826	$ 1,888	$ 1,857	$ 1,860	$ 1,824	$ 1,882	$ 888	$ 888	$ 888	$ 888	$ 143	$ 143	$ 143	$ 143
2022	$ 1,893	$ 1,896	$ 1,856	$ 1,919	$ 1,888	$ 1,890	$ 1,854	$ 1,912	$ 903	$ 903	$ 903	$ 903	$ 145	$ 145	$ 145	$ 145
2023	$ 1,924	$ 1,927	$ 1,887	$ 1,950	$ 1,918	$ 1,921	$ 1,885	$ 1,943	$ 918	$ 918	$ 918	$ 918	$ 148	$ 148	$ 148	$ 148
2024	$ 1,956	$ 1,959	$ 1,919	$ 1,981	$ 1,950	$ 1,953	$ 1,917	$ 1,975	$ 934	$ 934	$ 934	$ 934	$ 150	$ 150	$ 150	$ 150
2025	$ 1,988	$ 1,991	$ 1,951	$ 2,013	$ 1,982	$ 1,985	$ 1,949	$ 2,007	$ 950	$ 950	$ 950	$ 950	$ 153	$ 153	$ 153	$ 153
2026	$ 2,020	$ 2,024	$ 1,983	$ 2,046	$ 2,015	$ 2,017	$ 1,981	$ 2,040	$ 966	$ 966	$ 966	$ 966	$ 156	$ 156	$ 156	$ 156
2027	$ 2,054	$ 2,057	$ 2,017	$ 2,079	$ 2,048	$ 2,051	$ 2,015	$ 2,073	$ 982	$ 982	$ 982	$ 982	$ 158	$ 158	$ 158	$ 158
2028	$ 2,087	$ 2,091	$ 2,051	$ 2,113	$ 2,082	$ 2,084	$ 2,048	$ 2,107	$ 999	$ 999	$ 999	$ 999	$ 161	$ 161	$ 161	$ 161
2029	$ 2,122	$ 2,125	$ 2,085	$ 2,147	$ 2,116	$ 2,119	$ 2,083	$ 2,141	$ 1,016	$ 1,016	$ 1,016	$ 1,016	$ 164	$ 164	$ 164	$ 164
2028	$ 2,157	$ 2,160	$ 2,120	$ 2,182	$ 2,151	$ 2,154	$ 2,118	$ 2,176	$ 1,033	$ 1,033	$ 1,033	$ 1,033	$ 166	$ 166	$ 166	$ 166
2029	$ 2,193	$ 2,196	$ 2,156	$ 2,218	$ 2,187	$ 2,190	$ 2,154	$ 2,212	$ 1,051	$ 1,051	$ 1,051	$ 1,051	$ 169	$ 169	$ 169	$ 169

Source: Derived from Exhibits B.5 and B.7

Exhibit B.9 Value of COI Increment by Year (Rotavirus, Immunocompromised Populations)

	< 2 Years Old				2 to 4 Years Old				5 to 15 Years Old				> 15 Years Old			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2007	$ 6,874	$ 6,851	$ 6,695	$ 7,131	$ 5,989	$ 5,965	$ 5,810	$ 6,245	$ 5,779	$ 5,779	$ 5,779	$ 5,779	$ 5,042	$ 5,042	$ 5,042	$ 5,042
2008	$ 6,925	$ 6,902	$ 6,746	$ 7,182	$ 6,019	$ 5,996	$ 5,841	$ 6,276	$ 5,810	$ 5,810	$ 5,810	$ 5,810	$ 5,056	$ 5,056	$ 5,056	$ 5,056
2009	$ 7,013	$ 6,990	$ 6,835	$ 7,270	$ 6,072	$ 6,049	$ 5,894	$ 6,329	$ 5,863	$ 5,863	$ 5,863	$ 5,863	$ 5,079	$ 5,079	$ 5,079	$ 5,079
2010	$ 7,092	$ 7,068	$ 6,913	$ 7,348	$ 6,119	$ 6,096	$ 5,940	$ 6,376	$ 5,910	$ 5,910	$ 5,910	$ 5,910	$ 5,100	$ 5,100	$ 5,100	$ 5,100
2011	$ 7,148	$ 7,125	$ 6,970	$ 7,405	$ 6,153	$ 6,130	$ 5,975	$ 6,410	$ 5,944	$ 5,944	$ 5,944	$ 5,944	$ 5,115	$ 5,115	$ 5,115	$ 5,115
2012	$ 7,195	$ 7,171	$ 7,016	$ 7,451	$ 6,181	$ 6,158	$ 6,002	$ 6,437	$ 5,971	$ 5,971	$ 5,971	$ 5,971	$ 5,127	$ 5,127	$ 5,127	$ 5,127
2013	$ 7,244	$ 7,221	$ 7,066	$ 7,501	$ 6,211	$ 6,187	$ 6,032	$ 6,467	$ 6,001	$ 6,001	$ 6,001	$ 6,001	$ 5,141	$ 5,141	$ 5,141	$ 5,141
2014	$ 7,295	$ 7,272	$ 7,116	$ 7,552	$ 6,241	$ 6,218	$ 6,063	$ 6,498	$ 6,032	$ 6,032	$ 6,032	$ 6,032	$ 5,154	$ 5,154	$ 5,154	$ 5,154
2015	$ 7,342	$ 7,318	$ 7,163	$ 7,598	$ 6,269	$ 6,246	$ 6,091	$ 6,526	$ 6,060	$ 6,060	$ 6,060	$ 6,060	$ 5,167	$ 5,167	$ 5,167	$ 5,167
2016	$ 7,386	$ 7,363	$ 7,208	$ 7,643	$ 6,296	$ 6,273	$ 6,117	$ 6,552	$ 6,086	$ 6,086	$ 6,086	$ 6,086	$ 5,179	$ 5,179	$ 5,179	$ 5,179
2017	$ 7,432	$ 7,409	$ 7,253	$ 7,689	$ 6,323	$ 6,300	$ 6,145	$ 6,580	$ 6,114	$ 6,114	$ 6,114	$ 6,114	$ 5,191	$ 5,191	$ 5,191	$ 5,191
2018	$ 7,478	$ 7,455	$ 7,300	$ 7,735	$ 6,351	$ 6,328	$ 6,172	$ 6,608	$ 6,142	$ 6,142	$ 6,142	$ 6,142	$ 5,203	$ 5,203	$ 5,203	$ 5,203
2019	$ 7,525	$ 7,502	$ 7,347	$ 7,782	$ 6,380	$ 6,356	$ 6,201	$ 6,636	$ 6,170	$ 6,170	$ 6,170	$ 6,170	$ 5,216	$ 5,216	$ 5,216	$ 5,216
2020	$ 7,573	$ 7,550	$ 7,395	$ 7,830	$ 6,408	$ 6,385	$ 6,229	$ 6,665	$ 6,199	$ 6,199	$ 6,199	$ 6,199	$ 5,228	$ 5,228	$ 5,228	$ 5,228
2021	$ 7,622	$ 7,599	$ 7,444	$ 7,879	$ 6,438	$ 6,414	$ 6,259	$ 6,694	$ 6,228	$ 6,228	$ 6,228	$ 6,228	$ 5,241	$ 5,241	$ 5,241	$ 5,241
2022	$ 7,672	$ 7,649	$ 7,494	$ 7,929	$ 6,468	$ 6,444	$ 6,289	$ 6,724	$ 6,258	$ 6,258	$ 6,258	$ 6,258	$ 5,255	$ 5,255	$ 5,255	$ 5,255
2023	$ 7,723	$ 7,700	$ 7,545	$ 7,980	$ 6,498	$ 6,475	$ 6,319	$ 6,755	$ 6,288	$ 6,288	$ 6,288	$ 6,288	$ 5,268	$ 5,268	$ 5,268	$ 5,268
2024	$ 7,775	$ 7,752	$ 7,597	$ 8,032	$ 6,529	$ 6,506	$ 6,351	$ 6,786	$ 6,320	$ 6,320	$ 6,320	$ 6,320	$ 5,282	$ 5,282	$ 5,282	$ 5,282
2025	$ 7,828	$ 7,805	$ 7,650	$ 8,085	$ 6,561	$ 6,538	$ 6,382	$ 6,818	$ 6,352	$ 6,352	$ 6,352	$ 6,352	$ 5,296	$ 5,296	$ 5,296	$ 5,296
2026	$ 7,882	$ 7,859	$ 7,704	$ 8,139	$ 6,594	$ 6,570	$ 6,415	$ 6,850	$ 6,384	$ 6,384	$ 6,384	$ 6,384	$ 5,311	$ 5,311	$ 5,311	$ 5,311
2027	$ 7,937	$ 7,914	$ 7,759	$ 8,194	$ 6,627	$ 6,603	$ 6,448	$ 6,883	$ 6,417	$ 6,417	$ 6,417	$ 6,417	$ 5,325	$ 5,325	$ 5,325	$ 5,325
2028	$ 7,993	$ 7,970	$ 7,815	$ 8,250	$ 6,660	$ 6,637	$ 6,481	$ 6,916	$ 6,450	$ 6,450	$ 6,450	$ 6,450	$ 5,340	$ 5,340	$ 5,340	$ 5,340
2029	$ 8,050	$ 8,027	$ 7,871	$ 8,307	$ 6,694	$ 6,671	$ 6,515	$ 6,950	$ 6,484	$ 6,484	$ 6,484	$ 6,484	$ 5,355	$ 5,355	$ 5,355	$ 5,355
2028	$ 8,108	$ 8,085	$ 7,929	$ 8,365	$ 6,729	$ 6,705	$ 6,550	$ 6,985	$ 6,519	$ 6,519	$ 6,519	$ 6,519	$ 5,371	$ 5,371	$ 5,371	$ 5,371
2029	$ 8,167	$ 8,144	$ 7,988	$ 8,424	$ 6,764	$ 6,741	$ 6,585	$ 7,021	$ 6,555	$ 6,555	$ 6,555	$ 6,555	$ 5,386	$ 5,386	$ 5,386	$ 5,386

Source: Derived from Exhibits B.5 and B.7

Exhibit B.10 Description of Enterovirus Valuation Parameters

Cost of Illness for Iillnesses Not Requiring Medical Treatment

Dist. Type	Triangular

Age Distribution	< 1 mo	1 mo - < 1 yr	1 to < 5 yrs	5 to < 16 yrs	≥ 16 yrs
Direct Costs					
Mode	$ -	$ -	$ -	$ -	$ -
Low End	n/a	n/a	n/a	n/a	n/a
High End	n/a	n/a	n/a	n/a	n/a
Mean	n/a	n/a	n/a	n/a	n/a
Direct Costs					
Mode	$ 1,281	$ 1,281	$ 1,281	$ 641	$ 336
Low End	$ 427	$ 427	$ 427	n/a	n/a
High End	$ 2,563	$ 2,563	$ 2,563	n/a	n/a
Mean	$ 1,424	$ 1,424	$ 1,424	n/a	n/a

Cost of Illness for Illnesses Requiring Doctor Visit

Dist. Type	Triangular

Age Distribution	< 1 mo	1 mo - < 1 yr	1 to < 5 yrs	5 to < 16 yrs	> 16 yrs
Direct Costs					
Mode	$ 181	$ 181	$ 181	$ 181	$ 181
Low End	n/a	n/a	n/a	n/a	n/a
High End	n/a	n/a	n/a	n/a	n/a
Mean	n/a	n/a	n/a	n/a	n/a
Direct Costs					
Mode	$ 2,136	$ 2,136	$ 2,136	$ 2,136	$ 1,139
Low End	$ 854	$ 854	$ 854	$ 854	$ 456
High End	$ 5,126	$ 5,126	$ 4,272	$ 2,990	$ 2,050
Mean	$ 2,705	$ 2,705	$ 2,421	$ 1,993	$ 1,215

Cost of Illness for Illnesses Requiring Hospitalization

Dist. Type	Triangular

Age Distribution	< 1 mo	1 mo - < 1 yr	1 to < 5 yrs	5 to < 16 yrs	> 16 yrs
Direct Costs					
Central Estimate	$ 23,431	$ 23,431	$ 9,187	$ 5,036	$ 5,036
Low End	n/a	n/a	n/a	n/a	n/a
High End	n/a	n/a	n/a	n/a	n/a
Simulation Mean	n/a	n/a	n/a	n/a	n/a
Direct Costs					
Central Estimate	$ 2,990	$ 2,990	$ 2,990	$ 2,990	$ 1,595
Low End	$ 854	$ 854	$ 854	$ 854	$ 456
High End	$ 5,980	$ 5,980	$ 5,980	$ 5,980	$ 3,189
Simulation Mean	$ 2,990	$ 2,990	$ 2,990	$ 2,990	$ 1,595

Note: N/A Designates Point Estimate.

Source: Appendix A, Exhibits A.3 and A.4.

Exhibit B.11 Value of COI Increment by Year (Enterovirus, Cases Not Requiring Medical Care)

Year	< 1 Month Old				1 Month to < 1 Year Old				1 to < 5 Years Old				5 to < 16 Years Old				≥ 16 Years Old			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2007	$ 1,474	$ 1,441	$ 754	$ 2,268	$ 1,474	$ 1,441	$ 751	$ 2,267	$ 1,474	$ 1,441	$ 754	$ 2,270	$ 663	$ 663	$ 663	$ 663	$ 348	$ 348	$ 348	$ 348
2008	$ 1,508	$ 1,474	$ 772	$ 2,320	$ 1,508	$ 1,474	$ 768	$ 2,319	$ 1,508	$ 1,474	$ 771	$ 2,322	$ 679	$ 679	$ 679	$ 679	$ 356	$ 356	$ 356	$ 356
2009	$ 1,567	$ 1,531	$ 802	$ 2,411	$ 1,567	$ 1,532	$ 798	$ 2,410	$ 1,567	$ 1,531	$ 801	$ 2,413	$ 705	$ 705	$ 705	$ 705	$ 370	$ 370	$ 370	$ 370
2010	$ 1,619	$ 1,582	$ 829	$ 2,491	$ 1,619	$ 1,582	$ 825	$ 2,490	$ 1,619	$ 1,582	$ 828	$ 2,493	$ 729	$ 729	$ 729	$ 729	$ 383	$ 383	$ 383	$ 383
2011	$ 1,657	$ 1,619	$ 848	$ 2,550	$ 1,657	$ 1,620	$ 844	$ 2,548	$ 1,657	$ 1,619	$ 848	$ 2,551	$ 746	$ 746	$ 746	$ 746	$ 392	$ 392	$ 392	$ 392
2012	$ 1,688	$ 1,649	$ 864	$ 2,597	$ 1,688	$ 1,650	$ 860	$ 2,595	$ 1,688	$ 1,649	$ 863	$ 2,599	$ 759	$ 759	$ 759	$ 759	$ 399	$ 399	$ 399	$ 399
2013	$ 1,721	$ 1,682	$ 881	$ 2,648	$ 1,721	$ 1,682	$ 877	$ 2,646	$ 1,721	$ 1,682	$ 880	$ 2,650	$ 774	$ 774	$ 774	$ 774	$ 407	$ 407	$ 407	$ 407
2014	$ 1,755	$ 1,715	$ 898	$ 2,700	$ 1,755	$ 1,715	$ 894	$ 2,698	$ 1,755	$ 1,715	$ 898	$ 2,702	$ 790	$ 790	$ 790	$ 790	$ 415	$ 415	$ 415	$ 415
2015	$ 1,786	$ 1,745	$ 914	$ 2,748	$ 1,786	$ 1,745	$ 910	$ 2,746	$ 1,786	$ 1,745	$ 913	$ 2,750	$ 804	$ 804	$ 804	$ 804	$ 422	$ 422	$ 422	$ 422
2016	$ 1,816	$ 1,774	$ 929	$ 2,794	$ 1,816	$ 1,775	$ 925	$ 2,792	$ 1,816	$ 1,774	$ 929	$ 2,796	$ 817	$ 817	$ 817	$ 817	$ 429	$ 429	$ 429	$ 429
2017	$ 1,846	$ 1,804	$ 945	$ 2,840	$ 1,846	$ 1,804	$ 941	$ 2,839	$ 1,846	$ 1,804	$ 944	$ 2,842	$ 831	$ 831	$ 831	$ 831	$ 436	$ 436	$ 436	$ 436
2018	$ 1,877	$ 1,834	$ 961	$ 2,888	$ 1,877	$ 1,834	$ 956	$ 2,886	$ 1,877	$ 1,834	$ 960	$ 2,890	$ 845	$ 845	$ 845	$ 845	$ 443	$ 443	$ 443	$ 443
2019	$ 1,908	$ 1,865	$ 977	$ 2,936	$ 1,908	$ 1,865	$ 972	$ 2,934	$ 1,908	$ 1,865	$ 976	$ 2,938	$ 859	$ 859	$ 859	$ 859	$ 451	$ 451	$ 451	$ 451
2020	$ 1,940	$ 1,896	$ 993	$ 2,985	$ 1,940	$ 1,896	$ 989	$ 2,984	$ 1,940	$ 1,896	$ 992	$ 2,987	$ 873	$ 873	$ 873	$ 873	$ 458	$ 458	$ 458	$ 458
2021	$ 1,973	$ 1,928	$ 1,010	$ 3,036	$ 1,973	$ 1,928	$ 1,005	$ 3,034	$ 1,973	$ 1,928	$ 1,009	$ 3,038	$ 888	$ 888	$ 888	$ 888	$ 466	$ 466	$ 466	$ 466
2022	$ 2,006	$ 1,961	$ 1,027	$ 3,087	$ 2,006	$ 1,961	$ 1,022	$ 3,085	$ 2,006	$ 1,961	$ 1,026	$ 3,089	$ 903	$ 903	$ 903	$ 903	$ 474	$ 474	$ 474	$ 474
2023	$ 2,040	$ 1,994	$ 1,044	$ 3,139	$ 2,040	$ 1,994	$ 1,039	$ 3,137	$ 2,040	$ 1,994	$ 1,044	$ 3,141	$ 918	$ 918	$ 918	$ 918	$ 482	$ 482	$ 482	$ 482
2024	$ 2,075	$ 2,028	$ 1,062	$ 3,193	$ 2,075	$ 2,028	$ 1,057	$ 3,191	$ 2,075	$ 2,028	$ 1,061	$ 3,195	$ 934	$ 934	$ 934	$ 934	$ 490	$ 490	$ 490	$ 490
2025	$ 2,110	$ 2,062	$ 1,080	$ 3,247	$ 2,110	$ 2,063	$ 1,075	$ 3,245	$ 2,110	$ 2,062	$ 1,079	$ 3,249	$ 950	$ 950	$ 950	$ 950	$ 499	$ 499	$ 499	$ 499
2026	$ 2,146	$ 2,098	$ 1,098	$ 3,302	$ 2,146	$ 2,098	$ 1,094	$ 3,300	$ 2,146	$ 2,098	$ 1,098	$ 3,305	$ 966	$ 966	$ 966	$ 966	$ 507	$ 507	$ 507	$ 507
2027	$ 2,183	$ 2,133	$ 1,117	$ 3,359	$ 2,183	$ 2,134	$ 1,112	$ 3,357	$ 2,183	$ 2,133	$ 1,117	$ 3,361	$ 982	$ 982	$ 982	$ 982	$ 516	$ 516	$ 516	$ 516
2028	$ 2,220	$ 2,170	$ 1,136	$ 3,416	$ 2,220	$ 2,170	$ 1,131	$ 3,414	$ 2,220	$ 2,170	$ 1,136	$ 3,418	$ 999	$ 999	$ 999	$ 999	$ 525	$ 525	$ 525	$ 525
2029	$ 2,258	$ 2,207	$ 1,156	$ 3,474	$ 2,258	$ 2,207	$ 1,150	$ 3,472	$ 2,258	$ 2,207	$ 1,155	$ 3,477	$ 1,016	$ 1,016	$ 1,016	$ 1,016	$ 534	$ 534	$ 534	$ 534
2028	$ 2,296	$ 2,245	$ 1,175	$ 3,534	$ 2,297	$ 2,245	$ 1,170	$ 3,532	$ 2,296	$ 2,245	$ 1,175	$ 3,536	$ 1,033	$ 1,033	$ 1,033	$ 1,033	$ 543	$ 543	$ 543	$ 543
2029	$ 2,336	$ 2,283	$ 1,196	$ 3,594	$ 2,336	$ 2,283	$ 1,190	$ 3,592	$ 2,336	$ 2,283	$ 1,195	$ 3,597	$ 1,051	$ 1,051	$ 1,051	$ 1,051	$ 552	$ 552	$ 552	$ 552

Source: Derived from Exhibits B.5 and B.10.

Exhibit B.12 Value of COI Increment by Year (Enterovirus, Cases Requiring Doctor Visit)

	< 1 Month Old				1 Month to < 1 Year Old				1 to < 5 Years Old				5 to < 16 Years Old				≥ 16 Years Old			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2007	$ 2,981	$ 2,866	$ 1,602	$ 4,651	$ 2,981	$ 2,866	$ 1,604	$ 4,657	$ 2,687	$ 2,625	$ 1,547	$ 3,977	$ 2,244	$ 2,276	$ 1,447	$ 2,959	$ 1,439	$ 1,420	$ 894	$ 2,021
2008	$ 3,046	$ 2,928	$ 1,635	$ 4,755	$ 3,046	$ 2,928	$ 1,637	$ 4,760	$ 2,744	$ 2,682	$ 1,578	$ 4,064	$ 2,292	$ 2,324	$ 1,476	$ 3,023	$ 1,468	$ 1,448	$ 910	$ 2,063
2009	$ 3,158	$ 3,036	$ 1,691	$ 4,933	$ 3,158	$ 3,036	$ 1,694	$ 4,939	$ 2,845	$ 2,779	$ 1,633	$ 4,216	$ 2,375	$ 2,408	$ 1,527	$ 3,134	$ 1,518	$ 1,498	$ 939	$ 2,137
2010	$ 3,257	$ 3,131	$ 1,742	$ 5,091	$ 3,257	$ 3,131	$ 1,745	$ 5,098	$ 2,933	$ 2,866	$ 1,681	$ 4,350	$ 2,447	$ 2,482	$ 1,572	$ 3,233	$ 1,562	$ 1,542	$ 964	$ 2,202
2011	$ 3,329	$ 3,200	$ 1,778	$ 5,206	$ 3,329	$ 3,200	$ 1,781	$ 5,213	$ 2,998	$ 2,929	$ 1,716	$ 4,448	$ 2,501	$ 2,536	$ 1,604	$ 3,304	$ 1,595	$ 1,573	$ 982	$ 2,249
2012	$ 3,387	$ 3,256	$ 1,808	$ 5,300	$ 3,387	$ 3,256	$ 1,811	$ 5,306	$ 3,050	$ 2,980	$ 1,745	$ 4,527	$ 2,544	$ 2,579	$ 1,631	$ 3,362	$ 1,621	$ 1,599	$ 997	$ 2,287
2013	$ 3,450	$ 3,316	$ 1,840	$ 5,400	$ 3,450	$ 3,316	$ 1,843	$ 5,407	$ 3,106	$ 3,035	$ 1,775	$ 4,612	$ 2,590	$ 2,626	$ 1,659	$ 3,424	$ 1,649	$ 1,627	$ 1,013	$ 2,329
2014	$ 3,515	$ 3,378	$ 1,872	$ 5,503	$ 3,515	$ 3,378	$ 1,876	$ 5,510	$ 3,164	$ 3,091	$ 1,807	$ 4,700	$ 2,637	$ 2,675	$ 1,688	$ 3,488	$ 1,678	$ 1,656	$ 1,030	$ 2,371
2015	$ 3,574	$ 3,434	$ 1,902	$ 5,597	$ 3,574	$ 3,435	$ 1,906	$ 5,604	$ 3,217	$ 3,142	$ 1,836	$ 4,780	$ 2,681	$ 2,719	$ 1,715	$ 3,547	$ 1,705	$ 1,682	$ 1,045	$ 2,410
2016	$ 3,631	$ 3,489	$ 1,931	$ 5,688	$ 3,631	$ 3,489	$ 1,934	$ 5,695	$ 3,267	$ 3,192	$ 1,863	$ 4,856	$ 2,723	$ 2,761	$ 1,741	$ 3,603	$ 1,730	$ 1,707	$ 1,059	$ 2,447
2017	$ 3,688	$ 3,544	$ 1,960	$ 5,780	$ 3,688	$ 3,544	$ 1,964	$ 5,787	$ 3,319	$ 3,242	$ 1,891	$ 4,935	$ 2,765	$ 2,804	$ 1,767	$ 3,660	$ 1,756	$ 1,732	$ 1,074	$ 2,485
2018	$ 3,747	$ 3,600	$ 1,990	$ 5,873	$ 3,747	$ 3,600	$ 1,994	$ 5,880	$ 3,371	$ 3,293	$ 1,920	$ 5,014	$ 2,808	$ 2,848	$ 1,793	$ 3,719	$ 1,782	$ 1,758	$ 1,089	$ 2,524
2019	$ 3,807	$ 3,658	$ 2,020	$ 5,968	$ 3,807	$ 3,658	$ 2,024	$ 5,976	$ 3,425	$ 3,346	$ 1,949	$ 5,095	$ 2,852	$ 2,893	$ 1,820	$ 3,778	$ 1,809	$ 1,785	$ 1,104	$ 2,563
2020	$ 3,867	$ 3,716	$ 2,051	$ 6,066	$ 3,867	$ 3,716	$ 2,055	$ 6,073	$ 3,479	$ 3,399	$ 1,979	$ 5,177	$ 2,897	$ 2,938	$ 1,848	$ 3,838	$ 1,836	$ 1,812	$ 1,119	$ 2,603
2021	$ 3,929	$ 3,775	$ 2,083	$ 6,165	$ 3,929	$ 3,775	$ 2,086	$ 6,172	$ 3,535	$ 3,453	$ 2,009	$ 5,262	$ 2,943	$ 2,985	$ 1,876	$ 3,900	$ 1,864	$ 1,839	$ 1,135	$ 2,643
2022	$ 3,993	$ 3,836	$ 2,115	$ 6,266	$ 3,993	$ 3,836	$ 2,118	$ 6,273	$ 3,591	$ 3,508	$ 2,040	$ 5,347	$ 2,990	$ 3,032	$ 1,904	$ 3,962	$ 1,893	$ 1,867	$ 1,151	$ 2,685
2023	$ 4,057	$ 3,898	$ 2,148	$ 6,369	$ 4,057	$ 3,898	$ 2,151	$ 6,377	$ 3,649	$ 3,564	$ 2,071	$ 5,435	$ 3,037	$ 3,080	$ 1,934	$ 4,026	$ 1,922	$ 1,896	$ 1,168	$ 2,727
2024	$ 4,123	$ 3,961	$ 2,181	$ 6,474	$ 4,123	$ 3,961	$ 2,185	$ 6,482	$ 3,708	$ 3,622	$ 2,103	$ 5,524	$ 3,086	$ 3,130	$ 1,963	$ 4,092	$ 1,951	$ 1,925	$ 1,185	$ 2,771
2025	$ 4,190	$ 4,026	$ 2,215	$ 6,581	$ 4,190	$ 4,026	$ 2,219	$ 6,589	$ 3,768	$ 3,681	$ 2,136	$ 5,615	$ 3,135	$ 3,180	$ 1,994	$ 4,159	$ 1,981	$ 1,954	$ 1,202	$ 2,815
2026	$ 4,259	$ 4,091	$ 2,250	$ 6,690	$ 4,259	$ 4,091	$ 2,254	$ 6,699	$ 3,829	$ 3,740	$ 2,170	$ 5,708	$ 3,186	$ 3,231	$ 2,025	$ 4,226	$ 2,012	$ 1,985	$ 1,219	$ 2,860
2027	$ 4,328	$ 4,158	$ 2,285	$ 6,801	$ 4,328	$ 4,158	$ 2,289	$ 6,810	$ 3,892	$ 3,801	$ 2,203	$ 5,802	$ 3,237	$ 3,283	$ 2,056	$ 4,295	$ 2,043	$ 2,016	$ 1,237	$ 2,905
2028	$ 4,399	$ 4,226	$ 2,321	$ 6,914	$ 4,399	$ 4,226	$ 2,325	$ 6,923	$ 3,955	$ 3,863	$ 2,238	$ 5,898	$ 3,289	$ 3,336	$ 2,088	$ 4,366	$ 2,075	$ 2,047	$ 1,255	$ 2,952
2029	$ 4,471	$ 4,295	$ 2,358	$ 7,029	$ 4,471	$ 4,295	$ 2,362	$ 7,038	$ 4,019	$ 3,926	$ 2,273	$ 5,996	$ 3,342	$ 3,390	$ 2,121	$ 4,437	$ 2,107	$ 2,079	$ 1,273	$ 2,999
2028	$ 4,544	$ 4,365	$ 2,395	$ 7,146	$ 4,544	$ 4,365	$ 2,399	$ 7,155	$ 4,085	$ 3,990	$ 2,309	$ 6,095	$ 3,396	$ 3,445	$ 2,154	$ 4,510	$ 2,140	$ 2,111	$ 1,292	$ 3,047
2029	$ 4,619	$ 4,437	$ 2,433	$ 7,266	$ 4,619	$ 4,437	$ 2,437	$ 7,275	$ 4,152	$ 4,055	$ 2,345	$ 6,196	$ 3,451	$ 3,501	$ 2,188	$ 4,584	$ 2,174	$ 2,144	$ 1,311	$ 3,097

Source: Derived from Exhibits B.5 and B.10.

Exhibit B.13 Value of COI Increment by Year (Enterovirus, Cases Requiring Hospitalization)

Year	< 1 Month Old				1 Month to < 1 Year Old				1 to < 5 Years Old				5 to < 16 Years Old				≥ 16 Years Old			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2007	$26,821	$ 26,753	$ 25,081	$ 28,713	$ 26,821	$26,755	$ 25,077	$ 28,713	$12,577	$12,511	$ 10,835	$ 14,459	$ 8,426	$ 8,358	$ 6,679	$ 10,319	$ 6,844	$ 6,808	$ 5,914	$ 7,850
2008	$26,900	$ 26,830	$ 25,119	$ 28,835	$ 26,899	$26,832	$ 25,115	$ 28,835	$12,655	$12,587	$ 10,873	$ 14,581	$ 8,504	$ 8,435	$ 6,717	$ 10,441	$ 6,886	$ 6,849	$ 5,935	$ 7,915
2009	$27,035	$ 26,963	$ 25,185	$ 29,046	$ 27,035	$26,965	$ 25,181	$ 29,046	$12,791	$12,720	$ 10,939	$ 14,792	$ 8,640	$ 8,568	$ 6,782	$ 10,652	$ 6,958	$ 6,919	$ 5,970	$ 8,027
2010	$27,155	$ 27,080	$ 25,243	$ 29,233	$ 27,155	$27,082	$ 25,239	$ 29,233	$12,911	$12,838	$ 10,997	$ 14,978	$ 8,760	$ 8,685	$ 6,840	$ 10,839	$ 7,022	$ 6,982	$ 6,001	$ 8,127
2011	$27,242	$ 27,166	$ 25,286	$ 29,369	$ 27,242	$27,168	$ 25,282	$ 29,369	$12,998	$12,923	$ 11,039	$ 15,114	$ 8,847	$ 8,771	$ 6,883	$ 10,975	$ 7,069	$ 7,028	$ 6,024	$ 8,199
2012	$27,313	$ 27,235	$ 25,320	$ 29,479	$ 27,313	$27,237	$ 25,316	$ 29,479	$13,068	$12,993	$ 11,074	$ 15,224	$ 8,918	$ 8,840	$ 6,917	$ 11,085	$ 7,106	$ 7,065	$ 6,042	$ 8,258
2013	$27,389	$ 27,310	$ 25,357	$ 29,598	$ 27,389	$27,312	$ 25,353	$ 29,597	$13,145	$13,067	$ 11,111	$ 15,342	$ 8,994	$ 8,914	$ 6,954	$ 11,203	$ 7,147	$ 7,104	$ 6,062	$ 8,321
2014	$27,467	$ 27,386	$ 25,395	$ 29,719	$ 27,467	$27,388	$ 25,391	$ 29,719	$13,223	$13,144	$ 11,148	$ 15,463	$ 9,072	$ 8,991	$ 6,992	$ 11,325	$ 7,188	$ 7,145	$ 6,082	$ 8,386
2015	$27,538	$ 27,456	$ 25,430	$ 29,831	$ 27,538	$27,458	$ 25,426	$ 29,830	$13,294	$13,214	$ 11,183	$ 15,575	$ 9,143	$ 9,061	$ 7,026	$ 11,436	$ 7,227	$ 7,183	$ 6,100	$ 8,445
2016	$27,607	$ 27,523	$ 25,463	$ 29,938	$ 27,607	$27,525	$ 25,459	$ 29,937	$13,363	$13,281	$ 11,217	$ 15,681	$ 9,212	$ 9,128	$ 7,060	$ 11,543	$ 7,263	$ 7,218	$ 6,118	$ 8,502
2017	$27,677	$ 27,592	$ 25,497	$ 30,046	$ 27,677	$27,594	$ 25,493	$ 30,046	$13,432	$13,350	$ 11,251	$ 15,790	$ 9,281	$ 9,197	$ 7,093	$ 11,652	$ 7,300	$ 7,255	$ 6,136	$ 8,560
2018	$27,748	$ 27,661	$ 25,532	$ 30,157	$ 27,748	$27,663	$ 25,527	$ 30,157	$13,503	$13,419	$ 11,285	$ 15,900	$ 9,352	$ 9,266	$ 7,128	$ 11,763	$ 7,338	$ 7,292	$ 6,155	$ 8,619
2019	$27,820	$ 27,732	$ 25,567	$ 30,270	$ 27,820	$27,734	$ 25,562	$ 30,269	$13,576	$13,490	$ 11,320	$ 16,013	$ 9,425	$ 9,337	$ 7,163	$ 11,875	$ 7,377	$ 7,330	$ 6,173	$ 8,679
2020	$27,894	$ 27,804	$ 25,603	$ 30,384	$ 27,894	$27,806	$ 25,598	$ 30,384	$13,649	$13,562	$ 11,356	$ 16,127	$ 9,498	$ 9,409	$ 7,198	$ 11,990	$ 7,416	$ 7,368	$ 6,192	$ 8,740
2021	$27,969	$ 27,878	$ 25,639	$ 30,501	$ 27,969	$27,880	$ 25,635	$ 30,501	$13,724	$13,636	$ 11,392	$ 16,244	$ 9,573	$ 9,483	$ 7,235	$ 12,107	$ 7,456	$ 7,407	$ 6,212	$ 8,802
2022	$28,045	$ 27,953	$ 25,676	$ 30,621	$ 28,045	$27,955	$ 25,672	$ 30,620	$13,801	$13,711	$ 11,430	$ 16,363	$ 9,650	$ 9,558	$ 7,272	$ 12,226	$ 7,497	$ 7,447	$ 6,232	$ 8,866
2023	$28,124	$ 28,029	$ 25,714	$ 30,742	$ 28,123	$28,032	$ 25,710	$ 30,742	$13,879	$13,788	$ 11,468	$ 16,485	$ 9,728	$ 9,634	$ 7,310	$ 12,348	$ 7,539	$ 7,488	$ 6,252	$ 8,931
2024	$28,203	$ 28,108	$ 25,753	$ 30,867	$ 28,203	$28,110	$ 25,748	$ 30,866	$13,959	$13,866	$ 11,506	$ 16,609	$ 9,808	$ 9,712	$ 7,348	$ 12,472	$ 7,581	$ 7,530	$ 6,273	$ 8,997
2025	$28,285	$ 28,187	$ 25,793	$ 30,994	$ 28,285	$28,190	$ 25,788	$ 30,993	$14,040	$13,946	$ 11,546	$ 16,735	$ 9,889	$ 9,792	$ 7,388	$ 12,599	$ 7,625	$ 7,573	$ 6,294	$ 9,065
2026	$28,368	$ 28,269	$ 25,833	$ 31,122	$ 28,367	$28,271	$ 25,828	$ 31,122	$14,123	$14,027	$ 11,586	$ 16,864	$ 9,972	$ 9,873	$ 7,428	$ 12,728	$ 7,669	$ 7,616	$ 6,315	$ 9,133
2027	$28,452	$ 28,351	$ 25,874	$ 31,254	$ 28,452	$28,353	$ 25,869	$ 31,253	$14,207	$14,109	$ 11,627	$ 16,995	$10,056	$ 9,956	$ 7,469	$ 12,859	$ 7,714	$ 7,660	$ 6,337	$ 9,203
2028	$28,537	$ 28,435	$ 25,916	$ 31,387	$ 28,537	$28,437	$ 25,911	$ 31,387	$14,293	$14,193	$ 11,669	$ 17,128	$10,142	$10,040	$ 7,510	$ 12,993	$ 7,759	$ 7,705	$ 6,359	$ 9,274
2029	$28,625	$ 28,520	$ 25,958	$ 31,523	$ 28,624	$28,523	$ 25,953	$ 31,522	$14,380	$14,279	$ 11,711	$ 17,264	$10,229	$10,125	$ 7,553	$ 13,129	$ 7,806	$ 7,750	$ 6,382	$ 9,347
2028	$28,713	$ 28,607	$ 26,001	$ 31,661	$ 28,713	$28,610	$ 25,996	$ 31,661	$14,469	$14,366	$ 11,754	$ 17,402	$10,318	$10,212	$ 7,596	$ 13,267	$ 7,853	$ 7,797	$ 6,405	$ 9,420
2029	$28,804	$ 28,696	$ 26,045	$ 31,802	$ 28,804	$28,699	$ 26,040	$ 31,802	$14,559	$14,455	$ 11,798	$ 17,542	$10,408	$10,301	$ 7,639	$ 13,408	$ 7,901	$ 7,844	$ 6,428	$ 9,495

Source: Derived from Exhibits B.5 and B.10.

Exhibit B.14a Type A Virus Illnesses Avoided for Healthy Population by the GWR

	Ages <2 years			Ages 2 - 4 years			Ages 5 - 15 years			Ages 16 - 64 years			Ages ≥ 65 years		
	mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound	
Size Category		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th
<100	75	14	116	41	6	71	224	33	376	1,615	230	2,612	316	45	510
100 -500	133	32	189	71	13	142	383	68	778	2,650	472	5,271	518	92	1,030
501- 1,000	84	24	131	45	10	89	237	48	466	1,552	320	3,080	303	62	599
1,001 - 3,300	138	33	264	74	15	150	366	79	714	2,226	485	4,355	434	95	844
3,301 - 10,000	247	74	447	130	33	269	628	160	1,357	3,607	880	7,278	701	172	1,416
10,001 - 50,000	223	73	386	118	31	251	582	157	1,344	3,429	895	8,094	668	174	1,575
50,001-100,000	396	139	637	217	60	438	1,061	315	2,090	6,077	1,886	11,317	1,180	368	2,196
100,001-1,000,000	388	141	660	208	55	482	1,013	292	2,317	5,832	1,661	12,850	1,133	322	2,493
> 1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,684	531	2,829	904	224	1,893	4,494	1,151	9,442	26,989	6,828	54,858	5,252	1,329	10,664

Exhibit B.14b Type A Virus Illnesses Avoided for Immunocompromised Population by the GWR

Size Category	Ages <2 years			Ages 2 - 4 years			Ages 5 - 15 years			Ages 16 - 64 years			Ages ≥ 65 years		
	mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound	
		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th
<100	0.2	0.0	0.3	0.1	0.0	0.2	0.7	0.1	1.1	4.9	0.7	7.9	0.9	0.1	1.5
100 -500	0.4	0.1	0.6	0.2	0.0	0.4	1.2	0.2	2.3	8.0	1.4	15.9	1.6	0.3	3.1
501- 1,000	0.3	0.1	0.4	0.1	0.0	0.3	0.7	0.1	1.4	4.7	1.0	9.3	0.9	0.2	1.8
1,001 - 3,300	0.4	0.1	0.8	0.2	0.0	0.5	1.1	0.2	2.1	6.7	1.5	13.1	1.3	0.3	2.5
3,301 - 10,000	0.7	0.2	1.3	0.4	0.1	0.8	1.9	0.5	4.1	10.9	2.6	21.9	2.1	0.5	4.3
10,001 - 50,000	0.7	0.2	1.2	0.4	0.1	0.8	1.8	0.5	4.0	10.3	2.7	24.4	2.0	0.5	4.7
50,001-100,000	1.2	0.4	1.9	0.7	0.2	1.3	3.2	0.9	6.3	18.3	5.7	34.1	3.6	1.1	6.6
100,001-1,000,000	1.2	0.4	2.0	0.6	0.2	1.5	3.0	0.9	7.0	17.5	5.0	38.7	3.4	1.0	7.5
> 1,000,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	5.1	1.6	8.5	2.7	0.7	5.7	13.5	3.5	28.4	81.2	20.5	165.1	15.8	4.0	32.1

Exhibit B.15a Type B Virus Illnesses - No Medical Care - Avoided by the GWR

Size Category	Ages < 1 month			Ages 1 month - < 1 year			Ages 1 - 4 years			Ages 5 - 15 years			Ages 16 - 64 years			Ages ≥ 65 years		
	mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound	
		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th
<100	0.1	0.0	0.3	1.0	0.1	3.1	4.0	0.2	12.6	9.2	0.5	30.2	44.1	2.8	149.1	8.6	0.5	29.1
100 -500	0.2	0.0	0.6	1.8	0.1	6.1	7.5	0.4	24.8	17.7	1.0	61.3	84.8	6.1	282.7	16.6	1.2	55.3
501- 1,000	0.1	0.0	0.5	1.5	0.1	5.2	6.0	0.3	21.0	13.7	0.8	50.2	65.2	3.6	213.2	12.7	0.7	41.6
1,001 - 3,300	0.2	0.0	0.8	2.5	0.1	9.3	10.4	0.5	37.8	24.4	1.3	79.0	117.0	7.3	405.4	22.9	1.4	79.2
3,301 - 10,000	0.5	0.0	1.3	5.3	0.3	14.3	21.7	1.2	58.7	48.0	2.3	124.1	211.6	16.5	643.5	41.3	3.2	125.5
10,001 - 50,000	0.5	0.0	1.6	5.2	0.3	17.2	21.2	1.2	70.8	47.8	2.9	165.0	215.0	15.3	678.2	42.0	3.0	132.4
50,001-100,000	0.8	0.1	2.5	8.5	0.7	28.0	34.7	2.7	114.8	79.3	5.6	247.3	352.9	28.2	1,159.4	68.9	5.5	225.9
100,001-1,000,000	0.8	0.1	2.7	8.7	0.8	30.1	35.7	3.1	123.2	83.9	5.8	285.7	376.2	33.4	1,418.0	73.5	6.5	277.0
> 1,000,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	3.1	0.2	10.3	34.5	2.4	113.2	141.2	9.8	463.8	324.1	20.3	1,042.8	1,466.7	113.1	4,949.5	286.5	22.2	966.0

Exhibit B.15b Type B Virus Illnesses - Doctor Care Required - Avoided by the GWR

	Ages < 1 month			Ages 1 month - < 1 year			Ages 1 - 4 years			Ages 5 - 15 years			Ages 16 - 64 years			Ages ≥ 65 years		
	mean value	Percent Confidence Bound		mean value	Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound	
Size Category		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th
<100	0.0	0.0	0.0	0.1	0.0	0.2	0.3	0.0	0.8	0.6	0.0	1.9	2.8	0.2	9.6	0.6	0.0	1.9
100 -500	0.0	0.0	0.0	0.1	0.0	0.4	0.5	0.0	1.6	1.1	0.1	4.0	5.5	0.4	18.2	1.1	0.1	3.6
501- 1,000	0.0	0.0	0.0	0.1	0.0	0.3	0.4	0.0	1.4	0.9	0.1	3.2	4.2	0.2	13.8	0.8	0.0	2.7
1,001 - 3,300	0.0	0.0	0.1	0.2	0.0	0.6	0.7	0.0	2.4	1.6	0.1	5.1	7.5	0.5	26.2	1.5	0.1	5.1
3,301 - 10,000	0.0	0.0	0.1	0.3	0.0	0.9	1.4	0.1	3.8	3.1	0.1	8.0	13.7	1.1	41.5	2.7	0.2	8.1
10,001 - 50,000	0.0	0.0	0.1	0.3	0.0	1.1	1.4	0.1	4.6	3.1	0.2	10.6	13.9	1.0	43.8	2.7	0.2	8.5
50,001-100,000	0.0	0.0	0.2	0.5	0.0	1.8	2.2	0.2	7.4	5.1	0.4	16.0	22.8	1.8	74.8	4.4	0.4	14.6
100,001-1,000,000	0.1	0.0	0.2	0.6	0.0	1.9	2.3	0.2	8.0	5.4	0.4	18.4	24.3	2.2	91.5	4.7	0.4	17.9
> 1,000,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.2	0.0	0.7	2.2	0.2	7.3	9.1	0.6	29.9	20.9	1.3	67.3	94.6	7.3	319.3	18.5	1.4	62.3

Exhibit B.15c Type B Virus Illnesses - Hospitalization Required - Avoided by the GWR

Size Category	Ages < 1 month			Ages 1 month - < 1 year			Ages 1 - 4 years			Ages 5 - 15 years			Ages 16 - 64 years			Ages ≥ 65 years		
	mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound	
		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th
<100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.3	0.5	0.0	1.6	0.1	0.0	0.3
100 -500	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.3	0.2	0.0	0.7	0.9	0.1	3.0	0.2	0.0	0.6
501- 1,000	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.0	0.5	0.7	0.0	2.3	0.1	0.0	0.4
1,001 - 3,300	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.4	0.3	0.0	0.8	1.3	0.1	4.4	0.2	0.0	0.9
3,301 - 10,000	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.0	0.6	0.5	0.0	1.3	2.3	0.2	6.9	0.4	0.0	1.3
10,001 - 50,000	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.0	0.8	0.5	0.0	1.8	2.3	0.2	7.3	0.5	0.0	1.4
50,001-100,000	0.0	0.0	0.0	0.1	0.0	0.3	0.4	0.0	1.2	0.9	0.1	2.7	3.8	0.3	12.5	0.7	0.1	2.4
100,001-1,000,000	0.0	0.0	0.0	0.1	0.0	0.3	0.4	0.0	1.3	0.9	0.1	3.1	4.0	0.4	15.2	0.8	0.1	3.0
> 1,000,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.1	0.4	0.0	1.2	1.5	0.1	5.0	3.5	0.2	11.2	15.8	1.2	53.2	3.1	0.2	10.4

Exhibit B.16 Type A Virus Deaths Avoided by the GWR

	Ages <2 years			Ages 2 - 4 years			Ages 5 - 15 years			Ages 16 - 64			Ages > 65 years		
	mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound	
Size Category		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th
<100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00
100 -500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.04	0.00	0.00	0.01
501- 1,000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00
1,001 - 3,300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.03	0.00	0.00	0.01
3,301 - 10,000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.05	0.00	0.00	0.01
10,001 - 50,000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.05	0.00	0.00	0.01
50,001-100,000	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.04	0.01	0.08	0.01	0.00	0.02
100,001-1,000,000	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.04	0.01	0.08	0.01	0.00	0.02
> 1,000,000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.01	0.00	0.02	0.01	0.00	0.01	0.03	0.01	0.06	0.18	0.04	0.38	0.04	0.01	0.07

Exhibit B.17 Type B Virus Deaths Avoided by the GWR

	Ages < 1 month			Ages 1 month to < 1 year			Ages 1 - 4 years			Ages 5 - 15 years			Ages 16 - 64 years			Ages ≥ 65 years		
	mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound		mean value	90 Percent Confidence Bound	
Size Category		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th		5th	95th
<100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.02	0.03	0.00	0.06	0.01	0.00	0.01
100 -500	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.03	0.06	0.00	0.14	0.01	0.00	0.03
501- 1,000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.02	0.04	0.00	0.09	0.01	0.00	0.02
1,001 - 3,300	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.04	0.09	0.01	0.12	0.02	0.00	0.02
3,301 - 10,000	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.03	0.03	0.00	0.08	0.13	0.01	0.32	0.02	0.00	0.06
10,001 - 50,000	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.02	0.02	0.00	0.07	0.10	0.00	0.25	0.02	0.00	0.05
50,001-100,000	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.04	0.03	0.00	0.10	0.16	0.01	0.43	0.03	0.00	0.08
100,001-1,000,000	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.04	0.03	0.00	0.10	0.16	0.01	0.48	0.03	0.00	0.09
> 1,000,000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.02	0.00	0.04	0.07	0.00	0.16	0.16	0.01	0.46	0.77	0.04	1.89	0.15	0.01	0.37

B18. Number and Percent of Systems with Acute or Monthly TCR MCL Violations by System Type and System Size

		Number of Systems				Percentage of Systems with Acute TCR MCL Violations as a Percent of Total Systems	Percentage of Systems with Any TCR MCL Violations as a Percent of Total Systems	Mean Percentage of Systems with TCR MCL Violations as a Percent of Total Systems
	System Size (Population Served)	Total Systems	Systems with Acute TCR MCL Violations	Additional Systems with Monthly TCR MCL Violations	Total Systems with TCR MCL Violations			
		A	B	C	D	E = B/A	F = (B+C)/A	G = (E+F)/2
CWS	<100	12,506	46	625	671	0.37%	5.37%	2.87%
	101-500	13,306	56	596	652	0.42%	4.90%	2.66%
	501-1,000	4,233	13	131	144	0.31%	3.40%	1.85%
	1,001-3,300	5,359	10	219	229	0.19%	4.27%	2.23%
	3,301-10,000	2,513	10	155	165	0.40%	6.57%	3.48%
	10,001-50,000	1,233	6	72	78	0.49%	6.33%	3.41%
	50,001-100K	137	0	5	5	0.00%	3.65%	1.82%
	100,001- 1 Million	64	1	2	3	1.56%	4.69%	3.13%
	> 1 Million	3	0	0	0	0.00%	0.00%	0.00%
NTNCWS	<100	9,432	47	442	489	0.50%	5.18%	2.84%
	101-500	6,726	28	246	274	0.42%	4.07%	2.25%
	501-1,000	1,884	6	58	64	0.32%	3.40%	1.86%
	1,001-3,300	706	3	27	30	0.42%	4.25%	2.34%
	3,301-10,000	68	0	3	3	0.00%	4.41%	2.21%
	10,001-50,000	7	0	0	0	0.00%	0.00%	0.00%
	50,001-100K	1	0	0	0	0.00%	0.00%	0.00%
	100,001- 1 Million	1	0	0	0	0.00%	0.00%	0.00%
	> 1 Million	0	0	0	0	0.00%	0.00%	0.00%
TNCWS	<100	63,856	292	2390	2682	0.46%	4.20%	2.33%
	101-500	18,915	106	696	802	0.56%	4.24%	2.40%
	501-1,000	1,913	8	72	80	0.42%	4.18%	2.30%
	1,001-3,300	571	2	37	39	0.35%	6.83%	3.59%
	3,301-10,000	71	0	4	4	0.00%	5.63%	2.82%
	10,001-50,000	17	0	1	1	0.00%	5.88%	2.94%
	50,001-100K	0	0	0	0	0.00%	0.00%	0.00%
	100,001- 1 Million	1	0	0	0	0.00%	0.00%	0.00%
	> 1 Million	0	0	0	0	0.00%	0.00%	0.00%

Source: SDWIS (2003a)

Note: System totals may not match totals presented in Exhibit 4.1. Systems without adequate TCR violation data are not included in this exhibit.

Appendix C

Benefits Detail

Matrix of Appendix C Contents

Applicable Rule Option(s)	Applicable System Type(s)	Exhibit Description	Virus Type	Applicable System Size	Exhibit Number
Final Rule	CWSs	Value of Avoided Illnesses and Deaths	Type A	<100	C.1a
			Type B		C.1b
			Type A	101-500	C.1c
			Type B		C.1d
			Type A	501-1,000	C.1e
			Type B		C.1f
			Type A	1,001-3,300	C.1g
			Type B		C.1h
			Type A	3,301-10K	C.1i
			Type B		C.1j
			Type A	10,001-50K	C.1k
			Type B		C.1l
			Type A	50,001-100K	C.1m
			Type B		C.1n
			Type A	100,001-1M	C.1o
			Type B		C.1p
			Type A	>1 Million	C.1q
			Type B		C.1r
		Total Value of Avoided Illnesses and Deaths	Both	All	C.2a
		Present Value of Total at 3 Percent	Both	All	C.2b
		Present Value of Total at 7 Percent	Both	All	C.2c
	NTNCWSs	Value of Avoided Illnesses and Deaths	Type A	<100	C.3a
			Type B		C.3b
			Type A	101-500	C.3c
			Type B		C.3d
			Type A	501-1,000	C.3e
			Type B		C.3f
			Type A	1,001-3,300	C.3g
			Type B		C.3h
			Type A	3,301-10K	C.3i
			Type B		C.3j
			Type A	10,001-50K	C.3k
			Type B		C.3l
			Type A	50,001-100K	C.3m
			Type B		C.3n
			Type A	100,001-1M	C.3o
			Type B		C.3p
			Type A	>1 Million	C.3q
			Type B		C.3r
		Total Value of Avoided Illnesses and Deaths	Both	All	C.4a
		Present Value of Total at 3 Percent	Both	All	C.4b
		Present Value of Total at 7 Percent	Both	All	C.4c
Final Rule	TNCWSs	Value of Avoided Illnesses and Deaths	Type A	<100	C.5a
			Type B		C.5b
			Type A	101-500	C.5c
			Type B		C.5d
			Type A	501-1,000	C.5e
			Type B		C.5f
			Type A	1,001-3,300	C.5g
			Type B		C.5h
			Type A	3,301-10K	C.5i
			Type B		C.5j
			Type A	10,001-50K	C.5k
			Type B		C.5l
			Type A	50,001-100K	C.5m
			Type B		C.5n
			Type A	100,001-1M	C.5o
			Type B		C.5p
			Type A	>1 Million	C.5q
			Type B		C.5r
		Total Value of Avoided Illnesses and Deaths	Both	All	C.6a
		Present Value of Total at 3 Percent	Both	All	C.6b
		Present Value of Total at 7 Percent	Both	All	C.6c
	All	Total Value of Avoided Illnesses and Deaths	Both	All	C.7a
	All	Present Value of Total at 3 Percent	Both	All	C.7b
	All	Present Value of Total at 7 Percent	Both	All	C.7c

Exhibit C.1a Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving <100 (Rotavirus)

Year	Value of Illnesses Avoided								Value of Deaths Avoided								Total Benefits			
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs							
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0003	$ 0.0003	$ 0.0000	$ 0.0009	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0005	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0000	$ 0.0000	$ 0.0002	$ 0.0006	$ 0.0004	$ 0.0001	$ 0.0017
2009	$ 0.0015	$ 0.0012	$ 0.0003	$ 0.0032	$ 0.0008	$ 0.0006	$ 0.0002	$ 0.0017	$0.0001	$0.0001	$ 0.0000	$ 0.0002	$0.0003	$0.0002	$ 0.0000	$ 0.0008	$ 0.0026	$ 0.0021	$ 0.0006	$ 0.0060
2010	$ 0.0033	$ 0.0028	$ 0.0007	$ 0.0070	$ 0.0016	$ 0.0014	$ 0.0004	$ 0.0036	$0.0002	$0.0001	$ 0.0000	$ 0.0004	$0.0006	$0.0004	$ 0.0001	$ 0.0017	$ 0.0057	$ 0.0047	$ 0.0012	$ 0.0127
2011	$ 0.0297	$ 0.0266	$ 0.0128	$ 0.0538	$ 0.0148	$ 0.0137	$ 0.0056	$ 0.0257	$0.0015	$0.0011	$ 0.0002	$ 0.0043	$0.0059	$0.0042	$ 0.0006	$ 0.0164	$ 0.0519	$ 0.0455	$ 0.0191	$ 0.1003
2012	$ 0.0392	$ 0.0352	$ 0.0171	$ 0.0699	$ 0.0197	$ 0.0183	$ 0.0078	$ 0.0338	$0.0019	$0.0014	$ 0.0002	$ 0.0056	$0.0078	$0.0055	$ 0.0008	$ 0.0224	$ 0.0687	$ 0.0604	$ 0.0259	$ 0.1317
2013	$ 0.0690	$ 0.0609	$ 0.0280	$ 0.1256	$ 0.0356	$ 0.0320	$ 0.0127	$ 0.0672	$0.0034	$0.0023	$ 0.0004	$ 0.0096	$0.0141	$0.0097	$ 0.0014	$ 0.0389	$ 0.1221	$ 0.1048	$ 0.0426	$ 0.2413
2014	$ 0.0718	$ 0.0636	$ 0.0296	$ 0.1296	$ 0.0372	$ 0.0336	$ 0.0134	$ 0.0690	$0.0035	$0.0024	$ 0.0004	$ 0.0099	$0.0146	$0.0103	$ 0.0015	$ 0.0403	$ 0.1271	$ 0.1098	$ 0.0449	$ 0.2487
2015	$ 0.0746	$ 0.0671	$ 0.0309	$ 0.1346	$ 0.0387	$ 0.0351	$ 0.0142	$ 0.0709	$0.0036	$0.0025	$ 0.0004	$ 0.0101	$0.0150	$0.0105	$ 0.0016	$ 0.0416	$ 0.1319	$ 0.1152	$ 0.0471	$ 0.2573
2016	$ 0.0908	$ 0.0822	$ 0.0425	$ 0.1587	$ 0.0472	$ 0.0433	$ 0.0208	$ 0.0793	$0.0044	$0.0032	$ 0.0005	$ 0.0120	$0.0182	$0.0130	$ 0.0020	$ 0.0496	$ 0.1606	$ 0.1417	$ 0.0657	$ 0.2996
2017	$ 0.0935	$ 0.0843	$ 0.0437	$ 0.1640	$ 0.0486	$ 0.0448	$ 0.0213	$ 0.0821	$0.0045	$0.0032	$ 0.0005	$ 0.0121	$0.0186	$0.0133	$ 0.0020	$ 0.0512	$ 0.1652	$ 0.1456	$ 0.0675	$ 0.3094
2018	$ 0.0967	$ 0.0876	$ 0.0460	$ 0.1698	$ 0.0502	$ 0.0462	$ 0.0220	$ 0.0838	$0.0046	$0.0033	$ 0.0005	$ 0.0125	$0.0191	$0.0137	$ 0.0021	$ 0.0535	$ 0.1707	$ 0.1508	$ 0.0706	$ 0.3196
2019	$ 0.1112	$ 0.1000	$ 0.0522	$ 0.1950	$ 0.0572	$ 0.0521	$ 0.0251	$ 0.0986	$0.0052	$0.0038	$ 0.0006	$ 0.0141	$0.0216	$0.0156	$ 0.0023	$ 0.0618	$ 0.1951	$ 0.1716	$ 0.0802	$ 0.3695
2020	$ 0.1144	$ 0.1032	$ 0.0541	$ 0.2013	$ 0.0589	$ 0.0538	$ 0.0260	$ 0.1011	$0.0053	$0.0039	$ 0.0006	$ 0.0145	$0.0220	$0.0159	$ 0.0024	$ 0.0628	$ 0.2006	$ 0.1767	$ 0.0831	$ 0.3797
2021	$ 0.1229	$ 0.1125	$ 0.0601	$ 0.2129	$ 0.0642	$ 0.0603	$ 0.0290	$ 0.1068	$0.0057	$0.0042	$ 0.0006	$ 0.0153	$0.0238	$0.0172	$ 0.0027	$ 0.0672	$ 0.2165	$ 0.1943	$ 0.0923	$ 0.4021
2022	$ 0.1269	$ 0.1167	$ 0.0623	$ 0.2184	$ 0.0661	$ 0.0620	$ 0.0299	$ 0.1096	$0.0058	$0.0043	$ 0.0007	$ 0.0157	$0.0243	$0.0176	$ 0.0028	$ 0.0683	$ 0.2231	$ 0.2006	$ 0.0956	$ 0.4120
2023	$ 0.1303	$ 0.1203	$ 0.0640	$ 0.2248	$ 0.0680	$ 0.0637	$ 0.0311	$ 0.1123	$0.0059	$0.0044	$ 0.0007	$ 0.0160	$0.0248	$0.0179	$ 0.0028	$ 0.0692	$ 0.2290	$ 0.2063	$ 0.0986	$ 0.4223
2024	$ 0.1441	$ 0.1307	$ 0.0686	$ 0.2569	$ 0.0755	$ 0.0700	$ 0.0341	$ 0.1297	$0.0064	$0.0047	$ 0.0008	$ 0.0174	$0.0272	$0.0195	$ 0.0030	$ 0.0771	$ 0.2532	$ 0.2249	$ 0.1065	$ 0.4811
2025	$ 0.1480	$ 0.1344	$ 0.0704	$ 0.2632	$ 0.0775	$ 0.0716	$ 0.0352	$ 0.1325	$0.0066	$0.0048	$ 0.0008	$ 0.0176	$0.0277	$0.0198	$ 0.0031	$ 0.0781	$ 0.2597	$ 0.2306	$ 0.1094	$ 0.4914
2026	$ 0.1531	$ 0.1391	$ 0.0729	$ 0.2721	$ 0.0801	$ 0.0742	$ 0.0364	$ 0.1355	$0.0067	$0.0049	$ 0.0008	$ 0.0180	$0.0284	$0.0203	$ 0.0031	$ 0.0793	$ 0.2683	$ 0.2385	$ 0.1133	$ 0.5050
2027	$ 0.1656	$ 0.1514	$ 0.0797	$ 0.2916	$ 0.0871	$ 0.0793	$ 0.0401	$ 0.1538	$0.0072	$0.0053	$ 0.0008	$ 0.0193	$0.0306	$0.0224	$ 0.0034	$ 0.0846	$ 0.2905	$ 0.2584	$ 0.1240	$ 0.5492
2028	$ 0.1698	$ 0.1551	$ 0.0816	$ 0.2992	$ 0.0894	$ 0.0811	$ 0.0411	$ 0.1574	$0.0073	$0.0054	$ 0.0008	$ 0.0195	$0.0311	$0.0227	$ 0.0034	$ 0.0857	$ 0.2976	$ 0.2644	$ 0.1270	$ 0.5617
2029	$ 0.1810	$ 0.1642	$ 0.0862	$ 0.3127	$ 0.0956	$ 0.0868	$ 0.0439	$ 0.1642	$0.0078	$0.0057	$ 0.0009	$ 0.0205	$0.0332	$0.0239	$ 0.0036	$ 0.0933	$ 0.3176	$ 0.2805	$ 0.1346	$ 0.5908

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1b Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving <100 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$0.0000	$0.0000	$ 0.0000	$ 0.0002	$0.0001	$0.0000	$ 0.0000	$ 0.0007	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0012
2009	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0010	$0.0002	$0.0001	$ 0.0000	$ 0.0008	$0.0008	$0.0002	$ 0.0000	$ 0.0025	$ 0.0015	$ 0.0005	$ 0.0000	$ 0.0047
2010	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0017	$ 0.0006	$ 0.0002	$ 0.0000	$ 0.0031	$0.0005	$0.0001	$ 0.0000	$ 0.0022	$0.0017	$0.0005	$ 0.0000	$ 0.0075	$ 0.0032	$ 0.0010	$ 0.0001	$ 0.0145
2011	$ 0.0026	$ 0.0020	$ 0.0006	$ 0.0072	$ 0.0036	$ 0.0028	$ 0.0009	$ 0.0088	$0.0035	$0.0018	$ 0.0002	$ 0.0123	$0.0116	$0.0061	$ 0.0007	$ 0.0409	$ 0.0213	$ 0.0127	$ 0.0024	$ 0.0692
2012	$ 0.0034	$ 0.0026	$ 0.0008	$ 0.0093	$ 0.0047	$ 0.0037	$ 0.0012	$ 0.0115	$0.0045	$0.0024	$ 0.0003	$ 0.0157	$0.0150	$0.0079	$ 0.0009	$ 0.0531	$ 0.0276	$ 0.0165	$ 0.0032	$ 0.0895
2013	$ 0.0057	$ 0.0040	$ 0.0012	$ 0.0164	$ 0.0079	$ 0.0058	$ 0.0021	$ 0.0215	$0.0075	$0.0038	$ 0.0004	$ 0.0263	$0.0249	$0.0133	$ 0.0014	$ 0.0929	$ 0.0460	$ 0.0269	$ 0.0052	$ 0.1572
2014	$ 0.0059	$ 0.0042	$ 0.0013	$ 0.0170	$ 0.0083	$ 0.0061	$ 0.0023	$ 0.0224	$0.0077	$0.0040	$ 0.0005	$ 0.0271	$0.0258	$0.0138	$ 0.0015	$ 0.0979	$ 0.0477	$ 0.0280	$ 0.0056	$ 0.1645
2015	$ 0.0063	$ 0.0045	$ 0.0014	$ 0.0179	$ 0.0089	$ 0.0067	$ 0.0024	$ 0.0238	$0.0081	$0.0042	$ 0.0005	$ 0.0284	$0.0274	$0.0145	$ 0.0016	$ 0.1013	$ 0.0507	$ 0.0298	$ 0.0059	$ 0.1715
2016	$ 0.0076	$ 0.0056	$ 0.0018	$ 0.0212	$ 0.0113	$ 0.0086	$ 0.0033	$ 0.0283	$0.0098	$0.0054	$ 0.0006	$ 0.0315	$0.0342	$0.0194	$ 0.0021	$ 0.1182	$ 0.0629	$ 0.0390	$ 0.0078	$ 0.1992
2017	$ 0.0085	$ 0.0057	$ 0.0019	$ 0.0254	$ 0.0121	$ 0.0087	$ 0.0033	$ 0.0304	$0.0107	$0.0056	$ 0.0006	$ 0.0387	$0.0364	$0.0198	$ 0.0021	$ 0.1267	$ 0.0676	$ 0.0398	$ 0.0080	$ 0.2211
2018	$ 0.0087	$ 0.0059	$ 0.0020	$ 0.0259	$ 0.0125	$ 0.0090	$ 0.0034	$ 0.0310	$0.0109	$0.0058	$ 0.0006	$ 0.0397	$0.0372	$0.0201	$ 0.0022	$ 0.1282	$ 0.0694	$ 0.0409	$ 0.0083	$ 0.2248
2019	$ 0.0139	$ 0.0068	$ 0.0023	$ 0.0471	$ 0.0186	$ 0.0106	$ 0.0040	$ 0.0756	$0.0168	$0.0069	$ 0.0007	$ 0.0730	$0.0536	$0.0235	$ 0.0025	$ 0.2233	$ 0.1030	$ 0.0478	$ 0.0096	$ 0.4190
2020	$ 0.0142	$ 0.0070	$ 0.0024	$ 0.0478	$ 0.0190	$ 0.0108	$ 0.0042	$ 0.0769	$0.0171	$0.0070	$ 0.0007	$ 0.0736	$0.0543	$0.0238	$ 0.0026	$ 0.2261	$ 0.1046	$ 0.0486	$ 0.0099	$ 0.4245
2021	$ 0.0151	$ 0.0075	$ 0.0025	$ 0.0506	$ 0.0203	$ 0.0114	$ 0.0044	$ 0.0823	$0.0181	$0.0074	$ 0.0008	$ 0.0782	$0.0576	$0.0257	$ 0.0028	$ 0.2439	$ 0.1111	$ 0.0519	$ 0.0105	$ 0.4550
2022	$ 0.0155	$ 0.0077	$ 0.0026	$ 0.0515	$ 0.0208	$ 0.0118	$ 0.0047	$ 0.0836	$0.0184	$0.0075	$ 0.0008	$ 0.0790	$0.0587	$0.0261	$ 0.0028	$ 0.2499	$ 0.1134	$ 0.0531	$ 0.0110	$ 0.4641
2023	$ 0.0158	$ 0.0079	$ 0.0027	$ 0.0524	$ 0.0213	$ 0.0121	$ 0.0048	$ 0.0851	$0.0186	$0.0076	$ 0.0008	$ 0.0796	$0.0594	$0.0265	$ 0.0029	$ 0.2527	$ 0.1151	$ 0.0542	$ 0.0112	$ 0.4697
2024	$ 0.0165	$ 0.0085	$ 0.0029	$ 0.0537	$ 0.0222	$ 0.0127	$ 0.0051	$ 0.0872	$0.0192	$0.0079	$ 0.0009	$ 0.0809	$0.0615	$0.0281	$ 0.0030	$ 0.2632	$ 0.1194	$ 0.0573	$ 0.0119	$ 0.4851
2025	$ 0.0168	$ 0.0087	$ 0.0030	$ 0.0546	$ 0.0226	$ 0.0130	$ 0.0052	$ 0.0886	$0.0195	$0.0080	$ 0.0009	$ 0.0815	$0.0623	$0.0289	$ 0.0031	$ 0.2659	$ 0.1213	$ 0.0587	$ 0.0121	$ 0.4906
2026	$ 0.0174	$ 0.0092	$ 0.0030	$ 0.0559	$ 0.0234	$ 0.0138	$ 0.0054	$ 0.0911	$0.0200	$0.0084	$ 0.0009	$ 0.0834	$0.0641	$0.0296	$ 0.0031	$ 0.2716	$ 0.1249	$ 0.0609	$ 0.0125	$ 0.5020
2027	$ 0.0188	$ 0.0097	$ 0.0033	$ 0.0650	$ 0.0249	$ 0.0148	$ 0.0059	$ 0.0974	$0.0213	$0.0090	$ 0.0010	$ 0.0908	$0.0678	$0.0322	$ 0.0033	$ 0.2798	$ 0.1328	$ 0.0657	$ 0.0135	$ 0.5329
2028	$ 0.0193	$ 0.0099	$ 0.0033	$ 0.0666	$ 0.0256	$ 0.0151	$ 0.0060	$ 0.0999	$0.0216	$0.0092	$ 0.0010	$ 0.0922	$0.0690	$0.0329	$ 0.0034	$ 0.2848	$ 0.1355	$ 0.0672	$ 0.0138	$ 0.5436
2029	$ 0.0198	$ 0.0104	$ 0.0035	$ 0.0679	$ 0.0264	$ 0.0158	$ 0.0063	$ 0.1020	$0.0221	$0.0095	$ 0.0010	$ 0.0930	$0.0707	$0.0340	$ 0.0035	$ 0.2868	$ 0.1390	$ 0.0698	$ 0.0143	$ 0.5497

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1c Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 101-500 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided								Total Benefits			
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs							
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0008	$ 0.0006	$ 0.0001	$ 0.0020	$ 0.0004	$ 0.0004	$ 0.0001	$ 0.0011	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0002	$0.0001	$ 0.0000	$ 0.0005	$ 0.0014	$ 0.0011	$ 0.0002	$ 0.0038
2009	$ 0.0035	$ 0.0029	$ 0.0008	$ 0.0078	$ 0.0019	$ 0.0016	$ 0.0005	$ 0.0043	$0.0002	$0.0001	$ 0.0000	$ 0.0005	$0.0007	$0.0005	$ 0.0001	$ 0.0022	$ 0.0063	$ 0.0051	$ 0.0014	$ 0.0148
2010	$ 0.0453	$ 0.0394	$ 0.0206	$ 0.0853	$ 0.0234	$ 0.0212	$ 0.0094	$ 0.0421	$0.0023	$0.0017	$ 0.0002	$ 0.0068	$0.0093	$0.0068	$ 0.0010	$ 0.0284	$ 0.0803	$ 0.0690	$ 0.0312	$ 0.1626
2011	$ 0.0640	$ 0.0559	$ 0.0302	$ 0.1183	$ 0.0331	$ 0.0297	$ 0.0145	$ 0.0598	$0.0032	$0.0023	$ 0.0003	$ 0.0094	$0.0130	$0.0095	$ 0.0014	$ 0.0389	$ 0.1134	$ 0.0974	$ 0.0464	$ 0.2264
2012	$ 0.0851	$ 0.0756	$ 0.0400	$ 0.1545	$ 0.0442	$ 0.0405	$ 0.0198	$ 0.0789	$0.0042	$0.0031	$ 0.0004	$ 0.0124	$0.0173	$0.0127	$ 0.0018	$ 0.0500	$ 0.1508	$ 0.1320	$ 0.0620	$ 0.2959
2013	$ 0.1484	$ 0.1243	$ 0.0669	$ 0.2772	$ 0.0775	$ 0.0673	$ 0.0350	$ 0.1497	$0.0073	$0.0054	$ 0.0007	$ 0.0210	$0.0305	$0.0222	$ 0.0028	$ 0.0865	$ 0.2638	$ 0.2192	$ 0.1054	$ 0.5345
2014	$ 0.1545	$ 0.1303	$ 0.0702	$ 0.2842	$ 0.0808	$ 0.0710	$ 0.0367	$ 0.1553	$0.0076	$0.0055	$ 0.0008	$ 0.0217	$0.0316	$0.0231	$ 0.0029	$ 0.0905	$ 0.2744	$ 0.2299	$ 0.1106	$ 0.5517
2015	$ 0.1923	$ 0.1678	$ 0.0975	$ 0.3464	$ 0.1022	$ 0.0904	$ 0.0492	$ 0.1904	$0.0094	$0.0068	$ 0.0009	$ 0.0266	$0.0395	$0.0297	$ 0.0039	$ 0.1091	$ 0.3433	$ 0.2947	$ 0.1516	$ 0.6724
2016	$ 0.1978	$ 0.1730	$ 0.1005	$ 0.3545	$ 0.1051	$ 0.0931	$ 0.0507	$ 0.1952	$0.0096	$0.0070	$ 0.0010	$ 0.0269	$0.0403	$0.0304	$ 0.0040	$ 0.1115	$ 0.3528	$ 0.3035	$ 0.1562	$ 0.6881
2017	$ 0.2043	$ 0.1785	$ 0.1041	$ 0.3692	$ 0.1085	$ 0.0959	$ 0.0525	$ 0.2058	$0.0098	$0.0072	$ 0.0010	$ 0.0274	$0.0413	$0.0310	$ 0.0041	$ 0.1134	$ 0.3639	$ 0.3126	$ 0.1617	$ 0.7158
2018	$ 0.2346	$ 0.2079	$ 0.1215	$ 0.4164	$ 0.1230	$ 0.1080	$ 0.0610	$ 0.2323	$0.0111	$0.0083	$ 0.0012	$ 0.0315	$0.0463	$0.0341	$ 0.0049	$ 0.1313	$ 0.4150	$ 0.3582	$ 0.1886	$ 0.8115
2019	$ 0.2431	$ 0.2165	$ 0.1277	$ 0.4275	$ 0.1275	$ 0.1132	$ 0.0651	$ 0.2373	$0.0114	$0.0085	$ 0.0012	$ 0.0323	$0.0476	$0.0358	$ 0.0050	$ 0.1340	$ 0.4296	$ 0.3740	$ 0.1991	$ 0.8311
2020	$ 0.2611	$ 0.2357	$ 0.1402	$ 0.4499	$ 0.1375	$ 0.1236	$ 0.0702	$ 0.2508	$0.0121	$0.0092	$ 0.0013	$ 0.0336	$0.0508	$0.0390	$ 0.0055	$ 0.1410	$ 0.4615	$ 0.4074	$ 0.2171	$ 0.8754
2021	$ 0.2704	$ 0.2430	$ 0.1451	$ 0.4742	$ 0.1425	$ 0.1280	$ 0.0726	$ 0.2594	$0.0124	$0.0094	$ 0.0014	$ 0.0342	$0.0522	$0.0400	$ 0.0056	$ 0.1457	$ 0.4775	$ 0.4204	$ 0.2246	$ 0.9135
2022	$ 0.2790	$ 0.2509	$ 0.1504	$ 0.4861	$ 0.1468	$ 0.1325	$ 0.0744	$ 0.2657	$0.0127	$0.0096	$ 0.0014	$ 0.0349	$0.0534	$0.0411	$ 0.0057	$ 0.1503	$ 0.4919	$ 0.4342	$ 0.2320	$ 0.9370
2023	$ 0.3066	$ 0.2759	$ 0.1604	$ 0.5588	$ 0.1616	$ 0.1437	$ 0.0847	$ 0.3058	$0.0139	$0.0104	$ 0.0015	$ 0.0379	$0.0585	$0.0443	$ 0.0061	$ 0.1596	$ 0.5406	$ 0.4743	$ 0.2526	$ 1.0621
2024	$ 0.3189	$ 0.2866	$ 0.1663	$ 0.5763	$ 0.1673	$ 0.1504	$ 0.0877	$ 0.3150	$0.0143	$0.0109	$ 0.0015	$ 0.0394	$0.0601	$0.0461	$ 0.0062	$ 0.1637	$ 0.5605	$ 0.4940	$ 0.2617	$ 1.0943
2025	$ 0.3432	$ 0.3093	$ 0.1815	$ 0.6176	$ 0.1804	$ 0.1622	$ 0.0965	$ 0.3367	$0.0153	$0.0115	$ 0.0016	$ 0.0431	$0.0644	$0.0491	$ 0.0068	$ 0.1723	$ 0.6033	$ 0.5321	$ 0.2863	$ 1.1698
2026	$ 0.3565	$ 0.3208	$ 0.1880	$ 0.6511	$ 0.1862	$ 0.1674	$ 0.1002	$ 0.3579	$0.0157	$0.0118	$ 0.0017	$ 0.0444	$0.0659	$0.0503	$ 0.0069	$ 0.1784	$ 0.6243	$ 0.5503	$ 0.2967	$ 1.2318
2027	$ 0.3679	$ 0.3313	$ 0.1936	$ 0.6664	$ 0.1922	$ 0.1740	$ 0.1028	$ 0.3666	$0.0161	$0.0121	$ 0.0017	$ 0.0453	$0.0675	$0.0512	$ 0.0071	$ 0.1838	$ 0.6437	$ 0.5686	$ 0.3052	$ 1.2621
2028	$ 0.3936	$ 0.3510	$ 0.2047	$ 0.7115	$ 0.2066	$ 0.1828	$ 0.1075	$ 0.3853	$0.0171	$0.0127	$ 0.0018	$ 0.0497	$0.0720	$0.0538	$ 0.0075	$ 0.1977	$ 0.6893	$ 0.6002	$ 0.3215	$ 1.3443
2029	$ 0.4045	$ 0.3613	$ 0.2112	$ 0.7314	$ 0.2120	$ 0.1894	$ 0.1104	$ 0.3945	$0.0174	$0.0130	$ 0.0018	$ 0.0508	$0.0733	$0.0546	$ 0.0076	$ 0.2021	$ 0.7072	$ 0.6182	$ 0.3311	$ 1.3788

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1d Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 101-500 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0004	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$0.0003	$0.0001	$ 0.0000	$ 0.0011	$ 0.0005	$ 0.0002	$ 0.0000	$ 0.0020
2009	$ 0.0005	$ 0.0001	$ 0.0000	$ 0.0021	$ 0.0007	$ 0.0002	$ 0.0000	$ 0.0038	$0.0006	$0.0001	$ 0.0000	$ 0.0018	$0.0020	$0.0005	$ 0.0000	$ 0.0077	$ 0.0038	$ 0.0010	$ 0.0001	$ 0.0154
2010	$ 0.0037	$ 0.0030	$ 0.0008	$ 0.0088	$ 0.0057	$ 0.0047	$ 0.0014	$ 0.0151	$0.0047	$0.0027	$ 0.0002	$ 0.0145	$0.0174	$0.0100	$ 0.0009	$ 0.0611	$ 0.0315	$ 0.0203	$ 0.0033	$ 0.0995
2011	$ 0.0051	$ 0.0041	$ 0.0012	$ 0.0120	$ 0.0080	$ 0.0065	$ 0.0021	$ 0.0207	$0.0065	$0.0037	$ 0.0004	$ 0.0202	$0.0241	$0.0143	$ 0.0012	$ 0.0859	$ 0.0437	$ 0.0286	$ 0.0049	$ 0.1389
2012	$ 0.0066	$ 0.0054	$ 0.0016	$ 0.0154	$ 0.0104	$ 0.0086	$ 0.0029	$ 0.0264	$0.0083	$0.0048	$ 0.0005	$ 0.0258	$0.0312	$0.0185	$ 0.0016	$ 0.1125	$ 0.0565	$ 0.0373	$ 0.0066	$ 0.1801
2013	$ 0.0118	$ 0.0093	$ 0.0027	$ 0.0294	$ 0.0177	$ 0.0140	$ 0.0048	$ 0.0494	$0.0140	$0.0081	$ 0.0009	$ 0.0456	$0.0509	$0.0314	$ 0.0031	$ 0.1626	$ 0.0944	$ 0.0629	$ 0.0115	$ 0.2869
2014	$ 0.0125	$ 0.0097	$ 0.0028	$ 0.0309	$ 0.0186	$ 0.0146	$ 0.0051	$ 0.0520	$0.0146	$0.0085	$ 0.0009	$ 0.0486	$0.0527	$0.0324	$ 0.0031	$ 0.1658	$ 0.0984	$ 0.0652	$ 0.0120	$ 0.2973
2015	$ 0.0163	$ 0.0130	$ 0.0038	$ 0.0415	$ 0.0246	$ 0.0198	$ 0.0070	$ 0.0659	$0.0189	$0.0111	$ 0.0013	$ 0.0629	$0.0691	$0.0420	$ 0.0047	$ 0.2086	$ 0.1289	$ 0.0858	$ 0.0168	$ 0.3789
2016	$ 0.0168	$ 0.0133	$ 0.0039	$ 0.0432	$ 0.0254	$ 0.0203	$ 0.0071	$ 0.0683	$0.0193	$0.0113	$ 0.0013	$ 0.0641	$0.0706	$0.0425	$ 0.0048	$ 0.2115	$ 0.1321	$ 0.0875	$ 0.0172	$ 0.3871
2017	$ 0.0195	$ 0.0136	$ 0.0040	$ 0.0586	$ 0.0283	$ 0.0207	$ 0.0073	$ 0.0799	$0.0221	$0.0116	$ 0.0014	$ 0.0738	$0.0773	$0.0439	$ 0.0049	$ 0.2371	$ 0.1471	$ 0.0897	$ 0.0175	$ 0.4494
2018	$ 0.0268	$ 0.0150	$ 0.0046	$ 0.1078	$ 0.0373	$ 0.0231	$ 0.0086	$ 0.1510	$0.0292	$0.0134	$ 0.0016	$ 0.0984	$0.0974	$0.0516	$ 0.0057	$ 0.3618	$ 0.1907	$ 0.1032	$ 0.0205	$ 0.7189
2019	$ 0.0276	$ 0.0155	$ 0.0048	$ 0.1104	$ 0.0384	$ 0.0239	$ 0.0090	$ 0.1548	$0.0298	$0.0136	$ 0.0017	$ 0.0994	$0.0995	$0.0528	$ 0.0059	$ 0.3713	$ 0.1953	$ 0.1058	$ 0.0214	$ 0.7360
2020	$ 0.0287	$ 0.0164	$ 0.0052	$ 0.1141	$ 0.0400	$ 0.0251	$ 0.0097	$ 0.1582	$0.0307	$0.0141	$ 0.0018	$ 0.1023	$0.1030	$0.0552	$ 0.0064	$ 0.3826	$ 0.2024	$ 0.1109	$ 0.0231	$ 0.7573
2021	$ 0.0299	$ 0.0170	$ 0.0054	$ 0.1183	$ 0.0416	$ 0.0259	$ 0.0100	$ 0.1629	$0.0316	$0.0143	$ 0.0018	$ 0.1057	$0.1061	$0.0576	$ 0.0065	$ 0.4017	$ 0.2092	$ 0.1148	$ 0.0237	$ 0.7886
2022	$ 0.0307	$ 0.0175	$ 0.0055	$ 0.1208	$ 0.0428	$ 0.0267	$ 0.0105	$ 0.1656	$0.0323	$0.0152	$ 0.0019	$ 0.1066	$0.1085	$0.0599	$ 0.0069	$ 0.4045	$ 0.2144	$ 0.1193	$ 0.0248	$ 0.7975
2023	$ 0.0318	$ 0.0188	$ 0.0059	$ 0.1233	$ 0.0445	$ 0.0281	$ 0.0113	$ 0.1691	$0.0333	$0.0158	$ 0.0020	$ 0.1118	$0.1124	$0.0625	$ 0.0073	$ 0.4076	$ 0.2220	$ 0.1251	$ 0.0264	$ 0.8117
2024	$ 0.0328	$ 0.0195	$ 0.0061	$ 0.1258	$ 0.0459	$ 0.0295	$ 0.0117	$ 0.1719	$0.0340	$0.0160	$ 0.0020	$ 0.1129	$0.1152	$0.0638	$ 0.0075	$ 0.4104	$ 0.2278	$ 0.1288	$ 0.0274	$ 0.8209
2025	$ 0.0362	$ 0.0207	$ 0.0065	$ 0.1412	$ 0.0493	$ 0.0314	$ 0.0124	$ 0.1893	$0.0371	$0.0172	$ 0.0021	$ 0.1301	$0.1234	$0.0680	$ 0.0079	$ 0.4597	$ 0.2460	$ 0.1373	$ 0.0290	$ 0.9203
2026	$ 0.0373	$ 0.0216	$ 0.0067	$ 0.1439	$ 0.0509	$ 0.0328	$ 0.0128	$ 0.1926	$0.0381	$0.0176	$ 0.0022	$ 0.1314	$0.1270	$0.0688	$ 0.0082	$ 0.4636	$ 0.2533	$ 0.1409	$ 0.0299	$ 0.9315
2027	$ 0.0381	$ 0.0222	$ 0.0070	$ 0.1465	$ 0.0521	$ 0.0337	$ 0.0131	$ 0.1959	$0.0386	$0.0179	$ 0.0022	$ 0.1324	$0.1289	$0.0695	$ 0.0083	$ 0.4670	$ 0.2577	$ 0.1434	$ 0.0306	$ 0.9418
2028	$ 0.0395	$ 0.0232	$ 0.0074	$ 0.1509	$ 0.0542	$ 0.0350	$ 0.0137	$ 0.2003	$0.0397	$0.0187	$ 0.0023	$ 0.1337	$0.1330	$0.0718	$ 0.0085	$ 0.4737	$ 0.2664	$ 0.1488	$ 0.0319	$ 0.9585
2029	$ 0.0404	$ 0.0237	$ 0.0076	$ 0.1539	$ 0.0554	$ 0.0359	$ 0.0141	$ 0.2037	$0.0402	$0.0191	$ 0.0023	$ 0.1346	$0.1349	$0.0740	$ 0.0088	$ 0.4774	$ 0.2709	$ 0.1527	$ 0.0328	$ 0.9696

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1e Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 501-1,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0006	$ 0.0004	$ 0.0001	$ 0.0019	$ 0.0004	$ 0.0003	$ 0.0000	$ 0.0010	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0001	$ 0.0000	$ 0.0005	$ 0.0012	$ 0.0008	$ 0.0001	$ 0.0035
2009	$ 0.0028	$ 0.0023	$ 0.0006	$ 0.0069	$ 0.0016	$ 0.0013	$ 0.0004	$ 0.0041	$0.0001	$0.0001	$ 0.0000	$ 0.0004	$0.0006	$0.0004	$ 0.0000	$ 0.0020	$ 0.0051	$ 0.0040	$ 0.0010	$ 0.0134
2010	$ 0.0393	$ 0.0337	$ 0.0164	$ 0.0765	$ 0.0203	$ 0.0176	$ 0.0079	$ 0.0427	$0.0019	$0.0013	$ 0.0002	$ 0.0056	$0.0077	$0.0054	$ 0.0008	$ 0.0241	$ 0.0692	$ 0.0581	$ 0.0253	$ 0.1489
2011	$ 0.0557	$ 0.0484	$ 0.0239	$ 0.1061	$ 0.0286	$ 0.0248	$ 0.0112	$ 0.0585	$0.0027	$0.0019	$ 0.0003	$ 0.0078	$0.0109	$0.0078	$ 0.0011	$ 0.0330	$ 0.0979	$ 0.0828	$ 0.0365	$ 0.2055
2012	$ 0.1047	$ 0.0870	$ 0.0438	$ 0.2138	$ 0.0547	$ 0.0463	$ 0.0205	$ 0.1208	$0.0050	$0.0034	$ 0.0005	$ 0.0149	$0.0206	$0.0142	$ 0.0021	$ 0.0620	$ 0.1849	$ 0.1509	$ 0.0669	$ 0.4115
2013	$ 0.1308	$ 0.1087	$ 0.0569	$ 0.2648	$ 0.0684	$ 0.0583	$ 0.0258	$ 0.1516	$0.0062	$0.0042	$ 0.0006	$ 0.0185	$0.0255	$0.0180	$ 0.0026	$ 0.0765	$ 0.2310	$ 0.1892	$ 0.0859	$ 0.5114
2014	$ 0.1633	$ 0.1382	$ 0.0816	$ 0.3132	$ 0.0880	$ 0.0746	$ 0.0397	$ 0.1784	$0.0077	$0.0056	$ 0.0009	$ 0.0218	$0.0327	$0.0240	$ 0.0036	$ 0.0950	$ 0.2918	$ 0.2424	$ 0.1258	$ 0.6083
2015	$ 0.1693	$ 0.1450	$ 0.0854	$ 0.3219	$ 0.0912	$ 0.0771	$ 0.0416	$ 0.1831	$0.0079	$0.0058	$ 0.0009	$ 0.0222	$0.0336	$0.0249	$ 0.0037	$ 0.0972	$ 0.3020	$ 0.2527	$ 0.1316	$ 0.6244
2016	$ 0.1928	$ 0.1669	$ 0.0955	$ 0.3685	$ 0.1044	$ 0.0879	$ 0.0486	$ 0.2121	$0.0089	$0.0065	$ 0.0010	$ 0.0254	$0.0382	$0.0278	$ 0.0042	$ 0.1147	$ 0.3444	$ 0.2891	$ 0.1494	$ 0.7207
2017	$ 0.1985	$ 0.1715	$ 0.0985	$ 0.3779	$ 0.1072	$ 0.0897	$ 0.0499	$ 0.2168	$0.0091	$0.0066	$ 0.0010	$ 0.0259	$0.0390	$0.0282	$ 0.0043	$ 0.1170	$ 0.3538	$ 0.2960	$ 0.1536	$ 0.7377
2018	$ 0.2143	$ 0.1862	$ 0.1104	$ 0.3954	$ 0.1166	$ 0.0996	$ 0.0555	$ 0.2326	$0.0098	$0.0072	$ 0.0011	$ 0.0280	$0.0420	$0.0308	$ 0.0047	$ 0.1238	$ 0.3827	$ 0.3237	$ 0.1717	$ 0.7798
2019	$ 0.2219	$ 0.1940	$ 0.1145	$ 0.4052	$ 0.1205	$ 0.1039	$ 0.0572	$ 0.2401	$0.0101	$0.0075	$ 0.0012	$ 0.0285	$0.0431	$0.0317	$ 0.0048	$ 0.1252	$ 0.3956	$ 0.3371	$ 0.1776	$ 0.7991
2020	$ 0.2468	$ 0.2140	$ 0.1227	$ 0.4628	$ 0.1324	$ 0.1148	$ 0.0620	$ 0.2643	$0.0111	$0.0082	$ 0.0013	$ 0.0311	$0.0469	$0.0351	$ 0.0053	$ 0.1372	$ 0.4372	$ 0.3721	$ 0.1912	$ 0.8955
2021	$ 0.2549	$ 0.2198	$ 0.1256	$ 0.4884	$ 0.1366	$ 0.1188	$ 0.0640	$ 0.2720	$0.0113	$0.0084	$ 0.0013	$ 0.0322	$0.0480	$0.0359	$ 0.0053	$ 0.1385	$ 0.4509	$ 0.3828	$ 0.1963	$ 0.9311
2022	$ 0.2781	$ 0.2408	$ 0.1400	$ 0.5287	$ 0.1492	$ 0.1299	$ 0.0707	$ 0.2961	$0.0123	$0.0090	$ 0.0014	$ 0.0345	$0.0521	$0.0386	$ 0.0058	$ 0.1499	$ 0.4917	$ 0.4183	$ 0.2178	$ 1.0091
2023	$ 0.2854	$ 0.2468	$ 0.1431	$ 0.5419	$ 0.1531	$ 0.1326	$ 0.0720	$ 0.3020	$0.0125	$0.0091	$ 0.0014	$ 0.0349	$0.0531	$0.0393	$ 0.0058	$ 0.1524	$ 0.5041	$ 0.4280	$ 0.2223	$ 1.0313
2024	$ 0.3110	$ 0.2702	$ 0.1545	$ 0.5923	$ 0.1666	$ 0.1418	$ 0.0783	$ 0.3392	$0.0135	$0.0098	$ 0.0015	$ 0.0372	$0.0572	$0.0420	$ 0.0062	$ 0.1731	$ 0.5483	$ 0.4639	$ 0.2404	$ 1.1419
2025	$ 0.3187	$ 0.2777	$ 0.1581	$ 0.6068	$ 0.1709	$ 0.1449	$ 0.0806	$ 0.3487	$0.0137	$0.0100	$ 0.0015	$ 0.0379	$0.0582	$0.0427	$ 0.0063	$ 0.1754	$ 0.5615	$ 0.4753	$ 0.2465	$ 1.1687
2026	$ 0.3381	$ 0.2945	$ 0.1677	$ 0.6416	$ 0.1808	$ 0.1569	$ 0.0839	$ 0.3697	$0.0144	$0.0105	$ 0.0016	$ 0.0398	$0.0611	$0.0444	$ 0.0065	$ 0.1812	$ 0.5945	$ 0.5064	$ 0.2598	$ 1.2324
2027	$ 0.3478	$ 0.3036	$ 0.1715	$ 0.6564	$ 0.1863	$ 0.1617	$ 0.0871	$ 0.3813	$0.0147	$0.0108	$ 0.0016	$ 0.0407	$0.0625	$0.0464	$ 0.0066	$ 0.1829	$ 0.6112	$ 0.5225	$ 0.2668	$ 1.2614
2028	$ 0.3581	$ 0.3117	$ 0.1758	$ 0.6792	$ 0.1924	$ 0.1661	$ 0.0905	$ 0.3969	$0.0150	$0.0111	$ 0.0017	$ 0.0417	$0.0641	$0.0476	$ 0.0068	$ 0.1864	$ 0.6297	$ 0.5364	$ 0.2747	$ 1.3042
2029	$ 0.3676	$ 0.3199	$ 0.1816	$ 0.6929	$ 0.1975	$ 0.1708	$ 0.0942	$ 0.4073	$0.0153	$0.0113	$ 0.0017	$ 0.0423	$0.0653	$0.0485	$ 0.0069	$ 0.1889	$ 0.6456	$ 0.5505	$ 0.2844	$ 1.3315

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1f Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 501-1,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0004	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$0.0003	$0.0001	$ 0.0000	$ 0.0013	$ 0.0006	$ 0.0002	$ 0.0000	$ 0.0023
2009	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0018	$ 0.0006	$ 0.0003	$ 0.0000	$ 0.0030	$0.0004	$0.0001	$ 0.0000	$ 0.0018	$0.0015	$0.0004	$ 0.0000	$ 0.0064	$ 0.0029	$ 0.0009	$ 0.0001	$ 0.0130
2010	$ 0.0035	$ 0.0026	$ 0.0006	$ 0.0088	$ 0.0052	$ 0.0041	$ 0.0010	$ 0.0128	$0.0041	$0.0021	$ 0.0002	$ 0.0159	$0.0141	$0.0077	$ 0.0009	$ 0.0504	$ 0.0269	$ 0.0166	$ 0.0029	$ 0.0879
2011	$ 0.0048	$ 0.0036	$ 0.0010	$ 0.0121	$ 0.0072	$ 0.0059	$ 0.0016	$ 0.0175	$0.0056	$0.0030	$ 0.0003	$ 0.0216	$0.0196	$0.0112	$ 0.0013	$ 0.0682	$ 0.0373	$ 0.0236	$ 0.0042	$ 0.1194
2012	$ 0.0078	$ 0.0057	$ 0.0017	$ 0.0222	$ 0.0118	$ 0.0095	$ 0.0029	$ 0.0314	$0.0091	$0.0048	$ 0.0006	$ 0.0335	$0.0315	$0.0185	$ 0.0022	$ 0.1143	$ 0.0603	$ 0.0385	$ 0.0073	$ 0.2013
2013	$ 0.0102	$ 0.0073	$ 0.0021	$ 0.0287	$ 0.0153	$ 0.0119	$ 0.0038	$ 0.0419	$0.0117	$0.0061	$ 0.0007	$ 0.0417	$0.0405	$0.0235	$ 0.0027	$ 0.1424	$ 0.0777	$ 0.0489	$ 0.0094	$ 0.2547
2014	$ 0.0125	$ 0.0095	$ 0.0030	$ 0.0338	$ 0.0194	$ 0.0162	$ 0.0051	$ 0.0495	$0.0144	$0.0079	$ 0.0011	$ 0.0543	$0.0518	$0.0312	$ 0.0042	$ 0.1744	$ 0.0981	$ 0.0647	$ 0.0133	$ 0.3121
2015	$ 0.0134	$ 0.0100	$ 0.0032	$ 0.0371	$ 0.0209	$ 0.0171	$ 0.0055	$ 0.0557	$0.0153	$0.0082	$ 0.0011	$ 0.0570	$0.0551	$0.0330	$ 0.0045	$ 0.1801	$ 0.1047	$ 0.0683	$ 0.0143	$ 0.3299
2016	$ 0.0231	$ 0.0111	$ 0.0037	$ 0.0866	$ 0.0319	$ 0.0190	$ 0.0063	$ 0.1030	$0.0258	$0.0098	$ 0.0013	$ 0.0874	$0.0815	$0.0368	$ 0.0052	$ 0.2643	$ 0.1623	$ 0.0767	$ 0.0165	$ 0.5413
2017	$ 0.0244	$ 0.0113	$ 0.0038	$ 0.1052	$ 0.0335	$ 0.0193	$ 0.0065	$ 0.1275	$0.0268	$0.0100	$ 0.0013	$ 0.0931	$0.0843	$0.0372	$ 0.0052	$ 0.2782	$ 0.1690	$ 0.0779	$ 0.0168	$ 0.6041
2018	$ 0.0254	$ 0.0121	$ 0.0041	$ 0.1078	$ 0.0349	$ 0.0203	$ 0.0072	$ 0.1306	$0.0276	$0.0105	$ 0.0014	$ 0.0975	$0.0874	$0.0399	$ 0.0057	$ 0.2849	$ 0.1754	$ 0.0828	$ 0.0184	$ 0.6208
2019	$ 0.0261	$ 0.0126	$ 0.0043	$ 0.1100	$ 0.0359	$ 0.0208	$ 0.0076	$ 0.1333	$0.0282	$0.0106	$ 0.0014	$ 0.0987	$0.0893	$0.0413	$ 0.0061	$ 0.2888	$ 0.1795	$ 0.0852	$ 0.0194	$ 0.6308
2020	$ 0.0270	$ 0.0131	$ 0.0046	$ 0.1121	$ 0.0374	$ 0.0223	$ 0.0082	$ 0.1361	$0.0290	$0.0113	$ 0.0015	$ 0.1003	$0.0925	$0.0441	$ 0.0064	$ 0.2930	$ 0.1859	$ 0.0908	$ 0.0206	$ 0.6416
2021	$ 0.0282	$ 0.0135	$ 0.0047	$ 0.1183	$ 0.0390	$ 0.0228	$ 0.0084	$ 0.1440	$0.0301	$0.0115	$ 0.0015	$ 0.1042	$0.0959	$0.0451	$ 0.0064	$ 0.3243	$ 0.1932	$ 0.0928	$ 0.0211	$ 0.6908
2022	$ 0.0311	$ 0.0146	$ 0.0050	$ 0.1398	$ 0.0417	$ 0.0245	$ 0.0091	$ 0.1574	$0.0325	$0.0124	$ 0.0016	$ 0.1129	$0.1017	$0.0483	$ 0.0068	$ 0.3340	$ 0.2070	$ 0.0998	$ 0.0225	$ 0.7440
2023	$ 0.0317	$ 0.0149	$ 0.0051	$ 0.1430	$ 0.0426	$ 0.0249	$ 0.0093	$ 0.1614	$0.0329	$0.0126	$ 0.0017	$ 0.1143	$0.1030	$0.0491	$ 0.0069	$ 0.3366	$ 0.2101	$ 0.1015	$ 0.0230	$ 0.7553
2024	$ 0.0335	$ 0.0170	$ 0.0055	$ 0.1463	$ 0.0454	$ 0.0287	$ 0.0100	$ 0.1657	$0.0345	$0.0135	$ 0.0018	$ 0.1185	$0.1090	$0.0525	$ 0.0074	$ 0.3681	$ 0.2225	$ 0.1118	$ 0.0247	$ 0.7986
2025	$ 0.0342	$ 0.0173	$ 0.0057	$ 0.1489	$ 0.0464	$ 0.0294	$ 0.0103	$ 0.1704	$0.0349	$0.0138	$ 0.0018	$ 0.1198	$0.1104	$0.0536	$ 0.0076	$ 0.3708	$ 0.2258	$ 0.1141	$ 0.0254	$ 0.8099
2026	$ 0.0356	$ 0.0184	$ 0.0059	$ 0.1517	$ 0.0486	$ 0.0305	$ 0.0106	$ 0.1755	$0.0361	$0.0144	$ 0.0019	$ 0.1249	$0.1150	$0.0562	$ 0.0079	$ 0.3806	$ 0.2352	$ 0.1195	$ 0.0263	$ 0.8327
2027	$ 0.0363	$ 0.0188	$ 0.0060	$ 0.1542	$ 0.0497	$ 0.0314	$ 0.0109	$ 0.1783	$0.0366	$0.0147	$ 0.0019	$ 0.1263	$0.1166	$0.0572	$ 0.0080	$ 0.3844	$ 0.2391	$ 0.1222	$ 0.0269	$ 0.8431
2028	$ 0.0372	$ 0.0192	$ 0.0062	$ 0.1583	$ 0.0510	$ 0.0321	$ 0.0113	$ 0.1828	$0.0371	$0.0150	$ 0.0020	$ 0.1284	$0.1189	$0.0583	$ 0.0082	$ 0.4006	$ 0.2441	$ 0.1246	$ 0.0276	$ 0.8702
2029	$ 0.0380	$ 0.0196	$ 0.0064	$ 0.1611	$ 0.0521	$ 0.0327	$ 0.0116	$ 0.1860	$0.0376	$0.0153	$ 0.0020	$ 0.1297	$0.1206	$0.0610	$ 0.0082	$ 0.4106	$ 0.2482	$ 0.1286	$ 0.0282	$ 0.8874

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1g Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 1,001-3,300 (Rotavirus)

	Value of Illnesses Avoided								**Value of Deaths Avoided**											
	0 - 15 years				**> 15 yrs**				**0 - 15 years**				**> 15 yrs**				**Total Benefits**			
			90 Percent Confidence Bound				**90 Percent Confidence Bound**				**90 Percent Confidence Bound**				**90 Percent Confidence Bound**				**90 Percent Confidence Bound**	
Year	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0025	$ 0.0018	$ 0.0003	$ 0.0065	$ 0.0015	$ 0.0012	$ 0.0002	$ 0.0042	$0.0001	$0.0001	$ 0.0000	$ 0.0006	$0.0006	$0.0003	$ 0.0000	$ 0.0022	$ 0.0048	$ 0.0035	$ 0.0006	$ 0.0134
2009	$ 0.0120	$ 0.0107	$ 0.0024	$ 0.0278	$ 0.0064	$ 0.0052	$ 0.0018	$ 0.0160	$0.0006	$0.0004	$ 0.0000	$ 0.0021	$0.0024	$0.0017	$ 0.0002	$ 0.0075	$ 0.0215	$ 0.0179	$ 0.0044	$ 0.0534
2010	$ 0.0270	$ 0.0226	$ 0.0065	$ 0.0642	$ 0.0144	$ 0.0107	$ 0.0037	$ 0.0355	$0.0013	$0.0009	$ 0.0001	$ 0.0043	$0.0054	$0.0034	$ 0.0004	$ 0.0163	$ 0.0480	$ 0.0376	$ 0.0107	$ 0.1204
2011	$ 0.0469	$ 0.0403	$ 0.0128	$ 0.1073	$ 0.0249	$ 0.0210	$ 0.0068	$ 0.0595	$0.0023	$0.0016	$ 0.0002	$ 0.0069	$0.0094	$0.0061	$ 0.0007	$ 0.0301	$ 0.0834	$ 0.0690	$ 0.0206	$ 0.2038
2012	$ 0.0711	$ 0.0655	$ 0.0199	$ 0.1471	$ 0.0387	$ 0.0335	$ 0.0107	$ 0.0907	$0.0035	$0.0025	$ 0.0003	$ 0.0105	$0.0146	$0.0100	$ 0.0012	$ 0.0464	$ 0.1279	$ 0.1115	$ 0.0320	$ 0.2948
2013	$ 0.3371	$ 0.3127	$ 0.1437	$ 0.5928	$ 0.1709	$ 0.1591	$ 0.0689	$ 0.3221	$0.0158	$0.0122	$ 0.0018	$ 0.0439	$0.0628	$0.0475	$ 0.0070	$ 0.1760	$ 0.5866	$ 0.5316	$ 0.2214	$ 1.1348
2014	$ 0.3544	$ 0.3324	$ 0.1543	$ 0.6118	$ 0.1797	$ 0.1671	$ 0.0737	$ 0.3343	$0.0166	$0.0127	$ 0.0019	$ 0.0462	$0.0658	$0.0493	$ 0.0074	$ 0.1879	$ 0.6166	$ 0.5615	$ 0.2372	$ 1.1802
2015	$ 0.3772	$ 0.3545	$ 0.1646	$ 0.6523	$ 0.1904	$ 0.1788	$ 0.0787	$ 0.3521	$0.0175	$0.0134	$ 0.0020	$ 0.0483	$0.0695	$0.0521	$ 0.0078	$ 0.1965	$ 0.6545	$ 0.5988	$ 0.2531	$ 1.2491
2016	$ 0.3951	$ 0.3715	$ 0.1740	$ 0.6783	$ 0.2006	$ 0.1867	$ 0.0848	$ 0.3711	$0.0181	$0.0140	$ 0.0021	$ 0.0496	$0.0725	$0.0542	$ 0.0081	$ 0.2034	$ 0.6864	$ 0.6263	$ 0.2689	$ 1.3023
2017	$ 0.5437	$ 0.4924	$ 0.2207	$ 1.0581	$ 0.2796	$ 0.2552	$ 0.1091	$ 0.5580	$0.0245	$0.0184	$ 0.0026	$ 0.0696	$0.0995	$0.0699	$ 0.0108	$ 0.2882	$ 0.9473	$ 0.8358	$ 0.3432	$ 1.9740
2018	$ 0.5642	$ 0.5115	$ 0.2314	$ 1.0803	$ 0.2897	$ 0.2670	$ 0.1147	$ 0.5812	$0.0252	$0.0191	$ 0.0027	$ 0.0715	$0.1025	$0.0727	$ 0.0110	$ 0.2992	$ 0.9816	$ 0.8703	$ 0.3598	$ 2.0322
2019	$ 0.5894	$ 0.5385	$ 0.2462	$ 1.1128	$ 0.3032	$ 0.2816	$ 0.1257	$ 0.5947	$0.0262	$0.0197	$ 0.0028	$ 0.0733	$0.1067	$0.0788	$ 0.0115	$ 0.3164	$ 1.0255	$ 0.9186	$ 0.3861	$ 2.0972
2020	$ 0.6103	$ 0.5604	$ 0.2542	$ 1.1578	$ 0.3159	$ 0.2939	$ 0.1304	$ 0.6214	$0.0269	$0.0202	$ 0.0028	$ 0.0758	$0.1103	$0.0811	$ 0.0120	$ 0.3251	$ 1.0634	$ 0.9556	$ 0.3994	$ 2.1801
2021	$ 0.6356	$ 0.5827	$ 0.2668	$ 1.2252	$ 0.3296	$ 0.3046	$ 0.1368	$ 0.6647	$0.0277	$0.0207	$ 0.0029	$ 0.0776	$0.1141	$0.0846	$ 0.0125	$ 0.3333	$ 1.1069	$ 0.9926	$ 0.4190	$ 2.3009
2022	$ 0.7750	$ 0.7106	$ 0.3798	$ 1.4193	$ 0.4062	$ 0.3748	$ 0.1901	$ 0.7817	$0.0338	$0.0269	$ 0.0039	$ 0.0899	$0.1397	$0.1060	$ 0.0165	$ 0.3921	$ 1.3547	$ 1.2184	$ 0.5903	$ 2.6830
2023	$ 0.8018	$ 0.7357	$ 0.3904	$ 1.5042	$ 0.4210	$ 0.3881	$ 0.1958	$ 0.8296	$0.0346	$0.0277	$ 0.0039	$ 0.0926	$0.1436	$0.1080	$ 0.0168	$ 0.4051	$ 1.4011	$ 1.2595	$ 0.6070	$ 2.8315
2024	$ 0.8403	$ 0.7740	$ 0.4114	$ 1.5467	$ 0.4393	$ 0.4054	$ 0.2043	$ 0.8505	$0.0361	$0.0290	$ 0.0041	$ 0.0958	$0.1490	$0.1117	$ 0.0176	$ 0.4238	$ 1.4646	$ 1.3201	$ 0.6374	$ 2.9168
2025	$ 0.8673	$ 0.8010	$ 0.4247	$ 1.5920	$ 0.4531	$ 0.4171	$ 0.2099	$ 0.8725	$0.0369	$0.0295	$ 0.0042	$ 0.0986	$0.1526	$0.1144	$ 0.0180	$ 0.4350	$ 1.5100	$ 1.3621	$ 0.6567	$ 2.9982
2026	$ 0.9704	$ 0.8974	$ 0.4853	$ 1.8170	$ 0.4965	$ 0.4549	$ 0.2407	$ 0.9479	$0.0408	$0.0331	$ 0.0048	$ 0.1076	$0.1655	$0.1280	$ 0.0198	$ 0.4626	$ 1.6732	$ 1.5134	$ 0.7506	$ 3.3351
2027	$ 1.0067	$ 0.9281	$ 0.5013	$ 1.8623	$ 0.5151	$ 0.4745	$ 0.2482	$ 0.9818	$0.0420	$0.0340	$ 0.0050	$ 0.1112	$0.1706	$0.1312	$ 0.0202	$ 0.4753	$ 1.7344	$ 1.5678	$ 0.7746	$ 3.4307
2028	$ 1.0414	$ 0.9541	$ 0.5141	$ 1.9640	$ 0.5316	$ 0.4871	$ 0.2554	$ 1.0470	$0.0429	$0.0348	$ 0.0051	$ 0.1138	$0.1744	$0.1344	$ 0.0204	$ 0.4842	$ 1.7903	$ 1.6105	$ 0.7949	$ 3.6091
2029	$ 1.0750	$ 0.9837	$ 0.5363	$ 2.0131	$ 0.5500	$ 0.5022	$ 0.2656	$ 1.0832	$0.0440	$0.0356	$ 0.0051	$ 0.1164	$0.1790	$0.1389	$ 0.0208	$ 0.4986	$ 1.8480	$ 1.6604	$ 0.8278	$ 3.7113

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1h Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 1,001-3,300 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0006	$ 0.0003	$ 0.0002	$ 0.0000	$ 0.0013	$0.0002	$0.0001	$ 0.0000	$ 0.0010	$0.0012	$0.0003	$ 0.0000	$ 0.0044	$ 0.0019	$ 0.0006	$ 0.0001	$ 0.0073
2009	$ 0.0016	$ 0.0005	$ 0.0001	$ 0.0076	$ 0.0025	$ 0.0008	$ 0.0001	$ 0.0118	$0.0022	$0.0004	$ 0.0000	$ 0.0071	$0.0088	$0.0016	$ 0.0001	$ 0.0357	$ 0.0151	$ 0.0034	$ 0.0004	$ 0.0622
2010	$ 0.0031	$ 0.0011	$ 0.0002	$ 0.0164	$ 0.0047	$ 0.0017	$ 0.0002	$ 0.0239	$0.0041	$0.0009	$ 0.0001	$ 0.0148	$0.0162	$0.0032	$ 0.0002	$ 0.0591	$ 0.0280	$ 0.0068	$ 0.0007	$ 0.1142
2011	$ 0.0046	$ 0.0019	$ 0.0004	$ 0.0226	$ 0.0072	$ 0.0031	$ 0.0009	$ 0.0337	$0.0060	$0.0016	$ 0.0002	$ 0.0211	$0.0240	$0.0063	$ 0.0006	$ 0.0798	$ 0.0419	$ 0.0130	$ 0.0020	$ 0.1573
2012	$ 0.0065	$ 0.0033	$ 0.0006	$ 0.0288	$ 0.0103	$ 0.0051	$ 0.0012	$ 0.0432	$0.0084	$0.0025	$ 0.0003	$ 0.0312	$0.0336	$0.0097	$ 0.0010	$ 0.1058	$ 0.0588	$ 0.0206	$ 0.0031	$ 0.2090
2013	$ 0.0284	$ 0.0206	$ 0.0058	$ 0.0751	$ 0.0444	$ 0.0351	$ 0.0106	$ 0.1098	$0.0384	$0.0196	$ 0.0023	$ 0.1313	$0.1416	$0.0759	$ 0.0087	$ 0.4890	$ 0.2528	$ 0.1512	$ 0.0275	$ 0.8052
2014	$ 0.0300	$ 0.0217	$ 0.0062	$ 0.0795	$ 0.0469	$ 0.0373	$ 0.0112	$ 0.1183	$0.0402	$0.0205	$ 0.0025	$ 0.1358	$0.1486	$0.0814	$ 0.0092	$ 0.5039	$ 0.2657	$ 0.1610	$ 0.0291	$ 0.8375
2015	$ 0.0335	$ 0.0243	$ 0.0066	$ 0.0889	$ 0.0523	$ 0.0410	$ 0.0118	$ 0.1339	$0.0443	$0.0229	$ 0.0026	$ 0.1466	$0.1647	$0.0925	$ 0.0096	$ 0.5396	$ 0.2948	$ 0.1808	$ 0.0306	$ 0.9091
2016	$ 0.0350	$ 0.0252	$ 0.0069	$ 0.0934	$ 0.0546	$ 0.0426	$ 0.0122	$ 0.1424	$0.0459	$0.0237	$ 0.0027	$ 0.1498	$0.1704	$0.0950	$ 0.0101	$ 0.5549	$ 0.3058	$ 0.1865	$ 0.0319	$ 0.9405
2017	$ 0.0517	$ 0.0333	$ 0.0093	$ 0.1643	$ 0.0749	$ 0.0526	$ 0.0160	$ 0.2446	$0.0657	$0.0293	$ 0.0032	$ 0.2302	$0.2317	$0.1198	$ 0.0130	$ 0.8178	$ 0.4241	$ 0.2351	$ 0.0415	$ 1.4570
2018	$ 0.0540	$ 0.0350	$ 0.0100	$ 0.1677	$ 0.0783	$ 0.0553	$ 0.0173	$ 0.2532	$0.0680	$0.0307	$ 0.0035	$ 0.2389	$0.2396	$0.1226	$ 0.0139	$ 0.8400	$ 0.4399	$ 0.2435	$ 0.0447	$ 1.4997
2019	$ 0.0566	$ 0.0371	$ 0.0104	$ 0.1710	$ 0.0821	$ 0.0595	$ 0.0183	$ 0.2590	$0.0708	$0.0325	$ 0.0036	$ 0.2494	$0.2495	$0.1275	$ 0.0147	$ 0.8554	$ 0.4591	$ 0.2566	$ 0.0470	$ 1.5348
2020	$ 0.0581	$ 0.0383	$ 0.0108	$ 0.1741	$ 0.0842	$ 0.0622	$ 0.0191	$ 0.2631	$0.0720	$0.0337	$ 0.0038	$ 0.2525	$0.2539	$0.1324	$ 0.0151	$ 0.8634	$ 0.4682	$ 0.2667	$ 0.0487	$ 1.5531
2021	$ 0.0612	$ 0.0404	$ 0.0111	$ 0.1930	$ 0.0893	$ 0.0639	$ 0.0199	$ 0.2786	$0.0753	$0.0347	$ 0.0038	$ 0.2622	$0.2679	$0.1354	$ 0.0154	$ 0.8727	$ 0.4937	$ 0.2745	$ 0.0503	$ 1.6065
2022	$ 0.0755	$ 0.0520	$ 0.0155	$ 0.2214	$ 0.1129	$ 0.0826	$ 0.0273	$ 0.3287	$0.0922	$0.0452	$ 0.0049	$ 0.3148	$0.3337	$0.1808	$ 0.0203	$ 1.0703	$ 0.6143	$ 0.3607	$ 0.0680	$ 1.9352
2023	$ 0.0772	$ 0.0535	$ 0.0160	$ 0.2253	$ 0.1155	$ 0.0848	$ 0.0280	$ 0.3347	$0.0934	$0.0462	$ 0.0050	$ 0.3177	$0.3383	$0.1834	$ 0.0206	$ 1.0870	$ 0.6244	$ 0.3679	$ 0.0695	$ 1.9647
2024	$ 0.0804	$ 0.0555	$ 0.0167	$ 0.2339	$ 0.1198	$ 0.0881	$ 0.0288	$ 0.3466	$0.0963	$0.0484	$ 0.0052	$ 0.3266	$0.3480	$0.1899	$ 0.0213	$ 1.0993	$ 0.6445	$ 0.3818	$ 0.0720	$ 2.0064
2025	$ 0.0823	$ 0.0570	$ 0.0173	$ 0.2381	$ 0.1226	$ 0.0907	$ 0.0293	$ 0.3531	$0.0978	$0.0494	$ 0.0053	$ 0.3294	$0.3530	$0.1932	$ 0.0215	$ 1.1165	$ 0.6557	$ 0.3904	$ 0.0734	$ 2.0371
2026	$ 0.0895	$ 0.0634	$ 0.0201	$ 0.2552	$ 0.1344	$ 0.1014	$ 0.0357	$ 0.3812	$0.1052	$0.0546	$ 0.0060	$ 0.3466	$0.3829	$0.2119	$ 0.0241	$ 1.1941	$ 0.7120	$ 0.4313	$ 0.0859	$ 2.1771
2027	$ 0.0920	$ 0.0652	$ 0.0206	$ 0.2609	$ 0.1381	$ 0.1055	$ 0.0365	$ 0.3897	$0.1072	$0.0564	$ 0.0061	$ 0.3514	$0.3905	$0.2188	$ 0.0247	$ 1.2201	$ 0.7278	$ 0.4459	$ 0.0879	$ 2.2221
2028	$ 0.0946	$ 0.0667	$ 0.0211	$ 0.2696	$ 0.1419	$ 0.1080	$ 0.0374	$ 0.4036	$0.1092	$0.0570	$ 0.0062	$ 0.3621	$0.3982	$0.2214	$ 0.0251	$ 1.2594	$ 0.7439	$ 0.4531	$ 0.0897	$ 2.2947
2029	$ 0.1017	$ 0.0692	$ 0.0219	$ 0.3106	$ 0.1498	$ 0.1124	$ 0.0386	$ 0.4451	$0.1160	$0.0584	$ 0.0063	$ 0.3979	$0.4172	$0.2271	$ 0.0253	$ 1.2766	$ 0.7847	$ 0.4670	$ 0.0921	$ 2.4302

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1i Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 3,301-10,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0045	$ 0.0038	$ 0.0005	$ 0.0124	$ 0.0020	$ 0.0017	$ 0.0004	$ 0.0051	$0.0002	$0.0001	$ 0.0000	$ 0.0009	$0.0008	$0.0005	$ 0.0000	$ 0.0029	$ 0.0077	$ 0.0062	$ 0.0009	$ 0.0212
2009	$ 0.0182	$ 0.0164	$ 0.0050	$ 0.0383	$ 0.0091	$ 0.0078	$ 0.0029	$ 0.0186	$0.0010	$0.0006	$ 0.0001	$ 0.0030	$0.0036	$0.0024	$ 0.0003	$ 0.0116	$ 0.0318	$ 0.0272	$ 0.0084	$ 0.0715
2010	$ 0.2414	$ 0.2181	$ 0.1116	$ 0.4383	$ 0.1174	$ 0.1063	$ 0.0514	$ 0.2178	$0.0118	$0.0084	$ 0.0012	$ 0.0331	$0.0451	$0.0325	$ 0.0056	$ 0.1271	$ 0.4156	$ 0.3653	$ 0.1698	$ 0.8164
2011	$ 0.4879	$ 0.4329	$ 0.2235	$ 0.8597	$ 0.2423	$ 0.2177	$ 0.1095	$ 0.4362	$0.0239	$0.0162	$ 0.0024	$ 0.0677	$0.0929	$0.0639	$ 0.0112	$ 0.2548	$ 0.8470	$ 0.7308	$ 0.3466	$ 1.6184
2012	$ 0.6374	$ 0.5731	$ 0.2958	$ 1.1120	$ 0.3185	$ 0.2934	$ 0.1445	$ 0.5638	$0.0310	$0.0213	$ 0.0032	$ 0.0875	$0.1215	$0.0841	$ 0.0144	$ 0.3365	$ 1.1084	$ 0.9718	$ 0.4579	$ 2.0997
2013	$ 0.9526	$ 0.8667	$ 0.4845	$ 1.6415	$ 0.4895	$ 0.4456	$ 0.2287	$ 0.8245	$0.0459	$0.0328	$ 0.0048	$ 0.1273	$0.1868	$0.1314	$ 0.0213	$ 0.5069	$ 1.6747	$ 1.4765	$ 0.7393	$ 3.1001
2014	$ 0.9858	$ 0.8980	$ 0.5076	$ 1.6856	$ 0.5065	$ 0.4639	$ 0.2380	$ 0.8457	$0.0471	$0.0336	$ 0.0050	$ 0.1298	$0.1919	$0.1376	$ 0.0223	$ 0.5207	$ 1.7314	$ 1.5332	$ 0.7729	$ 3.1819
2015	$ 1.1401	$ 1.0451	$ 0.5916	$ 1.9354	$ 0.5831	$ 0.5397	$ 0.2850	$ 0.9834	$0.0540	$0.0389	$ 0.0056	$ 0.1470	$0.2184	$0.1597	$ 0.0273	$ 0.5964	$ 1.9956	$ 1.7834	$ 0.9095	$ 3.6622
2016	$ 1.1715	$ 1.0789	$ 0.6077	$ 2.0004	$ 0.5998	$ 0.5559	$ 0.2933	$ 1.0021	$0.0550	$0.0399	$ 0.0057	$ 0.1503	$0.2232	$0.1640	$ 0.0279	$ 0.6099	$ 2.0494	$ 1.8388	$ 0.9346	$ 3.7628
2017	$ 1.2592	$ 1.1652	$ 0.6732	$ 2.1052	$ 0.6550	$ 0.6067	$ 0.3227	$ 1.0891	$0.0587	$0.0439	$ 0.0061	$ 0.1612	$0.2417	$0.1812	$ 0.0294	$ 0.6413	$ 2.2146	$ 1.9970	$ 1.0314	$ 3.9968
2018	$ 1.3948	$ 1.2902	$ 0.7321	$ 2.3590	$ 0.7280	$ 0.6721	$ 0.3599	$ 1.2051	$0.0643	$0.0467	$ 0.0067	$ 0.1741	$0.2663	$0.1991	$ 0.0324	$ 0.7200	$ 2.4534	$ 2.2080	$ 1.1311	$ 4.4582
2019	$ 1.4420	$ 1.3332	$ 0.7631	$ 2.4196	$ 0.7511	$ 0.6940	$ 0.3747	$ 1.2322	$0.0661	$0.0480	$ 0.0068	$ 0.1798	$0.2731	$0.2022	$ 0.0330	$ 0.7329	$ 2.5323	$ 2.2774	$ 1.1777	$ 4.5646
2020	$ 1.5656	$ 1.4493	$ 0.8172	$ 2.6398	$ 0.8174	$ 0.7683	$ 0.4064	$ 1.3341	$0.0710	$0.0520	$ 0.0074	$ 0.1926	$0.2943	$0.2166	$ 0.0358	$ 0.7916	$ 2.7483	$ 2.4863	$ 1.2669	$ 4.9581
2021	$ 1.6152	$ 1.4897	$ 0.8426	$ 2.7276	$ 0.8427	$ 0.7897	$ 0.4181	$ 1.3737	$0.0727	$0.0534	$ 0.0076	$ 0.1975	$0.3014	$0.2188	$ 0.0365	$ 0.8056	$ 2.8319	$ 2.5516	$ 1.3048	$ 5.1044
2022	$ 1.7530	$ 1.6182	$ 0.9183	$ 2.9527	$ 0.9161	$ 0.8476	$ 0.4593	$ 1.5158	$0.0785	$0.0571	$ 0.0082	$ 0.2120	$0.3259	$0.2385	$ 0.0386	$ 0.8523	$ 3.0735	$ 2.7615	$ 1.4243	$ 5.5329
2023	$ 1.7966	$ 1.6558	$ 0.9396	$ 3.0212	$ 0.9396	$ 0.8698	$ 0.4698	$ 1.5558	$0.0798	$0.0583	$ 0.0084	$ 0.2161	$0.3319	$0.2405	$ 0.0392	$ 0.8662	$ 3.1478	$ 2.8244	$ 1.4570	$ 5.6593
2024	$ 1.9078	$ 1.7689	$ 0.9910	$ 3.1853	$ 0.9927	$ 0.9175	$ 0.4960	$ 1.6289	$0.0841	$0.0609	$ 0.0087	$ 0.2307	$0.3481	$0.2534	$ 0.0407	$ 0.9102	$ 3.3327	$ 3.0007	$ 1.5364	$ 5.9551
2025	$ 1.9881	$ 1.8526	$ 1.0479	$ 3.3129	$ 1.0303	$ 0.9527	$ 0.5286	$ 1.6918	$0.0869	$0.0630	$ 0.0090	$ 0.2338	$0.3582	$0.2598	$ 0.0422	$ 0.9258	$ 3.4635	$ 3.1281	$ 1.6277	$ 6.1643
2026	$ 2.0474	$ 1.9072	$ 1.0814	$ 3.4046	$ 1.0596	$ 0.9763	$ 0.5460	$ 1.7440	$0.0887	$0.0643	$ 0.0092	$ 0.2380	$0.3656	$0.2660	$ 0.0428	$ 0.9376	$ 3.5613	$ 3.2138	$ 1.6794	$ 6.3241
2027	$ 2.1342	$ 1.9850	$ 1.1381	$ 3.5239	$ 1.1027	$ 1.0118	$ 0.5707	$ 1.8094	$0.0917	$0.0674	$ 0.0096	$ 0.2478	$0.3777	$0.2775	$ 0.0439	$ 0.9792	$ 3.7063	$ 3.3416	$ 1.7623	$ 6.5604
2028	$ 2.1855	$ 2.0330	$ 1.1665	$ 3.6184	$ 1.1296	$ 1.0420	$ 0.5841	$ 1.8772	$0.0931	$0.0681	$ 0.0097	$ 0.2508	$0.3841	$0.2807	$ 0.0444	$ 0.9898	$ 3.7923	$ 3.4238	$ 1.8046	$ 6.7362
2029	$ 2.2593	$ 2.1195	$ 1.2104	$ 3.7237	$ 1.1772	$ 1.0892	$ 0.6022	$ 1.9630	$0.0956	$0.0700	$ 0.0099	$ 0.2555	$0.3973	$0.2914	$ 0.0452	$ 1.0255	$ 3.9294	$ 3.5701	$ 1.8676	$ 6.9677

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1j Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 3,301-10,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0008	$ 0.0005	$ 0.0002	$ 0.0000	$ 0.0015	$0.0003	$0.0001	$ 0.0000	$ 0.0012	$0.0013	$0.0005	$ 0.0000	$ 0.0043	$ 0.0024	$ 0.0009	$ 0.0001	$ 0.0079
2009	$ 0.0022	$ 0.0009	$ 0.0001	$ 0.0051	$ 0.0032	$ 0.0014	$ 0.0003	$ 0.0092	$0.0033	$0.0007	$ 0.0000	$ 0.0067	$0.0107	$0.0024	$ 0.0002	$ 0.0227	$ 0.0194	$ 0.0054	$ 0.0007	$ 0.0437
2010	$ 0.0209	$ 0.0159	$ 0.0037	$ 0.0562	$ 0.0294	$ 0.0258	$ 0.0066	$ 0.0726	$0.0248	$0.0130	$ 0.0014	$ 0.0871	$0.0846	$0.0465	$ 0.0054	$ 0.2733	$ 0.1597	$ 0.1013	$ 0.0172	$ 0.4892
2011	$ 0.0377	$ 0.0283	$ 0.0077	$ 0.1090	$ 0.0534	$ 0.0448	$ 0.0139	$ 0.1363	$0.0447	$0.0240	$ 0.0025	$ 0.1434	$0.1542	$0.0877	$ 0.0101	$ 0.5185	$ 0.2901	$ 0.1848	$ 0.0342	$ 0.9073
2012	$ 0.0487	$ 0.0365	$ 0.0102	$ 0.1414	$ 0.0693	$ 0.0582	$ 0.0180	$ 0.1779	$0.0571	$0.0308	$ 0.0033	$ 0.1839	$0.1980	$0.1137	$ 0.0131	$ 0.6624	$ 0.3730	$ 0.2392	$ 0.0446	$ 1.1656
2013	$ 0.0766	$ 0.0570	$ 0.0168	$ 0.2225	$ 0.1131	$ 0.0936	$ 0.0298	$ 0.2949	$0.0905	$0.0476	$ 0.0058	$ 0.3003	$0.3241	$0.1807	$ 0.0218	$ 1.0453	$ 0.6044	$ 0.3789	$ 0.0742	$ 1.8629
2014	$ 0.0787	$ 0.0587	$ 0.0177	$ 0.2268	$ 0.1161	$ 0.0963	$ 0.0312	$ 0.2994	$0.0924	$0.0484	$ 0.0060	$ 0.3054	$0.3303	$0.1853	$ 0.0222	$ 1.0622	$ 0.6175	$ 0.3887	$ 0.0771	$ 1.8938
2015	$ 0.1241	$ 0.0685	$ 0.0199	$ 0.3909	$ 0.1674	$ 0.1090	$ 0.0370	$ 0.5119	$0.1557	$0.0559	$ 0.0064	$ 0.5505	$0.4916	$0.2199	$ 0.0254	$ 1.6400	$ 0.9388	$ 0.4533	$ 0.0888	$ 3.0933
2016	$ 0.1272	$ 0.0704	$ 0.0207	$ 0.3997	$ 0.1715	$ 0.1120	$ 0.0381	$ 0.5228	$0.1584	$0.0570	$ 0.0067	$ 0.5577	$0.5001	$0.2266	$ 0.0262	$ 1.6633	$ 0.9572	$ 0.4659	$ 0.0916	$ 3.1434
2017	$ 0.1377	$ 0.0733	$ 0.0227	$ 0.4665	$ 0.1852	$ 0.1188	$ 0.0411	$ 0.5678	$0.1720	$0.0595	$ 0.0071	$ 0.6454	$0.5404	$0.2371	$ 0.0278	$ 1.7159	$ 1.0353	$ 0.4887	$ 0.0986	$ 3.3957
2018	$ 0.1437	$ 0.0780	$ 0.0253	$ 0.4772	$ 0.1947	$ 0.1283	$ 0.0443	$ 0.5842	$0.1778	$0.0639	$ 0.0081	$ 0.6644	$0.5637	$0.2559	$ 0.0300	$ 1.9013	$ 1.0798	$ 0.5260	$ 0.1077	$ 3.6272
2019	$ 0.1486	$ 0.0808	$ 0.0262	$ 0.4889	$ 0.2010	$ 0.1320	$ 0.0459	$ 0.5939	$0.1818	$0.0667	$ 0.0083	$ 0.6803	$0.5771	$0.2629	$ 0.0303	$ 1.9370	$ 1.1086	$ 0.5424	$ 0.1108	$ 3.7001
2020	$ 0.1612	$ 0.0877	$ 0.0278	$ 0.5478	$ 0.2161	$ 0.1413	$ 0.0512	$ 0.6517	$0.1962	$0.0718	$ 0.0090	$ 0.7333	$0.6161	$0.2785	$ 0.0330	$ 2.2317	$ 1.1896	$ 0.5792	$ 0.1209	$ 4.1645
2021	$ 0.1665	$ 0.0900	$ 0.0290	$ 0.5672	$ 0.2232	$ 0.1461	$ 0.0527	$ 0.6683	$0.2013	$0.0736	$ 0.0091	$ 0.7540	$0.6322	$0.2859	$ 0.0348	$ 2.3448	$ 1.2232	$ 0.5956	$ 0.1256	$ 4.3343
2022	$ 0.1769	$ 0.1010	$ 0.0313	$ 0.5779	$ 0.2394	$ 0.1614	$ 0.0575	$ 0.6899	$0.2111	$0.0783	$ 0.0101	$ 0.7616	$0.6705	$0.3129	$ 0.0400	$ 2.4090	$ 1.2978	$ 0.6536	$ 0.1389	$ 4.4384
2023	$ 0.1807	$ 0.1035	$ 0.0320	$ 0.5889	$ 0.2445	$ 0.1651	$ 0.0587	$ 0.7024	$0.2140	$0.0795	$ 0.0102	$ 0.7707	$0.6801	$0.3157	$ 0.0404	$ 2.4324	$ 1.3193	$ 0.6639	$ 0.1412	$ 4.4943
2024	$ 0.1880	$ 0.1092	$ 0.0337	$ 0.6018	$ 0.2558	$ 0.1727	$ 0.0607	$ 0.7254	$0.2205	$0.0821	$ 0.0105	$ 0.7825	$0.7048	$0.3273	$ 0.0419	$ 2.4858	$ 1.3690	$ 0.6913	$ 0.1468	$ 4.5955
2025	$ 0.2013	$ 0.1238	$ 0.0360	$ 0.6233	$ 0.2767	$ 0.1981	$ 0.0650	$ 0.7675	$0.2335	$0.0906	$ 0.0116	$ 0.7971	$0.7540	$0.3740	$ 0.0453	$ 2.6076	$ 1.4655	$ 0.7864	$ 0.1579	$ 4.7956
2026	$ 0.2065	$ 0.1267	$ 0.0371	$ 0.6380	$ 0.2837	$ 0.2028	$ 0.0668	$ 0.7811	$0.2371	$0.0922	$ 0.0118	$ 0.8043	$0.7668	$0.3843	$ 0.0473	$ 2.6687	$ 1.4940	$ 0.8061	$ 0.1630	$ 4.8922
2027	$ 0.2130	$ 0.1311	$ 0.0384	$ 0.6511	$ 0.2931	$ 0.2108	$ 0.0689	$ 0.8052	$0.2423	$0.0952	$ 0.0121	$ 0.8320	$0.7852	$0.3972	$ 0.0485	$ 2.7159	$ 1.5336	$ 0.8342	$ 0.1679	$ 5.0043
2028	$ 0.2172	$ 0.1336	$ 0.0393	$ 0.6652	$ 0.2995	$ 0.2148	$ 0.0703	$ 0.8212	$0.2452	$0.0963	$ 0.0122	$ 0.8381	$0.7964	$0.4018	$ 0.0492	$ 2.7878	$ 1.5584	$ 0.8464	$ 0.1710	$ 5.1123
2029	$ 0.2230	$ 0.1375	$ 0.0410	$ 0.6810	$ 0.3075	$ 0.2203	$ 0.0729	$ 0.8454	$0.2493	$0.0989	$ 0.0125	$ 0.8451	$0.8107	$0.4117	$ 0.0501	$ 2.8726	$ 1.5906	$ 0.8683	$ 0.1766	$ 5.2441

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.1k Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 10,001-50,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0417	$ 0.0374	$ 0.0166	$ 0.0799	$ 0.0220	$ 0.0203	$ 0.0093	$ 0.0398	$0.0021	$0.0015	$ 0.0003	$ 0.0061	$0.0089	$0.0063	$ 0.0011	$ 0.0270	$ 0.0746	$ 0.0654	$ 0.0272	$ 0.1528
2009	$ 0.1678	$ 0.1540	$ 0.0771	$ 0.3006	$ 0.0895	$ 0.0831	$ 0.0397	$ 0.1570	$0.0085	$0.0060	$ 0.0011	$ 0.0229	$0.0356	$0.0252	$ 0.0047	$ 0.0944	$ 0.3014	$ 0.2683	$ 0.1227	$ 0.5749
2010	$ 0.3135	$ 0.2911	$ 0.1528	$ 0.5331	$ 0.1690	$ 0.1544	$ 0.0783	$ 0.2905	$0.0156	$0.0113	$ 0.0021	$ 0.0429	$0.0666	$0.0489	$ 0.0085	$ 0.1773	$ 0.5646	$ 0.5056	$ 0.2417	$ 1.0438
2011	$ 0.5031	$ 0.4641	$ 0.2572	$ 0.8692	$ 0.2744	$ 0.2516	$ 0.1346	$ 0.4682	$0.0248	$0.0184	$ 0.0032	$ 0.0701	$0.1070	$0.0789	$ 0.0134	$ 0.2922	$ 0.9092	$ 0.8130	$ 0.4084	$ 1.6997
2012	$ 0.7163	$ 0.6612	$ 0.3599	$ 1.2517	$ 0.3911	$ 0.3557	$ 0.1855	$ 0.6800	$0.0352	$0.0258	$ 0.0045	$ 0.0997	$0.1518	$0.1129	$ 0.0190	$ 0.4447	$ 1.2944	$ 1.1556	$ 0.5689	$ 2.4761
2013	$ 0.9674	$ 0.9012	$ 0.5076	$ 1.6326	$ 0.5246	$ 0.4883	$ 0.2567	$ 0.9067	$0.0469	$0.0356	$ 0.0061	$ 0.1318	$0.2014	$0.1493	$ 0.0259	$ 0.5745	$ 1.7402	$ 1.5744	$ 0.7962	$ 3.2456
2014	$ 1.0209	$ 0.9346	$ 0.5320	$ 1.7128	$ 0.5562	$ 0.5076	$ 0.2701	$ 0.9758	$0.0496	$0.0370	$ 0.0063	$ 0.1420	$0.2136	$0.1568	$ 0.0273	$ 0.6128	$ 1.8403	$ 1.6360	$ 0.8356	$ 3.4434
2015	$ 1.0950	$ 1.0012	$ 0.5588	$ 1.8134	$ 0.5943	$ 0.5402	$ 0.2828	$ 1.0246	$0.0528	$0.0392	$ 0.0068	$ 0.1494	$0.2268	$0.1661	$ 0.0296	$ 0.6610	$ 1.9689	$ 1.7466	$ 0.8780	$ 3.6483
2016	$ 1.1551	$ 1.0718	$ 0.5899	$ 1.9026	$ 0.6278	$ 0.5779	$ 0.2930	$ 1.0569	$0.0553	$0.0406	$ 0.0070	$ 0.1565	$0.2383	$0.1731	$ 0.0301	$ 0.6717	$ 2.0765	$ 1.8634	$ 0.9201	$ 3.7877
2017	$ 1.2092	$ 1.1240	$ 0.6114	$ 1.9744	$ 0.6562	$ 0.5985	$ 0.3068	$ 1.0902	$0.0576	$0.0422	$ 0.0073	$ 0.1604	$0.2476	$0.1806	$ 0.0313	$ 0.6900	$ 2.1705	$ 1.9453	$ 0.9568	$ 3.9151
2018	$ 1.2893	$ 1.2013	$ 0.6480	$ 2.1364	$ 0.6892	$ 0.6305	$ 0.3188	$ 1.1527	$0.0609	$0.0448	$ 0.0076	$ 0.1727	$0.2583	$0.1883	$ 0.0321	$ 0.7297	$ 2.2977	$ 2.0650	$ 1.0065	$ 4.1915
2019	$ 1.3411	$ 1.2504	$ 0.6877	$ 2.1956	$ 0.7169	$ 0.6584	$ 0.3335	$ 1.1809	$0.0628	$0.0465	$ 0.0078	$ 0.1776	$0.2665	$0.1958	$ 0.0331	$ 0.7595	$ 2.3872	$ 2.1510	$ 1.0621	$ 4.3136
2020	$ 1.3832	$ 1.2896	$ 0.7134	$ 2.2783	$ 0.7418	$ 0.6840	$ 0.3438	$ 1.2135	$0.0642	$0.0478	$ 0.0081	$ 0.1833	$0.2737	$0.2035	$ 0.0340	$ 0.7873	$ 2.4628	$ 2.2249	$ 1.0992	$ 4.4624
2021	$ 1.4218	$ 1.3305	$ 0.7316	$ 2.3255	$ 0.7643	$ 0.7125	$ 0.3531	$ 1.2521	$0.0654	$0.0489	$ 0.0082	$ 0.1867	$0.2797	$0.2111	$ 0.0347	$ 0.8057	$ 2.5313	$ 2.3029	$ 1.1275	$ 4.5701
2022	$ 1.4653	$ 1.3773	$ 0.7518	$ 2.3808	$ 0.7851	$ 0.7325	$ 0.3642	$ 1.2933	$0.0669	$0.0498	$ 0.0084	$ 0.1899	$0.2853	$0.2154	$ 0.0355	$ 0.8205	$ 2.6026	$ 2.3750	$ 1.1599	$ 4.6846
2023	$ 1.5105	$ 1.4188	$ 0.7884	$ 2.4375	$ 0.8116	$ 0.7620	$ 0.3899	$ 1.3250	$0.0683	$0.0513	$ 0.0086	$ 0.1946	$0.2925	$0.2230	$ 0.0367	$ 0.8400	$ 2.6829	$ 2.4551	$ 1.2235	$ 4.7970
2024	$ 1.5608	$ 1.4676	$ 0.8201	$ 2.5073	$ 0.8397	$ 0.7865	$ 0.4048	$ 1.3749	$0.0700	$0.0526	$ 0.0088	$ 0.1986	$0.3002	$0.2288	$ 0.0377	$ 0.8553	$ 2.7707	$ 2.5355	$ 1.2713	$ 4.9361
2025	$ 1.5986	$ 1.5013	$ 0.8403	$ 2.5677	$ 0.8601	$ 0.8098	$ 0.4144	$ 1.4070	$0.0711	$0.0535	$ 0.0089	$ 0.2015	$0.3054	$0.2314	$ 0.0384	$ 0.8684	$ 2.8352	$ 2.5960	$ 1.3020	$ 5.0445
2026	$ 1.6436	$ 1.5398	$ 0.8660	$ 2.6208	$ 0.8844	$ 0.8316	$ 0.4248	$ 1.4420	$0.0724	$0.0544	$ 0.0092	$ 0.2077	$0.3114	$0.2356	$ 0.0397	$ 0.8810	$ 2.9118	$ 2.6614	$ 1.3397	$ 5.1514
2027	$ 1.6944	$ 1.5884	$ 0.8939	$ 2.6996	$ 0.9129	$ 0.8559	$ 0.4339	$ 1.4874	$0.0740	$0.0556	$ 0.0093	$ 0.2136	$0.3187	$0.2432	$ 0.0406	$ 0.9014	$ 3.0000	$ 2.7431	$ 1.3778	$ 5.3019
2028	$ 1.7333	$ 1.6230	$ 0.9121	$ 2.7529	$ 0.9344	$ 0.8750	$ 0.4424	$ 1.5244	$0.0751	$0.0564	$ 0.0094	$ 0.2165	$0.3236	$0.2491	$ 0.0412	$ 0.9180	$ 3.0664	$ 2.8033	$ 1.4051	$ 5.4118
2029	$ 1.7727	$ 1.6620	$ 0.9317	$ 2.8123	$ 0.9547	$ 0.8948	$ 0.4502	$ 1.5537	$0.0762	$0.0574	$ 0.0095	$ 0.2206	$0.3281	$0.2510	$ 0.0418	$ 0.9351	$ 3.1316	$ 2.8653	$ 1.4333	$ 5.5217

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1l Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 10,001-50,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided								Total Benefits			
	0 -16 years				>16 years				0 -16 years				>16 years							
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0045	$ 0.0026	$ 0.0008	$ 0.0116	$ 0.0064	$ 0.0041	$ 0.0012	$ 0.0161	$0.0059	$0.0024	$ 0.0003	$ 0.0159	$0.0189	$0.0079	$ 0.0013	$ 0.0592	$ 0.0356	$ 0.0170	$ 0.0036	$ 0.1028
2009	$ 0.0159	$ 0.0109	$ 0.0032	$ 0.0424	$ 0.0231	$ 0.0160	$ 0.0062	$ 0.0634	$0.0205	$0.0096	$ 0.0013	$ 0.0638	$0.0681	$0.0356	$ 0.0050	$ 0.2262	$ 0.1276	$ 0.0721	$ 0.0158	$ 0.3958
2010	$ 0.0326	$ 0.0195	$ 0.0060	$ 0.0954	$ 0.0479	$ 0.0287	$ 0.0120	$ 0.1295	$0.0417	$0.0188	$ 0.0024	$ 0.1244	$0.1392	$0.0702	$ 0.0097	$ 0.4674	$ 0.2614	$ 0.1372	$ 0.0301	$ 0.8166
2011	$ 0.0574	$ 0.0307	$ 0.0096	$ 0.1802	$ 0.0785	$ 0.0456	$ 0.0193	$ 0.2216	$0.0725	$0.0293	$ 0.0039	$ 0.2001	$0.2251	$0.1046	$ 0.0156	$ 0.7295	$ 0.4334	$ 0.2102	$ 0.0483	$ 1.3314
2012	$ 0.0822	$ 0.0446	$ 0.0137	$ 0.2508	$ 0.1125	$ 0.0710	$ 0.0266	$ 0.3134	$0.1019	$0.0420	$ 0.0061	$ 0.2837	$0.3200	$0.1567	$ 0.0226	$ 0.9775	$ 0.6166	$ 0.3142	$ 0.0689	$ 1.8255
2013	$ 0.1119	$ 0.0675	$ 0.0205	$ 0.3218	$ 0.1567	$ 0.1061	$ 0.0399	$ 0.4034	$0.1376	$0.0611	$ 0.0090	$ 0.3975	$0.4438	$0.2290	$ 0.0370	$ 1.3828	$ 0.8500	$ 0.4636	$ 0.1064	$ 2.5055
2014	$ 0.1174	$ 0.0706	$ 0.0211	$ 0.3489	$ 0.1640	$ 0.1104	$ 0.0411	$ 0.4293	$0.1433	$0.0650	$ 0.0093	$ 0.4369	$0.4614	$0.2326	$ 0.0378	$ 1.4398	$ 0.8861	$ 0.4786	$ 0.1093	$ 2.6549
2015	$ 0.1252	$ 0.0764	$ 0.0228	$ 0.3730	$ 0.1760	$ 0.1222	$ 0.0434	$ 0.4732	$0.1520	$0.0681	$ 0.0098	$ 0.4656	$0.4934	$0.2519	$ 0.0390	$ 1.6036	$ 0.9466	$ 0.5185	$ 0.1149	$ 2.9154
2016	$ 0.1302	$ 0.0811	$ 0.0245	$ 0.3828	$ 0.1837	$ 0.1277	$ 0.0470	$ 0.4847	$0.1568	$0.0716	$ 0.0104	$ 0.4830	$0.5120	$0.2649	$ 0.0410	$ 1.6387	$ 0.9827	$ 0.5453	$ 0.1228	$ 2.9892
2017	$ 0.1385	$ 0.0836	$ 0.0253	$ 0.4588	$ 0.1919	$ 0.1316	$ 0.0483	$ 0.5196	$0.1667	$0.0738	$ 0.0108	$ 0.5188	$0.5343	$0.2747	$ 0.0418	$ 1.6886	$ 1.0313	$ 0.5637	$ 0.1261	$ 3.1859
2018	$ 0.1464	$ 0.0877	$ 0.0267	$ 0.4940	$ 0.2033	$ 0.1394	$ 0.0520	$ 0.5570	$0.1753	$0.0768	$ 0.0112	$ 0.5637	$0.5641	$0.2965	$ 0.0438	$ 1.8129	$ 1.0891	$ 0.6003	$ 0.1337	$ 3.4276
2019	$ 0.1510	$ 0.0914	$ 0.0281	$ 0.5032	$ 0.2103	$ 0.1455	$ 0.0547	$ 0.5704	$0.1795	$0.0795	$ 0.0117	$ 0.5725	$0.5800	$0.3027	$ 0.0456	$ 1.8292	$ 1.1208	$ 0.6190	$ 0.1401	$ 3.4754
2020	$ 0.1546	$ 0.0936	$ 0.0290	$ 0.5146	$ 0.2152	$ 0.1490	$ 0.0569	$ 0.5827	$0.1822	$0.0813	$ 0.0120	$ 0.5799	$0.5892	$0.3058	$ 0.0463	$ 1.8658	$ 1.1411	$ 0.6296	$ 0.1442	$ 3.5431
2021	$ 0.1574	$ 0.0957	$ 0.0296	$ 0.5233	$ 0.2193	$ 0.1523	$ 0.0584	$ 0.5925	$0.1840	$0.0820	$ 0.0122	$ 0.5848	$0.5963	$0.3075	$ 0.0467	$ 1.8866	$ 1.1570	$ 0.6374	$ 0.1469	$ 3.5873
2022	$ 0.1606	$ 0.0978	$ 0.0303	$ 0.5324	$ 0.2238	$ 0.1559	$ 0.0599	$ 0.6032	$0.1862	$0.0832	$ 0.0124	$ 0.5902	$0.6041	$0.3093	$ 0.0471	$ 1.9076	$ 1.1747	$ 0.6463	$ 0.1497	$ 3.6334
2023	$ 0.1670	$ 0.1005	$ 0.0322	$ 0.5466	$ 0.2327	$ 0.1594	$ 0.0626	$ 0.6186	$0.1916	$0.0852	$ 0.0126	$ 0.6183	$0.6224	$0.3152	$ 0.0475	$ 1.9616	$ 1.2137	$ 0.6604	$ 0.1549	$ 3.7450
2024	$ 0.1711	$ 0.1040	$ 0.0336	$ 0.5585	$ 0.2386	$ 0.1629	$ 0.0647	$ 0.6293	$0.1949	$0.0881	$ 0.0130	$ 0.6290	$0.6335	$0.3197	$ 0.0483	$ 1.9908	$ 1.2382	$ 0.6747	$ 0.1595	$ 3.8076
2025	$ 0.1743	$ 0.1061	$ 0.0342	$ 0.5682	$ 0.2430	$ 0.1665	$ 0.0663	$ 0.6397	$0.1968	$0.0889	$ 0.0131	$ 0.6373	$0.6402	$0.3249	$ 0.0488	$ 2.0123	$ 1.2543	$ 0.6864	$ 0.1624	$ 3.8575
2026	$ 0.1780	$ 0.1090	$ 0.0350	$ 0.5793	$ 0.2484	$ 0.1712	$ 0.0678	$ 0.6555	$0.1992	$0.0900	$ 0.0133	$ 0.6465	$0.6497	$0.3290	$ 0.0491	$ 2.0275	$ 1.2754	$ 0.6991	$ 0.1652	$ 3.9088
2027	$ 0.1823	$ 0.1120	$ 0.0362	$ 0.5893	$ 0.2548	$ 0.1766	$ 0.0695	$ 0.6659	$0.2021	$0.0916	$ 0.0139	$ 0.6560	$0.6605	$0.3403	$ 0.0496	$ 2.0530	$ 1.2997	$ 0.7205	$ 0.1692	$ 3.9642
2028	$ 0.1858	$ 0.1146	$ 0.0370	$ 0.6013	$ 0.2595	$ 0.1808	$ 0.0708	$ 0.6797	$0.2043	$0.0924	$ 0.0140	$ 0.6648	$0.6674	$0.3447	$ 0.0500	$ 2.0932	$ 1.3169	$ 0.7326	$ 0.1718	$ 4.0391
2029	$ 0.1895	$ 0.1169	$ 0.0377	$ 0.6116	$ 0.2649	$ 0.1847	$ 0.0730	$ 0.6919	$0.2065	$0.0945	$ 0.0143	$ 0.6731	$0.6759	$0.3525	$ 0.0504	$ 2.1180	$ 1.3368	$ 0.7486	$ 0.1754	$ 4.0945

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1m Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 50,001-100,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.1320	$ 0.1135	$ 0.0584	$ 0.2439	$ 0.0710	$ 0.0612	$ 0.0277	$ 0.1366	$0.0068	$0.0047	$ 0.0007	$ 0.0189	$0.0288	$0.0200	$ 0.0028	$ 0.0844	$ 0.2385	$ 0.1994	$ 0.0896	$ 0.4839
2009	$ 0.4427	$ 0.4023	$ 0.2052	$ 0.8087	$ 0.2449	$ 0.2138	$ 0.1004	$ 0.4929	$0.0226	$0.0167	$ 0.0023	$ 0.0652	$0.0979	$0.0687	$ 0.0096	$ 0.3000	$ 0.8081	$ 0.7015	$ 0.3176	$ 1.6668
2010	$ 0.8168	$ 0.7237	$ 0.3813	$ 1.4409	$ 0.4511	$ 0.3855	$ 0.1815	$ 0.8845	$0.0413	$0.0297	$ 0.0041	$ 0.1175	$0.1792	$0.1265	$ 0.0170	$ 0.5409	$ 1.4884	$ 1.2654	$ 0.5839	$ 2.9838
2011	$ 1.2275	$ 1.0929	$ 0.5599	$ 2.1405	$ 0.6757	$ 0.5770	$ 0.2717	$ 1.3331	$0.0614	$0.0440	$ 0.0060	$ 0.1760	$0.2662	$0.1898	$ 0.0249	$ 0.7965	$ 2.2308	$ 1.9036	$ 0.8625	$ 4.4461
2012	$ 1.6557	$ 1.4809	$ 0.7614	$ 2.9229	$ 0.9062	$ 0.7809	$ 0.3772	$ 1.7617	$0.0822	$0.0594	$ 0.0081	$ 0.2365	$0.3547	$0.2569	$ 0.0329	$ 1.0492	$ 2.9988	$ 2.5782	$ 1.1797	$ 5.9703
2013	$ 2.0799	$ 1.8599	$ 0.9682	$ 3.6550	$ 1.1383	$ 0.9825	$ 0.4806	$ 2.1882	$0.1024	$0.0741	$ 0.0101	$ 0.2973	$0.4426	$0.3179	$ 0.0416	$ 1.3347	$ 3.7631	$ 3.2344	$ 1.5004	$ 7.4752
2014	$ 2.1554	$ 1.9321	$ 1.0076	$ 3.7760	$ 1.1802	$ 1.0257	$ 0.4995	$ 2.2592	$0.1053	$0.0765	$ 0.0105	$ 0.3078	$0.4558	$0.3259	$ 0.0431	$ 1.3641	$ 3.8967	$ 3.3602	$ 1.5607	$ 7.7070
2015	$ 2.2263	$ 1.9978	$ 1.0443	$ 3.8798	$ 1.2187	$ 1.0633	$ 0.5162	$ 2.3137	$0.1079	$0.0781	$ 0.0108	$ 0.3174	$0.4670	$0.3335	$ 0.0444	$ 1.4147	$ 4.0200	$ 3.4726	$ 1.6156	$ 7.9255
2016	$ 2.3085	$ 2.0825	$ 1.0800	$ 3.9885	$ 1.2613	$ 1.1073	$ 0.5327	$ 2.3847	$0.1109	$0.0796	$ 0.0110	$ 0.3242	$0.4801	$0.3428	$ 0.0459	$ 1.4566	$ 4.1609	$ 3.6121	$ 1.6696	$ 8.1540
2017	$ 2.3911	$ 2.1688	$ 1.1197	$ 4.0856	$ 1.3078	$ 1.1486	$ 0.5520	$ 2.4828	$0.1138	$0.0820	$ 0.0113	$ 0.3359	$0.4943	$0.3513	$ 0.0472	$ 1.5021	$ 4.3070	$ 3.7506	$ 1.7303	$ 8.4065
2018	$ 2.4499	$ 2.2229	$ 1.1529	$ 4.1784	$ 1.3391	$ 1.1735	$ 0.5655	$ 2.5302	$0.1157	$0.0838	$ 0.0114	$ 0.3451	$0.5022	$0.3560	$ 0.0483	$ 1.5365	$ 4.4068	$ 3.8363	$ 1.7781	$ 8.5902
2019	$ 2.5369	$ 2.2770	$ 1.1839	$ 4.2865	$ 1.3874	$ 1.2019	$ 0.5804	$ 2.5905	$0.1190	$0.0859	$ 0.0116	$ 0.3542	$0.5169	$0.3679	$ 0.0489	$ 1.5643	$ 4.5602	$ 3.9326	$ 1.8249	$ 8.7956
2020	$ 2.6055	$ 2.3322	$ 1.2256	$ 4.3924	$ 1.4241	$ 1.2365	$ 0.5949	$ 2.6563	$0.1212	$0.0878	$ 0.0118	$ 0.3601	$0.5266	$0.3726	$ 0.0497	$ 1.5994	$ 4.6773	$ 4.0291	$ 1.8820	$ 9.0081
2021	$ 2.6643	$ 2.3833	$ 1.2558	$ 4.5030	$ 1.4577	$ 1.2644	$ 0.6078	$ 2.7098	$0.1230	$0.0890	$ 0.0121	$ 0.3670	$0.5350	$0.3772	$ 0.0506	$ 1.6385	$ 4.7800	$ 4.1138	$ 1.9263	$ 9.2183
2022	$ 2.7264	$ 2.4400	$ 1.2977	$ 4.5897	$ 1.4893	$ 1.2988	$ 0.6242	$ 2.7597	$0.1247	$0.0903	$ 0.0123	$ 0.3714	$0.5425	$0.3838	$ 0.0516	$ 1.6704	$ 4.8829	$ 4.2129	$ 1.9857	$ 9.3912
2023	$ 2.8128	$ 2.5173	$ 1.3301	$ 4.8091	$ 1.5310	$ 1.3213	$ 0.6403	$ 2.9080	$0.1274	$0.0922	$ 0.0125	$ 0.3858	$0.5531	$0.3876	$ 0.0528	$ 1.7061	$ 5.0243	$ 4.3185	$ 2.0357	$ 9.8090
2024	$ 2.9032	$ 2.6112	$ 1.3694	$ 4.9544	$ 1.5748	$ 1.3619	$ 0.6667	$ 2.9719	$0.1303	$0.0941	$ 0.0129	$ 0.3934	$0.5645	$0.3964	$ 0.0540	$ 1.7562	$ 5.1728	$ 4.4637	$ 2.1030	$ 10.0760
2025	$ 2.9613	$ 2.6612	$ 1.3968	$ 5.0469	$ 1.6051	$ 1.3899	$ 0.6819	$ 3.0216	$0.1318	$0.0952	$ 0.0131	$ 0.3992	$0.5709	$0.4000	$ 0.0545	$ 1.7878	$ 5.2691	$ 4.5464	$ 2.1463	$ 10.2556
2026	$ 3.0286	$ 2.7273	$ 1.4308	$ 5.1485	$ 1.6406	$ 1.4187	$ 0.6990	$ 3.0805	$0.1336	$0.0965	$ 0.0132	$ 0.4057	$0.5791	$0.4052	$ 0.0555	$ 1.8150	$ 5.3818	$ 4.6477	$ 2.1985	$ 10.4497
2027	$ 3.1008	$ 2.7866	$ 1.4704	$ 5.2777	$ 1.6764	$ 1.4476	$ 0.7140	$ 3.1419	$0.1356	$0.0977	$ 0.0135	$ 0.4147	$0.5870	$0.4093	$ 0.0572	$ 1.8484	$ 5.4998	$ 4.7412	$ 2.2552	$ 10.6826
2028	$ 3.1813	$ 2.8660	$ 1.4988	$ 5.4061	$ 1.7140	$ 1.4778	$ 0.7256	$ 3.2108	$0.1379	$0.0989	$ 0.0138	$ 0.4212	$0.5957	$0.4164	$ 0.0587	$ 1.8727	$ 5.6289	$ 4.8591	$ 2.2970	$ 10.9108
2029	$ 3.2730	$ 2.9332	$ 1.5308	$ 5.6608	$ 1.7588	$ 1.5174	$ 0.7409	$ 3.3441	$0.1405	$0.1003	$ 0.0140	$ 0.4278	$0.6063	$0.4235	$ 0.0595	$ 1.9044	$ 5.7786	$ 4.9745	$ 2.3452	$ 11.3371

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1n Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 50,001-100,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0123	$ 0.0078	$ 0.0025	$ 0.0354	$ 0.0177	$ 0.0122	$ 0.0041	$ 0.0456	$0.0180	$0.0066	$ 0.0008	$ 0.0691	$0.0626	$0.0256	$ 0.0032	$ 0.2246	$ 0.1105	$ 0.0522	$ 0.0106	$ 0.3748
2009	$ 0.0435	$ 0.0244	$ 0.0080	$ 0.1156	$ 0.0593	$ 0.0395	$ 0.0139	$ 0.1375	$0.0637	$0.0211	$ 0.0026	$ 0.2086	$0.2119	$0.0789	$ 0.0097	$ 0.6359	$ 0.3785	$ 0.1638	$ 0.0342	$ 1.0976
2010	$ 0.0823	$ 0.0489	$ 0.0151	$ 0.2238	$ 0.1156	$ 0.0825	$ 0.0245	$ 0.2923	$0.1193	$0.0424	$ 0.0051	$ 0.4388	$0.4045	$0.1584	$ 0.0193	$ 1.3088	$ 0.7218	$ 0.3323	$ 0.0640	$ 2.2637
2011	$ 0.1177	$ 0.0718	$ 0.0230	$ 0.3217	$ 0.1673	$ 0.1210	$ 0.0361	$ 0.4143	$0.1689	$0.0624	$ 0.0075	$ 0.6281	$0.5776	$0.2336	$ 0.0280	$ 1.8737	$ 1.0314	$ 0.4888	$ 0.0946	$ 3.2378
2012	$ 0.1559	$ 0.0952	$ 0.0313	$ 0.4258	$ 0.2233	$ 0.1627	$ 0.0490	$ 0.5657	$0.2227	$0.0823	$ 0.0101	$ 0.8284	$0.7679	$0.3098	$ 0.0379	$ 2.5939	$ 1.3698	$ 0.6500	$ 0.1283	$ 4.4138
2013	$ 0.1948	$ 0.1183	$ 0.0399	$ 0.5305	$ 0.2793	$ 0.2016	$ 0.0626	$ 0.7123	$0.2758	$0.1017	$ 0.0126	$ 1.0274	$0.9536	$0.3837	$ 0.0488	$ 3.1752	$ 1.7034	$ 0.8053	$ 0.1639	$ 5.4454
2014	$ 0.2004	$ 0.1218	$ 0.0413	$ 0.5427	$ 0.2875	$ 0.2089	$ 0.0649	$ 0.7243	$0.2812	$0.1043	$ 0.0128	$ 1.0490	$0.9734	$0.3935	$ 0.0496	$ 3.2124	$ 1.7425	$ 0.8284	$ 0.1686	$ 5.5284
2015	$ 0.2068	$ 0.1256	$ 0.0429	$ 0.5678	$ 0.2971	$ 0.2163	$ 0.0677	$ 0.7806	$0.2879	$0.1056	$ 0.0132	$ 1.0615	$0.9974	$0.4005	$ 0.0522	$ 3.2929	$ 1.7891	$ 0.8481	$ 0.1760	$ 5.7027
2016	$ 0.2142	$ 0.1303	$ 0.0441	$ 0.5828	$ 0.3078	$ 0.2233	$ 0.0695	$ 0.8021	$0.2957	$0.1078	$ 0.0135	$ 1.0724	$1.0265	$0.4088	$ 0.0539	$ 3.3545	$ 1.8442	$ 0.8701	$ 0.1811	$ 5.8119
2017	$ 0.2245	$ 0.1344	$ 0.0450	$ 0.6996	$ 0.3196	$ 0.2297	$ 0.0710	$ 0.8470	$0.3078	$0.1095	$ 0.0137	$ 1.1417	$1.0573	$0.4146	$ 0.0550	$ 3.4760	$ 1.9093	$ 0.8883	$ 0.1847	$ 6.1644
2018	$ 0.2287	$ 0.1369	$ 0.0458	$ 0.7120	$ 0.3254	$ 0.2344	$ 0.0730	$ 0.8620	$0.3110	$0.1110	$ 0.0138	$ 1.1502	$1.0684	$0.4174	$ 0.0562	$ 3.5062	$ 1.9334	$ 0.8998	$ 0.1889	$ 6.2304
2019	$ 0.2347	$ 0.1416	$ 0.0474	$ 0.7348	$ 0.3334	$ 0.2406	$ 0.0766	$ 0.8814	$0.3161	$0.1139	$ 0.0142	$ 1.1634	$1.0859	$0.4314	$ 0.0586	$ 3.5467	$ 1.9702	$ 0.9275	$ 0.1967	$ 6.3262
2020	$ 0.2393	$ 0.1447	$ 0.0485	$ 0.7478	$ 0.3401	$ 0.2449	$ 0.0787	$ 0.8984	$0.3196	$0.1152	$ 0.0144	$ 1.1739	$1.0986	$0.4364	$ 0.0604	$ 3.5848	$ 1.9975	$ 0.9413	$ 0.2020	$ 6.4049
2021	$ 0.2438	$ 0.1476	$ 0.0493	$ 0.7638	$ 0.3464	$ 0.2502	$ 0.0802	$ 0.9155	$0.3228	$0.1167	$ 0.0147	$ 1.1844	$1.1103	$0.4425	$ 0.0608	$ 3.6487	$ 2.0233	$ 0.9570	$ 0.2051	$ 6.5123
2022	$ 0.2484	$ 0.1505	$ 0.0509	$ 0.7773	$ 0.3532	$ 0.2552	$ 0.0827	$ 0.9316	$0.3263	$0.1181	$ 0.0150	$ 1.1961	$1.1232	$0.4451	$ 0.0616	$ 3.7020	$ 2.0511	$ 0.9689	$ 0.2101	$ 6.6070
2023	$ 0.2612	$ 0.1571	$ 0.0524	$ 0.8273	$ 0.3735	$ 0.2641	$ 0.0845	$ 1.0396	$0.3458	$0.1226	$ 0.0152	$ 1.2803	$1.1973	$0.4631	$ 0.0622	$ 4.1269	$ 2.1778	$ 1.0069	$ 0.2142	$ 7.2742
2024	$ 0.2674	$ 0.1630	$ 0.0538	$ 0.8414	$ 0.3821	$ 0.2701	$ 0.0880	$ 1.0572	$0.3508	$0.1245	$ 0.0155	$ 1.2940	$1.2146	$0.4678	$ 0.0631	$ 4.1955	$ 2.2149	$ 1.0254	$ 0.2205	$ 7.3881
2025	$ 0.2729	$ 0.1662	$ 0.0553	$ 0.8556	$ 0.3898	$ 0.2772	$ 0.0909	$ 1.0739	$0.3550	$0.1268	$ 0.0159	$ 1.3110	$1.2296	$0.4822	$ 0.0666	$ 4.2395	$ 2.2474	$ 1.0524	$ 0.2287	$ 7.4800
2026	$ 0.2787	$ 0.1699	$ 0.0570	$ 0.8797	$ 0.3977	$ 0.2831	$ 0.0928	$ 1.0912	$0.3592	$0.1286	$ 0.0161	$ 1.3285	$1.2441	$0.4882	$ 0.0678	$ 4.3067	$ 2.2797	$ 1.0697	$ 0.2337	$ 7.6061
2027	$ 0.2840	$ 0.1741	$ 0.0585	$ 0.8945	$ 0.4052	$ 0.2913	$ 0.0944	$ 1.1086	$0.3630	$0.1300	$ 0.0163	$ 1.3424	$1.2579	$0.4939	$ 0.0684	$ 4.3390	$ 2.3101	$ 1.0893	$ 0.2376	$ 7.6846
2028	$ 0.2954	$ 0.1800	$ 0.0598	$ 0.9491	$ 0.4193	$ 0.2987	$ 0.0960	$ 1.1640	$0.3733	$0.1368	$ 0.0166	$ 1.3958	$1.2886	$0.5278	$ 0.0688	$ 4.4088	$ 2.3765	$ 1.1433	$ 0.2412	$ 7.9177
2029	$ 0.3018	$ 0.1838	$ 0.0618	$ 0.9677	$ 0.4281	$ 0.3052	$ 0.0978	$ 1.1848	$0.3780	$0.1391	$ 0.0168	$ 1.4169	$1.3052	$0.5342	$ 0.0694	$ 4.4555	$ 2.4130	$ 1.1623	$ 0.2458	$ 8.0249

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1o Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 100,001-1,000,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.1422	$ 0.1291	$ 0.0754	$ 0.2399	$ 0.0784	$ 0.0717	$ 0.0379	$ 0.1334	$0.0072	$0.0053	$ 0.0009	$ 0.0182	$0.0306	$0.0236	$ 0.0042	$ 0.0736	$ 0.2583	$ 0.2298	$ 0.1184	$ 0.4651
2009	$ 0.4636	$ 0.4246	$ 0.2331	$ 0.7892	$ 0.2519	$ 0.2325	$ 0.1244	$ 0.4332	$0.0231	$0.0175	$ 0.0030	$ 0.0599	$0.0983	$0.0765	$ 0.0125	$ 0.2484	$ 0.8370	$ 0.7510	$ 0.3731	$ 1.5306
2010	$ 0.8366	$ 0.7779	$ 0.4131	$ 1.4036	$ 0.4518	$ 0.4119	$ 0.2169	$ 0.8104	$0.0414	$0.0318	$ 0.0053	$ 0.1098	$0.1751	$0.1365	$ 0.0227	$ 0.4557	$ 1.5049	$ 1.3581	$ 0.6580	$ 2.7795
2011	$ 1.1911	$ 1.1002	$ 0.6062	$ 2.0118	$ 0.6503	$ 0.5943	$ 0.3137	$ 1.1407	$0.0585	$0.0451	$ 0.0075	$ 0.1545	$0.2504	$0.1964	$ 0.0326	$ 0.6507	$ 2.1503	$ 1.9359	$ 0.9599	$ 3.9577
2012	$ 1.5568	$ 1.4466	$ 0.7939	$ 2.5936	$ 0.8512	$ 0.7827	$ 0.4084	$ 1.4760	$0.0759	$0.0579	$ 0.0098	$ 0.1971	$0.3251	$0.2566	$ 0.0427	$ 0.8349	$ 2.8091	$ 2.5439	$ 1.2548	$ 5.1017
2013	$ 1.9485	$ 1.8117	$ 0.9931	$ 3.2024	$ 1.0614	$ 0.9779	$ 0.5093	$ 1.8093	$0.0941	$0.0726	$ 0.0122	$ 0.2438	$0.4020	$0.3187	$ 0.0529	$ 1.0269	$ 3.5061	$ 3.1808	$ 1.5676	$ 6.2823
2014	$ 2.0386	$ 1.8923	$ 1.0309	$ 3.3630	$ 1.1098	$ 1.0238	$ 0.5268	$ 1.9336	$0.0980	$0.0749	$ 0.0125	$ 0.2607	$0.4176	$0.3279	$ 0.0544	$ 1.0968	$ 3.6640	$ 3.3189	$ 1.6245	$ 6.6541
2015	$ 2.1128	$ 1.9592	$ 1.0662	$ 3.4689	$ 1.1499	$ 1.0600	$ 0.5474	$ 1.9967	$0.1007	$0.0771	$ 0.0128	$ 0.2704	$0.4298	$0.3333	$ 0.0554	$ 1.1470	$ 3.7932	$ 3.4295	$ 1.6817	$ 6.8830
2016	$ 2.1655	$ 2.0151	$ 1.0994	$ 3.5515	$ 1.1807	$ 1.0853	$ 0.5608	$ 2.0704	$0.1024	$0.0779	$ 0.0130	$ 0.2757	$0.4382	$0.3393	$ 0.0563	$ 1.1726	$ 3.8868	$ 3.5176	$ 1.7295	$ 7.0702
2017	$ 2.2304	$ 2.0902	$ 1.1350	$ 3.6737	$ 1.2120	$ 1.1099	$ 0.5757	$ 2.1121	$0.1048	$0.0800	$ 0.0132	$ 0.2824	$0.4467	$0.3465	$ 0.0575	$ 1.1975	$ 3.9939	$ 3.6265	$ 1.7814	$ 7.2657
2018	$ 2.3094	$ 2.1758	$ 1.1688	$ 3.8398	$ 1.2539	$ 1.1550	$ 0.5901	$ 2.2018	$0.1076	$0.0816	$ 0.0134	$ 0.2926	$0.4594	$0.3547	$ 0.0585	$ 1.2496	$ 4.1304	$ 3.7671	$ 1.8308	$ 7.5838
2019	$ 2.3673	$ 2.2352	$ 1.2039	$ 3.9195	$ 1.2838	$ 1.1842	$ 0.6046	$ 2.2406	$0.1094	$0.0831	$ 0.0137	$ 0.2967	$0.4669	$0.3607	$ 0.0594	$ 1.2707	$ 4.2274	$ 3.8632	$ 1.8815	$ 7.7275
2020	$ 2.4202	$ 2.2839	$ 1.2359	$ 4.0045	$ 1.3126	$ 1.2094	$ 0.6295	$ 2.2970	$0.1109	$0.0847	$ 0.0138	$ 0.3005	$0.4738	$0.3671	$ 0.0601	$ 1.2839	$ 4.3174	$ 3.9450	$ 1.9393	$ 7.8858
2021	$ 2.5030	$ 2.3636	$ 1.2679	$ 4.2159	$ 1.3543	$ 1.2439	$ 0.6477	$ 2.3928	$0.1138	$0.0868	$ 0.0141	$ 0.3126	$0.4855	$0.3771	$ 0.0614	$ 1.3040	$ 4.4567	$ 4.0713	$ 1.9913	$ 8.2253
2022	$ 2.5803	$ 2.4289	$ 1.3430	$ 4.3078	$ 1.3944	$ 1.2731	$ 0.6674	$ 2.4831	$0.1163	$0.0891	$ 0.0144	$ 0.3188	$0.4964	$0.3874	$ 0.0625	$ 1.3225	$ 4.5873	$ 4.1786	$ 2.0874	$ 8.4322
2023	$ 2.6351	$ 2.4810	$ 1.3729	$ 4.3864	$ 1.4218	$ 1.2996	$ 0.6811	$ 2.5255	$0.1177	$0.0903	$ 0.0146	$ 0.3227	$0.5023	$0.3929	$ 0.0634	$ 1.3346	$ 4.6770	$ 4.2638	$ 2.1320	$ 8.5693
2024	$ 2.7210	$ 2.5694	$ 1.4189	$ 4.4824	$ 1.4596	$ 1.3364	$ 0.6992	$ 2.5829	$0.1204	$0.0928	$ 0.0151	$ 0.3286	$0.5116	$0.4016	$ 0.0647	$ 1.3574	$ 4.8126	$ 4.4000	$ 2.1979	$ 8.7514
2025	$ 2.8082	$ 2.6490	$ 1.4588	$ 4.5901	$ 1.5005	$ 1.3758	$ 0.7135	$ 2.6322	$0.1232	$0.0949	$ 0.0154	$ 0.3346	$0.5219	$0.4087	$ 0.0658	$ 1.3915	$ 4.9537	$ 4.5284	$ 2.2535	$ 8.9485
2026	$ 2.8753	$ 2.7244	$ 1.4921	$ 4.7376	$ 1.5358	$ 1.4123	$ 0.7295	$ 2.7080	$0.1251	$0.0964	$ 0.0156	$ 0.3395	$0.5301	$0.4146	$ 0.0669	$ 1.4192	$ 5.0663	$ 4.6477	$ 2.3041	$ 9.2043
2027	$ 2.9482	$ 2.7983	$ 1.5239	$ 4.8360	$ 1.5757	$ 1.4591	$ 0.7512	$ 2.7861	$0.1272	$0.0983	$ 0.0158	$ 0.3447	$0.5400	$0.4198	$ 0.0679	$ 1.4518	$ 5.1912	$ 4.7756	$ 2.3588	$ 9.4186
2028	$ 3.0063	$ 2.8546	$ 1.5558	$ 4.9304	$ 1.6064	$ 1.4891	$ 0.7694	$ 2.8411	$0.1286	$0.0995	$ 0.0159	$ 0.3488	$0.5464	$0.4248	$ 0.0685	$ 1.4660	$ 5.2877	$ 4.8680	$ 2.4096	$ 9.5863
2029	$ 3.0698	$ 2.9165	$ 1.5903	$ 5.0220	$ 1.6402	$ 1.5261	$ 0.7955	$ 2.8898	$0.1301	$0.1006	$ 0.0161	$ 0.3532	$0.5535	$0.4305	$ 0.0692	$ 1.4831	$ 5.3935	$ 4.9738	$ 2.4711	$ 9.7481

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.1p Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving 100,001-1,000,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0166	$ 0.0085	$ 0.0028	$ 0.0559	$ 0.0238	$ 0.0134	$ 0.0045	$ 0.0840	$0.0194	$0.0079	$ 0.0008	$ 0.0782	$0.0656	$0.0313	$ 0.0029	$ 0.2412	$ 0.1254	$ 0.0611	$ 0.0110	$ 0.4592
2009	$ 0.0526	$ 0.0288	$ 0.0086	$ 0.1734	$ 0.0739	$ 0.0470	$ 0.0153	$ 0.2356	$0.0613	$0.0264	$ 0.0025	$ 0.2513	$0.2045	$0.0975	$ 0.0105	$ 0.7372	$ 0.3924	$ 0.1996	$ 0.0369	$ 1.3975
2010	$ 0.0871	$ 0.0517	$ 0.0153	$ 0.2745	$ 0.1246	$ 0.0841	$ 0.0273	$ 0.3883	$0.1013	$0.0455	$ 0.0046	$ 0.3970	$0.3443	$0.1681	$ 0.0184	$ 1.1895	$ 0.6572	$ 0.3494	$ 0.0657	$ 2.2492
2011	$ 0.1239	$ 0.0730	$ 0.0221	$ 0.4014	$ 0.1788	$ 0.1194	$ 0.0395	$ 0.5687	$0.1433	$0.0643	$ 0.0065	$ 0.5474	$0.4915	$0.2370	$ 0.0262	$ 1.6903	$ 0.9375	$ 0.4936	$ 0.0942	$ 3.2077
2012	$ 0.1607	$ 0.0955	$ 0.0289	$ 0.5148	$ 0.2325	$ 0.1550	$ 0.0509	$ 0.7268	$0.1850	$0.0841	$ 0.0083	$ 0.7176	$0.6369	$0.3087	$ 0.0342	$ 2.1819	$ 1.2151	$ 0.6433	$ 0.1224	$ 4.1410
2013	$ 0.2018	$ 0.1215	$ 0.0365	$ 0.6402	$ 0.2928	$ 0.1967	$ 0.0639	$ 0.9093	$0.2312	$0.1059	$ 0.0104	$ 0.8860	$0.7984	$0.3875	$ 0.0421	$ 2.7161	$ 1.5242	$ 0.8117	$ 0.1528	$ 5.1516
2014	$ 0.2067	$ 0.1248	$ 0.0375	$ 0.6514	$ 0.2995	$ 0.2028	$ 0.0661	$ 0.9251	$0.2351	$0.1080	$ 0.0107	$ 0.9057	$0.8110	$0.3980	$ 0.0435	$ 2.7699	$ 1.5523	$ 0.8335	$ 0.1578	$ 5.2520
2015	$ 0.2133	$ 0.1304	$ 0.0387	$ 0.6668	$ 0.3091	$ 0.2104	$ 0.0682	$ 0.9889	$0.2409	$0.1132	$ 0.0111	$ 0.9241	$0.8315	$0.4192	$ 0.0443	$ 2.8309	$ 1.5948	$ 0.8732	$ 0.1623	$ 5.4107
2016	$ 0.2176	$ 0.1333	$ 0.0398	$ 0.6799	$ 0.3154	$ 0.2151	$ 0.0707	$ 1.0108	$0.2440	$0.1150	$ 0.0112	$ 0.9373	$0.8430	$0.4240	$ 0.0453	$ 2.8738	$ 1.6200	$ 0.8874	$ 0.1670	$ 5.5018
2017	$ 0.2276	$ 0.1371	$ 0.0407	$ 0.7780	$ 0.3263	$ 0.2203	$ 0.0719	$ 1.0807	$0.2520	$0.1171	$ 0.0113	$ 0.9764	$0.8639	$0.4294	$ 0.0464	$ 2.9344	$ 1.6698	$ 0.9041	$ 0.1703	$ 5.7694
2018	$ 0.2404	$ 0.1421	$ 0.0419	$ 0.8400	$ 0.3478	$ 0.2307	$ 0.0736	$ 1.2485	$0.2637	$0.1204	$ 0.0116	$ 0.9997	$0.9108	$0.4539	$ 0.0471	$ 2.9801	$ 1.7627	$ 0.9471	$ 0.1742	$ 6.0683
2019	$ 0.2461	$ 0.1462	$ 0.0430	$ 0.8543	$ 0.3551	$ 0.2368	$ 0.0751	$ 1.2710	$0.2678	$0.1223	$ 0.0120	$ 1.0135	$0.9232	$0.4575	$ 0.0484	$ 3.0359	$ 1.7922	$ 0.9627	$ 0.1785	$ 6.1748
2020	$ 0.2506	$ 0.1493	$ 0.0440	$ 0.8688	$ 0.3615	$ 0.2410	$ 0.0770	$ 1.2922	$0.2706	$0.1238	$ 0.0122	$ 1.0234	$0.9334	$0.4668	$ 0.0492	$ 3.0882	$ 1.8162	$ 0.9809	$ 0.1824	$ 6.2727
2021	$ 0.2612	$ 0.1537	$ 0.0451	$ 0.8873	$ 0.3746	$ 0.2509	$ 0.0797	$ 1.3131	$0.2809	$0.1286	$ 0.0125	$ 1.0984	$0.9638	$0.4744	$ 0.0505	$ 3.5293	$ 1.8805	$ 1.0076	$ 0.1878	$ 6.8281
2022	$ 0.2679	$ 0.1596	$ 0.0468	$ 0.9025	$ 0.3844	$ 0.2575	$ 0.0839	$ 1.3366	$0.2861	$0.1319	$ 0.0128	$ 1.1167	$0.9825	$0.4839	$ 0.0529	$ 3.5828	$ 1.9208	$ 1.0329	$ 0.1964	$ 6.9386
2023	$ 0.2727	$ 0.1628	$ 0.0477	$ 0.9177	$ 0.3910	$ 0.2618	$ 0.0857	$ 1.3575	$0.2891	$0.1330	$ 0.0130	$ 1.1249	$0.9924	$0.4879	$ 0.0534	$ 3.6203	$ 1.9452	$ 1.0456	$ 0.1998	$ 7.0203
2024	$ 0.2794	$ 0.1689	$ 0.0496	$ 0.9338	$ 0.4009	$ 0.2693	$ 0.0906	$ 1.3816	$0.2940	$0.1374	$ 0.0132	$ 1.1527	$1.0106	$0.5031	$ 0.0551	$ 3.6796	$ 1.9849	$ 1.0787	$ 0.2085	$ 7.1477
2025	$ 0.2849	$ 0.1726	$ 0.0507	$ 0.9496	$ 0.4088	$ 0.2753	$ 0.0924	$ 1.4035	$0.2975	$0.1391	$ 0.0133	$ 1.1653	$1.0234	$0.5125	$ 0.0560	$ 3.7160	$ 2.0146	$ 1.0995	$ 0.2124	$ 7.2345
2026	$ 0.2913	$ 0.1756	$ 0.0519	$ 0.9660	$ 0.4175	$ 0.2824	$ 0.0948	$ 1.4263	$0.3018	$0.1419	$ 0.0135	$ 1.1792	$1.0376	$0.5208	$ 0.0567	$ 3.8145	$ 2.0482	$ 1.1207	$ 0.2169	$ 7.3860
2027	$ 0.2971	$ 0.1792	$ 0.0530	$ 0.9826	$ 0.4256	$ 0.2896	$ 0.0978	$ 1.4498	$0.3055	$0.1447	$ 0.0137	$ 1.1976	$1.0506	$0.5299	$ 0.0576	$ 3.8739	$ 2.0787	$ 1.1435	$ 0.2221	$ 7.5039
2028	$ 0.3033	$ 0.1830	$ 0.0540	$ 1.0004	$ 0.4341	$ 0.2968	$ 0.1000	$ 1.4727	$0.3094	$0.1468	$ 0.0140	$ 1.2104	$1.0640	$0.5376	$ 0.0582	$ 3.9393	$ 2.1108	$ 1.1642	$ 0.2262	$ 7.6228
2029	$ 0.3089	$ 0.1863	$ 0.0551	$ 1.0175	$ 0.4421	$ 0.3032	$ 0.1020	$ 1.4982	$0.3127	$0.1483	$ 0.0142	$ 1.2241	$1.0757	$0.5508	$ 0.0587	$ 3.9994	$ 2.1395	$ 1.1886	$ 0.2299	$ 7.7392

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.1q Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving >1,000,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided								Total Benefits			
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs							
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$0.000001	$0.000001	$0.000000	$0.000003	$0.000001	$0.000001	$0.000000	$0.000002	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000001	$0.000002	$0.000001	$0.000000	$0.000006
2009	$0.000002	$0.000002	$0.000000	$0.000006	$0.000002	$0.000001	$0.000000	$0.000006	$0.000000	$0.000000	$0.000000	$0.000000	$0.000001	$0.000000	$0.000000	$0.000003	$0.000005	$0.000004	$0.000000	$0.000015
2010	$0.000005	$0.000004	$0.000000	$0.000011	$0.000004	$0.000003	$0.000000	$0.000010	$0.000000	$0.000000	$0.000000	$0.000001	$0.000002	$0.000001	$0.000000	$0.000005	$0.000011	$0.000009	$0.000000	$0.000027
2011	$0.000008	$0.000008	$0.000000	$0.000017	$0.000007	$0.000006	$0.000000	$0.000015	$0.000000	$0.000000	$0.000000	$0.000001	$0.000003	$0.000002	$0.000000	$0.000009	$0.000018	$0.000016	$0.000000	$0.000042
2012	$0.000012	$0.000011	$0.000000	$0.000026	$0.000010	$0.000009	$0.000000	$0.000023	$0.000001	$0.000000	$0.000000	$0.000002	$0.000004	$0.000003	$0.000000	$0.000012	$0.000026	$0.000022	$0.000001	$0.000063
2013	$0.000019	$0.000016	$0.000001	$0.000046	$0.000015	$0.000013	$0.000001	$0.000039	$0.000001	$0.000001	$0.000000	$0.000003	$0.000006	$0.000004	$0.000000	$0.000019	$0.000041	$0.000033	$0.000001	$0.000107
2014	$0.000021	$0.000019	$0.000001	$0.000052	$0.000018	$0.000015	$0.000001	$0.000044	$0.000001	$0.000001	$0.000000	$0.000003	$0.000007	$0.000004	$0.000000	$0.000022	$0.000047	$0.000038	$0.000001	$0.000123
2015	$0.000029	$0.000027	$0.000001	$0.000068	$0.000024	$0.000020	$0.000001	$0.000060	$0.000001	$0.000001	$0.000000	$0.000005	$0.000009	$0.000005	$0.000000	$0.000032	$0.000063	$0.000054	$0.000001	$0.000165
2016	$0.000032	$0.000028	$0.000002	$0.000080	$0.000026	$0.000021	$0.000001	$0.000073	$0.000002	$0.000001	$0.000000	$0.000005	$0.000010	$0.000006	$0.000000	$0.000034	$0.000069	$0.000056	$0.000003	$0.000192
2017	$0.000033	$0.000030	$0.000002	$0.000081	$0.000027	$0.000023	$0.000002	$0.000074	$0.000002	$0.000001	$0.000000	$0.000005	$0.000010	$0.000006	$0.000000	$0.000035	$0.000072	$0.000059	$0.000004	$0.000195
2018	$0.000035	$0.000031	$0.000002	$0.000087	$0.000029	$0.000024	$0.000002	$0.000077	$0.000002	$0.000001	$0.000000	$0.000006	$0.000011	$0.000006	$0.000000	$0.000037	$0.000077	$0.000062	$0.000004	$0.000207
2019	$0.000037	$0.000032	$0.000006	$0.000091	$0.000031	$0.000025	$0.000005	$0.000080	$0.000002	$0.000001	$0.000000	$0.000006	$0.000011	$0.000007	$0.000001	$0.000038	$0.000081	$0.000064	$0.000012	$0.000215
2020	$0.000038	$0.000033	$0.000006	$0.000092	$0.000032	$0.000026	$0.000005	$0.000081	$0.000002	$0.000001	$0.000000	$0.000006	$0.000012	$0.000007	$0.000001	$0.000039	$0.000083	$0.000067	$0.000012	$0.000218
2021	$0.000040	$0.000034	$0.000007	$0.000096	$0.000033	$0.000027	$0.000005	$0.000085	$0.000002	$0.000001	$0.000000	$0.000006	$0.000012	$0.000007	$0.000001	$0.000040	$0.000087	$0.000070	$0.000012	$0.000227
2022	$0.000042	$0.000036	$0.000007	$0.000100	$0.000035	$0.000029	$0.000005	$0.000087	$0.000002	$0.000001	$0.000000	$0.000006	$0.000012	$0.000007	$0.000001	$0.000042	$0.000091	$0.000073	$0.000013	$0.000235
2023	$0.000043	$0.000037	$0.000007	$0.000103	$0.000036	$0.000030	$0.000005	$0.000090	$0.000002	$0.000001	$0.000000	$0.000007	$0.000013	$0.000008	$0.000001	$0.000043	$0.000094	$0.000076	$0.000013	$0.000243
2024	$0.000051	$0.000043	$0.000007	$0.000128	$0.000042	$0.000034	$0.000005	$0.000112	$0.000002	$0.000001	$0.000000	$0.000008	$0.000015	$0.000008	$0.000001	$0.000051	$0.000109	$0.000087	$0.000014	$0.000299
2025	$0.000053	$0.000046	$0.000008	$0.000131	$0.000044	$0.000036	$0.000006	$0.000114	$0.000002	$0.000001	$0.000000	$0.000008	$0.000015	$0.000009	$0.000001	$0.000052	$0.000115	$0.000093	$0.000014	$0.000306
2026	$0.000055	$0.000048	$0.000008	$0.000136	$0.000045	$0.000037	$0.000006	$0.000119	$0.000002	$0.000001	$0.000000	$0.000008	$0.000016	$0.000009	$0.000001	$0.000054	$0.000118	$0.000095	$0.000015	$0.000317
2027	$0.000062	$0.000052	$0.000008	$0.000149	$0.000051	$0.000041	$0.000006	$0.000132	$0.000003	$0.000002	$0.000000	$0.000010	$0.000018	$0.000010	$0.000001	$0.000066	$0.000133	$0.000104	$0.000015	$0.000357
2028	$0.000064	$0.000053	$0.000008	$0.000153	$0.000052	$0.000042	$0.000006	$0.000136	$0.000003	$0.000002	$0.000000	$0.000010	$0.000018	$0.000010	$0.000001	$0.000067	$0.000137	$0.000107	$0.000016	$0.000367
2029	$0.000068	$0.000057	$0.000009	$0.000159	$0.000056	$0.000045	$0.000007	$0.000142	$0.000003	$0.000002	$0.000000	$0.000010	$0.000019	$0.000011	$0.000001	$0.000068	$0.000146	$0.000114	$0.000016	$0.000381

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.1r Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for CWSs Serving >1,000,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided								Total Benefits			
	0 -16 years				>16 years				0 -16 years				>16 years							
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$0.000000	$0.000000	$0.000000	$ 0.000000	$ 0.000000	$ 0.000000	$0.000000	$ 0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$ 0.000000	$ 0.000000	$0.000000	$ 0.000001
2009	$0.000000	$0.000000	$0.000000	$ 0.000000	$ 0.000000	$ 0.000000	$0.000000	$ 0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000000	$0.000001	$ 0.000001	$ 0.000000	$0.000000	$ 0.000002
2010	$0.000000	$0.000000	$0.000000	$ 0.000000	$ 0.000000	$ 0.000000	$0.000000	$ 0.000001	$0.000000	$0.000000	$0.000000	$0.000001	$0.000001	$0.000000	$0.000000	$0.000002	$ 0.000001	$ 0.000000	$0.000000	$ 0.000004
2011	$0.000000	$0.000000	$0.000000	$ 0.000001	$ 0.000000	$ 0.000000	$0.000000	$ 0.000001	$0.000000	$0.000000	$0.000000	$0.000001	$0.000001	$0.000000	$0.000000	$0.000003	$ 0.000002	$ 0.000001	$0.000000	$ 0.000006
2012	$0.000000	$0.000000	$0.000000	$ 0.000001	$ 0.000001	$ 0.000000	$0.000000	$ 0.000002	$0.000000	$0.000000	$0.000000	$0.000001	$0.000001	$0.000001	$0.000000	$0.000005	$ 0.000003	$ 0.000001	$0.000000	$ 0.000009
2013	$0.000000	$0.000000	$0.000000	$ 0.000002	$ 0.000001	$ 0.000000	$0.000000	$ 0.000003	$0.000001	$0.000000	$0.000000	$0.000002	$0.000002	$0.000001	$0.000000	$0.000008	$ 0.000005	$ 0.000002	$0.000000	$ 0.000016
2014	$0.000001	$0.000000	$0.000000	$ 0.000002	$ 0.000001	$ 0.000001	$0.000000	$ 0.000003	$0.000001	$0.000000	$0.000000	$0.000002	$0.000003	$0.000001	$0.000000	$0.000009	$ 0.000005	$ 0.000002	$0.000000	$ 0.000016
2015	$0.000001	$0.000000	$0.000000	$ 0.000004	$ 0.000002	$ 0.000001	$0.000000	$ 0.000007	$0.000001	$0.000000	$0.000000	$0.000004	$0.000004	$0.000001	$0.000000	$0.000015	$ 0.000007	$ 0.000003	$0.000000	$ 0.000030
2016	$0.000001	$0.000000	$0.000000	$ 0.000004	$ 0.000002	$ 0.000001	$0.000000	$ 0.000007	$0.000001	$0.000000	$0.000000	$0.000004	$0.000004	$0.000001	$0.000000	$0.000017	$ 0.000008	$ 0.000003	$0.000000	$ 0.000032
2017	$0.000002	$0.000000	$0.000000	$ 0.000005	$ 0.000003	$ 0.000001	$0.000000	$ 0.000009	$0.000003	$0.000000	$0.000000	$0.000008	$0.000009	$0.000001	$0.000000	$0.000033	$ 0.000018	$ 0.000003	$0.000000	$ 0.000056
2018	$0.000002	$0.000000	$0.000000	$ 0.000005	$ 0.000004	$ 0.000001	$0.000000	$ 0.000009	$0.000003	$0.000000	$0.000000	$0.000008	$0.000009	$0.000002	$0.000000	$0.000034	$ 0.000018	$ 0.000003	$0.000000	$ 0.000057
2019	$0.000002	$0.000000	$0.000000	$ 0.000006	$ 0.000004	$ 0.000001	$0.000000	$ 0.000010	$0.000003	$0.000000	$0.000000	$0.000008	$0.000009	$0.000002	$0.000000	$0.000035	$ 0.000018	$ 0.000003	$0.000000	$ 0.000058
2020	$0.000003	$0.000000	$0.000000	$ 0.000006	$ 0.000004	$ 0.000001	$0.000000	$ 0.000010	$0.000003	$0.000000	$0.000000	$0.000009	$0.000010	$0.000002	$0.000000	$0.000035	$ 0.000019	$ 0.000004	$0.000000	$ 0.000059
2021	$0.000003	$0.000001	$0.000000	$ 0.000006	$ 0.000004	$ 0.000001	$0.000000	$ 0.000010	$0.000003	$0.000000	$0.000000	$0.000009	$0.000010	$0.000002	$0.000000	$0.000036	$ 0.000020	$ 0.000004	$0.000000	$ 0.000061
2022	$0.000003	$0.000001	$0.000000	$ 0.000006	$ 0.000004	$ 0.000001	$0.000000	$ 0.000010	$0.000003	$0.000000	$0.000000	$0.000009	$0.000011	$0.000002	$0.000000	$0.000037	$ 0.000021	$ 0.000004	$0.000000	$ 0.000063
2023	$0.000003	$0.000001	$0.000000	$ 0.000006	$ 0.000004	$ 0.000001	$0.000000	$ 0.000011	$0.000003	$0.000000	$0.000000	$0.000010	$0.000011	$0.000002	$0.000000	$0.000038	$ 0.000021	$ 0.000004	$0.000000	$ 0.000065
2024	$0.000003	$0.000001	$0.000000	$ 0.000006	$ 0.000005	$ 0.000001	$0.000000	$ 0.000011	$0.000003	$0.000001	$0.000000	$0.000010	$0.000012	$0.000002	$0.000000	$0.000039	$ 0.000023	$ 0.000005	$0.000001	$ 0.000066
2025	$0.000003	$0.000001	$0.000000	$ 0.000006	$ 0.000005	$ 0.000002	$0.000000	$ 0.000011	$0.000003	$0.000001	$0.000000	$0.000010	$0.000012	$0.000003	$0.000000	$0.000039	$ 0.000023	$ 0.000005	$0.000001	$ 0.000067
2026	$0.000003	$0.000001	$0.000000	$ 0.000007	$ 0.000005	$ 0.000002	$0.000000	$ 0.000011	$0.000003	$0.000001	$0.000000	$0.000010	$0.000012	$0.000003	$0.000000	$0.000039	$ 0.000023	$ 0.000006	$0.000001	$ 0.000067
2027	$0.000003	$0.000001	$0.000000	$ 0.000007	$ 0.000005	$ 0.000002	$0.000000	$ 0.000012	$0.000004	$0.000001	$0.000000	$0.000011	$0.000012	$0.000003	$0.000000	$0.000041	$ 0.000024	$ 0.000006	$0.000001	$ 0.000071
2028	$0.000003	$0.000001	$0.000000	$ 0.000008	$ 0.000005	$ 0.000002	$0.000000	$ 0.000014	$0.000004	$0.000001	$0.000000	$0.000012	$0.000013	$0.000003	$0.000000	$0.000042	$ 0.000025	$ 0.000006	$0.000001	$ 0.000076
2029	$0.000004	$0.000001	$0.000000	$ 0.000008	$ 0.000005	$ 0.000002	$0.000000	$ 0.000014	$0.000004	$0.000001	$0.000000	$0.000012	$0.000013	$0.000003	$0.000000	$0.000045	$ 0.000026	$ 0.000007	$0.000001	$ 0.000079

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.2a Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for All CWSs

	Total - Illness				Total - Death				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.6	$ 0.5	$ 0.2	$ 1.2	$ 0.3	$ 0.1	$ 0.0	$ 0.9	$ 0.9	$ 0.6	$ 0.3	$ 2.1
2009	$ 2.0	$ 1.7	$ 0.9	$ 3.9	$ 1.0	$ 0.5	$ 0.1	$ 3.0	$ 3.0	$ 2.2	$ 0.9	$ 7.0
2010	$ 4.1	$ 3.6	$ 1.8	$ 8.0	$ 1.9	$ 1.0	$ 0.1	$ 6.2	$ 6.1	$ 4.6	$ 1.9	$ 14.2
2011	$ 6.4	$ 5.6	$ 2.8	$ 12.3	$ 2.9	$ 1.6	$ 0.2	$ 9.3	$ 9.3	$ 7.1	$ 3.0	$ 21.6
2012	$ 8.6	$ 7.5	$ 3.7	$ 16.6	$ 3.9	$ 2.1	$ 0.3	$ 12.4	$ 12.5	$ 9.7	$ 4.0	$ 29.0
2013	$ 11.8	$ 10.3	$ 5.2	$ 22.2	$ 5.3	$ 2.9	$ 0.4	$ 16.8	$ 17.0	$ 13.3	$ 5.6	$ 39.0
2014	$ 12.3	$ 10.8	$ 5.5	$ 23.2	$ 5.4	$ 3.0	$ 0.4	$ 17.3	$ 17.8	$ 13.8	$ 5.9	$ 40.5
2015	$ 13.2	$ 11.5	$ 5.8	$ 24.9	$ 5.9	$ 3.2	$ 0.4	$ 18.9	$ 19.1	$ 14.8	$ 6.3	$ 43.8
2016	$ 13.7	$ 12.0	$ 6.1	$ 25.8	$ 6.1	$ 3.3	$ 0.5	$ 19.5	$ 19.8	$ 15.4	$ 6.5	$ 45.3
2017	$ 14.5	$ 12.7	$ 6.4	$ 27.9	$ 6.5	$ 3.5	$ 0.5	$ 20.7	$ 21.0	$ 16.2	$ 6.9	$ 48.6
2018	$ 15.3	$ 13.4	$ 6.7	$ 29.5	$ 6.7	$ 3.6	$ 0.5	$ 21.6	$ 22.0	$ 17.0	$ 7.2	$ 51.2
2019	$ 15.8	$ 13.8	$ 7.0	$ 30.3	$ 6.9	$ 3.7	$ 0.5	$ 22.2	$ 22.7	$ 17.6	$ 7.5	$ 52.5
2020	$ 16.4	$ 14.4	$ 7.3	$ 31.5	$ 7.1	$ 3.8	$ 0.5	$ 22.9	$ 23.5	$ 18.2	$ 7.8	$ 54.4
2021	$ 16.9	$ 14.8	$ 7.5	$ 32.6	$ 7.2	$ 3.9	$ 0.5	$ 23.9	$ 24.1	$ 18.8	$ 8.1	$ 56.5
2022	$ 17.8	$ 15.6	$ 8.0	$ 34.0	$ 7.5	$ 4.1	$ 0.6	$ 24.6	$ 25.3	$ 19.7	$ 8.6	$ 58.6
2023	$ 18.3	$ 16.1	$ 8.3	$ 35.2	$ 7.7	$ 4.2	$ 0.6	$ 25.5	$ 26.0	$ 20.3	$ 8.9	$ 60.7
2024	$ 19.0	$ 16.7	$ 8.6	$ 36.4	$ 7.9	$ 4.3	$ 0.6	$ 26.0	$ 26.9	$ 21.1	$ 9.2	$ 62.4
2025	$ 19.6	$ 17.3	$ 8.9	$ 37.3	$ 8.1	$ 4.5	$ 0.6	$ 26.6	$ 27.7	$ 21.7	$ 9.5	$ 63.9
2026	$ 20.2	$ 17.9	$ 9.2	$ 38.5	$ 8.3	$ 4.6	$ 0.6	$ 27.1	$ 28.5	$ 22.4	$ 9.9	$ 65.7
2027	$ 20.8	$ 18.4	$ 9.5	$ 39.6	$ 8.4	$ 4.7	$ 0.6	$ 27.6	$ 29.3	$ 23.1	$ 10.2	$ 67.2
2028	$ 21.4	$ 18.9	$ 9.8	$ 40.7	$ 8.6	$ 4.8	$ 0.6	$ 28.1	$ 29.9	$ 23.6	$ 10.4	$ 68.8
2029	$ 21.9	$ 19.4	$ 10.0	$ 41.9	$ 8.7	$ 4.9	$ 0.7	$ 28.6	$ 30.7	$ 24.3	$ 10.7	$ 70.5

Source: GWR Benefits Model.

Exhibit C.2b Present Value of Illnesses and Deaths Avoided Under the Final Rule by Year at 3 Percent, for CWSs

	Total - Illness				Total - Deaths				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.5	$ 0.5	$ 0.2	$ 1.1	$ 0.3	$ 0.1	$ 0.0	$ 0.9	$ 0.8	$ 0.6	$ 0.2	$ 1.9
2009	$ 1.8	$ 1.5	$ 0.8	$ 3.5	$ 0.8	$ 0.4	$ 0.1	$ 2.7	$ 2.6	$ 2.0	$ 0.8	$ 6.2
2010	$ 3.6	$ 3.1	$ 1.5	$ 6.9	$ 1.7	$ 0.9	$ 0.1	$ 5.4	$ 5.2	$ 4.0	$ 1.6	$ 12.3
2011	$ 5.4	$ 4.7	$ 2.3	$ 10.3	$ 2.4	$ 1.3	$ 0.2	$ 7.8	$ 7.8	$ 6.0	$ 2.5	$ 18.1
2012	$ 7.0	$ 6.1	$ 3.0	$ 13.5	$ 3.2	$ 1.7	$ 0.2	$ 10.1	$ 10.2	$ 7.9	$ 3.3	$ 23.6
2013	$ 9.3	$ 8.2	$ 4.1	$ 17.5	$ 4.2	$ 2.3	$ 0.3	$ 13.2	$ 13.5	$ 10.5	$ 4.4	$ 30.8
2014	$ 9.4	$ 8.3	$ 4.2	$ 17.8	$ 4.2	$ 2.3	$ 0.3	$ 13.3	$ 13.6	$ 10.6	$ 4.5	$ 31.1
2015	$ 9.8	$ 8.6	$ 4.3	$ 18.5	$ 4.4	$ 2.4	$ 0.3	$ 14.1	$ 14.2	$ 11.0	$ 4.7	$ 32.6
2016	$ 9.9	$ 8.7	$ 4.4	$ 18.7	$ 4.4	$ 2.4	$ 0.3	$ 14.1	$ 14.3	$ 11.1	$ 4.7	$ 32.7
2017	$ 10.2	$ 8.9	$ 4.5	$ 19.6	$ 4.5	$ 2.4	$ 0.3	$ 14.5	$ 14.7	$ 11.4	$ 4.8	$ 34.1
2018	$ 10.4	$ 9.1	$ 4.6	$ 20.1	$ 4.6	$ 2.5	$ 0.3	$ 14.7	$ 15.0	$ 11.6	$ 4.9	$ 34.9
2019	$ 10.4	$ 9.1	$ 4.6	$ 20.1	$ 4.6	$ 2.5	$ 0.3	$ 14.7	$ 15.0	$ 11.6	$ 5.0	$ 34.7
2020	$ 10.5	$ 9.2	$ 4.7	$ 20.2	$ 4.5	$ 2.5	$ 0.3	$ 14.7	$ 15.1	$ 11.7	$ 5.0	$ 34.9
2021	$ 10.5	$ 9.2	$ 4.7	$ 20.3	$ 4.5	$ 2.4	$ 0.3	$ 14.9	$ 15.0	$ 11.7	$ 5.0	$ 35.2
2022	$ 10.7	$ 9.4	$ 4.9	$ 20.6	$ 4.6	$ 2.5	$ 0.3	$ 14.9	$ 15.3	$ 11.9	$ 5.2	$ 35.5
2023	$ 10.7	$ 9.4	$ 4.9	$ 20.7	$ 4.5	$ 2.5	$ 0.3	$ 15.0	$ 15.3	$ 11.9	$ 5.2	$ 35.7
2024	$ 10.8	$ 9.5	$ 4.9	$ 20.7	$ 4.5	$ 2.5	$ 0.3	$ 14.9	$ 15.4	$ 12.0	$ 5.3	$ 35.6
2025	$ 10.8	$ 9.6	$ 4.9	$ 20.7	$ 4.5	$ 2.5	$ 0.3	$ 14.7	$ 15.3	$ 12.0	$ 5.3	$ 35.4
2026	$ 10.9	$ 9.6	$ 5.0	$ 20.7	$ 4.5	$ 2.5	$ 0.3	$ 14.6	$ 15.3	$ 12.1	$ 5.3	$ 35.3
2027	$ 10.9	$ 9.6	$ 5.0	$ 20.6	$ 4.4	$ 2.4	$ 0.3	$ 14.4	$ 15.3	$ 12.0	$ 5.3	$ 35.1
2028	$ 10.8	$ 9.6	$ 4.9	$ 20.6	$ 4.3	$ 2.4	$ 0.3	$ 14.3	$ 15.2	$ 12.0	$ 5.3	$ 34.9
2029	$ 10.8	$ 9.5	$ 4.9	$ 20.6	$ 4.3	$ 2.4	$ 0.3	$ 14.1	$ 15.1	$ 11.9	$ 5.3	$ 34.7
Total	$ 195.2	$ 171.5	$ 87.4	$ 373.3	$ 83.9	$ 45.9	$ 6.3	$ 271.7	$ 279.1	$ 217.4	$ 93.7	$ 645.0
Ann	$ 11.2	$ 9.8	$ 5.0	$ 21.4	$ 4.8	$ 2.6	$ 0.4	$ 15.6	$ 16.0	$ 12.5	$ 5.4	$ 37.0

Notes: Details may not sum due to rounding and individual statistical analyses.

Source: GWR Benefits Model.

Exhibit C.2c Present Value of Illnesses and Deaths Avoided Under the Final Rule by Year at 7 Percent, for CWSs

	Total - Illness				Total - Deaths				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.5	$ 0.4	$ 0.2	$ 0.9	$ 0.2	$ 0.1	$ 0.0	$ 0.8	$ 0.7	$ 0.5	$ 0.2	$ 1.7
2009	$ 1.5	$ 1.3	$ 0.6	$ 3.0	$ 0.7	$ 0.4	$ 0.1	$ 2.3	$ 2.3	$ 1.7	$ 0.7	$ 5.3
2010	$ 3.0	$ 2.6	$ 1.3	$ 5.7	$ 1.4	$ 0.7	$ 0.1	$ 4.4	$ 4.3	$ 3.3	$ 1.4	$ 10.1
2011	$ 4.3	$ 3.7	$ 1.8	$ 8.2	$ 1.9	$ 1.1	$ 0.1	$ 6.2	$ 6.2	$ 4.8	$ 2.0	$ 14.4
2012	$ 5.4	$ 4.7	$ 2.3	$ 10.3	$ 2.4	$ 1.3	$ 0.2	$ 7.7	$ 7.8	$ 6.0	$ 2.5	$ 18.1
2013	$ 6.8	$ 6.0	$ 3.0	$ 12.9	$ 3.1	$ 1.7	$ 0.2	$ 9.8	$ 9.9	$ 7.7	$ 3.3	$ 22.7
2014	$ 6.7	$ 5.9	$ 3.0	$ 12.6	$ 3.0	$ 1.7	$ 0.2	$ 9.4	$ 9.7	$ 7.5	$ 3.2	$ 22.0
2015	$ 6.7	$ 5.9	$ 3.0	$ 12.7	$ 3.0	$ 1.6	$ 0.2	$ 9.6	$ 9.7	$ 7.5	$ 3.2	$ 22.3
2016	$ 6.5	$ 5.7	$ 2.9	$ 12.3	$ 2.9	$ 1.6	$ 0.2	$ 9.3	$ 9.4	$ 7.3	$ 3.1	$ 21.5
2017	$ 6.4	$ 5.6	$ 2.8	$ 12.4	$ 2.9	$ 1.5	$ 0.2	$ 9.2	$ 9.3	$ 7.2	$ 3.1	$ 21.6
2018	$ 6.3	$ 5.6	$ 2.8	$ 12.3	$ 2.8	$ 1.5	$ 0.2	$ 9.0	$ 9.1	$ 7.1	$ 3.0	$ 21.2
2019	$ 6.1	$ 5.4	$ 2.7	$ 11.8	$ 2.7	$ 1.4	$ 0.2	$ 8.6	$ 8.8	$ 6.8	$ 2.9	$ 20.4
2020	$ 5.9	$ 5.2	$ 2.6	$ 11.4	$ 2.6	$ 1.4	$ 0.2	$ 8.3	$ 8.5	$ 6.6	$ 2.8	$ 19.7
2021	$ 5.7	$ 5.0	$ 2.5	$ 11.0	$ 2.5	$ 1.3	$ 0.2	$ 8.1	$ 8.2	$ 6.4	$ 2.7	$ 19.1
2022	$ 5.6	$ 4.9	$ 2.5	$ 10.8	$ 2.4	$ 1.3	$ 0.2	$ 7.8	$ 8.0	$ 6.2	$ 2.7	$ 18.6
2023	$ 5.4	$ 4.7	$ 2.5	$ 10.4	$ 2.3	$ 1.2	$ 0.2	$ 7.5	$ 7.7	$ 6.0	$ 2.6	$ 18.0
2024	$ 5.3	$ 4.6	$ 2.4	$ 10.1	$ 2.2	$ 1.2	$ 0.2	$ 7.2	$ 7.4	$ 5.8	$ 2.6	$ 17.3
2025	$ 5.1	$ 4.5	$ 2.3	$ 9.6	$ 2.1	$ 1.2	$ 0.2	$ 6.9	$ 7.2	$ 5.6	$ 2.5	$ 16.5
2026	$ 4.9	$ 4.3	$ 2.2	$ 9.3	$ 2.0	$ 1.1	$ 0.2	$ 6.6	$ 6.9	$ 5.4	$ 2.4	$ 15.9
2027	$ 4.7	$ 4.2	$ 2.2	$ 8.9	$ 1.9	$ 1.1	$ 0.1	$ 6.2	$ 6.6	$ 5.2	$ 2.3	$ 15.2
2028	$ 4.5	$ 4.0	$ 2.1	$ 8.6	$ 1.8	$ 1.0	$ 0.1	$ 5.9	$ 6.3	$ 5.0	$ 2.2	$ 14.5
2029	$ 4.3	$ 3.8	$ 2.0	$ 8.3	$ 1.7	$ 1.0	$ 0.1	$ 5.6	$ 6.0	$ 4.8	$ 2.1	$ 13.9
Total	$ 111.6	$ 98.0	$ 49.8	$ 213.5	$ 48.4	$ 26.5	$ 3.6	$ 156.4	$ 160.0	$ 124.4	$ 53.4	$ 369.9
Ann	$ 9.6	$ 8.4	$ 4.3	$ 18.3	$ 4.2	$ 2.3	$ 0.3	$ 13.4	$ 13.7	$ 10.7	$ 4.6	$ 31.7

Notes: Details may not sum due to rounding and individual statistical analyses.

Source: GWR Benefits Model.

Exhibit C.3a Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving <100 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$0.0000	$0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0006
2009	$ 0.0004	$ 0.0003	$ 0.0001	$ 0.0010	$ 0.0003	$ 0.0002	$ 0.0001	$ 0.0006	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0001	$ 0.0000	$ 0.0004	$ 0.0008	$ 0.0006	$ 0.0002	$ 0.0021
2010	$ 0.0009	$ 0.0008	$ 0.0002	$ 0.0024	$ 0.0006	$ 0.0005	$ 0.0001	$ 0.0013	$0.0000	$0.0000	$ 0.0000	$ 0.0002	$0.0002	$0.0001	$ 0.0000	$ 0.0007	$ 0.0018	$ 0.0014	$ 0.0004	$ 0.0046
2011	$ 0.0017	$ 0.0016	$ 0.0004	$ 0.0039	$ 0.0010	$ 0.0009	$ 0.0003	$ 0.0022	$0.0001	$0.0001	$ 0.0000	$ 0.0003	$0.0004	$0.0003	$ 0.0000	$ 0.0013	$ 0.0032	$ 0.0028	$ 0.0007	$ 0.0076
2012	$ 0.0026	$ 0.0023	$ 0.0006	$ 0.0053	$ 0.0015	$ 0.0014	$ 0.0004	$ 0.0031	$0.0001	$0.0001	$ 0.0000	$ 0.0004	$0.0006	$0.0004	$ 0.0001	$ 0.0018	$ 0.0048	$ 0.0042	$ 0.0011	$ 0.0106
2013	$ 0.0171	$ 0.0154	$ 0.0069	$ 0.0336	$ 0.0090	$ 0.0081	$ 0.0038	$ 0.0164	$0.0008	$0.0006	$ 0.0001	$ 0.0026	$0.0036	$0.0024	$ 0.0004	$ 0.0114	$ 0.0306	$ 0.0265	$ 0.0112	$ 0.0640
2014	$ 0.0208	$ 0.0188	$ 0.0086	$ 0.0404	$ 0.0110	$ 0.0099	$ 0.0047	$ 0.0201	$0.0010	$0.0007	$ 0.0001	$ 0.0031	$0.0043	$0.0029	$ 0.0004	$ 0.0137	$ 0.0372	$ 0.0323	$ 0.0138	$ 0.0773
2015	$ 0.0249	$ 0.0230	$ 0.0102	$ 0.0477	$ 0.0132	$ 0.0121	$ 0.0056	$ 0.0238	$0.0012	$0.0008	$ 0.0001	$ 0.0037	$0.0051	$0.0035	$ 0.0005	$ 0.0160	$ 0.0445	$ 0.0394	$ 0.0165	$ 0.0912
2016	$ 0.0291	$ 0.0269	$ 0.0120	$ 0.0556	$ 0.0155	$ 0.0141	$ 0.0067	$ 0.0276	$0.0014	$0.0010	$ 0.0002	$ 0.0043	$0.0060	$0.0040	$ 0.0006	$ 0.0184	$ 0.0519	$ 0.0460	$ 0.0194	$ 0.1059
2017	$ 0.0393	$ 0.0357	$ 0.0148	$ 0.0714	$ 0.0212	$ 0.0189	$ 0.0081	$ 0.0400	$0.0019	$0.0013	$ 0.0002	$ 0.0055	$0.0081	$0.0053	$ 0.0008	$ 0.0259	$ 0.0705	$ 0.0612	$ 0.0238	$ 0.1429
2018	$ 0.0407	$ 0.0372	$ 0.0154	$ 0.0732	$ 0.0219	$ 0.0198	$ 0.0084	$ 0.0412	$0.0019	$0.0013	$ 0.0002	$ 0.0057	$0.0083	$0.0055	$ 0.0008	$ 0.0266	$ 0.0728	$ 0.0639	$ 0.0249	$ 0.1467
2019	$ 0.0423	$ 0.0389	$ 0.0163	$ 0.0757	$ 0.0229	$ 0.0206	$ 0.0090	$ 0.0423	$0.0020	$0.0013	$ 0.0002	$ 0.0059	$0.0086	$0.0057	$ 0.0009	$ 0.0274	$ 0.0757	$ 0.0666	$ 0.0264	$ 0.1512
2020	$ 0.0436	$ 0.0402	$ 0.0167	$ 0.0777	$ 0.0235	$ 0.0211	$ 0.0093	$ 0.0436	$0.0020	$0.0014	$ 0.0002	$ 0.0061	$0.0088	$0.0058	$ 0.0009	$ 0.0279	$ 0.0779	$ 0.0685	$ 0.0271	$ 0.1553
2021	$ 0.0452	$ 0.0417	$ 0.0173	$ 0.0807	$ 0.0244	$ 0.0217	$ 0.0098	$ 0.0458	$0.0021	$0.0014	$ 0.0002	$ 0.0062	$0.0090	$0.0059	$ 0.0009	$ 0.0284	$ 0.0807	$ 0.0707	$ 0.0282	$ 0.1612
2022	$ 0.0532	$ 0.0494	$ 0.0240	$ 0.0887	$ 0.0296	$ 0.0262	$ 0.0124	$ 0.0531	$0.0024	$0.0017	$ 0.0003	$ 0.0068	$0.0109	$0.0072	$ 0.0012	$ 0.0325	$ 0.0961	$ 0.0845	$ 0.0378	$ 0.1810
2023	$ 0.0548	$ 0.0507	$ 0.0247	$ 0.0931	$ 0.0305	$ 0.0268	$ 0.0128	$ 0.0545	$0.0025	$0.0017	$ 0.0003	$ 0.0069	$0.0111	$0.0074	$ 0.0012	$ 0.0337	$ 0.0989	$ 0.0866	$ 0.0390	$ 0.1882
2024	$ 0.0573	$ 0.0533	$ 0.0260	$ 0.0965	$ 0.0318	$ 0.0280	$ 0.0134	$ 0.0564	$0.0026	$0.0018	$ 0.0003	$ 0.0071	$0.0115	$0.0077	$ 0.0012	$ 0.0348	$ 0.1032	$ 0.0907	$ 0.0409	$ 0.1948
2025	$ 0.0589	$ 0.0548	$ 0.0268	$ 0.0994	$ 0.0327	$ 0.0290	$ 0.0138	$ 0.0585	$0.0026	$0.0018	$ 0.0003	$ 0.0073	$0.0118	$0.0078	$ 0.0013	$ 0.0352	$ 0.1060	$ 0.0934	$ 0.0422	$ 0.2004
2026	$ 0.0656	$ 0.0618	$ 0.0297	$ 0.1100	$ 0.0363	$ 0.0322	$ 0.0154	$ 0.0635	$0.0029	$0.0020	$ 0.0003	$ 0.0082	$0.0129	$0.0088	$ 0.0014	$ 0.0383	$ 0.1177	$ 0.1047	$ 0.0468	$ 0.2200
2027	$ 0.0676	$ 0.0641	$ 0.0307	$ 0.1132	$ 0.0375	$ 0.0332	$ 0.0159	$ 0.0663	$0.0030	$0.0020	$ 0.0003	$ 0.0084	$0.0133	$0.0089	$ 0.0014	$ 0.0394	$ 0.1214	$ 0.1083	$ 0.0484	$ 0.2273
2028	$ 0.0697	$ 0.0664	$ 0.0315	$ 0.1171	$ 0.0386	$ 0.0341	$ 0.0163	$ 0.0699	$0.0030	$0.0021	$ 0.0003	$ 0.0086	$0.0135	$0.0090	$ 0.0015	$ 0.0402	$ 0.1248	$ 0.1117	$ 0.0496	$ 0.2359
2029	$ 0.0716	$ 0.0684	$ 0.0326	$ 0.1200	$ 0.0397	$ 0.0353	$ 0.0171	$ 0.0717	$0.0031	$0.0021	$ 0.0004	$ 0.0088	$0.0138	$0.0092	$ 0.0015	$ 0.0412	$ 0.1283	$ 0.1150	$ 0.0516	$ 0.2417

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3b Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving <100 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0002
2009	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0002	$0.0001	$ 0.0000	$ 0.0004	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0009
2010	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0005	$0.0001	$0.0000	$ 0.0000	$ 0.0004	$0.0003	$0.0001	$ 0.0000	$ 0.0011	$ 0.0006	$ 0.0002	$ 0.0000	$ 0.0023
2011	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0005	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0008	$0.0001	$0.0001	$ 0.0000	$ 0.0006	$0.0005	$0.0002	$ 0.0000	$ 0.0021	$ 0.0010	$ 0.0004	$ 0.0001	$ 0.0040
2012	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0007	$ 0.0003	$ 0.0002	$ 0.0000	$ 0.0010	$0.0002	$0.0001	$ 0.0000	$ 0.0008	$0.0008	$0.0003	$ 0.0000	$ 0.0032	$ 0.0015	$ 0.0006	$ 0.0001	$ 0.0057
2013	$ 0.0009	$ 0.0007	$ 0.0002	$ 0.0024	$ 0.0015	$ 0.0011	$ 0.0003	$ 0.0038	$0.0013	$0.0006	$ 0.0001	$ 0.0050	$0.0048	$0.0025	$ 0.0003	$ 0.0170	$ 0.0085	$ 0.0049	$ 0.0008	$ 0.0281
2014	$ 0.0011	$ 0.0008	$ 0.0002	$ 0.0030	$ 0.0018	$ 0.0014	$ 0.0004	$ 0.0046	$0.0015	$0.0007	$ 0.0001	$ 0.0060	$0.0058	$0.0031	$ 0.0004	$ 0.0201	$ 0.0102	$ 0.0060	$ 0.0010	$ 0.0338
2015	$ 0.0014	$ 0.0010	$ 0.0002	$ 0.0037	$ 0.0022	$ 0.0017	$ 0.0005	$ 0.0056	$0.0018	$0.0009	$ 0.0001	$ 0.0070	$0.0069	$0.0039	$ 0.0004	$ 0.0234	$ 0.0124	$ 0.0075	$ 0.0012	$ 0.0397
2016	$ 0.0016	$ 0.0012	$ 0.0003	$ 0.0043	$ 0.0026	$ 0.0020	$ 0.0005	$ 0.0065	$0.0021	$0.0010	$ 0.0001	$ 0.0080	$0.0080	$0.0045	$ 0.0005	$ 0.0270	$ 0.0144	$ 0.0088	$ 0.0015	$ 0.0458
2017	$ 0.0024	$ 0.0015	$ 0.0004	$ 0.0075	$ 0.0038	$ 0.0026	$ 0.0007	$ 0.0102	$0.0031	$0.0014	$ 0.0002	$ 0.0121	$0.0113	$0.0056	$ 0.0006	$ 0.0453	$ 0.0206	$ 0.0111	$ 0.0019	$ 0.0751
2018	$ 0.0025	$ 0.0016	$ 0.0004	$ 0.0076	$ 0.0039	$ 0.0027	$ 0.0008	$ 0.0106	$0.0031	$0.0014	$ 0.0002	$ 0.0124	$0.0117	$0.0059	$ 0.0007	$ 0.0461	$ 0.0213	$ 0.0117	$ 0.0020	$ 0.0767
2019	$ 0.0026	$ 0.0017	$ 0.0004	$ 0.0079	$ 0.0041	$ 0.0028	$ 0.0008	$ 0.0109	$0.0032	$0.0015	$ 0.0002	$ 0.0130	$0.0120	$0.0061	$ 0.0007	$ 0.0469	$ 0.0220	$ 0.0121	$ 0.0021	$ 0.0787
2020	$ 0.0027	$ 0.0017	$ 0.0005	$ 0.0081	$ 0.0042	$ 0.0029	$ 0.0009	$ 0.0111	$0.0033	$0.0015	$ 0.0002	$ 0.0135	$0.0123	$0.0062	$ 0.0007	$ 0.0473	$ 0.0225	$ 0.0124	$ 0.0022	$ 0.0800
2021	$ 0.0028	$ 0.0018	$ 0.0005	$ 0.0088	$ 0.0045	$ 0.0030	$ 0.0009	$ 0.0117	$0.0034	$0.0016	$ 0.0002	$ 0.0140	$0.0128	$0.0063	$ 0.0007	$ 0.0497	$ 0.0236	$ 0.0127	$ 0.0023	$ 0.0841
2022	$ 0.0033	$ 0.0022	$ 0.0007	$ 0.0096	$ 0.0053	$ 0.0037	$ 0.0012	$ 0.0133	$0.0040	$0.0019	$ 0.0002	$ 0.0156	$0.0149	$0.0079	$ 0.0008	$ 0.0578	$ 0.0275	$ 0.0157	$ 0.0029	$ 0.0962
2023	$ 0.0034	$ 0.0023	$ 0.0007	$ 0.0098	$ 0.0054	$ 0.0038	$ 0.0012	$ 0.0136	$0.0040	$0.0019	$ 0.0002	$ 0.0157	$0.0151	$0.0080	$ 0.0009	$ 0.0589	$ 0.0280	$ 0.0161	$ 0.0030	$ 0.0979
2024	$ 0.0036	$ 0.0024	$ 0.0007	$ 0.0101	$ 0.0057	$ 0.0040	$ 0.0013	$ 0.0139	$0.0042	$0.0020	$ 0.0002	$ 0.0160	$0.0156	$0.0082	$ 0.0009	$ 0.0599	$ 0.0290	$ 0.0166	$ 0.0031	$ 0.0999
2025	$ 0.0037	$ 0.0024	$ 0.0007	$ 0.0103	$ 0.0058	$ 0.0041	$ 0.0013	$ 0.0141	$0.0042	$0.0020	$ 0.0002	$ 0.0162	$0.0159	$0.0084	$ 0.0009	$ 0.0605	$ 0.0296	$ 0.0170	$ 0.0032	$ 0.1011
2026	$ 0.0040	$ 0.0027	$ 0.0009	$ 0.0112	$ 0.0063	$ 0.0045	$ 0.0015	$ 0.0154	$0.0046	$0.0022	$ 0.0003	$ 0.0170	$0.0172	$0.0090	$ 0.0010	$ 0.0657	$ 0.0321	$ 0.0185	$ 0.0036	$ 0.1093
2027	$ 0.0041	$ 0.0029	$ 0.0009	$ 0.0114	$ 0.0065	$ 0.0046	$ 0.0015	$ 0.0158	$0.0047	$0.0023	$ 0.0003	$ 0.0172	$0.0175	$0.0092	$ 0.0010	$ 0.0665	$ 0.0328	$ 0.0189	$ 0.0037	$ 0.1108
2028	$ 0.0042	$ 0.0029	$ 0.0009	$ 0.0117	$ 0.0067	$ 0.0047	$ 0.0016	$ 0.0162	$0.0047	$0.0023	$ 0.0003	$ 0.0173	$0.0178	$0.0093	$ 0.0010	$ 0.0673	$ 0.0334	$ 0.0192	$ 0.0037	$ 0.1124
2029	$ 0.0045	$ 0.0030	$ 0.0009	$ 0.0122	$ 0.0071	$ 0.0049	$ 0.0016	$ 0.0171	$0.0049	$0.0024	$ 0.0003	$ 0.0178	$0.0185	$0.0095	$ 0.0010	$ 0.0679	$ 0.0350	$ 0.0198	$ 0.0038	$ 0.1150

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3c Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 101-500 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0003	$ 0.0002	$ 0.0000	$ 0.0009	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0006	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$ 0.0006	$ 0.0004	$ 0.0000	$ 0.0018
2009	$ 0.0014	$ 0.0011	$ 0.0002	$ 0.0036	$ 0.0008	$ 0.0006	$ 0.0001	$ 0.0021	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$0.0003	$0.0002	$ 0.0000	$ 0.0012	$ 0.0026	$ 0.0019	$ 0.0004	$ 0.0072
2010	$ 0.0031	$ 0.0026	$ 0.0006	$ 0.0084	$ 0.0018	$ 0.0015	$ 0.0003	$ 0.0042	$0.0002	$0.0001	$ 0.0000	$ 0.0006	$0.0007	$0.0004	$ 0.0000	$ 0.0026	$ 0.0058	$ 0.0046	$ 0.0009	$ 0.0157
2011	$ 0.0056	$ 0.0049	$ 0.0011	$ 0.0128	$ 0.0032	$ 0.0028	$ 0.0006	$ 0.0073	$0.0003	$0.0002	$ 0.0000	$ 0.0010	$0.0013	$0.0008	$ 0.0001	$ 0.0041	$ 0.0103	$ 0.0087	$ 0.0017	$ 0.0252
2012	$ 0.0411	$ 0.0368	$ 0.0179	$ 0.0777	$ 0.0217	$ 0.0192	$ 0.0087	$ 0.0416	$0.0020	$0.0015	$ 0.0002	$ 0.0055	$0.0082	$0.0062	$ 0.0010	$ 0.0230	$ 0.0729	$ 0.0637	$ 0.0278	$ 0.1478
2013	$ 0.0517	$ 0.0465	$ 0.0224	$ 0.0959	$ 0.0273	$ 0.0243	$ 0.0111	$ 0.0513	$0.0024	$0.0019	$ 0.0003	$ 0.0069	$0.0103	$0.0079	$ 0.0012	$ 0.0284	$ 0.0918	$ 0.0806	$ 0.0350	$ 0.1825
2014	$ 0.0631	$ 0.0571	$ 0.0276	$ 0.1156	$ 0.0335	$ 0.0302	$ 0.0137	$ 0.0624	$0.0030	$0.0022	$ 0.0004	$ 0.0083	$0.0125	$0.0095	$ 0.0015	$ 0.0343	$ 0.1121	$ 0.0990	$ 0.0432	$ 0.2206
2015	$ 0.0760	$ 0.0695	$ 0.0332	$ 0.1373	$ 0.0404	$ 0.0366	$ 0.0168	$ 0.0736	$0.0035	$0.0027	$ 0.0004	$ 0.0098	$0.0150	$0.0115	$ 0.0018	$ 0.0406	$ 0.1349	$ 0.1202	$ 0.0522	$ 0.2612
2016	$ 0.0887	$ 0.0814	$ 0.0389	$ 0.1594	$ 0.0473	$ 0.0426	$ 0.0193	$ 0.0880	$0.0041	$0.0031	$ 0.0005	$ 0.0113	$0.0174	$0.0134	$ 0.0021	$ 0.0493	$ 0.1575	$ 0.1405	$ 0.0608	$ 0.3081
2017	$ 0.1205	$ 0.1098	$ 0.0509	$ 0.2229	$ 0.0648	$ 0.0576	$ 0.0256	$ 0.1207	$0.0056	$0.0041	$ 0.0007	$ 0.0158	$0.0238	$0.0167	$ 0.0027	$ 0.0651	$ 0.2146	$ 0.1882	$ 0.0798	$ 0.4245
2018	$ 0.1249	$ 0.1139	$ 0.0530	$ 0.2291	$ 0.0669	$ 0.0592	$ 0.0264	$ 0.1243	$0.0057	$0.0042	$ 0.0007	$ 0.0163	$0.0244	$0.0172	$ 0.0029	$ 0.0667	$ 0.2219	$ 0.1945	$ 0.0830	$ 0.4363
2019	$ 0.1298	$ 0.1187	$ 0.0561	$ 0.2373	$ 0.0698	$ 0.0617	$ 0.0277	$ 0.1282	$0.0059	$0.0043	$ 0.0007	$ 0.0166	$0.0253	$0.0183	$ 0.0029	$ 0.0694	$ 0.2308	$ 0.2029	$ 0.0875	$ 0.4514
2020	$ 0.1339	$ 0.1221	$ 0.0575	$ 0.2439	$ 0.0720	$ 0.0636	$ 0.0285	$ 0.1343	$0.0061	$0.0044	$ 0.0008	$ 0.0170	$0.0260	$0.0186	$ 0.0030	$ 0.0710	$ 0.2379	$ 0.2087	$ 0.0898	$ 0.4662
2021	$ 0.1588	$ 0.1475	$ 0.0783	$ 0.2732	$ 0.0883	$ 0.0780	$ 0.0358	$ 0.1639	$0.0072	$0.0054	$ 0.0009	$ 0.0198	$0.0315	$0.0231	$ 0.0038	$ 0.0884	$ 0.2858	$ 0.2540	$ 0.1188	$ 0.5453
2022	$ 0.1643	$ 0.1547	$ 0.0813	$ 0.2796	$ 0.0913	$ 0.0811	$ 0.0373	$ 0.1685	$0.0074	$0.0055	$ 0.0009	$ 0.0204	$0.0323	$0.0235	$ 0.0039	$ 0.0908	$ 0.2954	$ 0.2649	$ 0.1234	$ 0.5594
2023	$ 0.1693	$ 0.1584	$ 0.0831	$ 0.2899	$ 0.0942	$ 0.0837	$ 0.0382	$ 0.1739	$0.0076	$0.0056	$ 0.0009	$ 0.0213	$0.0331	$0.0238	$ 0.0040	$ 0.0929	$ 0.3042	$ 0.2716	$ 0.1262	$ 0.5781
2024	$ 0.1774	$ 0.1667	$ 0.0870	$ 0.3010	$ 0.0983	$ 0.0879	$ 0.0402	$ 0.1800	$0.0079	$0.0059	$ 0.0010	$ 0.0222	$0.0343	$0.0251	$ 0.0041	$ 0.0955	$ 0.3179	$ 0.2856	$ 0.1323	$ 0.5986
2025	$ 0.1823	$ 0.1706	$ 0.0897	$ 0.3075	$ 0.1011	$ 0.0904	$ 0.0416	$ 0.1847	$0.0080	$0.0060	$ 0.0010	$ 0.0227	$0.0351	$0.0259	$ 0.0042	$ 0.0991	$ 0.3265	$ 0.2928	$ 0.1365	$ 0.6139
2026	$ 0.2023	$ 0.1896	$ 0.1007	$ 0.3401	$ 0.1122	$ 0.1013	$ 0.0472	$ 0.2081	$0.0088	$0.0066	$ 0.0011	$ 0.0253	$0.0387	$0.0279	$ 0.0049	$ 0.1096	$ 0.3620	$ 0.3254	$ 0.1539	$ 0.6831
2027	$ 0.2091	$ 0.1956	$ 0.1039	$ 0.3502	$ 0.1161	$ 0.1048	$ 0.0485	$ 0.2143	$0.0090	$0.0067	$ 0.0011	$ 0.0260	$0.0397	$0.0287	$ 0.0049	$ 0.1113	$ 0.3739	$ 0.3359	$ 0.1585	$ 0.7018
2028	$ 0.2149	$ 0.2001	$ 0.1062	$ 0.3622	$ 0.1192	$ 0.1072	$ 0.0498	$ 0.2197	$0.0092	$0.0068	$ 0.0012	$ 0.0272	$0.0405	$0.0292	$ 0.0051	$ 0.1144	$ 0.3838	$ 0.3433	$ 0.1623	$ 0.7235
2029	$ 0.2212	$ 0.2066	$ 0.1096	$ 0.3708	$ 0.1230	$ 0.1107	$ 0.0517	$ 0.2261	$0.0094	$0.0070	$ 0.0012	$ 0.0277	$0.0414	$0.0299	$ 0.0052	$ 0.1156	$ 0.3950	$ 0.3542	$ 0.1676	$ 0.7402

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3d Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 101-500 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0000	$ 0.0000	$ 0.0004	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0006
2009	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0003	$0.0001	$0.0000	$ 0.0000	$ 0.0004	$0.0004	$0.0001	$ 0.0000	$ 0.0015	$ 0.0008	$ 0.0003	$ 0.0000	$ 0.0025
2010	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0008	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0014	$0.0002	$0.0001	$ 0.0000	$ 0.0008	$0.0008	$0.0003	$ 0.0000	$ 0.0032	$ 0.0017	$ 0.0006	$ 0.0001	$ 0.0062
2011	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0013	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0019	$0.0003	$0.0001	$ 0.0000	$ 0.0012	$0.0013	$0.0006	$ 0.0000	$ 0.0047	$ 0.0026	$ 0.0012	$ 0.0002	$ 0.0091
2012	$ 0.0022	$ 0.0015	$ 0.0005	$ 0.0061	$ 0.0033	$ 0.0026	$ 0.0009	$ 0.0086	$0.0027	$0.0015	$ 0.0002	$ 0.0093	$0.0105	$0.0056	$ 0.0007	$ 0.0380	$ 0.0187	$ 0.0112	$ 0.0022	$ 0.0620
2013	$ 0.0028	$ 0.0020	$ 0.0006	$ 0.0082	$ 0.0044	$ 0.0034	$ 0.0011	$ 0.0109	$0.0034	$0.0019	$ 0.0003	$ 0.0125	$0.0135	$0.0072	$ 0.0009	$ 0.0541	$ 0.0241	$ 0.0145	$ 0.0029	$ 0.0856
2014	$ 0.0034	$ 0.0024	$ 0.0007	$ 0.0099	$ 0.0053	$ 0.0042	$ 0.0014	$ 0.0132	$0.0041	$0.0023	$ 0.0003	$ 0.0152	$0.0163	$0.0088	$ 0.0011	$ 0.0657	$ 0.0292	$ 0.0177	$ 0.0036	$ 0.1040
2015	$ 0.0043	$ 0.0030	$ 0.0009	$ 0.0121	$ 0.0066	$ 0.0050	$ 0.0017	$ 0.0159	$0.0050	$0.0028	$ 0.0004	$ 0.0190	$0.0197	$0.0108	$ 0.0013	$ 0.0789	$ 0.0356	$ 0.0217	$ 0.0043	$ 0.1260
2016	$ 0.0050	$ 0.0035	$ 0.0010	$ 0.0144	$ 0.0078	$ 0.0059	$ 0.0019	$ 0.0187	$0.0058	$0.0033	$ 0.0005	$ 0.0219	$0.0229	$0.0129	$ 0.0015	$ 0.0907	$ 0.0414	$ 0.0256	$ 0.0050	$ 0.1456
2017	$ 0.0073	$ 0.0045	$ 0.0014	$ 0.0211	$ 0.0111	$ 0.0070	$ 0.0028	$ 0.0287	$0.0076	$0.0042	$ 0.0006	$ 0.0285	$0.0297	$0.0170	$ 0.0022	$ 0.1241	$ 0.0558	$ 0.0327	$ 0.0070	$ 0.2025
2018	$ 0.0076	$ 0.0047	$ 0.0015	$ 0.0216	$ 0.0115	$ 0.0074	$ 0.0029	$ 0.0294	$0.0078	$0.0043	$ 0.0007	$ 0.0293	$0.0307	$0.0175	$ 0.0023	$ 0.1284	$ 0.0576	$ 0.0340	$ 0.0074	$ 0.2086
2019	$ 0.0079	$ 0.0050	$ 0.0015	$ 0.0222	$ 0.0120	$ 0.0082	$ 0.0031	$ 0.0300	$0.0081	$0.0045	$ 0.0007	$ 0.0297	$0.0318	$0.0185	$ 0.0025	$ 0.1360	$ 0.0598	$ 0.0361	$ 0.0078	$ 0.2179
2020	$ 0.0081	$ 0.0051	$ 0.0016	$ 0.0227	$ 0.0123	$ 0.0084	$ 0.0031	$ 0.0306	$0.0083	$0.0046	$ 0.0007	$ 0.0300	$0.0323	$0.0190	$ 0.0026	$ 0.1372	$ 0.0610	$ 0.0371	$ 0.0080	$ 0.2204
2021	$ 0.0098	$ 0.0064	$ 0.0020	$ 0.0270	$ 0.0151	$ 0.0105	$ 0.0041	$ 0.0382	$0.0102	$0.0058	$ 0.0009	$ 0.0373	$0.0398	$0.0238	$ 0.0033	$ 0.1687	$ 0.0749	$ 0.0465	$ 0.0103	$ 0.2713
2022	$ 0.0103	$ 0.0067	$ 0.0021	$ 0.0279	$ 0.0158	$ 0.0110	$ 0.0043	$ 0.0390	$0.0105	$0.0061	$ 0.0009	$ 0.0386	$0.0411	$0.0243	$ 0.0034	$ 0.1801	$ 0.0777	$ 0.0481	$ 0.0107	$ 0.2855
2023	$ 0.0105	$ 0.0069	$ 0.0022	$ 0.0284	$ 0.0162	$ 0.0113	$ 0.0044	$ 0.0396	$0.0106	$0.0061	$ 0.0009	$ 0.0391	$0.0417	$0.0247	$ 0.0034	$ 0.1819	$ 0.0790	$ 0.0490	$ 0.0110	$ 0.2891
2024	$ 0.0109	$ 0.0071	$ 0.0023	$ 0.0290	$ 0.0168	$ 0.0117	$ 0.0046	$ 0.0404	$0.0109	$0.0062	$ 0.0010	$ 0.0398	$0.0428	$0.0259	$ 0.0036	$ 0.1849	$ 0.0815	$ 0.0510	$ 0.0115	$ 0.2940
2025	$ 0.0112	$ 0.0073	$ 0.0024	$ 0.0296	$ 0.0172	$ 0.0121	$ 0.0047	$ 0.0411	$0.0111	$0.0064	$ 0.0010	$ 0.0403	$0.0435	$0.0263	$ 0.0037	$ 0.1913	$ 0.0830	$ 0.0521	$ 0.0118	$ 0.3023
2026	$ 0.0122	$ 0.0081	$ 0.0027	$ 0.0328	$ 0.0189	$ 0.0133	$ 0.0053	$ 0.0450	$0.0120	$0.0072	$ 0.0012	$ 0.0427	$0.0472	$0.0295	$ 0.0041	$ 0.2060	$ 0.0903	$ 0.0580	$ 0.0132	$ 0.3266
2027	$ 0.0125	$ 0.0084	$ 0.0028	$ 0.0334	$ 0.0194	$ 0.0137	$ 0.0054	$ 0.0459	$0.0122	$0.0073	$ 0.0012	$ 0.0432	$0.0482	$0.0300	$ 0.0042	$ 0.2095	$ 0.0923	$ 0.0594	$ 0.0136	$ 0.3321
2028	$ 0.0129	$ 0.0086	$ 0.0028	$ 0.0344	$ 0.0198	$ 0.0141	$ 0.0056	$ 0.0473	$0.0124	$0.0074	$ 0.0012	$ 0.0438	$0.0490	$0.0303	$ 0.0043	$ 0.2139	$ 0.0941	$ 0.0604	$ 0.0139	$ 0.3393
2029	$ 0.0138	$ 0.0088	$ 0.0029	$ 0.0355	$ 0.0211	$ 0.0145	$ 0.0057	$ 0.0490	$0.0129	$0.0076	$ 0.0012	$ 0.0453	$0.0508	$0.0306	$ 0.0044	$ 0.2192	$ 0.0985	$ 0.0615	$ 0.0143	$ 0.3490

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3e Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 501-1,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0002	$ 0.0002	$ 0.0000	$ 0.0007	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0005	$0.0000	$0.0000	$ 0.0000	$ 0.0000	$0.0001	$0.0000	$ 0.0000	$ 0.0002	$ 0.0005	$ 0.0003	$ 0.0000	$ 0.0015
2009	$ 0.0012	$ 0.0009	$ 0.0003	$ 0.0032	$ 0.0007	$ 0.0005	$ 0.0001	$ 0.0017	$0.0001	$0.0000	$ 0.0000	$ 0.0002	$0.0003	$0.0002	$ 0.0000	$ 0.0010	$ 0.0022	$ 0.0016	$ 0.0004	$ 0.0062
2010	$ 0.0026	$ 0.0021	$ 0.0006	$ 0.0070	$ 0.0015	$ 0.0012	$ 0.0003	$ 0.0038	$0.0001	$0.0001	$ 0.0000	$ 0.0005	$0.0006	$0.0004	$ 0.0000	$ 0.0020	$ 0.0049	$ 0.0038	$ 0.0009	$ 0.0134
2011	$ 0.0047	$ 0.0040	$ 0.0012	$ 0.0109	$ 0.0028	$ 0.0024	$ 0.0007	$ 0.0064	$0.0002	$0.0002	$ 0.0000	$ 0.0008	$0.0011	$0.0007	$ 0.0001	$ 0.0035	$ 0.0089	$ 0.0073	$ 0.0020	$ 0.0215
2012	$ 0.0341	$ 0.0306	$ 0.0147	$ 0.0674	$ 0.0190	$ 0.0164	$ 0.0073	$ 0.0379	$0.0017	$0.0012	$ 0.0002	$ 0.0050	$0.0077	$0.0051	$ 0.0008	$ 0.0231	$ 0.0625	$ 0.0533	$ 0.0229	$ 0.1335
2013	$ 0.0428	$ 0.0384	$ 0.0185	$ 0.0838	$ 0.0240	$ 0.0211	$ 0.0093	$ 0.0474	$0.0022	$0.0015	$ 0.0002	$ 0.0062	$0.0096	$0.0064	$ 0.0009	$ 0.0286	$ 0.0785	$ 0.0674	$ 0.0290	$ 0.1660
2014	$ 0.0520	$ 0.0466	$ 0.0229	$ 0.1005	$ 0.0292	$ 0.0255	$ 0.0118	$ 0.0566	$0.0026	$0.0018	$ 0.0002	$ 0.0073	$0.0116	$0.0078	$ 0.0011	$ 0.0341	$ 0.0954	$ 0.0816	$ 0.0360	$ 0.1986
2015	$ 0.0840	$ 0.0759	$ 0.0344	$ 0.1543	$ 0.0477	$ 0.0410	$ 0.0177	$ 0.0951	$0.0042	$0.0028	$ 0.0004	$ 0.0122	$0.0190	$0.0118	$ 0.0017	$ 0.0574	$ 0.1549	$ 0.1315	$ 0.0542	$ 0.3190
2016	$ 0.0977	$ 0.0882	$ 0.0400	$ 0.1785	$ 0.0553	$ 0.0475	$ 0.0205	$ 0.1092	$0.0048	$0.0033	$ 0.0005	$ 0.0141	$0.0218	$0.0137	$ 0.0019	$ 0.0660	$ 0.1797	$ 0.1526	$ 0.0629	$ 0.3678
2017	$ 0.1007	$ 0.0906	$ 0.0412	$ 0.1846	$ 0.0573	$ 0.0492	$ 0.0211	$ 0.1142	$0.0049	$0.0034	$ 0.0005	$ 0.0148	$0.0225	$0.0140	$ 0.0020	$ 0.0682	$ 0.1854	$ 0.1571	$ 0.0648	$ 0.3817
2018	$ 0.1044	$ 0.0942	$ 0.0427	$ 0.1901	$ 0.0591	$ 0.0507	$ 0.0218	$ 0.1173	$0.0051	$0.0034	$ 0.0005	$ 0.0152	$0.0230	$0.0143	$ 0.0020	$ 0.0705	$ 0.1916	$ 0.1627	$ 0.0670	$ 0.3930
2019	$ 0.1243	$ 0.1146	$ 0.0607	$ 0.2097	$ 0.0712	$ 0.0608	$ 0.0310	$ 0.1321	$0.0060	$0.0042	$ 0.0007	$ 0.0171	$0.0274	$0.0175	$ 0.0026	$ 0.0773	$ 0.2289	$ 0.1972	$ 0.0950	$ 0.4362
2020	$ 0.1278	$ 0.1174	$ 0.0619	$ 0.2152	$ 0.0733	$ 0.0629	$ 0.0317	$ 0.1378	$0.0061	$0.0043	$ 0.0007	$ 0.0173	$0.0280	$0.0178	$ 0.0027	$ 0.0798	$ 0.2352	$ 0.2024	$ 0.0970	$ 0.4500
2021	$ 0.1323	$ 0.1218	$ 0.0636	$ 0.2236	$ 0.0758	$ 0.0649	$ 0.0328	$ 0.1411	$0.0063	$0.0044	$ 0.0007	$ 0.0176	$0.0287	$0.0184	$ 0.0027	$ 0.0809	$ 0.2430	$ 0.2095	$ 0.0999	$ 0.4632
2022	$ 0.1480	$ 0.1369	$ 0.0706	$ 0.2593	$ 0.0848	$ 0.0727	$ 0.0371	$ 0.1564	$0.0069	$0.0049	$ 0.0007	$ 0.0192	$0.0319	$0.0212	$ 0.0030	$ 0.0920	$ 0.2717	$ 0.2357	$ 0.1115	$ 0.5269
2023	$ 0.1521	$ 0.1408	$ 0.0723	$ 0.2657	$ 0.0871	$ 0.0753	$ 0.0380	$ 0.1603	$0.0071	$0.0050	$ 0.0008	$ 0.0195	$0.0326	$0.0216	$ 0.0031	$ 0.0937	$ 0.2788	$ 0.2428	$ 0.1141	$ 0.5392
2024	$ 0.1588	$ 0.1473	$ 0.0747	$ 0.2768	$ 0.0905	$ 0.0795	$ 0.0394	$ 0.1668	$0.0073	$0.0052	$ 0.0008	$ 0.0202	$0.0335	$0.0221	$ 0.0032	$ 0.0989	$ 0.2902	$ 0.2541	$ 0.1181	$ 0.5627
2025	$ 0.1631	$ 0.1511	$ 0.0764	$ 0.2827	$ 0.0931	$ 0.0823	$ 0.0404	$ 0.1722	$0.0074	$0.0053	$ 0.0008	$ 0.0206	$0.0342	$0.0227	$ 0.0033	$ 0.1003	$ 0.2979	$ 0.2615	$ 0.1210	$ 0.5758
2026	$ 0.1735	$ 0.1606	$ 0.0835	$ 0.2946	$ 0.0994	$ 0.0867	$ 0.0441	$ 0.1832	$0.0079	$0.0057	$ 0.0008	$ 0.0215	$0.0362	$0.0245	$ 0.0034	$ 0.1040	$ 0.3170	$ 0.2775	$ 0.1319	$ 0.6034
2027	$ 0.1795	$ 0.1662	$ 0.0857	$ 0.3048	$ 0.1027	$ 0.0910	$ 0.0455	$ 0.1919	$0.0081	$0.0058	$ 0.0009	$ 0.0225	$0.0371	$0.0250	$ 0.0035	$ 0.1071	$ 0.3274	$ 0.2881	$ 0.1355	$ 0.6263
2028	$ 0.1852	$ 0.1700	$ 0.0875	$ 0.3137	$ 0.1057	$ 0.0930	$ 0.0465	$ 0.1965	$0.0082	$0.0059	$ 0.0009	$ 0.0230	$0.0379	$0.0256	$ 0.0035	$ 0.1094	$ 0.3371	$ 0.2945	$ 0.1385	$ 0.6426
2029	$ 0.1982	$ 0.1826	$ 0.0942	$ 0.3319	$ 0.1125	$ 0.0979	$ 0.0489	$ 0.2108	$0.0087	$0.0063	$ 0.0009	$ 0.0243	$0.0400	$0.0265	$ 0.0037	$ 0.1161	$ 0.3594	$ 0.3132	$ 0.1478	$ 0.6831

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3f Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 501-1,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0000	$ 0.0000	$ 0.0004	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0006
2009	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0006	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0009	$0.0001	$0.0000	$ 0.0000	$ 0.0006	$0.0006	$0.0001	$ 0.0000	$ 0.0020	$ 0.0011	$ 0.0002	$ 0.0000	$ 0.0041
2010	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0013	$ 0.0004	$ 0.0001	$ 0.0000	$ 0.0017	$0.0003	$0.0001	$ 0.0000	$ 0.0013	$0.0011	$0.0002	$ 0.0000	$ 0.0045	$ 0.0020	$ 0.0005	$ 0.0001	$ 0.0088
2011	$ 0.0004	$ 0.0001	$ 0.0000	$ 0.0018	$ 0.0006	$ 0.0002	$ 0.0001	$ 0.0024	$0.0004	$0.0001	$ 0.0000	$ 0.0018	$0.0017	$0.0004	$ 0.0000	$ 0.0066	$ 0.0031	$ 0.0009	$ 0.0002	$ 0.0126
2012	$ 0.0017	$ 0.0013	$ 0.0003	$ 0.0045	$ 0.0028	$ 0.0023	$ 0.0006	$ 0.0065	$0.0021	$0.0011	$ 0.0001	$ 0.0073	$0.0081	$0.0044	$ 0.0005	$ 0.0263	$ 0.0148	$ 0.0092	$ 0.0015	$ 0.0446
2013	$ 0.0023	$ 0.0017	$ 0.0005	$ 0.0064	$ 0.0037	$ 0.0029	$ 0.0008	$ 0.0092	$0.0028	$0.0014	$ 0.0001	$ 0.0095	$0.0107	$0.0056	$ 0.0006	$ 0.0356	$ 0.0195	$ 0.0116	$ 0.0020	$ 0.0607
2014	$ 0.0028	$ 0.0020	$ 0.0006	$ 0.0080	$ 0.0045	$ 0.0035	$ 0.0010	$ 0.0117	$0.0033	$0.0018	$ 0.0001	$ 0.0113	$0.0130	$0.0069	$ 0.0007	$ 0.0444	$ 0.0236	$ 0.0142	$ 0.0024	$ 0.0755
2015	$ 0.0044	$ 0.0032	$ 0.0009	$ 0.0126	$ 0.0070	$ 0.0052	$ 0.0015	$ 0.0187	$0.0051	$0.0028	$ 0.0003	$ 0.0165	$0.0196	$0.0108	$ 0.0012	$ 0.0591	$ 0.0360	$ 0.0219	$ 0.0039	$ 0.1069
2016	$ 0.0051	$ 0.0037	$ 0.0010	$ 0.0149	$ 0.0081	$ 0.0060	$ 0.0018	$ 0.0220	$0.0059	$0.0032	$ 0.0003	$ 0.0192	$0.0226	$0.0124	$ 0.0014	$ 0.0678	$ 0.0417	$ 0.0253	$ 0.0045	$ 0.1240
2017	$ 0.0064	$ 0.0037	$ 0.0011	$ 0.0219	$ 0.0099	$ 0.0061	$ 0.0018	$ 0.0286	$0.0073	$0.0033	$ 0.0003	$ 0.0244	$0.0270	$0.0126	$ 0.0015	$ 0.0867	$ 0.0506	$ 0.0257	$ 0.0046	$ 0.1617
2018	$ 0.0066	$ 0.0039	$ 0.0011	$ 0.0224	$ 0.0102	$ 0.0064	$ 0.0019	$ 0.0292	$0.0075	$0.0034	$ 0.0003	$ 0.0248	$0.0277	$0.0131	$ 0.0015	$ 0.0882	$ 0.0520	$ 0.0268	$ 0.0048	$ 0.1645
2019	$ 0.0080	$ 0.0052	$ 0.0014	$ 0.0245	$ 0.0125	$ 0.0083	$ 0.0028	$ 0.0325	$0.0089	$0.0044	$ 0.0004	$ 0.0277	$0.0336	$0.0170	$ 0.0022	$ 0.1082	$ 0.0630	$ 0.0349	$ 0.0068	$ 0.1929
2020	$ 0.0082	$ 0.0053	$ 0.0015	$ 0.0249	$ 0.0127	$ 0.0085	$ 0.0029	$ 0.0330	$0.0090	$0.0044	$ 0.0004	$ 0.0282	$0.0341	$0.0173	$ 0.0022	$ 0.1091	$ 0.0640	$ 0.0355	$ 0.0069	$ 0.1952
2021	$ 0.0086	$ 0.0054	$ 0.0015	$ 0.0292	$ 0.0134	$ 0.0088	$ 0.0029	$ 0.0396	$0.0094	$0.0045	$ 0.0004	$ 0.0293	$0.0357	$0.0176	$ 0.0022	$ 0.1228	$ 0.0671	$ 0.0363	$ 0.0071	$ 0.2208
2022	$ 0.0136	$ 0.0060	$ 0.0018	$ 0.0701	$ 0.0212	$ 0.0099	$ 0.0035	$ 0.1021	$0.0134	$0.0051	$ 0.0005	$ 0.0627	$0.0523	$0.0209	$ 0.0025	$ 0.2042	$ 0.1005	$ 0.0419	$ 0.0082	$ 0.4392
2023	$ 0.0139	$ 0.0062	$ 0.0018	$ 0.0713	$ 0.0216	$ 0.0101	$ 0.0035	$ 0.1037	$0.0135	$0.0052	$ 0.0005	$ 0.0632	$0.0529	$0.0212	$ 0.0025	$ 0.2068	$ 0.1020	$ 0.0427	$ 0.0084	$ 0.4450
2024	$ 0.0142	$ 0.0064	$ 0.0019	$ 0.0725	$ 0.0221	$ 0.0104	$ 0.0036	$ 0.1054	$0.0137	$0.0055	$ 0.0005	$ 0.0638	$0.0538	$0.0217	$ 0.0026	$ 0.2092	$ 0.1039	$ 0.0439	$ 0.0086	$ 0.4509
2025	$ 0.0145	$ 0.0065	$ 0.0020	$ 0.0737	$ 0.0226	$ 0.0107	$ 0.0037	$ 0.1071	$0.0139	$0.0056	$ 0.0005	$ 0.0643	$0.0545	$0.0222	$ 0.0026	$ 0.2139	$ 0.1055	$ 0.0450	$ 0.0088	$ 0.4590
2026	$ 0.0151	$ 0.0069	$ 0.0021	$ 0.0761	$ 0.0236	$ 0.0114	$ 0.0038	$ 0.1104	$0.0144	$0.0058	$ 0.0005	$ 0.0659	$0.0566	$0.0232	$ 0.0027	$ 0.2294	$ 0.1098	$ 0.0474	$ 0.0091	$ 0.4818
2027	$ 0.0155	$ 0.0071	$ 0.0021	$ 0.0774	$ 0.0241	$ 0.0117	$ 0.0039	$ 0.1123	$0.0146	$0.0059	$ 0.0005	$ 0.0665	$0.0575	$0.0235	$ 0.0028	$ 0.2321	$ 0.1117	$ 0.0483	$ 0.0094	$ 0.4883
2028	$ 0.0158	$ 0.0073	$ 0.0022	$ 0.0790	$ 0.0246	$ 0.0120	$ 0.0040	$ 0.1147	$0.0148	$0.0060	$ 0.0006	$ 0.0675	$0.0584	$0.0238	$ 0.0028	$ 0.2352	$ 0.1136	$ 0.0491	$ 0.0096	$ 0.4963
2029	$ 0.0169	$ 0.0076	$ 0.0023	$ 0.0857	$ 0.0262	$ 0.0126	$ 0.0041	$ 0.1292	$0.0158	$0.0061	$ 0.0006	$ 0.0695	$0.0618	$0.0247	$ 0.0030	$ 0.2472	$ 0.1209	$ 0.0510	$ 0.0100	$ 0.5316

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3g Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 1,001-3,300 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0002	$ 0.0002	$ 0.0000	$ 0.0007	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0004	$0.0000	$0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0002	$ 0.0004	$ 0.0003	$ 0.0000	$ 0.0013
2009	$ 0.0101	$ 0.0090	$ 0.0038	$ 0.0206	$ 0.0052	$ 0.0046	$ 0.0020	$ 0.0109	$0.0005	$0.0004	$ 0.0000	$ 0.0014	$0.0020	$0.0016	$ 0.0002	$ 0.0056	$ 0.0178	$ 0.0155	$ 0.0061	$ 0.0385
2010	$ 0.0161	$ 0.0143	$ 0.0061	$ 0.0322	$ 0.0083	$ 0.0075	$ 0.0033	$ 0.0173	$0.0008	$0.0006	$ 0.0001	$ 0.0022	$0.0032	$0.0025	$ 0.0003	$ 0.0086	$ 0.0284	$ 0.0250	$ 0.0097	$ 0.0602
2011	$ 0.0313	$ 0.0291	$ 0.0125	$ 0.0572	$ 0.0164	$ 0.0146	$ 0.0063	$ 0.0330	$0.0015	$0.0012	$ 0.0001	$ 0.0041	$0.0061	$0.0049	$ 0.0006	$ 0.0163	$ 0.0553	$ 0.0498	$ 0.0195	$ 0.1106
2012	$ 0.0476	$ 0.0449	$ 0.0215	$ 0.0807	$ 0.0264	$ 0.0234	$ 0.0115	$ 0.0516	$0.0023	$0.0018	$ 0.0002	$ 0.0062	$0.0099	$0.0078	$ 0.0010	$ 0.0263	$ 0.0862	$ 0.0779	$ 0.0342	$ 0.1649
2013	$ 0.0593	$ 0.0561	$ 0.0272	$ 0.1001	$ 0.0330	$ 0.0291	$ 0.0145	$ 0.0634	$0.0028	$0.0023	$ 0.0003	$ 0.0077	$0.0122	$0.0095	$ 0.0012	$ 0.0322	$ 0.1072	$ 0.0971	$ 0.0432	$ 0.2034
2014	$ 0.0794	$ 0.0761	$ 0.0379	$ 0.1359	$ 0.0441	$ 0.0398	$ 0.0198	$ 0.0819	$0.0037	$0.0030	$ 0.0004	$ 0.0101	$0.0162	$0.0128	$ 0.0017	$ 0.0433	$ 0.1434	$ 0.1317	$ 0.0597	$ 0.2711
2015	$ 0.0977	$ 0.0933	$ 0.0475	$ 0.1646	$ 0.0548	$ 0.0501	$ 0.0250	$ 0.1000	$0.0045	$0.0037	$ 0.0005	$ 0.0123	$0.0201	$0.0156	$ 0.0021	$ 0.0537	$ 0.1771	$ 0.1627	$ 0.0750	$ 0.3307
2016	$ 0.1129	$ 0.1084	$ 0.0551	$ 0.1895	$ 0.0632	$ 0.0582	$ 0.0293	$ 0.1155	$0.0052	$0.0042	$ 0.0006	$ 0.0140	$0.0230	$0.0178	$ 0.0024	$ 0.0614	$ 0.2043	$ 0.1886	$ 0.0873	$ 0.3804
2017	$ 0.1267	$ 0.1214	$ 0.0595	$ 0.2167	$ 0.0698	$ 0.0628	$ 0.0326	$ 0.1267	$0.0058	$0.0047	$ 0.0006	$ 0.0157	$0.0251	$0.0200	$ 0.0025	$ 0.0682	$ 0.2274	$ 0.2088	$ 0.0952	$ 0.4273
2018	$ 0.1369	$ 0.1321	$ 0.0660	$ 0.2304	$ 0.0750	$ 0.0688	$ 0.0366	$ 0.1364	$0.0062	$0.0050	$ 0.0007	$ 0.0167	$0.0268	$0.0217	$ 0.0027	$ 0.0734	$ 0.2449	$ 0.2276	$ 0.1059	$ 0.4570
2019	$ 0.1494	$ 0.1441	$ 0.0710	$ 0.2462	$ 0.0822	$ 0.0758	$ 0.0398	$ 0.1458	$0.0067	$0.0055	$ 0.0007	$ 0.0185	$0.0291	$0.0242	$ 0.0029	$ 0.0806	$ 0.2675	$ 0.2496	$ 0.1144	$ 0.4911
2020	$ 0.1531	$ 0.1483	$ 0.0727	$ 0.2510	$ 0.0842	$ 0.0775	$ 0.0407	$ 0.1486	$0.0068	$0.0056	$ 0.0007	$ 0.0187	$0.0296	$0.0246	$ 0.0029	$ 0.0816	$ 0.2738	$ 0.2559	$ 0.1171	$ 0.4999
2021	$ 0.1644	$ 0.1593	$ 0.0766	$ 0.2724	$ 0.0908	$ 0.0833	$ 0.0434	$ 0.1582	$0.0073	$0.0059	$ 0.0008	$ 0.0196	$0.0316	$0.0260	$ 0.0031	$ 0.0861	$ 0.2941	$ 0.2745	$ 0.1239	$ 0.5363
2022	$ 0.1759	$ 0.1715	$ 0.0861	$ 0.2842	$ 0.0962	$ 0.0884	$ 0.0471	$ 0.1640	$0.0077	$0.0063	$ 0.0009	$ 0.0209	$0.0333	$0.0279	$ 0.0033	$ 0.0903	$ 0.3131	$ 0.2941	$ 0.1374	$ 0.5594
2023	$ 0.1799	$ 0.1753	$ 0.0878	$ 0.2898	$ 0.0984	$ 0.0907	$ 0.0479	$ 0.1693	$0.0078	$0.0064	$ 0.0009	$ 0.0212	$0.0339	$0.0282	$ 0.0034	$ 0.0912	$ 0.3200	$ 0.3006	$ 0.1400	$ 0.5715
2024	$ 0.1884	$ 0.1840	$ 0.0930	$ 0.3001	$ 0.1030	$ 0.0958	$ 0.0515	$ 0.1756	$0.0081	$0.0067	$ 0.0009	$ 0.0218	$0.0352	$0.0290	$ 0.0036	$ 0.0939	$ 0.3347	$ 0.3156	$ 0.1490	$ 0.5914
2025	$ 0.1949	$ 0.1904	$ 0.0964	$ 0.3120	$ 0.1073	$ 0.0999	$ 0.0534	$ 0.1828	$0.0083	$0.0069	$ 0.0009	$ 0.0222	$0.0364	$0.0301	$ 0.0037	$ 0.0970	$ 0.3469	$ 0.3273	$ 0.1544	$ 0.6140
2026	$ 0.2003	$ 0.1958	$ 0.0988	$ 0.3196	$ 0.1104	$ 0.1025	$ 0.0547	$ 0.1890	$0.0085	$0.0070	$ 0.0009	$ 0.0225	$0.0372	$0.0306	$ 0.0037	$ 0.0985	$ 0.3564	$ 0.3359	$ 0.1583	$ 0.6296
2027	$ 0.2076	$ 0.2024	$ 0.1019	$ 0.3317	$ 0.1149	$ 0.1060	$ 0.0564	$ 0.1956	$0.0087	$0.0072	$ 0.0010	$ 0.0230	$0.0383	$0.0318	$ 0.0038	$ 0.1008	$ 0.3696	$ 0.3474	$ 0.1630	$ 0.6512
2028	$ 0.2129	$ 0.2076	$ 0.1044	$ 0.3402	$ 0.1183	$ 0.1083	$ 0.0577	$ 0.2022	$0.0089	$0.0073	$ 0.0010	$ 0.0233	$0.0390	$0.0324	$ 0.0038	$ 0.1023	$ 0.3791	$ 0.3557	$ 0.1670	$ 0.6680
2029	$ 0.2186	$ 0.2130	$ 0.1076	$ 0.3485	$ 0.1210	$ 0.1112	$ 0.0593	$ 0.2063	$0.0090	$0.0074	$ 0.0010	$ 0.0237	$0.0396	$0.0330	$ 0.0039	$ 0.1037	$ 0.3883	$ 0.3646	$ 0.1717	$ 0.6821

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3h Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 1,001-3,300 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0004
2009	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0034	$ 0.0014	$ 0.0008	$ 0.0002	$ 0.0050	$0.0012	$0.0004	$ 0.0000	$ 0.0035	$0.0044	$0.0014	$ 0.0002	$ 0.0135	$ 0.0079	$ 0.0030	$ 0.0005	$ 0.0254
2010	$ 0.0014	$ 0.0008	$ 0.0002	$ 0.0053	$ 0.0022	$ 0.0013	$ 0.0003	$ 0.0078	$0.0018	$0.0006	$ 0.0001	$ 0.0060	$0.0069	$0.0023	$ 0.0003	$ 0.0219	$ 0.0124	$ 0.0049	$ 0.0008	$ 0.0410
2011	$ 0.0024	$ 0.0012	$ 0.0003	$ 0.0099	$ 0.0037	$ 0.0021	$ 0.0005	$ 0.0136	$0.0031	$0.0010	$ 0.0001	$ 0.0102	$0.0115	$0.0038	$ 0.0005	$ 0.0377	$ 0.0207	$ 0.0081	$ 0.0014	$ 0.0714
2012	$ 0.0038	$ 0.0020	$ 0.0005	$ 0.0146	$ 0.0058	$ 0.0033	$ 0.0010	$ 0.0224	$0.0048	$0.0016	$ 0.0002	$ 0.0166	$0.0178	$0.0065	$ 0.0008	$ 0.0594	$ 0.0321	$ 0.0135	$ 0.0026	$ 0.1130
2013	$ 0.0047	$ 0.0026	$ 0.0007	$ 0.0181	$ 0.0073	$ 0.0043	$ 0.0013	$ 0.0274	$0.0059	$0.0021	$ 0.0003	$ 0.0207	$0.0222	$0.0082	$ 0.0011	$ 0.0756	$ 0.0402	$ 0.0171	$ 0.0033	$ 0.1419
2014	$ 0.0075	$ 0.0033	$ 0.0010	$ 0.0321	$ 0.0119	$ 0.0055	$ 0.0018	$ 0.0509	$0.0095	$0.0028	$ 0.0004	$ 0.0354	$0.0362	$0.0111	$ 0.0015	$ 0.1334	$ 0.0651	$ 0.0228	$ 0.0046	$ 0.2519
2015	$ 0.0091	$ 0.0041	$ 0.0012	$ 0.0381	$ 0.0144	$ 0.0068	$ 0.0022	$ 0.0613	$0.0114	$0.0035	$ 0.0005	$ 0.0416	$0.0436	$0.0134	$ 0.0019	$ 0.1571	$ 0.0786	$ 0.0278	$ 0.0058	$ 0.2981
2016	$ 0.0105	$ 0.0047	$ 0.0014	$ 0.0438	$ 0.0166	$ 0.0079	$ 0.0026	$ 0.0703	$0.0131	$0.0041	$ 0.0005	$ 0.0472	$0.0499	$0.0155	$ 0.0022	$ 0.1802	$ 0.0901	$ 0.0321	$ 0.0068	$ 0.3416
2017	$ 0.0112	$ 0.0049	$ 0.0015	$ 0.0506	$ 0.0176	$ 0.0082	$ 0.0028	$ 0.0785	$0.0139	$0.0042	$ 0.0006	$ 0.0494	$0.0526	$0.0165	$ 0.0023	$ 0.1843	$ 0.0954	$ 0.0338	$ 0.0072	$ 0.3629
2018	$ 0.0148	$ 0.0055	$ 0.0017	$ 0.0660	$ 0.0220	$ 0.0092	$ 0.0031	$ 0.0954	$0.0180	$0.0047	$ 0.0006	$ 0.0631	$0.0653	$0.0181	$ 0.0025	$ 0.2067	$ 0.1201	$ 0.0374	$ 0.0079	$ 0.4313
2019	$ 0.0156	$ 0.0062	$ 0.0018	$ 0.0676	$ 0.0233	$ 0.0105	$ 0.0034	$ 0.0976	$0.0188	$0.0051	$ 0.0007	$ 0.0650	$0.0686	$0.0203	$ 0.0028	$ 0.2190	$ 0.1264	$ 0.0421	$ 0.0087	$ 0.4492
2020	$ 0.0159	$ 0.0064	$ 0.0019	$ 0.0687	$ 0.0238	$ 0.0107	$ 0.0035	$ 0.0992	$0.0190	$0.0052	$ 0.0007	$ 0.0655	$0.0695	$0.0209	$ 0.0028	$ 0.2217	$ 0.1282	$ 0.0432	$ 0.0089	$ 0.4551
2021	$ 0.0166	$ 0.0067	$ 0.0019	$ 0.0724	$ 0.0249	$ 0.0113	$ 0.0037	$ 0.1078	$0.0197	$0.0055	$ 0.0007	$ 0.0676	$0.0721	$0.0217	$ 0.0029	$ 0.2328	$ 0.1333	$ 0.0452	$ 0.0092	$ 0.4806
2022	$ 0.0179	$ 0.0081	$ 0.0021	$ 0.0746	$ 0.0269	$ 0.0137	$ 0.0039	$ 0.1128	$0.0210	$0.0065	$ 0.0008	$ 0.0711	$0.0771	$0.0246	$ 0.0030	$ 0.2408	$ 0.1430	$ 0.0530	$ 0.0099	$ 0.4993
2023	$ 0.0182	$ 0.0082	$ 0.0022	$ 0.0758	$ 0.0274	$ 0.0140	$ 0.0040	$ 0.1146	$0.0212	$0.0065	$ 0.0008	$ 0.0716	$0.0779	$0.0252	$ 0.0031	$ 0.2437	$ 0.1448	$ 0.0540	$ 0.0101	$ 0.5057
2024	$ 0.0187	$ 0.0086	$ 0.0023	$ 0.0772	$ 0.0281	$ 0.0146	$ 0.0043	$ 0.1167	$0.0216	$0.0066	$ 0.0008	$ 0.0722	$0.0794	$0.0263	$ 0.0033	$ 0.2484	$ 0.1478	$ 0.0560	$ 0.0107	$ 0.5144
2025	$ 0.0191	$ 0.0089	$ 0.0024	$ 0.0786	$ 0.0288	$ 0.0151	$ 0.0044	$ 0.1188	$0.0220	$0.0068	$ 0.0009	$ 0.0732	$0.0808	$0.0272	$ 0.0034	$ 0.2534	$ 0.1507	$ 0.0580	$ 0.0111	$ 0.5239
2026	$ 0.0195	$ 0.0091	$ 0.0024	$ 0.0799	$ 0.0295	$ 0.0156	$ 0.0045	$ 0.1207	$0.0222	$0.0069	$ 0.0009	$ 0.0740	$0.0820	$0.0280	$ 0.0035	$ 0.2636	$ 0.1532	$ 0.0597	$ 0.0113	$ 0.5382
2027	$ 0.0200	$ 0.0094	$ 0.0025	$ 0.0813	$ 0.0301	$ 0.0160	$ 0.0047	$ 0.1227	$0.0225	$0.0071	$ 0.0009	$ 0.0746	$0.0831	$0.0286	$ 0.0035	$ 0.2671	$ 0.1557	$ 0.0611	$ 0.0116	$ 0.5456
2028	$ 0.0203	$ 0.0095	$ 0.0026	$ 0.0827	$ 0.0307	$ 0.0163	$ 0.0048	$ 0.1252	$0.0228	$0.0072	$ 0.0009	$ 0.0753	$0.0841	$0.0290	$ 0.0036	$ 0.2703	$ 0.1579	$ 0.0620	$ 0.0118	$ 0.5536
2029	$ 0.0208	$ 0.0098	$ 0.0026	$ 0.0842	$ 0.0313	$ 0.0168	$ 0.0049	$ 0.1273	$0.0230	$0.0073	$ 0.0009	$ 0.0759	$0.0852	$0.0291	$ 0.0036	$ 0.2744	$ 0.1603	$ 0.0630	$ 0.0121	$ 0.5618

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3i Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 3,301-10,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0002	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$0.0000	$0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0004
2009	$ 0.0052	$ 0.0045	$ 0.0020	$ 0.0104	$ 0.0028	$ 0.0023	$ 0.0010	$ 0.0059	$0.0003	$0.0002	$ 0.0000	$ 0.0008	$0.0011	$0.0009	$ 0.0001	$ 0.0033	$ 0.0094	$ 0.0079	$ 0.0031	$ 0.0204
2010	$ 0.0110	$ 0.0098	$ 0.0049	$ 0.0197	$ 0.0062	$ 0.0053	$ 0.0026	$ 0.0124	$0.0006	$0.0004	$ 0.0001	$ 0.0016	$0.0025	$0.0019	$ 0.0002	$ 0.0069	$ 0.0202	$ 0.0175	$ 0.0077	$ 0.0405
2011	$ 0.0172	$ 0.0157	$ 0.0079	$ 0.0304	$ 0.0098	$ 0.0086	$ 0.0042	$ 0.0195	$0.0009	$0.0007	$ 0.0001	$ 0.0024	$0.0039	$0.0031	$ 0.0003	$ 0.0105	$ 0.0318	$ 0.0281	$ 0.0126	$ 0.0628
2012	$ 0.0250	$ 0.0229	$ 0.0121	$ 0.0435	$ 0.0144	$ 0.0126	$ 0.0067	$ 0.0273	$0.0013	$0.0010	$ 0.0001	$ 0.0034	$0.0057	$0.0045	$ 0.0005	$ 0.0156	$ 0.0463	$ 0.0410	$ 0.0195	$ 0.0898
2013	$ 0.0340	$ 0.0319	$ 0.0169	$ 0.0576	$ 0.0194	$ 0.0171	$ 0.0091	$ 0.0371	$0.0017	$0.0013	$ 0.0002	$ 0.0045	$0.0076	$0.0059	$ 0.0007	$ 0.0211	$ 0.0627	$ 0.0563	$ 0.0269	$ 0.1204
2014	$ 0.0411	$ 0.0388	$ 0.0209	$ 0.0689	$ 0.0234	$ 0.0208	$ 0.0113	$ 0.0442	$0.0020	$0.0016	$ 0.0002	$ 0.0053	$0.0091	$0.0071	$ 0.0009	$ 0.0250	$ 0.0757	$ 0.0682	$ 0.0333	$ 0.1435
2015	$ 0.0509	$ 0.0473	$ 0.0251	$ 0.0866	$ 0.0288	$ 0.0255	$ 0.0137	$ 0.0533	$0.0025	$0.0020	$ 0.0003	$ 0.0067	$0.0111	$0.0085	$ 0.0011	$ 0.0312	$ 0.0934	$ 0.0833	$ 0.0402	$ 0.1778
2016	$ 0.0612	$ 0.0563	$ 0.0295	$ 0.1033	$ 0.0347	$ 0.0300	$ 0.0162	$ 0.0642	$0.0030	$0.0023	$ 0.0003	$ 0.0082	$0.0134	$0.0102	$ 0.0013	$ 0.0379	$ 0.1123	$ 0.0988	$ 0.0472	$ 0.2137
2017	$ 0.0645	$ 0.0595	$ 0.0307	$ 0.1088	$ 0.0368	$ 0.0323	$ 0.0170	$ 0.0679	$0.0031	$0.0024	$ 0.0003	$ 0.0085	$0.0141	$0.0107	$ 0.0014	$ 0.0401	$ 0.1185	$ 0.1049	$ 0.0494	$ 0.2254
2018	$ 0.0670	$ 0.0616	$ 0.0317	$ 0.1128	$ 0.0388	$ 0.0336	$ 0.0176	$ 0.0732	$0.0032	$0.0025	$ 0.0003	$ 0.0087	$0.0147	$0.0109	$ 0.0014	$ 0.0426	$ 0.1237	$ 0.1086	$ 0.0510	$ 0.2374
2019	$ 0.0696	$ 0.0638	$ 0.0328	$ 0.1166	$ 0.0402	$ 0.0345	$ 0.0181	$ 0.0747	$0.0033	$0.0025	$ 0.0003	$ 0.0090	$0.0151	$0.0112	$ 0.0014	$ 0.0434	$ 0.1282	$ 0.1121	$ 0.0527	$ 0.2437
2020	$ 0.0725	$ 0.0665	$ 0.0347	$ 0.1247	$ 0.0418	$ 0.0358	$ 0.0190	$ 0.0782	$0.0034	$0.0026	$ 0.0003	$ 0.0093	$0.0156	$0.0116	$ 0.0015	$ 0.0443	$ 0.1334	$ 0.1165	$ 0.0556	$ 0.2566
2021	$ 0.0747	$ 0.0682	$ 0.0357	$ 0.1278	$ 0.0431	$ 0.0367	$ 0.0195	$ 0.0811	$0.0035	$0.0027	$ 0.0004	$ 0.0094	$0.0160	$0.0118	$ 0.0015	$ 0.0457	$ 0.1373	$ 0.1194	$ 0.0571	$ 0.2640
2022	$ 0.0785	$ 0.0724	$ 0.0382	$ 0.1335	$ 0.0448	$ 0.0384	$ 0.0209	$ 0.0836	$0.0036	$0.0028	$ 0.0004	$ 0.0099	$0.0165	$0.0121	$ 0.0016	$ 0.0474	$ 0.1434	$ 0.1257	$ 0.0611	$ 0.2744
2023	$ 0.0805	$ 0.0745	$ 0.0392	$ 0.1362	$ 0.0461	$ 0.0399	$ 0.0217	$ 0.0856	$0.0037	$0.0029	$ 0.0004	$ 0.0101	$0.0168	$0.0126	$ 0.0016	$ 0.0483	$ 0.1472	$ 0.1298	$ 0.0629	$ 0.2801
2024	$ 0.0832	$ 0.0768	$ 0.0406	$ 0.1397	$ 0.0475	$ 0.0415	$ 0.0223	$ 0.0881	$0.0038	$0.0029	$ 0.0004	$ 0.0103	$0.0172	$0.0129	$ 0.0017	$ 0.0490	$ 0.1517	$ 0.1342	$ 0.0649	$ 0.2871
2025	$ 0.0855	$ 0.0786	$ 0.0418	$ 0.1432	$ 0.0490	$ 0.0429	$ 0.0229	$ 0.0903	$0.0039	$0.0030	$ 0.0004	$ 0.0105	$0.0176	$0.0133	$ 0.0017	$ 0.0495	$ 0.1560	$ 0.1379	$ 0.0668	$ 0.2935
2026	$ 0.0878	$ 0.0810	$ 0.0432	$ 0.1464	$ 0.0502	$ 0.0443	$ 0.0236	$ 0.0921	$0.0039	$0.0030	$ 0.0004	$ 0.0106	$0.0179	$0.0135	$ 0.0017	$ 0.0500	$ 0.1598	$ 0.1420	$ 0.0690	$ 0.2991
2027	$ 0.0904	$ 0.0837	$ 0.0448	$ 0.1497	$ 0.0516	$ 0.0455	$ 0.0247	$ 0.0938	$0.0040	$0.0031	$ 0.0004	$ 0.0109	$0.0182	$0.0138	$ 0.0018	$ 0.0507	$ 0.1643	$ 0.1461	$ 0.0717	$ 0.3050
2028	$ 0.0925	$ 0.0857	$ 0.0458	$ 0.1540	$ 0.0527	$ 0.0465	$ 0.0252	$ 0.0956	$0.0041	$0.0031	$ 0.0004	$ 0.0111	$0.0185	$0.0141	$ 0.0018	$ 0.0516	$ 0.1677	$ 0.1494	$ 0.0732	$ 0.3122
2029	$ 0.0950	$ 0.0879	$ 0.0473	$ 0.1588	$ 0.0542	$ 0.0482	$ 0.0259	$ 0.0985	$0.0041	$0.0032	$ 0.0004	$ 0.0112	$0.0188	$0.0143	$ 0.0018	$ 0.0531	$ 0.1722	$ 0.1536	$ 0.0755	$ 0.3216

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3j Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 3,301-10,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0002
2009	$ 0.0004	$ 0.0002	$ 0.0001	$ 0.0012	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0018	$0.0004	$0.0002	$ 0.0000	$ 0.0014	$0.0015	$0.0007	$ 0.0001	$ 0.0060	$ 0.0028	$ 0.0014	$ 0.0003	$ 0.0103
2010	$ 0.0009	$ 0.0004	$ 0.0001	$ 0.0033	$ 0.0014	$ 0.0008	$ 0.0003	$ 0.0057	$0.0009	$0.0004	$ 0.0000	$ 0.0035	$0.0038	$0.0016	$ 0.0001	$ 0.0122	$ 0.0071	$ 0.0033	$ 0.0006	$ 0.0247
2011	$ 0.0013	$ 0.0007	$ 0.0002	$ 0.0049	$ 0.0021	$ 0.0011	$ 0.0004	$ 0.0088	$0.0014	$0.0006	$ 0.0001	$ 0.0055	$0.0056	$0.0025	$ 0.0002	$ 0.0189	$ 0.0105	$ 0.0049	$ 0.0009	$ 0.0382
2012	$ 0.0022	$ 0.0010	$ 0.0003	$ 0.0085	$ 0.0034	$ 0.0018	$ 0.0006	$ 0.0137	$0.0022	$0.0010	$ 0.0001	$ 0.0080	$0.0089	$0.0037	$ 0.0003	$ 0.0280	$ 0.0168	$ 0.0075	$ 0.0013	$ 0.0581
2013	$ 0.0030	$ 0.0015	$ 0.0004	$ 0.0110	$ 0.0046	$ 0.0026	$ 0.0009	$ 0.0176	$0.0031	$0.0014	$ 0.0001	$ 0.0101	$0.0121	$0.0054	$ 0.0005	$ 0.0380	$ 0.0229	$ 0.0110	$ 0.0019	$ 0.0766
2014	$ 0.0036	$ 0.0018	$ 0.0005	$ 0.0130	$ 0.0055	$ 0.0032	$ 0.0010	$ 0.0208	$0.0036	$0.0017	$ 0.0002	$ 0.0120	$0.0144	$0.0065	$ 0.0006	$ 0.0449	$ 0.0272	$ 0.0132	$ 0.0023	$ 0.0907
2015	$ 0.0044	$ 0.0022	$ 0.0007	$ 0.0164	$ 0.0069	$ 0.0039	$ 0.0013	$ 0.0272	$0.0044	$0.0021	$ 0.0002	$ 0.0149	$0.0177	$0.0081	$ 0.0007	$ 0.0550	$ 0.0335	$ 0.0163	$ 0.0029	$ 0.1135
2016	$ 0.0052	$ 0.0026	$ 0.0008	$ 0.0188	$ 0.0080	$ 0.0046	$ 0.0015	$ 0.0311	$0.0052	$0.0024	$ 0.0002	$ 0.0176	$0.0206	$0.0097	$ 0.0009	$ 0.0625	$ 0.0390	$ 0.0192	$ 0.0033	$ 0.1300
2017	$ 0.0055	$ 0.0028	$ 0.0008	$ 0.0216	$ 0.0085	$ 0.0048	$ 0.0015	$ 0.0351	$0.0055	$0.0025	$ 0.0002	$ 0.0182	$0.0218	$0.0102	$ 0.0009	$ 0.0633	$ 0.0413	$ 0.0202	$ 0.0035	$ 0.1382
2018	$ 0.0056	$ 0.0028	$ 0.0008	$ 0.0220	$ 0.0087	$ 0.0049	$ 0.0016	$ 0.0357	$0.0056	$0.0026	$ 0.0002	$ 0.0186	$0.0221	$0.0103	$ 0.0009	$ 0.0644	$ 0.0421	$ 0.0207	$ 0.0036	$ 0.1407
2019	$ 0.0058	$ 0.0029	$ 0.0009	$ 0.0226	$ 0.0090	$ 0.0051	$ 0.0017	$ 0.0368	$0.0057	$0.0026	$ 0.0002	$ 0.0191	$0.0226	$0.0106	$ 0.0010	$ 0.0652	$ 0.0431	$ 0.0212	$ 0.0038	$ 0.1437
2020	$ 0.0060	$ 0.0030	$ 0.0009	$ 0.0237	$ 0.0093	$ 0.0054	$ 0.0019	$ 0.0383	$0.0059	$0.0027	$ 0.0003	$ 0.0194	$0.0233	$0.0108	$ 0.0010	$ 0.0672	$ 0.0444	$ 0.0219	$ 0.0041	$ 0.1485
2021	$ 0.0061	$ 0.0031	$ 0.0009	$ 0.0241	$ 0.0095	$ 0.0055	$ 0.0019	$ 0.0389	$0.0060	$0.0028	$ 0.0003	$ 0.0198	$0.0236	$0.0111	$ 0.0010	$ 0.0676	$ 0.0451	$ 0.0224	$ 0.0041	$ 0.1504
2022	$ 0.0063	$ 0.0032	$ 0.0010	$ 0.0246	$ 0.0097	$ 0.0057	$ 0.0020	$ 0.0395	$0.0061	$0.0029	$ 0.0003	$ 0.0201	$0.0241	$0.0114	$ 0.0011	$ 0.0693	$ 0.0462	$ 0.0231	$ 0.0043	$ 0.1536
2023	$ 0.0064	$ 0.0033	$ 0.0010	$ 0.0251	$ 0.0099	$ 0.0058	$ 0.0021	$ 0.0403	$0.0061	$0.0029	$ 0.0003	$ 0.0204	$0.0244	$0.0116	$ 0.0011	$ 0.0701	$ 0.0468	$ 0.0236	$ 0.0044	$ 0.1558
2024	$ 0.0065	$ 0.0034	$ 0.0010	$ 0.0255	$ 0.0101	$ 0.0059	$ 0.0021	$ 0.0410	$0.0062	$0.0029	$ 0.0003	$ 0.0207	$0.0248	$0.0118	$ 0.0011	$ 0.0725	$ 0.0477	$ 0.0241	$ 0.0046	$ 0.1598
2025	$ 0.0067	$ 0.0035	$ 0.0011	$ 0.0259	$ 0.0103	$ 0.0061	$ 0.0022	$ 0.0417	$0.0063	$0.0030	$ 0.0003	$ 0.0210	$0.0251	$0.0120	$ 0.0011	$ 0.0739	$ 0.0484	$ 0.0246	$ 0.0047	$ 0.1625
2026	$ 0.0068	$ 0.0036	$ 0.0011	$ 0.0266	$ 0.0106	$ 0.0062	$ 0.0023	$ 0.0429	$0.0064	$0.0030	$ 0.0003	$ 0.0214	$0.0257	$0.0124	$ 0.0011	$ 0.0754	$ 0.0496	$ 0.0252	$ 0.0048	$ 0.1664
2027	$ 0.0070	$ 0.0037	$ 0.0012	$ 0.0271	$ 0.0109	$ 0.0064	$ 0.0024	$ 0.0437	$0.0065	$0.0031	$ 0.0003	$ 0.0217	$0.0261	$0.0126	$ 0.0012	$ 0.0762	$ 0.0506	$ 0.0258	$ 0.0050	$ 0.1687
2028	$ 0.0072	$ 0.0038	$ 0.0012	$ 0.0277	$ 0.0111	$ 0.0065	$ 0.0024	$ 0.0445	$0.0066	$0.0031	$ 0.0003	$ 0.0221	$0.0265	$0.0127	$ 0.0012	$ 0.0767	$ 0.0513	$ 0.0262	$ 0.0051	$ 0.1710
2029	$ 0.0073	$ 0.0039	$ 0.0012	$ 0.0282	$ 0.0114	$ 0.0067	$ 0.0024	$ 0.0453	$0.0067	$0.0032	$ 0.0003	$ 0.0224	$0.0269	$0.0130	$ 0.0012	$ 0.0780	$ 0.0523	$ 0.0268	$ 0.0052	$ 0.1738

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3k Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 10,001-50,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0015	$ 0.0014	$ 0.0006	$ 0.0029	$ 0.0008	$ 0.0007	$ 0.0003	$ 0.0017	$0.0001	$0.0001	$ 0.0000	$ 0.0002	$0.0003	$0.0002	$ 0.0000	$ 0.0010	$ 0.0028	$ 0.0024	$ 0.0009	$ 0.0058
2009	$ 0.0051	$ 0.0048	$ 0.0022	$ 0.0088	$ 0.0029	$ 0.0025	$ 0.0011	$ 0.0056	$0.0003	$0.0002	$ 0.0000	$ 0.0008	$0.0012	$0.0008	$ 0.0001	$ 0.0034	$ 0.0094	$ 0.0082	$ 0.0034	$ 0.0186
2010	$ 0.0092	$ 0.0085	$ 0.0037	$ 0.0160	$ 0.0052	$ 0.0045	$ 0.0019	$ 0.0098	$0.0005	$0.0003	$ 0.0000	$ 0.0013	$0.0021	$0.0014	$ 0.0002	$ 0.0059	$ 0.0169	$ 0.0147	$ 0.0058	$ 0.0331
2011	$ 0.0135	$ 0.0126	$ 0.0053	$ 0.0238	$ 0.0076	$ 0.0065	$ 0.0029	$ 0.0146	$0.0007	$0.0005	$ 0.0001	$ 0.0020	$0.0030	$0.0020	$ 0.0003	$ 0.0086	$ 0.0249	$ 0.0216	$ 0.0085	$ 0.0489
2012	$ 0.0183	$ 0.0170	$ 0.0072	$ 0.0322	$ 0.0104	$ 0.0089	$ 0.0039	$ 0.0203	$0.0009	$0.0006	$ 0.0001	$ 0.0027	$0.0041	$0.0028	$ 0.0004	$ 0.0120	$ 0.0337	$ 0.0293	$ 0.0115	$ 0.0671
2013	$ 0.0229	$ 0.0211	$ 0.0092	$ 0.0399	$ 0.0130	$ 0.0111	$ 0.0049	$ 0.0251	$0.0011	$0.0008	$ 0.0001	$ 0.0032	$0.0051	$0.0035	$ 0.0005	$ 0.0146	$ 0.0420	$ 0.0365	$ 0.0147	$ 0.0829
2014	$ 0.0276	$ 0.0258	$ 0.0112	$ 0.0477	$ 0.0157	$ 0.0136	$ 0.0059	$ 0.0300	$0.0013	$0.0009	$ 0.0001	$ 0.0039	$0.0061	$0.0041	$ 0.0006	$ 0.0176	$ 0.0507	$ 0.0445	$ 0.0179	$ 0.0992
2015	$ 0.0325	$ 0.0305	$ 0.0134	$ 0.0558	$ 0.0185	$ 0.0167	$ 0.0070	$ 0.0351	$0.0016	$0.0011	$ 0.0002	$ 0.0046	$0.0071	$0.0050	$ 0.0007	$ 0.0204	$ 0.0598	$ 0.0532	$ 0.0213	$ 0.1158
2016	$ 0.0382	$ 0.0356	$ 0.0157	$ 0.0659	$ 0.0217	$ 0.0194	$ 0.0082	$ 0.0411	$0.0018	$0.0013	$ 0.0002	$ 0.0054	$0.0083	$0.0058	$ 0.0008	$ 0.0241	$ 0.0699	$ 0.0621	$ 0.0249	$ 0.1365
2017	$ 0.0393	$ 0.0365	$ 0.0161	$ 0.0679	$ 0.0224	$ 0.0202	$ 0.0084	$ 0.0427	$0.0019	$0.0013	$ 0.0002	$ 0.0055	$0.0085	$0.0059	$ 0.0009	$ 0.0247	$ 0.0721	$ 0.0639	$ 0.0255	$ 0.1408
2018	$ 0.0404	$ 0.0376	$ 0.0164	$ 0.0698	$ 0.0231	$ 0.0206	$ 0.0085	$ 0.0438	$0.0019	$0.0013	$ 0.0002	$ 0.0056	$0.0087	$0.0060	$ 0.0009	$ 0.0249	$ 0.0741	$ 0.0656	$ 0.0260	$ 0.1442
2019	$ 0.0413	$ 0.0383	$ 0.0168	$ 0.0711	$ 0.0237	$ 0.0212	$ 0.0088	$ 0.0452	$0.0019	$0.0014	$ 0.0002	$ 0.0057	$0.0088	$0.0062	$ 0.0009	$ 0.0254	$ 0.0757	$ 0.0671	$ 0.0267	$ 0.1474
2020	$ 0.0422	$ 0.0391	$ 0.0172	$ 0.0728	$ 0.0242	$ 0.0217	$ 0.0090	$ 0.0461	$0.0020	$0.0014	$ 0.0002	$ 0.0058	$0.0089	$0.0063	$ 0.0009	$ 0.0257	$ 0.0773	$ 0.0685	$ 0.0274	$ 0.1503
2021	$ 0.0432	$ 0.0402	$ 0.0177	$ 0.0744	$ 0.0247	$ 0.0221	$ 0.0093	$ 0.0469	$0.0020	$0.0014	$ 0.0002	$ 0.0059	$0.0091	$0.0064	$ 0.0009	$ 0.0261	$ 0.0790	$ 0.0701	$ 0.0281	$ 0.1532
2022	$ 0.0451	$ 0.0416	$ 0.0182	$ 0.0796	$ 0.0256	$ 0.0227	$ 0.0095	$ 0.0496	$0.0020	$0.0014	$ 0.0002	$ 0.0061	$0.0093	$0.0066	$ 0.0009	$ 0.0269	$ 0.0821	$ 0.0724	$ 0.0289	$ 0.1622
2023	$ 0.0467	$ 0.0434	$ 0.0189	$ 0.0813	$ 0.0263	$ 0.0234	$ 0.0099	$ 0.0509	$0.0021	$0.0015	$ 0.0002	$ 0.0062	$0.0095	$0.0067	$ 0.0009	$ 0.0281	$ 0.0846	$ 0.0750	$ 0.0300	$ 0.1665
2024	$ 0.0479	$ 0.0446	$ 0.0194	$ 0.0834	$ 0.0270	$ 0.0242	$ 0.0102	$ 0.0520	$0.0021	$0.0015	$ 0.0002	$ 0.0063	$0.0097	$0.0069	$ 0.0010	$ 0.0285	$ 0.0867	$ 0.0772	$ 0.0308	$ 0.1702
2025	$ 0.0489	$ 0.0455	$ 0.0198	$ 0.0851	$ 0.0276	$ 0.0246	$ 0.0104	$ 0.0528	$0.0022	$0.0015	$ 0.0002	$ 0.0064	$0.0098	$0.0070	$ 0.0010	$ 0.0289	$ 0.0884	$ 0.0786	$ 0.0314	$ 0.1733
2026	$ 0.0499	$ 0.0465	$ 0.0202	$ 0.0870	$ 0.0281	$ 0.0251	$ 0.0106	$ 0.0538	$0.0022	$0.0016	$ 0.0002	$ 0.0065	$0.0099	$0.0070	$ 0.0010	$ 0.0291	$ 0.0901	$ 0.0802	$ 0.0320	$ 0.1764
2027	$ 0.0515	$ 0.0478	$ 0.0206	$ 0.0901	$ 0.0290	$ 0.0258	$ 0.0107	$ 0.0550	$0.0022	$0.0016	$ 0.0002	$ 0.0066	$0.0101	$0.0072	$ 0.0010	$ 0.0304	$ 0.0929	$ 0.0825	$ 0.0326	$ 0.1821
2028	$ 0.0526	$ 0.0490	$ 0.0211	$ 0.0920	$ 0.0298	$ 0.0263	$ 0.0110	$ 0.0579	$0.0023	$0.0016	$ 0.0002	$ 0.0067	$0.0103	$0.0073	$ 0.0010	$ 0.0306	$ 0.0950	$ 0.0842	$ 0.0333	$ 0.1872
2029	$ 0.0537	$ 0.0502	$ 0.0216	$ 0.0936	$ 0.0304	$ 0.0269	$ 0.0112	$ 0.0589	$0.0023	$0.0016	$ 0.0002	$ 0.0068	$0.0104	$0.0074	$ 0.0010	$ 0.0309	$ 0.0968	$ 0.0861	$ 0.0340	$ 0.1902

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3l Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 10,001-50,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0003	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0005	$0.0001	$0.0000	$ 0.0000	$ 0.0004	$0.0005	$0.0002	$ 0.0000	$ 0.0016	$ 0.0008	$ 0.0004	$ 0.0000	$ 0.0027
2009	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0013	$ 0.0006	$ 0.0004	$ 0.0001	$ 0.0022	$0.0005	$0.0002	$ 0.0000	$ 0.0015	$0.0020	$0.0007	$ 0.0001	$ 0.0056	$ 0.0036	$ 0.0014	$ 0.0002	$ 0.0106
2010	$ 0.0007	$ 0.0004	$ 0.0001	$ 0.0022	$ 0.0011	$ 0.0006	$ 0.0001	$ 0.0037	$0.0009	$0.0003	$ 0.0000	$ 0.0028	$0.0034	$0.0012	$ 0.0001	$ 0.0112	$ 0.0061	$ 0.0025	$ 0.0003	$ 0.0199
2011	$ 0.0010	$ 0.0005	$ 0.0001	$ 0.0031	$ 0.0016	$ 0.0009	$ 0.0002	$ 0.0051	$0.0012	$0.0004	$ 0.0000	$ 0.0040	$0.0047	$0.0017	$ 0.0001	$ 0.0169	$ 0.0085	$ 0.0036	$ 0.0004	$ 0.0291
2012	$ 0.0013	$ 0.0007	$ 0.0001	$ 0.0041	$ 0.0021	$ 0.0012	$ 0.0002	$ 0.0069	$0.0016	$0.0006	$ 0.0000	$ 0.0054	$0.0062	$0.0023	$ 0.0002	$ 0.0227	$ 0.0112	$ 0.0048	$ 0.0006	$ 0.0390
2013	$ 0.0016	$ 0.0008	$ 0.0002	$ 0.0051	$ 0.0026	$ 0.0015	$ 0.0003	$ 0.0085	$0.0020	$0.0007	$ 0.0000	$ 0.0067	$0.0077	$0.0029	$ 0.0002	$ 0.0288	$ 0.0139	$ 0.0059	$ 0.0007	$ 0.0491
2014	$ 0.0019	$ 0.0010	$ 0.0002	$ 0.0061	$ 0.0031	$ 0.0018	$ 0.0004	$ 0.0101	$0.0023	$0.0008	$ 0.0001	$ 0.0080	$0.0091	$0.0034	$ 0.0003	$ 0.0340	$ 0.0165	$ 0.0070	$ 0.0009	$ 0.0581
2015	$ 0.0023	$ 0.0012	$ 0.0002	$ 0.0074	$ 0.0037	$ 0.0021	$ 0.0004	$ 0.0123	$0.0028	$0.0010	$ 0.0001	$ 0.0093	$0.0108	$0.0040	$ 0.0003	$ 0.0412	$ 0.0196	$ 0.0082	$ 0.0010	$ 0.0702
2016	$ 0.0026	$ 0.0014	$ 0.0003	$ 0.0085	$ 0.0043	$ 0.0024	$ 0.0005	$ 0.0141	$0.0032	$0.0011	$ 0.0001	$ 0.0107	$0.0124	$0.0046	$ 0.0004	$ 0.0470	$ 0.0225	$ 0.0095	$ 0.0012	$ 0.0803
2017	$ 0.0028	$ 0.0014	$ 0.0003	$ 0.0115	$ 0.0046	$ 0.0025	$ 0.0005	$ 0.0175	$0.0034	$0.0011	$ 0.0001	$ 0.0110	$0.0130	$0.0048	$ 0.0004	$ 0.0475	$ 0.0238	$ 0.0098	$ 0.0012	$ 0.0876
2018	$ 0.0029	$ 0.0014	$ 0.0003	$ 0.0117	$ 0.0047	$ 0.0026	$ 0.0005	$ 0.0177	$0.0034	$0.0012	$ 0.0001	$ 0.0111	$0.0132	$0.0048	$ 0.0004	$ 0.0480	$ 0.0241	$ 0.0100	$ 0.0012	$ 0.0886
2019	$ 0.0029	$ 0.0015	$ 0.0003	$ 0.0119	$ 0.0047	$ 0.0026	$ 0.0005	$ 0.0180	$0.0035	$0.0012	$ 0.0001	$ 0.0113	$0.0133	$0.0049	$ 0.0004	$ 0.0484	$ 0.0244	$ 0.0102	$ 0.0012	$ 0.0896
2020	$ 0.0030	$ 0.0015	$ 0.0003	$ 0.0121	$ 0.0048	$ 0.0027	$ 0.0005	$ 0.0183	$0.0035	$0.0012	$ 0.0001	$ 0.0115	$0.0134	$0.0049	$ 0.0004	$ 0.0487	$ 0.0247	$ 0.0103	$ 0.0013	$ 0.0906
2021	$ 0.0030	$ 0.0015	$ 0.0003	$ 0.0124	$ 0.0049	$ 0.0027	$ 0.0005	$ 0.0186	$0.0035	$0.0012	$ 0.0001	$ 0.0117	$0.0136	$0.0050	$ 0.0004	$ 0.0491	$ 0.0250	$ 0.0104	$ 0.0013	$ 0.0917
2022	$ 0.0032	$ 0.0016	$ 0.0003	$ 0.0129	$ 0.0052	$ 0.0028	$ 0.0006	$ 0.0201	$0.0037	$0.0012	$ 0.0001	$ 0.0120	$0.0142	$0.0051	$ 0.0004	$ 0.0558	$ 0.0262	$ 0.0108	$ 0.0013	$ 0.1008
2023	$ 0.0032	$ 0.0016	$ 0.0003	$ 0.0131	$ 0.0053	$ 0.0030	$ 0.0006	$ 0.0205	$0.0037	$0.0012	$ 0.0001	$ 0.0122	$0.0144	$0.0052	$ 0.0004	$ 0.0565	$ 0.0266	$ 0.0111	$ 0.0013	$ 0.1023
2024	$ 0.0033	$ 0.0017	$ 0.0003	$ 0.0133	$ 0.0054	$ 0.0030	$ 0.0006	$ 0.0208	$0.0037	$0.0013	$ 0.0001	$ 0.0123	$0.0145	$0.0053	$ 0.0004	$ 0.0572	$ 0.0269	$ 0.0113	$ 0.0014	$ 0.1037
2025	$ 0.0034	$ 0.0017	$ 0.0003	$ 0.0136	$ 0.0055	$ 0.0031	$ 0.0006	$ 0.0211	$0.0038	$0.0013	$ 0.0001	$ 0.0124	$0.0146	$0.0054	$ 0.0004	$ 0.0580	$ 0.0272	$ 0.0114	$ 0.0014	$ 0.1051
2026	$ 0.0034	$ 0.0018	$ 0.0003	$ 0.0138	$ 0.0056	$ 0.0031	$ 0.0006	$ 0.0214	$0.0038	$0.0013	$ 0.0001	$ 0.0126	$0.0148	$0.0055	$ 0.0004	$ 0.0588	$ 0.0276	$ 0.0116	$ 0.0014	$ 0.1066
2027	$ 0.0036	$ 0.0018	$ 0.0003	$ 0.0142	$ 0.0058	$ 0.0032	$ 0.0006	$ 0.0218	$0.0039	$0.0013	$ 0.0001	$ 0.0136	$0.0152	$0.0056	$ 0.0004	$ 0.0602	$ 0.0285	$ 0.0120	$ 0.0014	$ 0.1098
2028	$ 0.0037	$ 0.0019	$ 0.0003	$ 0.0145	$ 0.0060	$ 0.0033	$ 0.0006	$ 0.0222	$0.0040	$0.0013	$ 0.0001	$ 0.0137	$0.0154	$0.0057	$ 0.0004	$ 0.0624	$ 0.0290	$ 0.0122	$ 0.0014	$ 0.1129
2029	$ 0.0037	$ 0.0019	$ 0.0003	$ 0.0148	$ 0.0061	$ 0.0034	$ 0.0006	$ 0.0226	$0.0040	$0.0013	$ 0.0001	$ 0.0138	$0.0155	$0.0057	$ 0.0004	$ 0.0632	$ 0.0293	$ 0.0123	$ 0.0015	$ 0.1144

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3m Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 50,001-100,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0006	$ 0.0005	$ 0.0002	$ 0.0011	$ 0.0003	$ 0.0003	$ 0.0001	$ 0.0007	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0001	$ 0.0000	$ 0.0004	$ 0.0011	$ 0.0009	$ 0.0003	$ 0.0022
2009	$ 0.0019	$ 0.0017	$ 0.0006	$ 0.0034	$ 0.0011	$ 0.0009	$ 0.0004	$ 0.0022	$0.0001	$0.0001	$ 0.0000	$ 0.0003	$0.0005	$0.0003	$ 0.0000	$ 0.0013	$ 0.0035	$ 0.0030	$ 0.0010	$ 0.0073
2010	$ 0.0033	$ 0.0030	$ 0.0011	$ 0.0063	$ 0.0019	$ 0.0017	$ 0.0007	$ 0.0039	$0.0002	$0.0001	$ 0.0000	$ 0.0005	$0.0008	$0.0005	$ 0.0001	$ 0.0024	$ 0.0062	$ 0.0053	$ 0.0019	$ 0.0130
2011	$ 0.0047	$ 0.0043	$ 0.0016	$ 0.0088	$ 0.0027	$ 0.0023	$ 0.0010	$ 0.0056	$0.0002	$0.0002	$ 0.0000	$ 0.0007	$0.0011	$0.0007	$ 0.0001	$ 0.0033	$ 0.0087	$ 0.0075	$ 0.0027	$ 0.0183
2012	$ 0.0060	$ 0.0055	$ 0.0021	$ 0.0113	$ 0.0035	$ 0.0031	$ 0.0012	$ 0.0071	$0.0003	$0.0002	$ 0.0000	$ 0.0008	$0.0014	$0.0009	$ 0.0001	$ 0.0043	$ 0.0113	$ 0.0098	$ 0.0035	$ 0.0235
2013	$ 0.0077	$ 0.0071	$ 0.0027	$ 0.0143	$ 0.0045	$ 0.0039	$ 0.0016	$ 0.0089	$0.0004	$0.0003	$ 0.0000	$ 0.0011	$0.0018	$0.0012	$ 0.0001	$ 0.0052	$ 0.0144	$ 0.0125	$ 0.0044	$ 0.0294
2014	$ 0.0092	$ 0.0086	$ 0.0032	$ 0.0173	$ 0.0055	$ 0.0047	$ 0.0019	$ 0.0106	$0.0005	$0.0003	$ 0.0000	$ 0.0013	$0.0022	$0.0015	$ 0.0002	$ 0.0065	$ 0.0173	$ 0.0151	$ 0.0053	$ 0.0357
2015	$ 0.0109	$ 0.0101	$ 0.0039	$ 0.0203	$ 0.0064	$ 0.0055	$ 0.0023	$ 0.0123	$0.0005	$0.0004	$ 0.0000	$ 0.0015	$0.0026	$0.0017	$ 0.0002	$ 0.0076	$ 0.0204	$ 0.0177	$ 0.0064	$ 0.0416
2016	$ 0.0126	$ 0.0116	$ 0.0044	$ 0.0233	$ 0.0074	$ 0.0063	$ 0.0026	$ 0.0141	$0.0006	$0.0004	$ 0.0001	$ 0.0017	$0.0029	$0.0020	$ 0.0002	$ 0.0087	$ 0.0235	$ 0.0203	$ 0.0074	$ 0.0478
2017	$ 0.0133	$ 0.0123	$ 0.0046	$ 0.0247	$ 0.0078	$ 0.0067	$ 0.0027	$ 0.0157	$0.0007	$0.0005	$ 0.0001	$ 0.0018	$0.0030	$0.0020	$ 0.0002	$ 0.0088	$ 0.0247	$ 0.0215	$ 0.0076	$ 0.0510
2018	$ 0.0136	$ 0.0126	$ 0.0046	$ 0.0252	$ 0.0079	$ 0.0068	$ 0.0028	$ 0.0160	$0.0007	$0.0005	$ 0.0001	$ 0.0018	$0.0031	$0.0020	$ 0.0002	$ 0.0089	$ 0.0252	$ 0.0219	$ 0.0077	$ 0.0518
2019	$ 0.0138	$ 0.0129	$ 0.0048	$ 0.0256	$ 0.0081	$ 0.0070	$ 0.0029	$ 0.0163	$0.0007	$0.0005	$ 0.0001	$ 0.0018	$0.0031	$0.0021	$ 0.0003	$ 0.0090	$ 0.0257	$ 0.0224	$ 0.0080	$ 0.0527
2020	$ 0.0143	$ 0.0132	$ 0.0049	$ 0.0266	$ 0.0083	$ 0.0072	$ 0.0029	$ 0.0171	$0.0007	$0.0005	$ 0.0001	$ 0.0019	$0.0032	$0.0021	$ 0.0003	$ 0.0092	$ 0.0264	$ 0.0230	$ 0.0081	$ 0.0548
2021	$ 0.0148	$ 0.0137	$ 0.0051	$ 0.0274	$ 0.0086	$ 0.0074	$ 0.0031	$ 0.0176	$0.0007	$0.0005	$ 0.0001	$ 0.0019	$0.0033	$0.0021	$ 0.0003	$ 0.0094	$ 0.0274	$ 0.0238	$ 0.0085	$ 0.0563
2022	$ 0.0151	$ 0.0140	$ 0.0052	$ 0.0282	$ 0.0088	$ 0.0076	$ 0.0031	$ 0.0179	$0.0007	$0.0005	$ 0.0001	$ 0.0019	$0.0033	$0.0022	$ 0.0003	$ 0.0094	$ 0.0279	$ 0.0242	$ 0.0087	$ 0.0575
2023	$ 0.0154	$ 0.0142	$ 0.0054	$ 0.0287	$ 0.0089	$ 0.0078	$ 0.0032	$ 0.0182	$0.0007	$0.0005	$ 0.0001	$ 0.0019	$0.0033	$0.0022	$ 0.0003	$ 0.0095	$ 0.0284	$ 0.0247	$ 0.0089	$ 0.0583
2024	$ 0.0161	$ 0.0150	$ 0.0055	$ 0.0294	$ 0.0093	$ 0.0080	$ 0.0033	$ 0.0186	$0.0007	$0.0005	$ 0.0001	$ 0.0020	$0.0035	$0.0023	$ 0.0003	$ 0.0098	$ 0.0296	$ 0.0258	$ 0.0092	$ 0.0597
2025	$ 0.0165	$ 0.0154	$ 0.0056	$ 0.0300	$ 0.0096	$ 0.0083	$ 0.0034	$ 0.0198	$0.0008	$0.0005	$ 0.0001	$ 0.0021	$0.0035	$0.0023	$ 0.0003	$ 0.0099	$ 0.0303	$ 0.0266	$ 0.0094	$ 0.0619
2026	$ 0.0168	$ 0.0157	$ 0.0057	$ 0.0306	$ 0.0097	$ 0.0085	$ 0.0035	$ 0.0202	$0.0008	$0.0005	$ 0.0001	$ 0.0021	$0.0036	$0.0023	$ 0.0003	$ 0.0101	$ 0.0309	$ 0.0270	$ 0.0096	$ 0.0629
2027	$ 0.0172	$ 0.0161	$ 0.0059	$ 0.0312	$ 0.0100	$ 0.0087	$ 0.0035	$ 0.0206	$0.0008	$0.0006	$ 0.0001	$ 0.0021	$0.0036	$0.0024	$ 0.0003	$ 0.0102	$ 0.0315	$ 0.0277	$ 0.0098	$ 0.0640
2028	$ 0.0175	$ 0.0164	$ 0.0060	$ 0.0318	$ 0.0101	$ 0.0088	$ 0.0036	$ 0.0209	$0.0008	$0.0006	$ 0.0001	$ 0.0021	$0.0036	$0.0024	$ 0.0003	$ 0.0102	$ 0.0321	$ 0.0282	$ 0.0100	$ 0.0650
2029	$ 0.0179	$ 0.0168	$ 0.0062	$ 0.0323	$ 0.0103	$ 0.0090	$ 0.0037	$ 0.0213	$0.0008	$0.0006	$ 0.0001	$ 0.0022	$0.0037	$0.0024	$ 0.0003	$ 0.0104	$ 0.0327	$ 0.0288	$ 0.0102	$ 0.0661

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.3n Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 50,001-100,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0003	$0.0000	$0.0000	$ 0.0000	$ 0.0002	$0.0002	$0.0001	$ 0.0000	$ 0.0008	$ 0.0004	$ 0.0001	$ 0.0000	$ 0.0015
2009	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0011	$0.0002	$0.0001	$ 0.0000	$ 0.0006	$0.0007	$0.0002	$ 0.0000	$ 0.0029	$ 0.0013	$ 0.0005	$ 0.0001	$ 0.0052
2010	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0010	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0016	$0.0003	$0.0001	$ 0.0000	$ 0.0010	$0.0012	$0.0004	$ 0.0000	$ 0.0047	$ 0.0021	$ 0.0008	$ 0.0001	$ 0.0084
2011	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0014	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0023	$0.0004	$0.0001	$ 0.0000	$ 0.0014	$0.0016	$0.0006	$ 0.0000	$ 0.0064	$ 0.0029	$ 0.0012	$ 0.0002	$ 0.0116
2012	$ 0.0005	$ 0.0002	$ 0.0000	$ 0.0018	$ 0.0007	$ 0.0004	$ 0.0001	$ 0.0030	$0.0005	$0.0002	$ 0.0000	$ 0.0019	$0.0021	$0.0007	$ 0.0001	$ 0.0083	$ 0.0037	$ 0.0015	$ 0.0002	$ 0.0149
2013	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0022	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0037	$0.0006	$0.0002	$ 0.0000	$ 0.0024	$0.0026	$0.0009	$ 0.0001	$ 0.0105	$ 0.0047	$ 0.0019	$ 0.0002	$ 0.0188
2014	$ 0.0007	$ 0.0003	$ 0.0001	$ 0.0026	$ 0.0011	$ 0.0006	$ 0.0001	$ 0.0044	$0.0007	$0.0002	$ 0.0000	$ 0.0028	$0.0031	$0.0011	$ 0.0001	$ 0.0124	$ 0.0056	$ 0.0023	$ 0.0003	$ 0.0222
2015	$ 0.0008	$ 0.0004	$ 0.0001	$ 0.0032	$ 0.0013	$ 0.0007	$ 0.0001	$ 0.0053	$0.0008	$0.0003	$ 0.0000	$ 0.0033	$0.0036	$0.0012	$ 0.0001	$ 0.0143	$ 0.0065	$ 0.0027	$ 0.0003	$ 0.0261
2016	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0037	$ 0.0015	$ 0.0008	$ 0.0002	$ 0.0061	$0.0009	$0.0003	$ 0.0000	$ 0.0037	$0.0041	$0.0014	$ 0.0001	$ 0.0163	$ 0.0074	$ 0.0030	$ 0.0004	$ 0.0297
2017	$ 0.0010	$ 0.0005	$ 0.0001	$ 0.0050	$ 0.0017	$ 0.0009	$ 0.0002	$ 0.0079	$0.0010	$0.0003	$ 0.0000	$ 0.0042	$0.0045	$0.0015	$ 0.0001	$ 0.0167	$ 0.0082	$ 0.0032	$ 0.0004	$ 0.0338
2018	$ 0.0010	$ 0.0005	$ 0.0001	$ 0.0051	$ 0.0017	$ 0.0009	$ 0.0002	$ 0.0080	$0.0010	$0.0003	$ 0.0000	$ 0.0043	$0.0045	$0.0015	$ 0.0001	$ 0.0169	$ 0.0082	$ 0.0032	$ 0.0004	$ 0.0342
2019	$ 0.0011	$ 0.0005	$ 0.0001	$ 0.0052	$ 0.0017	$ 0.0009	$ 0.0002	$ 0.0081	$0.0010	$0.0003	$ 0.0000	$ 0.0043	$0.0046	$0.0015	$ 0.0001	$ 0.0170	$ 0.0083	$ 0.0033	$ 0.0004	$ 0.0346
2020	$ 0.0011	$ 0.0005	$ 0.0001	$ 0.0053	$ 0.0018	$ 0.0009	$ 0.0002	$ 0.0082	$0.0010	$0.0004	$ 0.0000	$ 0.0045	$0.0047	$0.0016	$ 0.0001	$ 0.0180	$ 0.0086	$ 0.0034	$ 0.0004	$ 0.0360
2021	$ 0.0011	$ 0.0006	$ 0.0001	$ 0.0054	$ 0.0018	$ 0.0009	$ 0.0002	$ 0.0084	$0.0011	$0.0004	$ 0.0000	$ 0.0045	$0.0048	$0.0016	$ 0.0001	$ 0.0182	$ 0.0088	$ 0.0035	$ 0.0004	$ 0.0365
2022	$ 0.0011	$ 0.0006	$ 0.0001	$ 0.0055	$ 0.0019	$ 0.0010	$ 0.0002	$ 0.0085	$0.0011	$0.0004	$ 0.0000	$ 0.0046	$0.0048	$0.0016	$ 0.0001	$ 0.0185	$ 0.0089	$ 0.0035	$ 0.0004	$ 0.0371
2023	$ 0.0012	$ 0.0006	$ 0.0001	$ 0.0055	$ 0.0019	$ 0.0010	$ 0.0002	$ 0.0087	$0.0011	$0.0004	$ 0.0000	$ 0.0046	$0.0048	$0.0017	$ 0.0001	$ 0.0187	$ 0.0090	$ 0.0036	$ 0.0005	$ 0.0375
2024	$ 0.0012	$ 0.0006	$ 0.0001	$ 0.0056	$ 0.0019	$ 0.0010	$ 0.0002	$ 0.0088	$0.0011	$0.0004	$ 0.0000	$ 0.0047	$0.0049	$0.0017	$ 0.0001	$ 0.0189	$ 0.0091	$ 0.0037	$ 0.0005	$ 0.0380
2025	$ 0.0012	$ 0.0006	$ 0.0001	$ 0.0057	$ 0.0020	$ 0.0010	$ 0.0002	$ 0.0089	$0.0011	$0.0004	$ 0.0000	$ 0.0047	$0.0050	$0.0017	$ 0.0001	$ 0.0191	$ 0.0092	$ 0.0038	$ 0.0005	$ 0.0384
2026	$ 0.0012	$ 0.0006	$ 0.0001	$ 0.0058	$ 0.0020	$ 0.0011	$ 0.0002	$ 0.0091	$0.0011	$0.0004	$ 0.0000	$ 0.0048	$0.0050	$0.0017	$ 0.0001	$ 0.0192	$ 0.0094	$ 0.0038	$ 0.0005	$ 0.0388
2027	$ 0.0013	$ 0.0006	$ 0.0001	$ 0.0059	$ 0.0020	$ 0.0011	$ 0.0002	$ 0.0092	$0.0011	$0.0004	$ 0.0000	$ 0.0048	$0.0051	$0.0018	$ 0.0001	$ 0.0194	$ 0.0095	$ 0.0039	$ 0.0005	$ 0.0394
2028	$ 0.0013	$ 0.0006	$ 0.0001	$ 0.0060	$ 0.0021	$ 0.0011	$ 0.0002	$ 0.0094	$0.0011	$0.0004	$ 0.0000	$ 0.0048	$0.0051	$0.0018	$ 0.0001	$ 0.0196	$ 0.0096	$ 0.0039	$ 0.0005	$ 0.0399
2029	$ 0.0013	$ 0.0007	$ 0.0001	$ 0.0061	$ 0.0021	$ 0.0011	$ 0.0002	$ 0.0095	$0.0011	$0.0004	$ 0.0000	$ 0.0049	$0.0052	$0.0018	$ 0.0001	$ 0.0200	$ 0.0097	$ 0.0040	$ 0.0005	$ 0.0406

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3o Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 100,001-1,000,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0010	$ 0.0009	$ 0.0003	$ 0.0018	$ 0.0006	$ 0.0005	$ 0.0002	$ 0.0011	$0.0001	$0.0000	$ 0.0000	$ 0.0001	$0.0002	$0.0002	$ 0.0000	$ 0.0006	$ 0.0018	$ 0.0016	$ 0.0006	$ 0.0038
2009	$ 0.0033	$ 0.0030	$ 0.0011	$ 0.0061	$ 0.0019	$ 0.0016	$ 0.0007	$ 0.0040	$0.0002	$0.0001	$ 0.0000	$ 0.0005	$0.0008	$0.0005	$ 0.0001	$ 0.0021	$ 0.0062	$ 0.0052	$ 0.0019	$ 0.0126
2010	$ 0.0058	$ 0.0054	$ 0.0020	$ 0.0111	$ 0.0035	$ 0.0029	$ 0.0012	$ 0.0072	$0.0003	$0.0002	$ 0.0000	$ 0.0008	$0.0014	$0.0009	$ 0.0001	$ 0.0036	$ 0.0110	$ 0.0093	$ 0.0034	$ 0.0227
2011	$ 0.0083	$ 0.0075	$ 0.0029	$ 0.0156	$ 0.0049	$ 0.0041	$ 0.0018	$ 0.0103	$0.0004	$0.0003	$ 0.0000	$ 0.0012	$0.0019	$0.0013	$ 0.0002	$ 0.0051	$ 0.0155	$ 0.0131	$ 0.0049	$ 0.0322
2012	$ 0.0107	$ 0.0098	$ 0.0038	$ 0.0199	$ 0.0063	$ 0.0053	$ 0.0023	$ 0.0131	$0.0005	$0.0004	$ 0.0001	$ 0.0015	$0.0025	$0.0016	$ 0.0002	$ 0.0065	$ 0.0200	$ 0.0172	$ 0.0065	$ 0.0411
2013	$ 0.0135	$ 0.0126	$ 0.0049	$ 0.0249	$ 0.0080	$ 0.0069	$ 0.0029	$ 0.0164	$0.0007	$0.0005	$ 0.0001	$ 0.0019	$0.0031	$0.0021	$ 0.0003	$ 0.0088	$ 0.0253	$ 0.0220	$ 0.0082	$ 0.0520
2014	$ 0.0163	$ 0.0151	$ 0.0059	$ 0.0302	$ 0.0098	$ 0.0084	$ 0.0035	$ 0.0198	$0.0008	$0.0005	$ 0.0001	$ 0.0023	$0.0038	$0.0025	$ 0.0004	$ 0.0105	$ 0.0307	$ 0.0265	$ 0.0098	$ 0.0628
2015	$ 0.0192	$ 0.0179	$ 0.0070	$ 0.0352	$ 0.0115	$ 0.0099	$ 0.0042	$ 0.0231	$0.0009	$0.0006	$ 0.0001	$ 0.0026	$0.0044	$0.0029	$ 0.0004	$ 0.0122	$ 0.0361	$ 0.0312	$ 0.0117	$ 0.0732
2016	$ 0.0221	$ 0.0206	$ 0.0080	$ 0.0405	$ 0.0133	$ 0.0114	$ 0.0049	$ 0.0265	$0.0011	$0.0007	$ 0.0001	$ 0.0030	$0.0051	$0.0033	$ 0.0005	$ 0.0140	$ 0.0415	$ 0.0360	$ 0.0135	$ 0.0839
2017	$ 0.0234	$ 0.0217	$ 0.0083	$ 0.0429	$ 0.0139	$ 0.0119	$ 0.0050	$ 0.0287	$0.0011	$0.0008	$ 0.0001	$ 0.0032	$0.0052	$0.0033	$ 0.0005	$ 0.0150	$ 0.0436	$ 0.0378	$ 0.0139	$ 0.0898
2018	$ 0.0239	$ 0.0222	$ 0.0085	$ 0.0436	$ 0.0141	$ 0.0121	$ 0.0051	$ 0.0292	$0.0011	$0.0008	$ 0.0001	$ 0.0032	$0.0053	$0.0034	$ 0.0005	$ 0.0152	$ 0.0445	$ 0.0386	$ 0.0142	$ 0.0912
2019	$ 0.0243	$ 0.0228	$ 0.0087	$ 0.0444	$ 0.0144	$ 0.0124	$ 0.0052	$ 0.0297	$0.0011	$0.0008	$ 0.0001	$ 0.0033	$0.0054	$0.0035	$ 0.0005	$ 0.0154	$ 0.0453	$ 0.0395	$ 0.0146	$ 0.0927
2020	$ 0.0251	$ 0.0232	$ 0.0089	$ 0.0459	$ 0.0149	$ 0.0129	$ 0.0053	$ 0.0310	$0.0012	$0.0008	$ 0.0001	$ 0.0033	$0.0055	$0.0036	$ 0.0005	$ 0.0159	$ 0.0467	$ 0.0405	$ 0.0149	$ 0.0962
2021	$ 0.0260	$ 0.0244	$ 0.0093	$ 0.0473	$ 0.0154	$ 0.0132	$ 0.0057	$ 0.0319	$0.0012	$0.0008	$ 0.0001	$ 0.0034	$0.0057	$0.0037	$ 0.0005	$ 0.0161	$ 0.0483	$ 0.0422	$ 0.0156	$ 0.0988
2022	$ 0.0266	$ 0.0249	$ 0.0096	$ 0.0486	$ 0.0157	$ 0.0135	$ 0.0058	$ 0.0325	$0.0012	$0.0008	$ 0.0001	$ 0.0035	$0.0057	$0.0037	$ 0.0005	$ 0.0163	$ 0.0492	$ 0.0430	$ 0.0160	$ 0.1009
2023	$ 0.0270	$ 0.0253	$ 0.0098	$ 0.0494	$ 0.0160	$ 0.0138	$ 0.0059	$ 0.0330	$0.0012	$0.0009	$ 0.0001	$ 0.0035	$0.0058	$0.0038	$ 0.0005	$ 0.0165	$ 0.0501	$ 0.0438	$ 0.0163	$ 0.1024
2024	$ 0.0282	$ 0.0266	$ 0.0101	$ 0.0507	$ 0.0166	$ 0.0143	$ 0.0061	$ 0.0336	$0.0013	$0.0009	$ 0.0001	$ 0.0036	$0.0060	$0.0039	$ 0.0006	$ 0.0168	$ 0.0521	$ 0.0457	$ 0.0169	$ 0.1046
2025	$ 0.0289	$ 0.0273	$ 0.0103	$ 0.0517	$ 0.0171	$ 0.0146	$ 0.0062	$ 0.0348	$0.0013	$0.0009	$ 0.0001	$ 0.0037	$0.0061	$0.0040	$ 0.0006	$ 0.0170	$ 0.0534	$ 0.0469	$ 0.0172	$ 0.1072
2026	$ 0.0295	$ 0.0278	$ 0.0105	$ 0.0527	$ 0.0174	$ 0.0150	$ 0.0063	$ 0.0354	$0.0013	$0.0009	$ 0.0001	$ 0.0037	$0.0062	$0.0041	$ 0.0006	$ 0.0174	$ 0.0544	$ 0.0478	$ 0.0176	$ 0.1091
2027	$ 0.0302	$ 0.0287	$ 0.0108	$ 0.0537	$ 0.0178	$ 0.0153	$ 0.0065	$ 0.0359	$0.0013	$0.0009	$ 0.0001	$ 0.0038	$0.0063	$0.0042	$ 0.0006	$ 0.0178	$ 0.0556	$ 0.0491	$ 0.0180	$ 0.1112
2028	$ 0.0307	$ 0.0292	$ 0.0110	$ 0.0546	$ 0.0181	$ 0.0156	$ 0.0066	$ 0.0365	$0.0013	$0.0009	$ 0.0001	$ 0.0038	$0.0063	$0.0042	$ 0.0006	$ 0.0182	$ 0.0565	$ 0.0500	$ 0.0184	$ 0.1131
2029	$ 0.0314	$ 0.0299	$ 0.0112	$ 0.0560	$ 0.0185	$ 0.0160	$ 0.0068	$ 0.0371	$0.0014	$0.0009	$ 0.0001	$ 0.0039	$0.0064	$0.0043	$ 0.0006	$ 0.0185	$ 0.0577	$ 0.0511	$ 0.0187	$ 0.1156

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3p Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving 100,001-1,000,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0003	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0004	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$0.0004	$0.0001	$ 0.0000	$ 0.0011	$ 0.0007	$ 0.0002	$ 0.0000	$ 0.0021
2009	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0010	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0014	$0.0003	$0.0001	$ 0.0000	$ 0.0011	$0.0014	$0.0004	$ 0.0000	$ 0.0040	$ 0.0024	$ 0.0008	$ 0.0001	$ 0.0076
2010	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0016	$ 0.0006	$ 0.0004	$ 0.0001	$ 0.0023	$0.0005	$0.0002	$ 0.0000	$ 0.0019	$0.0023	$0.0007	$ 0.0000	$ 0.0066	$ 0.0039	$ 0.0014	$ 0.0002	$ 0.0123
2011	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0022	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0032	$0.0008	$0.0002	$ 0.0000	$ 0.0027	$0.0032	$0.0009	$ 0.0001	$ 0.0096	$ 0.0054	$ 0.0019	$ 0.0002	$ 0.0178
2012	$ 0.0007	$ 0.0004	$ 0.0001	$ 0.0029	$ 0.0011	$ 0.0007	$ 0.0001	$ 0.0042	$0.0010	$0.0003	$ 0.0000	$ 0.0034	$0.0041	$0.0012	$ 0.0001	$ 0.0121	$ 0.0069	$ 0.0025	$ 0.0003	$ 0.0226
2013	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0036	$ 0.0014	$ 0.0008	$ 0.0002	$ 0.0052	$0.0012	$0.0004	$ 0.0000	$ 0.0043	$0.0052	$0.0015	$ 0.0001	$ 0.0151	$ 0.0087	$ 0.0032	$ 0.0004	$ 0.0282
2014	$ 0.0010	$ 0.0005	$ 0.0001	$ 0.0043	$ 0.0017	$ 0.0010	$ 0.0002	$ 0.0062	$0.0014	$0.0004	$ 0.0000	$ 0.0051	$0.0061	$0.0018	$ 0.0001	$ 0.0178	$ 0.0103	$ 0.0038	$ 0.0005	$ 0.0333
2015	$ 0.0012	$ 0.0006	$ 0.0001	$ 0.0052	$ 0.0020	$ 0.0012	$ 0.0003	$ 0.0075	$0.0017	$0.0005	$ 0.0000	$ 0.0059	$0.0071	$0.0021	$ 0.0002	$ 0.0206	$ 0.0120	$ 0.0044	$ 0.0006	$ 0.0392
2016	$ 0.0014	$ 0.0007	$ 0.0001	$ 0.0060	$ 0.0023	$ 0.0013	$ 0.0003	$ 0.0086	$0.0019	$0.0006	$ 0.0000	$ 0.0067	$0.0081	$0.0024	$ 0.0002	$ 0.0234	$ 0.0137	$ 0.0051	$ 0.0007	$ 0.0447
2017	$ 0.0016	$ 0.0008	$ 0.0002	$ 0.0078	$ 0.0026	$ 0.0014	$ 0.0003	$ 0.0114	$0.0021	$0.0006	$ 0.0000	$ 0.0075	$0.0088	$0.0026	$ 0.0002	$ 0.0270	$ 0.0150	$ 0.0054	$ 0.0007	$ 0.0537
2018	$ 0.0016	$ 0.0008	$ 0.0002	$ 0.0079	$ 0.0026	$ 0.0014	$ 0.0003	$ 0.0115	$0.0021	$0.0006	$ 0.0000	$ 0.0075	$0.0089	$0.0026	$ 0.0002	$ 0.0274	$ 0.0152	$ 0.0055	$ 0.0007	$ 0.0544
2019	$ 0.0017	$ 0.0008	$ 0.0002	$ 0.0081	$ 0.0027	$ 0.0014	$ 0.0003	$ 0.0117	$0.0021	$0.0006	$ 0.0000	$ 0.0076	$0.0089	$0.0027	$ 0.0002	$ 0.0277	$ 0.0154	$ 0.0056	$ 0.0007	$ 0.0551
2020	$ 0.0017	$ 0.0008	$ 0.0002	$ 0.0083	$ 0.0028	$ 0.0015	$ 0.0003	$ 0.0123	$0.0022	$0.0007	$ 0.0000	$ 0.0081	$0.0092	$0.0027	$ 0.0002	$ 0.0292	$ 0.0159	$ 0.0057	$ 0.0007	$ 0.0579
2021	$ 0.0018	$ 0.0009	$ 0.0002	$ 0.0085	$ 0.0028	$ 0.0016	$ 0.0003	$ 0.0125	$0.0022	$0.0007	$ 0.0000	$ 0.0082	$0.0094	$0.0028	$ 0.0002	$ 0.0294	$ 0.0162	$ 0.0059	$ 0.0008	$ 0.0586
2022	$ 0.0018	$ 0.0009	$ 0.0002	$ 0.0086	$ 0.0029	$ 0.0016	$ 0.0003	$ 0.0127	$0.0023	$0.0007	$ 0.0000	$ 0.0083	$0.0095	$0.0028	$ 0.0002	$ 0.0297	$ 0.0164	$ 0.0060	$ 0.0008	$ 0.0592
2023	$ 0.0018	$ 0.0009	$ 0.0002	$ 0.0087	$ 0.0029	$ 0.0016	$ 0.0003	$ 0.0129	$0.0023	$0.0007	$ 0.0000	$ 0.0083	$0.0096	$0.0028	$ 0.0002	$ 0.0299	$ 0.0166	$ 0.0060	$ 0.0008	$ 0.0598
2024	$ 0.0019	$ 0.0009	$ 0.0002	$ 0.0089	$ 0.0030	$ 0.0017	$ 0.0004	$ 0.0131	$0.0023	$0.0007	$ 0.0000	$ 0.0084	$0.0097	$0.0029	$ 0.0002	$ 0.0301	$ 0.0169	$ 0.0062	$ 0.0008	$ 0.0605
2025	$ 0.0019	$ 0.0010	$ 0.0002	$ 0.0090	$ 0.0031	$ 0.0017	$ 0.0004	$ 0.0133	$0.0023	$0.0007	$ 0.0000	$ 0.0085	$0.0098	$0.0029	$ 0.0002	$ 0.0305	$ 0.0171	$ 0.0063	$ 0.0008	$ 0.0613
2026	$ 0.0020	$ 0.0010	$ 0.0002	$ 0.0092	$ 0.0031	$ 0.0017	$ 0.0004	$ 0.0135	$0.0024	$0.0007	$ 0.0000	$ 0.0086	$0.0099	$0.0030	$ 0.0002	$ 0.0307	$ 0.0173	$ 0.0064	$ 0.0008	$ 0.0619
2027	$ 0.0020	$ 0.0010	$ 0.0002	$ 0.0093	$ 0.0032	$ 0.0018	$ 0.0004	$ 0.0137	$0.0024	$0.0007	$ 0.0000	$ 0.0086	$0.0100	$0.0030	$ 0.0002	$ 0.0309	$ 0.0175	$ 0.0065	$ 0.0008	$ 0.0626
2028	$ 0.0020	$ 0.0010	$ 0.0002	$ 0.0095	$ 0.0032	$ 0.0018	$ 0.0004	$ 0.0139	$0.0024	$0.0007	$ 0.0000	$ 0.0087	$0.0101	$0.0030	$ 0.0002	$ 0.0312	$ 0.0177	$ 0.0066	$ 0.0009	$ 0.0633
2029	$ 0.0021	$ 0.0010	$ 0.0002	$ 0.0097	$ 0.0033	$ 0.0019	$ 0.0004	$ 0.0142	$0.0024	$0.0008	$ 0.0001	$ 0.0088	$0.0102	$0.0031	$ 0.0002	$ 0.0314	$ 0.0180	$ 0.0068	$ 0.0009	$ 0.0640

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.3q Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving >1,000,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2009	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2010	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2012	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2013	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2014	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2015	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2016	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2017	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2018	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2019	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2021	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2022	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2023	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2024	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2025	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2026	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2027	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2028	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2029	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.3r Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for NTNCWSs Serving >1,000,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2009	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2010	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2012	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2013	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2014	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2015	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2016	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2017	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2018	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2019	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2021	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2022	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2023	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2024	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2025	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2026	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2027	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2028	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2029	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.4a Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for All NTNCWSs

	Total - Illness				Total - Deaths				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.0	$ 0.0	$ 0.2
2010	$ 0.1	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.1	$ 0.0	$ 0.3
2011	$ 0.1	$ 0.1	$ 0.0	$ 0.3	$ 0.1	$ 0.0	$ 0.0	$ 0.2	$ 0.2	$ 0.2	$ 0.1	$ 0.5
2012	$ 0.3	$ 0.3	$ 0.1	$ 0.6	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.4	$ 0.3	$ 0.1	$ 1.0
2013	$ 0.4	$ 0.4	$ 0.2	$ 0.8	$ 0.2	$ 0.1	$ 0.0	$ 0.5	$ 0.6	$ 0.5	$ 0.2	$ 1.4
2014	$ 0.5	$ 0.5	$ 0.2	$ 1.1	$ 0.2	$ 0.1	$ 0.0	$ 0.7	$ 0.7	$ 0.6	$ 0.2	$ 1.8
2015	$ 0.7	$ 0.6	$ 0.3	$ 1.3	$ 0.3	$ 0.1	$ 0.0	$ 0.9	$ 0.9	$ 0.7	$ 0.3	$ 2.2
2016	$ 0.8	$ 0.7	$ 0.3	$ 1.6	$ 0.3	$ 0.2	$ 0.0	$ 1.0	$ 1.1	$ 0.9	$ 0.3	$ 2.5
2017	$ 0.9	$ 0.8	$ 0.4	$ 1.8	$ 0.3	$ 0.2	$ 0.0	$ 1.1	$ 1.2	$ 1.0	$ 0.4	$ 3.0
2018	$ 0.9	$ 0.8	$ 0.4	$ 1.9	$ 0.4	$ 0.2	$ 0.0	$ 1.2	$ 1.3	$ 1.0	$ 0.4	$ 3.1
2019	$ 1.0	$ 0.9	$ 0.4	$ 2.0	$ 0.4	$ 0.2	$ 0.0	$ 1.3	$ 1.4	$ 1.1	$ 0.4	$ 3.3
2020	$ 1.0	$ 0.9	$ 0.4	$ 2.1	$ 0.4	$ 0.2	$ 0.0	$ 1.3	$ 1.5	$ 1.1	$ 0.5	$ 3.4
2021	$ 1.1	$ 1.0	$ 0.5	$ 2.2	$ 0.4	$ 0.2	$ 0.0	$ 1.4	$ 1.6	$ 1.2	$ 0.5	$ 3.6
2022	$ 1.2	$ 1.1	$ 0.5	$ 2.5	$ 0.5	$ 0.3	$ 0.0	$ 1.6	$ 1.7	$ 1.3	$ 0.6	$ 4.0
2023	$ 1.3	$ 1.1	$ 0.5	$ 2.5	$ 0.5	$ 0.3	$ 0.0	$ 1.6	$ 1.7	$ 1.4	$ 0.6	$ 4.1
2024	$ 1.3	$ 1.1	$ 0.6	$ 2.6	$ 0.5	$ 0.3	$ 0.0	$ 1.6	$ 1.8	$ 1.4	$ 0.6	$ 4.2
2025	$ 1.3	$ 1.2	$ 0.6	$ 2.7	$ 0.5	$ 0.3	$ 0.0	$ 1.7	$ 1.8	$ 1.5	$ 0.6	$ 4.3
2026	$ 1.4	$ 1.3	$ 0.6	$ 2.8	$ 0.5	$ 0.3	$ 0.0	$ 1.8	$ 1.9	$ 1.5	$ 0.6	$ 4.6
2027	$ 1.5	$ 1.3	$ 0.6	$ 2.9	$ 0.5	$ 0.3	$ 0.0	$ 1.8	$ 2.0	$ 1.6	$ 0.7	$ 4.7
2028	$ 1.5	$ 1.3	$ 0.6	$ 3.0	$ 0.5	$ 0.3	$ 0.0	$ 1.8	$ 2.0	$ 1.6	$ 0.7	$ 4.8
2029	$ 1.6	$ 1.4	$ 0.7	$ 3.1	$ 0.6	$ 0.3	$ 0.0	$ 1.9	$ 2.1	$ 1.7	$ 0.7	$ 4.9

Source: GWR Benefits Model.

Exhibit C.4b Present Value of Illnesses and Deaths Avoided Under the Final Rule by Year at 3 Percent, for All NTNCWSs

	Total - Illness				Total - Death				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.0	$ 0.0	$ 0.2
2010	$ 0.1	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.1	$ 0.0	$ 0.3
2011	$ 0.1	$ 0.1	$ 0.0	$ 0.3	$ 0.1	$ 0.0	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.0	$ 0.4
2012	$ 0.3	$ 0.2	$ 0.1	$ 0.5	$ 0.1	$ 0.1	$ 0.0	$ 0.3	$ 0.4	$ 0.3	$ 0.1	$ 0.8
2013	$ 0.3	$ 0.3	$ 0.1	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.5	$ 0.4	$ 0.1	$ 1.1
2014	$ 0.4	$ 0.4	$ 0.2	$ 0.8	$ 0.2	$ 0.1	$ 0.0	$ 0.5	$ 0.6	$ 0.4	$ 0.2	$ 1.3
2015	$ 0.5	$ 0.4	$ 0.2	$ 1.0	$ 0.2	$ 0.1	$ 0.0	$ 0.6	$ 0.7	$ 0.5	$ 0.2	$ 1.6
2016	$ 0.6	$ 0.5	$ 0.2	$ 1.1	$ 0.2	$ 0.1	$ 0.0	$ 0.7	$ 0.8	$ 0.6	$ 0.2	$ 1.8
2017	$ 0.6	$ 0.5	$ 0.2	$ 1.3	$ 0.2	$ 0.1	$ 0.0	$ 0.8	$ 0.9	$ 0.7	$ 0.3	$ 2.1
2018	$ 0.6	$ 0.6	$ 0.3	$ 1.3	$ 0.3	$ 0.1	$ 0.0	$ 0.8	$ 0.9	$ 0.7	$ 0.3	$ 2.1
2019	$ 0.7	$ 0.6	$ 0.3	$ 1.3	$ 0.3	$ 0.1	$ 0.0	$ 0.8	$ 0.9	$ 0.7	$ 0.3	$ 2.2
2020	$ 0.7	$ 0.6	$ 0.3	$ 1.3	$ 0.3	$ 0.1	$ 0.0	$ 0.8	$ 0.9	$ 0.7	$ 0.3	$ 2.2
2021	$ 0.7	$ 0.6	$ 0.3	$ 1.4	$ 0.3	$ 0.1	$ 0.0	$ 0.9	$ 1.0	$ 0.8	$ 0.3	$ 2.3
2022	$ 0.7	$ 0.6	$ 0.3	$ 1.5	$ 0.3	$ 0.2	$ 0.0	$ 1.0	$ 1.0	$ 0.8	$ 0.3	$ 2.4
2023	$ 0.7	$ 0.6	$ 0.3	$ 1.5	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.0	$ 0.8	$ 0.3	$ 2.4
2024	$ 0.7	$ 0.7	$ 0.3	$ 1.5	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.0	$ 0.8	$ 0.3	$ 2.4
2025	$ 0.7	$ 0.7	$ 0.3	$ 1.5	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.0	$ 0.8	$ 0.3	$ 2.4
2026	$ 0.8	$ 0.7	$ 0.3	$ 1.5	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.0	$ 0.8	$ 0.3	$ 2.5
2027	$ 0.8	$ 0.7	$ 0.3	$ 1.5	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.0	$ 0.8	$ 0.3	$ 2.4
2028	$ 0.8	$ 0.7	$ 0.3	$ 1.5	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.0	$ 0.8	$ 0.3	$ 2.4
2029	$ 0.8	$ 0.7	$ 0.3	$ 1.5	$ 0.3	$ 0.1	$ 0.0	$ 0.9	$ 1.0	$ 0.8	$ 0.3	$ 2.4
Total	$ 11.6	$ 10.2	$ 4.8	$ 23.2	$ 4.4	$ 2.4	$ 0.3	$ 14.6	$ 16.1	$ 12.6	$ 5.1	$ 37.8
Ann	$ 0.7	$ 0.6	$ 0.3	$ 1.3	$ 0.3	$ 0.1	$ 0.0	$ 0.8	$ 0.9	$ 0.7	$ 0.3	$ 2.2

Notes: Details may not sum due to rounding and individual statistical analyses.

Source: GWR Benefits Model.

Exhibit C.4c Present Value of Illnesses and Deaths Avoided Under the Final Rule by Year at 7 Percent, for All NTNCWSs

	Total - Illness				Total - Deaths				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.0	$ 0.0	$ 0.1
2010	$ 0.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.1	$ 0.0	$ 0.2
2011	$ 0.1	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.1	$ 0.0	$ 0.3
2012	$ 0.2	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.0	$ 0.2	$ 0.3	$ 0.2	$ 0.1	$ 0.6
2013	$ 0.2	$ 0.2	$ 0.1	$ 0.5	$ 0.1	$ 0.1	$ 0.0	$ 0.3	$ 0.3	$ 0.3	$ 0.1	$ 0.8
2014	$ 0.3	$ 0.2	$ 0.1	$ 0.6	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.4	$ 0.3	$ 0.1	$ 1.0
2015	$ 0.3	$ 0.3	$ 0.1	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.5	$ 0.4	$ 0.1	$ 1.1
2016	$ 0.4	$ 0.3	$ 0.1	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.5	$ 0.5	$ 0.4	$ 0.2	$ 1.2
2017	$ 0.4	$ 0.3	$ 0.2	$ 0.8	$ 0.2	$ 0.1	$ 0.0	$ 0.5	$ 0.6	$ 0.4	$ 0.2	$ 1.3
2018	$ 0.4	$ 0.3	$ 0.2	$ 0.8	$ 0.2	$ 0.1	$ 0.0	$ 0.5	$ 0.5	$ 0.4	$ 0.2	$ 1.3
2019	$ 0.4	$ 0.3	$ 0.2	$ 0.8	$ 0.2	$ 0.1	$ 0.0	$ 0.5	$ 0.5	$ 0.4	$ 0.2	$ 1.3
2020	$ 0.4	$ 0.3	$ 0.2	$ 0.8	$ 0.1	$ 0.1	$ 0.0	$ 0.5	$ 0.5	$ 0.4	$ 0.2	$ 1.2
2021	$ 0.4	$ 0.3	$ 0.2	$ 0.8	$ 0.1	$ 0.1	$ 0.0	$ 0.5	$ 0.5	$ 0.4	$ 0.2	$ 1.2
2022	$ 0.4	$ 0.3	$ 0.2	$ 0.8	$ 0.2	$ 0.1	$ 0.0	$ 0.5	$ 0.5	$ 0.4	$ 0.2	$ 1.3
2023	$ 0.4	$ 0.3	$ 0.2	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.5	$ 0.5	$ 0.4	$ 0.2	$ 1.2
2024	$ 0.4	$ 0.3	$ 0.2	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.5	$ 0.5	$ 0.4	$ 0.2	$ 1.2
2025	$ 0.3	$ 0.3	$ 0.1	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.5	$ 0.4	$ 0.2	$ 1.1
2026	$ 0.3	$ 0.3	$ 0.1	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.5	$ 0.4	$ 0.2	$ 1.1
2027	$ 0.3	$ 0.3	$ 0.1	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.5	$ 0.4	$ 0.2	$ 1.1
2028	$ 0.3	$ 0.3	$ 0.1	$ 0.6	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.4	$ 0.3	$ 0.1	$ 1.0
2029	$ 0.3	$ 0.3	$ 0.1	$ 0.6	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.4	$ 0.3	$ 0.1	$ 1.0
Total	$ 6.3	$ 5.6	$ 2.6	$ 12.7	$ 2.4	$ 1.3	$ 0.2	$ 8.0	$ 8.8	$ 6.9	$ 2.8	$ 20.7
Ann	$ 0.5	$ 0.5	$ 0.2	$ 1.1	$ 0.2	$ 0.1	$ 0.0	$ 0.7	$ 0.8	$ 0.6	$ 0.2	$ 1.8

Notes: Details may not sum due to rounding and individual statistical analyses.

Source: GWR Benefits Model.

Exhibit C.5a Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving <100 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0007	$ 0.0006	$ 0.0001	$ 0.0020	$ 0.0006	$ 0.0005	$ 0.0000	$ 0.0018	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0002	$0.0001	$ 0.0000	$ 0.0008	$ 0.0016	$ 0.0012	$ 0.0001	$ 0.0048
2009	$ 0.0035	$ 0.0029	$ 0.0005	$ 0.0081	$ 0.0029	$ 0.0024	$ 0.0004	$ 0.0074	$0.0002	$0.0001	$ 0.0000	$ 0.0005	$0.0012	$0.0007	$ 0.0001	$ 0.0036	$ 0.0078	$ 0.0061	$ 0.0009	$ 0.0197
2010	$ 0.0537	$ 0.0472	$ 0.0163	$ 0.1211	$ 0.0436	$ 0.0385	$ 0.0132	$ 0.0980	$0.0028	$0.0019	$ 0.0003	$ 0.0075	$0.0170	$0.0120	$ 0.0016	$ 0.0455	$ 0.1170	$ 0.0995	$ 0.0314	$ 0.2721
2011	$ 0.0757	$ 0.0676	$ 0.0234	$ 0.1676	$ 0.0611	$ 0.0544	$ 0.0191	$ 0.1349	$0.0039	$0.0027	$ 0.0004	$ 0.0103	$0.0237	$0.0167	$ 0.0023	$ 0.0617	$ 0.1644	$ 0.1413	$ 0.0451	$ 0.3743
2012	$ 0.1259	$ 0.1190	$ 0.0418	$ 0.2359	$ 0.1045	$ 0.0985	$ 0.0336	$ 0.2065	$0.0063	$0.0047	$ 0.0007	$ 0.0163	$0.0397	$0.0288	$ 0.0042	$ 0.1017	$ 0.2764	$ 0.2509	$ 0.0802	$ 0.5605
2013	$ 0.1560	$ 0.1479	$ 0.0537	$ 0.2899	$ 0.1294	$ 0.1220	$ 0.0420	$ 0.2530	$0.0077	$0.0057	$ 0.0009	$ 0.0199	$0.0488	$0.0351	$ 0.0053	$ 0.1241	$ 0.3419	$ 0.3108	$ 0.1019	$ 0.6869
2014	$ 0.2182	$ 0.2071	$ 0.0776	$ 0.4153	$ 0.1787	$ 0.1687	$ 0.0588	$ 0.3374	$0.0107	$0.0080	$ 0.0012	$ 0.0271	$0.0669	$0.0485	$ 0.0072	$ 0.1668	$ 0.4745	$ 0.4321	$ 0.1448	$ 0.9466
2015	$ 0.2643	$ 0.2535	$ 0.0979	$ 0.4935	$ 0.2162	$ 0.2045	$ 0.0729	$ 0.3991	$0.0129	$0.0095	$ 0.0014	$ 0.0331	$0.0806	$0.0581	$ 0.0085	$ 0.2038	$ 0.5740	$ 0.5256	$ 0.1807	$ 1.1296
2016	$ 0.3054	$ 0.2929	$ 0.1139	$ 0.5681	$ 0.2499	$ 0.2368	$ 0.0853	$ 0.4652	$0.0148	$0.0109	$ 0.0016	$ 0.0378	$0.0925	$0.0668	$ 0.0097	$ 0.2325	$ 0.6626	$ 0.6073	$ 0.2105	$ 1.3036
2017	$ 0.3503	$ 0.3332	$ 0.1271	$ 0.6367	$ 0.2834	$ 0.2633	$ 0.0959	$ 0.5314	$0.0168	$0.0123	$ 0.0018	$ 0.0444	$0.1040	$0.0754	$ 0.0106	$ 0.2532	$ 0.7545	$ 0.6842	$ 0.2354	$ 1.4657
2018	$ 0.3674	$ 0.3456	$ 0.1353	$ 0.6583	$ 0.2959	$ 0.2779	$ 0.1022	$ 0.5516	$0.0175	$0.0129	$ 0.0018	$ 0.0453	$0.1079	$0.0784	$ 0.0109	$ 0.2597	$ 0.7886	$ 0.7149	$ 0.2502	$ 1.5149
2019	$ 0.3874	$ 0.3634	$ 0.1441	$ 0.6966	$ 0.3131	$ 0.2974	$ 0.1081	$ 0.5774	$0.0183	$0.0139	$ 0.0019	$ 0.0471	$0.1134	$0.0850	$ 0.0121	$ 0.2797	$ 0.8322	$ 0.7597	$ 0.2662	$ 1.6009
2020	$ 0.3982	$ 0.3754	$ 0.1479	$ 0.7108	$ 0.3218	$ 0.3071	$ 0.1115	$ 0.5888	$0.0186	$0.0142	$ 0.0020	$ 0.0479	$0.1158	$0.0874	$ 0.0122	$ 0.2843	$ 0.8544	$ 0.7841	$ 0.2735	$ 1.6318
2021	$ 0.4446	$ 0.4204	$ 0.1551	$ 0.7942	$ 0.3566	$ 0.3371	$ 0.1218	$ 0.6491	$0.0206	$0.0157	$ 0.0021	$ 0.0525	$0.1272	$0.0949	$ 0.0132	$ 0.3350	$ 0.9490	$ 0.8681	$ 0.2922	$ 1.8309
2022	$ 0.4581	$ 0.4359	$ 0.1598	$ 0.8108	$ 0.3670	$ 0.3487	$ 0.1257	$ 0.6638	$0.0210	$0.0161	$ 0.0022	$ 0.0535	$0.1299	$0.0970	$ 0.0134	$ 0.3426	$ 0.9761	$ 0.8977	$ 0.3012	$ 1.8707
2023	$ 0.4828	$ 0.4637	$ 0.1742	$ 0.8415	$ 0.3865	$ 0.3710	$ 0.1346	$ 0.6884	$0.0219	$0.0168	$ 0.0023	$ 0.0558	$0.1358	$0.1017	$ 0.0142	$ 0.3559	$ 1.0270	$ 0.9533	$ 0.3253	$ 1.9416
2024	$ 0.5020	$ 0.4821	$ 0.1803	$ 0.8737	$ 0.4011	$ 0.3837	$ 0.1391	$ 0.7087	$0.0226	$0.0173	$ 0.0023	$ 0.0580	$0.1399	$0.1042	$ 0.0145	$ 0.3659	$ 1.0656	$ 0.9873	$ 0.3363	$ 2.0064
2025	$ 0.5310	$ 0.5178	$ 0.1963	$ 0.9076	$ 0.4236	$ 0.4138	$ 0.1463	$ 0.7415	$0.0238	$0.0183	$ 0.0025	$ 0.0624	$0.1468	$0.1116	$ 0.0150	$ 0.3853	$ 1.1251	$ 1.0615	$ 0.3600	$ 2.0968
2026	$ 0.5496	$ 0.5357	$ 0.2023	$ 0.9348	$ 0.4385	$ 0.4266	$ 0.1503	$ 0.7738	$0.0244	$0.0186	$ 0.0025	$ 0.0637	$0.1508	$0.1163	$ 0.0153	$ 0.3961	$ 1.1633	$ 1.0973	$ 0.3704	$ 2.1684
2027	$ 0.5814	$ 0.5647	$ 0.2124	$ 0.9924	$ 0.4631	$ 0.4503	$ 0.1565	$ 0.8160	$0.0256	$0.0196	$ 0.0026	$ 0.0660	$0.1580	$0.1219	$ 0.0156	$ 0.4081	$ 1.2281	$ 1.1564	$ 0.3871	$ 2.2825
2028	$ 0.5939	$ 0.5769	$ 0.2171	$ 1.0157	$ 0.4726	$ 0.4599	$ 0.1596	$ 0.8356	$0.0259	$0.0199	$ 0.0026	$ 0.0667	$0.1600	$0.1232	$ 0.0158	$ 0.4130	$ 1.2524	$ 1.1798	$ 0.3951	$ 2.3310
2029	$ 0.6115	$ 0.5946	$ 0.2256	$ 1.0404	$ 0.4861	$ 0.4755	$ 0.1685	$ 0.8630	$0.0264	$0.0201	$ 0.0027	$ 0.0689	$0.1633	$0.1257	$ 0.0161	$ 0.4225	$ 1.2873	$ 1.2160	$ 0.4129	$ 2.3947

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5b Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving <100 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0005
2009	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0002	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0004	$0.0001	$0.0000	$ 0.0000	$ 0.0004	$0.0006	$0.0002	$ 0.0000	$ 0.0019	$ 0.0011	$ 0.0004	$ 0.0000	$ 0.0030
2010	$ 0.0016	$ 0.0009	$ 0.0002	$ 0.0056	$ 0.0027	$ 0.0018	$ 0.0004	$ 0.0085	$0.0019	$0.0009	$ 0.0001	$ 0.0062	$0.0082	$0.0035	$ 0.0004	$ 0.0255	$ 0.0143	$ 0.0071	$ 0.0011	$ 0.0458
2011	$ 0.0022	$ 0.0013	$ 0.0003	$ 0.0078	$ 0.0037	$ 0.0024	$ 0.0007	$ 0.0125	$0.0027	$0.0012	$ 0.0001	$ 0.0086	$0.0113	$0.0051	$ 0.0005	$ 0.0358	$ 0.0198	$ 0.0100	$ 0.0016	$ 0.0647
2012	$ 0.0040	$ 0.0024	$ 0.0006	$ 0.0145	$ 0.0067	$ 0.0045	$ 0.0012	$ 0.0226	$0.0049	$0.0022	$ 0.0002	$ 0.0160	$0.0204	$0.0097	$ 0.0008	$ 0.0642	$ 0.0359	$ 0.0187	$ 0.0029	$ 0.1173
2013	$ 0.0049	$ 0.0030	$ 0.0008	$ 0.0184	$ 0.0083	$ 0.0055	$ 0.0015	$ 0.0286	$0.0060	$0.0027	$ 0.0002	$ 0.0199	$0.0252	$0.0120	$ 0.0010	$ 0.0816	$ 0.0444	$ 0.0232	$ 0.0036	$ 0.1486
2014	$ 0.0065	$ 0.0042	$ 0.0012	$ 0.0231	$ 0.0110	$ 0.0077	$ 0.0023	$ 0.0361	$0.0079	$0.0038	$ 0.0004	$ 0.0265	$0.0334	$0.0170	$ 0.0014	$ 0.1012	$ 0.0588	$ 0.0326	$ 0.0053	$ 0.1868
2015	$ 0.0078	$ 0.0050	$ 0.0015	$ 0.0279	$ 0.0132	$ 0.0092	$ 0.0028	$ 0.0432	$0.0095	$0.0045	$ 0.0004	$ 0.0309	$0.0400	$0.0203	$ 0.0016	$ 0.1202	$ 0.0705	$ 0.0390	$ 0.0063	$ 0.2221
2016	$ 0.0090	$ 0.0058	$ 0.0017	$ 0.0320	$ 0.0152	$ 0.0106	$ 0.0032	$ 0.0495	$0.0108	$0.0052	$ 0.0005	$ 0.0350	$0.0456	$0.0230	$ 0.0019	$ 0.1373	$ 0.0806	$ 0.0446	$ 0.0073	$ 0.2538
2017	$ 0.0156	$ 0.0065	$ 0.0019	$ 0.0826	$ 0.0254	$ 0.0123	$ 0.0038	$ 0.1146	$0.0183	$0.0062	$ 0.0006	$ 0.0654	$0.0786	$0.0272	$ 0.0023	$ 0.2253	$ 0.1379	$ 0.0521	$ 0.0086	$ 0.4879
2018	$ 0.0160	$ 0.0067	$ 0.0020	$ 0.0840	$ 0.0259	$ 0.0127	$ 0.0040	$ 0.1164	$0.0186	$0.0064	$ 0.0006	$ 0.0661	$0.0797	$0.0277	$ 0.0024	$ 0.2277	$ 0.1401	$ 0.0535	$ 0.0090	$ 0.4943
2019	$ 0.0169	$ 0.0071	$ 0.0022	$ 0.0872	$ 0.0274	$ 0.0133	$ 0.0043	$ 0.1197	$0.0195	$0.0067	$ 0.0006	$ 0.0695	$0.0834	$0.0288	$ 0.0026	$ 0.2463	$ 0.1471	$ 0.0558	$ 0.0097	$ 0.5227
2020	$ 0.0172	$ 0.0073	$ 0.0022	$ 0.0887	$ 0.0280	$ 0.0137	$ 0.0044	$ 0.1216	$0.0197	$0.0068	$ 0.0006	$ 0.0700	$0.0844	$0.0294	$ 0.0027	$ 0.2494	$ 0.1493	$ 0.0571	$ 0.0100	$ 0.5296
2021	$ 0.0182	$ 0.0079	$ 0.0024	$ 0.0911	$ 0.0295	$ 0.0150	$ 0.0048	$ 0.1256	$0.0207	$0.0074	$ 0.0007	$ 0.0713	$0.0887	$0.0319	$ 0.0030	$ 0.2699	$ 0.1570	$ 0.0622	$ 0.0109	$ 0.5580
2022	$ 0.0187	$ 0.0083	$ 0.0025	$ 0.0927	$ 0.0303	$ 0.0155	$ 0.0050	$ 0.1280	$0.0211	$0.0077	$ 0.0007	$ 0.0719	$0.0905	$0.0333	$ 0.0031	$ 0.2799	$ 0.1606	$ 0.0647	$ 0.0114	$ 0.5724
2023	$ 0.0209	$ 0.0088	$ 0.0026	$ 0.1060	$ 0.0334	$ 0.0164	$ 0.0052	$ 0.1579	$0.0234	$0.0080	$ 0.0008	$ 0.0786	$0.1003	$0.0357	$ 0.0033	$ 0.2927	$ 0.1781	$ 0.0690	$ 0.0119	$ 0.6352
2024	$ 0.0214	$ 0.0091	$ 0.0027	$ 0.1078	$ 0.0342	$ 0.0168	$ 0.0055	$ 0.1603	$0.0238	$0.0082	$ 0.0008	$ 0.0791	$0.1017	$0.0366	$ 0.0034	$ 0.2946	$ 0.1811	$ 0.0707	$ 0.0124	$ 0.6418
2025	$ 0.0222	$ 0.0097	$ 0.0030	$ 0.1105	$ 0.0356	$ 0.0182	$ 0.0059	$ 0.1632	$0.0244	$0.0088	$ 0.0008	$ 0.0804	$0.1047	$0.0394	$ 0.0035	$ 0.2991	$ 0.1869	$ 0.0761	$ 0.0132	$ 0.6532
2026	$ 0.0229	$ 0.0101	$ 0.0031	$ 0.1132	$ 0.0367	$ 0.0188	$ 0.0061	$ 0.1661	$0.0251	$0.0090	$ 0.0008	$ 0.0818	$0.1073	$0.0402	$ 0.0036	$ 0.3027	$ 0.1920	$ 0.0781	$ 0.0136	$ 0.6637
2027	$ 0.0236	$ 0.0106	$ 0.0031	$ 0.1156	$ 0.0378	$ 0.0198	$ 0.0063	$ 0.1694	$0.0255	$0.0093	$ 0.0009	$ 0.0826	$0.1093	$0.0416	$ 0.0037	$ 0.3057	$ 0.1962	$ 0.0814	$ 0.0140	$ 0.6733
2028	$ 0.0240	$ 0.0108	$ 0.0032	$ 0.1179	$ 0.0385	$ 0.0202	$ 0.0065	$ 0.1722	$0.0258	$0.0095	$ 0.0009	$ 0.0835	$0.1107	$0.0421	$ 0.0037	$ 0.3106	$ 0.1991	$ 0.0827	$ 0.0143	$ 0.6842
2029	$ 0.0246	$ 0.0112	$ 0.0033	$ 0.1199	$ 0.0394	$ 0.0207	$ 0.0068	$ 0.1751	$0.0262	$0.0097	$ 0.0009	$ 0.0842	$0.1122	$0.0429	$ 0.0038	$ 0.3126	$ 0.2024	$ 0.0845	$ 0.0148	$ 0.6918

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5c Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 101-500 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0011	$ 0.0009	$ 0.0001	$ 0.0034	$ 0.0009	$ 0.0007	$ 0.0000	$ 0.0029	$0.0001	$0.0000	$ 0.0000	$ 0.0002	$0.0004	$0.0002	$ 0.0000	$ 0.0011	$ 0.0025	$ 0.0018	$ 0.0001	$ 0.0076
2009	$ 0.0057	$ 0.0049	$ 0.0009	$ 0.0132	$ 0.0044	$ 0.0036	$ 0.0006	$ 0.0111	$0.0003	$0.0002	$ 0.0000	$ 0.0009	$0.0017	$0.0010	$ 0.0001	$ 0.0060	$ 0.0120	$ 0.0096	$ 0.0016	$ 0.0312
2010	$ 0.0787	$ 0.0637	$ 0.0255	$ 0.1821	$ 0.0630	$ 0.0521	$ 0.0204	$ 0.1488	$0.0040	$0.0027	$ 0.0004	$ 0.0108	$0.0245	$0.0175	$ 0.0022	$ 0.0655	$ 0.1702	$ 0.1360	$ 0.0484	$ 0.4073
2011	$ 0.1107	$ 0.0903	$ 0.0360	$ 0.2524	$ 0.0882	$ 0.0734	$ 0.0300	$ 0.2075	$0.0056	$0.0039	$ 0.0005	$ 0.0155	$0.0341	$0.0248	$ 0.0030	$ 0.0932	$ 0.2385	$ 0.1924	$ 0.0695	$ 0.5685
2012	$ 0.1843	$ 0.1700	$ 0.0697	$ 0.3449	$ 0.1495	$ 0.1298	$ 0.0522	$ 0.3059	$0.0092	$0.0067	$ 0.0009	$ 0.0255	$0.0573	$0.0417	$ 0.0053	$ 0.1531	$ 0.4003	$ 0.3483	$ 0.1281	$ 0.8294
2013	$ 0.2281	$ 0.2112	$ 0.0880	$ 0.4241	$ 0.1852	$ 0.1621	$ 0.0659	$ 0.3759	$0.0113	$0.0082	$ 0.0011	$ 0.0312	$0.0704	$0.0512	$ 0.0064	$ 0.1875	$ 0.4950	$ 0.4327	$ 0.1615	$ 1.0188
2014	$ 0.3218	$ 0.2989	$ 0.1217	$ 0.6171	$ 0.2570	$ 0.2262	$ 0.0921	$ 0.5072	$0.0159	$0.0112	$ 0.0015	$ 0.0459	$0.0978	$0.0693	$ 0.0087	$ 0.2789	$ 0.6925	$ 0.6056	$ 0.2241	$ 1.4491
2015	$ 0.3851	$ 0.3627	$ 0.1477	$ 0.7254	$ 0.3075	$ 0.2750	$ 0.1087	$ 0.5984	$0.0189	$0.0133	$ 0.0018	$ 0.0537	$0.1162	$0.0821	$ 0.0103	$ 0.3238	$ 0.8277	$ 0.7331	$ 0.2685	$ 1.7013
2016	$ 0.4905	$ 0.4606	$ 0.1878	$ 0.8960	$ 0.3851	$ 0.3533	$ 0.1361	$ 0.7464	$0.0239	$0.0166	$ 0.0024	$ 0.0659	$0.1444	$0.1010	$ 0.0127	$ 0.3968	$ 1.0439	$ 0.9316	$ 0.3389	$ 2.1050
2017	$ 0.5011	$ 0.4698	$ 0.1948	$ 0.9137	$ 0.3934	$ 0.3621	$ 0.1389	$ 0.7602	$0.0242	$0.0167	$ 0.0024	$ 0.0669	$0.1465	$0.1036	$ 0.0128	$ 0.3984	$ 1.0652	$ 0.9522	$ 0.3490	$ 2.1392
2018	$ 0.5335	$ 0.5055	$ 0.2089	$ 0.9497	$ 0.4192	$ 0.3856	$ 0.1520	$ 0.8009	$0.0256	$0.0177	$ 0.0025	$ 0.0707	$0.1550	$0.1077	$ 0.0138	$ 0.4166	$ 1.1332	$ 1.0166	$ 0.3773	$ 2.2378
2019	$ 0.5505	$ 0.5208	$ 0.2170	$ 0.9799	$ 0.4327	$ 0.3982	$ 0.1608	$ 0.8276	$0.0261	$0.0181	$ 0.0026	$ 0.0718	$0.1587	$0.1110	$ 0.0141	$ 0.4258	$ 1.1680	$ 1.0481	$ 0.3945	$ 2.3051
2020	$ 0.6048	$ 0.5724	$ 0.2341	$ 1.0739	$ 0.4794	$ 0.4325	$ 0.1738	$ 0.8765	$0.0284	$0.0198	$ 0.0028	$ 0.0775	$0.1737	$0.1216	$ 0.0157	$ 0.4757	$ 1.2863	$ 1.1463	$ 0.4264	$ 2.5036
2021	$ 0.6231	$ 0.5919	$ 0.2392	$ 1.0966	$ 0.4939	$ 0.4477	$ 0.1790	$ 0.8978	$0.0290	$0.0206	$ 0.0028	$ 0.0791	$0.1777	$0.1255	$ 0.0159	$ 0.4925	$ 1.3238	$ 1.1857	$ 0.4370	$ 2.5661
2022	$ 0.6439	$ 0.6085	$ 0.2472	$ 1.1281	$ 0.5091	$ 0.4627	$ 0.1854	$ 0.9157	$0.0297	$0.0213	$ 0.0029	$ 0.0813	$0.1818	$0.1291	$ 0.0163	$ 0.5027	$ 1.3645	$ 1.2216	$ 0.4517	$ 2.6278
2023	$ 0.6817	$ 0.6506	$ 0.2673	$ 1.1821	$ 0.5403	$ 0.4939	$ 0.1994	$ 0.9767	$0.0313	$0.0223	$ 0.0030	$ 0.0839	$0.1915	$0.1361	$ 0.0176	$ 0.5354	$ 1.4448	$ 1.3029	$ 0.4874	$ 2.7781
2024	$ 0.7072	$ 0.6748	$ 0.2755	$ 1.2193	$ 0.5596	$ 0.5108	$ 0.2049	$ 1.0009	$0.0321	$0.0228	$ 0.0031	$ 0.0864	$0.1970	$0.1397	$ 0.0178	$ 0.5507	$ 1.4959	$ 1.3481	$ 0.5013	$ 2.8573
2025	$ 0.7434	$ 0.7206	$ 0.2947	$ 1.2674	$ 0.5877	$ 0.5495	$ 0.2216	$ 1.0386	$0.0336	$0.0244	$ 0.0034	$ 0.0892	$0.2059	$0.1489	$ 0.0196	$ 0.5795	$ 1.5706	$ 1.4435	$ 0.5393	$ 2.9747
2026	$ 0.7715	$ 0.7496	$ 0.3024	$ 1.3153	$ 0.6100	$ 0.5815	$ 0.2271	$ 1.0738	$0.0346	$0.0253	$ 0.0034	$ 0.0919	$0.2122	$0.1546	$ 0.0199	$ 0.5915	$ 1.6283	$ 1.5110	$ 0.5528	$ 3.0725
2027	$ 0.8138	$ 0.7911	$ 0.3168	$ 1.3996	$ 0.6452	$ 0.6051	$ 0.2356	$ 1.1389	$0.0362	$0.0262	$ 0.0035	$ 0.0979	$0.2230	$0.1657	$ 0.0206	$ 0.6081	$ 1.7182	$ 1.5881	$ 0.5766	$ 3.2445
2028	$ 0.8317	$ 0.8080	$ 0.3242	$ 1.4310	$ 0.6591	$ 0.6199	$ 0.2406	$ 1.1642	$0.0367	$0.0265	$ 0.0036	$ 0.0993	$0.2261	$0.1674	$ 0.0209	$ 0.6147	$ 1.7536	$ 1.6219	$ 0.5892	$ 3.3093
2029	$ 0.8528	$ 0.8289	$ 0.3350	$ 1.4683	$ 0.6756	$ 0.6349	$ 0.2455	$ 1.1866	$0.0373	$0.0270	$ 0.0036	$ 0.1012	$0.2299	$0.1700	$ 0.0214	$ 0.6269	$ 1.7956	$ 1.6609	$ 0.6055	$ 3.3829

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5d Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 101-500 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0000	$ 0.0000	$ 0.0004	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0007
2009	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0008	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0014	$0.0003	$0.0001	$ 0.0000	$ 0.0011	$0.0013	$0.0003	$ 0.0000	$ 0.0032	$ 0.0021	$ 0.0006	$ 0.0001	$ 0.0065
2010	$ 0.0022	$ 0.0014	$ 0.0003	$ 0.0068	$ 0.0038	$ 0.0026	$ 0.0007	$ 0.0117	$0.0027	$0.0012	$ 0.0002	$ 0.0098	$0.0115	$0.0050	$ 0.0007	$ 0.0436	$ 0.0201	$ 0.0102	$ 0.0019	$ 0.0720
2011	$ 0.0030	$ 0.0020	$ 0.0005	$ 0.0093	$ 0.0052	$ 0.0036	$ 0.0010	$ 0.0166	$0.0037	$0.0017	$ 0.0002	$ 0.0135	$0.0159	$0.0070	$ 0.0010	$ 0.0591	$ 0.0279	$ 0.0143	$ 0.0027	$ 0.0984
2012	$ 0.0052	$ 0.0035	$ 0.0009	$ 0.0150	$ 0.0092	$ 0.0065	$ 0.0019	$ 0.0278	$0.0064	$0.0032	$ 0.0004	$ 0.0206	$0.0272	$0.0132	$ 0.0019	$ 0.0954	$ 0.0481	$ 0.0265	$ 0.0051	$ 0.1588
2013	$ 0.0065	$ 0.0044	$ 0.0012	$ 0.0191	$ 0.0114	$ 0.0080	$ 0.0024	$ 0.0356	$0.0080	$0.0040	$ 0.0005	$ 0.0255	$0.0339	$0.0165	$ 0.0024	$ 0.1165	$ 0.0598	$ 0.0328	$ 0.0065	$ 0.1967
2014	$ 0.0088	$ 0.0063	$ 0.0018	$ 0.0241	$ 0.0154	$ 0.0114	$ 0.0036	$ 0.0450	$0.0106	$0.0057	$ 0.0007	$ 0.0334	$0.0451	$0.0243	$ 0.0033	$ 0.1550	$ 0.0799	$ 0.0477	$ 0.0094	$ 0.2575
2015	$ 0.0107	$ 0.0074	$ 0.0021	$ 0.0309	$ 0.0187	$ 0.0138	$ 0.0045	$ 0.0541	$0.0129	$0.0068	$ 0.0009	$ 0.0396	$0.0550	$0.0291	$ 0.0040	$ 0.1924	$ 0.0973	$ 0.0572	$ 0.0114	$ 0.3169
2016	$ 0.0212	$ 0.0098	$ 0.0029	$ 0.0881	$ 0.0367	$ 0.0175	$ 0.0057	$ 0.1650	$0.0269	$0.0093	$ 0.0011	$ 0.1134	$0.1121	$0.0389	$ 0.0050	$ 0.4849	$ 0.1969	$ 0.0756	$ 0.0146	$ 0.8513
2017	$ 0.0227	$ 0.0100	$ 0.0029	$ 0.0983	$ 0.0391	$ 0.0179	$ 0.0059	$ 0.1904	$0.0287	$0.0094	$ 0.0011	$ 0.1194	$0.1201	$0.0393	$ 0.0050	$ 0.5227	$ 0.2106	$ 0.0766	$ 0.0150	$ 0.9309
2018	$ 0.0236	$ 0.0104	$ 0.0032	$ 0.1012	$ 0.0407	$ 0.0187	$ 0.0066	$ 0.1955	$0.0295	$0.0100	$ 0.0012	$ 0.1225	$0.1237	$0.0415	$ 0.0054	$ 0.5429	$ 0.2175	$ 0.0806	$ 0.0163	$ 0.9621
2019	$ 0.0244	$ 0.0109	$ 0.0035	$ 0.1030	$ 0.0421	$ 0.0195	$ 0.0068	$ 0.1988	$0.0304	$0.0103	$ 0.0012	$ 0.1236	$0.1271	$0.0424	$ 0.0055	$ 0.5785	$ 0.2240	$ 0.0831	$ 0.0170	$ 1.0039
2020	$ 0.0257	$ 0.0122	$ 0.0038	$ 0.1070	$ 0.0443	$ 0.0217	$ 0.0073	$ 0.2023	$0.0315	$0.0113	$ 0.0013	$ 0.1247	$0.1323	$0.0469	$ 0.0059	$ 0.5851	$ 0.2339	$ 0.0921	$ 0.0183	$ 1.0191
2021	$ 0.0267	$ 0.0126	$ 0.0039	$ 0.1100	$ 0.0459	$ 0.0225	$ 0.0075	$ 0.2098	$0.0326	$0.0116	$ 0.0014	$ 0.1255	$0.1366	$0.0497	$ 0.0060	$ 0.5994	$ 0.2418	$ 0.0964	$ 0.0188	$ 1.0448
2022	$ 0.0274	$ 0.0131	$ 0.0041	$ 0.1120	$ 0.0471	$ 0.0233	$ 0.0078	$ 0.2134	$0.0332	$0.0120	$ 0.0014	$ 0.1270	$0.1391	$0.0510	$ 0.0064	$ 0.6085	$ 0.2467	$ 0.0994	$ 0.0197	$ 1.0609
2023	$ 0.0315	$ 0.0139	$ 0.0043	$ 0.1337	$ 0.0534	$ 0.0246	$ 0.0083	$ 0.2578	$0.0384	$0.0125	$ 0.0015	$ 0.1557	$0.1588	$0.0536	$ 0.0067	$ 0.6802	$ 0.2822	$ 0.1046	$ 0.0208	$ 1.2273
2024	$ 0.0322	$ 0.0143	$ 0.0044	$ 0.1360	$ 0.0547	$ 0.0253	$ 0.0087	$ 0.2624	$0.0390	$0.0130	$ 0.0015	$ 0.1572	$0.1611	$0.0551	$ 0.0068	$ 0.6873	$ 0.2870	$ 0.1077	$ 0.0215	$ 1.2429
2025	$ 0.0334	$ 0.0154	$ 0.0047	$ 0.1391	$ 0.0566	$ 0.0268	$ 0.0092	$ 0.2669	$0.0400	$0.0136	$ 0.0017	$ 0.1584	$0.1653	$0.0603	$ 0.0073	$ 0.6929	$ 0.2953	$ 0.1161	$ 0.0228	$ 1.2573
2026	$ 0.0344	$ 0.0160	$ 0.0048	$ 0.1419	$ 0.0584	$ 0.0278	$ 0.0094	$ 0.2720	$0.0409	$0.0140	$ 0.0017	$ 0.1607	$0.1693	$0.0625	$ 0.0075	$ 0.7331	$ 0.3030	$ 0.1202	$ 0.0233	$ 1.3077
2027	$ 0.0354	$ 0.0169	$ 0.0049	$ 0.1447	$ 0.0600	$ 0.0288	$ 0.0097	$ 0.2777	$0.0417	$0.0145	$ 0.0018	$ 0.1630	$0.1726	$0.0641	$ 0.0077	$ 0.7421	$ 0.3098	$ 0.1242	$ 0.0241	$ 1.3275
2028	$ 0.0361	$ 0.0172	$ 0.0050	$ 0.1473	$ 0.0612	$ 0.0293	$ 0.0099	$ 0.2821	$0.0422	$0.0147	$ 0.0018	$ 0.1641	$0.1746	$0.0648	$ 0.0077	$ 0.7577	$ 0.3141	$ 0.1261	$ 0.0245	$ 1.3511
2029	$ 0.0369	$ 0.0177	$ 0.0052	$ 0.1499	$ 0.0625	$ 0.0302	$ 0.0103	$ 0.2868	$0.0427	$0.0150	$ 0.0019	$ 0.1654	$0.1768	$0.0661	$ 0.0079	$ 0.7645	$ 0.3190	$ 0.1289	$ 0.0254	$ 1.3666

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5e Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 501-1,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0005	$ 0.0004	$ 0.0000	$ 0.0013	$ 0.0003	$ 0.0002	$ 0.0000	$ 0.0010	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0001	$ 0.0000	$ 0.0005	$ 0.0010	$ 0.0007	$ 0.0000	$ 0.0029
2009	$ 0.0020	$ 0.0016	$ 0.0003	$ 0.0047	$ 0.0015	$ 0.0012	$ 0.0002	$ 0.0037	$0.0001	$0.0001	$ 0.0000	$ 0.0004	$0.0006	$0.0003	$ 0.0000	$ 0.0022	$ 0.0042	$ 0.0032	$ 0.0006	$ 0.0109
2010	$ 0.0317	$ 0.0279	$ 0.0117	$ 0.0690	$ 0.0245	$ 0.0216	$ 0.0081	$ 0.0554	$0.0016	$0.0011	$ 0.0002	$ 0.0050	$0.0097	$0.0065	$ 0.0010	$ 0.0292	$ 0.0676	$ 0.0571	$ 0.0210	$ 0.1586
2011	$ 0.0572	$ 0.0546	$ 0.0220	$ 0.1046	$ 0.0451	$ 0.0412	$ 0.0168	$ 0.0894	$0.0029	$0.0021	$ 0.0003	$ 0.0087	$0.0178	$0.0123	$ 0.0020	$ 0.0526	$ 0.1230	$ 0.1102	$ 0.0412	$ 0.2553
2012	$ 0.0735	$ 0.0701	$ 0.0288	$ 0.1334	$ 0.0579	$ 0.0525	$ 0.0216	$ 0.1148	$0.0038	$0.0027	$ 0.0004	$ 0.0110	$0.0226	$0.0158	$ 0.0026	$ 0.0671	$ 0.1578	$ 0.1411	$ 0.0533	$ 0.3262
2013	$ 0.1072	$ 0.0988	$ 0.0447	$ 0.2019	$ 0.0850	$ 0.0779	$ 0.0331	$ 0.1685	$0.0054	$0.0037	$ 0.0006	$ 0.0161	$0.0327	$0.0220	$ 0.0036	$ 0.1004	$ 0.2304	$ 0.2025	$ 0.0820	$ 0.4869
2014	$ 0.1286	$ 0.1185	$ 0.0536	$ 0.2406	$ 0.1018	$ 0.0932	$ 0.0399	$ 0.2004	$0.0064	$0.0044	$ 0.0007	$ 0.0192	$0.0389	$0.0261	$ 0.0042	$ 0.1210	$ 0.2758	$ 0.2422	$ 0.0985	$ 0.5812
2015	$ 0.1719	$ 0.1598	$ 0.0719	$ 0.3197	$ 0.1364	$ 0.1238	$ 0.0528	$ 0.2670	$0.0085	$0.0058	$ 0.0010	$ 0.0246	$0.0516	$0.0347	$ 0.0057	$ 0.1565	$ 0.3684	$ 0.3242	$ 0.1314	$ 0.7679
2016	$ 0.2016	$ 0.1873	$ 0.0861	$ 0.3706	$ 0.1598	$ 0.1467	$ 0.0636	$ 0.3097	$0.0099	$0.0069	$ 0.0011	$ 0.0289	$0.0600	$0.0408	$ 0.0066	$ 0.1821	$ 0.4312	$ 0.3817	$ 0.1574	$ 0.8913
2017	$ 0.2058	$ 0.1912	$ 0.0879	$ 0.3777	$ 0.1630	$ 0.1496	$ 0.0648	$ 0.3146	$0.0100	$0.0070	$ 0.0011	$ 0.0293	$0.0607	$0.0414	$ 0.0067	$ 0.1849	$ 0.4394	$ 0.3891	$ 0.1606	$ 0.9064
2018	$ 0.2333	$ 0.2186	$ 0.0972	$ 0.4147	$ 0.1834	$ 0.1662	$ 0.0708	$ 0.3428	$0.0112	$0.0080	$ 0.0012	$ 0.0321	$0.0681	$0.0474	$ 0.0073	$ 0.1956	$ 0.4961	$ 0.4403	$ 0.1766	$ 0.9852
2019	$ 0.2403	$ 0.2259	$ 0.0999	$ 0.4256	$ 0.1888	$ 0.1727	$ 0.0728	$ 0.3492	$0.0115	$0.0082	$ 0.0012	$ 0.0337	$0.0696	$0.0488	$ 0.0075	$ 0.2107	$ 0.5102	$ 0.4557	$ 0.1814	$ 1.0193
2020	$ 0.2544	$ 0.2410	$ 0.1102	$ 0.4421	$ 0.2004	$ 0.1849	$ 0.0802	$ 0.3608	$0.0120	$0.0087	$ 0.0013	$ 0.0347	$0.0731	$0.0505	$ 0.0080	$ 0.2178	$ 0.5399	$ 0.4851	$ 0.1997	$ 1.0554
2021	$ 0.2686	$ 0.2529	$ 0.1196	$ 0.4585	$ 0.2113	$ 0.1957	$ 0.0868	$ 0.3778	$0.0126	$0.0091	$ 0.0014	$ 0.0356	$0.0765	$0.0541	$ 0.0088	$ 0.2236	$ 0.5689	$ 0.5118	$ 0.2166	$ 1.0955
2022	$ 0.2766	$ 0.2594	$ 0.1228	$ 0.4701	$ 0.2170	$ 0.1998	$ 0.0888	$ 0.3919	$0.0129	$0.0093	$ 0.0015	$ 0.0365	$0.0779	$0.0549	$ 0.0091	$ 0.2285	$ 0.5844	$ 0.5233	$ 0.2222	$ 1.1270
2023	$ 0.2890	$ 0.2694	$ 0.1282	$ 0.4891	$ 0.2268	$ 0.2094	$ 0.0923	$ 0.4071	$0.0133	$0.0096	$ 0.0015	$ 0.0378	$0.0808	$0.0565	$ 0.0095	$ 0.2387	$ 0.6099	$ 0.5449	$ 0.2315	$ 1.1728
2024	$ 0.2998	$ 0.2802	$ 0.1329	$ 0.5056	$ 0.2350	$ 0.2166	$ 0.0948	$ 0.4189	$0.0137	$0.0098	$ 0.0016	$ 0.0387	$0.0830	$0.0579	$ 0.0097	$ 0.2442	$ 0.6315	$ 0.5645	$ 0.2390	$ 1.2073
2025	$ 0.3178	$ 0.2997	$ 0.1435	$ 0.5387	$ 0.2489	$ 0.2316	$ 0.1022	$ 0.4440	$0.0144	$0.0103	$ 0.0017	$ 0.0401	$0.0872	$0.0608	$ 0.0103	$ 0.2574	$ 0.6682	$ 0.6025	$ 0.2577	$ 1.2802
2026	$ 0.3301	$ 0.3128	$ 0.1494	$ 0.5542	$ 0.2584	$ 0.2421	$ 0.1065	$ 0.4602	$0.0148	$0.0106	$ 0.0017	$ 0.0413	$0.0898	$0.0623	$ 0.0106	$ 0.2654	$ 0.6931	$ 0.6277	$ 0.2682	$ 1.3210
2027	$ 0.3403	$ 0.3237	$ 0.1531	$ 0.5720	$ 0.2656	$ 0.2508	$ 0.1107	$ 0.4713	$0.0151	$0.0108	$ 0.0017	$ 0.0426	$0.0916	$0.0634	$ 0.0109	$ 0.2708	$ 0.7126	$ 0.6486	$ 0.2765	$ 1.3567
2028	$ 0.3492	$ 0.3316	$ 0.1568	$ 0.5852	$ 0.2730	$ 0.2570	$ 0.1131	$ 0.4875	$0.0154	$0.0110	$ 0.0018	$ 0.0437	$0.0934	$0.0652	$ 0.0111	$ 0.2778	$ 0.7309	$ 0.6647	$ 0.2828	$ 1.3943
2029	$ 0.3567	$ 0.3396	$ 0.1603	$ 0.5961	$ 0.2787	$ 0.2634	$ 0.1152	$ 0.4986	$0.0156	$0.0111	$ 0.0018	$ 0.0443	$0.0946	$0.0658	$ 0.0112	$ 0.2797	$ 0.7456	$ 0.6799	$ 0.2884	$ 1.4186

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5f Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 501-1,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002
2009	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0003	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$0.0004	$0.0001	$ 0.0000	$ 0.0010	$ 0.0008	$ 0.0002	$ 0.0000	$ 0.0017
2010	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0035	$ 0.0015	$ 0.0009	$ 0.0002	$ 0.0049	$0.0011	$0.0005	$ 0.0000	$ 0.0035	$0.0045	$0.0017	$ 0.0002	$ 0.0149	$ 0.0081	$ 0.0036	$ 0.0005	$ 0.0268
2011	$ 0.0017	$ 0.0009	$ 0.0003	$ 0.0065	$ 0.0030	$ 0.0017	$ 0.0005	$ 0.0094	$0.0022	$0.0009	$ 0.0001	$ 0.0071	$0.0088	$0.0036	$ 0.0005	$ 0.0294	$ 0.0157	$ 0.0070	$ 0.0013	$ 0.0524
2012	$ 0.0022	$ 0.0012	$ 0.0003	$ 0.0083	$ 0.0038	$ 0.0021	$ 0.0006	$ 0.0122	$0.0028	$0.0012	$ 0.0001	$ 0.0091	$0.0113	$0.0046	$ 0.0006	$ 0.0377	$ 0.0201	$ 0.0091	$ 0.0017	$ 0.0673
2013	$ 0.0031	$ 0.0017	$ 0.0005	$ 0.0113	$ 0.0052	$ 0.0031	$ 0.0010	$ 0.0164	$0.0038	$0.0017	$ 0.0002	$ 0.0119	$0.0154	$0.0066	$ 0.0008	$ 0.0495	$ 0.0275	$ 0.0131	$ 0.0024	$ 0.0890
2014	$ 0.0037	$ 0.0021	$ 0.0006	$ 0.0134	$ 0.0062	$ 0.0037	$ 0.0012	$ 0.0195	$0.0046	$0.0020	$ 0.0002	$ 0.0140	$0.0182	$0.0079	$ 0.0009	$ 0.0583	$ 0.0326	$ 0.0157	$ 0.0030	$ 0.1051
2015	$ 0.0086	$ 0.0028	$ 0.0008	$ 0.0469	$ 0.0148	$ 0.0053	$ 0.0017	$ 0.0873	$0.0113	$0.0027	$ 0.0003	$ 0.0469	$0.0474	$0.0110	$ 0.0014	$ 0.2023	$ 0.0821	$ 0.0218	$ 0.0043	$ 0.3833
2016	$ 0.0100	$ 0.0033	$ 0.0010	$ 0.0544	$ 0.0173	$ 0.0063	$ 0.0021	$ 0.1013	$0.0131	$0.0032	$ 0.0004	$ 0.0540	$0.0548	$0.0131	$ 0.0017	$ 0.2327	$ 0.0952	$ 0.0259	$ 0.0051	$ 0.4424
2017	$ 0.0106	$ 0.0034	$ 0.0010	$ 0.0592	$ 0.0184	$ 0.0064	$ 0.0021	$ 0.1077	$0.0138	$0.0032	$ 0.0004	$ 0.0552	$0.0578	$0.0132	$ 0.0017	$ 0.2543	$ 0.1006	$ 0.0263	$ 0.0052	$ 0.4764
2018	$ 0.0110	$ 0.0037	$ 0.0011	$ 0.0603	$ 0.0191	$ 0.0068	$ 0.0023	$ 0.1095	$0.0142	$0.0035	$ 0.0004	$ 0.0563	$0.0594	$0.0147	$ 0.0019	$ 0.2563	$ 0.1037	$ 0.0288	$ 0.0057	$ 0.4824
2019	$ 0.0114	$ 0.0039	$ 0.0012	$ 0.0619	$ 0.0196	$ 0.0070	$ 0.0024	$ 0.1128	$0.0145	$0.0036	$ 0.0004	$ 0.0593	$0.0606	$0.0149	$ 0.0019	$ 0.2591	$ 0.1062	$ 0.0295	$ 0.0059	$ 0.4931
2020	$ 0.0133	$ 0.0042	$ 0.0012	$ 0.0698	$ 0.0226	$ 0.0077	$ 0.0026	$ 0.1267	$0.0168	$0.0040	$ 0.0004	$ 0.0678	$0.0697	$0.0156	$ 0.0020	$ 0.3152	$ 0.1225	$ 0.0315	$ 0.0063	$ 0.5795
2021	$ 0.0140	$ 0.0046	$ 0.0013	$ 0.0723	$ 0.0238	$ 0.0082	$ 0.0027	$ 0.1291	$0.0175	$0.0042	$ 0.0005	$ 0.0690	$0.0724	$0.0170	$ 0.0022	$ 0.3187	$ 0.1276	$ 0.0340	$ 0.0067	$ 0.5891
2022	$ 0.0143	$ 0.0047	$ 0.0013	$ 0.0735	$ 0.0243	$ 0.0085	$ 0.0028	$ 0.1312	$0.0177	$0.0043	$ 0.0005	$ 0.0694	$0.0733	$0.0175	$ 0.0023	$ 0.3207	$ 0.1296	$ 0.0350	$ 0.0069	$ 0.5948
2023	$ 0.0147	$ 0.0050	$ 0.0014	$ 0.0752	$ 0.0249	$ 0.0089	$ 0.0029	$ 0.1345	$0.0180	$0.0044	$ 0.0005	$ 0.0704	$0.0747	$0.0179	$ 0.0024	$ 0.3264	$ 0.1323	$ 0.0361	$ 0.0071	$ 0.6066
2024	$ 0.0150	$ 0.0051	$ 0.0014	$ 0.0764	$ 0.0254	$ 0.0092	$ 0.0030	$ 0.1366	$0.0182	$0.0045	$ 0.0005	$ 0.0709	$0.0756	$0.0182	$ 0.0024	$ 0.3282	$ 0.1342	$ 0.0370	$ 0.0074	$ 0.6122
2025	$ 0.0159	$ 0.0059	$ 0.0015	$ 0.0787	$ 0.0270	$ 0.0103	$ 0.0031	$ 0.1412	$0.0192	$0.0050	$ 0.0006	$ 0.0722	$0.0792	$0.0200	$ 0.0027	$ 0.3323	$ 0.1413	$ 0.0413	$ 0.0080	$ 0.6244
2026	$ 0.0163	$ 0.0062	$ 0.0016	$ 0.0804	$ 0.0277	$ 0.0108	$ 0.0032	$ 0.1436	$0.0195	$0.0052	$ 0.0006	$ 0.0734	$0.0807	$0.0204	$ 0.0029	$ 0.3340	$ 0.1442	$ 0.0425	$ 0.0083	$ 0.6313
2027	$ 0.0166	$ 0.0063	$ 0.0016	$ 0.0817	$ 0.0282	$ 0.0110	$ 0.0033	$ 0.1459	$0.0197	$0.0053	$ 0.0006	$ 0.0738	$0.0815	$0.0207	$ 0.0030	$ 0.3357	$ 0.1460	$ 0.0432	$ 0.0085	$ 0.6370
2028	$ 0.0169	$ 0.0065	$ 0.0017	$ 0.0833	$ 0.0288	$ 0.0113	$ 0.0035	$ 0.1484	$0.0199	$0.0053	$ 0.0006	$ 0.0743	$0.0824	$0.0210	$ 0.0030	$ 0.3379	$ 0.1481	$ 0.0441	$ 0.0087	$ 0.6439
2029	$ 0.0173	$ 0.0067	$ 0.0017	$ 0.0848	$ 0.0293	$ 0.0115	$ 0.0036	$ 0.1508	$0.0201	$0.0055	$ 0.0006	$ 0.0749	$0.0833	$0.0213	$ 0.0031	$ 0.3396	$ 0.1500	$ 0.0449	$ 0.0089	$ 0.6500

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5g Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 1,001-3,300 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided								Total Benefits			
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs							
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0003	$ 0.0003	$ 0.0000	$ 0.0009	$ 0.0002	$ 0.0002	$ 0.0000	$ 0.0007	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0001	$ 0.0000	$ 0.0004	$ 0.0007	$ 0.0005	$ 0.0000	$ 0.0020
2009	$ 0.0136	$ 0.0115	$ 0.0038	$ 0.0310	$ 0.0107	$ 0.0087	$ 0.0031	$ 0.0249	$0.0007	$0.0005	$ 0.0000	$ 0.0023	$0.0043	$0.0029	$ 0.0003	$ 0.0140	$ 0.0293	$ 0.0236	$ 0.0073	$ 0.0722
2010	$ 0.0286	$ 0.0272	$ 0.0091	$ 0.0563	$ 0.0232	$ 0.0214	$ 0.0074	$ 0.0487	$0.0015	$0.0010	$ 0.0001	$ 0.0044	$0.0091	$0.0061	$ 0.0008	$ 0.0269	$ 0.0623	$ 0.0558	$ 0.0174	$ 0.1363
2011	$ 0.0452	$ 0.0421	$ 0.0163	$ 0.0871	$ 0.0366	$ 0.0333	$ 0.0128	$ 0.0753	$0.0023	$0.0016	$ 0.0002	$ 0.0068	$0.0142	$0.0102	$ 0.0013	$ 0.0426	$ 0.0982	$ 0.0873	$ 0.0305	$ 0.2119
2012	$ 0.0663	$ 0.0619	$ 0.0238	$ 0.1241	$ 0.0529	$ 0.0486	$ 0.0184	$ 0.1061	$0.0034	$0.0023	$ 0.0003	$ 0.0099	$0.0206	$0.0146	$ 0.0017	$ 0.0591	$ 0.1432	$ 0.1275	$ 0.0443	$ 0.2992
2013	$ 0.0930	$ 0.0888	$ 0.0329	$ 0.1743	$ 0.0734	$ 0.0671	$ 0.0256	$ 0.1452	$0.0047	$0.0032	$ 0.0004	$ 0.0135	$0.0283	$0.0204	$ 0.0023	$ 0.0849	$ 0.1995	$ 0.1795	$ 0.0613	$ 0.4179
2014	$ 0.1152	$ 0.1100	$ 0.0429	$ 0.2124	$ 0.0912	$ 0.0842	$ 0.0336	$ 0.1762	$0.0058	$0.0040	$ 0.0005	$ 0.0162	$0.0350	$0.0251	$ 0.0030	$ 0.1025	$ 0.2473	$ 0.2232	$ 0.0800	$ 0.5073
2015	$ 0.1424	$ 0.1352	$ 0.0550	$ 0.2620	$ 0.1123	$ 0.1052	$ 0.0439	$ 0.2125	$0.0071	$0.0049	$ 0.0006	$ 0.0196	$0.0427	$0.0309	$ 0.0038	$ 0.1228	$ 0.3044	$ 0.2763	$ 0.1034	$ 0.6168
2016	$ 0.1684	$ 0.1609	$ 0.0645	$ 0.3060	$ 0.1331	$ 0.1240	$ 0.0509	$ 0.2527	$0.0083	$0.0057	$ 0.0007	$ 0.0227	$0.0503	$0.0362	$ 0.0044	$ 0.1409	$ 0.3602	$ 0.3267	$ 0.1205	$ 0.7223
2017	$ 0.1859	$ 0.1762	$ 0.0716	$ 0.3404	$ 0.1471	$ 0.1392	$ 0.0559	$ 0.2798	$0.0092	$0.0063	$ 0.0008	$ 0.0257	$0.0554	$0.0392	$ 0.0046	$ 0.1562	$ 0.3976	$ 0.3608	$ 0.1329	$ 0.8021
2018	$ 0.1944	$ 0.1836	$ 0.0755	$ 0.3528	$ 0.1541	$ 0.1441	$ 0.0590	$ 0.2937	$0.0095	$0.0066	$ 0.0008	$ 0.0263	$0.0578	$0.0405	$ 0.0047	$ 0.1602	$ 0.4158	$ 0.3747	$ 0.1400	$ 0.8331
2019	$ 0.2030	$ 0.1916	$ 0.0803	$ 0.3647	$ 0.1609	$ 0.1508	$ 0.0620	$ 0.3061	$0.0099	$0.0068	$ 0.0009	$ 0.0275	$0.0599	$0.0421	$ 0.0050	$ 0.1684	$ 0.4336	$ 0.3914	$ 0.1482	$ 0.8668
2020	$ 0.2154	$ 0.2116	$ 0.0842	$ 0.3777	$ 0.1698	$ 0.1605	$ 0.0650	$ 0.3138	$0.0103	$0.0073	$ 0.0009	$ 0.0284	$0.0626	$0.0446	$ 0.0053	$ 0.1725	$ 0.4582	$ 0.4239	$ 0.1554	$ 0.8924
2021	$ 0.2209	$ 0.2169	$ 0.0860	$ 0.3859	$ 0.1741	$ 0.1662	$ 0.0670	$ 0.3201	$0.0105	$0.0074	$ 0.0009	$ 0.0287	$0.0637	$0.0452	$ 0.0054	$ 0.1744	$ 0.4692	$ 0.4356	$ 0.1594	$ 0.9091
2022	$ 0.2310	$ 0.2262	$ 0.0886	$ 0.3955	$ 0.1824	$ 0.1770	$ 0.0695	$ 0.3324	$0.0109	$0.0076	$ 0.0010	$ 0.0295	$0.0663	$0.0463	$ 0.0057	$ 0.1783	$ 0.4906	$ 0.4571	$ 0.1648	$ 0.9357
2023	$ 0.2363	$ 0.2310	$ 0.0906	$ 0.4040	$ 0.1866	$ 0.1806	$ 0.0712	$ 0.3394	$0.0111	$0.0077	$ 0.0010	$ 0.0299	$0.0673	$0.0470	$ 0.0058	$ 0.1805	$ 0.5013	$ 0.4663	$ 0.1686	$ 0.9538
2024	$ 0.2445	$ 0.2392	$ 0.0940	$ 0.4176	$ 0.1931	$ 0.1874	$ 0.0756	$ 0.3485	$0.0113	$0.0080	$ 0.0010	$ 0.0303	$0.0691	$0.0492	$ 0.0060	$ 0.1862	$ 0.5181	$ 0.4837	$ 0.1766	$ 0.9826
2025	$ 0.2521	$ 0.2453	$ 0.0963	$ 0.4326	$ 0.1981	$ 0.1917	$ 0.0776	$ 0.3560	$0.0116	$0.0080	$ 0.0010	$ 0.0306	$0.0704	$0.0497	$ 0.0061	$ 0.1886	$ 0.5323	$ 0.4949	$ 0.1811	$ 1.0079
2026	$ 0.2596	$ 0.2525	$ 0.0988	$ 0.4443	$ 0.2038	$ 0.1984	$ 0.0796	$ 0.3673	$0.0118	$0.0082	$ 0.0010	$ 0.0310	$0.0719	$0.0506	$ 0.0062	$ 0.1918	$ 0.5471	$ 0.5096	$ 0.1856	$ 1.0344
2027	$ 0.2688	$ 0.2609	$ 0.1010	$ 0.4631	$ 0.2102	$ 0.2026	$ 0.0813	$ 0.3791	$0.0122	$0.0084	$ 0.0011	$ 0.0324	$0.0737	$0.0517	$ 0.0063	$ 0.1971	$ 0.5649	$ 0.5236	$ 0.1896	$ 1.0716
2028	$ 0.2778	$ 0.2713	$ 0.1063	$ 0.4778	$ 0.2169	$ 0.2105	$ 0.0846	$ 0.3870	$0.0124	$0.0086	$ 0.0011	$ 0.0329	$0.0753	$0.0531	$ 0.0064	$ 0.2035	$ 0.5825	$ 0.5436	$ 0.1984	$ 1.1013
2029	$ 0.2846	$ 0.2773	$ 0.1088	$ 0.4873	$ 0.2221	$ 0.2159	$ 0.0870	$ 0.3946	$0.0126	$0.0088	$ 0.0011	$ 0.0333	$0.0765	$0.0539	$ 0.0066	$ 0.2057	$ 0.5958	$ 0.5559	$ 0.2034	$ 1.1209

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

ExhibitC.5h Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 1,001-3,300 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0000	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001
2009	$ 0.0005	$ 0.0002	$ 0.0001	$ 0.0022	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0031	$0.0008	$0.0002	$ 0.0000	$ 0.0027	$0.0035	$0.0010	$ 0.0001	$ 0.0101	$ 0.0057	$ 0.0019	$ 0.0003	$ 0.0182
2010	$ 0.0011	$ 0.0005	$ 0.0001	$ 0.0044	$ 0.0019	$ 0.0010	$ 0.0003	$ 0.0075	$0.0016	$0.0005	$ 0.0001	$ 0.0054	$0.0071	$0.0022	$ 0.0002	$ 0.0221	$ 0.0116	$ 0.0043	$ 0.0007	$ 0.0394
2011	$ 0.0016	$ 0.0009	$ 0.0003	$ 0.0061	$ 0.0027	$ 0.0015	$ 0.0005	$ 0.0104	$0.0022	$0.0008	$ 0.0001	$ 0.0080	$0.0102	$0.0034	$ 0.0004	$ 0.0304	$ 0.0167	$ 0.0066	$ 0.0012	$ 0.0549
2012	$ 0.0026	$ 0.0013	$ 0.0004	$ 0.0109	$ 0.0046	$ 0.0023	$ 0.0007	$ 0.0174	$0.0037	$0.0012	$ 0.0001	$ 0.0140	$0.0174	$0.0052	$ 0.0006	$ 0.0528	$ 0.0283	$ 0.0099	$ 0.0018	$ 0.0951
2013	$ 0.0033	$ 0.0017	$ 0.0005	$ 0.0135	$ 0.0059	$ 0.0031	$ 0.0010	$ 0.0218	$0.0047	$0.0016	$ 0.0002	$ 0.0175	$0.0222	$0.0069	$ 0.0007	$ 0.0666	$ 0.0361	$ 0.0132	$ 0.0024	$ 0.1194
2014	$ 0.0053	$ 0.0021	$ 0.0007	$ 0.0226	$ 0.0096	$ 0.0039	$ 0.0013	$ 0.0319	$0.0081	$0.0020	$ 0.0002	$ 0.0261	$0.0390	$0.0088	$ 0.0009	$ 0.1284	$ 0.0620	$ 0.0168	$ 0.0031	$ 0.2090
2015	$ 0.0064	$ 0.0027	$ 0.0009	$ 0.0269	$ 0.0116	$ 0.0049	$ 0.0016	$ 0.0397	$0.0097	$0.0025	$ 0.0003	$ 0.0337	$0.0462	$0.0114	$ 0.0013	$ 0.1503	$ 0.0739	$ 0.0214	$ 0.0041	$ 0.2506
2016	$ 0.0076	$ 0.0032	$ 0.0011	$ 0.0325	$ 0.0136	$ 0.0058	$ 0.0020	$ 0.0488	$0.0112	$0.0029	$ 0.0004	$ 0.0388	$0.0536	$0.0132	$ 0.0015	$ 0.1781	$ 0.0861	$ 0.0251	$ 0.0049	$ 0.2982
2017	$ 0.0085	$ 0.0038	$ 0.0012	$ 0.0353	$ 0.0152	$ 0.0070	$ 0.0022	$ 0.0539	$0.0123	$0.0034	$ 0.0004	$ 0.0458	$0.0579	$0.0162	$ 0.0017	$ 0.1904	$ 0.0938	$ 0.0304	$ 0.0055	$ 0.3255
2018	$ 0.0088	$ 0.0040	$ 0.0012	$ 0.0359	$ 0.0158	$ 0.0073	$ 0.0023	$ 0.0548	$0.0126	$0.0035	$ 0.0004	$ 0.0465	$0.0594	$0.0165	$ 0.0018	$ 0.2077	$ 0.0966	$ 0.0313	$ 0.0058	$ 0.3450
2019	$ 0.0091	$ 0.0042	$ 0.0013	$ 0.0367	$ 0.0163	$ 0.0077	$ 0.0025	$ 0.0558	$0.0129	$0.0037	$ 0.0005	$ 0.0471	$0.0607	$0.0169	$ 0.0019	$ 0.2118	$ 0.0990	$ 0.0324	$ 0.0061	$ 0.3514
2020	$ 0.0097	$ 0.0044	$ 0.0014	$ 0.0393	$ 0.0174	$ 0.0083	$ 0.0026	$ 0.0614	$0.0135	$0.0040	$ 0.0005	$ 0.0525	$0.0637	$0.0179	$ 0.0019	$ 0.2252	$ 0.1043	$ 0.0345	$ 0.0063	$ 0.3784
2021	$ 0.0099	$ 0.0045	$ 0.0014	$ 0.0400	$ 0.0177	$ 0.0084	$ 0.0026	$ 0.0625	$0.0136	$0.0040	$ 0.0005	$ 0.0530	$0.0644	$0.0182	$ 0.0019	$ 0.2263	$ 0.1057	$ 0.0351	$ 0.0065	$ 0.3817
2022	$ 0.0101	$ 0.0046	$ 0.0014	$ 0.0407	$ 0.0181	$ 0.0086	$ 0.0027	$ 0.0635	$0.0138	$0.0041	$ 0.0005	$ 0.0534	$0.0651	$0.0186	$ 0.0020	$ 0.2284	$ 0.1071	$ 0.0360	$ 0.0066	$ 0.3859
2023	$ 0.0103	$ 0.0047	$ 0.0015	$ 0.0417	$ 0.0185	$ 0.0088	$ 0.0028	$ 0.0648	$0.0139	$0.0042	$ 0.0005	$ 0.0537	$0.0658	$0.0189	$ 0.0020	$ 0.2302	$ 0.1086	$ 0.0366	$ 0.0068	$ 0.3904
2024	$ 0.0106	$ 0.0049	$ 0.0015	$ 0.0425	$ 0.0189	$ 0.0091	$ 0.0029	$ 0.0659	$0.0142	$0.0043	$ 0.0005	$ 0.0541	$0.0668	$0.0198	$ 0.0020	$ 0.2321	$ 0.1105	$ 0.0382	$ 0.0070	$ 0.3946
2025	$ 0.0108	$ 0.0051	$ 0.0016	$ 0.0432	$ 0.0193	$ 0.0093	$ 0.0029	$ 0.0671	$0.0143	$0.0045	$ 0.0005	$ 0.0543	$0.0676	$0.0205	$ 0.0021	$ 0.2332	$ 0.1121	$ 0.0393	$ 0.0071	$ 0.3978
2026	$ 0.0111	$ 0.0052	$ 0.0016	$ 0.0440	$ 0.0197	$ 0.0096	$ 0.0030	$ 0.0684	$0.0145	$0.0046	$ 0.0005	$ 0.0547	$0.0684	$0.0208	$ 0.0021	$ 0.2342	$ 0.1138	$ 0.0403	$ 0.0073	$ 0.4013
2027	$ 0.0113	$ 0.0054	$ 0.0017	$ 0.0447	$ 0.0201	$ 0.0098	$ 0.0031	$ 0.0695	$0.0147	$0.0047	$ 0.0006	$ 0.0549	$0.0693	$0.0213	$ 0.0021	$ 0.2352	$ 0.1154	$ 0.0412	$ 0.0075	$ 0.4044
2028	$ 0.0116	$ 0.0056	$ 0.0018	$ 0.0456	$ 0.0206	$ 0.0101	$ 0.0032	$ 0.0708	$0.0149	$0.0048	$ 0.0006	$ 0.0554	$0.0703	$0.0218	$ 0.0022	$ 0.2369	$ 0.1174	$ 0.0423	$ 0.0077	$ 0.4086
2029	$ 0.0119	$ 0.0057	$ 0.0018	$ 0.0464	$ 0.0211	$ 0.0104	$ 0.0033	$ 0.0721	$0.0151	$0.0049	$ 0.0006	$ 0.0557	$0.0711	$0.0224	$ 0.0022	$ 0.2388	$ 0.1192	$ 0.0433	$ 0.0079	$ 0.4130

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5i Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 3,301-10,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0026	$ 0.0022	$ 0.0007	$ 0.0059	$ 0.0020	$ 0.0017	$ 0.0006	$ 0.0046	$0.0001	$0.0001	$ 0.0000	$ 0.0004	$0.0008	$0.0006	$ 0.0001	$ 0.0024	$ 0.0056	$ 0.0045	$ 0.0014	$ 0.0133
2009	$ 0.0095	$ 0.0090	$ 0.0036	$ 0.0176	$ 0.0076	$ 0.0070	$ 0.0028	$ 0.0151	$0.0005	$0.0004	$ 0.0001	$ 0.0014	$0.0031	$0.0023	$ 0.0003	$ 0.0087	$ 0.0208	$ 0.0186	$ 0.0067	$ 0.0428
2010	$ 0.0178	$ 0.0169	$ 0.0073	$ 0.0318	$ 0.0142	$ 0.0131	$ 0.0054	$ 0.0263	$0.0009	$0.0007	$ 0.0001	$ 0.0026	$0.0057	$0.0042	$ 0.0006	$ 0.0160	$ 0.0386	$ 0.0350	$ 0.0134	$ 0.0766
2011	$ 0.0287	$ 0.0276	$ 0.0121	$ 0.0496	$ 0.0230	$ 0.0215	$ 0.0093	$ 0.0405	$0.0015	$0.0011	$ 0.0002	$ 0.0042	$0.0091	$0.0067	$ 0.0010	$ 0.0252	$ 0.0623	$ 0.0569	$ 0.0225	$ 0.1196
2012	$ 0.0385	$ 0.0368	$ 0.0163	$ 0.0665	$ 0.0306	$ 0.0286	$ 0.0123	$ 0.0534	$0.0020	$0.0015	$ 0.0002	$ 0.0056	$0.0120	$0.0089	$ 0.0013	$ 0.0339	$ 0.0831	$ 0.0759	$ 0.0302	$ 0.1594
2013	$ 0.0510	$ 0.0484	$ 0.0205	$ 0.0875	$ 0.0405	$ 0.0379	$ 0.0159	$ 0.0722	$0.0026	$0.0019	$ 0.0003	$ 0.0071	$0.0157	$0.0118	$ 0.0018	$ 0.0426	$ 0.1099	$ 0.0999	$ 0.0384	$ 0.2094
2014	$ 0.0643	$ 0.0612	$ 0.0251	$ 0.1108	$ 0.0507	$ 0.0470	$ 0.0195	$ 0.0904	$0.0032	$0.0024	$ 0.0004	$ 0.0090	$0.0196	$0.0148	$ 0.0021	$ 0.0566	$ 0.1379	$ 0.1255	$ 0.0471	$ 0.2669
2015	$ 0.0770	$ 0.0733	$ 0.0304	$ 0.1316	$ 0.0609	$ 0.0566	$ 0.0236	$ 0.1076	$0.0038	$0.0029	$ 0.0004	$ 0.0106	$0.0233	$0.0176	$ 0.0026	$ 0.0665	$ 0.1650	$ 0.1503	$ 0.0570	$ 0.3163
2016	$ 0.0914	$ 0.0881	$ 0.0359	$ 0.1562	$ 0.0723	$ 0.0673	$ 0.0279	$ 0.1295	$0.0045	$0.0034	$ 0.0005	$ 0.0122	$0.0274	$0.0210	$ 0.0032	$ 0.0768	$ 0.1956	$ 0.1798	$ 0.0675	$ 0.3748
2017	$ 0.0972	$ 0.0929	$ 0.0378	$ 0.1662	$ 0.0767	$ 0.0705	$ 0.0296	$ 0.1369	$0.0047	$0.0036	$ 0.0005	$ 0.0129	$0.0289	$0.0220	$ 0.0034	$ 0.0805	$ 0.2076	$ 0.1889	$ 0.0713	$ 0.3965
2018	$ 0.0998	$ 0.0954	$ 0.0391	$ 0.1696	$ 0.0786	$ 0.0726	$ 0.0307	$ 0.1397	$0.0048	$0.0036	$ 0.0006	$ 0.0131	$0.0295	$0.0224	$ 0.0035	$ 0.0814	$ 0.2128	$ 0.1939	$ 0.0738	$ 0.4038
2019	$ 0.1032	$ 0.0985	$ 0.0405	$ 0.1736	$ 0.0813	$ 0.0755	$ 0.0317	$ 0.1436	$0.0050	$0.0037	$ 0.0006	$ 0.0133	$0.0302	$0.0229	$ 0.0036	$ 0.0822	$ 0.2196	$ 0.2006	$ 0.0764	$ 0.4126
2020	$ 0.1063	$ 0.1011	$ 0.0419	$ 0.1791	$ 0.0836	$ 0.0774	$ 0.0328	$ 0.1463	$0.0051	$0.0038	$ 0.0006	$ 0.0134	$0.0309	$0.0233	$ 0.0036	$ 0.0830	$ 0.2258	$ 0.2056	$ 0.0790	$ 0.4219
2021	$ 0.1085	$ 0.1030	$ 0.0429	$ 0.1827	$ 0.0852	$ 0.0787	$ 0.0335	$ 0.1488	$0.0051	$0.0039	$ 0.0006	$ 0.0136	$0.0312	$0.0237	$ 0.0037	$ 0.0839	$ 0.2300	$ 0.2092	$ 0.0807	$ 0.4291
2022	$ 0.1110	$ 0.1055	$ 0.0450	$ 0.1864	$ 0.0871	$ 0.0806	$ 0.0349	$ 0.1517	$0.0052	$0.0039	$ 0.0006	$ 0.0139	$0.0317	$0.0240	$ 0.0038	$ 0.0852	$ 0.2350	$ 0.2141	$ 0.0843	$ 0.4372
2023	$ 0.1132	$ 0.1075	$ 0.0460	$ 0.1901	$ 0.0887	$ 0.0821	$ 0.0356	$ 0.1546	$0.0053	$0.0040	$ 0.0006	$ 0.0141	$0.0320	$0.0242	$ 0.0038	$ 0.0857	$ 0.2391	$ 0.2178	$ 0.0861	$ 0.4444
2024	$ 0.1165	$ 0.1107	$ 0.0477	$ 0.1958	$ 0.0912	$ 0.0843	$ 0.0367	$ 0.1580	$0.0054	$0.0041	$ 0.0006	$ 0.0143	$0.0326	$0.0247	$ 0.0039	$ 0.0870	$ 0.2457	$ 0.2237	$ 0.0890	$ 0.4550
2025	$ 0.1189	$ 0.1132	$ 0.0487	$ 0.1996	$ 0.0930	$ 0.0860	$ 0.0376	$ 0.1609	$0.0054	$0.0041	$ 0.0007	$ 0.0145	$0.0330	$0.0251	$ 0.0040	$ 0.0874	$ 0.2504	$ 0.2284	$ 0.0909	$ 0.4624
2026	$ 0.1223	$ 0.1167	$ 0.0500	$ 0.2043	$ 0.0956	$ 0.0887	$ 0.0389	$ 0.1642	$0.0055	$0.0042	$ 0.0007	$ 0.0147	$0.0337	$0.0256	$ 0.0040	$ 0.0886	$ 0.2571	$ 0.2352	$ 0.0936	$ 0.4718
2027	$ 0.1259	$ 0.1201	$ 0.0512	$ 0.2104	$ 0.0980	$ 0.0914	$ 0.0398	$ 0.1684	$0.0056	$0.0043	$ 0.0007	$ 0.0149	$0.0342	$0.0258	$ 0.0041	$ 0.0897	$ 0.2637	$ 0.2416	$ 0.0958	$ 0.4835
2028	$ 0.1286	$ 0.1227	$ 0.0523	$ 0.2143	$ 0.1000	$ 0.0937	$ 0.0407	$ 0.1727	$0.0057	$0.0043	$ 0.0007	$ 0.0151	$0.0347	$0.0261	$ 0.0041	$ 0.0912	$ 0.2690	$ 0.2468	$ 0.0977	$ 0.4933
2029	$ 0.1313	$ 0.1252	$ 0.0538	$ 0.2189	$ 0.1020	$ 0.0956	$ 0.0415	$ 0.1762	$0.0058	$0.0044	$ 0.0007	$ 0.0153	$0.0351	$0.0265	$ 0.0041	$ 0.0920	$ 0.2742	$ 0.2517	$ 0.1001	$ 0.5024

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.5j Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 3,301-10,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0003	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0005	$0.0001	$0.0000	$ 0.0000	$ 0.0005	$0.0004	$0.0002	$ 0.0000	$ 0.0015	$ 0.0007	$ 0.0003	$ 0.0001	$ 0.0027
2009	$ 0.0003	$ 0.0002	$ 0.0001	$ 0.0011	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0017	$0.0004	$0.0002	$ 0.0000	$ 0.0014	$0.0016	$0.0007	$ 0.0001	$ 0.0060	$ 0.0029	$ 0.0013	$ 0.0003	$ 0.0102
2010	$ 0.0008	$ 0.0003	$ 0.0001	$ 0.0033	$ 0.0014	$ 0.0006	$ 0.0002	$ 0.0049	$0.0009	$0.0003	$ 0.0000	$ 0.0033	$0.0037	$0.0013	$ 0.0002	$ 0.0147	$ 0.0067	$ 0.0025	$ 0.0005	$ 0.0262
2011	$ 0.0013	$ 0.0006	$ 0.0002	$ 0.0050	$ 0.0023	$ 0.0011	$ 0.0003	$ 0.0078	$0.0016	$0.0005	$ 0.0001	$ 0.0060	$0.0065	$0.0023	$ 0.0003	$ 0.0249	$ 0.0117	$ 0.0046	$ 0.0009	$ 0.0437
2012	$ 0.0017	$ 0.0008	$ 0.0002	$ 0.0065	$ 0.0030	$ 0.0015	$ 0.0004	$ 0.0102	$0.0021	$0.0007	$ 0.0001	$ 0.0078	$0.0085	$0.0031	$ 0.0004	$ 0.0323	$ 0.0153	$ 0.0061	$ 0.0011	$ 0.0568
2013	$ 0.0023	$ 0.0011	$ 0.0003	$ 0.0082	$ 0.0040	$ 0.0019	$ 0.0006	$ 0.0127	$0.0027	$0.0009	$ 0.0001	$ 0.0098	$0.0110	$0.0040	$ 0.0005	$ 0.0442	$ 0.0198	$ 0.0079	$ 0.0014	$ 0.0749
2014	$ 0.0027	$ 0.0014	$ 0.0004	$ 0.0097	$ 0.0048	$ 0.0024	$ 0.0007	$ 0.0152	$0.0032	$0.0011	$ 0.0001	$ 0.0117	$0.0132	$0.0051	$ 0.0006	$ 0.0531	$ 0.0239	$ 0.0100	$ 0.0018	$ 0.0898
2015	$ 0.0033	$ 0.0017	$ 0.0005	$ 0.0117	$ 0.0057	$ 0.0028	$ 0.0009	$ 0.0179	$0.0038	$0.0014	$ 0.0002	$ 0.0136	$0.0157	$0.0060	$ 0.0007	$ 0.0616	$ 0.0285	$ 0.0119	$ 0.0022	$ 0.1048
2016	$ 0.0038	$ 0.0020	$ 0.0005	$ 0.0134	$ 0.0067	$ 0.0033	$ 0.0010	$ 0.0208	$0.0044	$0.0016	$ 0.0002	$ 0.0158	$0.0181	$0.0070	$ 0.0008	$ 0.0708	$ 0.0330	$ 0.0139	$ 0.0025	$ 0.1208
2017	$ 0.0041	$ 0.0021	$ 0.0006	$ 0.0174	$ 0.0072	$ 0.0035	$ 0.0011	$ 0.0232	$0.0047	$0.0017	$ 0.0002	$ 0.0194	$0.0197	$0.0074	$ 0.0008	$ 0.0760	$ 0.0357	$ 0.0146	$ 0.0027	$ 0.1360
2018	$ 0.0042	$ 0.0021	$ 0.0006	$ 0.0177	$ 0.0074	$ 0.0036	$ 0.0011	$ 0.0237	$0.0048	$0.0017	$ 0.0002	$ 0.0196	$0.0201	$0.0077	$ 0.0008	$ 0.0766	$ 0.0366	$ 0.0151	$ 0.0027	$ 0.1376
2019	$ 0.0044	$ 0.0022	$ 0.0006	$ 0.0181	$ 0.0077	$ 0.0037	$ 0.0011	$ 0.0245	$0.0050	$0.0018	$ 0.0002	$ 0.0202	$0.0207	$0.0078	$ 0.0008	$ 0.0781	$ 0.0377	$ 0.0154	$ 0.0028	$ 0.1409
2020	$ 0.0045	$ 0.0022	$ 0.0006	$ 0.0185	$ 0.0079	$ 0.0038	$ 0.0012	$ 0.0249	$0.0050	$0.0018	$ 0.0002	$ 0.0205	$0.0210	$0.0081	$ 0.0009	$ 0.0800	$ 0.0384	$ 0.0160	$ 0.0029	$ 0.1438
2021	$ 0.0046	$ 0.0023	$ 0.0007	$ 0.0188	$ 0.0080	$ 0.0039	$ 0.0012	$ 0.0253	$0.0051	$0.0019	$ 0.0002	$ 0.0206	$0.0212	$0.0081	$ 0.0009	$ 0.0807	$ 0.0389	$ 0.0162	$ 0.0030	$ 0.1455
2022	$ 0.0047	$ 0.0023	$ 0.0007	$ 0.0191	$ 0.0082	$ 0.0040	$ 0.0013	$ 0.0258	$0.0052	$0.0019	$ 0.0002	$ 0.0209	$0.0215	$0.0083	$ 0.0009	$ 0.0818	$ 0.0396	$ 0.0166	$ 0.0031	$ 0.1475
2023	$ 0.0048	$ 0.0024	$ 0.0007	$ 0.0194	$ 0.0083	$ 0.0041	$ 0.0013	$ 0.0262	$0.0052	$0.0019	$ 0.0002	$ 0.0210	$0.0217	$0.0084	$ 0.0009	$ 0.0826	$ 0.0400	$ 0.0168	$ 0.0031	$ 0.1492
2024	$ 0.0049	$ 0.0025	$ 0.0007	$ 0.0197	$ 0.0085	$ 0.0042	$ 0.0014	$ 0.0267	$0.0053	$0.0020	$ 0.0002	$ 0.0213	$0.0220	$0.0086	$ 0.0009	$ 0.0836	$ 0.0407	$ 0.0172	$ 0.0032	$ 0.1513
2025	$ 0.0050	$ 0.0025	$ 0.0007	$ 0.0201	$ 0.0088	$ 0.0043	$ 0.0014	$ 0.0276	$0.0054	$0.0020	$ 0.0002	$ 0.0216	$0.0224	$0.0086	$ 0.0009	$ 0.0844	$ 0.0415	$ 0.0174	$ 0.0033	$ 0.1537
2026	$ 0.0051	$ 0.0026	$ 0.0008	$ 0.0205	$ 0.0089	$ 0.0044	$ 0.0014	$ 0.0281	$0.0054	$0.0020	$ 0.0002	$ 0.0219	$0.0226	$0.0087	$ 0.0009	$ 0.0858	$ 0.0421	$ 0.0177	$ 0.0034	$ 0.1562
2027	$ 0.0052	$ 0.0026	$ 0.0008	$ 0.0208	$ 0.0091	$ 0.0045	$ 0.0015	$ 0.0285	$0.0055	$0.0020	$ 0.0002	$ 0.0222	$0.0229	$0.0089	$ 0.0009	$ 0.0867	$ 0.0427	$ 0.0181	$ 0.0034	$ 0.1582
2028	$ 0.0053	$ 0.0027	$ 0.0008	$ 0.0212	$ 0.0093	$ 0.0046	$ 0.0015	$ 0.0290	$0.0056	$0.0021	$ 0.0002	$ 0.0224	$0.0231	$0.0090	$ 0.0010	$ 0.0873	$ 0.0432	$ 0.0184	$ 0.0035	$ 0.1598
2029	$ 0.0054	$ 0.0027	$ 0.0008	$ 0.0215	$ 0.0094	$ 0.0047	$ 0.0015	$ 0.0295	$0.0056	$0.0021	$ 0.0003	$ 0.0226	$0.0233	$0.0092	$ 0.0010	$ 0.0879	$ 0.0438	$ 0.0187	$ 0.0036	$ 0.1615

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.5k Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 10,001-50,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0042	$ 0.0040	$ 0.0015	$ 0.0078	$ 0.0034	$ 0.0031	$ 0.0011	$ 0.0066	$0.0002	$0.0002	$ 0.0000	$ 0.0007	$0.0014	$0.0010	$ 0.0001	$ 0.0044	$ 0.0093	$ 0.0082	$ 0.0027	$ 0.0195
2009	$ 0.0133	$ 0.0130	$ 0.0050	$ 0.0229	$ 0.0108	$ 0.0104	$ 0.0038	$ 0.0191	$0.0007	$0.0005	$ 0.0001	$ 0.0022	$0.0044	$0.0031	$ 0.0005	$ 0.0143	$ 0.0293	$ 0.0270	$ 0.0093	$ 0.0585
2010	$ 0.0244	$ 0.0236	$ 0.0085	$ 0.0425	$ 0.0194	$ 0.0189	$ 0.0065	$ 0.0352	$0.0013	$0.0009	$ 0.0001	$ 0.0040	$0.0079	$0.0056	$ 0.0008	$ 0.0250	$ 0.0529	$ 0.0491	$ 0.0160	$ 0.1067
2011	$ 0.0341	$ 0.0331	$ 0.0122	$ 0.0596	$ 0.0271	$ 0.0261	$ 0.0092	$ 0.0489	$0.0018	$0.0013	$ 0.0002	$ 0.0055	$0.0109	$0.0077	$ 0.0012	$ 0.0343	$ 0.0740	$ 0.0682	$ 0.0228	$ 0.1482
2012	$ 0.0439	$ 0.0425	$ 0.0158	$ 0.0764	$ 0.0349	$ 0.0335	$ 0.0121	$ 0.0626	$0.0023	$0.0016	$ 0.0002	$ 0.0070	$0.0139	$0.0098	$ 0.0015	$ 0.0434	$ 0.0950	$ 0.0875	$ 0.0297	$ 0.1894
2013	$ 0.0556	$ 0.0540	$ 0.0204	$ 0.0964	$ 0.0441	$ 0.0423	$ 0.0155	$ 0.0803	$0.0029	$0.0021	$ 0.0003	$ 0.0086	$0.0175	$0.0122	$ 0.0019	$ 0.0543	$ 0.1201	$ 0.1106	$ 0.0382	$ 0.2397
2014	$ 0.0669	$ 0.0649	$ 0.0246	$ 0.1152	$ 0.0530	$ 0.0508	$ 0.0186	$ 0.0960	$0.0034	$0.0024	$ 0.0004	$ 0.0103	$0.0208	$0.0144	$ 0.0023	$ 0.0647	$ 0.1442	$ 0.1325	$ 0.0459	$ 0.2862
2015	$ 0.0788	$ 0.0763	$ 0.0298	$ 0.1350	$ 0.0625	$ 0.0598	$ 0.0223	$ 0.1120	$0.0040	$0.0029	$ 0.0005	$ 0.0122	$0.0244	$0.0171	$ 0.0028	$ 0.0771	$ 0.1697	$ 0.1561	$ 0.0554	$ 0.3363
2016	$ 0.0908	$ 0.0875	$ 0.0344	$ 0.1553	$ 0.0718	$ 0.0686	$ 0.0259	$ 0.1286	$0.0046	$0.0033	$ 0.0005	$ 0.0139	$0.0278	$0.0194	$ 0.0032	$ 0.0876	$ 0.1950	$ 0.1789	$ 0.0640	$ 0.3854
2017	$ 0.0948	$ 0.0914	$ 0.0357	$ 0.1647	$ 0.0756	$ 0.0717	$ 0.0270	$ 0.1355	$0.0047	$0.0035	$ 0.0005	$ 0.0142	$0.0290	$0.0207	$ 0.0033	$ 0.0908	$ 0.2041	$ 0.1873	$ 0.0665	$ 0.4052
2018	$ 0.0971	$ 0.0935	$ 0.0370	$ 0.1683	$ 0.0772	$ 0.0731	$ 0.0275	$ 0.1381	$0.0048	$0.0035	$ 0.0005	$ 0.0145	$0.0294	$0.0212	$ 0.0033	$ 0.0923	$ 0.2085	$ 0.1913	$ 0.0683	$ 0.4133
2019	$ 0.0997	$ 0.0958	$ 0.0383	$ 0.1722	$ 0.0791	$ 0.0749	$ 0.0283	$ 0.1407	$0.0049	$0.0036	$ 0.0005	$ 0.0147	$0.0299	$0.0215	$ 0.0033	$ 0.0933	$ 0.2136	$ 0.1957	$ 0.0704	$ 0.4208
2020	$ 0.1028	$ 0.0985	$ 0.0397	$ 0.1781	$ 0.0813	$ 0.0768	$ 0.0290	$ 0.1456	$0.0050	$0.0036	$ 0.0006	$ 0.0150	$0.0305	$0.0219	$ 0.0034	$ 0.0950	$ 0.2197	$ 0.2008	$ 0.0726	$ 0.4337
2021	$ 0.1071	$ 0.1026	$ 0.0405	$ 0.1884	$ 0.0845	$ 0.0796	$ 0.0296	$ 0.1542	$0.0052	$0.0037	$ 0.0006	$ 0.0155	$0.0315	$0.0220	$ 0.0034	$ 0.0972	$ 0.2283	$ 0.2080	$ 0.0741	$ 0.4552
2022	$ 0.1094	$ 0.1047	$ 0.0417	$ 0.1919	$ 0.0863	$ 0.0813	$ 0.0306	$ 0.1573	$0.0052	$0.0037	$ 0.0006	$ 0.0157	$0.0319	$0.0222	$ 0.0035	$ 0.0985	$ 0.2328	$ 0.2119	$ 0.0763	$ 0.4634
2023	$ 0.1114	$ 0.1067	$ 0.0424	$ 0.1952	$ 0.0878	$ 0.0826	$ 0.0311	$ 0.1599	$0.0053	$0.0038	$ 0.0006	$ 0.0159	$0.0322	$0.0223	$ 0.0035	$ 0.0993	$ 0.2367	$ 0.2154	$ 0.0776	$ 0.4702
2024	$ 0.1174	$ 0.1121	$ 0.0438	$ 0.2088	$ 0.0926	$ 0.0870	$ 0.0322	$ 0.1728	$0.0055	$0.0038	$ 0.0006	$ 0.0168	$0.0338	$0.0227	$ 0.0036	$ 0.1047	$ 0.2492	$ 0.2256	$ 0.0803	$ 0.5030
2025	$ 0.1200	$ 0.1143	$ 0.0453	$ 0.2127	$ 0.0946	$ 0.0892	$ 0.0331	$ 0.1766	$0.0056	$0.0039	$ 0.0006	$ 0.0171	$0.0343	$0.0236	$ 0.0037	$ 0.1072	$ 0.2545	$ 0.2309	$ 0.0827	$ 0.5136
2026	$ 0.1224	$ 0.1168	$ 0.0462	$ 0.2167	$ 0.0964	$ 0.0907	$ 0.0341	$ 0.1795	$0.0057	$0.0039	$ 0.0006	$ 0.0172	$0.0346	$0.0238	$ 0.0037	$ 0.1082	$ 0.2591	$ 0.2352	$ 0.0847	$ 0.5217
2027	$ 0.1256	$ 0.1196	$ 0.0480	$ 0.2209	$ 0.0988	$ 0.0926	$ 0.0349	$ 0.1825	$0.0058	$0.0040	$ 0.0006	$ 0.0176	$0.0352	$0.0242	$ 0.0038	$ 0.1104	$ 0.2654	$ 0.2404	$ 0.0873	$ 0.5314
2028	$ 0.1280	$ 0.1217	$ 0.0489	$ 0.2253	$ 0.1006	$ 0.0942	$ 0.0355	$ 0.1855	$0.0058	$0.0041	$ 0.0006	$ 0.0178	$0.0356	$0.0245	$ 0.0038	$ 0.1123	$ 0.2700	$ 0.2445	$ 0.0889	$ 0.5409
2029	$ 0.1307	$ 0.1240	$ 0.0500	$ 0.2296	$ 0.1026	$ 0.0959	$ 0.0363	$ 0.1892	$0.0059	$0.0041	$ 0.0006	$ 0.0181	$0.0360	$0.0248	$ 0.0038	$ 0.1140	$ 0.2752	$ 0.2488	$ 0.0908	$ 0.5508

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.5l Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 10,001-50,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0003	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0006	$0.0002	$0.0001	$ 0.0000	$ 0.0005	$0.0007	$0.0003	$ 0.0000	$ 0.0021	$ 0.0013	$ 0.0006	$ 0.0001	$ 0.0035
2009	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0016	$ 0.0009	$ 0.0005	$ 0.0002	$ 0.0027	$0.0007	$0.0003	$ 0.0000	$ 0.0023	$0.0029	$0.0012	$ 0.0001	$ 0.0103	$ 0.0051	$ 0.0022	$ 0.0004	$ 0.0169
2010	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0025	$ 0.0015	$ 0.0009	$ 0.0003	$ 0.0042	$0.0011	$0.0005	$ 0.0000	$ 0.0035	$0.0047	$0.0020	$ 0.0002	$ 0.0161	$ 0.0082	$ 0.0038	$ 0.0006	$ 0.0264
2011	$ 0.0012	$ 0.0007	$ 0.0002	$ 0.0036	$ 0.0022	$ 0.0012	$ 0.0004	$ 0.0061	$0.0016	$0.0006	$ 0.0001	$ 0.0050	$0.0066	$0.0028	$ 0.0003	$ 0.0232	$ 0.0115	$ 0.0053	$ 0.0009	$ 0.0379
2012	$ 0.0016	$ 0.0009	$ 0.0003	$ 0.0047	$ 0.0028	$ 0.0016	$ 0.0005	$ 0.0078	$0.0020	$0.0008	$ 0.0001	$ 0.0064	$0.0084	$0.0036	$ 0.0003	$ 0.0292	$ 0.0148	$ 0.0068	$ 0.0012	$ 0.0481
2013	$ 0.0020	$ 0.0011	$ 0.0003	$ 0.0059	$ 0.0035	$ 0.0020	$ 0.0007	$ 0.0098	$0.0025	$0.0011	$ 0.0001	$ 0.0081	$0.0105	$0.0046	$ 0.0004	$ 0.0372	$ 0.0186	$ 0.0088	$ 0.0015	$ 0.0609
2014	$ 0.0024	$ 0.0013	$ 0.0004	$ 0.0070	$ 0.0042	$ 0.0024	$ 0.0008	$ 0.0116	$0.0030	$0.0013	$ 0.0001	$ 0.0095	$0.0125	$0.0054	$ 0.0005	$ 0.0438	$ 0.0220	$ 0.0104	$ 0.0018	$ 0.0719
2015	$ 0.0028	$ 0.0015	$ 0.0005	$ 0.0083	$ 0.0049	$ 0.0028	$ 0.0009	$ 0.0137	$0.0035	$0.0015	$ 0.0001	$ 0.0112	$0.0146	$0.0065	$ 0.0006	$ 0.0505	$ 0.0258	$ 0.0123	$ 0.0021	$ 0.0836
2016	$ 0.0032	$ 0.0018	$ 0.0006	$ 0.0095	$ 0.0057	$ 0.0033	$ 0.0011	$ 0.0157	$0.0040	$0.0017	$ 0.0002	$ 0.0127	$0.0166	$0.0074	$ 0.0006	$ 0.0572	$ 0.0295	$ 0.0141	$ 0.0024	$ 0.0951
2017	$ 0.0035	$ 0.0018	$ 0.0006	$ 0.0119	$ 0.0062	$ 0.0034	$ 0.0011	$ 0.0220	$0.0042	$0.0017	$ 0.0002	$ 0.0142	$0.0177	$0.0078	$ 0.0007	$ 0.0655	$ 0.0315	$ 0.0147	$ 0.0025	$ 0.1136
2018	$ 0.0036	$ 0.0019	$ 0.0006	$ 0.0122	$ 0.0064	$ 0.0035	$ 0.0011	$ 0.0224	$0.0043	$0.0018	$ 0.0002	$ 0.0143	$0.0180	$0.0080	$ 0.0007	$ 0.0661	$ 0.0322	$ 0.0151	$ 0.0026	$ 0.1150
2019	$ 0.0037	$ 0.0019	$ 0.0006	$ 0.0124	$ 0.0065	$ 0.0035	$ 0.0012	$ 0.0228	$0.0043	$0.0018	$ 0.0002	$ 0.0144	$0.0182	$0.0082	$ 0.0007	$ 0.0669	$ 0.0327	$ 0.0155	$ 0.0027	$ 0.1165
2020	$ 0.0038	$ 0.0020	$ 0.0006	$ 0.0127	$ 0.0067	$ 0.0036	$ 0.0012	$ 0.0235	$0.0044	$0.0019	$ 0.0002	$ 0.0148	$0.0186	$0.0085	$ 0.0007	$ 0.0709	$ 0.0335	$ 0.0160	$ 0.0027	$ 0.1219
2021	$ 0.0039	$ 0.0021	$ 0.0007	$ 0.0129	$ 0.0068	$ 0.0037	$ 0.0012	$ 0.0239	$0.0045	$0.0019	$ 0.0002	$ 0.0150	$0.0189	$0.0087	$ 0.0007	$ 0.0717	$ 0.0341	$ 0.0164	$ 0.0028	$ 0.1234
2022	$ 0.0040	$ 0.0021	$ 0.0007	$ 0.0131	$ 0.0070	$ 0.0038	$ 0.0013	$ 0.0243	$0.0045	$0.0020	$ 0.0002	$ 0.0151	$0.0191	$0.0088	$ 0.0007	$ 0.0721	$ 0.0345	$ 0.0167	$ 0.0029	$ 0.1246
2023	$ 0.0040	$ 0.0022	$ 0.0007	$ 0.0133	$ 0.0071	$ 0.0039	$ 0.0013	$ 0.0247	$0.0046	$0.0020	$ 0.0002	$ 0.0152	$0.0193	$0.0089	$ 0.0007	$ 0.0726	$ 0.0349	$ 0.0169	$ 0.0029	$ 0.1257
2024	$ 0.0042	$ 0.0023	$ 0.0007	$ 0.0137	$ 0.0073	$ 0.0041	$ 0.0013	$ 0.0252	$0.0047	$0.0021	$ 0.0002	$ 0.0155	$0.0197	$0.0093	$ 0.0008	$ 0.0730	$ 0.0358	$ 0.0177	$ 0.0030	$ 0.1275
2025	$ 0.0043	$ 0.0024	$ 0.0007	$ 0.0140	$ 0.0074	$ 0.0042	$ 0.0014	$ 0.0256	$0.0047	$0.0021	$ 0.0002	$ 0.0157	$0.0199	$0.0094	$ 0.0008	$ 0.0734	$ 0.0364	$ 0.0180	$ 0.0031	$ 0.1287
2026	$ 0.0043	$ 0.0024	$ 0.0008	$ 0.0142	$ 0.0076	$ 0.0043	$ 0.0014	$ 0.0261	$0.0048	$0.0021	$ 0.0002	$ 0.0158	$0.0202	$0.0094	$ 0.0008	$ 0.0740	$ 0.0368	$ 0.0183	$ 0.0032	$ 0.1301
2027	$ 0.0044	$ 0.0025	$ 0.0008	$ 0.0145	$ 0.0077	$ 0.0044	$ 0.0015	$ 0.0265	$0.0048	$0.0022	$ 0.0002	$ 0.0159	$0.0204	$0.0095	$ 0.0008	$ 0.0744	$ 0.0373	$ 0.0185	$ 0.0032	$ 0.1313
2028	$ 0.0045	$ 0.0025	$ 0.0008	$ 0.0147	$ 0.0079	$ 0.0044	$ 0.0015	$ 0.0270	$0.0049	$0.0022	$ 0.0002	$ 0.0160	$0.0206	$0.0096	$ 0.0008	$ 0.0750	$ 0.0378	$ 0.0187	$ 0.0033	$ 0.1327
2029	$ 0.0046	$ 0.0026	$ 0.0008	$ 0.0150	$ 0.0080	$ 0.0045	$ 0.0015	$ 0.0275	$0.0049	$0.0022	$ 0.0002	$ 0.0162	$0.0208	$0.0097	$ 0.0008	$ 0.0754	$ 0.0383	$ 0.0190	$ 0.0034	$ 0.1341

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.5m Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 50,001-100,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0006	$ 0.0006	$ 0.0002	$ 0.0012	$ 0.0005	$ 0.0005	$ 0.0001	$ 0.0011	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0002	$0.0001	$ 0.0000	$ 0.0006	$ 0.0014	$ 0.0012	$ 0.0003	$ 0.0029
2009	$ 0.0020	$ 0.0019	$ 0.0006	$ 0.0037	$ 0.0017	$ 0.0015	$ 0.0004	$ 0.0032	$0.0001	$0.0001	$ 0.0000	$ 0.0003	$0.0006	$0.0005	$ 0.0001	$ 0.0019	$ 0.0044	$ 0.0040	$ 0.0011	$ 0.0090
2010	$ 0.0036	$ 0.0035	$ 0.0009	$ 0.0068	$ 0.0030	$ 0.0028	$ 0.0008	$ 0.0059	$0.0002	$0.0001	$ 0.0000	$ 0.0005	$0.0011	$0.0009	$ 0.0001	$ 0.0034	$ 0.0079	$ 0.0073	$ 0.0018	$ 0.0166
2011	$ 0.0051	$ 0.0048	$ 0.0013	$ 0.0095	$ 0.0041	$ 0.0038	$ 0.0011	$ 0.0082	$0.0003	$0.0002	$ 0.0000	$ 0.0007	$0.0016	$0.0012	$ 0.0001	$ 0.0046	$ 0.0110	$ 0.0100	$ 0.0025	$ 0.0231
2012	$ 0.0065	$ 0.0062	$ 0.0017	$ 0.0122	$ 0.0053	$ 0.0049	$ 0.0014	$ 0.0105	$0.0003	$0.0002	$ 0.0000	$ 0.0009	$0.0020	$0.0015	$ 0.0002	$ 0.0059	$ 0.0141	$ 0.0128	$ 0.0033	$ 0.0296
2013	$ 0.0083	$ 0.0079	$ 0.0021	$ 0.0154	$ 0.0067	$ 0.0063	$ 0.0017	$ 0.0132	$0.0004	$0.0003	$ 0.0000	$ 0.0012	$0.0025	$0.0019	$ 0.0002	$ 0.0073	$ 0.0179	$ 0.0164	$ 0.0041	$ 0.0371
2014	$ 0.0099	$ 0.0095	$ 0.0025	$ 0.0184	$ 0.0081	$ 0.0076	$ 0.0020	$ 0.0160	$0.0005	$0.0004	$ 0.0000	$ 0.0014	$0.0030	$0.0022	$ 0.0003	$ 0.0087	$ 0.0215	$ 0.0197	$ 0.0049	$ 0.0444
2015	$ 0.0117	$ 0.0113	$ 0.0032	$ 0.0216	$ 0.0095	$ 0.0091	$ 0.0026	$ 0.0188	$0.0006	$0.0004	$ 0.0001	$ 0.0016	$0.0035	$0.0026	$ 0.0003	$ 0.0102	$ 0.0253	$ 0.0234	$ 0.0062	$ 0.0522
2016	$ 0.0135	$ 0.0129	$ 0.0037	$ 0.0249	$ 0.0109	$ 0.0104	$ 0.0030	$ 0.0216	$0.0006	$0.0005	$ 0.0001	$ 0.0018	$0.0040	$0.0030	$ 0.0004	$ 0.0116	$ 0.0291	$ 0.0267	$ 0.0071	$ 0.0599
2017	$ 0.0142	$ 0.0135	$ 0.0038	$ 0.0267	$ 0.0116	$ 0.0108	$ 0.0031	$ 0.0228	$0.0007	$0.0005	$ 0.0001	$ 0.0019	$0.0042	$0.0031	$ 0.0004	$ 0.0119	$ 0.0308	$ 0.0279	$ 0.0073	$ 0.0634
2018	$ 0.0145	$ 0.0140	$ 0.0041	$ 0.0272	$ 0.0119	$ 0.0110	$ 0.0032	$ 0.0232	$0.0007	$0.0005	$ 0.0001	$ 0.0019	$0.0043	$0.0031	$ 0.0004	$ 0.0120	$ 0.0314	$ 0.0286	$ 0.0077	$ 0.0644
2019	$ 0.0148	$ 0.0142	$ 0.0042	$ 0.0277	$ 0.0121	$ 0.0112	$ 0.0033	$ 0.0236	$0.0007	$0.0005	$ 0.0001	$ 0.0019	$0.0043	$0.0032	$ 0.0004	$ 0.0122	$ 0.0319	$ 0.0291	$ 0.0079	$ 0.0654
2020	$ 0.0152	$ 0.0146	$ 0.0042	$ 0.0286	$ 0.0124	$ 0.0114	$ 0.0034	$ 0.0243	$0.0007	$0.0005	$ 0.0001	$ 0.0020	$0.0044	$0.0032	$ 0.0004	$ 0.0124	$ 0.0327	$ 0.0298	$ 0.0081	$ 0.0673
2021	$ 0.0160	$ 0.0151	$ 0.0044	$ 0.0302	$ 0.0130	$ 0.0120	$ 0.0035	$ 0.0259	$0.0007	$0.0005	$ 0.0001	$ 0.0021	$0.0045	$0.0033	$ 0.0004	$ 0.0128	$ 0.0342	$ 0.0310	$ 0.0085	$ 0.0709
2022	$ 0.0163	$ 0.0154	$ 0.0045	$ 0.0307	$ 0.0132	$ 0.0122	$ 0.0036	$ 0.0263	$0.0007	$0.0005	$ 0.0001	$ 0.0021	$0.0046	$0.0034	$ 0.0004	$ 0.0130	$ 0.0348	$ 0.0315	$ 0.0087	$ 0.0722
2023	$ 0.0166	$ 0.0157	$ 0.0046	$ 0.0313	$ 0.0134	$ 0.0124	$ 0.0037	$ 0.0267	$0.0007	$0.0005	$ 0.0001	$ 0.0021	$0.0046	$0.0034	$ 0.0004	$ 0.0132	$ 0.0354	$ 0.0320	$ 0.0088	$ 0.0733
2024	$ 0.0175	$ 0.0167	$ 0.0047	$ 0.0331	$ 0.0142	$ 0.0131	$ 0.0038	$ 0.0284	$0.0008	$0.0006	$ 0.0001	$ 0.0022	$0.0049	$0.0035	$ 0.0005	$ 0.0142	$ 0.0374	$ 0.0339	$ 0.0091	$ 0.0780
2025	$ 0.0179	$ 0.0171	$ 0.0049	$ 0.0340	$ 0.0146	$ 0.0133	$ 0.0040	$ 0.0290	$0.0008	$0.0006	$ 0.0001	$ 0.0023	$0.0049	$0.0035	$ 0.0005	$ 0.0146	$ 0.0382	$ 0.0345	$ 0.0094	$ 0.0799
2026	$ 0.0182	$ 0.0174	$ 0.0050	$ 0.0346	$ 0.0148	$ 0.0135	$ 0.0040	$ 0.0295	$0.0008	$0.0006	$ 0.0001	$ 0.0023	$0.0050	$0.0036	$ 0.0005	$ 0.0147	$ 0.0388	$ 0.0350	$ 0.0096	$ 0.0811
2027	$ 0.0187	$ 0.0178	$ 0.0053	$ 0.0354	$ 0.0152	$ 0.0141	$ 0.0042	$ 0.0302	$0.0008	$0.0006	$ 0.0001	$ 0.0024	$0.0051	$0.0036	$ 0.0005	$ 0.0150	$ 0.0397	$ 0.0361	$ 0.0100	$ 0.0829
2028	$ 0.0191	$ 0.0182	$ 0.0054	$ 0.0361	$ 0.0154	$ 0.0144	$ 0.0043	$ 0.0307	$0.0008	$0.0006	$ 0.0001	$ 0.0024	$0.0051	$0.0036	$ 0.0005	$ 0.0152	$ 0.0404	$ 0.0367	$ 0.0102	$ 0.0843
2029	$ 0.0194	$ 0.0185	$ 0.0055	$ 0.0369	$ 0.0157	$ 0.0146	$ 0.0044	$ 0.0312	$0.0008	$0.0006	$ 0.0001	$ 0.0024	$0.0052	$0.0037	$ 0.0005	$ 0.0153	$ 0.0411	$ 0.0374	$ 0.0104	$ 0.0857

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5n Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 50,001-100,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$0.0000	$0.0000	$ 0.0000	$ 0.0001	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0004
2009	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0003	$0.0001	$0.0000	$ 0.0000	$ 0.0003	$0.0004	$0.0001	$ 0.0000	$ 0.0012	$ 0.0007	$ 0.0003	$ 0.0000	$ 0.0019
2010	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0003	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0005	$0.0002	$0.0001	$ 0.0000	$ 0.0004	$0.0007	$0.0002	$ 0.0000	$ 0.0019	$ 0.0012	$ 0.0004	$ 0.0001	$ 0.0031
2011	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0004	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0007	$0.0002	$0.0001	$ 0.0000	$ 0.0006	$0.0010	$0.0003	$ 0.0000	$ 0.0026	$ 0.0017	$ 0.0006	$ 0.0001	$ 0.0043
2012	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0005	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0010	$0.0003	$0.0001	$ 0.0000	$ 0.0008	$0.0013	$0.0004	$ 0.0000	$ 0.0034	$ 0.0021	$ 0.0008	$ 0.0001	$ 0.0056
2013	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0006	$ 0.0005	$ 0.0002	$ 0.0000	$ 0.0012	$0.0004	$0.0001	$ 0.0000	$ 0.0010	$0.0016	$0.0005	$ 0.0000	$ 0.0044	$ 0.0027	$ 0.0010	$ 0.0001	$ 0.0072
2014	$ 0.0003	$ 0.0002	$ 0.0000	$ 0.0008	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0014	$0.0004	$0.0001	$ 0.0000	$ 0.0012	$0.0019	$0.0006	$ 0.0000	$ 0.0052	$ 0.0032	$ 0.0012	$ 0.0001	$ 0.0085
2015	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0009	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0017	$0.0005	$0.0002	$ 0.0000	$ 0.0014	$0.0022	$0.0007	$ 0.0000	$ 0.0062	$ 0.0037	$ 0.0014	$ 0.0002	$ 0.0103
2016	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0011	$ 0.0007	$ 0.0004	$ 0.0001	$ 0.0020	$0.0006	$0.0002	$ 0.0000	$ 0.0016	$0.0025	$0.0008	$ 0.0001	$ 0.0071	$ 0.0042	$ 0.0016	$ 0.0002	$ 0.0117
2017	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0014	$ 0.0008	$ 0.0004	$ 0.0001	$ 0.0025	$0.0006	$0.0002	$ 0.0000	$ 0.0018	$0.0026	$0.0008	$ 0.0001	$ 0.0076	$ 0.0045	$ 0.0016	$ 0.0002	$ 0.0133
2018	$ 0.0005	$ 0.0002	$ 0.0000	$ 0.0015	$ 0.0008	$ 0.0004	$ 0.0001	$ 0.0025	$0.0006	$0.0002	$ 0.0000	$ 0.0018	$0.0026	$0.0008	$ 0.0001	$ 0.0076	$ 0.0045	$ 0.0017	$ 0.0002	$ 0.0134
2019	$ 0.0005	$ 0.0003	$ 0.0000	$ 0.0015	$ 0.0008	$ 0.0004	$ 0.0001	$ 0.0026	$0.0006	$0.0002	$ 0.0000	$ 0.0018	$0.0027	$0.0008	$ 0.0001	$ 0.0077	$ 0.0046	$ 0.0017	$ 0.0002	$ 0.0136
2020	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0015	$ 0.0008	$ 0.0004	$ 0.0001	$ 0.0026	$0.0006	$0.0002	$ 0.0000	$ 0.0018	$0.0027	$0.0009	$ 0.0001	$ 0.0078	$ 0.0047	$ 0.0017	$ 0.0002	$ 0.0138
2021	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0015	$ 0.0009	$ 0.0004	$ 0.0001	$ 0.0027	$0.0006	$0.0002	$ 0.0000	$ 0.0019	$0.0027	$0.0009	$ 0.0001	$ 0.0079	$ 0.0047	$ 0.0018	$ 0.0002	$ 0.0140
2022	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0016	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0027	$0.0006	$0.0002	$ 0.0000	$ 0.0019	$0.0028	$0.0009	$ 0.0001	$ 0.0081	$ 0.0048	$ 0.0018	$ 0.0002	$ 0.0143
2023	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0016	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0028	$0.0006	$0.0002	$ 0.0000	$ 0.0019	$0.0028	$0.0009	$ 0.0001	$ 0.0081	$ 0.0048	$ 0.0018	$ 0.0002	$ 0.0144
2024	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0016	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0028	$0.0007	$0.0002	$ 0.0000	$ 0.0020	$0.0029	$0.0009	$ 0.0001	$ 0.0082	$ 0.0050	$ 0.0020	$ 0.0002	$ 0.0147
2025	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0016	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0028	$0.0007	$0.0002	$ 0.0000	$ 0.0020	$0.0029	$0.0010	$ 0.0001	$ 0.0083	$ 0.0051	$ 0.0020	$ 0.0002	$ 0.0148
2026	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0017	$ 0.0010	$ 0.0005	$ 0.0001	$ 0.0029	$0.0007	$0.0002	$ 0.0000	$ 0.0021	$0.0029	$0.0010	$ 0.0001	$ 0.0084	$ 0.0051	$ 0.0020	$ 0.0002	$ 0.0150
2027	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0017	$ 0.0010	$ 0.0005	$ 0.0001	$ 0.0029	$0.0007	$0.0002	$ 0.0000	$ 0.0021	$0.0030	$0.0010	$ 0.0001	$ 0.0084	$ 0.0052	$ 0.0021	$ 0.0002	$ 0.0152
2028	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0017	$ 0.0010	$ 0.0005	$ 0.0001	$ 0.0030	$0.0007	$0.0002	$ 0.0000	$ 0.0021	$0.0030	$0.0010	$ 0.0001	$ 0.0085	$ 0.0052	$ 0.0021	$ 0.0002	$ 0.0153
2029	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0018	$ 0.0010	$ 0.0006	$ 0.0001	$ 0.0030	$0.0007	$0.0002	$ 0.0000	$ 0.0021	$0.0030	$0.0010	$ 0.0001	$ 0.0086	$ 0.0053	$ 0.0021	$ 0.0003	$ 0.0155

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5o Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 100,001-1,000,000 (Rotavirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0014	$ 0.0014	$ 0.0004	$ 0.0028	$ 0.0011	$ 0.0010	$ 0.0003	$ 0.0024	$0.0001	$0.0000	$ 0.0000	$ 0.0002	$0.0004	$0.0003	$ 0.0000	$ 0.0013	$ 0.0031	$ 0.0027	$ 0.0007	$ 0.0068
2009	$ 0.0045	$ 0.0044	$ 0.0012	$ 0.0087	$ 0.0037	$ 0.0034	$ 0.0009	$ 0.0075	$0.0002	$0.0002	$ 0.0000	$ 0.0007	$0.0014	$0.0009	$ 0.0001	$ 0.0041	$ 0.0099	$ 0.0088	$ 0.0022	$ 0.0209
2010	$ 0.0085	$ 0.0082	$ 0.0020	$ 0.0170	$ 0.0067	$ 0.0062	$ 0.0015	$ 0.0143	$0.0004	$0.0003	$ 0.0000	$ 0.0013	$0.0026	$0.0017	$ 0.0003	$ 0.0076	$ 0.0182	$ 0.0163	$ 0.0038	$ 0.0401
2011	$ 0.0118	$ 0.0113	$ 0.0028	$ 0.0233	$ 0.0094	$ 0.0087	$ 0.0021	$ 0.0197	$0.0006	$0.0004	$ 0.0001	$ 0.0018	$0.0036	$0.0023	$ 0.0004	$ 0.0106	$ 0.0253	$ 0.0228	$ 0.0054	$ 0.0553
2012	$ 0.0151	$ 0.0145	$ 0.0037	$ 0.0297	$ 0.0120	$ 0.0111	$ 0.0027	$ 0.0251	$0.0007	$0.0005	$ 0.0001	$ 0.0022	$0.0045	$0.0030	$ 0.0005	$ 0.0133	$ 0.0324	$ 0.0291	$ 0.0070	$ 0.0703
2013	$ 0.0192	$ 0.0184	$ 0.0046	$ 0.0376	$ 0.0153	$ 0.0140	$ 0.0034	$ 0.0315	$0.0009	$0.0006	$ 0.0001	$ 0.0028	$0.0057	$0.0037	$ 0.0006	$ 0.0168	$ 0.0411	$ 0.0367	$ 0.0087	$ 0.0888
2014	$ 0.0230	$ 0.0221	$ 0.0056	$ 0.0454	$ 0.0183	$ 0.0169	$ 0.0041	$ 0.0385	$0.0011	$0.0007	$ 0.0001	$ 0.0034	$0.0068	$0.0044	$ 0.0007	$ 0.0205	$ 0.0493	$ 0.0441	$ 0.0105	$ 0.1078
2015	$ 0.0271	$ 0.0260	$ 0.0066	$ 0.0536	$ 0.0216	$ 0.0198	$ 0.0050	$ 0.0458	$0.0013	$0.0008	$ 0.0001	$ 0.0040	$0.0080	$0.0051	$ 0.0008	$ 0.0241	$ 0.0580	$ 0.0518	$ 0.0126	$ 0.1274
2016	$ 0.0311	$ 0.0298	$ 0.0076	$ 0.0615	$ 0.0248	$ 0.0228	$ 0.0058	$ 0.0524	$0.0015	$0.0010	$ 0.0001	$ 0.0046	$0.0091	$0.0059	$ 0.0009	$ 0.0276	$ 0.0665	$ 0.0595	$ 0.0144	$ 0.1460
2017	$ 0.0329	$ 0.0313	$ 0.0078	$ 0.0661	$ 0.0263	$ 0.0240	$ 0.0059	$ 0.0564	$0.0016	$0.0010	$ 0.0002	$ 0.0048	$0.0096	$0.0060	$ 0.0009	$ 0.0293	$ 0.0704	$ 0.0623	$ 0.0148	$ 0.1566
2018	$ 0.0337	$ 0.0320	$ 0.0081	$ 0.0675	$ 0.0269	$ 0.0244	$ 0.0060	$ 0.0574	$0.0016	$0.0010	$ 0.0002	$ 0.0049	$0.0097	$0.0061	$ 0.0009	$ 0.0296	$ 0.0719	$ 0.0635	$ 0.0152	$ 0.1594
2019	$ 0.0344	$ 0.0327	$ 0.0083	$ 0.0688	$ 0.0274	$ 0.0248	$ 0.0062	$ 0.0584	$0.0016	$0.0010	$ 0.0002	$ 0.0050	$0.0098	$0.0062	$ 0.0009	$ 0.0299	$ 0.0732	$ 0.0648	$ 0.0156	$ 0.1620
2020	$ 0.0353	$ 0.0333	$ 0.0086	$ 0.0705	$ 0.0281	$ 0.0254	$ 0.0064	$ 0.0602	$0.0016	$0.0011	$ 0.0002	$ 0.0050	$0.0100	$0.0063	$ 0.0010	$ 0.0302	$ 0.0749	$ 0.0661	$ 0.0161	$ 0.1659
2021	$ 0.0370	$ 0.0349	$ 0.0090	$ 0.0735	$ 0.0293	$ 0.0264	$ 0.0066	$ 0.0639	$0.0017	$0.0011	$ 0.0002	$ 0.0052	$0.0104	$0.0066	$ 0.0010	$ 0.0317	$ 0.0784	$ 0.0690	$ 0.0168	$ 0.1743
2022	$ 0.0377	$ 0.0356	$ 0.0092	$ 0.0747	$ 0.0299	$ 0.0269	$ 0.0068	$ 0.0650	$0.0017	$0.0011	$ 0.0002	$ 0.0052	$0.0105	$0.0067	$ 0.0010	$ 0.0320	$ 0.0797	$ 0.0703	$ 0.0171	$ 0.1770
2023	$ 0.0383	$ 0.0362	$ 0.0094	$ 0.0760	$ 0.0304	$ 0.0274	$ 0.0069	$ 0.0660	$0.0017	$0.0011	$ 0.0002	$ 0.0053	$0.0106	$0.0067	$ 0.0010	$ 0.0322	$ 0.0810	$ 0.0714	$ 0.0175	$ 0.1794
2024	$ 0.0406	$ 0.0386	$ 0.0096	$ 0.0799	$ 0.0322	$ 0.0290	$ 0.0071	$ 0.0694	$0.0018	$0.0012	$ 0.0002	$ 0.0056	$0.0111	$0.0070	$ 0.0010	$ 0.0339	$ 0.0857	$ 0.0758	$ 0.0179	$ 0.1887
2025	$ 0.0415	$ 0.0394	$ 0.0098	$ 0.0824	$ 0.0330	$ 0.0296	$ 0.0072	$ 0.0709	$0.0018	$0.0012	$ 0.0002	$ 0.0057	$0.0113	$0.0071	$ 0.0010	$ 0.0347	$ 0.0877	$ 0.0773	$ 0.0182	$ 0.1936
2026	$ 0.0423	$ 0.0401	$ 0.0100	$ 0.0838	$ 0.0336	$ 0.0301	$ 0.0073	$ 0.0721	$0.0019	$0.0012	$ 0.0002	$ 0.0057	$0.0114	$0.0072	$ 0.0011	$ 0.0349	$ 0.0891	$ 0.0786	$ 0.0186	$ 0.1964
2027	$ 0.0434	$ 0.0411	$ 0.0101	$ 0.0861	$ 0.0344	$ 0.0311	$ 0.0075	$ 0.0733	$0.0019	$0.0012	$ 0.0002	$ 0.0057	$0.0116	$0.0073	$ 0.0011	$ 0.0351	$ 0.0913	$ 0.0807	$ 0.0189	$ 0.2002
2028	$ 0.0442	$ 0.0419	$ 0.0103	$ 0.0877	$ 0.0350	$ 0.0316	$ 0.0076	$ 0.0744	$0.0019	$0.0012	$ 0.0002	$ 0.0058	$0.0117	$0.0074	$ 0.0011	$ 0.0352	$ 0.0929	$ 0.0821	$ 0.0193	$ 0.2031
2029	$ 0.0451	$ 0.0427	$ 0.0105	$ 0.0893	$ 0.0357	$ 0.0323	$ 0.0078	$ 0.0758	$0.0019	$0.0012	$ 0.0002	$ 0.0058	$0.0119	$0.0074	$ 0.0011	$ 0.0354	$ 0.0946	$ 0.0836	$ 0.0196	$ 0.2063

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5p Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving 100,001-1,000,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided											
	0 -16 years				>16 years				0 -16 years				>16 years				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0000	$ 0.0000	$ 0.0000	$ 0.0001	$ 0.0001	$ 0.0000	$ 0.0000	$ 0.0002	$0.0001	$0.0000	$ 0.0000	$ 0.0002	$0.0002	$0.0001	$ 0.0000	$ 0.0007	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0012
2009	$ 0.0002	$ 0.0001	$ 0.0000	$ 0.0005	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0009	$0.0002	$0.0001	$ 0.0000	$ 0.0008	$0.0009	$0.0003	$ 0.0000	$ 0.0030	$ 0.0015	$ 0.0006	$ 0.0001	$ 0.0053
2010	$ 0.0003	$ 0.0001	$ 0.0000	$ 0.0009	$ 0.0005	$ 0.0002	$ 0.0001	$ 0.0015	$0.0003	$0.0001	$ 0.0000	$ 0.0012	$0.0014	$0.0005	$ 0.0000	$ 0.0049	$ 0.0025	$ 0.0010	$ 0.0001	$ 0.0085
2011	$ 0.0004	$ 0.0002	$ 0.0000	$ 0.0013	$ 0.0007	$ 0.0004	$ 0.0001	$ 0.0022	$0.0005	$0.0002	$ 0.0000	$ 0.0018	$0.0019	$0.0007	$ 0.0001	$ 0.0067	$ 0.0035	$ 0.0014	$ 0.0002	$ 0.0119
2012	$ 0.0005	$ 0.0002	$ 0.0001	$ 0.0016	$ 0.0009	$ 0.0005	$ 0.0001	$ 0.0028	$0.0006	$0.0002	$ 0.0000	$ 0.0023	$0.0025	$0.0009	$ 0.0001	$ 0.0087	$ 0.0045	$ 0.0018	$ 0.0002	$ 0.0155
2013	$ 0.0006	$ 0.0003	$ 0.0001	$ 0.0021	$ 0.0011	$ 0.0006	$ 0.0001	$ 0.0035	$0.0008	$0.0003	$ 0.0000	$ 0.0029	$0.0031	$0.0011	$ 0.0001	$ 0.0109	$ 0.0056	$ 0.0023	$ 0.0003	$ 0.0194
2014	$ 0.0008	$ 0.0004	$ 0.0001	$ 0.0024	$ 0.0013	$ 0.0007	$ 0.0001	$ 0.0042	$0.0009	$0.0003	$ 0.0000	$ 0.0034	$0.0037	$0.0013	$ 0.0001	$ 0.0128	$ 0.0067	$ 0.0027	$ 0.0003	$ 0.0229
2015	$ 0.0009	$ 0.0004	$ 0.0001	$ 0.0030	$ 0.0016	$ 0.0008	$ 0.0002	$ 0.0051	$0.0011	$0.0004	$ 0.0000	$ 0.0041	$0.0043	$0.0016	$ 0.0001	$ 0.0148	$ 0.0079	$ 0.0032	$ 0.0004	$ 0.0270
2016	$ 0.0010	$ 0.0005	$ 0.0001	$ 0.0034	$ 0.0018	$ 0.0010	$ 0.0002	$ 0.0058	$0.0012	$0.0004	$ 0.0000	$ 0.0047	$0.0049	$0.0018	$ 0.0001	$ 0.0170	$ 0.0090	$ 0.0037	$ 0.0005	$ 0.0309
2017	$ 0.0011	$ 0.0005	$ 0.0001	$ 0.0043	$ 0.0020	$ 0.0010	$ 0.0002	$ 0.0070	$0.0013	$0.0004	$ 0.0000	$ 0.0058	$0.0053	$0.0018	$ 0.0002	$ 0.0222	$ 0.0097	$ 0.0038	$ 0.0005	$ 0.0395
2018	$ 0.0012	$ 0.0005	$ 0.0001	$ 0.0044	$ 0.0020	$ 0.0010	$ 0.0002	$ 0.0071	$0.0013	$0.0004	$ 0.0000	$ 0.0059	$0.0054	$0.0019	$ 0.0002	$ 0.0223	$ 0.0099	$ 0.0039	$ 0.0005	$ 0.0398
2019	$ 0.0012	$ 0.0006	$ 0.0001	$ 0.0045	$ 0.0020	$ 0.0010	$ 0.0002	$ 0.0073	$0.0013	$0.0005	$ 0.0000	$ 0.0059	$0.0054	$0.0019	$ 0.0002	$ 0.0225	$ 0.0100	$ 0.0039	$ 0.0005	$ 0.0402
2020	$ 0.0012	$ 0.0006	$ 0.0001	$ 0.0046	$ 0.0021	$ 0.0011	$ 0.0002	$ 0.0074	$0.0014	$0.0005	$ 0.0000	$ 0.0060	$0.0055	$0.0019	$ 0.0002	$ 0.0226	$ 0.0102	$ 0.0040	$ 0.0005	$ 0.0406
2021	$ 0.0012	$ 0.0006	$ 0.0001	$ 0.0047	$ 0.0021	$ 0.0011	$ 0.0002	$ 0.0075	$0.0014	$0.0005	$ 0.0000	$ 0.0061	$0.0056	$0.0020	$ 0.0002	$ 0.0230	$ 0.0104	$ 0.0042	$ 0.0005	$ 0.0413
2022	$ 0.0013	$ 0.0006	$ 0.0001	$ 0.0048	$ 0.0022	$ 0.0011	$ 0.0002	$ 0.0076	$0.0014	$0.0005	$ 0.0000	$ 0.0061	$0.0057	$0.0020	$ 0.0002	$ 0.0231	$ 0.0105	$ 0.0042	$ 0.0005	$ 0.0417
2023	$ 0.0013	$ 0.0006	$ 0.0001	$ 0.0048	$ 0.0022	$ 0.0011	$ 0.0002	$ 0.0078	$0.0014	$0.0005	$ 0.0000	$ 0.0062	$0.0057	$0.0020	$ 0.0002	$ 0.0232	$ 0.0106	$ 0.0043	$ 0.0006	$ 0.0420
2024	$ 0.0013	$ 0.0007	$ 0.0001	$ 0.0049	$ 0.0023	$ 0.0012	$ 0.0002	$ 0.0079	$0.0015	$0.0005	$ 0.0000	$ 0.0066	$0.0059	$0.0021	$ 0.0002	$ 0.0246	$ 0.0110	$ 0.0045	$ 0.0006	$ 0.0441
2025	$ 0.0013	$ 0.0007	$ 0.0001	$ 0.0050	$ 0.0023	$ 0.0012	$ 0.0002	$ 0.0081	$0.0015	$0.0005	$ 0.0000	$ 0.0066	$0.0060	$0.0021	$ 0.0002	$ 0.0248	$ 0.0112	$ 0.0046	$ 0.0006	$ 0.0445
2026	$ 0.0014	$ 0.0007	$ 0.0001	$ 0.0051	$ 0.0024	$ 0.0013	$ 0.0002	$ 0.0082	$0.0015	$0.0005	$ 0.0000	$ 0.0067	$0.0061	$0.0022	$ 0.0002	$ 0.0251	$ 0.0113	$ 0.0046	$ 0.0006	$ 0.0451
2027	$ 0.0014	$ 0.0007	$ 0.0001	$ 0.0052	$ 0.0024	$ 0.0013	$ 0.0002	$ 0.0083	$0.0015	$0.0005	$ 0.0000	$ 0.0067	$0.0061	$0.0022	$ 0.0002	$ 0.0252	$ 0.0114	$ 0.0047	$ 0.0006	$ 0.0455
2028	$ 0.0014	$ 0.0007	$ 0.0001	$ 0.0053	$ 0.0025	$ 0.0013	$ 0.0003	$ 0.0085	$0.0015	$0.0005	$ 0.0000	$ 0.0068	$0.0062	$0.0022	$ 0.0002	$ 0.0255	$ 0.0116	$ 0.0048	$ 0.0006	$ 0.0460
2029	$ 0.0014	$ 0.0007	$ 0.0001	$ 0.0054	$ 0.0025	$ 0.0013	$ 0.0003	$ 0.0086	$0.0015	$0.0005	$ 0.0000	$ 0.0068	$0.0062	$0.0023	$ 0.0002	$ 0.0257	$ 0.0117	$ 0.0049	$ 0.0006	$ 0.0465

Note: Values in millions of 2003 dollars.
Source: GWR Benefits Model.

Exhibit C.5q Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving >1,000,000 (Rotavirus)

Year	Value of Illnesses Avoided								Value of Deaths Avoided								Total Benefits			
	0 - 15 years				> 15 yrs				0 - 15 years				> 15 yrs							
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2009	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2010	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2012	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2013	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2014	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2015	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2016	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2017	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2018	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2019	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2021	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2022	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2023	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2024	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2025	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2026	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2027	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2028	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2029	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.5r Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for TNCWSs Serving >1,000,000 (Echovirus)

	Value of Illnesses Avoided								Value of Deaths Avoided								Total Benefits			
	0 -16 years				>16 years				0 -16 years				>16 years							
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2009	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2010	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2012	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2013	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2014	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2015	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2016	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2017	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2018	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2019	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2021	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2022	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2023	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2024	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2025	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2026	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2027	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2028	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2029	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Note: Values in millions of 2003 dollars.

Source: GWR Benefits Model.

Exhibit C.6a Value of Illnesses and Deaths Avoided Under the Final Rule by Year, for All TNCWSs

	Total - Illness				Total - Deaths				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1
2009	$ 0.1	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.1	$ 0.0	$ 0.3
2010	$ 0.5	$ 0.4	$ 0.1	$ 1.0	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.6	$ 0.5	$ 0.2	$ 1.5
2011	$ 0.7	$ 0.6	$ 0.2	$ 1.5	$ 0.2	$ 0.1	$ 0.0	$ 0.6	$ 0.9	$ 0.7	$ 0.2	$ 2.1
2012	$ 1.1	$ 1.0	$ 0.4	$ 2.1	$ 0.3	$ 0.2	$ 0.0	$ 1.0	$ 1.4	$ 1.2	$ 0.4	$ 3.0
2013	$ 1.4	$ 1.2	$ 0.5	$ 2.7	$ 0.4	$ 0.2	$ 0.0	$ 1.2	$ 1.8	$ 1.5	$ 0.5	$ 3.9
2014	$ 1.8	$ 1.6	$ 0.6	$ 3.5	$ 0.5	$ 0.3	$ 0.0	$ 1.6	$ 2.3	$ 2.0	$ 0.7	$ 5.1
2015	$ 2.2	$ 2.0	$ 0.8	$ 4.3	$ 0.7	$ 0.4	$ 0.1	$ 2.1	$ 2.9	$ 2.4	$ 0.8	$ 6.4
2016	$ 2.7	$ 2.4	$ 1.0	$ 5.3	$ 0.9	$ 0.5	$ 0.1	$ 2.8	$ 3.5	$ 2.9	$ 1.0	$ 8.1
2017	$ 2.8	$ 2.6	$ 1.0	$ 5.8	$ 1.0	$ 0.5	$ 0.1	$ 3.1	$ 3.8	$ 3.1	$ 1.1	$ 8.9
2018	$ 3.0	$ 2.7	$ 1.1	$ 6.0	$ 1.0	$ 0.5	$ 0.1	$ 3.2	$ 4.0	$ 3.3	$ 1.2	$ 9.2
2019	$ 3.1	$ 2.8	$ 1.1	$ 6.2	$ 1.0	$ 0.5	$ 0.1	$ 3.3	$ 4.1	$ 3.4	$ 1.2	$ 9.5
2020	$ 3.3	$ 3.0	$ 1.2	$ 6.5	$ 1.1	$ 0.6	$ 0.1	$ 3.5	$ 4.4	$ 3.6	$ 1.3	$ 10.0
2021	$ 3.5	$ 3.2	$ 1.3	$ 6.8	$ 1.1	$ 0.6	$ 0.1	$ 3.6	$ 4.6	$ 3.8	$ 1.3	$ 10.4
2022	$ 3.6	$ 3.3	$ 1.3	$ 6.9	$ 1.1	$ 0.6	$ 0.1	$ 3.7	$ 4.7	$ 3.9	$ 1.4	$ 10.7
2023	$ 3.8	$ 3.4	$ 1.4	$ 7.3	$ 1.2	$ 0.6	$ 0.1	$ 3.9	$ 5.0	$ 4.1	$ 1.5	$ 11.2
2024	$ 3.9	$ 3.6	$ 1.4	$ 7.5	$ 1.2	$ 0.7	$ 0.1	$ 4.0	$ 5.1	$ 4.2	$ 1.5	$ 11.5
2025	$ 4.1	$ 3.8	$ 1.5	$ 7.8	$ 1.3	$ 0.7	$ 0.1	$ 4.1	$ 5.4	$ 4.5	$ 1.6	$ 11.9
2026	$ 4.2	$ 3.9	$ 1.5	$ 8.0	$ 1.3	$ 0.7	$ 0.1	$ 4.2	$ 5.5	$ 4.7	$ 1.6	$ 12.2
2027	$ 4.4	$ 4.1	$ 1.6	$ 8.4	$ 1.3	$ 0.7	$ 0.1	$ 4.2	$ 5.7	$ 4.8	$ 1.7	$ 12.6
2028	$ 4.5	$ 4.2	$ 1.6	$ 8.6	$ 1.4	$ 0.8	$ 0.1	$ 4.3	$ 5.9	$ 5.0	$ 1.7	$ 12.9
2029	$ 4.6	$ 4.3	$ 1.7	$ 8.8	$ 1.4	$ 0.8	$ 0.1	$ 4.4	$ 6.0	$ 5.1	$ 1.8	$ 13.1

Source: GWR Benefits Model.

Exhibit C.6b Present Value of Illnesses and Deaths Avoided Under the Final Rule by Year at 3 Percent, for All TNCWSs

	Total - Illness				Total -Deaths				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1
2009	$ 0.1	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.1	$ 0.0	$ 0.3
2010	$ 0.4	$ 0.3	$ 0.1	$ 0.9	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.5	$ 0.4	$ 0.1	$ 1.3
2011	$ 0.6	$ 0.5	$ 0.2	$ 1.2	$ 0.2	$ 0.1	$ 0.0	$ 0.5	$ 0.8	$ 0.6	$ 0.2	$ 1.8
2012	$ 0.9	$ 0.8	$ 0.3	$ 1.7	$ 0.3	$ 0.2	$ 0.0	$ 0.8	$ 1.1	$ 0.9	$ 0.3	$ 2.5
2013	$ 1.1	$ 1.0	$ 0.4	$ 2.1	$ 0.3	$ 0.2	$ 0.0	$ 1.0	$ 1.4	$ 1.2	$ 0.4	$ 3.1
2014	$ 1.4	$ 1.3	$ 0.5	$ 2.7	$ 0.4	$ 0.2	$ 0.0	$ 1.3	$ 1.8	$ 1.5	$ 0.5	$ 3.9
2015	$ 1.6	$ 1.5	$ 0.6	$ 3.2	$ 0.5	$ 0.3	$ 0.0	$ 1.6	$ 2.1	$ 1.8	$ 0.6	$ 4.8
2016	$ 1.9	$ 1.8	$ 0.7	$ 3.8	$ 0.6	$ 0.3	$ 0.0	$ 2.0	$ 2.5	$ 2.1	$ 0.7	$ 5.8
2017	$ 2.0	$ 1.8	$ 0.7	$ 4.0	$ 0.7	$ 0.4	$ 0.0	$ 2.2	$ 2.7	$ 2.2	$ 0.8	$ 6.2
2018	$ 2.0	$ 1.9	$ 0.7	$ 4.1	$ 0.7	$ 0.4	$ 0.0	$ 2.2	$ 2.7	$ 2.2	$ 0.8	$ 6.3
2019	$ 2.1	$ 1.9	$ 0.7	$ 4.1	$ 0.7	$ 0.4	$ 0.0	$ 2.2	$ 2.7	$ 2.2	$ 0.8	$ 6.3
2020	$ 2.1	$ 1.9	$ 0.8	$ 4.2	$ 0.7	$ 0.4	$ 0.0	$ 2.3	$ 2.8	$ 2.3	$ 0.8	$ 6.4
2021	$ 2.2	$ 2.0	$ 0.8	$ 4.2	$ 0.7	$ 0.4	$ 0.0	$ 2.3	$ 2.9	$ 2.4	$ 0.8	$ 6.5
2022	$ 2.2	$ 2.0	$ 0.8	$ 4.2	$ 0.7	$ 0.4	$ 0.0	$ 2.2	$ 2.9	$ 2.4	$ 0.8	$ 6.4
2023	$ 2.2	$ 2.0	$ 0.8	$ 4.3	$ 0.7	$ 0.4	$ 0.0	$ 2.3	$ 2.9	$ 2.4	$ 0.9	$ 6.6
2024	$ 2.2	$ 2.0	$ 0.8	$ 4.3	$ 0.7	$ 0.4	$ 0.0	$ 2.3	$ 2.9	$ 2.4	$ 0.9	$ 6.6
2025	$ 2.3	$ 2.1	$ 0.8	$ 4.3	$ 0.7	$ 0.4	$ 0.1	$ 2.3	$ 3.0	$ 2.5	$ 0.9	$ 6.6
2026	$ 2.3	$ 2.1	$ 0.8	$ 4.3	$ 0.7	$ 0.4	$ 0.1	$ 2.2	$ 3.0	$ 2.5	$ 0.9	$ 6.6
2027	$ 2.3	$ 2.1	$ 0.8	$ 4.4	$ 0.7	$ 0.4	$ 0.1	$ 2.2	$ 3.0	$ 2.5	$ 0.9	$ 6.6
2028	$ 2.3	$ 2.1	$ 0.8	$ 4.4	$ 0.7	$ 0.4	$ 0.0	$ 2.2	$ 3.0	$ 2.5	$ 0.9	$ 6.5
2029	$ 2.3	$ 2.1	$ 0.8	$ 4.3	$ 0.7	$ 0.4	$ 0.0	$ 2.1	$ 3.0	$ 2.5	$ 0.9	$ 6.5
Total	$ 36.4	$ 33.3	$ 13.1	$ 71.0	$ 11.4	$ 6.3	$ 0.8	$ 36.6	$ 47.8	$ 39.6	$ 13.9	$ 107.6
Ann	$ 2.1	$ 1.9	$ 0.8	$ 4.1	$ 0.7	$ 0.4	$ 0.0	$ 2.1	$ 2.7	$ 2.3	$ 0.8	$ 6.2

Notes: Details may not sum due to rounding and individual statistical analyses.

Source: GWR Benefits Model.

Exhibit C.6c Present Value of Illnesses and Deaths Avoided Under the Final Rule by Year at 7 Percent, for All TNCWSs

	Total - Illness				Total - Deaths				Total Benefits			
			90 Percent Confidence Bound				90 Percent Confidence Bound				90 Percent Confidence Bound	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1
2009	$ 0.1	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.1	$ 0.0	$ 0.3
2010	$ 0.3	$ 0.3	$ 0.1	$ 0.7	$ 0.1	$ 0.1	$ 0.0	$ 0.3	$ 0.4	$ 0.3	$ 0.1	$ 1.0
2011	$ 0.5	$ 0.4	$ 0.2	$ 1.0	$ 0.1	$ 0.1	$ 0.0	$ 0.4	$ 0.6	$ 0.5	$ 0.2	$ 1.4
2012	$ 0.7	$ 0.6	$ 0.2	$ 1.3	$ 0.2	$ 0.1	$ 0.0	$ 0.6	$ 0.9	$ 0.7	$ 0.2	$ 1.9
2013	$ 0.8	$ 0.7	$ 0.3	$ 1.6	$ 0.2	$ 0.1	$ 0.0	$ 0.7	$ 1.0	$ 0.9	$ 0.3	$ 2.3
2014	$ 1.0	$ 0.9	$ 0.3	$ 1.9	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.3	$ 1.1	$ 0.4	$ 2.8
2015	$ 1.1	$ 1.0	$ 0.4	$ 2.2	$ 0.3	$ 0.2	$ 0.0	$ 1.1	$ 1.5	$ 1.2	$ 0.4	$ 3.3
2016	$ 1.3	$ 1.2	$ 0.5	$ 2.5	$ 0.4	$ 0.2	$ 0.0	$ 1.3	$ 1.7	$ 1.4	$ 0.5	$ 3.8
2017	$ 1.3	$ 1.1	$ 0.4	$ 2.6	$ 0.4	$ 0.2	$ 0.0	$ 1.4	$ 1.7	$ 1.4	$ 0.5	$ 3.9
2018	$ 1.2	$ 1.1	$ 0.4	$ 2.5	$ 0.4	$ 0.2	$ 0.0	$ 1.3	$ 1.7	$ 1.4	$ 0.5	$ 3.8
2019	$ 1.2	$ 1.1	$ 0.4	$ 2.4	$ 0.4	$ 0.2	$ 0.0	$ 1.3	$ 1.6	$ 1.3	$ 0.5	$ 3.7
2020	$ 1.2	$ 1.1	$ 0.4	$ 2.4	$ 0.4	$ 0.2	$ 0.0	$ 1.3	$ 1.6	$ 1.3	$ 0.5	$ 3.6
2021	$ 1.2	$ 1.1	$ 0.4	$ 2.3	$ 0.4	$ 0.2	$ 0.0	$ 1.2	$ 1.6	$ 1.3	$ 0.5	$ 3.5
2022	$ 1.1	$ 1.0	$ 0.4	$ 2.2	$ 0.4	$ 0.2	$ 0.0	$ 1.2	$ 1.5	$ 1.2	$ 0.4	$ 3.4
2023	$ 1.1	$ 1.0	$ 0.4	$ 2.2	$ 0.4	$ 0.2	$ 0.0	$ 1.2	$ 1.5	$ 1.2	$ 0.4	$ 3.3
2024	$ 1.1	$ 1.0	$ 0.4	$ 2.1	$ 0.3	$ 0.2	$ 0.0	$ 1.1	$ 1.4	$ 1.2	$ 0.4	$ 3.2
2025	$ 1.1	$ 1.0	$ 0.4	$ 2.0	$ 0.3	$ 0.2	$ 0.0	$ 1.1	$ 1.4	$ 1.2	$ 0.4	$ 3.1
2026	$ 1.0	$ 1.0	$ 0.4	$ 1.9	$ 0.3	$ 0.2	$ 0.0	$ 1.0	$ 1.3	$ 1.1	$ 0.4	$ 3.0
2027	$ 1.0	$ 0.9	$ 0.4	$ 1.9	$ 0.3	$ 0.2	$ 0.0	$ 1.0	$ 1.3	$ 1.1	$ 0.4	$ 2.9
2028	$ 1.0	$ 0.9	$ 0.3	$ 1.8	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.2	$ 1.0	$ 0.4	$ 2.7
2029	$ 0.9	$ 0.8	$ 0.3	$ 1.7	$ 0.3	$ 0.2	$ 0.0	$ 0.9	$ 1.2	$ 1.0	$ 0.4	$ 2.6
Total	$ 20.1	$ 18.3	$ 7.2	$ 39.3	$ 6.3	$ 3.5	$ 0.5	$ 20.2	$ 26.4	$ 21.8	$ 7.7	$ 59.5
Ann	$ 1.7	$ 1.6	$ 0.6	$ 3.4	$ 0.5	$ 0.3	$ 0.0	$ 1.7	$ 2.3	$ 1.9	$ 0.7	$ 5.1

Notes: Details may not sum due to rounding and individual statistical analyses.

Source: GWR Benefits Model.

Exhibit C.7a Value of Illnesses and Deaths Avoided Under the Final Rule by Year, All Systems

	Total - Illness				Total - Death				Total Benefits			
			90 Percent				90 Percent				90 Percent	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.6	$ 0.5	$ 0.2	$ 1.2	$ 0.3	$ 0.2	$ 0.0	$ 1.0	$ 0.9	$ 0.7	$ 0.3	$ 2.2
2009	$ 2.1	$ 1.9	$ 0.9	$ 4.3	$ 1.0	$ 0.5	$ 0.1	$ 3.2	$ 3.2	$ 2.4	$ 1.0	$ 7.5
2010	$ 4.7	$ 4.1	$ 1.9	$ 9.2	$ 2.1	$ 1.1	$ 0.2	$ 6.8	$ 6.8	$ 5.2	$ 2.1	$ 16.0
2011	$ 7.2	$ 6.3	$ 3.1	$ 14.1	$ 3.2	$ 1.7	$ 0.2	$ 10.1	$ 10.4	$ 8.0	$ 3.3	$ 24.3
2012	$ 10.0	$ 8.8	$ 4.2	$ 19.3	$ 4.3	$ 2.4	$ 0.3	$ 13.8	$ 14.3	$ 11.2	$ 4.6	$ 33.1
2013	$ 13.5	$ 11.9	$ 5.9	$ 25.7	$ 5.8	$ 3.3	$ 0.4	$ 18.5	$ 19.4	$ 15.2	$ 6.3	$ 44.3
2014	$ 14.6	$ 12.9	$ 6.3	$ 27.7	$ 6.2	$ 3.5	$ 0.5	$ 19.7	$ 20.8	$ 16.4	$ 6.8	$ 47.4
2015	$ 16.0	$ 14.1	$ 6.9	$ 30.5	$ 6.9	$ 3.8	$ 0.5	$ 21.9	$ 22.9	$ 17.9	$ 7.4	$ 52.5
2016	$ 17.1	$ 15.1	$ 7.3	$ 32.7	$ 7.3	$ 4.0	$ 0.5	$ 23.3	$ 24.4	$ 19.1	$ 7.9	$ 55.9
2017	$ 18.2	$ 16.1	$ 7.8	$ 35.5	$ 7.8	$ 4.2	$ 0.6	$ 24.9	$ 26.0	$ 20.2	$ 8.3	$ 60.4
2018	$ 19.2	$ 16.9	$ 8.2	$ 37.5	$ 8.1	$ 4.4	$ 0.6	$ 26.0	$ 27.3	$ 21.3	$ 8.8	$ 63.5
2019	$ 19.9	$ 17.6	$ 8.6	$ 38.6	$ 8.3	$ 4.5	$ 0.6	$ 26.8	$ 28.2	$ 22.1	$ 9.2	$ 65.3
2020	$ 20.8	$ 18.3	$ 8.9	$ 40.1	$ 8.6	$ 4.6	$ 0.6	$ 27.7	$ 29.3	$ 23.0	$ 9.6	$ 67.8
2021	$ 21.5	$ 19.0	$ 9.2	$ 41.6	$ 8.8	$ 4.8	$ 0.6	$ 28.9	$ 30.3	$ 23.8	$ 9.9	$ 70.5
2022	$ 22.6	$ 20.0	$ 9.9	$ 43.4	$ 9.2	$ 5.0	$ 0.7	$ 29.9	$ 31.7	$ 25.0	$ 10.5	$ 73.3
2023	$ 23.3	$ 20.6	$ 10.2	$ 45.1	$ 9.4	$ 5.1	$ 0.7	$ 31.0	$ 32.7	$ 25.7	$ 10.9	$ 76.0
2024	$ 24.2	$ 21.5	$ 10.6	$ 46.5	$ 9.7	$ 5.3	$ 0.7	$ 31.7	$ 33.9	$ 26.7	$ 11.3	$ 78.1
2025	$ 25.0	$ 22.2	$ 11.0	$ 47.8	$ 9.9	$ 5.4	$ 0.7	$ 32.3	$ 34.9	$ 27.7	$ 11.7	$ 80.1
2026	$ 25.9	$ 23.0	$ 11.4	$ 49.4	$ 10.1	$ 5.6	$ 0.8	$ 33.1	$ 36.0	$ 28.6	$ 12.2	$ 82.4
2027	$ 26.7	$ 23.8	$ 11.8	$ 50.8	$ 10.3	$ 5.7	$ 0.8	$ 33.6	$ 37.0	$ 29.5	$ 12.6	$ 84.5
2028	$ 27.4	$ 24.4	$ 12.1	$ 52.2	$ 10.5	$ 5.8	$ 0.8	$ 34.3	$ 37.9	$ 30.2	$ 12.8	$ 86.5
2029	$ 28.1	$ 25.1	$ 12.4	$ 53.8	$ 10.7	$ 6.0	$ 0.8	$ 34.8	$ 38.8	$ 31.0	$ 13.2	$ 88.6

Source: GWR Benefits Model.

Exhibit C.7b Present Value of Illnesses and Deaths Avoided Under the Final Rule by Year at 3 Percent, All Systems

	Total - Illness				Total - Deaths				Total Benefits			
			90 Percent				90 Percent				90 Percent	
Year	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Median Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.6	$ 0.5	$ 0.2	$ 1.1	$ 0.3	$ 0.1	$ 0.0	$ 0.9	$ 0.8	$ 0.6	$ 0.2	$ 2.0
2009	$ 1.9	$ 1.7	$ 0.8	$ 3.8	$ 0.9	$ 0.5	$ 0.1	$ 2.9	$ 2.8	$ 2.1	$ 0.9	$ 6.6
2010	$ 4.0	$ 3.5	$ 1.7	$ 8.0	$ 1.8	$ 1.0	$ 0.1	$ 5.8	$ 5.9	$ 4.5	$ 1.8	$ 13.8
2011	$ 6.1	$ 5.3	$ 2.6	$ 11.8	$ 2.7	$ 1.5	$ 0.2	$ 8.5	$ 8.7	$ 6.7	$ 2.8	$ 20.3
2012	$ 8.1	$ 7.1	$ 3.4	$ 15.7	$ 3.5	$ 1.9	$ 0.3	$ 11.2	$ 11.6	$ 9.1	$ 3.7	$ 26.9
2013	$ 10.7	$ 9.4	$ 4.6	$ 20.3	$ 4.6	$ 2.6	$ 0.4	$ 14.6	$ 15.3	$ 12.0	$ 5.0	$ 34.9
2014	$ 11.2	$ 9.9	$ 4.8	$ 21.3	$ 4.7	$ 2.7	$ 0.4	$ 15.1	$ 16.0	$ 12.5	$ 5.2	$ 36.3
2015	$ 11.9	$ 10.5	$ 5.1	$ 22.7	$ 5.1	$ 2.8	$ 0.4	$ 16.3	$ 17.0	$ 13.3	$ 5.5	$ 39.0
2016	$ 12.4	$ 10.9	$ 5.3	$ 23.6	$ 5.3	$ 2.9	$ 0.4	$ 16.8	$ 17.6	$ 13.8	$ 5.7	$ 40.4
2017	$ 12.8	$ 11.3	$ 5.5	$ 24.9	$ 5.4	$ 2.9	$ 0.4	$ 17.5	$ 18.2	$ 14.2	$ 5.9	$ 42.4
2018	$ 13.1	$ 11.5	$ 5.6	$ 25.5	$ 5.5	$ 3.0	$ 0.4	$ 17.7	$ 18.6	$ 14.5	$ 6.0	$ 43.2
2019	$ 13.2	$ 11.6	$ 5.7	$ 25.5	$ 5.5	$ 3.0	$ 0.4	$ 17.7	$ 18.7	$ 14.6	$ 6.1	$ 43.2
2020	$ 13.3	$ 11.8	$ 5.7	$ 25.7	$ 5.5	$ 3.0	$ 0.4	$ 17.8	$ 18.8	$ 14.7	$ 6.1	$ 43.5
2021	$ 13.4	$ 11.8	$ 5.8	$ 25.9	$ 5.5	$ 3.0	$ 0.4	$ 18.0	$ 18.9	$ 14.8	$ 6.2	$ 44.0
2022	$ 13.7	$ 12.1	$ 6.0	$ 26.3	$ 5.5	$ 3.0	$ 0.4	$ 18.1	$ 19.2	$ 15.1	$ 6.4	$ 44.4
2023	$ 13.7	$ 12.1	$ 6.0	$ 26.5	$ 5.5	$ 3.0	$ 0.4	$ 18.2	$ 19.2	$ 15.1	$ 6.4	$ 44.7
2024	$ 13.8	$ 12.2	$ 6.0	$ 26.5	$ 5.5	$ 3.0	$ 0.4	$ 18.1	$ 19.3	$ 15.2	$ 6.5	$ 44.6
2025	$ 13.8	$ 12.3	$ 6.1	$ 26.5	$ 5.5	$ 3.0	$ 0.4	$ 17.9	$ 19.3	$ 15.3	$ 6.5	$ 44.3
2026	$ 13.9	$ 12.4	$ 6.1	$ 26.6	$ 5.4	$ 3.0	$ 0.4	$ 17.8	$ 19.3	$ 15.4	$ 6.5	$ 44.3
2027	$ 13.9	$ 12.4	$ 6.1	$ 26.5	$ 5.4	$ 3.0	$ 0.4	$ 17.6	$ 19.3	$ 15.4	$ 6.6	$ 44.1
2028	$ 13.9	$ 12.4	$ 6.1	$ 26.5	$ 5.3	$ 3.0	$ 0.4	$ 17.4	$ 19.2	$ 15.3	$ 6.5	$ 43.8
2029	$ 13.8	$ 12.3	$ 6.1	$ 26.4	$ 5.2	$ 2.9	$ 0.4	$ 17.1	$ 19.1	$ 15.3	$ 6.5	$ 43.6
Total	$ 243.2	$ 215.0	$ 105.4	$ 467.5	$ 99.7	$ 54.6	$ 7.4	$ 322.9	$ 343.0	$ 269.6	$ 112.8	$ 790.4
Ann	$ 14.0	$ 12.3	$ 6.1	$ 26.8	$ 5.7	$ 3.1	$ 0.4	$ 18.5	$ 19.7	$ 15.5	$ 6.5	$ 45.4

Notes: Details may not sum due to rounding and individual statistical analyses.

Source: GWR Benefits Model.

Exhibit C.7c Present Value of Illnesses and Deaths Avoided Under the Final Rule by Year at 7 Percent, All Systems

	Total - Illness				**Total - Deaths**				**Total Benefits**			
			90 Percent				**90 Percent**				**90 Percent**	
Year	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Median Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ 0.5	$ 0.4	$ 0.2	$ 1.0	$ 0.2	$ 0.1	$ 0.0	$ 0.8	$ 0.7	$ 0.5	$ 0.2	$ 1.8
2009	$ 1.6	$ 1.4	$ 0.7	$ 3.2	$ 0.8	$ 0.4	$ 0.1	$ 2.5	$ 2.4	$ 1.8	$ 0.7	$ 5.7
2010	$ 3.3	$ 2.9	$ 1.4	$ 6.6	$ 1.5	$ 0.8	$ 0.1	$ 4.8	$ 4.8	$ 3.7	$ 1.5	$ 11.4
2011	$ 4.8	$ 4.2	$ 2.0	$ 9.4	$ 2.1	$ 1.2	$ 0.2	$ 6.7	$ 7.0	$ 5.3	$ 2.2	$ 16.2
2012	$ 6.2	$ 5.5	$ 2.6	$ 12.0	$ 2.7	$ 1.5	$ 0.2	$ 8.6	$ 8.9	$ 6.9	$ 2.8	$ 20.6
2013	$ 7.9	$ 6.9	$ 3.4	$ 15.0	$ 3.4	$ 1.9	$ 0.3	$ 10.8	$ 11.3	$ 8.9	$ 3.7	$ 25.8
2014	$ 8.0	$ 7.0	$ 3.4	$ 15.1	$ 3.4	$ 1.9	$ 0.3	$ 10.7	$ 11.3	$ 8.9	$ 3.7	$ 25.8
2015	$ 8.1	$ 7.2	$ 3.5	$ 15.5	$ 3.5	$ 1.9	$ 0.3	$ 11.1	$ 11.6	$ 9.1	$ 3.8	$ 26.7
2016	$ 8.1	$ 7.2	$ 3.5	$ 15.5	$ 3.5	$ 1.9	$ 0.3	$ 11.1	$ 11.6	$ 9.1	$ 3.7	$ 26.6
2017	$ 8.1	$ 7.1	$ 3.5	$ 15.8	$ 3.4	$ 1.8	$ 0.3	$ 11.1	$ 11.5	$ 9.0	$ 3.7	$ 26.8
2018	$ 8.0	$ 7.0	$ 3.4	$ 15.5	$ 3.4	$ 1.8	$ 0.2	$ 10.8	$ 11.3	$ 8.8	$ 3.6	$ 26.4
2019	$ 7.7	$ 6.8	$ 3.3	$ 15.0	$ 3.2	$ 1.7	$ 0.2	$ 10.4	$ 11.0	$ 8.6	$ 3.6	$ 25.3
2020	$ 7.5	$ 6.6	$ 3.2	$ 14.5	$ 3.1	$ 1.7	$ 0.2	$ 10.0	$ 10.6	$ 8.3	$ 3.5	$ 24.6
2021	$ 7.3	$ 6.4	$ 3.1	$ 14.1	$ 3.0	$ 1.6	$ 0.2	$ 9.8	$ 10.3	$ 8.1	$ 3.4	$ 23.9
2022	$ 7.1	$ 6.3	$ 3.1	$ 13.7	$ 2.9	$ 1.6	$ 0.2	$ 9.5	$ 10.0	$ 7.9	$ 3.3	$ 23.2
2023	$ 6.9	$ 6.1	$ 3.0	$ 13.3	$ 2.8	$ 1.5	$ 0.2	$ 9.2	$ 9.7	$ 7.6	$ 3.2	$ 22.5
2024	$ 6.7	$ 5.9	$ 2.9	$ 12.9	$ 2.7	$ 1.5	$ 0.2	$ 8.8	$ 9.4	$ 7.4	$ 3.1	$ 21.6
2025	$ 6.5	$ 5.7	$ 2.8	$ 12.3	$ 2.6	$ 1.4	$ 0.2	$ 8.3	$ 9.0	$ 7.1	$ 3.0	$ 20.7
2026	$ 6.2	$ 5.6	$ 2.8	$ 11.9	$ 2.4	$ 1.3	$ 0.2	$ 8.0	$ 8.7	$ 6.9	$ 2.9	$ 19.9
2027	$ 6.0	$ 5.4	$ 2.7	$ 11.5	$ 2.3	$ 1.3	$ 0.2	$ 7.6	$ 8.4	$ 6.7	$ 2.8	$ 19.1
2028	$ 5.8	$ 5.1	$ 2.5	$ 11.0	$ 2.2	$ 1.2	$ 0.2	$ 7.2	$ 8.0	$ 6.4	$ 2.7	$ 18.2
2029	$ 5.5	$ 4.9	$ 2.4	$ 10.6	$ 2.1	$ 1.2	$ 0.2	$ 6.9	$ 7.6	$ 6.1	$ 2.6	$ 17.5
Total	$ 138.0	$ 121.9	$ 59.6	$ 265.5	$ 57.1	$ 31.3	$ 4.2	$ 184.6	$ 195.2	$ 153.1	$ 63.9	$ 450.1
Ann.	$ 11.8	$ 10.5	$ 5.1	$ 22.8	$ 4.9	$ 2.7	$ 0.4	$ 15.8	$ 16.7	$ 13.1	$ 5.5	$ 38.6

Notes: Details may not sum due to rounding and individual statistical analyses.

Source: GWR Benefits Model.

Appendix D

Cost Details

Matrix of Appendix D Contents

Applicable Rule Option(s)	Exhibit Description	Applicable System Type(s)	Applicable System Size	Exhibit Number
Final Rule	Rule Activity Costs	CWSs	<100	D.1a
			101-500	D.1b
			501-1,000	D.1c
			1,001-3,300	D.1d
			3,301-10K	D.1e
			10,001-50K	D.1f
			50,001-100K	D.1g
			>100,001	D.1h
			All	D.1i
		NTNCWSs	<100	D.2a
			101-500	D.2b
			501-1,000	D.2c
			1,001-3,300	D.2d
			3,301-10K	D.2e
			10,001-50K	D.2f
			50,001-100K	D.2g
			>100,001	D.2h
			All	D.2i
		TNCWSs	<100	D.3a
			101-500	D.3b
			501-1,000	D.3c
			1,001-3,300	D.3d
			3,301-10K	D.3e
			10,001-50K	D.3f
			50,001-100K	D.3g
			>100,001	D.3h
			All	D.3i
		All	All	D.4a
		All (By Component)	All	D.4b
	Present Value of Costs at 3 Percent	CWSs	All	D.4c
		NTNCWSs	All	D.4d
		TNCWSs	All	D.4e
		All	All	D.4f
		All (By Component)	All	D.4g
	Present Value of Costs at 7 Percent	CWSs	All	D.4h
		NTNCWSs	All	D.4i
		TNCWSs	All	D.4j
		All	All	D.4k
		All (By Component)	All	D.4l
	Total State Costs	N/A	N/A	D.5a
	Present Value of State Costs at 3 Percent	N/A	N/A	D.5b
	Present Value of State Costs at 7 Percent	N/A	N/A	D.5c
Alternative 1	Rule Activity Costs	All	All	D.6a
	Present Value of Costs at 3 Percent	All	All	D.6b
	Present Value of Costs at 7 Percent	All	All	D.6c
	Total State Costs	N/A	N/A	D.6d
	Present Value of State Costs at 3 Percent	N/A	N/A	D.6e
	Present Value of State Costs at 7 Percent	N/A	N/A	D.6f
Alternative 3	Rule Activity Costs	All	All	D.7a
	Present Value of Costs at 3 Percent	All	All	D.7b
	Present Value of Costs at 7 Percent	All	All	D.7c
	Total State Costs	N/A	N/A	D.7d
	Present Value of State Costs at 3 Percent	N/A	N/A	D.7e
	Present Value of State Costs at 7 Percent	N/A	N/A	D.7f
Alternative 4	Rule Activity Costs	All	All	D.8a
	Present Value of Costs at 3 Percent	All	All	D.8b
	Present Value of Costs at 7 Percent	All	All	D.8c
	Total State Costs	N/A	N/A	D.8d
	Present Value of State Costs at 3 Percent	N/A	N/A	D.8e
	Present Value of State Costs at 7 Percent	N/A	N/A	D.8f

Note:
Appendix D presents step by step results for the projection and discounting of costs to show how yearly costs for each rule component are accounted for by the cost model for CWSs, NTNCWSs, TNCWSs, and Primacy Agencies. Exhibits D.1 through D.5 show the nominal costs projected over the rule schedule and the present value of each cost calculated to the expected year of rule implementation for the preferred regulatory alternative. Exhibits D.6 through D.8 show the results for Alternatives 1, 3, and 4. The detailed cost breakouts presented in this appendix are based on an independent analysis of the cost model outputs, and as a result the ninety percent confidence bounds presented in this appendix may not exactly match those presented in Chapter 6 and elsewhere in the GWR EA.

Exhibit D.1a Rule Activity Costs, by Year, for CWSs Serving <100

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ 5.6	$ 2.6	$ 9.8	$ 0.6	$ 0.4	$ 0.9	$ 0.3	$ 0.1	$ 0.6
2009	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.3	$ 0.1	$ 0.6
2010	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.3	$ 0.3	$ 0.1	$ 0.6
2011	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 1.0	$ 1.0	$ 1.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.5	$ 1.6	$ 6.2	$ 0.5	$ 0.3	$ 0.8	$ 0.5	$ 0.2	$ 0.9
2012	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.5	$ 0.2	$ 0.9
2013	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.5	$ 0.2	$ 0.9
2014	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 1.0	$ 0.9	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.6	$ 1.1	$ 4.9	$ 0.5	$ 0.3	$ 0.8	$ 0.6	$ 0.2	$ 1.2
2015	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.6	$ 0.6	$ 0.2	$ 1.2
2016	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.6	$ 0.2	$ 1.2
2017	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.0	$ 0.7	$ 4.1	$ 0.5	$ 0.2	$ 0.8	$ 0.7	$ 0.3	$ 1.3
2018	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.7	$ 0.7	$ 0.3	$ 1.3
2019	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.7	$ 0.3	$ 1.3
2020	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.7	$ 0.5	$ 3.5	$ 0.5	$ 0.2	$ 0.8	$ 0.8	$ 0.3	$ 1.5
2021	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 0.8	$ 0.3	$ 1.5
2022	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.7	$ 0.8	$ 0.3	$ 1.5
2023	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.3	$ 0.4	$ 2.8	$ 0.5	$ 0.2	$ 0.9	$ 0.9	$ 0.3	$ 1.6
2024	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.8	$ 0.9	$ 0.3	$ 1.6
2025	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.8	$ 0.9	$ 0.3	$ 1.6
2026	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.1	$ 0.3	$ 2.7	$ 0.5	$ 0.2	$ 0.9	$ 1.0	$ 0.3	$ 1.7
2027	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.8	$ 1.0	$ 0.3	$ 1.7
2028	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.8	$ 1.0	$ 0.3	$ 1.7
2029	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.0	$ 0.2	$ 2.4	$ 0.5	$ 0.2	$ 1.0	$ 1.0	$ 0.4	$ 1.8

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.1b Rule Activity Costs, by Year, for CWSs Serving 101-500

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.3	$ 1.2	$ 1.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 4.9	$ 2.0	$ 9.7	$ 0.5	$ 0.3	$ 0.8	$ 0.3	$ 0.1	$ 0.7
2009	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.3	$ 0.1	$ 0.7
2010	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.2	$ 1.1	$ 1.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ 3.2	$ 1.2	$ 6.7	$ 0.5	$ 0.3	$ 0.9	$ 0.5	$ 0.2	$ 1.1
2011	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.8	$ 0.5	$ 0.2	$ 1.1
2012	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.1	$ 1.1	$ 1.2	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 2.3	$ 0.7	$ 5.0	$ 0.6	$ 0.3	$ 1.0	$ 0.7	$ 0.2	$ 1.4
2013	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 1.0	$ 0.7	$ 0.2	$ 1.4
2014	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.1	$ 1.1	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.8	$ 0.4	$ 4.1	$ 0.6	$ 0.3	$ 1.2	$ 0.8	$ 0.2	$ 1.6
2015	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.1	$ 0.8	$ 0.2	$ 1.6
2016	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.4	$ 0.3	$ 3.4	$ 0.7	$ 0.3	$ 1.2	$ 0.9	$ 0.3	$ 1.8
2017	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.2	$ 0.9	$ 0.3	$ 1.8
2018	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.2	$ 0.2	$ 2.9	$ 0.7	$ 0.3	$ 1.3	$ 1.0	$ 0.3	$ 2.0
2019	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.3	$ 1.3	$ 1.0	$ 0.3	$ 2.0
2020	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.0	$ 0.2	$ 2.5	$ 0.8	$ 0.3	$ 1.4	$ 1.1	$ 0.3	$ 2.1
2021	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.2	$ 1.4	$ 1.1	$ 0.3	$ 2.1
2022	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.8	$ 0.1	$ 2.2	$ 0.8	$ 0.3	$ 1.5	$ 1.1	$ 0.3	$ 2.3
2023	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.3	$ 1.4	$ 1.1	$ 0.3	$ 2.3
2024	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.8	$ 0.1	$ 2.3	$ 0.8	$ 0.3	$ 1.5	$ 1.2	$ 0.3	$ 2.3
2025	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.3	$ 1.5	$ 1.2	$ 0.3	$ 2.3
2026	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.0	$ 2.1	$ 0.9	$ 0.3	$ 1.6	$ 1.2	$ 0.3	$ 2.4
2027	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.3	$ 1.6	$ 1.2	$ 0.3	$ 2.4
2028	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.0	$ 1.9	$ 0.9	$ 0.3	$ 1.6	$ 1.3	$ 0.4	$ 2.5
2029	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.9	$ 0.3	$ 1.6	$ 1.3	$ 0.4	$ 2.5

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.1c Rule Activity Costs, by Year, for CWSs Serving 501-1,000

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ 2.1	$ 0.9	$ 3.8	$ 0.1	$ 0.0	$ 0.2	$ 0.1	$ 0.0	$ 0.3
2009	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.1	$ 0.0	$ 0.3
2010	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.4	$ 0.6	$ 2.7	$ 0.2	$ 0.1	$ 0.4	$ 0.2	$ 0.1	$ 0.4
2011	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.2	$ 0.1	$ 0.4
2012	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.0	$ 0.3	$ 2.1	$ 0.3	$ 0.1	$ 0.5	$ 0.3	$ 0.1	$ 0.5
2013	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.3	$ 0.1	$ 0.5
2014	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.8	$ 0.2	$ 1.7	$ 0.3	$ 0.1	$ 0.6	$ 0.3	$ 0.1	$ 0.6
2015	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.3	$ 0.1	$ 0.6
2016	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.2	$ 1.3	$ 0.3	$ 0.1	$ 0.6	$ 0.4	$ 0.1	$ 0.7
2017	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.4	$ 0.1	$ 0.7
2018	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.1	$ 1.2	$ 0.4	$ 0.1	$ 0.7	$ 0.4	$ 0.1	$ 0.7
2019	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.7	$ 0.4	$ 0.1	$ 0.7
2020	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.1	$ 1.1	$ 0.4	$ 0.1	$ 0.7	$ 0.4	$ 0.1	$ 0.8
2021	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.7	$ 0.4	$ 0.1	$ 0.8
2022	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.1	$ 0.9	$ 0.4	$ 0.1	$ 0.8	$ 0.4	$ 0.1	$ 0.8
2023	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.8	$ 0.4	$ 0.1	$ 0.8
2024	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.9	$ 0.4	$ 0.1	$ 0.8	$ 0.5	$ 0.1	$ 0.8
2025	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.8	$ 0.5	$ 0.1	$ 0.8
2026	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.8	$ 0.5	$ 0.2	$ 0.8	$ 0.5	$ 0.1	$ 0.9
2027	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.8	$ 0.5	$ 0.1	$ 0.9
2028	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.7	$ 0.5	$ 0.2	$ 0.8	$ 0.5	$ 0.1	$ 0.9
2029	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.8	$ 0.5	$ 0.1	$ 0.9

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.

Source: Ground Water Rule model output.

Exhibit D.1d Rule Activity Costs, by Year, for CWSs Serving 1,001-3,300

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.8	$ 0.7	$ 0.8	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 4.8	$ 2.3	$ 7.9	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2009	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2010	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2011	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2012	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2013	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 3.2	$ 1.4	$ 5.9	$ 0.5	$ 0.1	$ 0.9	$ 0.4	$ 0.1	$ 0.7
2014	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 0.9	$ 0.4	$ 0.1	$ 0.7
2015	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 0.9	$ 0.4	$ 0.1	$ 0.7
2016	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 0.9	$ 0.4	$ 0.1	$ 0.7
2017	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 0.9	$ 0.4	$ 0.1	$ 0.7
2018	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 2.3	$ 0.9	$ 4.4	$ 0.6	$ 0.2	$ 1.1	$ 0.5	$ 0.1	$ 0.8
2019	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.1	$ 0.5	$ 0.1	$ 0.8
2020	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.1	$ 0.5	$ 0.1	$ 0.8
2021	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.1	$ 0.5	$ 0.1	$ 0.8
2022	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.1	$ 0.5	$ 0.1	$ 0.8
2023	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.8	$ 0.7	$ 3.5	$ 0.7	$ 0.2	$ 1.3	$ 0.5	$ 0.2	$ 1.0
2024	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.2	$ 1.3	$ 0.5	$ 0.2	$ 1.0
2025	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.2	$ 1.3	$ 0.5	$ 0.2	$ 1.0
2026	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.2	$ 1.3	$ 0.5	$ 0.2	$ 1.0
2027	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.2	$ 1.3	$ 0.5	$ 0.2	$ 1.0
2028	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.4	$ 0.5	$ 3.1	$ 0.8	$ 0.3	$ 1.5	$ 0.6	$ 0.2	$ 1.1
2029	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.3	$ 1.5	$ 0.6	$ 0.2	$ 1.1

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.1e Rule Activity Costs, by Year, for CWSs Serving 3,301-10,000

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ 5.3	$ 2.7	$ 8.4	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.0	$ 0.3
2009	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.1	$ 0.0	$ 0.1
2010	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 3.4	$ 1.6	$ 5.8	$ 0.5	$ 0.2	$ 0.9	$ 0.2	$ 0.0	$ 0.3
2011	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.9	$ 0.1	$ 0.0	$ 0.2
2012	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 2.5	$ 1.1	$ 4.2	$ 0.6	$ 0.2	$ 1.2	$ 0.2	$ 0.0	$ 0.4
2013	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.2	$ 0.2	$ 0.0	$ 0.3
2014	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 1.9	$ 0.8	$ 3.5	$ 0.7	$ 0.2	$ 1.3	$ 0.2	$ 0.1	$ 0.4
2015	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.2	$ 1.3	$ 0.2	$ 0.1	$ 0.3
2016	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.6	$ 0.5	$ 3.0	$ 0.8	$ 0.3	$ 1.5	$ 0.2	$ 0.1	$ 0.4
2017	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.3	$ 1.5	$ 0.2	$ 0.1	$ 0.4
2018	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.3	$ 0.4	$ 2.6	$ 0.9	$ 0.3	$ 1.6	$ 0.2	$ 0.1	$ 0.5
2019	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.9	$ 0.3	$ 1.6	$ 0.2	$ 0.1	$ 0.4
2020	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.1	$ 0.2	$ 2.3	$ 0.9	$ 0.3	$ 1.7	$ 0.3	$ 0.1	$ 0.5
2021	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.9	$ 0.3	$ 1.7	$ 0.2	$ 0.1	$ 0.4
2022	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.9	$ 0.2	$ 1.9	$ 1.0	$ 0.3	$ 1.8	$ 0.3	$ 0.1	$ 0.5
2023	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.0	$ 0.3	$ 1.8	$ 0.2	$ 0.1	$ 0.5
2024	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.8	$ 0.2	$ 1.8	$ 1.0	$ 0.3	$ 1.9	$ 0.3	$ 0.1	$ 0.5
2025	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.0	$ 0.3	$ 1.9	$ 0.3	$ 0.1	$ 0.5
2026	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.7	$ 0.1	$ 1.7	$ 1.1	$ 0.4	$ 2.0	$ 0.3	$ 0.1	$ 0.5
2027	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 0.4	$ 2.0	$ 0.3	$ 0.1	$ 0.5
2028	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.6	$ 0.1	$ 1.6	$ 1.1	$ 0.4	$ 2.0	$ 0.3	$ 0.1	$ 0.5
2029	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 0.4	$ 2.0	$ 0.3	$ 0.1	$ 0.5

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.1f Rule Activity Costs, by Year, for CWSs Serving 10,001-50,000

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.6	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.5	$ 9.4	$ 5.5	$ 14.2	$ 0.4	$ 0.2	$ 0.6	$ 0.1	$ 0.0	$ 0.2
2009	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 4.8	$ 2.3	$ 7.7	$ 0.5	$ 0.2	$ 0.9	$ 0.1	$ 0.0	$ 0.2
2010	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 3.0	$ 1.3	$ 5.3	$ 0.7	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.2
2011	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 2.1	$ 0.8	$ 3.8	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.2
2012	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.6	$ 0.5	$ 3.0	$ 0.8	$ 0.4	$ 1.3	$ 0.1	$ 0.0	$ 0.2
2013	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.2	$ 0.3	$ 2.6	$ 0.9	$ 0.4	$ 1.4	$ 0.1	$ 0.0	$ 0.2
2014	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.1	$ 0.2	$ 2.3	$ 0.9	$ 0.4	$ 1.5	$ 0.1	$ 0.0	$ 0.2
2015	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.9	$ 0.1	$ 1.9	$ 0.9	$ 0.4	$ 1.6	$ 0.1	$ 0.0	$ 0.2
2016	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.7	$ 0.1	$ 1.7	$ 1.0	$ 0.4	$ 1.6	$ 0.1	$ 0.0	$ 0.2
2017	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.7	$ 0.1	$ 1.6	$ 1.0	$ 0.4	$ 1.7	$ 0.1	$ 0.0	$ 0.2
2018	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.0	$ 1.3	$ 1.0	$ 0.4	$ 1.7	$ 0.1	$ 0.0	$ 0.3
2019	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.0	$ 1.3	$ 1.0	$ 0.5	$ 1.7	$ 0.1	$ 0.0	$ 0.3
2020	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.0	$ 1.2	$ 1.0	$ 0.5	$ 1.8	$ 0.1	$ 0.0	$ 0.3
2021	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ -	$ 1.1	$ 1.1	$ 0.5	$ 1.8	$ 0.1	$ 0.0	$ 0.3
2022	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ -	$ 1.1	$ 1.1	$ 0.5	$ 1.8	$ 0.1	$ 0.0	$ 0.3
2023	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ -	$ 1.0	$ 1.1	$ 0.5	$ 1.8	$ 0.1	$ 0.0	$ 0.3
2024	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ -	$ 0.9	$ 1.1	$ 0.5	$ 1.8	$ 0.1	$ 0.0	$ 0.3
2025	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.3	$ -	$ 1.0	$ 1.1	$ 0.5	$ 1.9	$ 0.1	$ 0.0	$ 0.3
2026	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.3	$ -	$ 0.9	$ 1.1	$ 0.5	$ 1.9	$ 0.1	$ 0.0	$ 0.3
2027	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.2	$ -	$ 0.8	$ 1.1	$ 0.5	$ 1.9	$ 0.1	$ 0.0	$ 0.3
2028	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.3	$ -	$ 0.8	$ 1.1	$ 0.5	$ 1.9	$ 0.1	$ 0.0	$ 0.3
2029	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.2	$ -	$ 0.7	$ 1.1	$ 0.5	$ 2.0	$ 0.1	$ 0.0	$ 0.3

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.1g Rule Activity Costs, by Year, for CWSs Serving 50,001-100,000

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.7	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ 6.7	$ 3.8	$ 10.5	$ 0.5	$ 0.2	$ 0.8	$ 0.1	$ 0.1	$ 0.3
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.8	$ 0.7	$ 3.1	$ 0.6	$ 0.2	$ 1.1	$ 0.1	$ 0.0	$ 0.2
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.9	$ 0.3	$ 1.8	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.2
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.1	$ 1.2	$ 0.7	$ 0.3	$ 1.3	$ 0.1	$ 0.0	$ 0.2
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.0	$ 0.9	$ 0.7	$ 0.3	$ 1.3	$ 0.1	$ 0.0	$ 0.2
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.7	$ 0.8	$ 0.3	$ 1.3	$ 0.1	$ 0.0	$ 0.2
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.6	$ 0.8	$ 0.3	$ 1.4	$ 0.1	$ 0.0	$ 0.2
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.5	$ 0.8	$ 0.3	$ 1.4	$ 0.1	$ 0.0	$ 0.2
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.4	$ 0.8	$ 0.3	$ 1.5	$ 0.1	$ 0.0	$ 0.2
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.2	$ -	$ 0.4	$ 0.8	$ 0.3	$ 1.5	$ 0.1	$ 0.0	$ 0.2
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.4	$ 0.8	$ 0.3	$ 1.5	$ 0.1	$ 0.0	$ 0.2
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.3	$ 0.8	$ 0.3	$ 1.5	$ 0.1	$ 0.0	$ 0.2
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.3	$ 0.8	$ 0.3	$ 1.5	$ 0.1	$ 0.0	$ 0.2
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.3	$ 0.8	$ 0.3	$ 1.5	$ 0.1	$ 0.0	$ 0.2
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.3	$ 0.9	$ 0.3	$ 1.6	$ 0.1	$ 0.0	$ 0.2
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.3	$ 0.9	$ 0.3	$ 1.6	$ 0.1	$ 0.0	$ 0.3
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.9	$ 0.3	$ 1.6	$ 0.1	$ 0.0	$ 0.3
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.9	$ 0.3	$ 1.6	$ 0.1	$ 0.0	$ 0.2
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.9	$ 0.3	$ 1.6	$ 0.1	$ 0.0	$ 0.2
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.9	$ 0.3	$ 1.6	$ 0.1	$ 0.0	$ 0.2
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.9	$ 0.3	$ 1.6	$ 0.1	$ 0.0	$ 0.3
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.9	$ 0.3	$ 1.6	$ 0.1	$ 0.0	$ 0.3

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.1h Rule Activity Costs, by Year, for CWSs Serving >100,001

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.6	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 11.9	$ 6.9	$ 17.9	$ 0.4	$ 0.2	$ 0.7	$ 0.1	$ 0.0	$ 0.1
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.5	$ 0.6	$ 4.5	$ 0.5	$ 0.2	$ 0.8	$ 0.1	$ 0.0	$ 0.1
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.2	$ 0.2	$ 2.5	$ 0.5	$ 0.2	$ 0.9	$ 0.1	$ 0.0	$ 0.1
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.8	$ 0.0	$ 1.8	$ 0.6	$ 0.2	$ 1.0	$ 0.1	$ 0.0	$ 0.1
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.0	$ 1.4	$ 0.6	$ 0.3	$ 1.0	$ 0.1	$ 0.0	$ 0.1
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.4	$ -	$ 1.1	$ 0.6	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.1
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.4	$ -	$ 0.9	$ 0.6	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.1
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.3	$ -	$ 0.9	$ 0.6	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.1
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.2	$ -	$ 0.7	$ 0.6	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.1
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.2	$ -	$ 0.7	$ 0.6	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.1
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.2	$ -	$ 0.6	$ 0.6	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.1
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.2	$ -	$ 0.6	$ 0.7	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.1
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.5	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.5	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.4	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.5	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.4	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.4	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.3	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.4	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.4	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.3	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.1i Rule Activity Costs, by Year, for All CWSs

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 5.8	$ 5.5	$ 6.2	$ -	$ -	$ -	$ 1.6	$ 1.1	$ 2.2	$ 50.7	$ 26.7	$ 82.2	$ 3.0	$ 1.4	$ 5.1	$ 1.4	$ 0.4	$ 2.9
2009	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 1.3	$ 1.2	$ 1.4	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ 9.0	$ 3.7	$ 15.3	$ 2.9	$ 1.2	$ 5.2	$ 1.3	$ 0.3	$ 2.6
2010	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 3.3	$ 3.2	$ 3.5	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.7	$ 13.2	$ 5.0	$ 24.8	$ 3.5	$ 1.4	$ 6.2	$ 1.7	$ 0.5	$ 3.3
2011	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 2.2	$ 2.1	$ 2.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 7.0	$ 2.5	$ 12.9	$ 3.9	$ 1.6	$ 6.9	$ 1.8	$ 0.5	$ 3.5
2012	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 3.2	$ 3.0	$ 3.3	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ 8.4	$ 2.7	$ 16.5	$ 4.2	$ 1.7	$ 7.4	$ 2.2	$ 0.6	$ 4.1
2013	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.9	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 5.2	$ 1.8	$ 10.4	$ 4.3	$ 1.7	$ 7.7	$ 2.3	$ 0.6	$ 4.3
2014	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 4.0	$ 3.9	$ 4.2	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 8.8	$ 2.8	$ 18.0	$ 4.9	$ 2.0	$ 8.7	$ 2.6	$ 0.7	$ 5.0
2015	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 1.1	$ 1.1	$ 1.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.4	$ 0.1	$ 3.2	$ 4.8	$ 1.9	$ 8.6	$ 2.6	$ 0.7	$ 4.9
2016	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 3.0	$ 2.9	$ 3.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 4.8	$ 1.1	$ 10.6	$ 5.0	$ 1.9	$ 9.0	$ 2.8	$ 0.8	$ 5.3
2017	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 2.0	$ 2.0	$ 2.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.1	$ 0.8	$ 6.9	$ 5.2	$ 2.0	$ 9.3	$ 2.9	$ 0.8	$ 5.4
2018	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 3.7	$ 3.5	$ 3.8	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 6.2	$ 1.6	$ 13.4	$ 5.5	$ 2.1	$ 9.7	$ 3.1	$ 0.9	$ 5.9
2019	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.8	$ 0.0	$ 2.2	$ 5.4	$ 2.1	$ 9.7	$ 3.1	$ 0.9	$ 5.8
2020	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 3.9	$ 3.7	$ 4.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 4.8	$ 1.0	$ 11.4	$ 5.8	$ 2.3	$ 10.2	$ 3.3	$ 1.0	$ 6.2
2021	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.6	$ -	$ 1.9	$ 5.7	$ 2.2	$ 10.1	$ 3.3	$ 1.0	$ 6.2
2022	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 2.9	$ 2.8	$ 3.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 2.7	$ 0.4	$ 6.8	$ 5.8	$ 2.2	$ 10.4	$ 3.4	$ 1.0	$ 6.5
2023	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 2.7	$ 2.5	$ 2.8	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 3.7	$ 1.1	$ 8.0	$ 6.0	$ 2.3	$ 10.8	$ 3.6	$ 1.0	$ 6.7
2024	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 2.9	$ 2.8	$ 3.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 2.4	$ 0.3	$ 6.4	$ 6.1	$ 2.3	$ 11.0	$ 3.7	$ 1.1	$ 6.9
2025	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.5	$ -	$ 1.5	$ 6.1	$ 2.2	$ 11.0	$ 3.7	$ 1.1	$ 6.9
2026	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 3.8	$ 3.6	$ 4.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 3.2	$ 0.5	$ 8.7	$ 6.3	$ 2.4	$ 11.3	$ 3.8	$ 1.1	$ 7.2
2027	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.4	$ -	$ 1.3	$ 6.2	$ 2.3	$ 11.2	$ 3.8	$ 1.1	$ 7.2
2028	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 3.5	$ 3.4	$ 3.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 3.3	$ 0.6	$ 8.7	$ 6.4	$ 2.4	$ 11.5	$ 3.9	$ 1.2	$ 7.4
2029	$ -	$ -	$ -	$ 3.1	$ 2.0	$ 4.2	$ -	$ -	$ -	$ 2.0	$ 1.9	$ 2.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.3	$ 0.2	$ 3.6	$ 6.5	$ 2.4	$ 11.7	$ 4.0	$ 1.2	$ 7.5

Notes: Values in millions of 2003 dollars.
Source: Ground Water Rule model output.

Exhibit D.2a Rule Activity Costs, by Year, for NTNCWSs Serving <100

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.8	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 4.0	$ 1.8	$ 7.0	$ 0.4	$ 0.3	$ 0.6	$ 0.2	$ 0.1	$ 0.4
2009	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.2	$ 0.1	$ 0.4
2010	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.4
2011	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.4
2012	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.4
2013	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.7	$ 1.2	$ 4.8	$ 0.4	$ 0.2	$ 0.6	$ 0.4	$ 0.1	$ 0.6
2014	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.4	$ 0.1	$ 0.6
2015	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.4	$ 0.1	$ 0.6
2016	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.4	$ 0.1	$ 0.6
2017	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.4	$ 0.1	$ 0.6
2018	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.9	$ 0.8	$ 3.5	$ 0.4	$ 0.2	$ 0.6	$ 0.5	$ 0.2	$ 0.8
2019	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.4	$ 0.5	$ 0.2	$ 0.8
2020	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.5	$ 0.2	$ 0.8
2021	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.5	$ 0.2	$ 0.8
2022	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.5	$ 0.2	$ 0.8
2023	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.5	$ 0.5	$ 3.1	$ 0.4	$ 0.2	$ 0.6	$ 0.5	$ 0.2	$ 1.0
2024	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.5	$ 0.2	$ 1.0
2025	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.5	$ 0.5	$ 0.2	$ 1.0
2026	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.5	$ 0.5	$ 0.2	$ 1.0
2027	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.5	$ 0.5	$ 0.2	$ 1.0
2028	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.2	$ 0.4	$ 2.5	$ 0.4	$ 0.2	$ 0.6	$ 0.6	$ 0.2	$ 1.1
2029	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.6	$ 0.2	$ 1.1

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.

Source: Ground Water Rule model output.

Exhibit D.2b Rule Activity Costs, by Year, for NTNCWSs Serving 101-50

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.7	$ 1.6	$ 6.9	$ 0.4	$ 0.3	$ 0.6	$ 0.2	$ 0.1	$ 0.5
2009	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.5
2010	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.0	$ 0.4	$ 0.2	$ 0.1	$ 0.5
2011	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.0	$ 0.4	$ 0.2	$ 0.1	$ 0.5
2012	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 2.4	$ 1.0	$ 4.5	$ 0.5	$ 0.2	$ 0.8	$ 0.4	$ 0.1	$ 0.8
2013	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 0.4	$ 0.1	$ 0.8
2014	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.7	$ 0.4	$ 0.1	$ 0.8
2015	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.7	$ 0.4	$ 0.1	$ 0.8
2016	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.8	$ 0.6	$ 3.5	$ 0.5	$ 0.2	$ 0.9	$ 0.5	$ 0.1	$ 1.0
2017	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.9	$ 0.5	$ 0.1	$ 1.0
2018	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.9	$ 0.5	$ 0.1	$ 1.0
2019	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.9	$ 0.5	$ 0.1	$ 1.0
2020	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.4	$ 0.4	$ 2.9	$ 0.6	$ 0.2	$ 1.1	$ 0.6	$ 0.2	$ 1.1
2021	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 1.0	$ 0.6	$ 0.2	$ 1.1
2022	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 1.0	$ 0.6	$ 0.2	$ 1.1
2023	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 1.0	$ 0.6	$ 0.2	$ 1.1
2024	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.1	$ 0.3	$ 2.4	$ 0.6	$ 0.2	$ 1.1	$ 0.7	$ 0.2	$ 1.3
2025	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.1	$ 0.7	$ 0.2	$ 1.3
2026	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.1	$ 0.7	$ 0.2	$ 1.3
2027	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.1	$ 0.7	$ 0.2	$ 1.3
2028	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.9	$ 0.2	$ 2.1	$ 0.7	$ 0.2	$ 1.2	$ 0.7	$ 0.2	$ 1.4
2029	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.2	$ 1.2	$ 0.7	$ 0.2	$ 1.4

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.2c Rule Activity Costs, by Year, for NTNCWSs Serving 501-1,000

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.4	$ 0.6	$ 2.3	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.1
2009	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 0.1	$ 0.0	$ 0.1
2010	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.1	$ 0.0	$ 0.1
2011	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.1	$ 0.0	$ 0.1
2012	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.9	$ 0.4	$ 1.6	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2013	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2014	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2015	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2016	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.3	$ 1.3	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.0	$ 0.3
2017	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.2	$ 0.0	$ 0.3
2018	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.2	$ 0.0	$ 0.3
2019	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.2	$ 0.0	$ 0.3
2020	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.2	$ 1.0	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2021	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2022	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2023	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2024	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.1	$ 0.9	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.1	$ 0.4
2025	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.1	$ 0.4
2026	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.1	$ 0.4
2027	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.1	$ 0.4
2028	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.7	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.1	$ 0.4
2029	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.1	$ 0.4

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.2d Rule Activity Costs, by Year, for NTNCWSs Serving 1,001-3,300

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.3	$ 1.2	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.1
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.2	$ 0.8	$ 0.1	$ 0.1	$ 0.2	$ 0.0	$ 0.0	$ 0.1
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 0.1	$ 0.1	$ 0.2	$ 0.1	$ 0.0	$ 0.1
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.5	$ 0.1	$ 0.1	$ 0.2	$ 0.1	$ 0.0	$ 0.1
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.1
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.4	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.

Source: Ground Water Rule model output.

Exhibit D.2e Rule Activity Costs, by Year, for NTNCWSs Serving 3,301-10,000

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.5	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.3	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.2f Rule Activity Costs, by Year, for NTNCWSs Serving 10,001-50,00

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.2g Rule Activity Costs, by Year, for NTNCWSs Serving 50,001-100,00

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.2h Rule Activity Costs, by Year, for NTNCWSs Serving >100,001

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.2i Rule Activity Costs, by Year, for All NTNCWSs

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.5	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 10.3	$ 4.6	$ 18.4	$ 1.2	$ 0.7	$ 1.7	$ 0.6	$ 0.1	$ 1.1
2009	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.2	$ 1.2	$ 0.8	$ 0.4	$ 1.3	$ 0.6	$ 0.1	$ 1.1
2010	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.1	$ 0.9	$ 0.6	$ 0.2	$ 1.1	$ 0.6	$ 0.2	$ 1.1
2011	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.7	$ 0.6	$ 0.2	$ 1.2	$ 0.6	$ 0.2	$ 1.2
2012	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.6	$ 1.5	$ 6.7	$ 1.0	$ 0.5	$ 1.7	$ 0.8	$ 0.2	$ 1.6
2013	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.9	$ 1.2	$ 5.3	$ 1.2	$ 0.5	$ 2.0	$ 1.0	$ 0.3	$ 1.8
2014	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.4	$ 1.0	$ 0.3	$ 1.8	$ 1.0	$ 0.3	$ 1.8
2015	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.4	$ 0.9	$ 0.3	$ 1.8	$ 1.0	$ 0.3	$ 1.8
2016	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.6	$ 0.9	$ 5.1	$ 1.2	$ 0.5	$ 2.2	$ 1.1	$ 0.3	$ 2.1
2017	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 1.1	$ 0.4	$ 2.1	$ 1.1	$ 0.3	$ 2.1
2018	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 2.0	$ 0.8	$ 3.8	$ 1.3	$ 0.5	$ 2.3	$ 1.3	$ 0.4	$ 2.3
2019	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 1.2	$ 0.4	$ 2.2	$ 1.3	$ 0.4	$ 2.3
2020	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 2.0	$ 0.6	$ 4.1	$ 1.4	$ 0.5	$ 2.5	$ 1.4	$ 0.4	$ 2.5
2021	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ -	$ 0.2	$ 1.3	$ 0.4	$ 2.4	$ 1.4	$ 0.4	$ 2.5
2022	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ -	$ 0.2	$ 1.3	$ 0.4	$ 2.4	$ 1.4	$ 0.4	$ 2.5
2023	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.6	$ 0.5	$ 3.3	$ 1.4	$ 0.5	$ 2.6	$ 1.5	$ 0.5	$ 2.7
2024	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.6	$ 0.5	$ 3.4	$ 1.5	$ 0.6	$ 2.7	$ 1.6	$ 0.5	$ 2.9
2025	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 1.4	$ 0.5	$ 2.6	$ 1.6	$ 0.5	$ 2.9
2026	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 1.4	$ 0.4	$ 2.7	$ 1.6	$ 0.5	$ 2.9
2027	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.2	$ 1.4	$ 0.4	$ 2.7	$ 1.6	$ 0.5	$ 2.9
2028	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.3	$ 1.2	$ 1.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.5	$ 0.7	$ 5.5	$ 1.7	$ 0.6	$ 3.0	$ 1.7	$ 0.5	$ 3.1
2029	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 1.6	$ 0.5	$ 2.9	$ 1.7	$ 0.5	$ 3.1

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.3a Rule Activity Costs, by Year, for TNCWSs Serving <100

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
	Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound	
		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)
2005	$ 2.3	$ 2.3	$ 2.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 2.3	$ 2.3	$ 2.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 2.3	$ 2.3	$ 2.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 5.3	$ 5.0	$ 5.6	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ 30.7	$ 14.6	$ 51.3	$ 3.3	$ 2.0	$ 4.8	$ 1.7	$ 0.5	$ 3.2
2009	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.5	$ 0.8	$ 2.4	$ 1.7	$ 0.5	$ 3.2
2010	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 5.0	$ 4.8	$ 5.2	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ 21.0	$ 9.3	$ 37.6	$ 3.0	$ 1.8	$ 4.2	$ 2.8	$ 1.0	$ 5.0
2011	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 0.8	$ 2.9	$ 2.8	$ 1.0	$ 5.0
2012	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.8	$ 4.7	$ 5.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 14.8	$ 5.8	$ 27.3	$ 2.8	$ 1.6	$ 4.4	$ 3.6	$ 1.2	$ 6.4
2013	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.0	$ 0.8	$ 3.4	$ 3.6	$ 1.2	$ 6.4
2014	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.7	$ 4.6	$ 4.9	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 11.6	$ 4.2	$ 21.6	$ 2.8	$ 1.4	$ 4.7	$ 4.2	$ 1.5	$ 7.4
2015	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.2	$ 0.8	$ 3.8	$ 4.2	$ 1.5	$ 7.4
2016	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.6	$ 4.5	$ 4.8	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 9.3	$ 3.1	$ 18.9	$ 2.9	$ 1.4	$ 4.7	$ 4.7	$ 1.7	$ 8.6
2017	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.3	$ 0.9	$ 4.1	$ 4.7	$ 1.7	$ 8.6
2018	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.6	$ 4.5	$ 4.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 7.2	$ 2.4	$ 15.7	$ 2.9	$ 1.3	$ 5.0	$ 5.2	$ 2.0	$ 9.2
2019	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.5	$ 1.0	$ 4.3	$ 5.2	$ 2.0	$ 9.2
2020	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.5	$ 4.4	$ 4.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 6.5	$ 1.9	$ 13.3	$ 3.0	$ 1.3	$ 5.1	$ 5.5	$ 2.0	$ 9.9
2021	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.6	$ 1.0	$ 4.6	$ 5.5	$ 2.0	$ 9.9
2022	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.5	$ 4.4	$ 4.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 5.5	$ 1.5	$ 12.6	$ 3.0	$ 1.2	$ 5.2	$ 5.8	$ 2.1	$ 10.6
2023	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.7	$ 1.0	$ 4.8	$ 5.8	$ 2.1	$ 10.6
2024	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.5	$ 4.4	$ 4.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 4.7	$ 1.2	$ 11.5	$ 3.1	$ 1.3	$ 5.5	$ 6.1	$ 2.2	$ 10.9
2025	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.8	$ 1.0	$ 5.2	$ 6.1	$ 2.2	$ 10.9
2026	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.5	$ 4.3	$ 4.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 4.1	$ 0.8	$ 10.3	$ 3.1	$ 1.3	$ 5.5	$ 6.3	$ 2.2	$ 11.3
2027	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.9	$ 1.1	$ 5.2	$ 6.3	$ 2.2	$ 11.3
2028	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 4.4	$ 4.3	$ 4.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.8	$ 0.5	$ 9.3	$ 3.2	$ 1.3	$ 5.7	$ 6.5	$ 2.4	$ 11.5
2029	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.0	$ 1.1	$ 5.3	$ 6.5	$ 2.4	$ 11.5

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.3b Rule Activity Costs, by Year, for TNCWSs Serving 101-500

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.6	$ 1.5	$ 1.7	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 11.4	$ 5.1	$ 21.5	$ 1.3	$ 0.8	$ 1.8	$ 0.8	$ 0.2	$ 1.5
2009	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.9	$ 0.4	$ 1.4	$ 0.8	$ 0.2	$ 1.5
2010	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.5	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 7.5	$ 3.2	$ 14.1	$ 1.4	$ 0.8	$ 2.2	$ 1.3	$ 0.4	$ 2.4
2011	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 0.5	$ 2.0	$ 1.3	$ 0.4	$ 2.4
2012	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 5.4	$ 2.0	$ 10.3	$ 1.5	$ 0.8	$ 2.5	$ 1.7	$ 0.5	$ 3.4
2013	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.3	$ 0.5	$ 2.4	$ 1.7	$ 0.5	$ 3.4
2014	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.4	$ 1.4	$ 1.4	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 4.1	$ 1.4	$ 8.4	$ 1.7	$ 0.7	$ 2.9	$ 2.0	$ 0.6	$ 3.8
2015	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.5	$ 0.6	$ 2.7	$ 2.0	$ 0.6	$ 3.8
2016	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.4	$ 1.3	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 3.3	$ 1.0	$ 6.8	$ 1.8	$ 0.7	$ 3.1	$ 2.2	$ 0.7	$ 4.2
2017	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.7	$ 0.6	$ 3.0	$ 2.2	$ 0.7	$ 4.2
2018	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.4	$ 1.3	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.7	$ 0.8	$ 6.3	$ 1.9	$ 0.7	$ 3.3	$ 2.4	$ 0.7	$ 4.5
2019	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 0.6	$ 3.3	$ 2.4	$ 0.7	$ 4.5
2020	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.3	$ 1.3	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.3	$ 0.6	$ 5.5	$ 2.0	$ 0.8	$ 3.5	$ 2.6	$ 0.8	$ 4.8
2021	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.9	$ 0.6	$ 3.5	$ 2.6	$ 0.8	$ 4.8
2022	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.3	$ 1.3	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.9	$ 0.4	$ 4.5	$ 2.0	$ 0.8	$ 3.7	$ 2.7	$ 0.8	$ 4.9
2023	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.0	$ 0.7	$ 3.6	$ 2.7	$ 0.8	$ 4.9
2024	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.3	$ 1.3	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.7	$ 0.3	$ 4.5	$ 2.1	$ 0.8	$ 3.9	$ 2.8	$ 0.9	$ 5.3
2025	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.0	$ 0.6	$ 3.8	$ 2.8	$ 0.9	$ 5.3
2026	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.3	$ 1.3	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.6	$ 0.3	$ 3.8	$ 2.2	$ 0.8	$ 3.9	$ 2.9	$ 1.0	$ 5.5
2027	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.1	$ 0.7	$ 4.0	$ 2.9	$ 1.0	$ 5.5
2028	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ 1.3	$ 1.3	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.3	$ 0.2	$ 3.5	$ 2.2	$ 0.8	$ 4.2	$ 3.0	$ 1.0	$ 5.7
2029	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.2	$ 0.7	$ 4.1	$ 3.0	$ 1.0	$ 5.7

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.3c Rule Activity Costs, by Year, for TNCWSs Serving 501-1,00

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.6	$ 0.8	$ 2.6	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2009	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2010	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.0	$ 0.5	$ 1.7	$ 0.3	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.3
2011	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.3
2012	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.8	$ 0.3	$ 1.4	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2013	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.2	$ 0.1	$ 0.4
2014	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.2	$ 1.1	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.1	$ 0.4
2015	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.2	$ 0.1	$ 0.4
2016	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.1	$ 0.9	$ 0.4	$ 0.1	$ 0.7	$ 0.2	$ 0.1	$ 0.5
2017	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.7	$ 0.2	$ 0.1	$ 0.5
2018	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.1	$ 0.8	$ 0.4	$ 0.1	$ 0.7	$ 0.3	$ 0.1	$ 0.5
2019	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.7	$ 0.3	$ 0.1	$ 0.5
2020	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.7	$ 0.4	$ 0.1	$ 0.8	$ 0.3	$ 0.1	$ 0.5
2021	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.8	$ 0.3	$ 0.1	$ 0.5
2022	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 0.4	$ 0.1	$ 0.8	$ 0.3	$ 0.1	$ 0.6
2023	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.8	$ 0.3	$ 0.1	$ 0.6
2024	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.1	$ 0.6	$ 0.5	$ 0.2	$ 0.8	$ 0.3	$ 0.1	$ 0.6
2025	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 0.8	$ 0.3	$ 0.1	$ 0.6
2026	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.5	$ 0.5	$ 0.2	$ 0.9	$ 0.3	$ 0.1	$ 0.6
2027	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 0.9	$ 0.3	$ 0.1	$ 0.6
2028	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.5	$ 0.5	$ 0.1	$ 0.9	$ 0.3	$ 0.1	$ 0.6
2029	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.1	$ 0.9	$ 0.3	$ 0.1	$ 0.6

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.3d Rule Activity Costs, by Year, for TNCWSs Serving 1,001-3,300

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.3	$ 1.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.2	$ 0.7	$ 0.1	$ 0.1	$ 0.2	$ 0.0	$ 0.0	$ 0.1
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 0.1	$ 0.0	$ 0.2	$ 0.1	$ 0.0	$ 0.1
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.1	$ 0.5	$ 0.1	$ 0.1	$ 0.2	$ 0.1	$ 0.0	$ 0.1
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.1	$ 0.2	$ 0.1	$ 0.0	$ 0.1
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.3	$ 0.1	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.1
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 0.1	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.2	$ 0.1	$ 0.3	$ 0.1	$ 0.0	$ 0.2
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.1	$ 0.0	$ 0.2

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.3e Rule Activity Costs, by Year, for TNCWSs Serving 3,301-10,000

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.2	$ 0.8	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.1	$ 0.4	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.

Source: Ground Water Rule model output.

Exhibit D.3f Rule Activity Costs, by Year, for TNCWSs Serving 10,001-50,000

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.1	$ 0.8	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.3g Rule Activity Costs, by Year, for TNCWSs Serving 50,001-100,00

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.3h Rule Activity Costs, by Year, for TNCWSs Serving >100,001

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2009	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2010	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2011	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2012	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2013	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2014	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2015	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2016	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2017	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2018	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2019	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2020	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2021	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2022	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2023	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2024	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2025	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2026	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2027	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2028	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
2029	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.3i Rule Activity Costs, by Year, for All TNCWSs

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 3.1	$ 3.1	$ 3.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 3.1	$ 3.1	$ 3.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 3.1	$ 3.1	$ 3.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 7.1	$ 6.8	$ 7.5	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 0.9	$ 45.3	$ 21.2	$ 78.1	$ 5.0	$ 3.0	$ 7.2	$ 2.6	$ 0.8	$ 5.0
2009	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.3	$ 1.3	$ 2.7	$ 1.3	$ 4.3	$ 2.6	$ 0.8	$ 5.0
2010	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.7	$ 6.4	$ 6.9	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ 30.0	$ 13.2	$ 54.4	$ 4.8	$ 2.8	$ 7.2	$ 4.3	$ 1.5	$ 7.9
2011	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.7	$ 3.3	$ 1.5	$ 5.7	$ 4.4	$ 1.5	$ 7.9
2012	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.5	$ 6.2	$ 6.7	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ 21.2	$ 8.1	$ 39.5	$ 4.9	$ 2.5	$ 7.9	$ 5.6	$ 1.8	$ 10.3
2013	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.5	$ 3.8	$ 1.5	$ 6.7	$ 5.6	$ 1.8	$ 10.3
2014	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.3	$ 6.1	$ 6.5	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 16.5	$ 5.9	$ 31.5	$ 5.1	$ 2.4	$ 8.7	$ 6.5	$ 2.2	$ 11.8
2015	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.4	$ 4.3	$ 1.6	$ 7.5	$ 6.5	$ 2.2	$ 11.8
2016	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.2	$ 6.0	$ 6.4	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 13.1	$ 4.3	$ 27.0	$ 5.3	$ 2.3	$ 8.9	$ 7.3	$ 2.5	$ 13.4
2017	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 4.6	$ 1.7	$ 8.2	$ 7.3	$ 2.5	$ 13.4
2018	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.1	$ 6.0	$ 6.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 10.5	$ 3.3	$ 23.1	$ 5.5	$ 2.3	$ 9.5	$ 7.9	$ 2.8	$ 14.4
2019	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 4.9	$ 1.8	$ 8.8	$ 7.9	$ 2.8	$ 14.4
2020	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.1	$ 5.9	$ 6.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 9.3	$ 2.6	$ 19.7	$ 5.7	$ 2.3	$ 9.9	$ 8.5	$ 2.9	$ 15.4
2021	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 5.2	$ 1.8	$ 9.4	$ 8.5	$ 2.9	$ 15.4
2022	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.0	$ 5.9	$ 6.2	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 7.8	$ 2.0	$ 17.9	$ 5.8	$ 2.2	$ 10.3	$ 8.9	$ 3.1	$ 16.4
2023	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 5.4	$ 1.9	$ 9.8	$ 8.9	$ 3.1	$ 16.4
2024	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.0	$ 5.8	$ 6.2	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 6.7	$ 1.5	$ 16.7	$ 6.0	$ 2.3	$ 10.8	$ 9.4	$ 3.3	$ 17.0
2025	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.2	$ 5.6	$ 1.8	$ 10.4	$ 9.4	$ 3.3	$ 17.0
2026	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.0	$ 5.8	$ 6.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 6.0	$ 1.1	$ 14.9	$ 6.1	$ 2.3	$ 10.9	$ 9.7	$ 3.2	$ 17.7
2027	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.2	$ 5.8	$ 2.0	$ 10.7	$ 9.7	$ 3.2	$ 17.7
2028	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 6.0	$ 5.8	$ 6.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 5.4	$ 0.8	$ 13.5	$ 6.2	$ 2.3	$ 11.4	$ 10.0	$ 3.5	$ 18.0
2029	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.2	$ 6.0	$ 2.0	$ 11.0	$ 10.0	$ 3.5	$ 18.0

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.4a Total Rule Activity Costs, by Year, for All PWSs

Year	CWSs			NTNCWSs			TNCWSs			Grand Total		
	Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound	
		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2007	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2008	$ 65.7	$ 37.0	$ 102.8	$ 14.9	$ 7.8	$ 24.8	$ 66.4	$ 36.1	$ 106.7	$ 147.0	$ 80.9	$ 234.2
2009	$ 17.9	$ 8.6	$ 29.1	$ 3.4	$ 1.7	$ 5.5	$ 11.9	$ 6.3	$ 18.7	$ 33.2	$ 16.6	$ 53.3
2010	$ 25.3	$ 12.4	$ 42.7	$ 3.0	$ 1.4	$ 4.9	$ 52.0	$ 28.0	$ 84.9	$ 80.3	$ 41.8	$ 132.6
2011	$ 18.2	$ 8.9	$ 30.1	$ 2.9	$ 1.4	$ 4.8	$ 13.8	$ 7.0	$ 22.3	$ 34.9	$ 17.2	$ 57.2
2012	$ 21.3	$ 10.3	$ 36.0	$ 7.4	$ 3.7	$ 12.5	$ 44.2	$ 22.7	$ 72.8	$ 72.9	$ 36.7	$ 121.2
2013	$ 16.8	$ 8.0	$ 28.8	$ 7.1	$ 3.6	$ 11.6	$ 15.4	$ 7.3	$ 25.5	$ 39.4	$ 18.9	$ 65.9
2014	$ 23.8	$ 11.6	$ 40.5	$ 3.5	$ 1.6	$ 5.8	$ 40.4	$ 20.6	$ 66.8	$ 67.7	$ 33.8	$ 113.2
2015	$ 13.0	$ 5.8	$ 22.2	$ 3.4	$ 1.5	$ 5.8	$ 16.8	$ 7.7	$ 27.7	$ 33.1	$ 15.0	$ 55.7
2016	$ 18.8	$ 8.8	$ 32.5	$ 6.9	$ 3.3	$ 11.8	$ 37.9	$ 19.1	$ 63.9	$ 63.6	$ 31.1	$ 108.2
2017	$ 16.3	$ 7.7	$ 28.0	$ 3.7	$ 1.6	$ 6.3	$ 17.8	$ 8.2	$ 29.9	$ 37.9	$ 17.5	$ 64.3
2018	$ 21.8	$ 10.3	$ 37.4	$ 6.6	$ 3.2	$ 10.9	$ 35.9	$ 18.3	$ 61.5	$ 64.2	$ 31.9	$ 109.8
2019	$ 13.5	$ 6.1	$ 23.2	$ 3.9	$ 1.7	$ 6.6	$ 18.7	$ 8.5	$ 31.5	$ 36.1	$ 16.3	$ 61.2
2020	$ 21.1	$ 10.1	$ 36.3	$ 6.7	$ 3.1	$ 11.5	$ 35.3	$ 17.6	$ 59.3	$ 63.1	$ 30.7	$ 107.2
2021	$ 13.8	$ 6.2	$ 23.6	$ 4.1	$ 1.8	$ 7.0	$ 19.5	$ 8.6	$ 33.0	$ 37.4	$ 16.6	$ 63.6
2022	$ 18.0	$ 8.4	$ 31.1	$ 4.0	$ 1.7	$ 6.9	$ 34.4	$ 17.0	$ 58.8	$ 56.5	$ 27.2	$ 96.8
2023	$ 19.2	$ 9.1	$ 32.7	$ 6.4	$ 3.0	$ 11.0	$ 20.2	$ 8.9	$ 34.3	$ 45.8	$ 21.0	$ 78.0
2024	$ 18.2	$ 8.5	$ 31.7	$ 6.6	$ 3.0	$ 11.4	$ 33.8	$ 16.8	$ 58.7	$ 58.7	$ 28.3	$ 101.8
2025	$ 14.4	$ 6.4	$ 24.8	$ 4.4	$ 1.9	$ 7.5	$ 20.8	$ 9.0	$ 35.5	$ 39.5	$ 17.2	$ 67.7
2026	$ 20.3	$ 9.7	$ 35.5	$ 4.3	$ 1.8	$ 7.5	$ 33.6	$ 16.3	$ 57.6	$ 58.2	$ 27.9	$ 100.5
2027	$ 14.6	$ 6.5	$ 25.1	$ 4.3	$ 1.8	$ 7.5	$ 21.3	$ 9.2	$ 36.5	$ 40.2	$ 17.5	$ 69.0
2028	$ 20.3	$ 9.6	$ 35.7	$ 8.5	$ 4.0	$ 14.7	$ 33.4	$ 16.3	$ 57.1	$ 62.1	$ 29.9	$ 107.5
2029	$ 16.9	$ 7.8	$ 29.1	$ 4.7	$ 2.0	$ 7.9	$ 21.8	$ 9.5	$ 37.1	$ 43.3	$ 19.3	$ 74.2

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2003.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.4b Rule Activity Costs, by Year and Component, for All PWS's

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring			Grand Total		
	Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound	
Year		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)
2005	$ 5.5	$ 5.5	$ 5.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.5	$ 5.5	$ 5.5
2006	$ 5.5	$ 5.5	$ 5.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.5	$ 5.5	$ 5.5
2007	$ 5.5	$ 5.5	$ 5.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.5	$ 5.5	$ 5.5
2008	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 14.4	$ 13.6	$ 15.3	$ -	$ -	$ -	$ 2.5	$ 1.7	$ 3.3	$ 106.3	$ 52.4	$ 178.8	$ 9.2	$ 5.1	$ 14.1	$ 4.6	$ 1.3	$ 8.9	$ 147.0	$ 80.9	$ 234.2
2009	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 1.5	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ 10.4	$ 4.2	$ 17.9	$ 6.4	$ 2.8	$ 10.9	$ 4.5	$ 1.2	$ 8.7	$ 33.2	$ 16.6	$ 53.3
2010	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 10.1	$ 9.7	$ 10.5	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.4	$ 43.7	$ 18.3	$ 80.0	$ 8.9	$ 4.4	$ 14.6	$ 6.6	$ 2.1	$ 12.3	$ 80.3	$ 41.8	$ 132.6
2011	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 2.3	$ 2.2	$ 2.4	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 7.7	$ 2.7	$ 14.4	$ 7.9	$ 3.3	$ 13.7	$ 6.8	$ 2.2	$ 12.6	$ 34.9	$ 17.2	$ 57.2
2012	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 10.3	$ 9.9	$ 10.7	$ -	$ -	$ -	$ 0.7	$ 0.4	$ 1.1	$ 33.2	$ 12.3	$ 62.8	$ 10.1	$ 4.7	$ 17.0	$ 8.6	$ 2.6	$ 15.9	$ 72.9	$ 36.7	$ 121.2
2013	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 2.7	$ 2.5	$ 2.8	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 8.3	$ 3.0	$ 16.1	$ 9.3	$ 3.7	$ 16.4	$ 8.8	$ 2.7	$ 16.4	$ 39.4	$ 18.9	$ 65.9
2014	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 10.4	$ 10.1	$ 10.8	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.8	$ 25.5	$ 8.7	$ 49.9	$ 11.0	$ 4.7	$ 19.2	$ 10.2	$ 3.2	$ 18.6	$ 67.7	$ 33.8	$ 113.2
2015	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 1.2	$ 1.2	$ 1.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.7	$ 0.2	$ 4.0	$ 10.0	$ 3.7	$ 17.9	$ 10.1	$ 3.2	$ 18.6	$ 33.1	$ 15.0	$ 55.7
2016	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 9.9	$ 9.6	$ 10.2	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 20.4	$ 6.2	$ 42.6	$ 11.5	$ 4.7	$ 20.0	$ 11.3	$ 3.6	$ 20.9	$ 63.6	$ 31.1	$ 108.2
2017	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 2.2	$ 2.1	$ 2.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.3	$ 0.8	$ 7.5	$ 11.0	$ 4.1	$ 19.6	$ 11.4	$ 3.7	$ 21.0	$ 37.9	$ 17.5	$ 64.3
2018	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 10.5	$ 10.2	$ 10.9	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 18.7	$ 5.8	$ 40.2	$ 12.2	$ 4.9	$ 21.6	$ 12.3	$ 4.1	$ 22.6	$ 64.2	$ 31.9	$ 109.8
2019	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 1.2	$ 1.1	$ 1.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.0	$ 0.0	$ 2.7	$ 11.5	$ 4.2	$ 20.8	$ 12.3	$ 4.1	$ 22.6	$ 36.1	$ 16.3	$ 61.2
2020	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 10.6	$ 10.3	$ 11.0	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 16.1	$ 4.2	$ 35.2	$ 12.8	$ 5.1	$ 22.6	$ 13.2	$ 4.3	$ 24.1	$ 63.1	$ 30.7	$ 107.2
2021	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 1.2	$ 1.1	$ 1.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.8	$ 0.0	$ 2.3	$ 12.2	$ 4.4	$ 22.0	$ 13.2	$ 4.3	$ 24.1	$ 37.4	$ 16.6	$ 63.6
2022	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 9.0	$ 8.7	$ 9.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 10.5	$ 2.4	$ 24.9	$ 12.9	$ 4.8	$ 23.0	$ 13.8	$ 4.5	$ 25.3	$ 56.5	$ 27.2	$ 96.8
2023	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 3.4	$ 3.3	$ 3.6	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 5.3	$ 1.6	$ 11.5	$ 12.9	$ 4.7	$ 23.2	$ 14.0	$ 4.6	$ 25.8	$ 45.8	$ 21.0	$ 78.0
2024	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 9.6	$ 9.2	$ 9.9	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 10.7	$ 2.3	$ 26.6	$ 13.6	$ 5.1	$ 24.5	$ 14.6	$ 4.8	$ 26.7	$ 58.7	$ 28.3	$ 101.8
2025	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 1.2	$ 1.1	$ 1.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.6	$ -	$ 1.9	$ 13.1	$ 4.5	$ 24.0	$ 14.6	$ 4.8	$ 26.7	$ 39.5	$ 17.2	$ 67.7
2026	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 9.8	$ 9.5	$ 10.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 9.3	$ 1.5	$ 23.7	$ 13.8	$ 5.1	$ 24.8	$ 15.1	$ 4.9	$ 27.7	$ 58.2	$ 27.9	$ 100.5
2027	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 1.2	$ 1.1	$ 1.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.5	$ -	$ 1.7	$ 13.4	$ 4.7	$ 24.5	$ 15.1	$ 4.9	$ 27.7	$ 40.2	$ 17.5	$ 69.0
2028	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 10.7	$ 10.4	$ 11.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 11.1	$ 2.1	$ 27.7	$ 14.3	$ 5.3	$ 25.9	$ 15.6	$ 5.3	$ 28.5	$ 62.1	$ 29.9	$ 107.5
2029	$ -	$ -	$ -	$ 10.0	$ 6.8	$ 13.8	$ -	$ -	$ -	$ 2.1	$ 2.0	$ 2.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.4	$ 0.2	$ 3.9	$ 14.0	$ 5.0	$ 25.6	$ 15.7	$ 5.3	$ 28.6	$ 43.3	$ 19.3	$ 74.2

Notes: Values in millions of 2003 dollars.
Detail may not add exactly to totals due to independent rounding.
Source: Ground Water Rule model output.

Exhibit D.4c Present Value of Rule Activity Costs at 3 Percent, by Year, for All CWSs

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 1.6	$ 1.6	$ 1.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 1.6	$ 1.6	$ 1.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 2.8	$ 1.9	$ 3.9	$ -	$ -	$ -	$ 5.3	$ 5.0	$ 5.7	$ -	$ -	$ -	$ 1.5	$ 1.0	$ 2.0	$ 46.4	$ 24.4	$ 75.2	$ 2.8	$ 1.3	$ 4.7	$ 1.3	$ 0.3	$ 2.6
2009	$ -	$ -	$ -	$ 2.7	$ 1.8	$ 3.7	$ -	$ -	$ -	$ 1.2	$ 1.1	$ 1.2	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ 8.0	$ 3.3	$ 13.6	$ 2.6	$ 1.0	$ 4.6	$ 1.1	$ 0.3	$ 2.3
2010	$ -	$ -	$ -	$ 2.6	$ 1.8	$ 3.6	$ -	$ -	$ -	$ 2.9	$ 2.7	$ 3.0	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ 11.4	$ 4.3	$ 21.4	$ 3.0	$ 1.2	$ 5.4	$ 1.5	$ 0.4	$ 2.9
2011	$ -	$ -	$ -	$ 2.6	$ 1.7	$ 3.5	$ -	$ -	$ -	$ 1.8	$ 1.7	$ 1.9	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 5.8	$ 2.1	$ 10.8	$ 3.3	$ 1.4	$ 5.7	$ 1.5	$ 0.4	$ 2.9
2012	$ -	$ -	$ -	$ 2.5	$ 1.7	$ 3.4	$ -	$ -	$ -	$ 2.6	$ 2.5	$ 2.7	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.4	$ 6.8	$ 2.2	$ 13.4	$ 3.4	$ 1.4	$ 6.0	$ 1.8	$ 0.5	$ 3.3
2013	$ -	$ -	$ -	$ 2.4	$ 1.6	$ 3.3	$ -	$ -	$ -	$ 1.5	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 4.1	$ 1.4	$ 8.2	$ 3.4	$ 1.3	$ 6.1	$ 1.8	$ 0.5	$ 3.4
2014	$ -	$ -	$ -	$ 2.3	$ 1.6	$ 3.2	$ -	$ -	$ -	$ 3.1	$ 3.0	$ 3.2	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 6.8	$ 2.1	$ 13.8	$ 3.8	$ 1.6	$ 6.7	$ 2.0	$ 0.6	$ 3.8
2015	$ -	$ -	$ -	$ 2.3	$ 1.5	$ 3.1	$ -	$ -	$ -	$ 0.8	$ 0.8	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.0	$ 0.1	$ 2.4	$ 3.6	$ 1.4	$ 6.4	$ 1.9	$ 0.6	$ 3.7
2016	$ -	$ -	$ -	$ 2.2	$ 1.5	$ 3.0	$ -	$ -	$ -	$ 2.2	$ 2.1	$ 2.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 3.4	$ 0.8	$ 7.6	$ 3.6	$ 1.4	$ 6.5	$ 2.0	$ 0.6	$ 3.8
2017	$ -	$ -	$ -	$ 2.1	$ 1.4	$ 3.0	$ -	$ -	$ -	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.1	$ 0.5	$ 4.8	$ 3.7	$ 1.4	$ 6.5	$ 2.0	$ 0.6	$ 3.8
2018	$ -	$ -	$ -	$ 2.1	$ 1.4	$ 2.9	$ -	$ -	$ -	$ 2.5	$ 2.4	$ 2.6	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 4.2	$ 1.1	$ 9.1	$ 3.7	$ 1.4	$ 6.6	$ 2.1	$ 0.6	$ 4.0
2019	$ -	$ -	$ -	$ 2.0	$ 1.4	$ 2.8	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.0	$ 1.5	$ 3.6	$ 1.4	$ 6.4	$ 2.1	$ 0.6	$ 3.9
2020	$ -	$ -	$ -	$ 2.0	$ 1.3	$ 2.7	$ -	$ -	$ -	$ 2.5	$ 2.4	$ 2.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 3.1	$ 0.6	$ 7.3	$ 3.7	$ 1.5	$ 6.6	$ 2.1	$ 0.6	$ 4.0
2021	$ -	$ -	$ -	$ 1.9	$ 1.3	$ 2.6	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ -	$ 1.2	$ 3.5	$ 1.3	$ 6.3	$ 2.1	$ 0.6	$ 3.9
2022	$ -	$ -	$ -	$ 1.9	$ 1.2	$ 2.5	$ -	$ -	$ -	$ 1.8	$ 1.7	$ 1.8	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.6	$ 0.2	$ 4.1	$ 3.5	$ 1.3	$ 6.3	$ 2.1	$ 0.6	$ 3.9
2023	$ -	$ -	$ -	$ 1.8	$ 1.2	$ 2.5	$ -	$ -	$ -	$ 1.6	$ 1.5	$ 1.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 2.2	$ 0.6	$ 4.7	$ 3.5	$ 1.4	$ 6.3	$ 2.1	$ 0.6	$ 3.9
2024	$ -	$ -	$ -	$ 1.7	$ 1.2	$ 2.4	$ -	$ -	$ -	$ 1.7	$ 1.6	$ 1.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.4	$ 0.2	$ 3.7	$ 3.5	$ 1.3	$ 6.3	$ 2.1	$ 0.6	$ 3.9
2025	$ -	$ -	$ -	$ 1.7	$ 1.1	$ 2.3	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.3	$ -	$ 0.9	$ 3.4	$ 1.2	$ 6.1	$ 2.0	$ 0.6	$ 3.8
2026	$ -	$ -	$ -	$ 1.6	$ 1.1	$ 2.3	$ -	$ -	$ -	$ 2.0	$ 2.0	$ 2.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.7	$ 0.2	$ 4.7	$ 3.4	$ 1.3	$ 6.1	$ 2.0	$ 0.6	$ 3.9
2027	$ -	$ -	$ -	$ 1.6	$ 1.1	$ 2.2	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.6	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.2	$ -	$ 0.7	$ 3.3	$ 1.2	$ 5.9	$ 2.0	$ 0.6	$ 3.7
2028	$ -	$ -	$ -	$ 1.6	$ 1.0	$ 2.1	$ -	$ -	$ -	$ 1.8	$ 1.7	$ 1.9	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.6	$ 0.3	$ 4.4	$ 3.2	$ 1.2	$ 5.8	$ 2.0	$ 0.6	$ 3.7
2029	$ -	$ -	$ -	$ 1.5	$ 1.0	$ 2.1	$ -	$ -	$ -	$ 1.0	$ 0.9	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.1	$ 1.8	$ 3.2	$ 1.2	$ 5.7	$ 2.0	$ 0.6	$ 3.7
Total	**$ 4.9**	**$ 4.9**	**$ 4.9**	**$ 46.0**	**$ 30.7**	**$ 63.2**	**$ -**	**$ -**	**$ -**	**$ 40.1**	**$ 38.2**	**$ 41.9**	**$ -**	**$ -**	**$ -**	**$ 3.8**	**$ 2.2**	**$ 5.8**	**$ 113.8**	**$ 44.6**	**$ 215.2**	**$ 74.7**	**$ 29.1**	**$ 133.1**	**$ 41.8**	**$ 12.0**	**$ 78.8**
Ann.	**$ 0.3**	**$ 0.3**	**$ 0.3**	**$ 2.6**	**$ 1.8**	**$ 3.6**	**$ -**	**$ -**	**$ -**	**$ 2.3**	**$ 2.2**	**$ 2.4**	**$ -**	**$ -**	**$ -**	**$ 0.2**	**$ 0.1**	**$ 0.3**	**$ 6.5**	**$ 2.6**	**$ 12.4**	**$ 4.3**	**$ 1.7**	**$ 7.6**	**$ 2.4**	**$ 0.7**	**$ 4.5**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.4d Present Value of Rule Activity Costs at 3 Percent, by Year, for All NTNCWSs

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 1.2	$ 0.8	$ 1.6	$ -	$ -	$ -	$ 1.3	$ 1.3	$ 1.4	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 9.4	$ 4.2	$ 16.9	$ 1.1	$ 0.6	$ 1.6	$ 0.5	$ 0.1	$ 1.0
2009	$ -	$ -	$ -	$ 1.1	$ 0.8	$ 1.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.2	$ 1.1	$ 0.7	$ 0.3	$ 1.2	$ 0.5	$ 0.1	$ 1.0
2010	$ -	$ -	$ -	$ 1.1	$ 0.7	$ 1.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.1	$ 0.7	$ 0.5	$ 0.2	$ 1.0	$ 0.5	$ 0.1	$ 1.0
2011	$ -	$ -	$ -	$ 1.1	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 0.5	$ 0.1	$ 1.0	$ 0.5	$ 0.1	$ 1.0
2012	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.9	$ 1.2	$ 5.5	$ 0.8	$ 0.4	$ 1.4	$ 0.7	$ 0.2	$ 1.3
2013	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.3	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.3	$ 1.0	$ 4.2	$ 0.9	$ 0.4	$ 1.6	$ 0.8	$ 0.2	$ 1.4
2014	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 0.7	$ 0.2	$ 1.4	$ 0.8	$ 0.2	$ 1.4
2015	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 0.7	$ 0.2	$ 1.3	$ 0.7	$ 0.2	$ 1.4
2016	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.8	$ 0.7	$ 3.7	$ 0.9	$ 0.4	$ 1.6	$ 0.8	$ 0.2	$ 1.5
2017	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.8	$ 0.3	$ 1.5	$ 0.8	$ 0.2	$ 1.5
2018	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.4	$ 0.5	$ 2.6	$ 0.9	$ 0.3	$ 1.6	$ 0.9	$ 0.3	$ 1.6
2019	$ -	$ -	$ -	$ 0.8	$ 0.6	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.8	$ 0.3	$ 1.5	$ 0.8	$ 0.3	$ 1.5
2020	$ -	$ -	$ -	$ 0.8	$ 0.6	$ 1.1	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.3	$ 0.4	$ 2.6	$ 0.9	$ 0.3	$ 1.6	$ 0.9	$ 0.3	$ 1.6
2021	$ -	$ -	$ -	$ 0.8	$ 0.5	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.8	$ 0.3	$ 1.5	$ 0.9	$ 0.3	$ 1.6
2022	$ -	$ -	$ -	$ 0.8	$ 0.5	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.8	$ 0.2	$ 1.4	$ 0.8	$ 0.3	$ 1.5
2023	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 1.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.9	$ 0.3	$ 1.9	$ 0.8	$ 0.3	$ 1.5	$ 0.9	$ 0.3	$ 1.6
2024	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 1.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.9	$ 0.3	$ 1.9	$ 0.9	$ 0.3	$ 1.6	$ 0.9	$ 0.3	$ 1.6
2025	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.8	$ 0.3	$ 1.5	$ 0.9	$ 0.3	$ 1.6
2026	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.8	$ 0.2	$ 1.4	$ 0.8	$ 0.3	$ 1.5
2027	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.7	$ 0.2	$ 1.4	$ 0.8	$ 0.3	$ 1.5
2028	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.9	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.3	$ 0.4	$ 2.8	$ 0.9	$ 0.3	$ 1.5	$ 0.9	$ 0.3	$ 1.6
2029	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.8	$ 0.3	$ 1.4	$ 0.8	$ 0.3	$ 1.5
Total	**$ 2.1**	**$ 2.1**	**$ 2.1**	**$ 19.0**	**$ 13.0**	**$ 25.7**	**$ -**	**$ -**	**$ -**	**$ 5.8**	**$ 5.6**	**$ 6.1**	**$ -**	**$ -**	**$ -**	**$ 0.4**	**$ 0.2**	**$ 0.6**	**$ 24.0**	**$ 9.4**	**$ 46.1**	**$ 17.4**	**$ 6.4**	**$ 31.3**	**$ 16.9**	**$ 5.1**	**$ 31.3**
Ann.	**$ 0.1**	**$ 0.1**	**$ 0.1**	**$ 1.1**	**$ 0.7**	**$ 1.5**	**$ -**	**$ -**	**$ -**	**$ 0.3**	**$ 0.3**	**$ 0.3**	**$ -**	**$ -**	**$ -**	**$ 0.0**	**$ 0.0**	**$ 0.0**	**$ 1.4**	**$ 0.5**	**$ 2.6**	**$ 1.0**	**$ 0.4**	**$ 1.8**	**$ 1.0**	**$ 0.3**	**$ 1.8**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.4e Present Value of Rule Activity Costs at 3 Percent, by Year, for All TNCWSs

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 3.1	$ 3.1	$ 3.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 3.1	$ 3.1	$ 3.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 3.0	$ 3.0	$ 3.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 5.2	$ 3.5	$ 7.2	$ -	$ -	$ -	$ 6.5	$ 6.2	$ 6.9	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.9	$ 41.4	$ 19.4	$ 71.5	$ 4.5	$ 2.8	$ 6.6	$ 2.4	$ 0.7	$ 4.6
2009	$ -	$ -	$ -	$ 5.1	$ 3.4	$ 7.0	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.2	$ 1.2	$ 2.4	$ 1.2	$ 3.9	$ 2.3	$ 0.7	$ 4.4
2010	$ -	$ -	$ -	$ 4.9	$ 3.3	$ 6.8	$ -	$ -	$ -	$ 5.8	$ 5.6	$ 6.0	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.5	$ 25.9	$ 11.4	$ 46.9	$ 4.2	$ 2.4	$ 6.2	$ 3.7	$ 1.3	$ 6.8
2011	$ -	$ -	$ -	$ 4.8	$ 3.2	$ 6.6	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 2.8	$ 1.3	$ 4.8	$ 3.6	$ 1.3	$ 6.6
2012	$ -	$ -	$ -	$ 4.7	$ 3.1	$ 6.4	$ -	$ -	$ -	$ 5.3	$ 5.1	$ 5.4	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.4	$ 17.3	$ 6.6	$ 32.2	$ 4.0	$ 2.1	$ 6.4	$ 4.5	$ 1.4	$ 8.4
2013	$ -	$ -	$ -	$ 4.5	$ 3.1	$ 6.2	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.0	$ 0.4	$ 3.0	$ 1.2	$ 5.3	$ 4.4	$ 1.4	$ 8.1
2014	$ -	$ -	$ -	$ 4.4	$ 3.0	$ 6.0	$ -	$ -	$ -	$ 4.8	$ 4.7	$ 5.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 12.6	$ 4.5	$ 24.2	$ 3.9	$ 1.8	$ 6.6	$ 5.0	$ 1.7	$ 9.1
2015	$ -	$ -	$ -	$ 4.3	$ 2.9	$ 5.9	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 3.2	$ 1.2	$ 5.6	$ 4.9	$ 1.6	$ 8.8
2016	$ -	$ -	$ -	$ 4.1	$ 2.8	$ 5.7	$ -	$ -	$ -	$ 4.5	$ 4.4	$ 4.6	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 9.5	$ 3.1	$ 19.5	$ 3.8	$ 1.6	$ 6.4	$ 5.3	$ 1.8	$ 9.7
2017	$ -	$ -	$ -	$ 4.0	$ 2.7	$ 5.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 3.2	$ 1.2	$ 5.8	$ 5.1	$ 1.8	$ 9.4
2018	$ -	$ -	$ -	$ 3.9	$ 2.6	$ 5.4	$ -	$ -	$ -	$ 4.2	$ 4.1	$ 4.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 7.1	$ 2.3	$ 15.7	$ 3.7	$ 1.6	$ 6.5	$ 5.4	$ 1.9	$ 9.8
2019	$ -	$ -	$ -	$ 3.8	$ 2.6	$ 5.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 3.2	$ 1.2	$ 5.8	$ 5.3	$ 1.9	$ 9.5
2020	$ -	$ -	$ -	$ 3.7	$ 2.5	$ 5.1	$ -	$ -	$ -	$ 3.9	$ 3.8	$ 4.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 5.9	$ 1.7	$ 12.6	$ 3.6	$ 1.5	$ 6.3	$ 5.4	$ 1.9	$ 9.9
2021	$ -	$ -	$ -	$ 3.6	$ 2.4	$ 4.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 3.2	$ 1.1	$ 5.9	$ 5.3	$ 1.8	$ 9.6
2022	$ -	$ -	$ -	$ 3.5	$ 2.3	$ 4.8	$ -	$ -	$ -	$ 3.7	$ 3.6	$ 3.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 4.7	$ 1.2	$ 10.8	$ 3.5	$ 1.3	$ 6.2	$ 5.4	$ 1.9	$ 9.9
2023	$ -	$ -	$ -	$ 3.4	$ 2.3	$ 4.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 3.2	$ 1.1	$ 5.8	$ 5.3	$ 1.8	$ 9.6
2024	$ -	$ -	$ -	$ 3.3	$ 2.2	$ 4.5	$ -	$ -	$ -	$ 3.4	$ 3.3	$ 3.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.8	$ 0.9	$ 9.5	$ 3.4	$ 1.3	$ 6.1	$ 5.3	$ 1.9	$ 9.7
2025	$ -	$ -	$ -	$ 3.2	$ 2.1	$ 4.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 3.1	$ 1.0	$ 5.7	$ 5.2	$ 1.8	$ 9.4
2026	$ -	$ -	$ -	$ 3.1	$ 2.1	$ 4.2	$ -	$ -	$ -	$ 3.2	$ 3.1	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 3.2	$ 0.6	$ 8.0	$ 3.3	$ 1.2	$ 5.8	$ 5.2	$ 1.7	$ 9.5
2027	$ -	$ -	$ -	$ 3.0	$ 2.0	$ 4.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 3.0	$ 1.0	$ 5.6	$ 5.1	$ 1.7	$ 9.2
2028	$ -	$ -	$ -	$ 2.9	$ 2.0	$ 4.0	$ -	$ -	$ -	$ 3.0	$ 2.9	$ 3.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.7	$ 0.4	$ 6.8	$ 3.2	$ 1.2	$ 5.8	$ 5.1	$ 1.8	$ 9.1
2029	$ -	$ -	$ -	$ 2.8	$ 1.9	$ 3.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.1	$ 2.9	$ 1.0	$ 5.4	$ 4.9	$ 1.7	$ 8.9
Total	**$ 9.2**	**$ 9.2**	**$ 9.2**	**$ 85.9**	**$ 58.1**	**$ 118.4**	**$ -**	**$ -**	**$ -**	**$ 48.8**	**$ 47.2**	**$ 50.4**	**$ -**	**$ -**	**$ -**	**$ 2.0**	**$ 1.1**	**$ 3.0**	**$ 135.7**	**$ 52.2**	**$ 261.1**	**$ 74.5**	**$ 31.3**	**$ 128.5**	**$ 104.2**	**$ 35.4**	**$ 190.1**
Ann.	**$ 0.5**	**$ 0.5**	**$ 0.5**	**$ 4.9**	**$ 3.3**	**$ 6.8**	**$ -**	**$ -**	**$ -**	**$ 2.8**	**$ 2.7**	**$ 2.9**	**$ -**	**$ -**	**$ -**	**$ 0.1**	**$ 0.1**	**$ 0.2**	**$ 7.8**	**$ 3.0**	**$ 15.0**	**$ 4.3**	**$ 1.8**	**$ 7.4**	**$ 6.0**	**$ 2.0**	**$ 10.9**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.4f Present Value of Total Rule Activity Costs at 3 Percent, by Year, for All PWSs

	CWSs			NTNCWSs			TNCWSs			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.4	$ 5.4	$ 5.4
2007	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 3.0	$ 3.0	$ 3.0	$ 5.2	$ 5.2	$ 5.2
2008	$ 60.2	$ 33.9	$ 94.1	$ 13.7	$ 7.2	$ 22.7	$ 60.7	$ 33.0	$ 97.6	$ 134.6	$ 74.1	$ 214.4
2009	$ 15.9	$ 7.7	$ 25.9	$ 3.0	$ 1.5	$ 4.9	$ 10.5	$ 5.6	$ 16.6	$ 29.5	$ 14.7	$ 47.4
2010	$ 21.8	$ 10.7	$ 36.8	$ 2.6	$ 1.2	$ 4.3	$ 44.9	$ 24.1	$ 73.3	$ 69.3	$ 36.1	$ 114.3
2011	$ 15.2	$ 7.4	$ 25.2	$ 2.4	$ 1.1	$ 4.1	$ 11.6	$ 5.9	$ 18.7	$ 29.2	$ 14.4	$ 47.9
2012	$ 17.3	$ 8.3	$ 29.2	$ 6.1	$ 3.0	$ 10.2	$ 35.9	$ 18.5	$ 59.2	$ 59.3	$ 29.8	$ 98.6
2013	$ 13.3	$ 6.3	$ 22.7	$ 5.6	$ 2.9	$ 9.2	$ 12.2	$ 5.8	$ 20.1	$ 31.1	$ 14.9	$ 52.0
2014	$ 18.2	$ 8.9	$ 31.1	$ 2.7	$ 1.2	$ 4.5	$ 31.0	$ 15.8	$ 51.2	$ 51.9	$ 25.9	$ 86.7
2015	$ 9.7	$ 4.3	$ 16.5	$ 2.5	$ 1.1	$ 4.3	$ 12.5	$ 5.7	$ 20.6	$ 24.6	$ 11.2	$ 41.5
2016	$ 13.6	$ 6.4	$ 23.5	$ 5.0	$ 2.4	$ 8.6	$ 27.4	$ 13.8	$ 46.2	$ 45.9	$ 22.5	$ 78.2
2017	$ 11.5	$ 5.4	$ 19.6	$ 2.6	$ 1.2	$ 4.4	$ 12.5	$ 5.7	$ 21.0	$ 26.6	$ 12.3	$ 45.1
2018	$ 14.8	$ 7.0	$ 25.5	$ 4.5	$ 2.2	$ 7.4	$ 24.4	$ 12.5	$ 41.9	$ 43.7	$ 21.7	$ 74.8
2019	$ 8.9	$ 4.0	$ 15.3	$ 2.6	$ 1.1	$ 4.3	$ 12.4	$ 5.6	$ 20.8	$ 23.9	$ 10.8	$ 40.5
2020	$ 13.5	$ 6.5	$ 23.3	$ 4.3	$ 2.0	$ 7.4	$ 22.7	$ 11.3	$ 38.1	$ 40.5	$ 19.7	$ 68.8
2021	$ 8.6	$ 3.8	$ 14.7	$ 2.5	$ 1.1	$ 4.3	$ 12.2	$ 5.4	$ 20.6	$ 23.3	$ 10.4	$ 39.6
2022	$ 10.9	$ 5.1	$ 18.8	$ 2.4	$ 1.0	$ 4.2	$ 20.8	$ 10.3	$ 35.6	$ 34.2	$ 16.5	$ 58.6
2023	$ 11.2	$ 5.3	$ 19.2	$ 3.8	$ 1.8	$ 6.5	$ 11.9	$ 5.2	$ 20.2	$ 26.9	$ 12.3	$ 45.8
2024	$ 10.4	$ 4.9	$ 18.1	$ 3.8	$ 1.7	$ 6.5	$ 19.3	$ 9.6	$ 33.5	$ 33.5	$ 16.1	$ 58.1
2025	$ 7.9	$ 3.5	$ 13.7	$ 2.4	$ 1.0	$ 4.1	$ 11.5	$ 5.0	$ 19.7	$ 21.9	$ 9.5	$ 37.5
2026	$ 10.9	$ 5.2	$ 19.1	$ 2.3	$ 1.0	$ 4.0	$ 18.0	$ 8.8	$ 30.9	$ 31.3	$ 15.0	$ 54.1
2027	$ 7.6	$ 3.4	$ 13.1	$ 2.3	$ 1.0	$ 3.9	$ 11.1	$ 4.8	$ 19.0	$ 21.0	$ 9.1	$ 36.0
2028	$ 10.3	$ 4.9	$ 18.1	$ 4.3	$ 2.0	$ 7.4	$ 16.9	$ 8.2	$ 28.9	$ 31.5	$ 15.1	$ 54.5
2029	$ 8.3	$ 3.8	$ 14.3	$ 2.3	$ 1.0	$ 3.9	$ 10.7	$ 4.7	$ 18.3	$ 21.3	$ 9.5	$ 36.5
Total	**$ 325.2**	**$ 161.7**	**$ 542.9**	**$ 85.5**	**$ 41.8**	**$ 143.1**	**$ 460.4**	**$ 234.4**	**$ 760.8**	**$ 871.1**	**$ 437.8**	**$ 1,446.8**
Ann.	**$ 18.7**	**$ 9.3**	**$ 31.2**	**$ 4.9**	**$ 2.4**	**$ 8.2**	**$ 26.4**	**$ 13.5**	**$ 43.7**	**$ 50.0**	**$ 25.1**	**$ 83.1**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.4g Present Value of Rule Activity Costs at 3 Percent, by Year and Component, for All PWSs

Year	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 5.5	$ 5.5	$ 5.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.5	$ 5.5	$ 5.5
2006	$ 5.4	$ 5.4	$ 5.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.4	$ 5.4	$ 5.4
2007	$ 5.2	$ 5.2	$ 5.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.2	$ 5.2	$ 5.2
2008	$ -	$ -	$ -	$ 9.2	$ 6.2	$ 12.6	$ -	$ -	$ -	$ 13.2	$ 12.5	$ 14.0	$ -	$ -	$ -	$ 2.2	$ 1.5	$ 3.1	$ 97.3	$ 48.0	$ 163.6	$ 8.4	$ 4.7	$ 12.9	$ 4.2	$ 1.2	$ 8.2	$ 134.6	$ 74.1	$ 214.4
2009	$ -	$ -	$ -	$ 8.9	$ 6.0	$ 12.3	$ -	$ -	$ -	$ 1.3	$ 1.2	$ 1.4	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ 9.3	$ 3.7	$ 15.9	$ 5.7	$ 2.5	$ 9.7	$ 4.0	$ 1.1	$ 7.7	$ 29.5	$ 14.7	$ 47.4
2010	$ -	$ -	$ -	$ 8.7	$ 5.8	$ 11.9	$ -	$ -	$ -	$ 8.7	$ 8.3	$ 9.0	$ -	$ -	$ -	$ 0.8	$ 0.5	$ 1.2	$ 37.7	$ 15.8	$ 69.0	$ 7.7	$ 3.8	$ 12.6	$ 5.7	$ 1.8	$ 10.7	$ 69.3	$ 36.1	$ 114.3
2011	$ -	$ -	$ -	$ 8.4	$ 5.7	$ 11.6	$ -	$ -	$ -	$ 1.9	$ 1.9	$ 2.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 6.4	$ 2.2	$ 12.0	$ 6.6	$ 2.8	$ 11.5	$ 5.7	$ 1.8	$ 10.5	$ 29.2	$ 14.4	$ 47.9
2012	$ -	$ -	$ -	$ 8.2	$ 5.5	$ 11.2	$ -	$ -	$ -	$ 8.4	$ 8.1	$ 8.7	$ -	$ -	$ -	$ 0.6	$ 0.3	$ 0.9	$ 27.0	$ 10.0	$ 51.0	$ 8.2	$ 3.8	$ 13.8	$ 7.0	$ 2.1	$ 13.0	$ 59.3	$ 29.8	$ 98.6
2013	$ -	$ -	$ -	$ 7.9	$ 5.3	$ 10.9	$ -	$ -	$ -	$ 2.1	$ 2.0	$ 2.2	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 6.5	$ 2.4	$ 12.7	$ 7.4	$ 2.9	$ 13.0	$ 7.0	$ 2.1	$ 12.9	$ 31.1	$ 14.9	$ 52.0
2014	$ -	$ -	$ -	$ 7.7	$ 5.2	$ 10.6	$ -	$ -	$ -	$ 8.0	$ 7.7	$ 8.3	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.6	$ 19.6	$ 6.7	$ 38.3	$ 8.4	$ 3.6	$ 14.7	$ 7.8	$ 2.5	$ 14.3	$ 51.9	$ 25.9	$ 86.7
2015	$ -	$ -	$ -	$ 7.5	$ 5.0	$ 10.3	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.2	$ 0.1	$ 3.0	$ 7.4	$ 2.7	$ 13.3	$ 7.6	$ 2.4	$ 13.8	$ 24.6	$ 11.2	$ 41.5
2016	$ -	$ -	$ -	$ 7.3	$ 4.9	$ 10.0	$ -	$ -	$ -	$ 7.2	$ 6.9	$ 7.4	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 14.8	$ 4.5	$ 30.8	$ 8.3	$ 3.4	$ 14.5	$ 8.1	$ 2.6	$ 15.1	$ 45.9	$ 22.5	$ 78.2
2017	$ -	$ -	$ -	$ 7.0	$ 4.8	$ 9.7	$ -	$ -	$ -	$ 1.5	$ 1.5	$ 1.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 2.3	$ 0.6	$ 5.3	$ 7.7	$ 2.9	$ 13.7	$ 8.0	$ 2.6	$ 14.7	$ 26.6	$ 12.3	$ 45.1
2018	$ -	$ -	$ -	$ 6.8	$ 4.6	$ 9.4	$ -	$ -	$ -	$ 7.2	$ 6.9	$ 7.4	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 12.7	$ 3.9	$ 27.4	$ 8.3	$ 3.3	$ 14.7	$ 8.4	$ 2.8	$ 15.4	$ 43.7	$ 21.7	$ 74.8
2019	$ -	$ -	$ -	$ 6.6	$ 4.5	$ 9.1	$ -	$ -	$ -	$ 0.8	$ 0.8	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.6	$ 0.0	$ 1.8	$ 7.6	$ 2.8	$ 13.7	$ 8.2	$ 2.7	$ 14.9	$ 23.9	$ 10.8	$ 40.5
2020	$ -	$ -	$ -	$ 6.4	$ 4.3	$ 8.9	$ -	$ -	$ -	$ 6.8	$ 6.6	$ 7.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 10.3	$ 2.7	$ 22.6	$ 8.2	$ 3.3	$ 14.5	$ 8.5	$ 2.8	$ 15.5	$ 40.5	$ 19.7	$ 68.8
2021	$ -	$ -	$ -	$ 6.3	$ 4.2	$ 8.6	$ -	$ -	$ -	$ 0.8	$ 0.7	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.0	$ 1.5	$ 7.6	$ 2.7	$ 13.7	$ 8.2	$ 2.7	$ 15.0	$ 23.3	$ 10.4	$ 39.6
2022	$ -	$ -	$ -	$ 6.1	$ 4.1	$ 8.4	$ -	$ -	$ -	$ 5.5	$ 5.3	$ 5.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 6.4	$ 1.4	$ 15.1	$ 7.8	$ 2.9	$ 13.9	$ 8.3	$ 2.7	$ 15.3	$ 34.2	$ 16.5	$ 58.6
2023	$ -	$ -	$ -	$ 5.9	$ 4.0	$ 8.1	$ -	$ -	$ -	$ 2.0	$ 1.9	$ 2.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.1	$ 0.9	$ 6.8	$ 7.6	$ 2.8	$ 13.6	$ 8.2	$ 2.7	$ 15.1	$ 26.9	$ 12.3	$ 45.8
2024	$ -	$ -	$ -	$ 5.7	$ 3.9	$ 7.9	$ -	$ -	$ -	$ 5.4	$ 5.3	$ 5.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 6.1	$ 1.3	$ 15.1	$ 7.8	$ 2.9	$ 14.0	$ 8.3	$ 2.8	$ 15.2	$ 33.5	$ 16.1	$ 58.1
2025	$ -	$ -	$ -	$ 5.6	$ 3.8	$ 7.6	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.3	$ -	$ 1.1	$ 7.3	$ 2.5	$ 13.3	$ 8.1	$ 2.7	$ 14.8	$ 21.9	$ 9.5	$ 37.5
2026	$ -	$ -	$ -	$ 5.4	$ 3.6	$ 7.4	$ -	$ -	$ -	$ 5.3	$ 5.1	$ 5.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 5.0	$ 0.8	$ 12.7	$ 7.4	$ 2.8	$ 13.3	$ 8.1	$ 2.6	$ 14.9	$ 31.3	$ 15.0	$ 54.1
2027	$ -	$ -	$ -	$ 5.2	$ 3.5	$ 7.2	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.3	$ -	$ 0.9	$ 7.0	$ 2.5	$ 12.8	$ 7.9	$ 2.5	$ 14.5	$ 21.0	$ 9.1	$ 36.0
2028	$ -	$ -	$ -	$ 5.1	$ 3.4	$ 7.0	$ -	$ -	$ -	$ 5.4	$ 5.3	$ 5.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 5.6	$ 1.1	$ 14.0	$ 7.3	$ 2.7	$ 13.1	$ 7.9	$ 2.7	$ 14.5	$ 31.5	$ 15.1	$ 54.5
2029	$ -	$ -	$ -	$ 4.9	$ 3.3	$ 6.8	$ -	$ -	$ -	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.1	$ 1.9	$ 6.9	$ 2.4	$ 12.6	$ 7.7	$ 2.6	$ 14.1	$ 21.3	$ 9.5	$ 36.5
Total	**$ 16.1**	**$ 16.1**	**$ 16.1**	**$ 150.9**	**$ 101.8**	**$ 207.3**	**$ -**	**$ -**	**$ -**	**$ 94.7**	**$ 91.0**	**$ 98.4**	**$ -**	**$ -**	**$ -**	**$ 6.2**	**$ 3.5**	**$ 9.4**	**$ 273.6**	**$ 106.3**	**$ 522.5**	**$ 166.6**	**$ 66.7**	**$ 292.9**	**$ 162.9**	**$ 52.5**	**$ 300.2**	**$ 871.1**	**$ 437.8**	**$ 1,446.8**
Ann.	**$ 0.9**	**$ 0.9**	**$ 0.9**	**$ 8.7**	**$ 5.8**	**$ 11.9**	**$ -**	**$ -**	**$ -**	**$ 5.4**	**$ 5.2**	**$ 5.6**	**$ -**	**$ -**	**$ -**	**$ 0.4**	**$ 0.2**	**$ 0.5**	**$ 15.7**	**$ 6.1**	**$ 30.0**	**$ 9.6**	**$ 3.8**	**$ 16.8**	**$ 9.4**	**$ 3.0**	**$ 17.2**	**$ 50.0**	**$ 25.1**	**$ 83.1**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.4h Present Value of Rule Activity Costs at 7 Percent, by Year, for All CWSs

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 1.6	$ 1.6	$ 1.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 1.5	$ 1.5	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 2.5	$ 1.7	$ 3.4	$ -	$ -	$ -	$ 4.8	$ 4.5	$ 5.1	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.8	$ 41.4	$ 21.8	$ 67.1	$ 2.5	$ 1.1	$ 4.2	$ 1.2	$ 0.3	$ 2.3
2009	$ -	$ -	$ -	$ 2.3	$ 1.6	$ 3.2	$ -	$ -	$ -	$ 1.0	$ 0.9	$ 1.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 6.9	$ 2.8	$ 11.7	$ 2.2	$ 0.9	$ 4.0	$ 1.0	$ 0.3	$ 2.0
2010	$ -	$ -	$ -	$ 2.2	$ 1.5	$ 3.0	$ -	$ -	$ -	$ 2.4	$ 2.3	$ 2.5	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.5	$ 9.4	$ 3.6	$ 17.7	$ 2.5	$ 1.0	$ 4.4	$ 1.2	$ 0.3	$ 2.4
2011	$ -	$ -	$ -	$ 2.0	$ 1.4	$ 2.8	$ -	$ -	$ -	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 4.7	$ 1.6	$ 8.6	$ 2.6	$ 1.1	$ 4.6	$ 1.2	$ 0.4	$ 2.3
2012	$ -	$ -	$ -	$ 1.9	$ 1.3	$ 2.6	$ -	$ -	$ -	$ 2.0	$ 1.9	$ 2.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 5.2	$ 1.7	$ 10.3	$ 2.6	$ 1.1	$ 4.6	$ 1.3	$ 0.4	$ 2.5
2013	$ -	$ -	$ -	$ 1.8	$ 1.2	$ 2.4	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 3.0	$ 1.0	$ 6.0	$ 2.5	$ 1.0	$ 4.5	$ 1.3	$ 0.4	$ 2.5
2014	$ -	$ -	$ -	$ 1.7	$ 1.1	$ 2.3	$ -	$ -	$ -	$ 2.2	$ 2.1	$ 2.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 4.8	$ 1.5	$ 9.8	$ 2.7	$ 1.1	$ 4.7	$ 1.4	$ 0.4	$ 2.7
2015	$ -	$ -	$ -	$ 1.6	$ 1.0	$ 2.1	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.7	$ 0.1	$ 1.6	$ 2.4	$ 0.9	$ 4.4	$ 1.3	$ 0.4	$ 2.5
2016	$ -	$ -	$ -	$ 1.5	$ 1.0	$ 2.0	$ -	$ -	$ -	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 2.3	$ 0.5	$ 5.0	$ 2.4	$ 0.9	$ 4.3	$ 1.3	$ 0.4	$ 2.5
2017	$ -	$ -	$ -	$ 1.4	$ 0.9	$ 1.9	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.4	$ 0.3	$ 3.1	$ 2.3	$ 0.9	$ 4.1	$ 1.3	$ 0.4	$ 2.4
2018	$ -	$ -	$ -	$ 1.3	$ 0.8	$ 1.7	$ -	$ -	$ -	$ 1.5	$ 1.5	$ 1.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 2.6	$ 0.7	$ 5.6	$ 2.3	$ 0.9	$ 4.0	$ 1.3	$ 0.4	$ 2.4
2019	$ -	$ -	$ -	$ 1.2	$ 0.8	$ 1.6	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.9	$ 2.1	$ 0.8	$ 3.8	$ 1.2	$ 0.4	$ 2.3
2020	$ -	$ -	$ -	$ 1.1	$ 0.7	$ 1.5	$ -	$ -	$ -	$ 1.4	$ 1.3	$ 1.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 1.8	$ 0.4	$ 4.1	$ 2.1	$ 0.8	$ 3.7	$ 1.2	$ 0.3	$ 2.3
2021	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ -	$ 0.6	$ 1.9	$ 0.7	$ 3.4	$ 1.1	$ 0.3	$ 2.1
2022	$ -	$ -	$ -	$ 1.0	$ 0.6	$ 1.3	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.8	$ 0.1	$ 2.1	$ 1.8	$ 0.7	$ 3.3	$ 1.1	$ 0.3	$ 2.0
2023	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.8	$ 0.8	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.1	$ 0.3	$ 2.4	$ 1.8	$ 0.7	$ 3.2	$ 1.1	$ 0.3	$ 2.0
2024	$ -	$ -	$ -	$ 0.8	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.8	$ 0.8	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.1	$ 1.8	$ 1.7	$ 0.6	$ 3.0	$ 1.0	$ 0.3	$ 1.9
2025	$ -	$ -	$ -	$ 0.8	$ 0.5	$ 1.1	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.4	$ 1.6	$ 0.6	$ 2.8	$ 0.9	$ 0.3	$ 1.8
2026	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 1.0	$ -	$ -	$ -	$ 0.9	$ 0.9	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.8	$ 0.1	$ 2.1	$ 1.5	$ 0.6	$ 2.7	$ 0.9	$ 0.3	$ 1.7
2027	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 0.9	$ -	$ -	$ -	$ 0.2	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.3	$ 1.4	$ 0.5	$ 2.5	$ 0.9	$ 0.3	$ 1.6
2028	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.9	$ -	$ -	$ -	$ 0.7	$ 0.7	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.1	$ 1.8	$ 1.4	$ 0.5	$ 2.4	$ 0.8	$ 0.2	$ 1.6
2029	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.7	$ 1.3	$ 0.5	$ 2.3	$ 0.8	$ 0.2	$ 1.5
Total	**$ 4.7**	**$ 4.7**	**$ 4.7**	**$ 29.6**	**$ 19.7**	**$ 40.7**	**$ -**	**$ -**	**$ -**	**$ 26.5**	**$ 25.3**	**$ 27.8**	**$ -**	**$ -**	**$ -**	**$ 3.0**	**$ 1.7**	**$ 4.4**	**$ 89.1**	**$ 36.8**	**$ 163.7**	**$ 45.6**	**$ 17.9**	**$ 81.1**	**$ 25.0**	**$ 7.1**	**$ 47.3**
Ann.	**$ 0.4**	**$ 0.4**	**$ 0.4**	**$ 2.5**	**$ 1.7**	**$ 3.5**	**$ -**	**$ -**	**$ -**	**$ 2.3**	**$ 2.2**	**$ 2.4**	**$ -**	**$ -**	**$ -**	**$ 0.3**	**$ 0.1**	**$ 0.4**	**$ 7.6**	**$ 3.2**	**$ 14.0**	**$ 3.9**	**$ 1.5**	**$ 7.0**	**$ 2.1**	**$ 0.6**	**$ 4.1**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.4i Present Value of Rule Activity Costs at 7 Percent, by Year, for All NTNCWSs

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.4	$ -	$ -	$ -	$ 1.2	$ 1.1	$ 1.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 8.4	$ 3.8	$ 15.0	$ 1.0	$ 0.6	$ 1.4	$ 0.5	$ 0.1	$ 0.9
2009	$ -	$ -	$ -	$ 1.0	$ 0.7	$ 1.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.2	$ 0.9	$ 0.6	$ 0.3	$ 1.0	$ 0.4	$ 0.1	$ 0.9
2010	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 0.4	$ 0.1	$ 0.8	$ 0.4	$ 0.1	$ 0.8
2011	$ -	$ -	$ -	$ 0.8	$ 0.6	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.1	$ 0.5	$ 0.4	$ 0.1	$ 0.8	$ 0.4	$ 0.1	$ 0.8
2012	$ -	$ -	$ -	$ 0.8	$ 0.5	$ 1.1	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 2.2	$ 0.9	$ 4.2	$ 0.6	$ 0.3	$ 1.1	$ 0.5	$ 0.1	$ 1.0
2013	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 1.0	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.7	$ 0.7	$ 3.1	$ 0.7	$ 0.3	$ 1.2	$ 0.6	$ 0.2	$ 1.1
2014	$ -	$ -	$ -	$ 0.7	$ 0.5	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.5	$ 0.2	$ 1.0	$ 0.5	$ 0.2	$ 1.0
2015	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 0.5	$ 0.1	$ 0.9	$ 0.5	$ 0.1	$ 0.9
2016	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.2	$ 0.4	$ 2.4	$ 0.6	$ 0.2	$ 1.0	$ 0.5	$ 0.2	$ 1.0
2017	$ -	$ -	$ -	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 0.5	$ 0.2	$ 0.9	$ 0.5	$ 0.1	$ 1.0
2018	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.7	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.8	$ 0.3	$ 1.6	$ 0.5	$ 0.2	$ 1.0	$ 0.5	$ 0.2	$ 1.0
2019	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.5	$ 0.1	$ 0.9	$ 0.5	$ 0.2	$ 0.9
2020	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.7	$ 0.2	$ 1.5	$ 0.5	$ 0.2	$ 0.9	$ 0.5	$ 0.2	$ 0.9
2021	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.4	$ 0.1	$ 0.8	$ 0.5	$ 0.1	$ 0.9
2022	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.4	$ 0.1	$ 0.8	$ 0.4	$ 0.1	$ 0.8
2023	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.5	$ -	$ -	$ -	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.2	$ 1.0	$ 0.4	$ 0.1	$ 0.8	$ 0.4	$ 0.1	$ 0.8
2024	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ -	$ -	$ -	$ 0.2	$ 0.2	$ 0.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.1	$ 0.9	$ 0.4	$ 0.2	$ 0.8	$ 0.4	$ 0.1	$ 0.8
2025	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.4	$ 0.1	$ 0.7	$ 0.4	$ 0.1	$ 0.7
2026	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 0.4	$ 0.1	$ 0.7
2027	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 0.4	$ 0.1	$ 0.6
2028	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.1	$ 1.2	$ 0.4	$ 0.1	$ 0.6	$ 0.4	$ 0.1	$ 0.7
2029	$ -	$ -	$ -	$ 0.2	$ 0.2	$ 0.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 0.3	$ 0.1	$ 0.6	$ 0.3	$ 0.1	$ 0.6
Total	**$ 2.0**	**$ 2.0**	**$ 2.0**	**$ 12.2**	**$ 8.4**	**$ 16.5**	**$ -**	**$ -**	**$ -**	**$ 3.9**	**$ 3.7**	**$ 4.1**	**$ -**	**$ -**	**$ -**	**$ 0.3**	**$ 0.2**	**$ 0.4**	**$ 17.9**	**$ 7.2**	**$ 33.9**	**$ 10.6**	**$ 4.0**	**$ 19.1**	**$ 10.0**	**$ 3.0**	**$ 18.6**
Ann.	**$ 0.2**	**$ 0.2**	**$ 0.2**	**$ 1.0**	**$ 0.7**	**$ 1.4**	**$ -**	**$ -**	**$ -**	**$ 0.3**	**$ 0.3**	**$ 0.3**	**$ -**	**$ -**	**$ -**	**$ 0.0**	**$ 0.0**	**$ 0.0**	**$ 1.5**	**$ 0.6**	**$ 2.9**	**$ 0.9**	**$ 0.3**	**$ 1.6**	**$ 0.9**	**$ 0.3**	**$ 1.6**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.4j Present Value of Rule Activity Costs at 7 Percent, by Year, for All TNCWSs

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 3.1	$ 3.1	$ 3.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2006	$ 2.9	$ 2.9	$ 2.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2007	$ 2.7	$ 2.7	$ 2.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2008	$ -	$ -	$ -	$ 4.7	$ 3.2	$ 6.4	$ -	$ -	$ -	$ 5.8	$ 5.5	$ 6.1	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.8	$ 37.0	$ 17.3	$ 63.8	$ 4.1	$ 2.5	$ 5.9	$ 2.1	$ 0.6	$ 4.1
2009	$ -	$ -	$ -	$ 4.4	$ 2.9	$ 6.0	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.5	$ 0.2	$ 1.0	$ 2.1	$ 1.0	$ 3.3	$ 2.0	$ 0.6	$ 3.8
2010	$ -	$ -	$ -	$ 4.1	$ 2.8	$ 5.6	$ -	$ -	$ -	$ 4.8	$ 4.6	$ 4.9	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ 21.4	$ 9.4	$ 38.8	$ 3.4	$ 2.0	$ 5.1	$ 3.1	$ 1.1	$ 5.6
2011	$ -	$ -	$ -	$ 3.8	$ 2.6	$ 5.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.2	$ 0.1	$ 0.5	$ 2.2	$ 1.0	$ 3.8	$ 2.9	$ 1.0	$ 5.3
2012	$ -	$ -	$ -	$ 3.6	$ 2.4	$ 4.9	$ -	$ -	$ -	$ 4.0	$ 3.9	$ 4.2	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 13.2	$ 5.1	$ 24.6	$ 3.1	$ 1.6	$ 4.9	$ 3.5	$ 1.1	$ 6.4
2013	$ -	$ -	$ -	$ 3.3	$ 2.2	$ 4.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.3	$ 2.2	$ 0.9	$ 3.9	$ 3.3	$ 1.0	$ 6.0
2014	$ -	$ -	$ -	$ 3.1	$ 2.1	$ 4.3	$ -	$ -	$ -	$ 3.4	$ 3.3	$ 3.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 9.0	$ 3.2	$ 17.1	$ 2.8	$ 1.3	$ 4.7	$ 3.6	$ 1.2	$ 6.4
2015	$ -	$ -	$ -	$ 2.9	$ 2.0	$ 4.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.2	$ 2.2	$ 0.8	$ 3.8	$ 3.3	$ 1.1	$ 6.0
2016	$ -	$ -	$ -	$ 2.7	$ 1.8	$ 3.7	$ -	$ -	$ -	$ 3.0	$ 2.9	$ 3.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 6.2	$ 2.0	$ 12.8	$ 2.5	$ 1.1	$ 4.2	$ 3.5	$ 1.2	$ 6.4
2017	$ -	$ -	$ -	$ 2.5	$ 1.7	$ 3.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ 0.1	$ 2.1	$ 0.8	$ 3.7	$ 3.2	$ 1.1	$ 6.0
2018	$ -	$ -	$ -	$ 2.4	$ 1.6	$ 3.3	$ -	$ -	$ -	$ 2.5	$ 2.5	$ 2.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 4.3	$ 1.4	$ 9.6	$ 2.3	$ 1.0	$ 3.9	$ 3.3	$ 1.2	$ 6.0
2019	$ -	$ -	$ -	$ 2.2	$ 1.5	$ 3.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 1.9	$ 0.7	$ 3.4	$ 3.1	$ 1.1	$ 5.6
2020	$ -	$ -	$ -	$ 2.1	$ 1.4	$ 2.9	$ -	$ -	$ -	$ 2.2	$ 2.1	$ 2.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 3.4	$ 0.9	$ 7.1	$ 2.1	$ 0.8	$ 3.6	$ 3.1	$ 1.0	$ 5.6
2021	$ -	$ -	$ -	$ 1.9	$ 1.3	$ 2.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 1.8	$ 0.6	$ 3.2	$ 2.9	$ 1.0	$ 5.2
2022	$ -	$ -	$ -	$ 1.8	$ 1.2	$ 2.5	$ -	$ -	$ -	$ 1.9	$ 1.9	$ 2.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.5	$ 0.6	$ 5.7	$ 1.8	$ 0.7	$ 3.2	$ 2.8	$ 1.0	$ 5.2
2023	$ -	$ -	$ -	$ 1.7	$ 1.1	$ 2.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.1	$ 1.6	$ 0.6	$ 2.9	$ 2.6	$ 0.9	$ 4.8
2024	$ -	$ -	$ -	$ 1.6	$ 1.1	$ 2.2	$ -	$ -	$ -	$ 1.7	$ 1.6	$ 1.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.8	$ 0.4	$ 4.6	$ 1.7	$ 0.6	$ 3.0	$ 2.6	$ 0.9	$ 4.7
2025	$ -	$ -	$ -	$ 1.5	$ 1.0	$ 2.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 1.5	$ 0.5	$ 2.7	$ 2.4	$ 0.8	$ 4.4
2026	$ -	$ -	$ -	$ 1.4	$ 0.9	$ 1.9	$ -	$ -	$ -	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.4	$ 0.3	$ 3.6	$ 1.5	$ 0.6	$ 2.6	$ 2.3	$ 0.8	$ 4.3
2027	$ -	$ -	$ -	$ 1.3	$ 0.9	$ 1.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 1.3	$ 0.5	$ 2.4	$ 2.2	$ 0.7	$ 4.0
2028	$ -	$ -	$ -	$ 1.2	$ 0.8	$ 1.7	$ -	$ -	$ -	$ 1.3	$ 1.2	$ 1.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.1	$ 0.2	$ 2.8	$ 1.3	$ 0.5	$ 2.4	$ 2.1	$ 0.7	$ 3.8
2029	$ -	$ -	$ -	$ 1.1	$ 0.8	$ 1.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 1.2	$ 0.4	$ 2.2	$ 2.0	$ 0.7	$ 3.6
Total	**$ 8.8**	**$ 8.8**	**$ 8.8**	**$ 55.3**	**$ 37.3**	**$ 76.2**	**$ -**	**$ -**	**$ -**	**$ 32.3**	**$ 31.3**	**$ 33.5**	**$ -**	**$ -**	**$ -**	**$ 1.5**	**$ 0.9**	**$ 2.3**	**$ 102.5**	**$ 41.0**	**$ 193.0**	**$ 46.4**	**$ 20.2**	**$ 78.9**	**$ 61.9**	**$ 20.9**	**$ 113.1**
Ann.	**$ 0.8**	**$ 0.8**	**$ 0.8**	**$ 4.7**	**$ 3.2**	**$ 6.5**	**$ -**	**$ -**	**$ -**	**$ 2.8**	**$ 2.7**	**$ 2.9**	**$ -**	**$ -**	**$ -**	**$ 0.1**	**$ 0.1**	**$ 0.2**	**$ 8.8**	**$ 3.5**	**$ 16.6**	**$ 4.0**	**$ 1.7**	**$ 6.8**	**$ 5.3**	**$ 1.8**	**$ 9.7**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.4k Present Value of Total Rule Activity Costs at 7 Percent, by Year, for All PWSs

	CWSs			**NTNCWSs**			**TNCWSs**			**Grand Total**		
		90 Percent Confidence Bound			**90 Percent Confidence Bound**			**90 Percent Confidence Bound**			**90 Percent Confidence Bound**	
Year	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 2.9	$ 2.9	$ 2.9	$ 5.2	$ 5.2	$ 5.2
2007	$ 1.5	$ 1.5	$ 1.5	$ 0.6	$ 0.6	$ 0.6	$ 2.7	$ 2.7	$ 2.7	$ 4.8	$ 4.8	$ 4.8
2008	$ 53.7	$ 30.2	$ 83.9	$ 12.2	$ 6.4	$ 20.2	$ 54.2	$ 29.4	$ 87.1	$ 120.0	$ 66.1	$ 191.2
2009	$ 13.7	$ 6.6	$ 22.2	$ 2.6	$ 1.3	$ 4.2	$ 9.0	$ 4.8	$ 14.3	$ 25.3	$ 12.7	$ 40.7
2010	$ 18.0	$ 8.9	$ 30.4	$ 2.1	$ 1.0	$ 3.5	$ 37.1	$ 20.0	$ 60.6	$ 57.3	$ 29.8	$ 94.5
2011	$ 12.1	$ 5.9	$ 20.0	$ 1.9	$ 0.9	$ 3.2	$ 9.2	$ 4.7	$ 14.8	$ 23.2	$ 11.5	$ 38.1
2012	$ 13.3	$ 6.4	$ 22.4	$ 4.6	$ 2.3	$ 7.8	$ 27.5	$ 14.1	$ 45.3	$ 45.4	$ 22.9	$ 75.5
2013	$ 9.8	$ 4.6	$ 16.8	$ 4.1	$ 2.1	$ 6.8	$ 9.0	$ 4.2	$ 14.8	$ 22.9	$ 11.0	$ 38.4
2014	$ 12.9	$ 6.3	$ 22.1	$ 1.9	$ 0.9	$ 3.2	$ 22.0	$ 11.2	$ 36.3	$ 36.8	$ 18.4	$ 61.6
2015	$ 6.6	$ 3.0	$ 11.3	$ 1.7	$ 0.8	$ 2.9	$ 8.5	$ 3.9	$ 14.1	$ 16.8	$ 7.6	$ 28.3
2016	$ 8.9	$ 4.2	$ 15.4	$ 3.3	$ 1.5	$ 5.6	$ 18.0	$ 9.1	$ 30.4	$ 30.2	$ 14.8	$ 51.4
2017	$ 7.2	$ 3.4	$ 12.4	$ 1.7	$ 0.7	$ 2.8	$ 7.9	$ 3.6	$ 13.3	$ 16.8	$ 7.8	$ 28.5
2018	$ 9.0	$ 4.3	$ 15.5	$ 2.7	$ 1.3	$ 4.5	$ 14.9	$ 7.6	$ 25.5	$ 26.7	$ 13.2	$ 45.6
2019	$ 5.2	$ 2.4	$ 9.0	$ 1.5	$ 0.7	$ 2.5	$ 7.3	$ 3.3	$ 12.2	$ 14.0	$ 6.3	$ 23.7
2020	$ 7.6	$ 3.6	$ 13.2	$ 2.4	$ 1.1	$ 4.2	$ 12.8	$ 6.4	$ 21.5	$ 22.9	$ 11.1	$ 38.9
2021	$ 4.7	$ 2.1	$ 8.0	$ 1.4	$ 0.6	$ 2.4	$ 6.6	$ 2.9	$ 11.2	$ 12.7	$ 5.6	$ 21.5
2022	$ 5.7	$ 2.7	$ 9.8	$ 1.3	$ 0.5	$ 2.2	$ 10.9	$ 5.4	$ 18.6	$ 17.9	$ 8.6	$ 30.6
2023	$ 5.7	$ 2.7	$ 9.7	$ 1.9	$ 0.9	$ 3.3	$ 6.0	$ 2.6	$ 10.2	$ 13.6	$ 6.2	$ 23.1
2024	$ 5.0	$ 2.4	$ 8.8	$ 1.8	$ 0.8	$ 3.2	$ 9.4	$ 4.6	$ 16.2	$ 16.2	$ 7.8	$ 28.2
2025	$ 3.7	$ 1.6	$ 6.4	$ 1.1	$ 0.5	$ 1.9	$ 5.4	$ 2.3	$ 9.2	$ 10.2	$ 4.5	$ 17.5
2026	$ 4.9	$ 2.3	$ 8.6	$ 1.0	$ 0.4	$ 1.8	$ 8.1	$ 3.9	$ 13.9	$ 14.1	$ 6.7	$ 24.3
2027	$ 3.3	$ 1.5	$ 5.7	$ 1.0	$ 0.4	$ 1.7	$ 4.8	$ 2.1	$ 8.2	$ 9.1	$ 3.9	$ 15.6
2028	$ 4.3	$ 2.0	$ 7.5	$ 1.8	$ 0.8	$ 3.1	$ 7.0	$ 3.4	$ 12.0	$ 13.1	$ 6.3	$ 22.7
2029	$ 3.3	$ 1.5	$ 5.7	$ 0.9	$ 0.4	$ 1.6	$ 4.3	$ 1.9	$ 7.3	$ 8.5	$ 3.8	$ 14.6
Total	**$ 223.6**	**$ 113.3**	**$ 369.6**	**$ 57.0**	**$ 28.5**	**$ 94.6**	**$ 308.8**	**$ 160.4**	**$ 505.8**	**$ 589.3**	**$ 302.2**	**$ 970.0**
Ann.	**$ 19.2**	**$ 9.7**	**$ 31.7**	**$ 4.9**	**$ 2.4**	**$ 8.1**	**$ 26.5**	**$ 13.8**	**$ 43.4**	**$ 50.6**	**$ 25.9**	**$ 83.2**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.4l Present Value of Rule Activity Costs at 7 Percent, by Year and Component, for All PWSs

	Implementation			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action - Plans			Corrective Action - Capital			Corrective Action - O&M			Compliance Monitoring			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 5.5	$ 5.5	$ 5.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.5	$ 5.5	$ 5.5
2006	$ 5.2	$ 5.2	$ 5.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.2	$ 5.2	$ 5.2
2007	$ 4.8	$ 4.8	$ 4.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.8	$ 4.8	$ 4.8
2008	$ -	$ -	$ -	$ 8.2	$ 5.5	$ 11.3	$ -	$ -	$ -	$ 11.8	$ 11.1	$ 12.5	$ -	$ -	$ -	$ 2.0	$ 1.4	$ 2.7	$ 86.8	$ 42.8	$ 145.9	$ 7.5	$ 4.2	$ 11.5	$ 3.8	$ 1.0	$ 7.3	$ 120.0	$ 66.1	$ 191.2
2009	$ -	$ -	$ -	$ 7.7	$ 5.2	$ 10.5	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.2	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.4	$ 7.9	$ 3.2	$ 13.6	$ 4.9	$ 2.2	$ 8.3	$ 3.4	$ 0.9	$ 6.6	$ 25.3	$ 12.7	$ 40.7
2010	$ -	$ -	$ -	$ 7.2	$ 4.8	$ 9.8	$ -	$ -	$ -	$ 7.2	$ 6.9	$ 7.5	$ -	$ -	$ -	$ 0.7	$ 0.4	$ 1.0	$ 31.1	$ 13.1	$ 57.1	$ 6.4	$ 3.1	$ 10.4	$ 4.7	$ 1.5	$ 8.8	$ 57.3	$ 29.8	$ 94.5
2011	$ -	$ -	$ -	$ 6.7	$ 4.5	$ 9.2	$ -	$ -	$ -	$ 1.5	$ 1.5	$ 1.6	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 5.1	$ 1.8	$ 9.6	$ 5.2	$ 2.2	$ 9.1	$ 4.5	$ 1.5	$ 8.4	$ 23.2	$ 11.5	$ 38.1
2012	$ -	$ -	$ -	$ 6.3	$ 4.2	$ 8.6	$ -	$ -	$ -	$ 6.4	$ 6.2	$ 6.7	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 20.7	$ 7.6	$ 39.1	$ 6.3	$ 2.9	$ 10.6	$ 5.3	$ 1.6	$ 9.9	$ 45.4	$ 22.9	$ 75.5
2013	$ -	$ -	$ -	$ 5.8	$ 3.9	$ 8.0	$ -	$ -	$ -	$ 1.5	$ 1.5	$ 1.6	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 4.8	$ 1.8	$ 9.4	$ 5.4	$ 2.2	$ 9.6	$ 5.1	$ 1.6	$ 9.5	$ 22.9	$ 11.0	$ 38.4
2014	$ -	$ -	$ -	$ 5.5	$ 3.7	$ 7.5	$ -	$ -	$ -	$ 5.7	$ 5.5	$ 5.9	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 13.9	$ 4.7	$ 27.1	$ 6.0	$ 2.6	$ 10.4	$ 5.5	$ 1.8	$ 10.1	$ 36.8	$ 18.4	$ 61.6
2015	$ -	$ -	$ -	$ 5.1	$ 3.4	$ 7.0	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.8	$ 0.1	$ 2.0	$ 5.1	$ 1.9	$ 9.1	$ 5.2	$ 1.6	$ 9.5	$ 16.8	$ 7.6	$ 28.3
2016	$ -	$ -	$ -	$ 4.8	$ 3.2	$ 6.6	$ -	$ -	$ -	$ 4.7	$ 4.5	$ 4.9	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 9.7	$ 3.0	$ 20.2	$ 5.5	$ 2.2	$ 9.5	$ 5.3	$ 1.7	$ 9.9	$ 30.2	$ 14.8	$ 51.4
2017	$ -	$ -	$ -	$ 4.5	$ 3.0	$ 6.1	$ -	$ -	$ -	$ 1.0	$ 0.9	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.5	$ 0.4	$ 3.3	$ 4.9	$ 1.8	$ 8.7	$ 5.0	$ 1.6	$ 9.3	$ 16.8	$ 7.8	$ 28.5
2018	$ -	$ -	$ -	$ 4.2	$ 2.8	$ 5.7	$ -	$ -	$ -	$ 4.4	$ 4.2	$ 4.5	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 7.8	$ 2.4	$ 16.7	$ 5.1	$ 2.0	$ 9.0	$ 5.1	$ 1.7	$ 9.4	$ 26.7	$ 13.2	$ 45.6
2019	$ -	$ -	$ -	$ 3.9	$ 2.6	$ 5.4	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.4	$ 0.0	$ 1.1	$ 4.5	$ 1.6	$ 8.1	$ 4.8	$ 1.6	$ 8.8	$ 14.0	$ 6.3	$ 23.7
2020	$ -	$ -	$ -	$ 3.6	$ 2.5	$ 5.0	$ -	$ -	$ -	$ 3.8	$ 3.7	$ 4.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 5.8	$ 1.5	$ 12.7	$ 4.6	$ 1.8	$ 8.2	$ 4.8	$ 1.6	$ 8.8	$ 22.9	$ 11.1	$ 38.9
2021	$ -	$ -	$ -	$ 3.4	$ 2.3	$ 4.7	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.8	$ 4.1	$ 1.5	$ 7.4	$ 4.5	$ 1.5	$ 8.2	$ 12.7	$ 5.6	$ 21.5
2022	$ -	$ -	$ -	$ 3.2	$ 2.1	$ 4.4	$ -	$ -	$ -	$ 2.9	$ 2.8	$ 2.9	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 3.3	$ 0.7	$ 7.9	$ 4.1	$ 1.5	$ 7.3	$ 4.4	$ 1.4	$ 8.0	$ 17.9	$ 8.6	$ 30.6
2023	$ -	$ -	$ -	$ 3.0	$ 2.0	$ 4.1	$ -	$ -	$ -	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 1.6	$ 0.5	$ 3.4	$ 3.8	$ 1.4	$ 6.9	$ 4.1	$ 1.4	$ 7.6	$ 13.6	$ 6.2	$ 23.1
2024	$ -	$ -	$ -	$ 2.8	$ 1.9	$ 3.8	$ -	$ -	$ -	$ 2.6	$ 2.6	$ 2.7	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 2.9	$ 0.6	$ 7.3	$ 3.8	$ 1.4	$ 6.8	$ 4.0	$ 1.3	$ 7.4	$ 16.2	$ 7.8	$ 28.2
2025	$ -	$ -	$ -	$ 2.6	$ 1.8	$ 3.6	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.5	$ 3.4	$ 1.2	$ 6.2	$ 3.8	$ 1.3	$ 6.9	$ 10.2	$ 4.5	$ 17.5
2026	$ -	$ -	$ -	$ 2.4	$ 1.6	$ 3.3	$ -	$ -	$ -	$ 2.4	$ 2.3	$ 2.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 2.2	$ 0.4	$ 5.7	$ 3.3	$ 1.2	$ 6.0	$ 3.6	$ 1.2	$ 6.7	$ 14.1	$ 6.7	$ 24.3
2027	$ -	$ -	$ -	$ 2.3	$ 1.5	$ 3.1	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.1	$ -	$ 0.4	$ 3.0	$ 1.1	$ 5.5	$ 3.4	$ 1.1	$ 6.3	$ 9.1	$ 3.9	$ 15.6
2028	$ -	$ -	$ -	$ 2.1	$ 1.4	$ 2.9	$ -	$ -	$ -	$ 2.3	$ 2.2	$ 2.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 2.3	$ 0.4	$ 5.8	$ 3.0	$ 1.1	$ 5.5	$ 3.3	$ 1.1	$ 6.0	$ 13.1	$ 6.3	$ 22.7
2029	$ -	$ -	$ -	$ 2.0	$ 1.3	$ 2.7	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.3	$ 0.0	$ 0.8	$ 2.8	$ 1.0	$ 5.0	$ 3.1	$ 1.0	$ 5.6	$ 8.5	$ 3.8	$ 14.6
Total	**$ 15.5**	**$ 15.5**	**$ 15.5**	**$ 97.1**	**$ 65.5**	**$ 133.4**	**$ -**	**$ -**	**$ -**	**$ 62.8**	**$ 60.3**	**$ 65.3**	**$ -**	**$ -**	**$ -**	**$ 4.8**	**$ 2.8**	**$ 7.1**	**$ 209.5**	**$ 85.0**	**$ 390.6**	**$ 102.6**	**$ 42.1**	**$ 179.0**	**$ 97.0**	**$ 31.0**	**$ 179.0**	**$ 589.3**	**$ 302.2**	**$ 970.0**
Ann.	**$ 1.3**	**$ 1.3**	**$ 1.3**	**$ 8.3**	**$ 5.6**	**$ 11.4**	**$ -**	**$ -**	**$ -**	**$ 5.4**	**$ 5.2**	**$ 5.6**	**$ -**	**$ -**	**$ -**	**$ 0.4**	**$ 0.2**	**$ 0.6**	**$ 18.0**	**$ 7.3**	**$ 33.5**	**$ 8.8**	**$ 3.6**	**$ 15.4**	**$ 8.3**	**$ 2.7**	**$ 15.4**	**$ 50.6**	**$ 25.9**	**$ 83.2**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.5a Primacy Agency Rule Activity Costs, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2006	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2007	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2008	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 3.0	$ 2.0	$ 4.1	$ 0.0	$ 0.0	$ 0.1	$ 15.8	$ 13.6	$ 18.1
2009	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ 0.0	$ 0.0	$ 12.4	$ 11.3	$ 13.5
2010	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.4	$ -	$ -	$ -	$ 1.3	$ 0.8	$ 1.8	$ 0.0	$ 0.0	$ 0.0	$ 13.7	$ 12.2	$ 15.4
2011	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ 0.0	$ 0.0	$ 12.4	$ 11.3	$ 13.5
2012	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ -	$ -	$ -	$ 1.0	$ 0.6	$ 1.5	$ 0.0	$ -	$ 0.0	$ 13.4	$ 11.9	$ 15.0
2013	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ 0.0	$ -	$ 0.0	$ 12.5	$ 11.4	$ 13.7
2014	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ -	$ -	$ -	$ 0.8	$ 0.4	$ 1.2	$ 0.0	$ -	$ 0.0	$ 13.1	$ 11.7	$ 14.6
2015	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2016	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.6	$ 0.3	$ 1.0	$ 0.0	$ -	$ 0.0	$ 12.9	$ 11.6	$ 14.4
2017	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 12.3	$ 11.3	$ 13.3
2018	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.6	$ 0.3	$ 1.0	$ 0.0	$ -	$ 0.0	$ 12.9	$ 11.6	$ 14.4
2019	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2020	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.8	$ 0.0	$ -	$ 0.0	$ 12.8	$ 11.5	$ 14.1
2021	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2022	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.0	$ -	$ 0.0	$ 12.6	$ 11.4	$ 13.8
2023	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 12.4	$ 11.3	$ 13.5
2024	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.6	$ 0.0	$ -	$ 0.0	$ 12.6	$ 11.3	$ 13.8
2025	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2026	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.0	$ -	$ 0.0	$ 12.5	$ 11.3	$ 13.8
2027	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2028	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.7	$ 0.0	$ -	$ 0.0	$ 12.6	$ 11.4	$ 13.9
2029	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.5b Present Value of Primacy Agency Rule Activity Costs at 3 Percent, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2006	$ 4.1	$ 4.1	$ 4.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.1	$ 4.1	$ 4.1
2007	$ 4.0	$ 4.0	$ 4.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.0	$ 4.0	$ 4.0
2008	$ 9.0	$ 9.0	$ 9.0	$ 2.1	$ 1.2	$ 3.0	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ 2.7	$ 1.9	$ 3.8	$ 0.0	$ 0.0	$ 0.1	$ 14.4	$ 12.5	$ 16.6
2009	$ 8.8	$ 8.8	$ 8.8	$ 2.1	$ 1.2	$ 2.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ 0.0	$ 0.0	$ 11.0	$ 10.1	$ 12.0
2010	$ 8.5	$ 8.5	$ 8.5	$ 2.0	$ 1.2	$ 2.8	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ -	$ -	$ -	$ 1.1	$ 0.7	$ 1.6	$ 0.0	$ 0.0	$ 0.0	$ 11.9	$ 10.5	$ 13.3
2011	$ 8.3	$ 8.3	$ 8.3	$ 2.0	$ 1.1	$ 2.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 10.4	$ 9.5	$ 11.3
2012	$ 8.0	$ 8.0	$ 8.0	$ 1.9	$ 1.1	$ 2.7	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.8	$ 0.5	$ 1.2	$ 0.0	$ -	$ 0.0	$ 10.9	$ 9.7	$ 12.2
2013	$ 7.8	$ 7.8	$ 7.8	$ 1.8	$ 1.1	$ 2.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.0	$ -	$ 0.0	$ 9.9	$ 9.0	$ 10.8
2014	$ 7.6	$ 7.6	$ 7.6	$ 1.8	$ 1.0	$ 2.5	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.6	$ 0.3	$ 0.9	$ 0.0	$ -	$ 0.0	$ 10.1	$ 9.0	$ 11.2
2015	$ 7.3	$ 7.3	$ 7.3	$ 1.7	$ 1.0	$ 2.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 9.1	$ 8.4	$ 9.8
2016	$ 7.1	$ 7.1	$ 7.1	$ 1.7	$ 1.0	$ 2.4	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 0.0	$ -	$ 0.0	$ 9.3	$ 8.4	$ 10.4
2017	$ 6.9	$ 6.9	$ 6.9	$ 1.6	$ 1.0	$ 2.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 8.6	$ 7.9	$ 9.3
2018	$ 6.7	$ 6.7	$ 6.7	$ 1.6	$ 0.9	$ 2.2	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 0.0	$ -	$ 0.0	$ 8.8	$ 7.9	$ 9.8
2019	$ 6.5	$ 6.5	$ 6.5	$ 1.5	$ 0.9	$ 2.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 8.1	$ 7.4	$ 8.7
2020	$ 6.3	$ 6.3	$ 6.3	$ 1.5	$ 0.9	$ 2.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.0	$ -	$ 0.0	$ 8.2	$ 7.4	$ 9.1
2021	$ 6.1	$ 6.1	$ 6.1	$ 1.5	$ 0.8	$ 2.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 7.6	$ 7.0	$ 8.2
2022	$ 6.0	$ 6.0	$ 6.0	$ 1.4	$ 0.8	$ 2.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 7.6	$ 6.9	$ 8.4
2023	$ 5.8	$ 5.8	$ 5.8	$ 1.4	$ 0.8	$ 1.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 0.0	$ -	$ 0.0	$ 7.3	$ 6.7	$ 7.9
2024	$ 5.6	$ 5.6	$ 5.6	$ 1.3	$ 0.8	$ 1.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 7.2	$ 6.5	$ 7.9
2025	$ 5.5	$ 5.5	$ 5.5	$ 1.3	$ 0.8	$ 1.8	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 6.8	$ 6.2	$ 7.3
2026	$ 5.3	$ 5.3	$ 5.3	$ 1.3	$ 0.7	$ 1.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 6.7	$ 6.1	$ 7.4
2027	$ 5.1	$ 5.1	$ 5.1	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 6.4	$ 5.9	$ 6.9
2028	$ 5.0	$ 5.0	$ 5.0	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 6.4	$ 5.8	$ 7.1
2029	$ 4.8	$ 4.8	$ 4.8	$ 1.1	$ 0.7	$ 1.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 6.0	$ 5.5	$ 6.5
Total	**$ 160.2**	**$ 160.2**	**$ 160.2**	**$ 35.0**	**$ 20.4**	**$ 49.5**	**$ -**	**$ -**	**$ -**	**$ 1.5**	**$ 0.9**	**$ 2.3**	**$ -**	**$ -**	**$ -**	**$ 8.0**	**$ 4.6**	**$ 12.1**	**$ 0.1**	**$ 0.0**	**$ 0.2**	**$ 204.9**	**$ 186.1**	**$ 224.3**
Ann.	**$ 9.2**	**$ 9.2**	**$ 9.2**	**$ 2.0**	**$ 1.2**	**$ 2.8**	**$ -**	**$ -**	**$ -**	**$ 0.1**	**$ 0.0**	**$ 0.1**	**$ -**	**$ -**	**$ -**	**$ 0.5**	**$ 0.3**	**$ 0.7**	**$ 0.0**	**$ 0.0**	**$ 0.0**	**$ 11.8**	**$ 10.7**	**$ 12.9**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.5c Present Value of Primacy Agency Rule Activity Costs at 7 Percent, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2006	$ 3.9	$ 3.9	$ 3.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.9	$ 3.9	$ 3.9
2007	$ 3.7	$ 3.7	$ 3.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.7	$ 3.7	$ 3.7
2008	$ 8.0	$ 8.0	$ 8.0	$ 1.9	$ 1.1	$ 2.7	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 2.4	$ 1.7	$ 3.4	$ 0.0	$ 0.0	$ 0.0	$ 12.9	$ 11.1	$ 14.8
2009	$ 7.5	$ 7.5	$ 7.5	$ 1.8	$ 1.0	$ 2.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 9.5	$ 8.7	$ 10.3
2010	$ 7.0	$ 7.0	$ 7.0	$ 1.7	$ 1.0	$ 2.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ -	$ -	$ -	$ 0.9	$ 0.6	$ 1.3	$ 0.0	$ 0.0	$ 0.0	$ 9.8	$ 8.7	$ 11.0
2011	$ 6.6	$ 6.6	$ 6.6	$ 1.6	$ 0.9	$ 2.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 8.3	$ 7.6	$ 9.0
2012	$ 6.1	$ 6.1	$ 6.1	$ 1.5	$ 0.8	$ 2.1	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.6	$ 0.3	$ 0.9	$ 0.0	$ -	$ 0.0	$ 8.3	$ 7.4	$ 9.3
2013	$ 5.7	$ 5.7	$ 5.7	$ 1.4	$ 0.8	$ 1.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 7.3	$ 6.6	$ 8.0
2014	$ 5.4	$ 5.4	$ 5.4	$ 1.3	$ 0.7	$ 1.8	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 0.0	$ -	$ 0.0	$ 7.1	$ 6.4	$ 8.0
2015	$ 5.0	$ 5.0	$ 5.0	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 6.2	$ 5.7	$ 6.7
2016	$ 4.7	$ 4.7	$ 4.7	$ 1.1	$ 0.6	$ 1.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.0	$ -	$ 0.0	$ 6.1	$ 5.5	$ 6.8
2017	$ 4.4	$ 4.4	$ 4.4	$ 1.0	$ 0.6	$ 1.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 5.5	$ 5.0	$ 5.9
2018	$ 4.1	$ 4.1	$ 4.1	$ 1.0	$ 0.6	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.4	$ 0.0	$ -	$ 0.0	$ 5.4	$ 4.8	$ 6.0
2019	$ 3.8	$ 3.8	$ 3.8	$ 0.9	$ 0.5	$ 1.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 4.7	$ 4.3	$ 5.1
2020	$ 3.6	$ 3.6	$ 3.6	$ 0.8	$ 0.5	$ 1.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 4.6	$ 4.2	$ 5.1
2021	$ 3.3	$ 3.3	$ 3.3	$ 0.8	$ 0.5	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 4.1	$ 3.8	$ 4.5
2022	$ 3.1	$ 3.1	$ 3.1	$ 0.7	$ 0.4	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ -	$ 0.0	$ 4.0	$ 3.6	$ 4.4
2023	$ 2.9	$ 2.9	$ 2.9	$ 0.7	$ 0.4	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 3.7	$ 3.4	$ 4.0
2024	$ 2.7	$ 2.7	$ 2.7	$ 0.6	$ 0.4	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ -	$ 0.0	$ 3.5	$ 3.1	$ 3.8
2025	$ 2.5	$ 2.5	$ 2.5	$ 0.6	$ 0.4	$ 0.9	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 3.2	$ 2.9	$ 3.4
2026	$ 2.4	$ 2.4	$ 2.4	$ 0.6	$ 0.3	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 3.0	$ 2.7	$ 3.3
2027	$ 2.2	$ 2.2	$ 2.2	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 2.8	$ 2.5	$ 3.0
2028	$ 2.1	$ 2.1	$ 2.1	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 2.7	$ 2.4	$ 2.9
2029	$ 1.9	$ 1.9	$ 1.9	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 2.4	$ 2.2	$ 2.6
Total	**$ 107.0**	**$ 107.0**	**$ 107.0**	**$ 22.5**	**$ 13.1**	**$ 31.8**	**$ -**	**$ -**	**$ -**	**$ 1.1**	**$ 0.7**	**$ 1.7**	**$ -**	**$ -**	**$ -**	**$ 6.1**	**$ 3.6**	**$ 9.0**	**$ 0.1**	**$ 0.0**	**$ 0.1**	**$ 136.8**	**$ 124.4**	**$ 149.7**
Ann.	**$ 9.2**	**$ 9.2**	**$ 9.2**	**$ 1.9**	**$ 1.1**	**$ 2.7**	**$ -**	**$ -**	**$ -**	**$ 0.1**	**$ 0.1**	**$ 0.1**	**$ -**	**$ -**	**$ -**	**$ 0.5**	**$ 0.3**	**$ 0.8**	**$ 0.0**	**$ 0.0**	**$ 0.0**	**$ 11.7**	**$ 10.7**	**$ 12.8**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.6a Total Activity Costs for Option 1, by Year, for All PWSs

Year	CWSs			NTNCWSs			TNCWSs			Grand Total		
	Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound	
		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2007	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2008	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2009	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2010	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2011	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2012	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2013	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2014	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2015	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2016	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2017	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2018	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2019	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2020	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2021	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2022	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2023	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2024	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2025	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2026	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2027	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2028	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6
2029	$ 3.0	$ 2.0	$ 4.2	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.7	$ 10.0	$ 6.8	$ 13.6

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.6b Present Value of Total Activity Costs at 3 Percent for Option 1, by Year, for All PWSs

Year	CWSs			NTNCWSs			TNCWSs			Grand Total		
	Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound	
		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.4	$ 5.4	$ 5.4
2007	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 3.0	$ 3.0	$ 3.0	$ 5.2	$ 5.2	$ 5.2
2008	$ 2.8	$ 1.9	$ 3.8	$ 1.1	$ 0.8	$ 1.6	$ 5.2	$ 3.6	$ 7.1	$ 9.1	$ 6.2	$ 12.4
2009	$ 2.7	$ 1.8	$ 3.7	$ 1.1	$ 0.8	$ 1.5	$ 5.1	$ 3.5	$ 6.9	$ 8.9	$ 6.0	$ 12.1
2010	$ 2.6	$ 1.7	$ 3.6	$ 1.1	$ 0.7	$ 1.5	$ 4.9	$ 3.4	$ 6.7	$ 8.6	$ 5.8	$ 11.7
2011	$ 2.6	$ 1.7	$ 3.5	$ 1.1	$ 0.7	$ 1.4	$ 4.8	$ 3.3	$ 6.5	$ 8.4	$ 5.7	$ 11.4
2012	$ 2.5	$ 1.6	$ 3.4	$ 1.0	$ 0.7	$ 1.4	$ 4.6	$ 3.2	$ 6.3	$ 8.1	$ 5.5	$ 11.1
2013	$ 2.4	$ 1.6	$ 3.3	$ 1.0	$ 0.7	$ 1.3	$ 4.5	$ 3.1	$ 6.1	$ 7.9	$ 5.3	$ 10.7
2014	$ 2.3	$ 1.6	$ 3.2	$ 1.0	$ 0.7	$ 1.3	$ 4.4	$ 3.0	$ 5.9	$ 7.7	$ 5.2	$ 10.4
2015	$ 2.3	$ 1.5	$ 3.1	$ 0.9	$ 0.6	$ 1.3	$ 4.2	$ 2.9	$ 5.7	$ 7.4	$ 5.0	$ 10.1
2016	$ 2.2	$ 1.5	$ 3.0	$ 0.9	$ 0.6	$ 1.2	$ 4.1	$ 2.8	$ 5.6	$ 7.2	$ 4.9	$ 9.8
2017	$ 2.1	$ 1.4	$ 2.9	$ 0.9	$ 0.6	$ 1.2	$ 4.0	$ 2.7	$ 5.4	$ 7.0	$ 4.8	$ 9.5
2018	$ 2.1	$ 1.4	$ 2.8	$ 0.9	$ 0.6	$ 1.2	$ 3.9	$ 2.7	$ 5.3	$ 6.8	$ 4.6	$ 9.3
2019	$ 2.0	$ 1.3	$ 2.8	$ 0.8	$ 0.6	$ 1.1	$ 3.8	$ 2.6	$ 5.1	$ 6.6	$ 4.5	$ 9.0
2020	$ 2.0	$ 1.3	$ 2.7	$ 0.8	$ 0.5	$ 1.1	$ 3.6	$ 2.5	$ 5.0	$ 6.4	$ 4.3	$ 8.7
2021	$ 1.9	$ 1.3	$ 2.6	$ 0.8	$ 0.5	$ 1.1	$ 3.5	$ 2.4	$ 4.8	$ 6.2	$ 4.2	$ 8.5
2022	$ 1.8	$ 1.2	$ 2.5	$ 0.8	$ 0.5	$ 1.0	$ 3.4	$ 2.4	$ 4.7	$ 6.0	$ 4.1	$ 8.2
2023	$ 1.8	$ 1.2	$ 2.5	$ 0.7	$ 0.5	$ 1.0	$ 3.3	$ 2.3	$ 4.5	$ 5.9	$ 4.0	$ 8.0
2024	$ 1.7	$ 1.2	$ 2.4	$ 0.7	$ 0.5	$ 1.0	$ 3.2	$ 2.2	$ 4.4	$ 5.7	$ 3.9	$ 7.8
2025	$ 1.7	$ 1.1	$ 2.3	$ 0.7	$ 0.5	$ 0.9	$ 3.1	$ 2.2	$ 4.3	$ 5.5	$ 3.8	$ 7.5
2026	$ 1.6	$ 1.1	$ 2.2	$ 0.7	$ 0.5	$ 0.9	$ 3.1	$ 2.1	$ 4.1	$ 5.4	$ 3.6	$ 7.3
2027	$ 1.6	$ 1.1	$ 2.2	$ 0.7	$ 0.4	$ 0.9	$ 3.0	$ 2.0	$ 4.0	$ 5.2	$ 3.5	$ 7.1
2028	$ 1.5	$ 1.0	$ 2.1	$ 0.6	$ 0.4	$ 0.9	$ 2.9	$ 2.0	$ 3.9	$ 5.1	$ 3.4	$ 6.9
2029	$ 1.5	$ 1.0	$ 2.1	$ 0.6	$ 0.4	$ 0.8	$ 2.8	$ 1.9	$ 3.8	$ 4.9	$ 3.3	$ 6.7
Total	**$ 50.7**	**$ 35.3**	**$ 67.6**	**$ 20.9**	**$ 14.9**	**$ 27.7**	**$ 94.6**	**$ 67.7**	**$ 125.1**	**$ 166.1**	**$ 117.9**	**$ 220.4**
Ann.	**$ 2.9**	**$ 2.0**	**$ 3.9**	**$ 1.2**	**$ 0.9**	**$ 1.6**	**$ 5.4**	**$ 3.9**	**$ 7.2**	**$ 9.5**	**$ 6.8**	**$ 12.7**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.6c Present Value of Total Rule Costs at 7 Percent for Option 1, by Year, for All PWSs

	CWSs			NTNCWSs			TNCWSs			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 2.9	$ 2.9	$ 2.9	$ 5.2	$ 5.2	$ 5.2
2007	$ 1.5	$ 1.5	$ 1.5	$ 0.6	$ 0.6	$ 0.6	$ 2.7	$ 2.7	$ 2.7	$ 4.8	$ 4.8	$ 4.8
2008	$ 2.5	$ 1.7	$ 3.4	$ 1.0	$ 0.7	$ 1.4	$ 4.6	$ 3.2	$ 6.3	$ 8.2	$ 5.5	$ 11.1
2009	$ 2.3	$ 1.5	$ 3.2	$ 1.0	$ 0.7	$ 1.3	$ 4.3	$ 3.0	$ 5.9	$ 7.6	$ 5.2	$ 10.4
2010	$ 2.2	$ 1.4	$ 3.0	$ 0.9	$ 0.6	$ 1.2	$ 4.1	$ 2.8	$ 5.5	$ 7.1	$ 4.8	$ 9.7
2011	$ 2.0	$ 1.3	$ 2.8	$ 0.8	$ 0.6	$ 1.1	$ 3.8	$ 2.6	$ 5.1	$ 6.7	$ 4.5	$ 9.1
2012	$ 1.9	$ 1.3	$ 2.6	$ 0.8	$ 0.5	$ 1.1	$ 3.5	$ 2.4	$ 4.8	$ 6.2	$ 4.2	$ 8.5
2013	$ 1.8	$ 1.2	$ 2.4	$ 0.7	$ 0.5	$ 1.0	$ 3.3	$ 2.3	$ 4.5	$ 5.8	$ 3.9	$ 7.9
2014	$ 1.7	$ 1.1	$ 2.3	$ 0.7	$ 0.5	$ 0.9	$ 3.1	$ 2.1	$ 4.2	$ 5.4	$ 3.7	$ 7.4
2015	$ 1.5	$ 1.0	$ 2.1	$ 0.6	$ 0.4	$ 0.9	$ 2.9	$ 2.0	$ 3.9	$ 5.1	$ 3.4	$ 6.9
2016	$ 1.4	$ 1.0	$ 2.0	$ 0.6	$ 0.4	$ 0.8	$ 2.7	$ 1.9	$ 3.7	$ 4.7	$ 3.2	$ 6.5
2017	$ 1.4	$ 0.9	$ 1.9	$ 0.6	$ 0.4	$ 0.8	$ 2.5	$ 1.7	$ 3.4	$ 4.4	$ 3.0	$ 6.0
2018	$ 1.3	$ 0.8	$ 1.7	$ 0.5	$ 0.4	$ 0.7	$ 2.4	$ 1.6	$ 3.2	$ 4.1	$ 2.8	$ 5.6
2019	$ 1.2	$ 0.8	$ 1.6	$ 0.5	$ 0.3	$ 0.7	$ 2.2	$ 1.5	$ 3.0	$ 3.9	$ 2.6	$ 5.3
2020	$ 1.1	$ 0.7	$ 1.5	$ 0.5	$ 0.3	$ 0.6	$ 2.1	$ 1.4	$ 2.8	$ 3.6	$ 2.5	$ 4.9
2021	$ 1.0	$ 0.7	$ 1.4	$ 0.4	$ 0.3	$ 0.6	$ 1.9	$ 1.3	$ 2.6	$ 3.4	$ 2.3	$ 4.6
2022	$ 1.0	$ 0.6	$ 1.3	$ 0.4	$ 0.3	$ 0.5	$ 1.8	$ 1.2	$ 2.4	$ 3.2	$ 2.1	$ 4.3
2023	$ 0.9	$ 0.6	$ 1.2	$ 0.4	$ 0.3	$ 0.5	$ 1.7	$ 1.2	$ 2.3	$ 3.0	$ 2.0	$ 4.0
2024	$ 0.8	$ 0.6	$ 1.2	$ 0.3	$ 0.2	$ 0.5	$ 1.6	$ 1.1	$ 2.1	$ 2.8	$ 1.9	$ 3.8
2025	$ 0.8	$ 0.5	$ 1.1	$ 0.3	$ 0.2	$ 0.4	$ 1.5	$ 1.0	$ 2.0	$ 2.6	$ 1.8	$ 3.5
2026	$ 0.7	$ 0.5	$ 1.0	$ 0.3	$ 0.2	$ 0.4	$ 1.4	$ 0.9	$ 1.9	$ 2.4	$ 1.6	$ 3.3
2027	$ 0.7	$ 0.5	$ 0.9	$ 0.3	$ 0.2	$ 0.4	$ 1.3	$ 0.9	$ 1.7	$ 2.3	$ 1.5	$ 3.1
2028	$ 0.6	$ 0.4	$ 0.9	$ 0.3	$ 0.2	$ 0.4	$ 1.2	$ 0.8	$ 1.6	$ 2.1	$ 1.4	$ 2.9
2029	$ 0.6	$ 0.4	$ 0.8	$ 0.2	$ 0.2	$ 0.3	$ 1.1	$ 0.8	$ 1.5	$ 2.0	$ 1.3	$ 2.7
Total	**$ 34.2**	**$ 24.3**	**$ 45.0**	**$ 14.1**	**$ 10.2**	**$ 18.4**	**$ 63.7**	**$ 46.5**	**$ 83.4**	**$ 112.0**	**$ 81.0**	**$ 146.9**
Ann.	**$ 2.9**	**$ 2.1**	**$ 3.9**	**$ 1.2**	**$ 0.9**	**$ 1.6**	**$ 5.5**	**$ 4.0**	**$ 7.2**	**$ 9.6**	**$ 7.0**	**$ 12.6**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.6d Primacy Agency Activity Costs for Option 1, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2006	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2007	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2008	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2009	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2010	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2011	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2012	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2013	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2014	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2015	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2016	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2017	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2018	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2019	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2020	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2021	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2022	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2023	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2024	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2025	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2026	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2027	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2028	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4
2029	$ 3.9	$ 3.9	$ 3.9	$ 2.4	$ 1.4	$ 3.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6.4	$ 5.3	$ 7.4

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.6e Present Value of Primacy Agency Rule Activity Costs for Option 1 at 3 Percent, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2006	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2007	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.7	$ 1.7	$ 1.7
2008	$ 3.6	$ 3.6	$ 3.6	$ 2.2	$ 1.3	$ 3.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.8	$ 4.9	$ 6.7
2009	$ 3.5	$ 3.5	$ 3.5	$ 2.2	$ 1.3	$ 3.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.6	$ 4.7	$ 6.5
2010	$ 3.4	$ 3.4	$ 3.4	$ 2.1	$ 1.2	$ 3.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.5	$ 4.6	$ 6.3
2011	$ 3.3	$ 3.3	$ 3.3	$ 2.0	$ 1.2	$ 2.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.3	$ 4.5	$ 6.2
2012	$ 3.2	$ 3.2	$ 3.2	$ 2.0	$ 1.1	$ 2.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.2	$ 4.3	$ 6.0
2013	$ 3.1	$ 3.1	$ 3.1	$ 1.9	$ 1.1	$ 2.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.0	$ 4.2	$ 5.8
2014	$ 3.0	$ 3.0	$ 3.0	$ 1.9	$ 1.1	$ 2.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.9	$ 4.1	$ 5.6
2015	$ 2.9	$ 2.9	$ 2.9	$ 1.8	$ 1.0	$ 2.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.7	$ 4.0	$ 5.5
2016	$ 2.8	$ 2.8	$ 2.8	$ 1.8	$ 1.0	$ 2.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.6	$ 3.9	$ 5.3
2017	$ 2.8	$ 2.8	$ 2.8	$ 1.7	$ 1.0	$ 2.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.5	$ 3.7	$ 5.2
2018	$ 2.7	$ 2.7	$ 2.7	$ 1.7	$ 1.0	$ 2.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.3	$ 3.6	$ 5.0
2019	$ 2.6	$ 2.6	$ 2.6	$ 1.6	$ 0.9	$ 2.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 3.5	$ 4.9
2020	$ 2.5	$ 2.5	$ 2.5	$ 1.6	$ 0.9	$ 2.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.1	$ 3.4	$ 4.7
2021	$ 2.4	$ 2.4	$ 2.4	$ 1.5	$ 0.9	$ 2.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.0	$ 3.3	$ 4.6
2022	$ 2.4	$ 2.4	$ 2.4	$ 1.5	$ 0.9	$ 2.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.8	$ 3.2	$ 4.4
2023	$ 2.3	$ 2.3	$ 2.3	$ 1.4	$ 0.8	$ 2.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.7	$ 3.1	$ 4.3
2024	$ 2.2	$ 2.2	$ 2.2	$ 1.4	$ 0.8	$ 2.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.6	$ 3.0	$ 4.2
2025	$ 2.2	$ 2.2	$ 2.2	$ 1.3	$ 0.8	$ 1.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.5	$ 3.0	$ 4.1
2026	$ 2.1	$ 2.1	$ 2.1	$ 1.3	$ 0.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.4	$ 2.9	$ 4.0
2027	$ 2.1	$ 2.1	$ 2.1	$ 1.3	$ 0.7	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.3	$ 2.8	$ 3.8
2028	$ 2.0	$ 2.0	$ 2.0	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.2	$ 2.7	$ 3.7
2029	$ 1.9	$ 1.9	$ 1.9	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.1	$ 2.6	$ 3.6
Total	**$ 64.4**	**$ 64.4**	**$ 64.4**	**$ 36.4**	**$ 21.1**	**$ 51.4**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 100.9**	**$ 85.6**	**$ 115.8**
Ann.	**$ 3.7**	**$ 3.7**	**$ 3.7**	**$ 2.1**	**$ 1.2**	**$ 3.0**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 5.8**	**$ 4.9**	**$ 6.7**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.6f Present Value of Primacy Agency Rule Activity Costs for Option 1 at 7 Percent, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2006	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.7	$ 1.7	$ 1.7
2007	$ 1.6	$ 1.6	$ 1.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.6	$ 1.6	$ 1.6
2008	$ 3.2	$ 3.2	$ 3.2	$ 2.0	$ 1.1	$ 2.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.2	$ 4.4	$ 6.0
2009	$ 3.0	$ 3.0	$ 3.0	$ 1.9	$ 1.1	$ 2.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.8	$ 4.1	$ 5.6
2010	$ 2.8	$ 2.8	$ 2.8	$ 1.7	$ 1.0	$ 2.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.5	$ 3.8	$ 5.2
2011	$ 2.6	$ 2.6	$ 2.6	$ 1.6	$ 0.9	$ 2.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 3.6	$ 4.9
2012	$ 2.4	$ 2.4	$ 2.4	$ 1.5	$ 0.9	$ 2.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.0	$ 3.3	$ 4.6
2013	$ 2.3	$ 2.3	$ 2.3	$ 1.4	$ 0.8	$ 2.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.7	$ 3.1	$ 4.3
2014	$ 2.1	$ 2.1	$ 2.1	$ 1.3	$ 0.8	$ 1.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.5	$ 2.9	$ 4.0
2015	$ 2.0	$ 2.0	$ 2.0	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.2	$ 2.7	$ 3.7
2016	$ 1.9	$ 1.9	$ 1.9	$ 1.2	$ 0.7	$ 1.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.0	$ 2.5	$ 3.5
2017	$ 1.7	$ 1.7	$ 1.7	$ 1.1	$ 0.6	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.8	$ 2.4	$ 3.3
2018	$ 1.6	$ 1.6	$ 1.6	$ 1.0	$ 0.6	$ 1.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.6	$ 2.2	$ 3.1
2019	$ 1.5	$ 1.5	$ 1.5	$ 0.9	$ 0.5	$ 1.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.5	$ 2.1	$ 2.9
2020	$ 1.4	$ 1.4	$ 1.4	$ 0.9	$ 0.5	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.3	$ 1.9	$ 2.7
2021	$ 1.3	$ 1.3	$ 1.3	$ 0.8	$ 0.5	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.2	$ 1.8	$ 2.5
2022	$ 1.2	$ 1.2	$ 1.2	$ 0.8	$ 0.4	$ 1.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.0	$ 1.7	$ 2.3
2023	$ 1.2	$ 1.2	$ 1.2	$ 0.7	$ 0.4	$ 1.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.9	$ 1.6	$ 2.2
2024	$ 1.1	$ 1.1	$ 1.1	$ 0.7	$ 0.4	$ 0.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.5	$ 2.0
2025	$ 1.0	$ 1.0	$ 1.0	$ 0.6	$ 0.4	$ 0.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.6	$ 1.4	$ 1.9
2026	$ 0.9	$ 0.9	$ 0.9	$ 0.6	$ 0.3	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.5	$ 1.3	$ 1.8
2027	$ 0.9	$ 0.9	$ 0.9	$ 0.5	$ 0.3	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.4	$ 1.2	$ 1.7
2028	$ 0.8	$ 0.8	$ 0.8	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.3	$ 1.1	$ 1.6
2029	$ 0.8	$ 0.8	$ 0.8	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.3	$ 1.1	$ 1.4
Total	**$ 43.2**	**$ 43.2**	**$ 43.2**	**$ 23.4**	**$ 13.6**	**$ 33.1**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 66.6**	**$ 56.7**	**$ 76.2**
Ann.	**$ 3.7**	**$ 3.7**	**$ 3.7**	**$ 2.0**	**$ 1.2**	**$ 2.8**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 5.7**	**$ 4.9**	**$ 6.5**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.7a Total Activity Costs for Option 3, by Year, for All PWSs

	CWSs			NTNCWSs			TNCWSs			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2007	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2008	$ 64.2	$ 36.1	$ 100.3	$ 15.0	$ 8.1	$ 24.8	$ 66.1	$ 36.5	$ 106.9	$ 145.2	$ 80.6	$ 232.0
2009	$ 17.6	$ 8.5	$ 29.0	$ 3.4	$ 1.7	$ 5.5	$ 11.8	$ 6.2	$ 18.9	$ 32.8	$ 16.4	$ 53.4
2010	$ 66.7	$ 35.9	$ 106.6	$ 3.0	$ 1.4	$ 5.0	$ 50.9	$ 27.3	$ 83.0	$ 120.6	$ 64.6	$ 194.6
2011	$ 18.5	$ 8.6	$ 31.4	$ 2.9	$ 1.3	$ 4.9	$ 43.7	$ 21.0	$ 73.1	$ 65.1	$ 31.0	$ 109.4
2012	$ 20.9	$ 9.7	$ 36.0	$ 22.7	$ 12.4	$ 35.7	$ 54.6	$ 29.4	$ 88.6	$ 98.2	$ 51.5	$ 160.2
2013	$ 17.0	$ 7.7	$ 28.9	$ 7.1	$ 3.5	$ 11.9	$ 30.8	$ 14.6	$ 53.3	$ 54.9	$ 25.8	$ 94.1
2014	$ 22.8	$ 10.8	$ 39.1	$ 4.1	$ 1.7	$ 7.1	$ 38.1	$ 19.3	$ 63.4	$ 65.0	$ 31.9	$ 109.7
2015	$ 14.0	$ 6.1	$ 24.3	$ 4.0	$ 1.7	$ 7.0	$ 18.6	$ 8.3	$ 31.2	$ 36.7	$ 16.1	$ 62.4
2016	$ 19.0	$ 8.8	$ 33.1	$ 6.8	$ 3.1	$ 11.9	$ 36.6	$ 18.1	$ 62.6	$ 62.4	$ 30.0	$ 107.6
2017	$ 16.7	$ 7.7	$ 28.7	$ 4.3	$ 1.8	$ 7.5	$ 19.5	$ 8.7	$ 33.1	$ 40.5	$ 18.2	$ 69.2
2018	$ 21.2	$ 10.0	$ 36.5	$ 6.5	$ 3.1	$ 11.3	$ 35.1	$ 17.7	$ 59.2	$ 62.9	$ 30.8	$ 106.9
2019	$ 14.4	$ 6.3	$ 24.7	$ 4.4	$ 1.9	$ 7.6	$ 20.2	$ 8.8	$ 34.0	$ 39.0	$ 17.0	$ 66.3
2020	$ 20.8	$ 10.0	$ 36.1	$ 6.7	$ 3.0	$ 11.6	$ 34.6	$ 16.8	$ 59.2	$ 62.1	$ 29.7	$ 106.9
2021	$ 14.6	$ 6.5	$ 25.2	$ 4.6	$ 1.9	$ 7.9	$ 20.8	$ 9.0	$ 35.4	$ 40.1	$ 17.4	$ 68.6
2022	$ 18.5	$ 8.6	$ 32.0	$ 4.5	$ 1.9	$ 7.9	$ 33.9	$ 16.6	$ 57.6	$ 56.9	$ 27.1	$ 97.5
2023	$ 19.0	$ 8.9	$ 32.6	$ 6.5	$ 3.0	$ 11.2	$ 21.4	$ 9.2	$ 36.4	$ 46.9	$ 21.1	$ 80.2
2024	$ 18.5	$ 8.6	$ 32.2	$ 6.6	$ 2.9	$ 11.7	$ 33.6	$ 16.2	$ 57.7	$ 58.7	$ 27.7	$ 101.7
2025	$ 15.1	$ 6.7	$ 25.8	$ 4.8	$ 2.0	$ 8.4	$ 21.9	$ 9.3	$ 37.2	$ 41.7	$ 18.0	$ 71.4
2026	$ 20.4	$ 9.7	$ 35.2	$ 4.8	$ 2.0	$ 8.4	$ 33.2	$ 16.1	$ 56.7	$ 58.4	$ 27.9	$ 100.3
2027	$ 15.3	$ 6.8	$ 26.3	$ 4.8	$ 2.0	$ 8.4	$ 22.3	$ 9.5	$ 37.9	$ 42.3	$ 18.3	$ 72.6
2028	$ 20.3	$ 9.6	$ 35.2	$ 8.2	$ 3.8	$ 14.4	$ 33.0	$ 16.1	$ 56.6	$ 61.5	$ 29.5	$ 106.2
2029	$ 17.2	$ 8.0	$ 29.7	$ 5.0	$ 2.1	$ 8.7	$ 22.7	$ 9.6	$ 38.5	$ 44.9	$ 19.6	$ 76.9

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.7b Present Value of Total Activity Costs at 3 Percent for Option 3, by Year, for All PWSs

	CWSs			NTNCWSs			TNCWSs			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.4	$ 5.4	$ 5.4
2007	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 3.0	$ 3.0	$ 3.0	$ 5.2	$ 5.2	$ 5.2
2008	$ 58.7	$ 33.0	$ 91.8	$ 13.7	$ 7.4	$ 22.7	$ 60.5	$ 33.4	$ 97.8	$ 132.9	$ 73.8	$ 212.3
2009	$ 15.7	$ 7.6	$ 25.8	$ 3.0	$ 1.5	$ 4.9	$ 10.5	$ 5.5	$ 16.8	$ 29.2	$ 14.6	$ 47.4
2010	$ 57.6	$ 31.0	$ 92.0	$ 2.6	$ 1.2	$ 4.3	$ 43.9	$ 23.5	$ 71.6	$ 104.0	$ 55.7	$ 167.9
2011	$ 15.5	$ 7.2	$ 26.3	$ 2.4	$ 1.1	$ 4.1	$ 36.6	$ 17.6	$ 61.2	$ 54.6	$ 25.9	$ 91.6
2012	$ 17.0	$ 7.9	$ 29.3	$ 18.4	$ 10.1	$ 29.0	$ 44.4	$ 23.9	$ 72.0	$ 79.9	$ 41.9	$ 130.3
2013	$ 13.4	$ 6.1	$ 22.8	$ 5.6	$ 2.8	$ 9.4	$ 24.3	$ 11.5	$ 42.1	$ 43.4	$ 20.4	$ 74.3
2014	$ 17.5	$ 8.3	$ 30.0	$ 3.1	$ 1.3	$ 5.4	$ 29.2	$ 14.8	$ 48.6	$ 49.8	$ 24.4	$ 84.0
2015	$ 10.4	$ 4.6	$ 18.1	$ 3.0	$ 1.3	$ 5.2	$ 13.8	$ 6.2	$ 23.2	$ 27.3	$ 12.0	$ 46.5
2016	$ 13.7	$ 6.3	$ 23.9	$ 4.9	$ 2.2	$ 8.6	$ 26.4	$ 13.1	$ 45.3	$ 45.1	$ 21.7	$ 77.7
2017	$ 11.7	$ 5.4	$ 20.1	$ 3.0	$ 1.3	$ 5.2	$ 13.7	$ 6.1	$ 23.2	$ 28.4	$ 12.7	$ 48.6
2018	$ 14.5	$ 6.8	$ 24.9	$ 4.5	$ 2.1	$ 7.7	$ 23.9	$ 12.0	$ 40.3	$ 42.8	$ 20.9	$ 72.8
2019	$ 9.5	$ 4.2	$ 16.3	$ 2.9	$ 1.2	$ 5.1	$ 13.4	$ 5.8	$ 22.5	$ 25.8	$ 11.2	$ 43.8
2020	$ 13.4	$ 6.4	$ 23.2	$ 4.3	$ 1.9	$ 7.5	$ 22.2	$ 10.8	$ 38.0	$ 39.8	$ 19.1	$ 68.6
2021	$ 9.1	$ 4.0	$ 15.7	$ 2.8	$ 1.2	$ 4.9	$ 13.0	$ 5.6	$ 22.1	$ 25.0	$ 10.9	$ 42.8
2022	$ 11.2	$ 5.2	$ 19.4	$ 2.7	$ 1.2	$ 4.8	$ 20.5	$ 10.0	$ 34.8	$ 34.4	$ 16.4	$ 59.0
2023	$ 11.2	$ 5.2	$ 19.2	$ 3.8	$ 1.8	$ 6.6	$ 12.6	$ 5.4	$ 21.4	$ 27.5	$ 12.4	$ 47.1
2024	$ 10.6	$ 4.9	$ 18.4	$ 3.8	$ 1.7	$ 6.7	$ 19.2	$ 9.2	$ 32.9	$ 33.5	$ 15.8	$ 58.0
2025	$ 8.3	$ 3.7	$ 14.3	$ 2.7	$ 1.1	$ 4.6	$ 12.1	$ 5.1	$ 20.6	$ 23.1	$ 10.0	$ 39.5
2026	$ 10.9	$ 5.2	$ 18.9	$ 2.6	$ 1.1	$ 4.5	$ 17.9	$ 8.7	$ 30.5	$ 31.4	$ 15.0	$ 53.9
2027	$ 8.0	$ 3.5	$ 13.7	$ 2.5	$ 1.0	$ 4.4	$ 11.6	$ 5.0	$ 19.8	$ 22.1	$ 9.5	$ 37.9
2028	$ 10.3	$ 4.9	$ 17.8	$ 4.2	$ 1.9	$ 7.3	$ 16.7	$ 8.2	$ 28.7	$ 31.2	$ 15.0	$ 53.8
2029	$ 8.5	$ 3.9	$ 14.6	$ 2.5	$ 1.0	$ 4.3	$ 11.2	$ 4.7	$ 18.9	$ 22.1	$ 9.7	$ 37.8
Total	**$ 361.6**	**$ 180.2**	**$ 601.3**	**$ 101.0**	**$ 49.4**	**$ 169.1**	**$ 506.8**	**$ 255.4**	**$ 841.4**	**$ 969.3**	**$ 485.0**	**$ 1,611.8**
Ann.	**$ 20.8**	**$ 10.4**	**$ 34.5**	**$ 5.8**	**$ 2.8**	**$ 9.7**	**$ 29.1**	**$ 14.7**	**$ 48.3**	**$ 55.7**	**$ 27.9**	**$ 92.6**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.7c Present Value of Total Rule Costs at 7 Percent for Option 3, by Year, for All PWSs

	CWSs			NTNCWSs			TNCWSs			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 2.9	$ 2.9	$ 2.9	$ 5.2	$ 5.2	$ 5.2
2007	$ 1.5	$ 1.5	$ 1.5	$ 0.6	$ 0.6	$ 0.6	$ 2.7	$ 2.7	$ 2.7	$ 4.8	$ 4.8	$ 4.8
2008	$ 52.4	$ 29.4	$ 81.9	$ 12.2	$ 6.6	$ 20.2	$ 53.9	$ 29.8	$ 87.2	$ 118.5	$ 65.8	$ 189.4
2009	$ 13.4	$ 6.5	$ 22.1	$ 2.6	$ 1.3	$ 4.2	$ 9.0	$ 4.7	$ 14.4	$ 25.0	$ 12.5	$ 40.7
2010	$ 47.6	$ 25.6	$ 76.0	$ 2.1	$ 1.0	$ 3.5	$ 36.3	$ 19.4	$ 59.2	$ 86.0	$ 46.1	$ 138.7
2011	$ 12.3	$ 5.7	$ 20.9	$ 1.9	$ 0.9	$ 3.2	$ 29.1	$ 14.0	$ 48.7	$ 43.4	$ 20.6	$ 72.9
2012	$ 13.0	$ 6.0	$ 22.4	$ 14.1	$ 7.7	$ 22.2	$ 34.0	$ 18.3	$ 55.1	$ 61.2	$ 32.1	$ 99.8
2013	$ 9.9	$ 4.5	$ 16.8	$ 4.1	$ 2.1	$ 6.9	$ 17.9	$ 8.5	$ 31.0	$ 32.0	$ 15.0	$ 54.8
2014	$ 12.4	$ 5.9	$ 21.3	$ 2.2	$ 0.9	$ 3.8	$ 20.7	$ 10.5	$ 34.5	$ 35.4	$ 17.3	$ 59.6
2015	$ 7.1	$ 3.1	$ 12.3	$ 2.1	$ 0.9	$ 3.6	$ 9.5	$ 4.2	$ 15.8	$ 18.6	$ 8.2	$ 31.7
2016	$ 9.0	$ 4.2	$ 15.7	$ 3.2	$ 1.5	$ 5.7	$ 17.4	$ 8.6	$ 29.8	$ 29.6	$ 14.2	$ 51.1
2017	$ 7.4	$ 3.4	$ 12.7	$ 1.9	$ 0.8	$ 3.3	$ 8.7	$ 3.8	$ 14.7	$ 18.0	$ 8.1	$ 30.7
2018	$ 8.8	$ 4.2	$ 15.2	$ 2.7	$ 1.3	$ 4.7	$ 14.6	$ 7.3	$ 24.5	$ 26.1	$ 12.8	$ 44.4
2019	$ 5.6	$ 2.4	$ 9.6	$ 1.7	$ 0.7	$ 3.0	$ 7.8	$ 3.4	$ 13.2	$ 15.1	$ 6.6	$ 25.7
2020	$ 7.6	$ 3.6	$ 13.1	$ 2.4	$ 1.1	$ 4.2	$ 12.5	$ 6.1	$ 21.5	$ 22.5	$ 10.8	$ 38.8
2021	$ 5.0	$ 2.2	$ 8.5	$ 1.5	$ 0.7	$ 2.7	$ 7.1	$ 3.1	$ 12.0	$ 13.6	$ 5.9	$ 23.2
2022	$ 5.9	$ 2.7	$ 10.1	$ 1.4	$ 0.6	$ 2.5	$ 10.7	$ 5.3	$ 18.2	$ 18.0	$ 8.6	$ 30.9
2023	$ 5.6	$ 2.6	$ 9.7	$ 1.9	$ 0.9	$ 3.3	$ 6.3	$ 2.7	$ 10.8	$ 13.9	$ 6.2	$ 23.7
2024	$ 5.1	$ 2.4	$ 8.9	$ 1.8	$ 0.8	$ 3.2	$ 9.3	$ 4.5	$ 16.0	$ 16.2	$ 7.7	$ 28.1
2025	$ 3.9	$ 1.7	$ 6.7	$ 1.2	$ 0.5	$ 2.2	$ 5.6	$ 2.4	$ 9.6	$ 10.8	$ 4.6	$ 18.4
2026	$ 4.9	$ 2.4	$ 8.5	$ 1.2	$ 0.5	$ 2.0	$ 8.0	$ 3.9	$ 13.7	$ 14.1	$ 6.7	$ 24.2
2027	$ 3.4	$ 1.5	$ 5.9	$ 1.1	$ 0.4	$ 1.9	$ 5.0	$ 2.2	$ 8.6	$ 9.5	$ 4.1	$ 16.4
2028	$ 4.3	$ 2.0	$ 7.4	$ 1.7	$ 0.8	$ 3.0	$ 7.0	$ 3.4	$ 11.9	$ 13.0	$ 6.2	$ 22.4
2029	$ 3.4	$ 1.6	$ 5.9	$ 1.0	$ 0.4	$ 1.7	$ 4.5	$ 1.9	$ 7.6	$ 8.9	$ 3.9	$ 15.2
Total	**$ 252.8**	**$ 128.5**	**$ 416.5**	**$ 68.2**	**$ 34.3**	**$ 113.1**	**$ 343.9**	**$ 176.8**	**$ 566.9**	**$ 665.0**	**$ 339.6**	**$ 1,096.5**
Ann.	**$ 21.7**	**$ 11.0**	**$ 35.7**	**$ 5.9**	**$ 2.9**	**$ 9.7**	**$ 29.5**	**$ 15.2**	**$ 48.6**	**$ 57.1**	**$ 29.1**	**$ 94.1**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.7d Primacy Agency Activity Costs for Option 3, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2006	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2007	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2008	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 3.0	$ 2.0	$ 4.1	$ 0.0	$ 0.0	$ 0.1	$ 15.8	$ 13.5	$ 18.1
2009	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ 1.9	$ 1.7	$ 2.1	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ 0.0	$ 0.0	$ 14.3	$ 13.0	$ 15.6
2010	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.7	$ 0.2	$ 1.4	$ 2.2	$ 1.3	$ 3.2	$ 0.0	$ 0.0	$ 0.0	$ 15.3	$ 12.8	$ 18.1
2011	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ 5.6	$ 4.9	$ 6.2	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.6	$ 0.3	$ 1.0	$ 0.0	$ 0.0	$ 0.0	$ 18.5	$ 16.6	$ 20.6
2012	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 0.4	$ 0.1	$ 0.7	$ 1.2	$ 0.6	$ 1.8	$ 0.0	$ 0.0	$ 0.0	$ 13.9	$ 12.0	$ 15.8
2013	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.6	$ 0.0	$ -	$ 0.0	$ 12.6	$ 11.4	$ 13.9
2014	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.6	$ 0.3	$ 1.0	$ 0.0	$ -	$ 0.0	$ 12.9	$ 11.6	$ 14.3
2015	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2016	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.8	$ 0.0	$ -	$ 0.0	$ 12.8	$ 11.5	$ 14.1
2017	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 12.3	$ 11.3	$ 13.3
2018	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.8	$ 0.0	$ -	$ 0.0	$ 12.8	$ 11.5	$ 14.1
2019	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2020	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.4	$ 0.1	$ 0.7	$ 0.0	$ -	$ 0.0	$ 12.6	$ 11.4	$ 14.0
2021	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2022	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.0	$ -	$ 0.0	$ 12.5	$ 11.3	$ 13.7
2023	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 12.4	$ 11.3	$ 13.4
2024	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.0	$ -	$ 0.0	$ 12.5	$ 11.3	$ 13.7
2025	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2026	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.0	$ -	$ 0.0	$ 12.5	$ 11.3	$ 13.7
2027	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2
2028	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.0	$ -	$ 0.0	$ 12.5	$ 11.3	$ 13.8
2029	$ 9.9	$ 9.9	$ 9.9	$ 2.3	$ 1.4	$ 3.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 12.2	$ 11.2	$ 13.2

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.7e Present Value of Primacy Agency Rule Activity Costs for Option 3 at 3 Percent, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2006	$ 4.1	$ 4.1	$ 4.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.1	$ 4.1	$ 4.1
2007	$ 4.0	$ 4.0	$ 4.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.0	$ 4.0	$ 4.0
2008	$ 9.0	$ 9.0	$ 9.0	$ 2.1	$ 1.2	$ 3.0	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ 2.7	$ 1.8	$ 3.8	$ 0.0	$ 0.0	$ 0.1	$ 14.4	$ 12.4	$ 16.5
2009	$ 8.8	$ 8.8	$ 8.8	$ 2.1	$ 1.2	$ 2.9	$ 1.7	$ 1.5	$ 1.9	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ 0.0	$ 0.0	$ 12.7	$ 11.6	$ 13.8
2010	$ 8.5	$ 8.5	$ 8.5	$ 2.0	$ 1.2	$ 2.8	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.6	$ 0.2	$ 1.2	$ 1.9	$ 1.1	$ 2.7	$ 0.0	$ 0.0	$ 0.0	$ 13.2	$ 11.1	$ 15.6
2011	$ 8.3	$ 8.3	$ 8.3	$ 1.9	$ 1.1	$ 2.7	$ 4.7	$ 4.1	$ 5.2	$ 0.1	$ 0.1	$ 0.2	$ -	$ -	$ -	$ 0.5	$ 0.3	$ 0.8	$ 0.0	$ 0.0	$ 0.0	$ 15.5	$ 13.9	$ 17.3
2012	$ 8.0	$ 8.0	$ 8.0	$ 1.9	$ 1.1	$ 2.7	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 0.3	$ 0.1	$ 0.6	$ 0.9	$ 0.5	$ 1.4	$ 0.0	$ 0.0	$ 0.0	$ 11.3	$ 9.8	$ 12.9
2013	$ 7.8	$ 7.8	$ 7.8	$ 1.8	$ 1.1	$ 2.6	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.1	$ 0.5	$ 0.0	$ -	$ 0.0	$ 10.0	$ 9.0	$ 11.0
2014	$ 7.6	$ 7.6	$ 7.6	$ 1.8	$ 1.0	$ 2.5	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ -	$ -	$ -	$ 0.5	$ 0.2	$ 0.7	$ 0.0	$ -	$ 0.0	$ 9.9	$ 8.9	$ 11.0
2015	$ 7.3	$ 7.3	$ 7.3	$ 1.7	$ 1.0	$ 2.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 9.1	$ 8.4	$ 9.8
2016	$ 7.1	$ 7.1	$ 7.1	$ 1.7	$ 1.0	$ 2.4	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.6	$ 0.0	$ -	$ 0.0	$ 9.2	$ 8.3	$ 10.2
2017	$ 6.9	$ 6.9	$ 6.9	$ 1.6	$ 1.0	$ 2.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 8.6	$ 7.9	$ 9.3
2018	$ 6.7	$ 6.7	$ 6.7	$ 1.6	$ 0.9	$ 2.2	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.6	$ 0.0	$ -	$ 0.0	$ 8.7	$ 7.8	$ 9.6
2019	$ 6.5	$ 6.5	$ 6.5	$ 1.5	$ 0.9	$ 2.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 8.1	$ 7.4	$ 8.7
2020	$ 6.3	$ 6.3	$ 6.3	$ 1.5	$ 0.9	$ 2.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.0	$ -	$ 0.0	$ 8.1	$ 7.3	$ 9.0
2021	$ 6.1	$ 6.1	$ 6.1	$ 1.4	$ 0.9	$ 2.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 7.6	$ 7.0	$ 8.2
2022	$ 6.0	$ 6.0	$ 6.0	$ 1.4	$ 0.8	$ 2.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 7.6	$ 6.9	$ 8.3
2023	$ 5.8	$ 5.8	$ 5.8	$ 1.4	$ 0.8	$ 1.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ -	$ 0.0	$ 7.3	$ 6.6	$ 7.9
2024	$ 5.6	$ 5.6	$ 5.6	$ 1.3	$ 0.8	$ 1.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.3	$ 0.0	$ -	$ 0.0	$ 7.1	$ 6.5	$ 7.8
2025	$ 5.5	$ 5.5	$ 5.5	$ 1.3	$ 0.8	$ 1.8	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 6.7	$ 6.2	$ 7.3
2026	$ 5.3	$ 5.3	$ 5.3	$ 1.3	$ 0.7	$ 1.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ -	$ 0.0	$ 6.7	$ 6.1	$ 7.3
2027	$ 5.1	$ 5.1	$ 5.1	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 6.4	$ 5.9	$ 6.9
2028	$ 5.0	$ 5.0	$ 5.0	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 6.4	$ 5.7	$ 7.0
2029	$ 4.8	$ 4.8	$ 4.8	$ 1.1	$ 0.7	$ 1.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 6.0	$ 5.5	$ 6.5
Total	**$ 160.2**	**$ 160.2**	**$ 160.2**	**$ 34.9**	**$ 20.5**	**$ 49.3**	**$ 6.4**	**$ 5.6**	**$ 7.1**	**$ 1.4**	**$ 0.8**	**$ 2.2**	**$ 0.9**	**$ 0.2**	**$ 1.7**	**$ 8.8**	**$ 4.8**	**$ 13.4**	**$ 0.1**	**$ 0.0**	**$ 0.2**	**$ 212.7**	**$ 192.2**	**$ 234.1**
Ann.	**$ 9.2**	**$ 9.2**	**$ 9.2**	**$ 2.0**	**$ 1.2**	**$ 2.8**	**$ 0.4**	**$ 0.3**	**$ 0.4**	**$ 0.1**	**$ 0.0**	**$ 0.1**	**$ 0.1**	**$ 0.0**	**$ 0.1**	**$ 0.5**	**$ 0.3**	**$ 0.8**	**$ 0.0**	**$ 0.0**	**$ 0.0**	**$ 12.2**	**$ 11.0**	**$ 13.4**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.7f Present Value of Primacy Agency Rule Activity Costs for Option 3 at 7 Percent, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 4.2	$ 4.2	$ 4.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.2	$ 4.2	$ 4.2
2006	$ 3.9	$ 3.9	$ 3.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.9	$ 3.9	$ 3.9
2007	$ 3.7	$ 3.7	$ 3.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3.7	$ 3.7	$ 3.7
2008	$ 8.0	$ 8.0	$ 8.0	$ 1.9	$ 1.1	$ 2.7	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 2.4	$ 1.6	$ 3.4	$ 0.0	$ 0.0	$ 0.0	$ 12.9	$ 11.1	$ 14.8
2009	$ 7.5	$ 7.5	$ 7.5	$ 1.8	$ 1.0	$ 2.5	$ 1.4	$ 1.3	$ 1.6	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 0.0	$ 0.0	$ 0.0	$ 10.9	$ 9.9	$ 11.9
2010	$ 7.0	$ 7.0	$ 7.0	$ 1.7	$ 1.0	$ 2.3	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.2	$ 0.5	$ 0.1	$ 1.0	$ 1.6	$ 0.9	$ 2.3	$ 0.0	$ 0.0	$ 0.0	$ 10.9	$ 9.2	$ 12.9
2011	$ 6.6	$ 6.6	$ 6.6	$ 1.5	$ 0.9	$ 2.2	$ 3.7	$ 3.3	$ 4.2	$ 0.1	$ 0.0	$ 0.2	$ -	$ -	$ -	$ 0.4	$ 0.2	$ 0.7	$ 0.0	$ 0.0	$ 0.0	$ 12.3	$ 11.0	$ 13.7
2012	$ 6.1	$ 6.1	$ 6.1	$ 1.4	$ 0.9	$ 2.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.2	$ 0.1	$ 0.4	$ 0.7	$ 0.4	$ 1.1	$ 0.0	$ 0.0	$ 0.0	$ 8.6	$ 7.5	$ 9.9
2013	$ 5.7	$ 5.7	$ 5.7	$ 1.4	$ 0.8	$ 1.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.0	$ -	$ 0.0	$ 7.3	$ 6.6	$ 8.1
2014	$ 5.4	$ 5.4	$ 5.4	$ 1.3	$ 0.7	$ 1.8	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.5	$ 0.0	$ -	$ 0.0	$ 7.0	$ 6.3	$ 7.8
2015	$ 5.0	$ 5.0	$ 5.0	$ 1.2	$ 0.7	$ 1.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 6.2	$ 5.7	$ 6.7
2016	$ 4.7	$ 4.7	$ 4.7	$ 1.1	$ 0.6	$ 1.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.4	$ 0.0	$ -	$ 0.0	$ 6.1	$ 5.5	$ 6.7
2017	$ 4.4	$ 4.4	$ 4.4	$ 1.0	$ 0.6	$ 1.5	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 5.4	$ 5.0	$ 5.9
2018	$ 4.1	$ 4.1	$ 4.1	$ 1.0	$ 0.6	$ 1.4	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.2	$ 0.1	$ 0.3	$ 0.0	$ -	$ 0.0	$ 5.3	$ 4.8	$ 5.9
2019	$ 3.8	$ 3.8	$ 3.8	$ 0.9	$ 0.5	$ 1.3	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 4.7	$ 4.4	$ 5.1
2020	$ 3.6	$ 3.6	$ 3.6	$ 0.8	$ 0.5	$ 1.2	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ -	$ -	$ -	$ 0.1	$ 0.1	$ 0.2	$ 0.0	$ -	$ 0.0	$ 4.6	$ 4.1	$ 5.1
2021	$ 3.3	$ 3.3	$ 3.3	$ 0.8	$ 0.5	$ 1.1	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 4.1	$ 3.8	$ 4.5
2022	$ 3.1	$ 3.1	$ 3.1	$ 0.7	$ 0.4	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.2	$ 0.0	$ -	$ 0.0	$ 4.0	$ 3.6	$ 4.4
2023	$ 2.9	$ 2.9	$ 2.9	$ 0.7	$ 0.4	$ 1.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 3.7	$ 3.3	$ 4.0
2024	$ 2.7	$ 2.7	$ 2.7	$ 0.6	$ 0.4	$ 0.9	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 3.5	$ 3.1	$ 3.8
2025	$ 2.5	$ 2.5	$ 2.5	$ 0.6	$ 0.4	$ 0.8	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 3.2	$ 2.9	$ 3.4
2026	$ 2.4	$ 2.4	$ 2.4	$ 0.6	$ 0.3	$ 0.8	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 3.0	$ 2.7	$ 3.3
2027	$ 2.2	$ 2.2	$ 2.2	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ -	$ -	$ -	$ 0.0	$ -	$ 0.0	$ 0.0	$ -	$ 0.0	$ 2.8	$ 2.5	$ 3.0
2028	$ 2.1	$ 2.1	$ 2.1	$ 0.5	$ 0.3	$ 0.7	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.1	$ 0.0	$ 0.1	$ 0.0	$ -	$ 0.0	$ 2.6	$ 2.4	$ 2.9
2029	$ 1.9	$ 1.9	$ 1.9	$ 0.5	$ 0.3	$ 0.6	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ -	$ -	$ -	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ -	$ 0.0	$ 2.4	$ 2.2	$ 2.6
Total	**$ 107.0**	**$ 107.0**	**$ 107.0**	**$ 22.5**	**$ 13.2**	**$ 31.7**	**$ 5.2**	**$ 4.6**	**$ 5.8**	**$ 1.1**	**$ 0.6**	**$ 1.7**	**$ 0.7**	**$ 0.2**	**$ 1.4**	**$ 6.8**	**$ 3.9**	**$ 10.2**	**$ 0.1**	**$ 0.0**	**$ 0.2**	**$ 143.3**	**$ 129.4**	**$ 157.9**
Ann.	**$ 9.2**	**$ 9.2**	**$ 9.2**	**$ 1.9**	**$ 1.1**	**$ 2.7**	**$ 0.4**	**$ 0.4**	**$ 0.5**	**$ 0.1**	**$ 0.1**	**$ 0.1**	**$ 0.1**	**$ 0.0**	**$ 0.1**	**$ 0.6**	**$ 0.3**	**$ 0.9**	**$ 0.0**	**$ 0.0**	**$ 0.0**	**$ 12.3**	**$ 11.1**	**$ 13.5**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.8a Total Activity Costs for Option 4, by Year, for All PWSs

	CWSs			NTNCWSs			TNCWSs			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2007	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2008	$ 2.9	$ 2.0	$ 3.9	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.6	$ 9.9	$ 6.8	$ 13.1
2009	$ 2.9	$ 2.0	$ 3.9	$ 1.3	$ 0.9	$ 1.7	$ 5.7	$ 3.9	$ 7.6	$ 9.9	$ 6.8	$ 13.1
2010	$ 1,396.8	$ 1,066.0	$ 1,723.7	$ 384.3	$ 304.5	$ 463.8	$ 1,189.4	$ 952.9	$ 1,424.6	$ 2,970.4	$ 2,323.4	$ 3,612.1
2011	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2012	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2013	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2014	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2015	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2016	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2017	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2018	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2019	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2020	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2021	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2022	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2023	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2024	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2025	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2026	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2027	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2028	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1
2029	$ 229.8	$ 207.5	$ 252.3	$ 113.9	$ 105.9	$ 121.7	$ 398.8	$ 371.1	$ 426.1	$ 742.6	$ 684.5	$ 800.1

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.8b Present Value of Total Activity Costs at 3 Percent for Option 4, by Year, for All PWSs

	CWSs			NTNCWSs			TNCWSs			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.4	$ 5.4	$ 5.4
2007	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 3.0	$ 3.0	$ 3.0	$ 5.2	$ 5.2	$ 5.2
2008	$ 2.7	$ 1.9	$ 3.6	$ 1.2	$ 0.8	$ 1.5	$ 5.2	$ 3.6	$ 6.9	$ 9.0	$ 6.2	$ 12.0
2009	$ 2.6	$ 1.8	$ 3.5	$ 1.1	$ 0.8	$ 1.5	$ 5.0	$ 3.5	$ 6.7	$ 8.8	$ 6.1	$ 11.7
2010	$ 1,204.9	$ 919.5	$ 1,486.9	$ 331.5	$ 262.7	$ 400.1	$ 1,025.9	$ 822.0	$ 1,228.9	$ 2,562.3	$ 2,004.2	$ 3,115.8
2011	$ 192.5	$ 173.8	$ 211.3	$ 95.4	$ 88.7	$ 102.0	$ 334.0	$ 310.8	$ 356.8	$ 621.9	$ 573.2	$ 670.1
2012	$ 186.9	$ 168.7	$ 205.1	$ 92.6	$ 86.1	$ 99.0	$ 324.3	$ 301.7	$ 346.4	$ 603.8	$ 556.6	$ 650.5
2013	$ 181.4	$ 163.8	$ 199.2	$ 89.9	$ 83.6	$ 96.1	$ 314.8	$ 292.9	$ 336.3	$ 586.2	$ 540.3	$ 631.6
2014	$ 176.1	$ 159.0	$ 193.4	$ 87.3	$ 81.2	$ 93.3	$ 305.7	$ 284.4	$ 326.5	$ 569.1	$ 524.6	$ 613.2
2015	$ 171.0	$ 154.4	$ 187.7	$ 84.8	$ 78.8	$ 90.6	$ 296.8	$ 276.1	$ 317.0	$ 552.6	$ 509.3	$ 595.3
2016	$ 166.0	$ 149.9	$ 182.3	$ 82.3	$ 76.5	$ 87.9	$ 288.1	$ 268.1	$ 307.8	$ 536.5	$ 494.5	$ 578.0
2017	$ 161.2	$ 145.5	$ 177.0	$ 79.9	$ 74.3	$ 85.4	$ 279.7	$ 260.3	$ 298.8	$ 520.8	$ 480.1	$ 561.2
2018	$ 156.5	$ 141.3	$ 171.8	$ 77.6	$ 72.1	$ 82.9	$ 271.6	$ 252.7	$ 290.1	$ 505.7	$ 466.1	$ 544.8
2019	$ 151.9	$ 137.2	$ 166.8	$ 75.3	$ 70.0	$ 80.5	$ 263.7	$ 245.3	$ 281.7	$ 490.9	$ 452.5	$ 529.0
2020	$ 147.5	$ 133.2	$ 161.9	$ 73.1	$ 68.0	$ 78.1	$ 256.0	$ 238.2	$ 273.5	$ 476.6	$ 439.3	$ 513.5
2021	$ 143.2	$ 129.3	$ 157.2	$ 71.0	$ 66.0	$ 75.9	$ 248.5	$ 231.3	$ 265.5	$ 462.8	$ 426.6	$ 498.6
2022	$ 139.0	$ 125.5	$ 152.6	$ 68.9	$ 64.1	$ 73.7	$ 241.3	$ 224.5	$ 257.8	$ 449.3	$ 414.1	$ 484.1
2023	$ 135.0	$ 121.9	$ 148.2	$ 66.9	$ 62.2	$ 71.5	$ 234.3	$ 218.0	$ 250.3	$ 436.2	$ 402.1	$ 470.0
2024	$ 131.1	$ 118.3	$ 143.9	$ 65.0	$ 60.4	$ 69.4	$ 227.5	$ 211.6	$ 243.0	$ 423.5	$ 390.4	$ 456.3
2025	$ 127.2	$ 114.9	$ 139.7	$ 63.1	$ 58.6	$ 67.4	$ 220.8	$ 205.5	$ 235.9	$ 411.2	$ 379.0	$ 443.0
2026	$ 123.5	$ 111.5	$ 135.6	$ 61.2	$ 56.9	$ 65.4	$ 214.4	$ 199.5	$ 229.0	$ 399.2	$ 367.9	$ 430.1
2027	$ 119.9	$ 108.3	$ 131.7	$ 59.5	$ 55.3	$ 63.5	$ 208.2	$ 193.7	$ 222.4	$ 387.6	$ 357.2	$ 417.6
2028	$ 116.5	$ 105.1	$ 127.8	$ 57.7	$ 53.7	$ 61.7	$ 202.1	$ 188.0	$ 215.9	$ 376.3	$ 346.8	$ 405.4
2029	$ 113.1	$ 102.1	$ 124.1	$ 56.0	$ 52.1	$ 59.9	$ 196.2	$ 182.6	$ 209.6	$ 365.3	$ 336.7	$ 393.6
Total	**$ 4,054.8**	**$ 3,491.7**	**$ 4,616.0**	**$ 1,743.6**	**$ 1,575.0**	**$ 1,909.3**	**$ 5,973.3**	**$ 5,423.3**	**$ 6,516.0**	**$ 11,771.6**	**$ 10,490.0**	**$ 13,041.4**
Ann.	**$ 232.9**	**$ 200.5**	**$ 265.1**	**$ 100.1**	**$ 90.5**	**$ 109.6**	**$ 343.0**	**$ 311.4**	**$ 374.2**	**$ 676.0**	**$ 602.4**	**$ 748.9**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.8c Present Value of Total Rule Costs at 7 Percent for Option 4, by Year, for All PWSs

	CWSs			NTNCWSs			TNCWSs			Grand Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.7	$ 1.7	$ 1.7	$ 0.7	$ 0.7	$ 0.7	$ 3.1	$ 3.1	$ 3.1	$ 5.5	$ 5.5	$ 5.5
2006	$ 1.6	$ 1.6	$ 1.6	$ 0.7	$ 0.7	$ 0.7	$ 2.9	$ 2.9	$ 2.9	$ 5.2	$ 5.2	$ 5.2
2007	$ 1.5	$ 1.5	$ 1.5	$ 0.6	$ 0.6	$ 0.6	$ 2.7	$ 2.7	$ 2.7	$ 4.8	$ 4.8	$ 4.8
2008	$ 2.4	$ 1.7	$ 3.2	$ 1.0	$ 0.7	$ 1.4	$ 4.6	$ 3.2	$ 6.2	$ 8.1	$ 5.6	$ 10.7
2009	$ 2.2	$ 1.6	$ 3.0	$ 1.0	$ 0.7	$ 1.3	$ 4.3	$ 3.0	$ 5.8	$ 7.5	$ 5.2	$ 10.0
2010	$ 995.9	$ 760.0	$ 1,229.0	$ 274.0	$ 217.1	$ 330.7	$ 848.0	$ 679.4	$ 1,015.7	$ 2,117.9	$ 1,656.5	$ 2,575.4
2011	$ 153.1	$ 138.3	$ 168.1	$ 75.9	$ 70.6	$ 81.1	$ 265.8	$ 247.3	$ 283.9	$ 494.8	$ 456.1	$ 533.1
2012	$ 143.1	$ 129.2	$ 157.1	$ 71.0	$ 66.0	$ 75.8	$ 248.4	$ 231.1	$ 265.3	$ 462.5	$ 426.3	$ 498.3
2013	$ 133.8	$ 120.8	$ 146.8	$ 66.3	$ 61.6	$ 70.9	$ 232.1	$ 216.0	$ 248.0	$ 432.2	$ 398.4	$ 465.7
2014	$ 125.0	$ 112.9	$ 137.2	$ 62.0	$ 57.6	$ 66.2	$ 216.9	$ 201.8	$ 231.7	$ 403.9	$ 372.3	$ 435.2
2015	$ 116.8	$ 105.5	$ 128.3	$ 57.9	$ 53.8	$ 61.9	$ 202.7	$ 188.6	$ 216.6	$ 377.5	$ 348.0	$ 406.7
2016	$ 109.2	$ 98.6	$ 119.9	$ 54.1	$ 50.3	$ 57.8	$ 189.5	$ 176.3	$ 202.4	$ 352.8	$ 325.2	$ 380.1
2017	$ 102.0	$ 92.1	$ 112.0	$ 50.6	$ 47.0	$ 54.1	$ 177.1	$ 164.8	$ 189.2	$ 329.7	$ 303.9	$ 355.2
2018	$ 95.4	$ 86.1	$ 104.7	$ 47.3	$ 44.0	$ 50.5	$ 165.5	$ 154.0	$ 176.8	$ 308.2	$ 284.0	$ 332.0
2019	$ 89.1	$ 80.5	$ 97.8	$ 44.2	$ 41.1	$ 47.2	$ 154.7	$ 143.9	$ 165.2	$ 288.0	$ 265.5	$ 310.3
2020	$ 83.3	$ 75.2	$ 91.4	$ 41.3	$ 38.4	$ 44.1	$ 144.6	$ 134.5	$ 154.4	$ 269.2	$ 248.1	$ 290.0
2021	$ 77.8	$ 70.3	$ 85.5	$ 38.6	$ 35.9	$ 41.2	$ 135.1	$ 125.7	$ 144.3	$ 251.5	$ 231.9	$ 271.0
2022	$ 72.8	$ 65.7	$ 79.9	$ 36.1	$ 33.5	$ 38.5	$ 126.3	$ 117.5	$ 134.9	$ 235.1	$ 216.7	$ 253.3
2023	$ 68.0	$ 61.4	$ 74.6	$ 33.7	$ 31.3	$ 36.0	$ 118.0	$ 109.8	$ 126.1	$ 219.7	$ 202.5	$ 236.7
2024	$ 63.5	$ 57.4	$ 69.8	$ 31.5	$ 29.3	$ 33.7	$ 110.3	$ 102.6	$ 117.8	$ 205.3	$ 189.3	$ 221.2
2025	$ 59.4	$ 53.6	$ 65.2	$ 29.4	$ 27.4	$ 31.5	$ 103.1	$ 95.9	$ 110.1	$ 191.9	$ 176.9	$ 206.8
2026	$ 55.5	$ 50.1	$ 60.9	$ 27.5	$ 25.6	$ 29.4	$ 96.3	$ 89.6	$ 102.9	$ 179.3	$ 165.3	$ 193.2
2027	$ 51.9	$ 46.8	$ 56.9	$ 25.7	$ 23.9	$ 27.5	$ 90.0	$ 83.8	$ 96.2	$ 167.6	$ 154.5	$ 180.6
2028	$ 48.5	$ 43.8	$ 53.2	$ 24.0	$ 22.3	$ 25.7	$ 84.1	$ 78.3	$ 89.9	$ 156.6	$ 144.4	$ 168.8
2029	$ 45.3	$ 40.9	$ 49.7	$ 22.5	$ 20.9	$ 24.0	$ 78.6	$ 73.2	$ 84.0	$ 146.4	$ 134.9	$ 157.7
Total	**$ 2,698.9**	**$ 2,296.9**	**$ 3,099.0**	**$ 1,117.6**	**$ 1,001.0**	**$ 1,232.4**	**$ 3,804.9**	**$ 3,429.0**	**$ 4,176.2**	**$ 7,621.3**	**$ 6,727.0**	**$ 8,507.6**
Ann.	**$ 231.6**	**$ 197.1**	**$ 265.9**	**$ 95.9**	**$ 85.9**	**$ 105.8**	**$ 326.5**	**$ 294.2**	**$ 358.4**	**$ 654.0**	**$ 577.2**	**$ 730.0**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.8d Primacy Agency Activity Costs for Option 4, by Year

Year	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
	Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound		Mean Value	90 Percent Confidence Bound	
		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)		Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2006	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2007	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2008	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.3	$ 5.3	$ 5.4
2009	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.3	$ 5.3	$ 5.4
2010	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 92.6	$ 91.3	$ 93.9	$ 1.1	$ 1.0	$ 1.3	$ 99.1	$ 97.6	$ 100.6
2011	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2012	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2013	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2014	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2015	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2016	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2017	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2018	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2019	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2020	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2021	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2022	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2023	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2024	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2025	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2026	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2027	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2028	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7
2029	$ 3.9	$ 3.9	$ 3.9	$ 1.4	$ 1.4	$ 1.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.1	$ 1.0	$ 1.3	$ 6.5	$ 6.2	$ 6.7

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2004.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.
Source: Ground Water Rule model output.

Exhibit D.8e Present Value of Primacy Agency Rule Activity Costs for Option 4 at 3 Percent, by Year

	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
Year	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**	**Mean Value**	**Lower (5th %tile)**	**Upper (95th %tile)**
2005	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2006	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2007	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.7	$ 1.7	$ 1.7
2008	$ 3.6	$ 3.6	$ 3.6	$ 1.3	$ 1.2	$ 1.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.9	$ 4.8	$ 4.9
2009	$ 3.5	$ 3.5	$ 3.5	$ 1.3	$ 1.2	$ 1.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.7	$ 4.7	$ 4.8
2010	$ 3.4	$ 3.4	$ 3.4	$ 1.2	$ 1.2	$ 1.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 79.9	$ 78.8	$ 81.0	$ 1.0	$ 0.8	$ 1.1	$ 85.5	$ 84.2	$ 86.7
2011	$ 3.3	$ 3.3	$ 3.3	$ 1.2	$ 1.1	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.9	$ 0.8	$ 1.1	$ 5.4	$ 5.2	$ 5.6
2012	$ 3.2	$ 3.2	$ 3.2	$ 1.1	$ 1.1	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.9	$ 0.8	$ 1.0	$ 5.2	$ 5.1	$ 5.4
2013	$ 3.1	$ 3.1	$ 3.1	$ 1.1	$ 1.1	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.9	$ 0.8	$ 1.0	$ 5.1	$ 4.9	$ 5.3
2014	$ 3.0	$ 3.0	$ 3.0	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.9	$ 0.7	$ 1.0	$ 4.9	$ 4.8	$ 5.1
2015	$ 2.9	$ 2.9	$ 2.9	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.7	$ 0.9	$ 4.8	$ 4.6	$ 5.0
2016	$ 2.8	$ 2.8	$ 2.8	$ 1.0	$ 1.0	$ 1.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.7	$ 0.9	$ 4.7	$ 4.5	$ 4.8
2017	$ 2.8	$ 2.8	$ 2.8	$ 1.0	$ 1.0	$ 1.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.7	$ 0.9	$ 4.5	$ 4.4	$ 4.7
2018	$ 2.7	$ 2.7	$ 2.7	$ 1.0	$ 0.9	$ 1.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.8	$ 0.7	$ 0.9	$ 4.4	$ 4.3	$ 4.5
2019	$ 2.6	$ 2.6	$ 2.6	$ 0.9	$ 0.9	$ 1.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.8	$ 4.3	$ 4.1	$ 4.4
2020	$ 2.5	$ 2.5	$ 2.5	$ 0.9	$ 0.9	$ 0.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.8	$ 4.1	$ 4.0	$ 4.3
2021	$ 2.4	$ 2.4	$ 2.4	$ 0.9	$ 0.8	$ 0.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.8	$ 4.0	$ 3.9	$ 4.2
2022	$ 2.4	$ 2.4	$ 2.4	$ 0.9	$ 0.8	$ 0.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.8	$ 3.9	$ 3.8	$ 4.0
2023	$ 2.3	$ 2.3	$ 2.3	$ 0.8	$ 0.8	$ 0.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.7	$ 3.8	$ 3.7	$ 3.9
2024	$ 2.2	$ 2.2	$ 2.2	$ 0.8	$ 0.8	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.7	$ 3.7	$ 3.6	$ 3.8
2025	$ 2.2	$ 2.2	$ 2.2	$ 0.8	$ 0.8	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.7	$ 3.6	$ 3.5	$ 3.7
2026	$ 2.1	$ 2.1	$ 2.1	$ 0.8	$ 0.7	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.7	$ 3.5	$ 3.4	$ 3.6
2027	$ 2.1	$ 2.1	$ 2.1	$ 0.7	$ 0.7	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.7	$ 3.4	$ 3.3	$ 3.5
2028	$ 2.0	$ 2.0	$ 2.0	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.6	$ 3.3	$ 3.2	$ 3.4
2029	$ 1.9	$ 1.9	$ 1.9	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.6	$ 3.2	$ 3.1	$ 3.3
Total	**$ 64.4**	**$ 64.4**	**$ 64.4**	**$ 21.2**	**$ 20.4**	**$ 21.9**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 79.9**	**$ 78.8**	**$ 81.0**	**$ 14.8**	**$ 12.7**	**$ 16.8**	**$ 180.2**	**$ 176.3**	**$ 184.1**
Ann.	**$ 3.7**	**$ 3.7**	**$ 3.7**	**$ 1.2**	**$ 1.2**	**$ 1.3**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 4.6**	**$ 4.5**	**$ 4.7**	**$ 0.8**	**$ 0.7**	**$ 1.0**	**$ 10.4**	**$ 10.1**	**$ 10.6**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Exhibit D.8f Present Value of Primacy Agency Rule Activity Costs for Option 4 at 7 Percent, by Year

Year	Rule Implementation & Annual Administration			Sanitary Surveys			HSAs			Triggered Monitoring			Assessment Monitoring			Corrective Action Plans			Compliance Monitoring			Total		
		90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound			90 Percent Confidence Bound	
	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)	Mean Value	Lower (5th %tile)	Upper (95th %tile)
2005	$ 1.8	$ 1.8	$ 1.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.8	$ 1.8	$ 1.8
2006	$ 1.7	$ 1.7	$ 1.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.7	$ 1.7	$ 1.7
2007	$ 1.6	$ 1.6	$ 1.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.6	$ 1.6	$ 1.6
2008	$ 3.2	$ 3.2	$ 3.2	$ 1.2	$ 1.1	$ 1.2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.4	$ 4.3	$ 4.4
2009	$ 3.0	$ 3.0	$ 3.0	$ 1.1	$ 1.0	$ 1.1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4.1	$ 4.0	$ 4.1
2010	$ 2.8	$ 2.8	$ 2.8	$ 1.0	$ 1.0	$ 1.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 66.0	$ 65.1	$ 66.9	$ 0.8	$ 0.7	$ 0.9	$ 70.6	$ 69.6	$ 71.7
2011	$ 2.6	$ 2.6	$ 2.6	$ 0.9	$ 0.9	$ 1.0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.8	$ 4.3	$ 4.2	$ 4.4
2012	$ 2.4	$ 2.4	$ 2.4	$ 0.9	$ 0.8	$ 0.9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.7	$ 0.6	$ 0.8	$ 4.0	$ 3.9	$ 4.1
2013	$ 2.3	$ 2.3	$ 2.3	$ 0.8	$ 0.8	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.6	$ 0.7	$ 3.8	$ 3.6	$ 3.9
2014	$ 2.1	$ 2.1	$ 2.1	$ 0.8	$ 0.7	$ 0.8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.7	$ 3.5	$ 3.4	$ 3.6
2015	$ 2.0	$ 2.0	$ 2.0	$ 0.7	$ 0.7	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.6	$ 0.5	$ 0.6	$ 3.3	$ 3.2	$ 3.4
2016	$ 1.9	$ 1.9	$ 1.9	$ 0.7	$ 0.6	$ 0.7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.6	$ 3.1	$ 3.0	$ 3.2
2017	$ 1.7	$ 1.7	$ 1.7	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.6	$ 2.9	$ 2.8	$ 3.0
2018	$ 1.6	$ 1.6	$ 1.6	$ 0.6	$ 0.6	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.5	$ 0.4	$ 0.5	$ 2.7	$ 2.6	$ 2.8
2019	$ 1.5	$ 1.5	$ 1.5	$ 0.5	$ 0.5	$ 0.6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.4	$ 0.5	$ 2.5	$ 2.4	$ 2.6
2020	$ 1.4	$ 1.4	$ 1.4	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.5	$ 2.3	$ 2.3	$ 2.4
2021	$ 1.3	$ 1.3	$ 1.3	$ 0.5	$ 0.5	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ 2.2	$ 2.1	$ 2.3
2022	$ 1.2	$ 1.2	$ 1.2	$ 0.4	$ 0.4	$ 0.5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.4	$ 0.3	$ 0.4	$ 2.0	$ 2.0	$ 2.1
2023	$ 1.2	$ 1.2	$ 1.2	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.4	$ 1.9	$ 1.8	$ 2.0
2024	$ 1.1	$ 1.1	$ 1.1	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.3	$ 0.4	$ 1.8	$ 1.7	$ 1.8
2025	$ 1.0	$ 1.0	$ 1.0	$ 0.4	$ 0.4	$ 0.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ 1.7	$ 1.6	$ 1.7
2026	$ 0.9	$ 0.9	$ 0.9	$ 0.3	$ 0.3	$ 0.4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ 1.6	$ 1.5	$ 1.6
2027	$ 0.9	$ 0.9	$ 0.9	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.3	$ 0.2	$ 0.3	$ 1.5	$ 1.4	$ 1.5
2028	$ 0.8	$ 0.8	$ 0.8	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.2	$ 0.3	$ 1.4	$ 1.3	$ 1.4
2029	$ 0.8	$ 0.8	$ 0.8	$ 0.3	$ 0.3	$ 0.3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 0.2	$ 0.2	$ 0.3	$ 1.3	$ 1.2	$ 1.3
Total	**$ 43.2**	**$ 43.2**	**$ 43.2**	**$ 13.6**	**$ 13.1**	**$ 14.1**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 66.0**	**$ 65.1**	**$ 66.9**	**$ 9.0**	**$ 7.8**	**$ 10.3**	**$ 131.8**	**$ 129.1**	**$ 134.5**
Ann.	**$ 3.7**	**$ 3.7**	**$ 3.7**	**$ 1.2**	**$ 1.1**	**$ 1.2**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 5.7**	**$ 5.6**	**$ 5.7**	**$ 0.8**	**$ 0.7**	**$ 0.9**	**$ 11.3**	**$ 11.1**	**$ 11.5**

Notes: Present values in millions of 2003 dollars. Estimates are discounted to 2005.
Detail may not add exactly to totals due to independent rounding.
Ann = value of total annualized at discount rate.

Source: Ground Water Rule model output.

Appendix E

Potential Implications of Population Dynamics and Secondary Transmission of Infection on the Benefits of the Ground Water Rule

Appendix E
Potential Implications of Population Dynamics and Secondary Transmission of Infection on the Benefits of the Ground Water Rule

E.1 Introduction

In this appendix the Agency provides a summary of its investigation into the potential uncertainties associated with secondary transmission of infection and subsequent illness within the context of the Ground Water Rule (GWR). Secondary transmission of an infectious disease occurs when an individual becomes infected due to person-to-person contact with an infected individual.

Microbiological Contaminants and Health Effects

Pathogenic enteric viral and bacterial microorganisms are excreted in the feces of infected humans and animals. The word enteric indicates that the natural habitat of these microorganisms is the intestinal tract of animals and humans. Enteric microorganisms sometimes referred to as intestinal microflora, can survive in wastewater and leachate (effluent) derived from septic tanks. When wastewater and leachate are released into the environment, they are sources of intestinal microflora and potential sources of viral and bacterial pathogens. Once in the environment, fecal matter from infected humans or animals may make its way into groundwater sources. If enteric pathogens are ingested, the likelihood of infection varies depending on the pathogenicity of the organism. The likelihood and severity of symptomatic illness also vary with the type of pathogen, the level of acquired immunity, and the general resistance of the person.

Examples of common fecal viral pathogens include enteroviruses (e.g., echoviruses and coxsackieviruses), rotavirus, and hepatitis A virus (HAV). Viruses cannot reproduce outside a host, although they can survive and remain infectious. With a few exceptions, viruses that can infect human cells typically cannot infect the cells of other animals, and vice versa. Viruses become capable of reproducing once they infect humans. Once infected, humans shed viruses in their feces. Regardless of whether individuals infected by the waterborne pathogen have symptoms of illness, such as diarrhea, they still shed the pathogen, and thus may infect other individuals. Infection via this process is called secondary spread or person-to-person transmission.

Examples of common bacterial pathogens include *E. coli*, *Salmonella*, *Shigella*, and *Campylobacter jejuni*. Some waterborne bacterial pathogens cause disease by rapid growth and dissemination (e.g., *Salmonella*) while others primarily cause disease via toxin production (e.g., *Shigella*, *E.coli* O157, *Campylobacter jejuni*). *Campylobacter jejuni*, *E. coli*, and *Salmonella* have a host range that includes both animals and humans; *Shigella* seems to be associated primarily but not exclusively with humans. Unlike pathogenic viruses, bacteria are able to reproduce outside the host.

Most of the waterborne bacterial pathogens cause gastrointestinal illness, but some can cause more severe illnesses as well. For example, *Legionella* causes Legionnaires Disease, a form of pneumonia that has a fatality rate of about 15 percent, and Pontiac Fever, which is a milder respiratory infection form of Legionnaires Disease. Several strains of *E. coli* can cause severe disease, including kidney failure.

Some bacterial pathogens are opportunistic (i.e., are only infectious in the presence of another, preexisting condition or weakness). Opportunistic pathogens usually cause illness only in immunocompromised persons or in other sensitive subpopulations, such as the very young or the elderly.

Other pathogens, such as *Salmonella*, *Shigella*, *Campylobacter jejuni*, are not entirely opportunistic but result in certain diseases with greater frequency and severity in immunocompromised persons (Framm and Soave 1997).

Data on the types of pathogens that have caused waterborne disease outbreaks can be obtained from EPA and the Centers for Disease Control and Prevention (CDC). Of the 68 outbreaks in groundwater systems reported to the CDC from 1991 through 2000, 14 (21%) were associated with specific bacterial pathogens. The fecal bacterial pathogen *Shigella* caused more reported outbreaks (7%) than any other single agent. Identified viral pathogens were associated with four (6%) reported outbreaks. Etiologic agents were not identified in 39 (57%) outbreaks; however, EPA suspects that many of these were caused by viruses, given that it is generally more difficult to analyze for viral pathogens than bacterial pathogens.

Microbial Risk Assessment

Microbial risk assessment (MRA) is a process that is used to evaluate the likelihood of adverse human health effects that can occur following exposure to pathogenic microorganisms or to a medium in which pathogens are present (ILSI 1996). Quantitative risk assessment has been used since the 1970s to assess human health effects associated with exposure to chemicals (Hammond and Coppick 1990). The principles, processes and methods for carrying out risk assessments for chemical agents were formalized in 1983 by the National Research Council (NRC) resulting in a four step framework (National Research Council 1983). The steps outlined by the NRC include hazard identification, dose-response assessment, exposure assessment, and risk characterization. Many of the early MRAs employed the NRC conceptual framework to provide a structure from which the assessments could be conducted (Haas 1983; Regli et al. 1991; Rose et al. 1987).

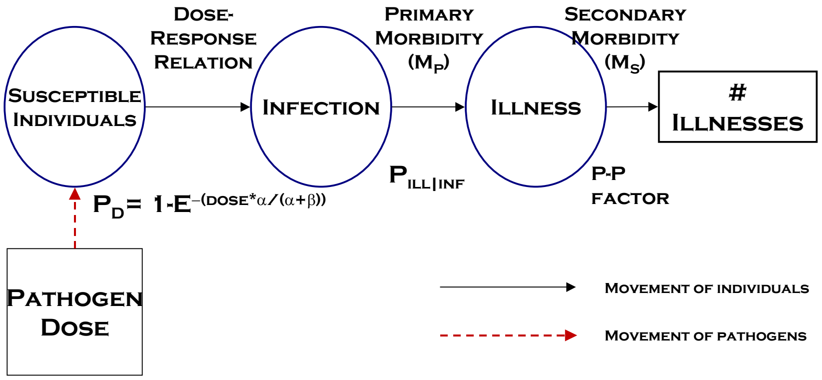
As the field of microbial risk assessment developed, it became clear that there were some complexities associated with the modeling of infectious diseases that are unique to pathogens such as person-to-person transmission of infection and immunity. Therefore, the conceptual framework for chemicals may not always be appropriate for the assessment of risk of human infection following exposure to pathogens (ILSI 1996). To address this concern, the EPA Office of Water sponsored a series of workshops to develop a conceptual framework to assess the risks of human infection associated with pathogenic microorganisms. Those workshops resulted in a published framework (ILSI 1996) that was then tested through the conduct of two case studies (Soller et al. 1999; Teunis et al. 1999) and subsequently revised (ILSI 2000; Schaub 2004). The EPA/ILSI framework for assessing the risk of human infection following exposure to water- and food-borne pathogens is comprised of three principal components: hazard identification, exposure assessment, dose response assessment, and risk characterization. At this time, both the NRC and EPA/ILSI frameworks are currently employed for the conduct of MRAs. Assessments conducted by EPA under either the NRC framework or the more recent EPA/ILSI framework are organized in accordance with the EPA Policy for Risk Characterization, EPA’s Guidance for Risk Characterization, and EPA’s Policy for Use of Probabilistic Analysis in Risk Assessment (U.S. EPA 1995a; U.S. EPA 1995b; U.S. EPA 1997)

A literature review was conducted recently to document the status, advantages, and limitations of different types of microbial risk assessment risk characterization techniques (Soller et al. 2004). That literature review of approximately 1,100 citations indicated that at the broadest level there was a distinction between direct estimates of risk or illness using epidemiological data and indirect estimates using models. Direct estimates entail collecting infection or disease outcome data, for example, prospective studies or outbreak investigations. Indirect estimates employ exposure data as input to numerical models to compute estimates of illnesses.

Based on the available literature, direct methods are used most commonly to assess the public health impact associated with a specific and known (or identifiable) exposure pathway. Those methods may not, however, provide the regulatory and management information needed for making decisions regarding changes in environmental conditions. For this purpose indirect methods of analysis can play a useful role. From the literature review it was found that MRA methodologies vary primarily in the manner in which they address the population dynamics of infectious disease transmission. The fundamental difference between the most common risk assessment techniques is that one class of models does not incorporate population level impacts of secondary transmission via person to person interaction nor the immune status of the infected population into the risk estimations for a given exposure scenario or range of exposures (static models), whereas the other class of models (dynamic models) does.

The risk characterization method employed by the base analysis in the GWR is based on a static model. A schematic of the GWR risk characterization method is presented in Exhibit E.1. As shown in Exhibit E.1, the predicted intensity of secondary (person-to-person) transmission is a multiplicative factor comprised of the number of illnesses and a secondary morbidity factor.

Exhibit E.1 MRA Conceptual Approach for the GWR Base Analysis



E.2 Motivation for Investigation

The limitations of treating infectious disease transmission as a static disease process with no interaction between those infected or diseased and those at risk has been illustrated for various infectious diseases including *Giardia* (Eisenberg et al. 1996), dengue (Koopman et al. 1991b), and sexually transmitted diseases (Koopman et al. 1991a). Further, a variety of model forms can be employed to characterize infectious disease transmission and to evaluate the potential for effective interventions. In this context, a model form is a mathematical representation of the epidemiological status of the population together with rules that define the movement of individuals and pathogens among sub-populations with defined characteristics (e.g. infected individuals, ill individuals, immune individuals).

Particular characteristics of each model form capture different aspects of the disease transmission system. However, it is unrealistic to presume that one model form is most appropriate for all waterborne microbial risk assessments (Soller et al. 2004).

In this investigation, a dynamic infectious disease model is used to explore the potential implications of population dynamics and secondary transmission of infection and subsequent illness relative to the static method employed by the base analysis in the GWR as described in the Economic Analysis for the GWR. For the purposes of this investigation, secondary transmission includes infections due to both person-to-person contacts and person-to-environment-to-person contacts where the environmental time frame is short. For example, inter-household disease transmission due to contact with contaminated household surfaces (fomites) would be included in this analysis.

E.3 Methods of Investigation

The potential implications of uncertainties associated with secondary transmission of infection and subsequent illness in the Ground Water Rule are evaluated via a hypothetical case study. In this case study it is assumed that a large tour group from a total population of 100,000 visit an outlying area that is served by a NCWS with untreated or inadequately treated groundwater that is contaminated with a type A virus. It is assumed that all of the individuals are exposed to the type A virus, 100 become infected, and then return home to the larger community[1]. The population is then assumed to mix homogeneously (that is inter-household transmission is not considered separately from intra-household transmission).

In the GWR base analysis, rotavirus is employed as the prototype type A virus to quantify the benefits of the rule. Noroviruses are also described as epidemiologically important type A viruses, however, illnesses from norovirus infection are not quantified in the GWR EA. Two types of analyses were conducted in this investigation, a median value analysis and a sensitivity/uncertainty analysis. In the median value analysis, the model type A virus employed is assumed to have the clinical properties and infectivity of rotavirus. However, it is assumed that age is not an important factor relative to infection and that individuals of all ages are equally likely to become infected and subsequently propagate infection via person-to-person transmission. The sensitivity/uncertainty analysis (referred to as uncertainty analysis hereafter) explores how uncertainty in model parameters and the model form selection influence the potential insights provided by the analysis and to consider how those insights may change for other type A viruses, such as noroviruses, with somewhat different clinical or environmental properties than the model virus investigated.

A literature review was conducted to identify appropriate values for model parameters. Numerical simulations are used to estimate the number of additional infections and illnesses (due to person-to-person transmission) within the large community after the group of infected individuals returns home. Cumulatively, the results of the median value analysis and uncertainty analysis simulations are used to identify combinations of model parameters under which the predicted magnitude of person-to-person transmission of illness in the community is substantially higher or lower than would have been predicted under the GWR base analysis method and assumptions.

The analysis presented herein is intended to complement the base analysis in the GWR. Although the GWR base analysis and that presented herein both focus on characterizing the risk associated with illness from groundwater sources, each analysis is built on a different set of assumptions. To the extent feasible, similar assumptions were applied in this analysis compared to those used in the base analysis. However, because the two analyses were intended to address slightly different questions, the results are not necessarily directly comparable. Further elaboration on this point is provided in Section 5.1.

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[1] The larger community is assumed to be served by a CWS.

E.3.1 Overview of Scenario Evaluated

The case study scenario may be characterized as follows:

- A hypothetical community with population of 100,000 individuals is considered;
- From that population, a large tour group is assumed to visit a NCWS that is contaminated with a type A virus;
- 100 individuals are assumed to become infected and then return home;
- The type A virus has the infectivity of rotavirus among adults in the US population;
- The type A virus has the background incidence levels of rotavirus in the US population;
- The type A virus has the morbidity of rotavirus among adults and children in the US population, based on weighted population averages;
- Secondary transmission is homogeneous among all individuals of all ages within the larger population, and the median value is based on community level data describing the proportion of household level infections in the community;
- Incubation and clinical severity are based on unweighted data on rotavirus from children and adults;
- Immunity data are based primarily on rotavirus data from children but informed by qualitative assessment of adults;
- None of the infected individuals would be considered “super-spreaders”; and
- Immunocompromised individuals are not considered separately from the rest of the population.

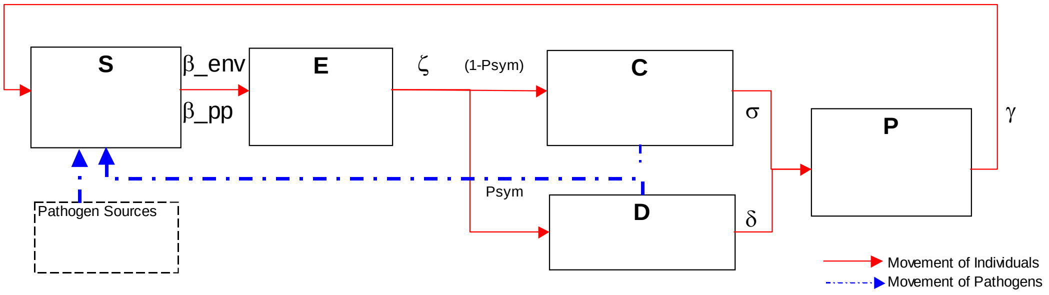
E.3.2 Risk Assessment Methodology

In the base analysis for the GWR, the magnitude of secondary transmission is estimated by multiplying the number of children less than 3 who are ill by a constant factor. In this investigation a population perspective is taken, and secondary transmission is estimated in a more mathematically rigorous manner using a dynamic infectious disease methodology. The basis for the numerical modeling approach employed herein is well supported in the technical literature and is consistent with a large base of literature describing the use of dynamic population models in the study of epidemics (Anderson and May 1991; Hethcote 1976; Hethcote 2000) and environmental processes and disease (Koopman et al. 2002.; Koopman et al. 2001; Koopman et al. 1991a).

The microbial risk assessment approach employed herein builds on previous studies addressing human health risks from exposure to waterborne pathogens (Eisenberg et al. 1996; Eisenberg et al. 1998; Soller et al. 2006; Soller et al. 1999; Soller et al. 2003; Soller et al. 2004), and is consistent with the EPA/ILSI framework for microbial risk assessment (ILSI 1996).

Two routes of transmission are accounted for in this investigation: primary transmission by background or environmental exposure and secondary transmission via person-to-person transmission. The conceptual model investigated herein for health effects associated with exposure to the model type A virus is presented in Exhibit E.2.

Exhibit E.2 Conceptual Health Effects Model



State	Description
S	Susceptible to infection
E	Infected, pre-symptoms, pre-infectious
C	Infectious, asymptomatic
D	Infectious, symptomatic
P	Protected from infection

The model is composed of 5 state variables that are used to track the number of individuals in each epidemiological state over time:

- S-Individuals susceptible to infection (Susceptible);
- E-Individuals who have been exposed but have yet to become infectious (Exposed);
- C-Infectious but asymptomatic individuals (Carrier);
- D-Infectious and symptomatic individuals (Diseased); and
- P-Post-symptomatic and non-infectious individuals (with limited term protection from infection) (Protected).

Eleven (11) model parameters are used to define the model (Exhibits E.3 and E.4). The parameters include the background incidence of infection in the community, parameters describing the dose-response relation, the rate of movement of individuals between epidemiological states, the probability of symptomatic response, the background level of pathogens that result in a disease incidence consistent with the primary endemic incidence, the probability of infection from environmental contact, and the probability of an infective contact.

Exhibit E.3 Model Parameters Derived Directly From Scientific Literature

Model Parameter	Description	Comments
Background incidence	Disease incidence in US	
α	Beta poisson dose response parameter	Maximum Liklihood Estimate fit to beta-Poisson
β_{dr}	Beta poisson dose response parameter	Maximum Liklihood Estimate fit to beta-Poisson
ζ	Inverse of duration of incubation (days)	Inverse represents rate of movement out of state E
psym	Probability of symptomatic response	
σ	Inverse of duration of asymptomatic infection (days)	Inverse represents rate of movement out of state C
δ	Inverse of duration of symptomatic infection (days)	Inverse represents rate of movement out of state D
γ	Inverse of duration of protection from infection (days)	Inverse represents rate of movement out of state P

Exhibit E.4 Model Parameters That Are Computed Based On Other Parameters

Model Parameter	Dependant Variables	Description	Comments
End_dose	All other model parameters	Background level of pathogen that results in a disease prevalence consistent with estimated levels in US	End_dose is derived for each simulation. It is the dose results in an average prevalence consistent with a specified level of endemic disease
β	End_dose, α, β_{dr}	Probability of infecton from environmental exosure	$1 - \exp\left(-\text{end\_dose}\cdot\frac{\alpha}{\alpha + \beta_{dr}}\right)$
β_pp	All other model parameters	Probability of infective contact due to person-to-person exposure	β_pp is derived for each simulation. It is a rate that results in a specified level of endemic disease due to secondary transmission

Assuming that the primary and secondary transmission processes are independent (Anderson and May 1991; Hethcote 1976), the change in the fraction of the population in any state from one time period to the next may be modeled as a series of first order differential equations. A summary of the mathematical details describing the movement of the population from one time step to the next is provided in Exhibit E.5. The model is implemented via numerical simulation and integration using MathCad version 13 (Mathsoft, Inc.). The model parameter values used in the analyses are discussed in the following section and a description of the numerical simulation methodology follows in Section E.3.4.

Exhibit E.5 First Order Differential Equations Used for MRA Modeling

$$\frac{d}{dt}S(t) = -\beta\cdot S(t) - \beta\_pp\cdot S(t)\cdot(C(t) + D(t)) + \gamma\cdot P(t)$$

$$\frac{d}{dt}E(t) = \beta\cdot S(t) + \beta\_pp\cdot S(t)\cdot(C(t) + D(t)) - \zeta\cdot E(t)$$

$$\frac{d}{dt}C(t) = \zeta\cdot(1 - psym)\cdot E(t) - \sigma\cdot C(t)$$

$$\frac{d}{dt}D(t) = \zeta\cdot psym\cdot E(t) - \delta\cdot D(t)$$

$$\frac{d}{dt}P(t) = \delta\cdot D(t) + \sigma\cdot C(t) - \gamma\cdot P(t)$$

E.3.3 Parameter Values Used in Model

A comprehensive literature review was conducted for the purpose of parameter value selection. Detailed results of the literature review are presented in a separate report (Soller, 2004). From the literature review, median values were determined for each of the model parameters shown in Exhibit E.3. Minimum and maximum reasonable values were also identified for use in the uncertainty analysis (Refer to Section E.3.5). The parameter values derived from the literature review used in the median value analysis and the uncertainty analyses are summarized in Exhibit E.6; a brief description of the basis for selection of these values follows.

Exhibit E.6 Parameter Values Used in Simulations

Primary Variable	Description	Median Value or Duration	Minimum and Maximum Reasonable Range	Median Rate[1]
Background incidence	Disease incidence in US	3,900,000	500,000-23,000,000	
α	Beta poisson dose response parameter	0.26	0.126-0.52	
βdr	Beta poisson dose response parameter	0.42	0.21-0.84	
ζ	inverse of duration of incubation (1/days)	2.5	1-5 days	0.4
psym	Probability of symptomatic response	0.45	0.1-0.6	
σ	Inverse of duration of asymptomatic infection (1/days)	5	2-8 days	0.2
δ	Inverse of duration of symptomatic infection (1/days)	6	2-8 days	0.17
γ	Inverse of duration of protection from infection (1/days)	548	7-30 months	0.0018

[1] The rates shown are the inverse of the median values and correspond to the mean amount of time spent in the corresponding states.

Background Incidence

The median estimate of background incidence of rotavirus illness in the US is 3,900,000 cases per year (Mead et al. 1999; Tucker et al. 1998) based on available primary data (Gurwith et al. 1981; Rodriquez et al. 1987). For the purposes of the uncertainty analysis, the minimum and maximum reasonable values are 50,000 and 23,000,000 cases per year, respectively (Mead et al. 1999). The minimum and maximum values are selected with the understanding that noroviruses are also type A viruses (highly infectious with low severity). This wide parameter range was investigated to account for the estimated incidence of norovirus illness in the US, their genetic diversity, and the uncertainty associated with norovirus cross-genotype immunity.

Dose-Response Parameters

The best fitting beta-Poisson dose response model has point estimates of $\boldsymbol{\alpha}$=0.265 and $\boldsymbol{\beta}$dr=0.42 (Haas et al. 1999; Regli et al. 1991; Ward et al. 1986). The corresponding 95% confidence intervals range from 0.126 to 0.52 for $\boldsymbol{\alpha}$ and from 0.21 to 0.84 for $\boldsymbol{\beta}$dr. The best fitting point estimates are employed in the median value analyses and the lower and upper 95% confidence values are used as the minimum and maximum reasonable values, respectively in the uncertainty analysis. Unfortunately, the shape of the 95% confidence region of the rotavirus dose-response maximum likelihood estimate (MLE) is not defined by a simple formula (Regli et al. 1991). The minimum and maximum values employed herein represent a reasonable approximation to the 95% confidence region. Preliminary numerical analyses indicated that refinement of the simple surface defined by the upper and lower 95% confidence values to more closely match the MLE 95% confidence region was not warranted for this investigation given the necessary complexity associated with the refinement.

Duration of Incubation

Based on the data presented in Appendix 1 of the investigator's full report (in Soller 2006 see Flewett et al. 1975; Flewett and Woode 1978; Rodriguez et al. 1979; Shepherd et al. 1975; Ward et al. 1986), a duration of incubation of 2.5 days is used in the median value analyses, and 1 and 5 days are used as the minimum and maximum reasonable values, respectively.

Probability of Symptomatic Response

Based on the data presented in Appendix 1 of the investigator's full report (in Soller 2006 see Kim et al. 1977; Tufvesson et al. 1977; Ward et al. 1986; Wenman et al. 1979), the median probability of symptomatic response for adults is 0.43. The minimum and maximum reasonable values for adults is 0.1 and 0.57, respectively.

For children, the median probability of symptomatic response is 0.67. The minimum and maximum reasonable values are 0.17 and 0.82, respectively (Barron-Romero et al. 1985; Bernstein et al. 1991; Champsaur et al. 1984; Ferson et al. 1997; Gurwith et al. 1981; Velazquez et al. 1993; Wenman et al. 1979).

Values used in the analysis are weighted averages for children and adults, based on census data from 2000 (U.S. Census Bureau 2000), assuming that children are represented by those under age 5 yrs. Thus, a probability of symptomatic response of 0.45 is used in the median value analyses, and 0.1 and 0.6 are used as the minimum and maximum reasonable values, respectively.

Duration of Symptomatic Infection

Based on the data presented in Appendix 1 of the investigator's full report (in Soller 2006 see Flewett et al. 1975; Flewett and Woode 1978; Gomez-Barreto et al. 1976; Gurwith et al. 1981; Lycke et al. 1978; Shepherd et al. 1975; Ward et al. 1986), a duration of symptomatic infection of 6 days is used in the median value analyses, and 2 and 8 days are used as the minimum and maximum reasonable values, respectively.

Duration of Asymptomatic Infection

The average duration of asymptomatic infections is 5 days with durations of asymptomatic infections ranging from 1 to 12 days (Ward et al. 1986). Based on these data, a duration of asymptomatic infection of 5 days is used in the median value analyses. Given the sparse data available for this parameter, the minimum and maximum reasonable values are the same as those used for the duration of symptomatic infections (2 and 8 days, respectively).

Duration of Protection from Infection

Based on the data presented in Appendix 1 of the investigator's full report (in Soller 2006 see Bernstein et al. 1991; Chiba et al. 1993; Koopman and Monto 1989; Ward and Bernstein 1994), it is inferred that the duration of protection from infection is highly uncertain and not well understood. From studies on children it has been found that infection confers immunity (typically from disease but not necessarily from infection) for a duration of not less than 1 year. Based on data from a lifetime analysis it appears that the duration of protection may be longer for adults than for children. Thus, a duration of 18 months is used in the median value analyses, and durations of 12 and 60 months are used as the minimum and maximum reasonable values, respectively.

Person-to-Person Transmission

Based on data from the Tecumseh study, Koopman et al. estimated the proportion of rotavirus infections acquired in the household (17-20%) compared to those acquired outside the household (Koopman et al. 1989). For the purposes of this investigation, it is assumed that infections acquired in the household are through a person-to-person route of transmission, and infections acquired in the community are acquired either through person-to-person transmission or from environmental sources. Based on data from the Tecumseh study, 20% is used in the median value analyses as the proportion of rotavirus infections acquired via person-to-person transmission, and a range of 10 and 60% is used to encapsulate the minimum and maximum reasonable values, respectively. This relatively wide range employed in the uncertainty analysis is based on professional judgment and is intended to be representative of the uncertainty associated with 1) extrapolating the results from Tecumseh to the US population and 2) the assumption that infections acquired in the community are due to a combination of environmental sources and person-to-person contacts outside of the household.

E.3.4 Numerical Simulation Methodology

Numerical simulation, as described above, was used to determine the number of individuals in each epidemiological state over time. To examine the impact of illness propagation through the community, several steps are required.

The first step is a calibration step that is used to identify the proportion of individuals in each state for the endemic conditions and to find appropriate values for the model parameters shown in Exhibit E.4. At the inception of each calibration simulation, it is assumed that 95% of the population is in State S (Susceptible) and 5% is in State E (Exposed), in a manner consistent with previous work (Soller et al. 2006; Soller et al. 1999). Note that the calibration procedure described below is also reasonably robust to other initial conditions. The parameter values shown in Exhibit E.6 are used to conduct the median value analysis calibration, and subsequently the median value analysis. Using those values with **β**pp set to zero, an "endemic dose" (and resulting value for **β**) is found that results in a proportion of the population in State D (Diseased) that is consistent with the background level of illness incidence in the United States and the assumption that 20% of cases are due to person-to-person transmission (or equivalently, 80% of cases due to primary transmission). Using those values for **β** and "endemic dose", a value of **β**pp is then identified so that the incidence of illness in the population was consistent with the background level shown in Exhibit E.6.

After the calibration is complete the median value analysis is conducted. The median value analysis is used to assess the magnitude of illness attributable to the 100 individuals returning with type A virus illnesses after visiting a contaminated NCWS, assuming that all parameter values are set equal to the median values of those reported in the literature. Mathematically, the simulation is conducted in a similar manner to that described above for the median value calibration except that 1) the initial conditions are set equal to the steady state conditions identified in the calibration including values for **β** and **β**pp, and then 2) 100 people are removed from State S (Susceptible) and moved into State E (Exposed). (Details are provided in Appendix II of the investigator's full report (Soller 2006)).

Similar simulations are employed to conduct the uncertainty analysis, except different parameter values or model forms are used as specified in Section E.3.5. For each simulation conducted for the uncertainty analysis, a calibration simulation is performed as described above, followed by a simulation representing the case study.

E.3.5 Uncertainty Analysis

The goal of the uncertainty analysis is to consider how uncertainty in the model and model parameters could impact the model output and the subsequent interpretation of the results. Specifically, the goal of this portion of the analysis is to identify parameter values and/or combinations of parameters that could have substantial impact on the interpretation of the results once uncertainty is considered.

The methodology for the sensitivity/uncertainty analysis is described in this section. The uncertainty analysis plan encompasses four broad categories:

- Model parameter uncertainty issues;
- Transmission parameter uncertainty issues;
- Model form uncertainty issues; and
- Population uncertainty issues.

The approach used to address each type of issue is discussed below. In all cases, the results from the analyses described below are interpreted relative to the results of the median value analysis.

E.3.5.1 Model parameter uncertainty issues

Background Incidence of Illness

The background level of illness, as noted in Sections E.3.3 and E.3.4, is an important factor in determining the status of the population under endemic conditions. Specifically, the calibration step is used to determine an "endemic dose" (and resulting value for **β**). resulting in a proportion of the population in State D (Diseased) that is consistent with the background level of illness incidence and the assumption that 20% of cases are due to person-to-person transmission (or equivalently, 80% of cases due to primary transmission). Using these values, **β**pp is then determined. The background level of illness may be substantially different than the value estimated using the median value for a number of reasons, including, but not limited to, the following:

- The background level of rotavirus illness in the US is uncertain. The values presented herein are the best available estimates, however, from a review of the primary literature, it is possible that the true incidence could be higher or lower than that estimated;

- The background level of illness varies between communities;

- Other type A viruses may have substantially different illness incidence levels than the one investigated in the median value analysis; and

- The general classification of type A viruses includes noroviruses. Noroviruses are estimated to cause 23,000,000 illnesses annually in the United States (Mead et al. 1999). However, noroviruses as a class are a genetically and antigenically diverse group of viruses (Ando et al. 2000). Of approximately 300 outbreaks in the United States between 1993 and 1999, 68 different outbreak strains have been identified and classified (Ando et al. 2000). The potential for cross-strain immunity is not well understood at this time.

To explore how the background level of illness could impact the insights provided by this analysis, a series of simulations was conducted in which the endemic level of illness in the US population was allowed to vary between 50,000 and 23,000,000 (as compared to an estimated 3,900,000 based on the incidence of rotavirus illness in the US). In each of these simulations, it is assumed that **β**pp (the probability of an infective contact due to person-to-person exposure) is not impacted by changing the background level of disease in the community.

Literature Derived Model Parameter Uncertainty

There are 7 model parameters (see Exhibit E.3) that impact the rate at which individuals move between epidemiological states. Those parameters include: $\boldsymbol{\zeta}$, $\boldsymbol{\sigma}$, $\boldsymbol{\delta}$, $\boldsymbol{\gamma}$, $\boldsymbol{\alpha}$, $\boldsymbol{\beta}_{\_dr}$, and P_{sym}. Based on the peer-reviewed literature, there is substantial uncertainty in each of these values (data for $\boldsymbol{\zeta}$, $\boldsymbol{\sigma}$, $\boldsymbol{\delta}$, and $\boldsymbol{\gamma}$ are reported in clinical literature as durations rather than rates, those durations are then converted to rates as the inverse of the durations for this analysis). For example, the duration of incubation is reported in the literature to range from 1 to 5 days (Flewett et al. 1975; Flewett and Woode 1978; Rodriguez et al. 1979; Shepherd et al. 1975; Ward et al. 1986). In the median value analysis a duration of incubation of 2.5 days was used to derive a median rate of 0.4 day^{-1}.

To determine how the uncertainty in these parameter values impacts the potential propagation of secondary transmission of illness, the minimum and maximum reasonable values are explored for each variable. Each unique combination of these minimum and maximum values was simulated. Given that there are 7 parameters to explore, each with two values (minimum and maximum reasonable values), this portion of the uncertainty analysis results in 128 simulations (2^7).

As described previously, minimum and maximum reasonable values for $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}_{\_dr}$ are the lower and upper 95% confidence values of the maximum likelihood fits for the beta-Poisson dose response function. Minimum and maximum reasonable values for P_{sym}, $\boldsymbol{\zeta}$, $\boldsymbol{\sigma}$, $\boldsymbol{\delta}$, and $\boldsymbol{\gamma}$ were based on data from the literature review.

In these analyses, the background incidence of illnesses is assumed to be the same as in the median value analysis. Thus, an "endemic dose" (and resulting value for $\boldsymbol{\beta}$) and $\boldsymbol{\beta}$pp were computed in each calibration simulation based on the background incidence of illnesses and the assumption that 20% of cases are due to person-to-person transmission.

E.3.5.2 Transmission parameter uncertainty issues

The two transmission parameters in the analysis are $\boldsymbol{\beta}$ (also referred to as $\boldsymbol{\beta}_{env}$) (probability of movement out of State S (Susceptible) due to environmental exposure) and $\boldsymbol{\beta}_{pp}$ (probability of movement out of State S due to person-to-person exposure). The purpose of this component of the uncertainty analysis is to evaluate the impact of the assumptions about the transmission parameters on the model output and the subsequent interpretation of that output.

Environmental Exposure

To be consistent with the base analysis in the GWR, $\boldsymbol{\beta}_{env}$ was computed using the following formula:

$$\beta_{env} := 1 - \exp\left((-1)\text{dose}\cdot\frac{\alpha}{\alpha + \beta_{dr}}\right)$$

Equation E.1

This is an approximation to the beta-Poisson model. Approximations to the beta-Poisson model are commonly employed in microbial risk assessment investigations because the exact form is complex and computationally intensive (Teunis et al. 1996). There are however, other approximations to the beta-Poisson function that are also reported and used in the literature, the most common of which are the following:

$$\beta_{env} := 1 - \left(1 + \frac{dose}{\beta_{dr}}\right)^{-\alpha}$$

Equation E.2

$$\beta_{env} := dose \cdot \left[\frac{\alpha}{\left(\alpha + \beta_{dr}\right)}\right]$$

Equation E.3

To determine if the functional form of the dose response model substantially impacts the interpretation of this analysis, additional analyses are conducted using the dose response model forms described above.

Person-to-Person Exposure

The approach employed for estimating the proportion of person-to-person transmission in a community is to solve the system of differential equations given in Exhibit E.5 for $\boldsymbol{\beta}_{pp}$ so that the results are consistent with those reported in the Tecumseh study (Koopman et al. 1989). In that study, the effect of rotavirus transmission within households and on the risk of infection from outside of the household was investigated through analyses of serum pairs (Koopman et al. 1989). Based on an analysis of serologic observations from 1,508 individuals from 1977 through 1981, it was found that 17 to 20% of rotavirus infections were acquired in the household, and the remainder were acquired in the community (Koopman et al. 1989). For this analysis it is assumed that rotavirus infections acquired in the household are due to person-to-person transmission and those acquired in the community are from other (environmental) exposures and from person-to-person transmission outside of the household. Thus, using the data from Koopman et al., it is inferred that person-to-person transmission was responsible for at least approximately 20% of the total infections in the community.

To determine how the uncertainty in $\boldsymbol{\beta}_{pp}$ impacts the propagation of secondary transmission of illness for the case study scenario, person-to-person transmission intensity within the minimum (10%) and maximum (60%) reasonable values for $\boldsymbol{\beta}_{pp}$ are explored.

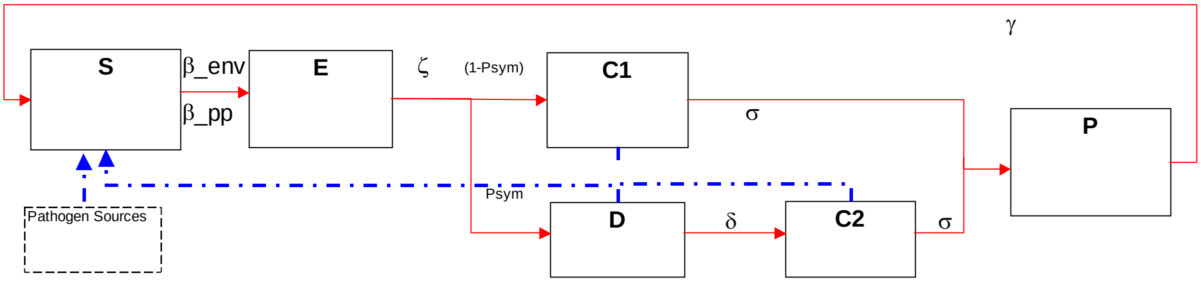
E.3.5.3 Model form uncertainty issues

The conceptual model used in the median value analysis was presented previously in Exhibit E.2. This model form is similar to conceptual models that have been used in other peer-reviewed studies used to investigate health effects associated with waterborne pathogens (Eisenberg et al. 1996; Eisenberg et al. 1998; Eisenberg et al. 2004; Soller et al. 2006; Soller et al. 2003; Soller et al. 2004). It should however be clear that a variety of model forms can be employed to characterize infectious disease transmission and to evaluate the potential for effective interventions.

The particular characteristics of a model form capture different aspects of the disease transmission system. However, it is unrealistic to presume that one model form is most appropriate for all waterborne microbial risk assessments. The selection of a model involves tradeoffs. Biological or demographic "realism" can come with the cost of analytical complexity that distances the model from available data (U.S. EPA 2004). With the perspective that different model forms and accompanying analytical approaches may be necessary for different applications, Koopman et al. (Koopman et al. 2001) suggested an analysis strategy involving a hierarchy of models from simple to increasingly complex models, which could be traversed to make microbial risk assessment analyses more realistic while remaining mathematically tractable.

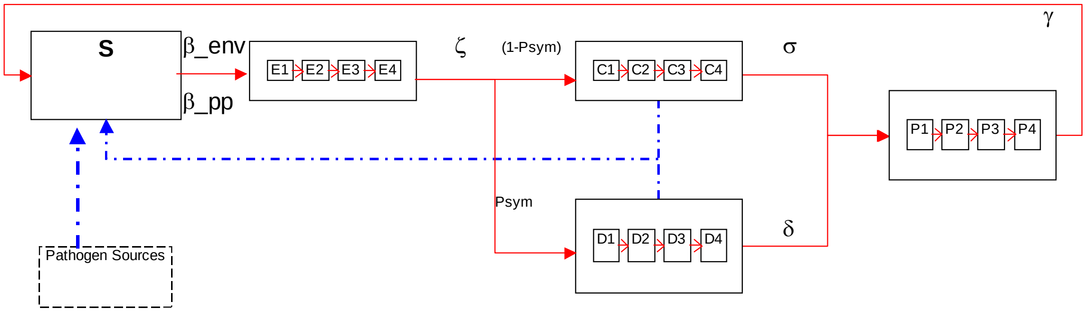
To determine how the particular model form impacts the magnitude of secondary transmission of illness in this investigation, two alternative model forms were evaluated through simulation using a median value analysis. The two alternative models are presented in Exhibits E.7 and E.8.

Exhibit E.7 Alternative Conceptual Model 1



State	Description
S	Susceptible to infection
E	Infected, pre-symptoms, pre-infectious
C	Infectious, asymptomatic
D	Infectious, symptomatic
P	Protected from infection

Exhibit E.8 Alternative Conceptual Model 2



State	Description
S	Susceptible to infection
E	Infected, pre-symptoms, pre-infectious
C	Infectious, asymptomatic
D	Infectious, symptomatic
P	Protected from infection

Relative to the model shown in Exhibit E.2, the model shown in Exhibit E.7 adds a carrier (infectious and asymptomatic) state after the diseased (infectious and symptomatic) state and prior to the state, which provides protection from infection. This modification accounts for the shedding of pathogens after symptoms subside. This characteristic has been reported in outbreak literature (refer to Appendix 1 of the investigator's full report (Soller 2006)) and has the potential to impact the predicted propagation of person-to-person transmission of illness in a community.

In the model presented in Exhibit E.8, movement within states E, C, D, and P is characterized by a distributed delay process (Eisenberg et al. 2004). The time that individuals spend in each these states is described by a gamma distribution. In the model presented in Exhibit E.2, the time that individuals spend in each of these states is characterized by an exponential distribution. The two parameters describing the gamma distribution are the number of sub-states per state (4) and the rate constant governing the movement between sub-states. The mean transit time in each state is 4 divided by the transition rate parameter used in the median value analysis. This model form was selected for evaluation based on models in peer reviewed literature (Eisenberg et al. 1996) and the fact that the incubation period is reasonably well characterized by a gamma distribution (Brookhart et al. 2002; Eisenberg et al. 2005).

E.3.5.4 Population uncertainty issues

One important assumption employed in this analysis is that the type A virus under investigation does not attack any particular portion of the population differently than any other (for example the model does not differentiate between children and adults). The purpose of this component of the uncertainty analysis is to determine how sensitive the predicted magnitude of secondary transmission in the community is to this assumption.

The type A virus described in the GWR is meant to represent highly infectious viruses with relatively low severity of illness. In considering rotavirus and noroviruses, both of which are considered type A viruses and account for a large percentage of illnesses from known pathogens (Mead et al. 1999), some portion of the population is likely either semi-permanently immune or genetically immune (Anderson and Weber 2004; Lindesmith et al. 2003).

To evaluate the uncertainty associated with portions of the population never moving into a "susceptible" state, a series of simulations are conducted in which 10, 25, 50 and 75% of the population never move out of State P (Protected).

E.3.5.5 Interaction of uncertainties

The final component of the uncertainty analysis is to determine if the results of the analysis are synergistically affected by uncertainty in multiple model parameters. To conduct this component of the analysis, the results from the four previously described components of the uncertainty analysis are considered jointly and several simulations are conducted. This component is important because it is possible that the results are sensitive to multiple parameters and/or categories of assumptions and the uncertainty analysis described above is limited in scope.

The methodology for this component of the analysis is to 1) identify several parameters which, based on the results of the analyses described in Sections E.3.5.1 through E.3.5.4 appear to have the strongest influence on the results, and 2) run simulations to investigate how the resultant disease propagation is influenced.

E.4 Results

The results of the median value analysis and the corresponding uncertainty analyses are presented and discussed in this section. These results summarize the output from over 300 individual simulations including the required calibration simulations. Representative programming code for the simulations that is used to generate the results presented in this section is found in Appendix II of the investigator's full report (Soller, 2006)

E.4.1 Median Value Analysis

The results of the median value analysis calibration and the median value analysis simulations are presented and discussed in following two subsections.

E.4.1.1 Median value analysis calibration

Calibration of the median value analysis was conducted as described in Section E.3.4. The results of the median value analysis calibration are shown in Exhibit E.9 and presented in Exhibit E.10. A detailed description of the calibration and the computer programming code used for the simulation of the median value analysis calibration are found in Appendix II of the investigator's full report (Soller 2006).

Exhibit E.9 Median Value Analysis Calibration

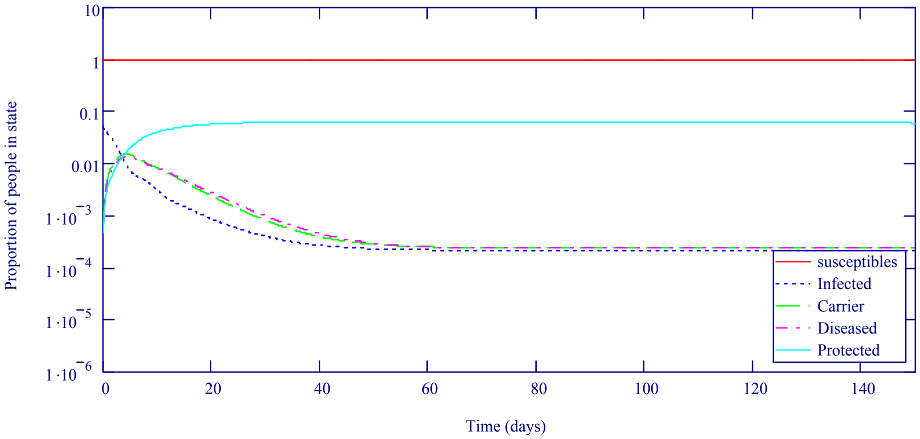


Exhibit E.10 Median Value Analysis Endemic Calibration Results

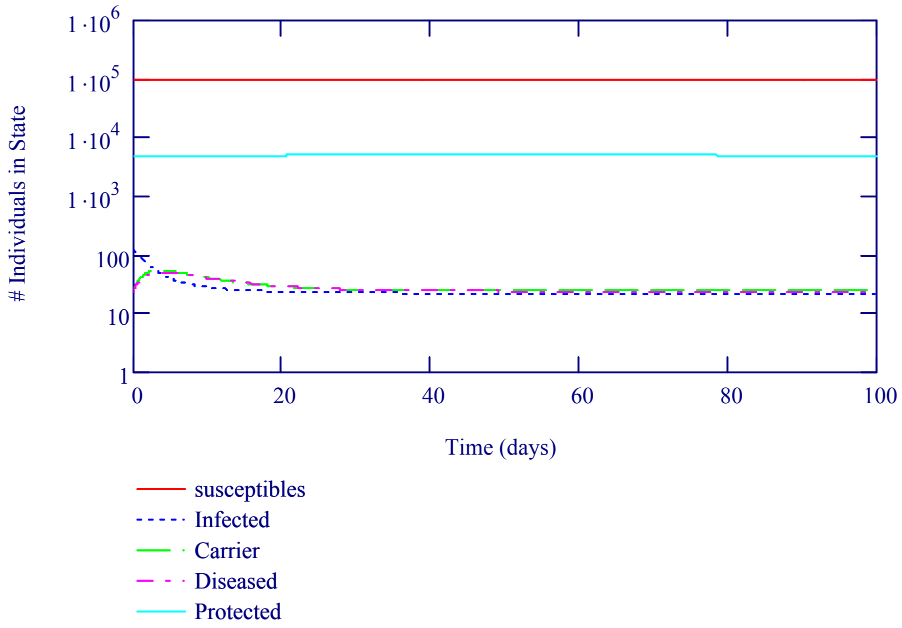
Endemic Level of Disease in US	3,900,000
Incidence per 100,000 / year	1418
Proportion ill	2.331E-04
Proportion ill -Primary transmission	1.87E-04
Proportion ill - Secondary transmission	4.66E-05
β_pp	3.99E-07
Endemic dose	1.88E-04
State S	0.95204
State E	0.00022
State C	0.00024
State D	0.00023
State P	0.04728

From a review of Exhibit E.9 and Exhibit E.10 it can be seen that a steady-state condition is reached relatively quickly in the simulation (about 60 days) and that the vast majority of the population is in State S (Susceptible) (95.2%) under these endemic conditions. For a population size of 100,000 individuals, the calibration indicates that under endemic conditions, approximately 95,200 individuals would be in State S, 22-24 individuals would be in States E, C, and D, and 4,728 individuals would be in State P (Protected). Equivalently, the proportion of individuals in State D (those individuals who are ill, defined as both infectious and symptomatic) under endemic conditions would be expected to be approximately 2.3×10^{-4} {23/100,000 or approximately (3.9 million/275 million)/ (365 days/year) x 6 days duration of disease}. (Kleinbaum et al. 1982; Soller et al. 2006).

E.4.1.2 Median value analysis results

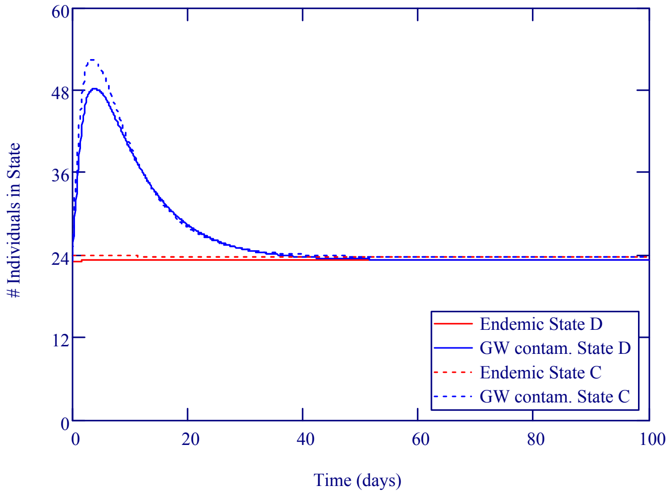
The results of the median value analysis are presented in Exhibit E.11. A detailed description of the median value analysis and the computer code used for the simulation of the median value analysis are found in Appendix II on the investigator's full report (Soller 2006).

Exhibit E.11 Median Value Analysis Results



The dynamic nature of the model under the case study scenario (for median parameter values) is illustrated in Exhibit E.12 and compared to endemic conditions. As illustrated in Exhibit E.12, endemic steady state conditions are reestablished approximately 50 days after the infected individuals return home.

Exhibit E.12 Median Value Analysis Compared to Endemic Conditions



The number of illnesses attributable to the case study is obtained as the difference of the areas under the curves shown in Exhibit E.12 for State D (Diseased) (one for endemic conditions and one for the case study) divided by the average duration of symptomatic illness. Mathematically, the number of attributable illnesses is computed as follows:

$$\text{Avg\_Attrib\_Inc} := \left[\frac{\int_0^T (\text{D\_gwc}(t) - \text{D\_end}(t))\,dt}{\text{delt\_avg}} \right]$$

Equation E.4

where:

- D_gwc represents the number of individuals in state D under the groundwater contamination case study scenario;
- D_end represents the number of individuals in state D under the endemic conditions; and
- delt_avg represents the average duration of symptomatic illness.

Further, the number of illness per incident illnesses and the number of illnesses per incident infection may be computed as follows:

$$\text{Illness\_per\_inc\_illness} := \frac{\text{Avg\_Attrib\_Inc}}{0.001 \cdot \text{Pop} \cdot \text{psym}}$$

Equation E.5

$$\text{Illness\_per\_infection} := \frac{\text{Avg\_Attrib\_Inc}}{0.001 \cdot \text{Pop}}$$

Equation E.6

where:

- Pop equals 100,000 and
- Psym is the probability of symptomatic response (in the median value analysis = 0.45).

The results of the median value analysis are summarized in Exhibit E.13. The principal findings reported in Exhibit E.13 are as follows:

- The number of illnesses attributable to the case study was approximately 53 illnesses: 45 of those illnesses were from primary exposure (the NCWS) and 8 from subsequent person-to-person transmission; and

- There were, on average, an additional 0.18 illnesses attributable to person-to-person transmission for each ill individual returning to the community. Alternatively, the number of additional illnesses can be computed based on the number of infected individual returning to the community, in which case were, there were on average, an additional 0.08 illnesses attributable to person-to-person transmission (for each infected individual returning to the community).

Exhibit E.13 Median Value Analysis Results

Endemic Level of Disease in US	3,900,000
Incidence per 100,000 / year	1418
Proportion ill	2.331E-04
Proportion ill - Primary transmission	1.87E-04
Proportion ill - Secondary transmission	4.66E-05
β_pp	3.99E-07
Endemic dose	1.88E-04
State S	0.95204
State E	0.00022
State C	0.00024
State D	0.00023
State P	0.04728
Attributable Number of Illnesses	53.2
# Illnesses per incident illness	1.18
# Illnesses per incident infection	0.53

E.4.2 Uncertainty Analysis

The results of the uncertainty analyses described in Section E.3.5 are presented in this section.

E.4.2.1 Model parameter uncertainty

Background Incidence

The results of the uncertainty analysis for background level of illness are presented in Exhibit E.14. Referring to Exhibit E.14, the magnitude of person-to-person transmission attributable to the case study is inversely related to the background level of disease in the community.

For example, at an average background incidence level of 50,000 illnesses annually in a population the size of the United States (as compared to the median value analysis which uses a background level of 3,900,000 illnesses), the number of illnesses attributable to the case study was about

57 illnesses, 12 of which were due to person-to-person transmission. These results indicate an average additional 0.27 illnesses attributable to person-to-person transmission for each ill individual returning to the community. Similarly, it can be seen that as the background incidence level increases, the number of illnesses attributable to the case study decreases.

From the data presented in Exhibit E.14, it appears that the number of individuals in State S (Susceptible) decreases as the endemic level of disease increases. Thus, it is likely that the inverse relation between attributable illness levels and background levels of disease is due to decreasing numbers of successful contacts with individuals in State S as the endemic level of disease increases.

Exhibit E.14 Uncertainty Analysis for Background Level of Illness

	Endemic Level of Disease in US					
	50,000	500,000	1,500,000	3,900,000	10,000,000	23,000,000
Incidence per 100,000 / year	18	182	545	1418	3636	8364
Proportion ill	2.989E-06	2.989E-05	8.966E-05	2.331E-04	5.978E-04	1.375E-03
Proportion ill Env	2.337E-06	2.344E-05	7.073E-05	1.865E-04	4.950E-04	1.214E-03
Proportion ill P-P	6.518E-07	6.448E-06	1.893E-05	4.663E-05	1.196E-04	2.750E-04
β_pp	4.005E-07	4.005E-07	4.005E-07	4.005E-07	4.005E-07	4.005E-07
Endemic dose	2.265E-06	2.282E-05	6.953E-05	1.879E-04	5.339E-04	1.567E-03
Steady State Conditions						
State S	0.99930	0.99378	0.9815	0.95203	0.8771	0.7172
State E	0.0000028	0.000028	0.000083	0.00022	0.00056	0.00127
State C	0.0000030	0.000030	0.000091	0.00024	0.00061	0.0014
State D	0.0000030	0.000030	0.000090	0.00023	0.00060	0.00138
State P	0.0006875	0.00613	0.01823	0.04728	0.12119	0.27880
Average Point Prevalence	0.3	3.0	9.0	23.3	59.81	137.58
Results of Perturbed Steady State						
Attributable Number of Illnesses	57.3	56.79	55.74	53.2	47.4	36.27
# Illness per Incident Illness	1.27	1.26	1.24	1.18	1.05	0.81
# Illness per incident infection	0.57	0.57	0.56	0.53	0.47	0.36

Notes:
Proportion ill based on duration of symptoms of 6 days (average symptomatic duration)
In these results the probability of symptomatic response is 0.45

Other Literature Derived Model Parameters

The results of the uncertainty analysis for other literature derived model parameters are presented in histogram format Exhibits E.15 and E.16. The attributable number of illnesses for these 128 simulations is presented in Exhibit E.15 and the number of illnesses per incident illness is presented in Exhibit E.16.

Exhibit E.15 Attributable Number of Illnesses for Model Parameter Uncertainty Analysis

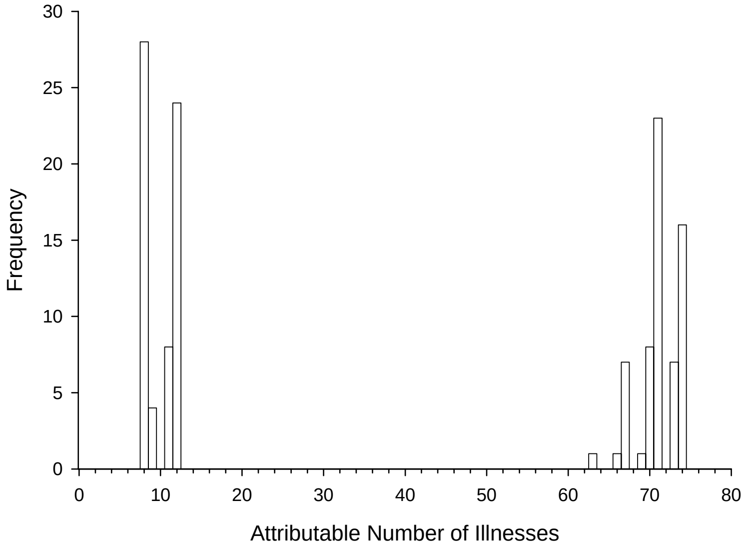
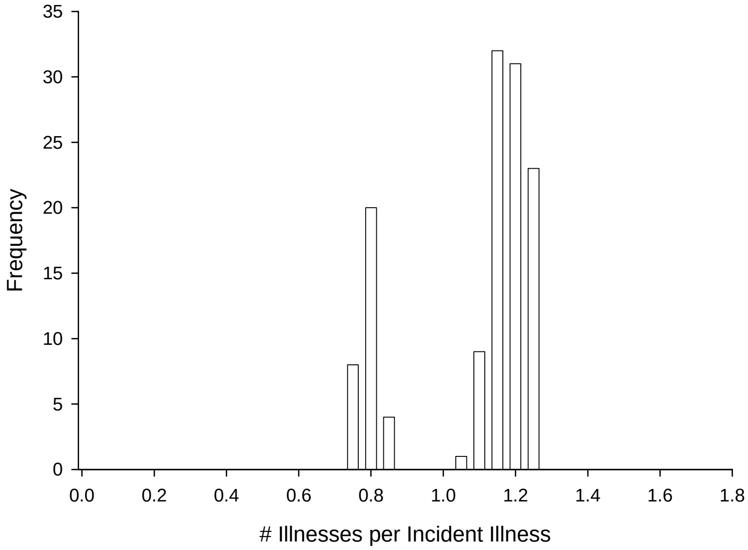


Exhibit E.16 Illnesses per Incident Illness for Model Parameter Uncertainty Analysis



From a review of Exhibits E.15 and E.16, it is found that the attributable number of illnesses varied between approximately 7 and 75 and the number of illnesses per incident illness varied between approximately 0.7 and 1.25 for these simulations. Note that the results of the median value analysis were an attributable number of illnesses of 53 and a corresponding 1.18 illnesses per incident illness.

Also of note is the fact that the results of these simulations appear to fall into two separate groups. For the attributable number of illnesses, the disparity is explained by the value of the probability of symptomatic response (the probability of symptomatic response was 0.1 in 50 % of simulations and 0.6 in the remaining 50 %). That is, in the simulations in which the probability of symptomatic response was low (0.1), the attributable number of illnesses was also low, and vice versa. The observation regarding the number of illnesses per incident illness is more complex. However, what can be said is that the combination of the probability of symptomatic response and the duration of immunity seem to interact to yield the lowest and highest values observed. Specifically, when the probability of symptomatic response was high and the duration of immunity was short, the highest values of illnesses per incident illness were observed. Similarly, when the probability of symptomatic response was low and the duration of immunity was long, the lowest values of illnesses per incident illness were observed.

E.4.2.2 Transmission parameter uncertainty

Environmental Exposure

The results of the uncertainty analysis for the dose response model form are presented in Exhibit E.17. As shown, two “variants” were run for each dose response model from investigated. In Variant 1, **β**$_{pp}$ was kept constant relative to the median value analysis and the “endemic dose” was varied to ensure that the incidence was consistent with the specified level (same as median value analysis). In Variant 2, **β**$_{pp}$ and “endemic dose” were kept constant relative to the median value analysis, and the incidence was allowed to vary. Results for variant 2 for the second alternative form are not shown because they are exactly the same as variant 1.

As shown in Exhibit E.17, the magnitude of person-to-person illness propagation in the case study is not related in a substantial way to the form of the dose response function, for the functional forms evaluated. It is however noteworthy that under the first alternative investigated, either the effective environmental dose was lower than in the other simulations (variant 1) or the incidence is higher (variant 2). Nevertheless, the number of illnesses attributable to the case study does not substantially change under any of the dose response model forms or variants investigated.

Exhibit E.17 Uncertainty Analysis for Dose Response Model Form

Dose Response Model form	Median value analysis β_{env}= 1-exp(dose* $\alpha/(\alpha+\beta)$)	β_{env}= 1-(1 + dose/β)$^{-\alpha}$		β_{env}= dose*[$\alpha/(\alpha+\beta)$]
Incidence per 100,000 / year	1418	Variant 1	Variant 2	1418
Proportion ill	2.331E-04	2.331E-04	3.640E-04	2.331E-04
Proportion ill Env	1.865E-04	1.87E-04	2.948E-04	1.87E-04
Proportion ill P-P	4.663E-05	4.66E-05	6.916E-05	4.66E-05
β_pp	4.005E-07	4.005E-07	4.005E-07	4.005E-07
Endemic dose	1.879E-04	1.161E-04	1.879E-04	1.879E-04
Steady State Conditions				
State S	0.95203	0.95204	0.92513	0.95203
State E	0.00022	0.00022	0.00034	0.00022
State C	0.00024	0.00024	0.00037	0.00024
State D	0.00023	0.00023	0.00036	0.00023
State P	0.04728	0.04728	0.07380	0.04729
Average Point Prevalence	23.3	23.3	36.4	23.3
Results of Perturbed Steady State				
Average Attributable Incidence	53.27	53.27	51.09	53.27
# Illness per incident illness	1.18	1.18	1.14	1.18

Person-to-Person Exposure

The results of the uncertainty analysis for the proportion of person-to-person transmission in a community are presented in Exhibit E.18. As shown in Exhibit E.18, the proportion of person-to-person transmission does impact the magnitude of the incidence attributable to the case study and consequently also impacts the number of illnesses per incident illness. For example, if person-to-person transmission accounted for 10% of the illness rather than the 20% reported in the Tecumseh study (Koopman et al. 1989), the estimated number of illnesses due to person-to-person transmission deceases from 8 to 2, and thus, the number of illnesses per incident illness decreases from 1.18 to 1.05. Similarly, if person-to-person transmission accounts for 60% of the illness in the community, the estimated number of illnesses from person-to-person transmission increases from 8 to 57 and, thus the number of illnesses per incident illness increases to 2.27. In interpreting the results presented in this section it should be noted that a static model would also predict increased attributable illnesses as the proportion of infections due to person-to-person transmission increases. Thus, the results observed in this portion of the uncertainty analysis are not necessarily due to the fact that a dynamic model was employed, but rather may be due to the particular scenario investigated.

Exhibit E.18 Uncertainty Analysis for Person-to-Person Transmission Intensity

		Median value analysis		
P-P transmission %	10%	20%	40%	60%
Incidence per 100,000 / year	1418	1418	1418	1418
Proportion ill	2.331E-04	2.331E-04	2.331E-04	2.331E-04
Proportion ill Env	2.098E-04	1.865E-04	1.399E-04	9.325E-05
Proportion ill P-P	2.331E-05	4.663E-05	9.325E-05	1.399E-04
β_pp	2.010E-07	4.005E-07	7.940E-07	1.179E-06
Endemic dose	2.124E-04	1.879E-04	1.395E-04	9.210E-05
Steady State Conditions				
State S	0.95205	0.95203	0.95201	0.95200
State E	0.00022	0.00022	0.00022	0.00022
State C	0.00024	0.00024	0.00024	0.00024
State D	0.00023	0.00023	0.00023	0.00023
State P	0.04727	0.04728	0.04731	0.04732
Average Point Prevalence	23.3	23.3	23.3	23.3
Results of Perturbed Steady State				
Attributable Number of Illnesses	47.4	53.2	70.4	102.4
# Illness per Incident Illness	1.05	1.18	1.56	2.27

E.4.2.3 Model form uncertainty

The results of the uncertainty analysis for health effects model form are presented in Exhibit E.19. The results of the simulations with the distributed delay model, as reported in Exhibit E.19 are similar to those for the median value analysis, and the attributable number of illnesses for the model employing a post-disease carrier state is slightly higher than those for the median value analysis for both variants investigated. Note that, in variant 1, $\boldsymbol{\beta}_{pp}$ and the endemic illness level were held constant, and in variant 2, $\boldsymbol{\beta}_{pp}$ and endemic dose were held constant. The observed increased attributable number of illnesses for the model with a post-disease carrier state is likely due to the fact that there are individuals that are shedding pathogens for a longer period of time, and thus the potential for person-to-person transmission is increased.

Exhibit E.19 Uncertainty Analysis for Model Form

Model description	Median value analysis Standard model	Model has post disease carrrier state		Distributed delay model
Incidence per 100,000 / year	1418	variant 1	variant 2	1418
Proportion ill	2.331E-04	2.331E-04	2.593E-04	2.331E-04
Proportion ill Env	1.865E-04	1.670E-04	1.865E-04	1.865E-04
Proportion ill P-P	4.663E-05	6.613E-05	7.280E-05	4.663E-05
β_pp	4.005E-07	4.005E-07	4.005E-07	4.005E-07
Endemic dose	1.879E-04	1.676E-04	1.879E-04	1.879E-04
Steady State Conditions				
State S	0.95203	0.95183	0.94644	0.95204
State E	0.00022	0.00022	0.00024	0.00022
State C1	0.00024	0.00024	0.00026	0.00024
State C2	-	0.00019	0.00022	-
State D	0.00023	0.00023	0.00026	0.00023
State P	0.04728	0.04729	0.05258	0.04727
Average Point Prevalence	23.3	23.3	25.9	23.3
Results of Perturbed Steady State				
Attributable Number of Illnesses	53.3	59.3	58.7	53.8
# Illness per incident illness	1.18	1.32	1.30	1.20

E.4.2.4 Population issues uncertainty

The results of the uncertainty analysis for population uncertainty issues are presented in Exhibit E.20. As shown, two “variants” were run for each proportion of the population that was permanently removed from State S (Susceptible). In Variant 1, the “endemic dose” was kept constant relative to the median value analysis and $\boldsymbol{\beta}_{pp}$ was varied to ensure that the incidence was consistent with the specified level (same as median value analysis). In Variant 2, $\boldsymbol{\beta}_{pp}$ was kept constant relative to the median value analysis, and the “endemic dose” and was varied to ensure that the incidence was consistent with the specified level. In both variants, the total incidence rate is the same as in the median value analysis, therefore, the endemic incidence in the *genetically susceptible* part of the population needs to be progressively greater as this portion of the population becomes smaller.

Variant 1 effectively keeps constant the number of pathogens that individuals are exposed to from the environment. Thus, as the number of individuals in State S decreases, the intensity of person-to-person transmission must increase for a given level of incidence. Similarly for Variant 2, with a constant probability of infective contact ($\boldsymbol{\beta}_{pp}$), the endemic dose must increase as the number of individuals in State S decreases for a given level of incidence. It is not known which of these two processes are more likely to represent a real world situation (or whether it is a combination thereof).

Exhibit E.20 Uncertainty Analysis for Population Uncertainty

Percent of Population Always in State P	Median value analysis 0%	10% Variant 1	10% Variant 2	25% Variant 1	25% Variant 2	50% Variant 1	50% Variant 2	75% Variant 1	75% Variant 2
Incidence per 100,000 / year	1418	1418	1418	1418	1418	1418	1418	1418	1418
Proportion ill	2.331E-04	2.331E-04	2.331E-04	2.331E-04	2.331E-04	2.331E-04	2.331E-04	2.331E-04	2.331E-04
Proportion ill Env	1.865E-04	1.679E-04	1.916E-04	1.399E-04	1.993E-04	9.326E-05	2.121E-04	4.662E-05	2.329E-04
Proportion ill P-P	4.663E-05	6.523E-05	4.153E-05	9.323E-05	3.383E-05	1.399E-04	2.103E-05	1.865E-04	2.258E-07
β_pp	4.005E-07	6.270E-07	4.005E-07	1.087E-06	4.005E-07	2.532E-06	4.005E-07	7.554E-06	4.005E-07
Endemic dose	1.879E-04	1.879E-04	2.157E-04	1.879E-04	2.723E-04	1.879E-04	4.503E-04	1.879E-04	1.069E-03
Steady State Conditions									
State S	0.95203	0.85202	0.85204	0.70202	0.70205	0.45204	0.45204	0.20205	0.20204
State E	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022
State C	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
State D	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
State P	0.04728	0.14730	0.14727	0.29730	0.29727	0.54728	0.54728	0.79726	0.79727
Average Point Prevalence	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
Results of Perturbed Steady State									
Attributable Number of Illnesses	53.2	58.7	51.6	68.9	49.1	92.9	44.6	106.7	37.6
# Illness per Incident Illness	1.18	1.30	1.15	1.53	1.09	2.06	0.99	2.37	0.84
# Illness per incident infection	0.53	0.59	0.52	0.69	0.49	0.93	0.45	1.07	0.38

Based on the results presented in Exhibit E.20, the number of illnesses attributable to the case study increases under Variant 1 assumptions rather dramatically. For example, if 25% of the population is permanently removed from State S (Susceptible), the estimated number of illnesses due to person-to person transmission increases from 8 to 24, and the number of illnesses per incident illness increases from 1.18 to 1.53. This type of analysis is intended to simulate the population dynamics that may be occurring in the general population for noroviruses (Lindesmith et al. 2003) or in the adult population for rotavirus (Anderson and Weber 2004). Similarly, if 50% of the population were permanently removed from State S, the estimated number of illnesses due to person-to person transmission increases from 8 to 48, and the number of illnesses per incident illness increases from 1.18 to 2.06 relative to the median value analysis.

One subtle but important point associated with this analysis is that these simulations involved a constant number of infected individuals regardless of the proportion of susceptible individuals in the population. As noted previously, it is assumed in this case study that a small subset of a population (100 people out of a population of 100,000) is exposed to untreated or inadequately treated groundwater from a NCWS contaminated with type A virus, and that all of those individuals become infected with the type A virus, and then return home. As the genetically susceptible portion of the population becomes smaller, this scenario becomes more unrealistic (for example, in the case where 75% of the population is never susceptible, ~20% of the population is in a susceptible state under endemic conditions, thus, it would be expected that 500 individuals would have to be exposed to result in 100 infections). Thus, caution is needed in interpreting these results.

E.4.2.5 Potential importance of uncertainty interaction

Based on the results presented in Sections E.4.2.1 through E.4.2.4 a combination of the following parameter values was investigated:

- Model parameter uncertainty: the probability of symptomatic response and the duration of immunity were shown to be parameters that influence disease propagation for the case study. Therefore, these two parameters were selected for further investigation.

- Transmission parameter uncertainty: from section E.4.2.2 the person-to-person transmission intensity influences the magnitude of the incidence attributable to the case study and consequently also impacts the number of illnesses per incident illness. For this portion of the uncertainty analysis, it is assumed that person-to-person transmission accounts for 40% of the illness rather than the 20% used in the median value analysis.

- Population issues uncertainty: from section E.4.2.4 the number of illnesses per incident illness increases if some of the population is permanently removed from State S (Susceptible). For this component of the uncertainty analysis, it is assumed that 25% of the population is either semi-permanently immune or genetically immune.

The results of the uncertainty analysis that consider the interaction of different types of uncertainties are presented in Exhibit E.21.

Exhibit E.21 Uncertainty Analysis for Interaction of Uncertainties

	Median value analysis		
P-P transmission %	20%	40%	40%
Percent of population always in State P	0%	0%	25%
Psym	0.45	0.60	0.60
gamma	0.0018	0.0048	0.0048
Incidence per 100,000 / year	1418	1418	1418
Proportion ill	2.331E-04	2.331E-04	2.331E-04
Proportion ill Env	1.865E-04	1.399E-04	1.399E-04
Proportion ill P-P	4.663E-05	9.325E-05	9.325E-05
β_pp	4.005E-07	7.303E-07	9.805E-07
Endemic dose	1.879E-04	1.025E-04	1.371E-04
Steady State Conditions			
State S	0.95203	0.98599	0.73599
State E	0.00022	0.00016	0.00016
State C	0.00024	0.00013	0.00013
State D	0.00023	0.00023	0.00023
State P	0.04728	0.01349	0.26349
Average Point Prevalence	23.3	23.3	23.3
Results of Perturbed Steady State			
Attributable Number of Illnesses	53.2	97.8	97.2
# Illness per Incident Illness	1.18	1.63	1.62

Based on the results presented in Exhibit E.21, there does seem to be some synergistic effects when the interactions of different types of uncertainties are considered. For example, in the second simulation shown in Exhibit E.21, the number of illnesses per incident illness is 1.63. This level may be compared to that shown in Exhibit E.18 (1.56), which uses median values for the probability of symptomatic response and duration of incubation along with a person-to-person transmission intensity based on 40% of illnesses due to person-to-person transmission.

In the third simulation presented in Exhibit E.21, the same parameter values are used as in the second simulation, except 25% of the population is assumed to be either semi-permanently immune or genetically immune. This modification did not impact the disease propagation through the community compared to the second simulation in Exhibit E.21. However, when compared to the analogous simulation in Exhibit E.20 (25% removed from State S, Variant 1), the reported number of illnesses per incident illness are slightly elevated (1.53 compared to 1.62). From a careful comparison of the data in Exhibits E.20 and E.21, the noted difference are likely due to changes in the parameter values for the probability of symptomatic response and the duration of immunity.

Finally, it should be noted that other simulations similar to those presented in Exhibit E.21 could be conducted. Those selected here are not intended to be exhaustive nor extreme values. Rather they were selected to determine the potential for interaction between important factors identified during the uncertainty analysis.

E.5 Discussion of results

E.5.1 Interpretation and Insights Gained from Analysis

In the analysis presented above, an infectious disease paradigm was employed to evaluate the potential implications of secondary transmission of infection and illness relative to the intensity of secondary transmission estimated using the approach in the GWR base analysis. The evaluation was conducted using a hypothetical case study scenario of a type A virus in a community with a population size of 100,000.

The predicted magnitude of person-to-person transmission of illness in the community was reported and discussed herein in terms of the number of illnesses per incident illness based on a number of individuals from that community visiting a NCWS contaminated with a type A virus. The number of illnesses per incident illness is a normalized metric to characterize person-to-person transmission intensity. It is robust to other formulations of the case study provided that the ratio of infected individuals (those that visit the NCWS and return home infected) to the total population is small. A series of sensitivity analyses were conducted to verify that the normalized results are robust within the range of 0.001% to 0.1% of the population assumed to be infected. Representative results of those sensitivity analyses are summarized in Exhibit E.22.

Exhibit E.22 Sensitivity Analysis for Case Study Formulation

Model description	Median value analysis		Person-to-person transmission accounts for 60% of infections in community		25% of population not available to move to State S variant 1	
Number of Individuals Assumed Infected	100	1	100	1	100	1
Incidence per 100,000 / year	1418	1418	1418	1418	1418	1418
Proportion ill	2.331E-04	2.331E-04	2.331E-04	2.331E-04	2.331E-04	2.331E-04
Proportion ill Env	1.865E-04	1.865E-04	9.325E-05	9.325E-05	1.399E-04	1.399E-04
Proportion ill P-P	4.663E-05	4.663E-05	1.399E-04	1.399E-04	9.323E-05	9.323E-05
β_pp	4.005E-07	4.005E-07	1.179E-06	1.179E-06	1.087E-06	1.087E-06
Endemic dose	1.879E-04	1.879E-04	9.210E-05	9.210E-05	1.879E-04	1.879E-04
Steady State Conditions						
State S	0.95203	0.95203	0.95200	0.95200	0.70202	0.70202
State E	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022
State C	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
State D	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
State P	0.04728	0.04728	0.04732	0.04732	0.29730	0.29730
Average Point Prevalence	23.3	23.3	23.3	23.3	23.3	23.3
Results of Perturbed Steady State						
Attributable Number of Illnesses	53.3	0.53	102.4	1.03	68.9	0.69
# Illness per incident illness	1.18	1.18	2.27	2.28	1.53	1.53

Because the number of illnesses per incident illness is robust to other case study scenarios and is thus, scalable, it is a useful metric for providing insight toward the expected implications for other situations in which either more or less individuals are exposed to or infected with Type A viruses from untreated or inadequately treated groundwater. For example, another scenario relevant to the GWR may be one in which low numbers of individuals return to a large community infected with a Type A virus after visiting an area served by a NCWS with untreated or inadequately treated groundwater. Based on the results summarized in Exhibit E.22, the average number of illnesses per incident illness can be used to predict the expected magnitude of person-to-person transmission from one or more event of this type.

Based on the results presented in Section E.4, it is clear that person-to-person transmission of infection is an important population level characteristic that could have significant implications on the predicted benefits of the GWR. The median value analysis predicted, on average, an additional 0.18 illnesses attributable to person-to-person transmission for each ill individual returning to the community.

From the results of the uncertainty analysis it was found that several parameters and assumptions have the potential to substantially influence the magnitude of disease propagation predicted by the median value analysis for the case study investigated. For example, the probability of symptomatic response and duration of immunity were both found to be important factors in predicting the propagation of illness via person-to-person transmission. Similarly, transmission parameter and population issue uncertainties were found to strongly affect the predicted magnitude of disease propagation. Finally, synergistic effects were observed when the interactions of different types of uncertainties were considered simultaneously.

One of the most important differences between the assumptions employed in this investigation and those employed in the GWR base analysis was the relaxation of the assumption that only children are sources of secondary infections. In the GWR base analysis, primary waterborne illnesses in young children are multiplied by a secondary transmission factor to estimate the number of secondary cases in individuals of all ages. In the analysis described herein, it is assumed that individuals of all ages are equally likely to become infected and subsequently propagate infection via person-to-person transmission. By relaxing the GWR assumption and deriving a different multiplicative factor for secondary spread based on the epidemiological data reported by Koopman et al. (1989), it is possible to illustrate the importance of this assumption for the analysis described herein. Those calculations (not shown) produce similar, albeit slightly higher estimates of person-to-person transmission than those derived with the dynamic model. The assumption that individuals of all ages are equally likely to become infected and subsequently propagate infection via person-to-person transmission, coupled with a simple epidemiologically based multiplicative factor tends to systematically overestimate the total number of illnesses attributable to TNCWS outbreak relative to the dynamic model. In this case, the dynamic model accounts for temporary removal of the primary infections (and all secondary infection cases that they generated) from the pool of susceptible individuals. By way of contrast, both the dynamic model and the simple epidemiologically based multiplicative factor model with the relaxed assumption about sources of secondary infection, both predict substantially higher person-to-person transmission than the GWR base analysis, with specific results depending on the parameter values employed.

The analysis presented herein is intended to complement the base analysis in the GWR. In that context, this analysis provides a perspective on the relative magnitude of uncertainty that may be associated with the benefits of the GWR due to secondary transmission of infection. Although the GWR base analysis and that presented herein both focus on characterizing the risk associated with illness from groundwater sources, each analysis is built on a different set of assumptions. To the extent feasible, similar parameter values and assumptions were applied in this analysis compared to those used in the base analysis. However, because the two analyses were intended to address slightly different questions, the results are not necessarily directly comparable. For example, in this analysis 6 days was used in the median value analyses for the duration of symptomatic infection, and 2 and 8 days are used as the minimum and maximum reasonable values, respectively. These durations represent the mean time periods for which individuals with symptomatic infections could realistically infect other individuals. In the base analysis, the duration of symptoms represents the time period in which individuals are sufficiently ill that they are likely to miss work or otherwise suspend their normal activities. Thus, the results of the two analyses address slightly different outcomes, and caution is warranted in directly comparing the results.

The analysis presented herein employed a model virus that was intended to be representative of highly infectious viruses that have low severity of clinical illness (type A viruses). The model virus in the median value analysis was assumed to have the clinical properties and endemic level of illness of rotavirus. As discussed above, it was further assumed that no specific portion of the population was any more or less likely to be infected upon exposure to the model virus.

Uncertainty analysis was used to explore the potential implications of type A virus characteristics different than those of the model virus employed. Of particular note and concern are noroviruses which are estimated to cause approximately 23,000,000 illnesses in the United States annually (Mead et al. 1999), are associated with up to 90% of the epidemic nonbacterial gastroenteritis worldwide (Lindesmith et al. 2003), and are also the major cause of acute nonbacterial gastroenteritis outbreaks worldwide (Ando et al. 2000). Although noroviruses are highly infectious, volunteer studies have shown that some subjects remain uninfected even after challenges with high doses (Johnson et al. 1990; Matsui and Greenberg 2000). Recent research indicates that resistance to norovirus infection is multifactorial and that a substantial portion of the population (approximately 20%) may not be susceptible to infection at any point in time (Lindesmith et al. 2003). Further, for the population that could be susceptible (at some point in time), it was found that a portion of the population (35%) was resistant to infection, suggesting that a memory immune response or some other unidentified factor also affords protection from norovirus infection (Lindesmith et al. 2003).

Rigorous modeling of norovirus transmission is extremely difficult at the present time for a number of reasons. Several important issues include: 1) the dose response relation has yet to be published, 2) little is known about the potential for cross strain immunity, and 3) the person-to-person transmission potential appears to be substantial based on outbreak data. It was noted previously that about 300 norovirus outbreaks were documented in the US between 1993 and 1999 and that the genetic diversity of the noroviruses responsible for those outbreaks encompassed approximately 68 strains (Ando et al. 2000). Clearly, the transmission of norovirus infection in a community is much more complicated than that presented herein. Nevertheless, several salient properties of noroviruses were explored in the uncertainty analysis in an attempt to provide some perspective on the potential importance of population dynamics for noroviruses with respect to the GWR. Specifically, 1) all infected individuals (children and adults) can spread infection , 2) portions of the population never move into the susceptible state (population uncertainty) and 3) person-to-person transmission intensity (transmission parameter uncertainty) different than that of rotavirus, were investigated herein.

Based on the results of this investigation, it is clear that secondary transmission could substantially impact the potential benefits of the GWR depending on the suite of population dynamic elements considered and the assumptions employed.

E.5.2 Limitations

Given the complexity of characterizing disease propagation from a case study such as that presented herein, a number of methodological assumptions were required for this investigation. The limitations of the analyses presented herein generally stem from those assumptions.

One fundamental limitation of any analysis such as this one is that the results are applicable only for parameter values within the range of those investigated. Although a detailed literature review was conducted and the data from the literature were evaluated carefully to identify appropriate parameter values for the investigation, it is possible that parameter values could be refined or changed based on future research.

A related assumption was that the epidemiological status of the population could be approximated reasonably with the relatively simple structure of the disease transmission model (Exhibit E.2). Although several alternative model forms were also investigated, it is possible that other types of models could yield additional and/or alternative insights. For example, 1) "super-spread events" may be important determinants in characterizing disease transmission magnitude (Riley et al. 2003), 2) There may be different transmission rates of viruses within and outside of households (but within the same community), and 3) virus infection rates may vary by season. Any or all of these factors are worthy of consideration for future extensions of this or related work.

Other simplifying assumptions were made to streamline both the analysis and the interpretation of the results presented herein. The most important of those assumptions were that insights could be drawn from the one hypothetical case study scenario that was investigated, and that the model type A virus, as constructed in the median value analysis and the uncertainty analyses is representative of the type A viruses of concern for groundwater contamination scenarios. Given these simplifying assumptions, the results presented herein should not be interpreted as absolute estimates of risk for any particular situation.

E.6 Conclusions

The major conclusion of this investigation is that population dynamics could substantially impact the potential benefits of the GWR depending on the suite of population dynamic elements considered and the assumptions employed. Potentially important elements include clinical disease character, etiologic agent infectivity, population immunity, and person-to-person transmission characteristics of each etiologic agent of interest. Specifically, based on the results described herein 1) the uncertainty bounding the magnitude of person-to-person transmission for type A virus illnesses is substantial; and 2) depending on the assumptions employed, the predicted number of additional illnesses due to secondary transmission could be greater than that predicted by the GWR base analysis by approximately an order of magnitude or could be as low as effectively zero. Given the uncertainties associated with estimating the potential benefits of regulating groundwater to prevent waterborne disease, the results of this investigation could have profound implications when extrapolated to the GWR.

Appendix F

Infectivity Dose Response Relationships: Description of Analyses Conducted to Select Model Forms and Estimate Model Parameters

Appendix F
Infectivity Dose Response Relationships: Description of Analyses Conducted to Select Model Forms and Estimate Model Parameters

F.1 Introduction

This appendix provides an expanded discussion of the information presented in EA Section 5.2.4 (Probability of Infection, Illness, and Mortality).

The following are the key information sources related to the development of these models.

1. Schiff et al. (1984). Studies of Echovirus-12 in Volunteers: Determination of Minimal Infectious Dose and the Effect of Previous Infection on Infective Dose.

   This study provides data on the rate of infection of 144 volunteers ingesting 0 to 333,000 plaque-forming units of echovirus-12 (a Type B virus).

2. Ward et al. (1986). Human Rotavirus Studies in Volunteers: Determination of Infectious Dose and Serological Response to Infection.

   This study provides data on the rate of infection of 62 volunteers ingesting 0 to 90,000 focus-forming units of rotavirus (a Type A virus).

3. Regli et al. (1991). Modeling the Risk from *Giardia* and Viruses from Drinking Water.

   This paper presents a detailed discussion of the use of the exponential and beta-Poisson dose-response models for characterizing risk of infectivity from ingestion of certain waterborne microorganisms. Included in this paper are model-fitting efforts for Type A and Type B viruses using the data from the two studies identified above. It should be noted that the model form described as the beta-Poisson in this paper is an approximation to the exact beta-Poisson, an important distinction that is discussed further in this section.

4. Haas et al. (1999). Quantitative Microbial Risk Assessment.

   This book, and specifically Chapter 7 "Conducting the Dose-Response Assessment," provides a detailed discussion of the use of various model forms – including the beta-Poisson and exponential models – to characterize the risk of infection from exposure to waterborne microbes.

5. Teunis and Havelaar (2000). The Beta Poisson Dose-Response Model Is Not a Single-Hit Model.

   This paper provides a detailed discussion of the application of the beta-Poisson dose-response model and, in particular, highlights limitations in using the approximation to the exact beta-Poisson model (as done in Regli et al. noted above).

F.2 Dose-Response Data

Dose-response data for rotavirus, shown below in Exhibit F.1, were taken from the paper by Ward et al. Data for echovirus, shown in Exhibit F.2, were taken from the paper by Schiff et al. These full data sets are used in EPA's primary dose-response analysis.

Exhibit F.1 Rotavirus Dose-Response Data

Dose (Poisson), focus-forming units (ffu)	Subjects receiving Dose	Subjects Infected
0.009	7	0
0.09	7	0
0.9	**7**	**1**
9	11	8
90	7	6
900	8	7
9,000	7	5
90,000	3	3

Exhibit F.2 Echovirus Dose-Response Data

Dose (Poisson), plaque-forming units (pfu)	Subjects receiving Dose	Subjects Infected
330	**50**	**15**
1,000	**20**	**9**
3,300	**26**	**19**
10,000	**12**	**12**
33,000	4	2
330,000	3	2

As discussed in EA section 5.2.4, EPA selected subsets of the data to inform the sensitivity analyses. These data are shaded in Exhibits F.1 and F.2, above. For rotavirus, the sensitivity analysis utilized only the data for dose 0.9. For echovirus, only data at doses less than 33,000 and 330,000 were used.

F.3 Dose-Response Models

The subsections that follow describe the exponential and beta-Poisson dose-response models and identify how they were used in the primary and sensitivity analysis.

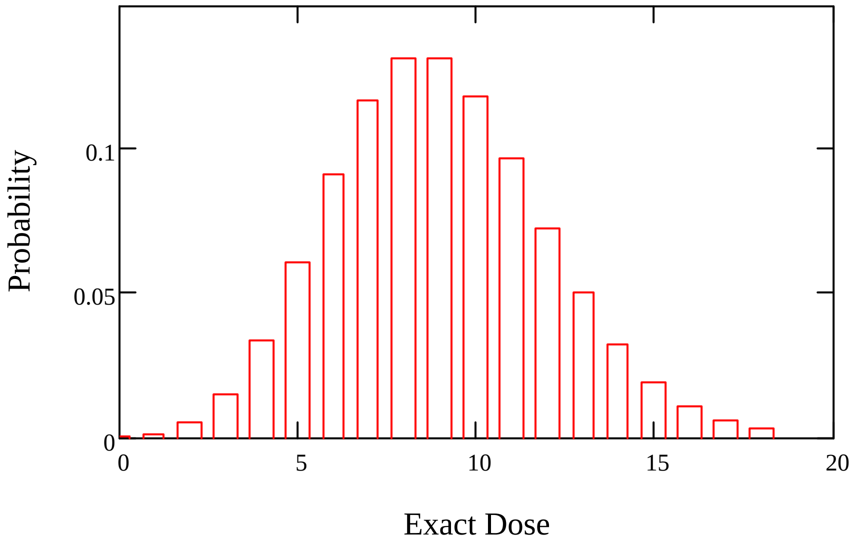
F.3.1 Exponential Model

Haas et al. (1999) provide a detailed discussion of the derivation of the beta-Poisson model and its applicability to microbial risk assessment. Haas first describes a simpler dose-response model, the exponential model, which has the following form:

$$P(d) = 1 - e^{-r\,d} \,,$$

where P(d) is the probability of infection, given Poisson dose d and r is the probability that an organism, once ingested, will survive to initiate an infection. In the dose-response studies, dose is expected number of infectious units (either plaque-forming or focus-forming units) in a carefully measured volume of diluted viral suspension. Similarly, the dose ingested by someone consuming contaminated drinking water is the expected number of infectious units in the volume of water ingested (the product of virus concentration in water and the volume ingested). In theory, the exact numbers ingested vary as Poisson random variables, about their expected values. For example, 1 ml volumes taken from a dilution that contains 9 infectious units per ml will have 9 infectious units, on average, but about 90% of the exact numbers will fall between 4 and 14, inclusive. This Poisson distribution (mean 9) is shown in Exhibit F.3, below.

Exhibit F.3 Poisson Probability Mass Function (λ = 9)



Under the exponential model, each viral infectious unit has an independent and identical probability, r, of initiating infection, if ingested by a human host. If these successful units could be identified and counted in advance, they would constitute r*100% of the total population of infectious units and the number of these in a volume taken from a well-mixed suspension will, in theory, be a Poisson random variable with parameter r*d, where d is the product of concentration and volume. The probability of having exactly zero of these successful units in the volume equals the Poisson probability of zero: e^{-d*r}. The probability of infection is 1 minus that quantity, which is precisely the formula for P(d) shown above.

F.3.2 Beta-Poisson Model

The beta-Poisson model is an extension of the exponential model and has the following form:

$$P(d) = 1 - \int_0^1 \left(e^{-r\,d}\right) f(r)\, dr$$

In this model form, the underlying assumption that each infectious unit has an independent and identical survival probability, r, is changed to reflect that for some host-unit combinations there may be variation in the survivability rate, perhaps reflecting different degrees of susceptibility in the exposed individuals. This variation is captured by the *f(r)* term, which is the beta probability density function. This function has two parameters (α and β) and the function form (where Γ is the gamma function):

$$f(r) = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\,\Gamma(\beta)}(r^{\alpha-1})(1-r)^{\beta-1}$$

Thus, the full dose-response function of the exact beta-Poisson model is:

$$P(d) = 1 - \int_0^1 \left(e^{-r\,d}\right) \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\,\Gamma(\beta)}(r^{\alpha-1})(1-r)^{\beta-1}\, dr$$

This expression does not have a simple algebraic solution and must be evaluated numerically. The numerical integration is difficult. Large parameter values can lead to numerical overflow ($\Gamma(171) > 2^{1023}$, which is a common computational limit). This difficulty led to the development of simpler forms that approximate the exact function. One of these, which is also discussed in the three modeling papers referenced above, is attributed to Furumoto and Mickey (1967) and has the form:

$$P(d) = 1 - \left(1 + \frac{d}{\beta}\right)^{-\alpha}$$

This form is often referred to as the beta-Poisson, with the full dose response form referred to as the <u>exact</u> beta-Poisson. In other cases, this approximation is referred to as the Pareto or Pareto II approximation to the exact beta-Poisson. For clarity and simplicity, this model from will be referred to in the remainder of this discussion as the Pareto approximation.

Another approximation to the exact beta-Poisson model for the infectivity dose-response equation was developed by EPA, and it has the form:

$$P(d) = d\left(\frac{\alpha}{\alpha+\beta}\right)$$

In this case, the α and β parameters are the same as those estimated for the beta distribution of the exact form of the model. This equation is only valid when the expected dose is at most one infectious unit. For reasons discussed later, this is referred to as the expected value approximation of the exact beta-Poisson model. These approximation forms are discussed further in the sections that follow.

F.3.3 Models Selected for the Primary and Secondary Analyses

The remainder of this appendix provides specific information on EPA's primary and sensitivity analyses, detailing the data and mathematical models that were selected to characterize the infectivity of Type A and Type B viruses. Results are reported for both the primary and sensitivity analyses. The primary analysis results are directly used to predict baseline risk and benefits in the economic analysis. The sensitivity analysis reveals the magnitude of model uncertainty for both types of viruses. Model uncertainty appears to be relatively small for Type A (rotavirus), but large for Type B (echovirus), where predictions require extrapolation far below the range of the dose-response data. The Exhibit below summarizes the data and models used in the primary and sensitivity analyses.

Exhibit F.4 Data and Models Used in the Primary and Secondary Analysis for Type A and Type B Viruses

	Type A = Rotavirus	**Type B = Echovirus**
Primary Analysis	All Data from Ward et al. Beta-Poisson Model (exact beta-Poisson)	All Data from Schiff et al. Beta-Poisson Model (Pareto approximation)
Sensitivity Analysis	Data from Dose 0.9 Only Exponential Model	Data from Doses < 33,000 pfu Exponential Model

F.4 Primary Analyses

For its primary analysis of both Type A and Type B viruses, EPA attempted to use the exact beta-Poisson model form. This required undertaking analytical steps to estimate the necessary parameters for the model, namely the α and β parameters for the beta distribution as included in the exact beta-Poisson model.

Further, it was recognized that because the parameter estimates were being derived from one study for each of the two virus types, there would be uncertainty inherent in the estimates obtained. Therefore, the procedures undertaken were designed not to produce just a single "best estimate" of those parameter values, but rather a set of plausible parameter pairs that capture the uncertainty in the estimates.

In the following sections, the attempts to estimate these parameter pairs for each of the two virus types are described. In the case of Type A virus, these parameters were estimable for the exact model. However, difficulties encountered with the numerical integration in the implementation of the model led to the development by EPA of expected value approximation model form noted earlier. In the case of Type B virus, EPA was unable to successfully estimate parameters for the exact beta-Poisson model. Therefore, it was necessary to use the Pareto approximation form for Type B viruses. The parameters were estimated for this dose response function using a bootstrap procedure as described below.

F.4.1 Type A Viruses

Description of procedure for estimating the parameters for Type A viruses.

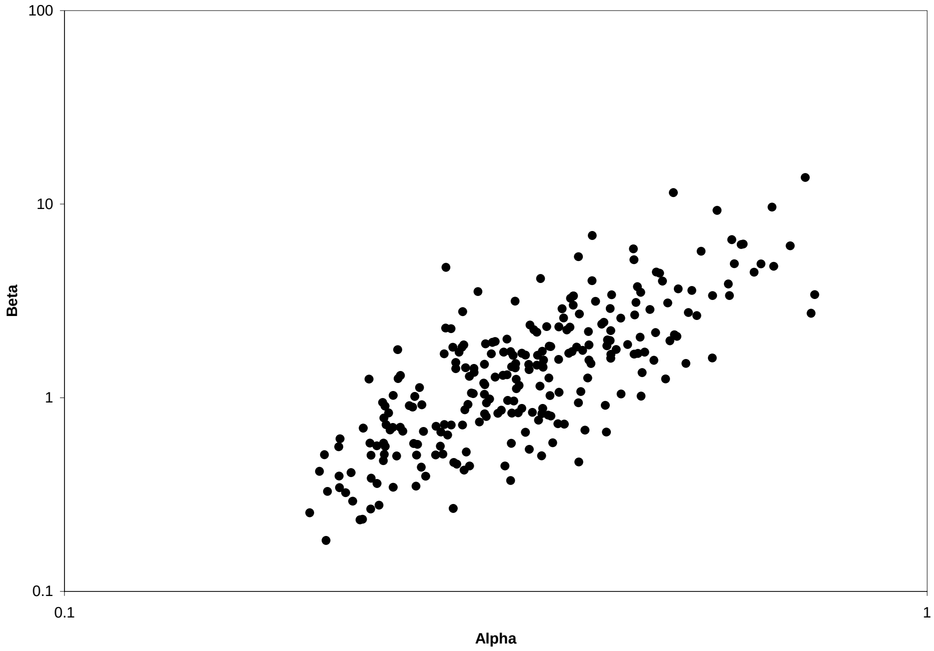
BUGS software (WinBUGS13) was used to produce a Markov Chain Monte Carlo (MCMC) sample of parameter pairs (alpha, beta) for rotavirus. The software (described by Gilks, Thomas, and Spiegelhalter, 1994) provides graphical and textual descriptions of the analysis model. The code below describes subject-specific parameters, r[subj], as beta distributed with parameters alpha and beta. Disperse, uniform priors were assigned to alpha and beta to convey a lack of prior knowledge about these two parameters. Given parameter r[subj], the subject's probability of infection is an exponential function of dose, $1 - e^{-dose[subj]*r[subj]}$.

```
model;
{
  alpha ~ dunif(0,5)
  beta ~ dunif(0,200)
  for( subj in 1 : 59 ) {
    r[subj] ~ dbeta(alpha,beta)
    inf[subj] ~ dbern(p[subj])
    p[subj] <- 1 - exp(-dose[subj] * r[subj])
  }
}
```

Characterization of Resulting Parameter Pairs for Type A

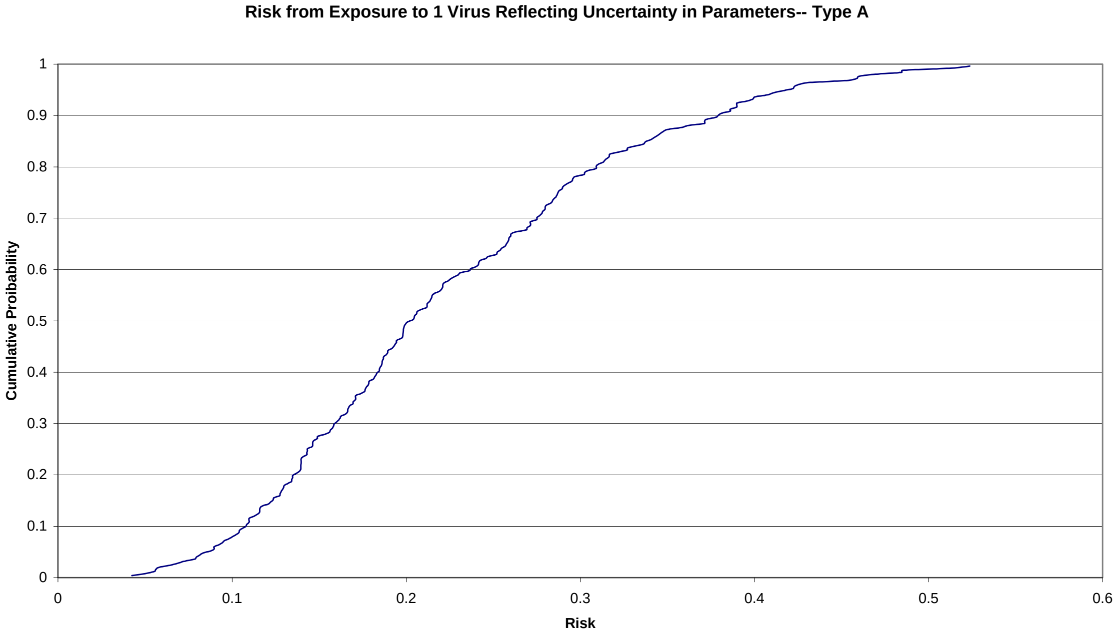
Parameters alpha and beta were strongly correlated in the posterior sample. The correlation is evident in Exhibit F.5. The figure shows that the ranges for these parameters are well within the much broader ranges defined by the uniform priors. The narrower ranges are due to the information content of the dose-response data and demonstrate that the priors were relatively non-informative, which was desired.

Exhibit F.5 Posterior Sample of Parameter Pairs for Type A Virus



The graph in Exhibit F.6 displays the distribution of average probability of infection for Type A viruses. As defined here, the average probability of infection is the mean exponential dose-response parameter (r), based on a distribution defined by parameters alpha and beta. The mean for a given parameter pair is alpha / (alpha + beta). This mean is the fraction of the population that would be infected if each person were to ingest exactly one infectious unit. The graph reveals the uncertainty in this mean value. Variability, though considerable, is not displayed in this figure. The overall mean is 0.224 and the 90% confidence bounds (from the 5th and 95th percentiles) are 0.088 and 0.414.

Exhibit F.6 Distribution of Probability of Infection for Type A Virus

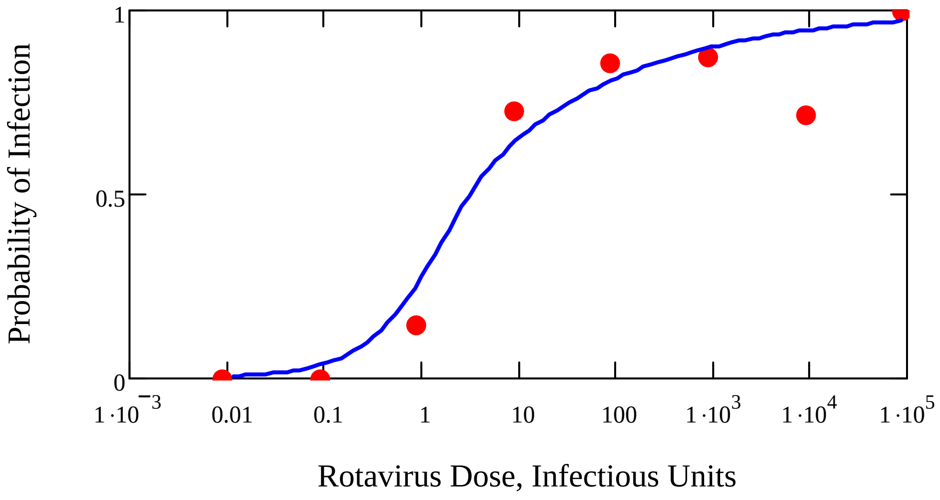


It is important to note that EPA/ORD estimated model parameters using a different procedure and produced estimates that appear to differ from those produced by this MCMC procedure. At low doses, ORD's estimates suggest risks that are about twice as great as those estimated by the MCMC procedure. To be conservative in our estimate, the lower MCMC values will be used to calculate the risk of infection from Type A viruses.

Goodness of Fit for Type A Virus

Exhibit F.7 shows the quality of fit for maximum likelihood parameter values ($\alpha = 0.265$, $\beta = 0.442$). The likelihood, given this parameter pair, is $3.48*10^{-4}$. A classical or frequentist approach was used to further assess goodness-of-fit. Artificial dose-response data sets were generated using the same distribution of subjects across doses, but simulating the outcomes as binomial random variables with infection probabilities as predicted by the maximum likelihood parameters. This was repeated 10,000 times and the likelihood was determined for each of the 10,000 artificial data sets. Among the 10,000 likelihoods, the actual data likelihood ranked at the 40th percentile. An extremely small value (below 1st percentile) would have been evidence of poor model fit or spurious data and an extremely large value (above 99th percentile) would have been evidence of over-fitting. The moderate value encountered (40th percentile) is evidence of good model fit.

Exhibit F.7 Data (Number Infected / Number Subjects) and Maximum Likelihood Number Dose-Response Function for Type A Viruses



F.4.2 Type B Viruses

Description of procedure for estimating the parameters for Type B viruses

As noted above, the same MCMC procedure was attempted for Type B viruses, but with limited success. Ideally, the MCMC algorithm would produce a sample of parameter pairs (alpha, beta) that are independent draws from the joint posterior distribution. The sequence of parameter pairs actually obtained showed a lack of independence, with strong autocorrelation (poor mixing).

Rather than run the MCMC algorithm with great thinning (e.g., accepting every 10,000th parameter pair), EPA used a bootstrap procedure to estimate the parameters for the Pareto approximation for Type B viruses. The algorithm described below is taken directly from *Quantitative Microbial Risk Assessment*, by Haas, Rose and Gerba, in Chapter 7 on page 291.

1. Fit the dose-response model to the data to get the maximum likelihood estimate (MLE) of (α, β).

2. Plug dose levels, from the study, into the MLE dose-response curve to get the modeled probability of infection for each data point.

3. Compute the standardized residuals -- the difference between the observed proportion of infections and the modeled probability of infection at each data point. These residuals are re-scaled to be approximately standard normal ($\mu = 0, \sigma^2 = 1$).

4. Randomly sample, with replacement, from the standardized residuals, choosing one residual to pair with each data point.

5. Using the randomly sampled residuals, compute a bootstrapped probability of infection from each data point.

6. Using each bootstrapped probability of infection ($\pi_i^{(m)}$) and the number of subjects (n_i) at the given dose level, randomly generate a number of infections by simulating a binomial ($n_i, \pi_i^{(m)}$) draw.

7. Generate a new (α, β) pair by fitting the dose-response model to the bootstrapped infection counts.

8. Repeat steps 4 through 7 one thousand times to generate one thousand plausible sets of (α, β) estimates given the observed variability in the original data set.

F.4.3 Step-by-Step Details for Type B Virus

1. **Fit the dose-response model to the data to get the maximum likelihood estimate (MLE) of (α, β).**

   Maximizing the likelihood function is equivalent to finding the (α,β) pair that minimizes the overall deviance between the observed infection rates and the rates predicted by the possible Beta-Poisson models. This deviance is given by equation 7-35 in Haas:

$$Y = -2\sum_{i=1}^{k}\left[p_i \ln\left(\frac{\pi_i}{\pi_i^0}\right) + (n_i - p_i)\ln\left(\frac{1-\pi_i}{1-\pi_i^0}\right)\right],$$

where:

$Y =$ -2 times the log likelihood ratio (deviance)
$i =$ dose level
$k =$ number of dose levels in the study
$p_i =$ observed number of infections at dose level i
$n_i =$ number of subjects at dose level i

$\pi_i^0 = \dfrac{p_i}{n_i} =$ observed rate of infection at dose level i
$\pi_i =$ modeled probability of infection from Beta-Poisson fit

In computing the deviance, there are two recurring problems:

First, when the number of infections at a given dose level is zero, the first term in the likelihood sum above results in division by zero ($\pi_i^0 = 0$). Second, when the number of infections was equal to the number of subjects at a given dose level (everybody got infected), the second term results in division by zero $(1-\pi_i^0 = 1-1 = 0)$.

When either of these problems occurred, in fitting the model, the entire term was set to zero. This appears to be the most sensible workaround since, in both cases, the term also includes a zero multiplier ($p_i = 0$ in the first case and $n_i - p_i = 0$ in the second).

The following MLE estimates were obtained (published values from Regli paper in parenthesis):

Rotavirus:
α = 0.265 (0.26)
β = 0.442 (0.42)

Echovirus:
α = 0.374 (0.374)
β = 186.690 (186.69)

The model fitting was done with the S-Plus function *nlminb* -- *N*on*L*inear *MIN*imization subject to *B*ox constraints. This general purpose S-Plus function takes, as input, an objective function to minimize over a vector of parameters. In this case, the objective function was the model deviance function given above.

The *nlminb* function also takes a starting value and constraints for possible parameter values to search. Starting alpha/beta values were set to 0.01. Minimum values were set to 0.001. This was necessary to prevent beta distribution parameters less than or equal to zero. While, theoretically, there is no upper limit on possible beta distribution parameters, a limit of one million was set in model fitting. Beyond this value, further changes in either α or β have negligible impact on the resulting modeled distribution of infectivity.

2. **Plug dose levels, from the study, into the MLE dose-response curve to get the modeled probability of infection for each data point.**

With MLE estimates for α and β, a fitted probability of infection can be computed for each study dose using the approximate Beta-Poisson dose-response equation (Equation 7-19 in Haas):

$$P_I(d) = 1 - \left(1 + \frac{d}{\beta}\right)^{-\alpha}$$

Where:
d = the dose level
$P_I(d)$ = modeled probability of infection at that dose

The result is a vector of modeled probabilities of infection, one per study dose.

3. **Compute the standardized residuals -- the difference between the observed proportion of infections and the modeled probability of infection at each data point, scaled to be approximately standard normal ($\mu = 0, \sigma^2 = 1$).**

   For each dose level in the study, the difference is computed between the observed proportion of infections $\left(\pi_i^0 = \frac{p_i}{n_i} \right)$ and the modeled probability of infection $\pi_i = P_I(d)$ (Equation 7-39 in Haas):

   $$e_i = \frac{\pi_i^0 - \pi_i}{\sqrt{\pi_i(1-\pi_i)/n_i}}$$

   The result is a set of residuals that is as large as the number of dose levels in the study.

   Since the variability of a proportion is a function of its magnitude, the un-scaled residuals are not directly comparable and standardizing them is an important step. In scaled form, each residual can be thought of as a random number of standard deviations from a mean and, as a collection, these differences reflect the variability seen in the data.

   For the echovirus data, the first data point caused division by zero at this step since $\pi_i = 0$ when $d = 0$ (see the equation in Step 2). Since fitting the Beta-Poisson model with and without this zero dose point resulted in the same MLE estimates for (α, β), and since it was not possible to complete the bootstrap procedure with this point included, it was dropped from the dataset.

4. **Randomly sample, with replacement, from the residuals, choosing one residual to pair with each data point.**

   The idea is to create a set of plausible true infection probabilities based on the observed variability in the original data. This is done by drawing random values, with replacement, from the standardized residuals.

   For example, the rotavirus study has eight dose levels resulting in a total of 8^8 equally likely vectors of 8 residuals (the first sampled residual can be any on of the eight, the second can be any of eight, and so on through the eighth dose level). While this is a very large number of possible residual sets, the number of possible bootstrapped infection vectors is more limited due to the discrete nature of the data (see Step 6).

5. **Using the randomly sampled residuals, compute a bootstrapped probability of infection from each data point.**

   The bootstrapped infection probabilities are computed as the MLE modeled probabilities plus a random standardized residual times the appropriate standard error (Equation 7-40) in Haas:

$$\pi_i^{(m)} = \pi_i^{(T)} + \delta_i \sqrt{\frac{\pi_i^{(T)}(1-\pi_i^{(T)})}{n_i}}$$

   Where:

   $\pi_i^{(m)}$ = the bootstrapped infection probability at dose level i

   $\pi_i^{(T)}$ = the MLE modeled infection probability at dose level i

   δ_i = a randomly selected standardized residual (number of standard errors)

   $\sqrt{\frac{\pi_i^{(T)}(1-\pi_i^{(T)})}{n_i}}$ = standard error of the MLE modeled infection probability

   If the bootstrapped probability is greater than one, it is set to one, and if it is less than zero, it is set to zero.

   Note that while the standard error changes along with the dose level, since the mean and variance are related for proportions, the randomly selected residuals are standardized so they can be usefully paired with any of these standard errors.

6. **Using each bootstrapped probability of infection ($\pi_i^{(m)}$) and the number of subjects (n_i) at the given dose level, randomly generate a number of infections by simulating a binomial ($n_i, \pi_i^{(m)}$) draw.**

   This is the second random element in the procedure. To re-fit the Beta-Poisson model, and generate a new (α, β) pair, a simulated dose response dataset is required, and this means infection counts, not modeled probabilities of infection, so the infection counts are simulated from the bootstrapped infection probabilities.

   The result of this step is a set of simulated infection counts, one for each dose level. The counts are all greater than or equal to zero, and less than or equal to the number of subjects at the given dose level.

   Since these counts can only be integers, and some of them are very unlikely (for example simulating 0 infections out of 10 subjects when the bootstrapped probability of infection is well above ½), the number of possible simulated datasets, from this step is much smaller than the number of possible random residual sets in Step 4. In other words, drawing a different random sample of eight residuals does not guarantee that the simulated infection counts that result will be different. Because of this, some data sets are repeated over one thousand iterations resulting in some duplicate (α, β) pairs in the final uncertainty collection.

7. **Generate a new (α, β) pair by fitting the dose-response model to the bootstrapped infection counts.**

   The model fitting procedure described in Step 1 is repeated, but this time the Beta-Poisson model is fit to the infection counts generated by the bootstrap procedure. These alternate infection counts represent what might reasonably be seen if the study were repeated and the first dataset is representative of the true dose-response relationship. Thus each iteration results in another plausible (α, β).

8. **Repeat steps 4 through 7 one thousand times to generate one thousand plausible sets of (α, β) estimates given the observed variability in the original data set.**

   Steps 1 through 3, fitting the MLE model and computing its residuals occurs just one time. These MLE estimates and residuals, as well as the number of subjects at each dose level, remain the same for the remainder of the process.

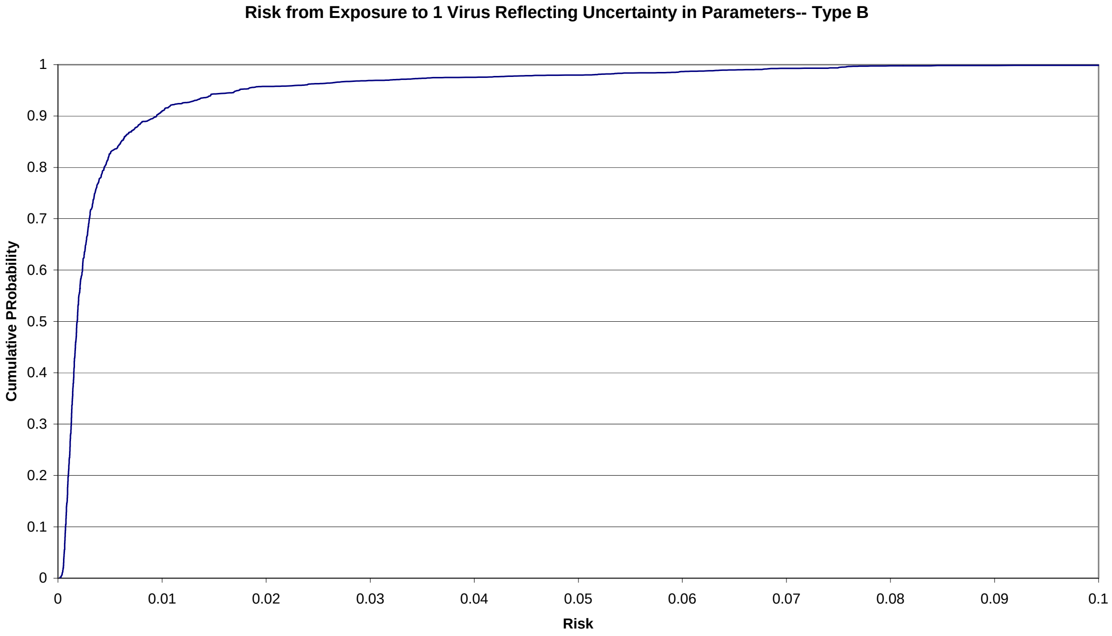
   Steps 4 through 7 are repeated one thousand times, each time starting with a random selection of residuals and finishing with a simulated (α, β) pair.

   The S-Plus procedure generates a plot of the rotovirus (α, N_{50}) pairs (N_{50} is computed directly from α and β) that matches Figure 7-15 in Haas which shows the results of Haas bootstrap on the same dataset. The shape of the scatter plot is roughly the same, and the number of outliers (non-plotted points) is similar.

Characterization of Resulting Parameter Pairs for Type B

The graph in Exhibit F.8 displays the distribution of average infection probability for Type B viruses. As defined here, average infection probability is the mean exponential dose-response parameter (r), based on a distribution defined by parameters alpha and beta. The mean for a given parameter pair is alpha / (alpha + beta). This mean is the fraction of the population that would be infected if each person were to ingest exactly one infectious unit. The graph reveals the uncertainty in this mean value. Variability, though considerable, is not displayed in this figure. The overall mean is 0.0044 and 90% confidence bounds (from the 5th and 95th percentiles) are 0.0006 and 0.0165.

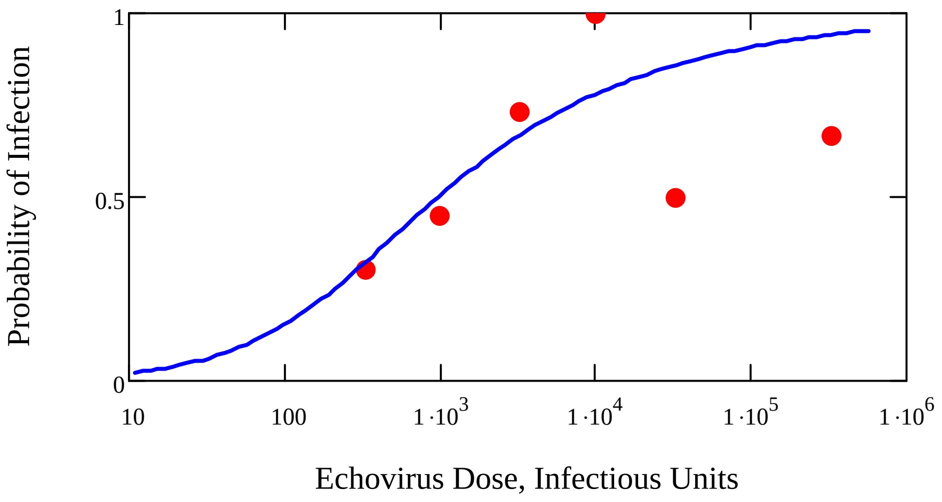
Exhibit F.8 Distribution of Probability of Infection for Type B Virus



Goodness of Fit for Type B Virus

Exhibit F.9 shows the quality of fit for maximum likelihood parameter values ($\alpha = 0.374$, $\beta = 186.69$). The likelihood, given this parameter pair is $1.73*10^{-6}$. To assess goodness-of-fit, artificial dose-response data sets were generated using the same distribution of subjects across doses, but simulating the outcomes as binomial random variables with infection probabilities as predicted by the maximum likelihood parameters. This was repeated 10,000 times and the likelihood was determined for each of the 10,000 artificial data sets. Among the 10,000 likelihoods, the actual data likelihood ranked at the 6^{th} percentile. An extremely small value (below 1^{st} percentile) would have been evidence of poor model fit or spurious data and an extremely large value (above 99^{th} percentile) would have been evidence of over-fitting. The value encountered (6^{th} percentile) is satisfactory, but suggests some sensitivity analysis may be in order to explore the influence of selected observations. In a sensitivity analysis, EPA analyzed the Echovirus data, but without observations for the two highest doses.

Exhibit F.9 Data (Number Infected / Number Subjects) and Maximum Likelihood Dose-Response Function for Type B Viruses



F.5 Sensitivity Analyses

As described in Section 5.2.4, EPA considered using alternative analyses for both Type A and Type B viruses to illustrate the potential magnitude of modeling uncertainty. The analyses discussed above were based on the full dose-response data sets and only one mathematical model (the beta-Poisson) for each type of virus. Those analyses produced large samples of parameter pairs to represent parameter uncertainty. This is the uncertainty due to having a limited amount of data to estimate the two model parameters (α and β). The sensitivity analyses use some of the same data, but with other mathematical models, so the estimated dose-response relationship will differ from the primary analysis because (a) less data can lead to greater parameter uncertainty, and systematically different average estimates at environmentally-relevant dose levels and (b) alternative models can produce significantly different estimates, particularly when extrapolating beyond the range of the data.

It is important to bear in mind that the models used here are only two simple alternatives to those used in the primary analysis. No measure is provided for these models' relative likelihoods or goodness-of-fit, compared to the primary analysis models. The limited amounts of dose-response data do not support the analysis of other, more complex models. It is difficult to judge how well our simple models would hold up, if large amounts of new data were to become available. It is unlikely, however, that new dose-response studies will be conducted anytime soon. The more likely source of new data will be from outbreaks, supported by high-quality exposure information. Until such data become available, EPA believes that the primary and sensitivity analyses presented here provide reasonable indications of the total uncertainty that may be due to the limited amount of existing data and the small number of plausible models that they can support.

The sections that follow detail the sensitivity analyses that were performed for Type A (rotavirus) and Type B (echovirus) viruses.

F.5.1 Type A Viruses

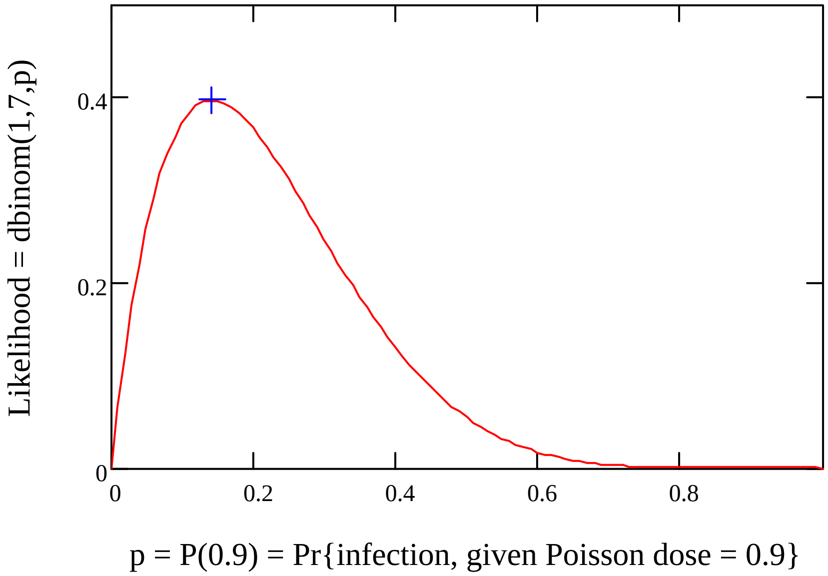
The data for this model are simply that one subject was infected of the seven who ingested doses of 0.9. Bearing in mind that the dose is Poisson, rather than exact, 1/7 is the maximum likelihood infection probability at this dose. In terms of the exponential model, where infection probability is $1 – e^{-d*r} = 1 – e^{-0.9*r}$, the maximum likelihood value of r is that for which $1 – e^{-0.9*r} = 1/7$.

Technically, the likelihood of observing one of seven subjects infected is the binomial probability of one success in seven trials with success probability p: dbinom(1,7,p) =

$$7*p*(1 - p)^6$$

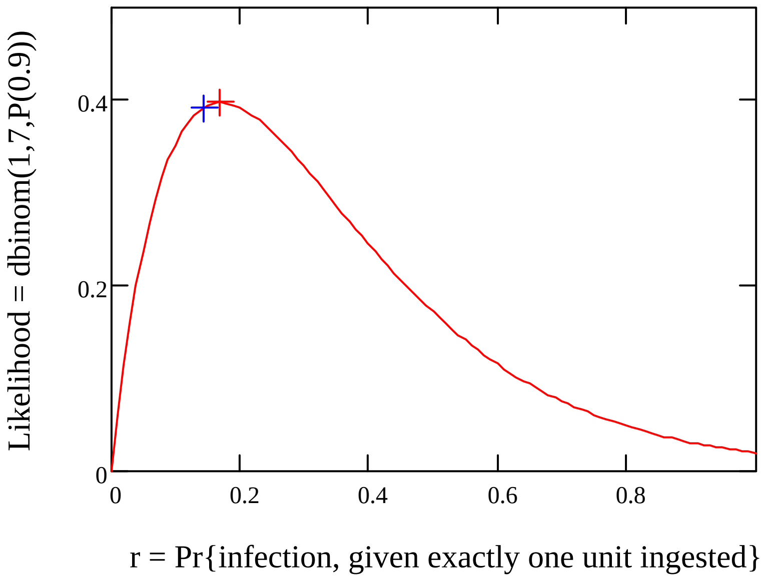
Exhibit F.10 displays the full binomial likelihood function. Its maximum is marked at p = 1/7 = 0.1433.

Exhibit F.10 Likelihood of Observing One in Seven Infected at Dose



In the Exhibit above, p is the probability of infection at dose 0.9, P(0.9), which is $1-e^{-0.9*r}$ under the exponential model. The likelihood, expressed in terms of r is therefore dbinom (1, 7, $1 - e^{- 0.9 * r}$). Exhibit F.11 displays this likelihood function and shows that the maximum likelihood parameter value is about 0.171, somewhat greater than 1/7 = 0.1433.

Exhibit F.11 Likelihood Function for Exponential Parameter r



A large sample was drawn, using this likelihood function for r. This was done using a Markov Chain Monte Carlo (MCMC) method with WinBUGS software, and also using the distribution function associated with the likelihood (scaling the function by dividing by its total likelihood mass) and a large set of standard uniform deviates (on the interval from 0 to 1). Below (Exhibit F.12) are summary statistics for the MCMC sample of size 10,000.

Exhibit F.12 Summary Statistics for Rotavirus (WinBUGS)

node	**mean**	**sd**	**MC error**	**2.5%**	**median**	**97.5%**
P(0.09)	0.239	0.1317	0.001669	0.03655	0.221	0.5271
r	0.3219	0.208	0.002696	0.04137	0.2775	0.8322

It is clear that this model would predict somewhat greater baseline risk than the primary analysis, for which the average probability of infection, given exactly one infectious unit, r, is about 0.224. The corresponding sensitivity analysis value from Exhibit F.12 is 0.3219, which is about 44% greater than the primary analysis' 0.224.

A second, simplified version of the exponential model was also used for a sensitivity analysis for Type A viruses.   In this approach, the same observations from the Ward et al. (1986) study that 1 of 7 subjects receiving a 0.9 dose became infected. In this case, however, the value obtained for the parameter r was assumed to be an exact value rather than being generated using the MCMC method as a set of values to reflect uncertainty in the true value of the parameter.

The derivation of the value for r in this case was done as follows:

$$1 - e^{-r \cdot 0.9} = 1/7$$
$$1 - 1/7 = 6/7 = e^{-r \cdot 0.9}$$
$$\ln(6/7) = -r \cdot 0.9$$
$$r = \frac{\ln(6/7)}{-0.9}$$
$$r = 0.171$$

This value for r, which also corresponds to the maximum likelihood value obtained in the analysis that includes uncertainty in the r parameter, was used as a fixed input to the baseline risk and benefits computed in the Type A alternative analysis as described in Chapter 5 (section 5.5.2).

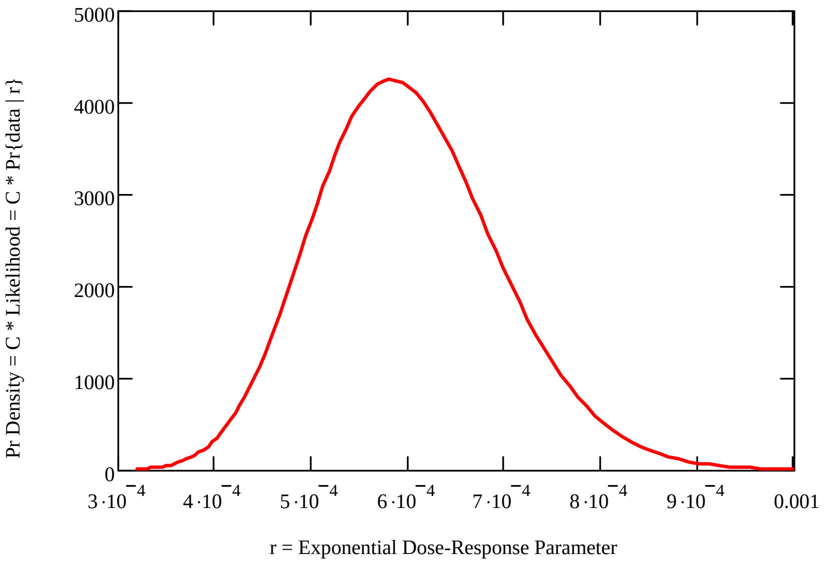
F.5.2 Type B Viruses

When the high dose (33,000 and 330,000) results are discarded, the remaining data are reasonably consistent with the exponential model. The likelihood is a product of four binomial probabilities, one for each of the four remaining dose levels:

$$L(r) = \sum_{\text{level}} \ln\left(\text{dbinom}\left(K_{\text{level}}, N_{\text{level}}, 1 - e^{-d_{\text{level}} \cdot r}\right)\right)$$

Exhibit F.13 displays the likelihood function, scaled so the total area under the curve is 1

Exhibit F.13 Likelihood Function for Exponential Parameter r



As with the other analyses, a large MCMC sample was generated using WinBUGS software. Exhibit F.14 displays summary statistics for the sample.

Exhibit F.14 Summary Statistics for Echovirus Sensitivity Analysis

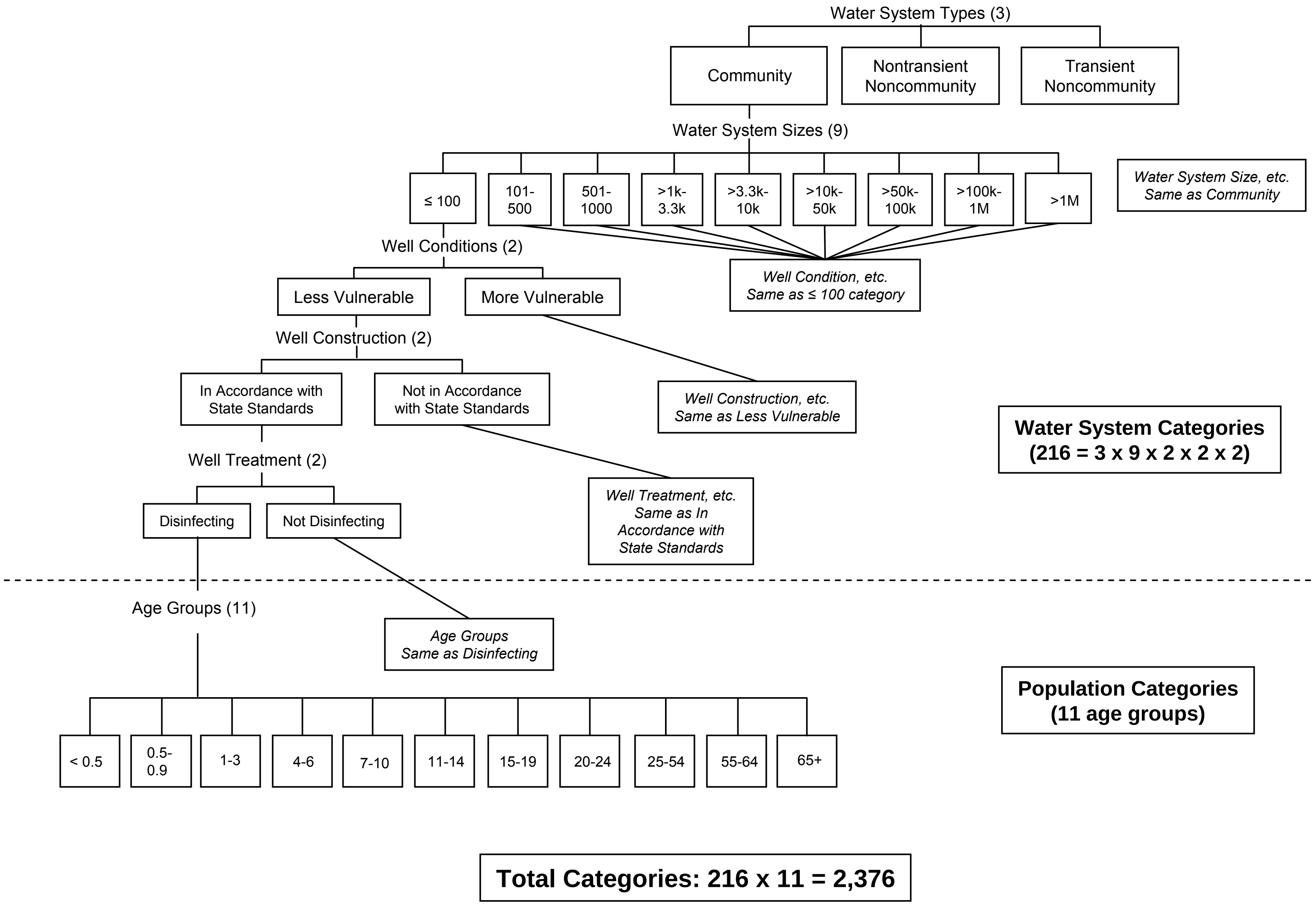
node	mean	sd	MC error	2.5%	median	97.5%
r	4.215E-4	6.391E-5	6.011E-7	3.091E-4	4.177E-4	5.589E-4
P[300]	0.1297	0.01829	1.722E-4	0.09697	0.1288	0.1684
P[1000]	0.3426	0.04157	3.926E-4	0.2659	0.3414	0.4281
P[3000]	0.7457	0.05219	4.961E-4	0.6394	0.748	0.8419
P[10000]	0.9821	0.01115	1.054E-4	0.9545	0.9847	0.9963

The average probability of infection, given exactly one unit ingested, is only about 0.0004. This is much smaller than the corresponding estimate from the primary analysis, which was 0.0044. The alternative analysis would be expected to predict a lower baseline risk and lower benefits from the GWR; this result is observed as described in Section 5.5.3.

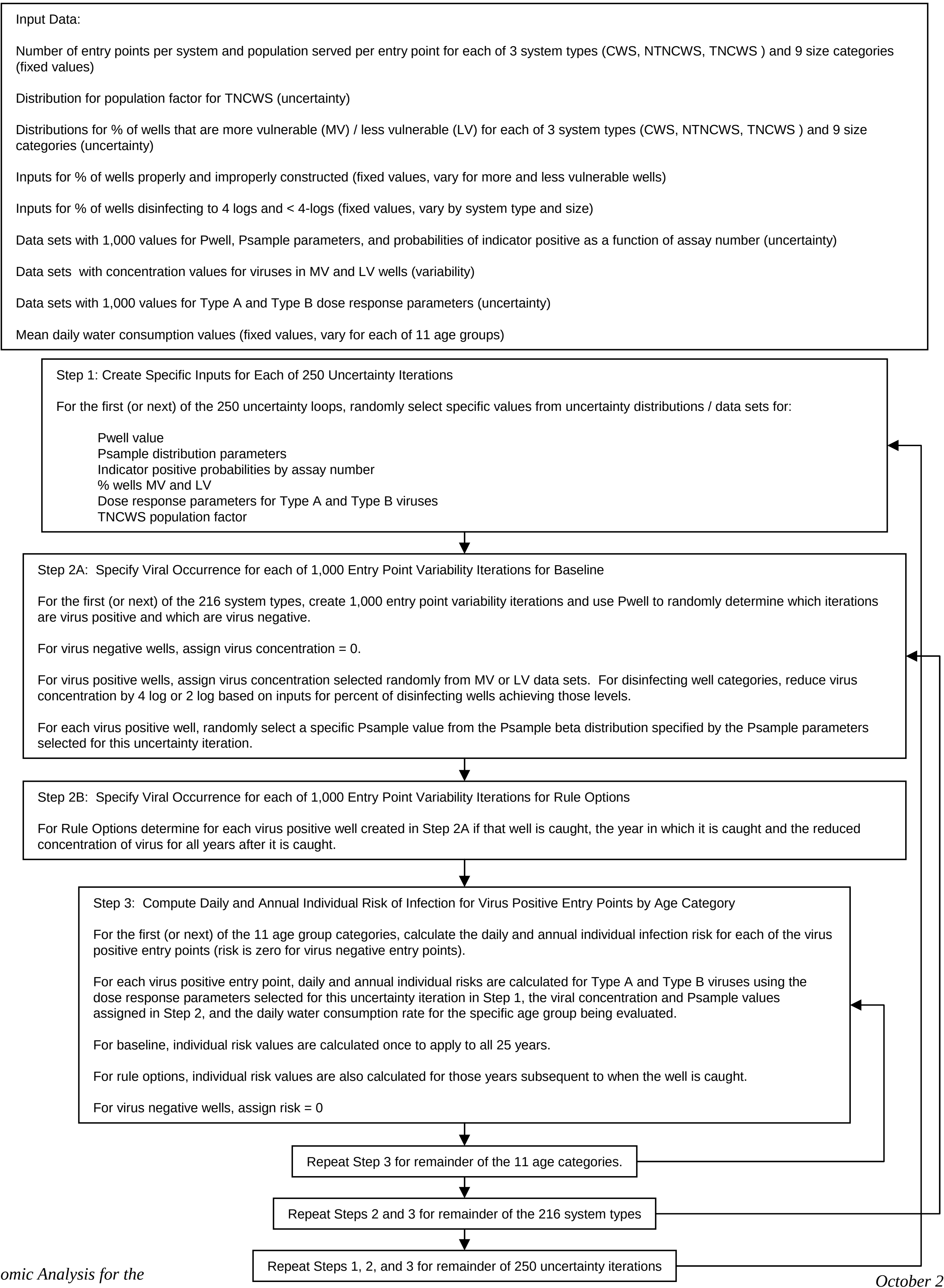
Appendix G

Summary Flowcharts for Baseline Risk and Benefits Model

Water Systems and Population Categories Used in Risk and Benefits Model



Part 1 – Determination of Annual Risks of Infection



Input Data:

Number of entry points per system and population served per entry point for each of 3 system types (CWS, NTNCWS, TNCWS) and 9 size categories (fixed values)

Distribution for population factor for TNCWS (uncertainty)

Distributions for % of wells that are more vulnerable (MV) / less vulnerable (LV) for each of 3 system types (CWS, NTNCWS, TNCWS) and 9 size categories (uncertainty)

Inputs for % of wells properly and improperly constructed (fixed values, vary for more and less vulnerable wells)

Inputs for % of wells disinfecting to 4 logs and < 4-logs (fixed values, vary by system type and size)

Data sets with 1,000 values for Pwell, Psample parameters, and probabilities of indicator positive as a function of assay number (uncertainty)

Data sets with concentration values for viruses in MV and LV wells (variability)

Data sets with 1,000 values for Type A and Type B dose response parameters (uncertainty)

Mean daily water consumption values (fixed values, vary for each of 11 age groups)

Step 1: Create Specific Inputs for Each of 250 Uncertainty Iterations

For the first (or next) of the 250 uncertainty loops, randomly select specific values from uncertainty distributions / data sets for:

Pwell value
Psample distribution parameters
Indicator positive probabilities by assay number
% wells MV and LV
Dose response parameters for Type A and Type B viruses
TNCWS population factor

Step 2A: Specify Viral Occurrence for each of 1,000 Entry Point Variability Iterations for Baseline

For the first (or next) of the 216 system types, create 1,000 entry point variability iterations and use Pwell to randomly determine which iterations are virus positive and which are virus negative.

For virus negative wells, assign virus concentration = 0.

For virus positive wells, assign virus concentration selected randomly from MV or LV data sets. For disinfecting well categories, reduce virus concentration by 4 log or 2 log based on inputs for percent of disinfecting wells achieving those levels.

For each virus positive well, randomly select a specific Psample value from the Psample beta distribution specified by the Psample parameters selected for this uncertainty iteration.

Step 2B: Specify Viral Occurrence for each of 1,000 Entry Point Variability Iterations for Rule Options

For Rule Options determine for each virus positive well created in Step 2A if that well is caught, the year in which it is caught and the reduced concentration of virus for all years after it is caught.

Step 3: Compute Daily and Annual Individual Risk of Infection for Virus Positive Entry Points by Age Category

For the first (or next) of the 11 age group categories, calculate the daily and annual individual infection risk for each of the virus positive entry points (risk is zero for virus negative entry points).

For each virus positive entry point, daily and annual individual risks are calculated for Type A and Type B viruses using the dose response parameters selected for this uncertainty iteration in Step 1, the viral concentration and Psample values assigned in Step 2, and the daily water consumption rate for the specific age group being evaluated.

For baseline, individual risk values are calculated once to apply to all 25 years.

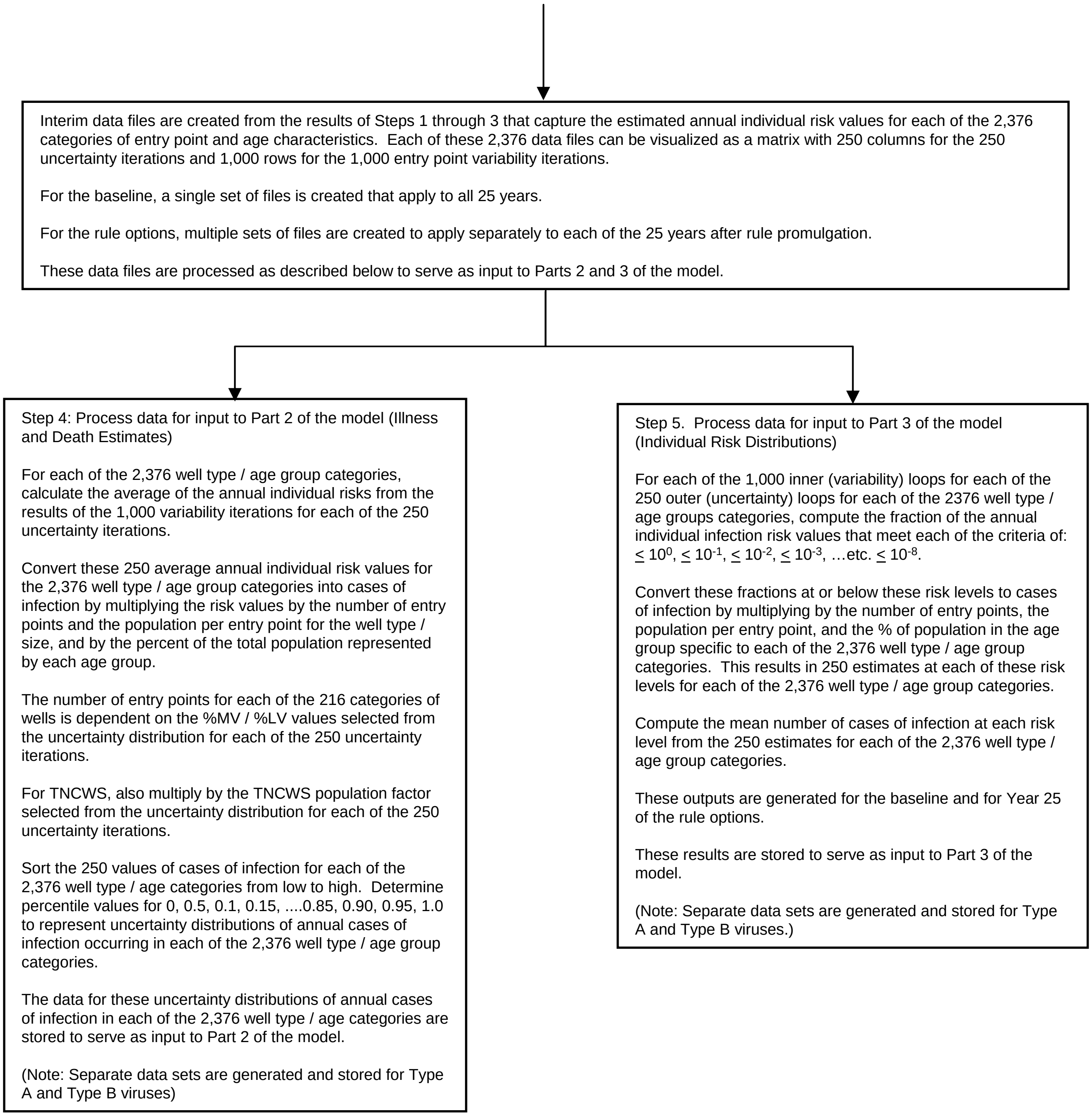
For rule options, individual risk values are also calculated for those years subsequent to when the well is caught.

For virus negative wells, assign risk = 0

Repeat Step 3 for remainder of the 11 age categories.

Repeat Steps 2 and 3 for remainder of the 216 system types

Repeat Steps 1, 2, and 3 for remainder of 250 uncertainty iterations



Interim data files are created from the results of Steps 1 through 3 that capture the estimated annual individual risk values for each of the 2,376 categories of entry point and age characteristics. Each of these 2,376 data files can be visualized as a matrix with 250 columns for the 250 uncertainty iterations and 1,000 rows for the 1,000 entry point variability iterations.

For the baseline, a single set of files is created that apply to all 25 years.

For the rule options, multiple sets of files are created to apply separately to each of the 25 years after rule promulgation.

These data files are processed as described below to serve as input to Parts 2 and 3 of the model.

Step 4: Process data for input to Part 2 of the model (Illness and Death Estimates)

For each of the 2,376 well type / age group categories, calculate the average of the annual individual risks from the results of the 1,000 variability iterations for each of the 250 uncertainty iterations.

Convert these 250 average annual individual risk values for the 2,376 well type / age group categories into cases of infection by multiplying the risk values by the number of entry points and the population per entry point for the well type / size, and by the percent of the total population represented by each age group.

The number of entry points for each of the 216 categories of wells is dependent on the %MV / %LV values selected from the uncertainty distribution for each of the 250 uncertainty iterations.

For TNCWS, also multiply by the TNCWS population factor selected from the uncertainty distribution for each of the 250 uncertainty iterations.

Sort the 250 values of cases of infection for each of the 2,376 well type / age categories from low to high. Determine percentile values for 0, 0.5, 0.1, 0.15, ...0.85, 0.90, 0.95, 1.0 to represent uncertainty distributions of annual cases of infection occurring in each of the 2,376 well type / age group categories.

The data for these uncertainty distributions of annual cases of infection in each of the 2,376 well type / age categories are stored to serve as input to Part 2 of the model.

(Note: Separate data sets are generated and stored for Type A and Type B viruses)

Step 5. Process data for input to Part 3 of the model (Individual Risk Distributions)

For each of the 1,000 inner (variability) loops for each of the 250 outer (uncertainty) loops for each of the 2376 well type / age groups categories, compute the fraction of the annual individual infection risk values that meet each of the criteria of: $\leq 10^{0}$, $\leq 10^{-1}$, $\leq 10^{-2}$, $\leq 10^{-3}$, …etc. $\leq 10^{-8}$.

Convert these fractions at or below these risk levels to cases of infection by multiplying by the number of entry points, the population per entry point, and the % of population in the age group specific to each of the 2,376 well type / age group categories. This results in 250 estimates at each of these risk levels for each of the 2,376 well type / age group categories.

Compute the mean number of cases of infection at each risk level from the 250 estimates for each of the 2,376 well type / age group categories.

These outputs are generated for the baseline and for Year 25 of the rule options.

These results are stored to serve as input to Part 3 of the model.

(Note: Separate data sets are generated and stored for Type A and Type B viruses.)

Part 2 – Determination of Annual Cases of Illness and Death (Morbidity and Mortality)

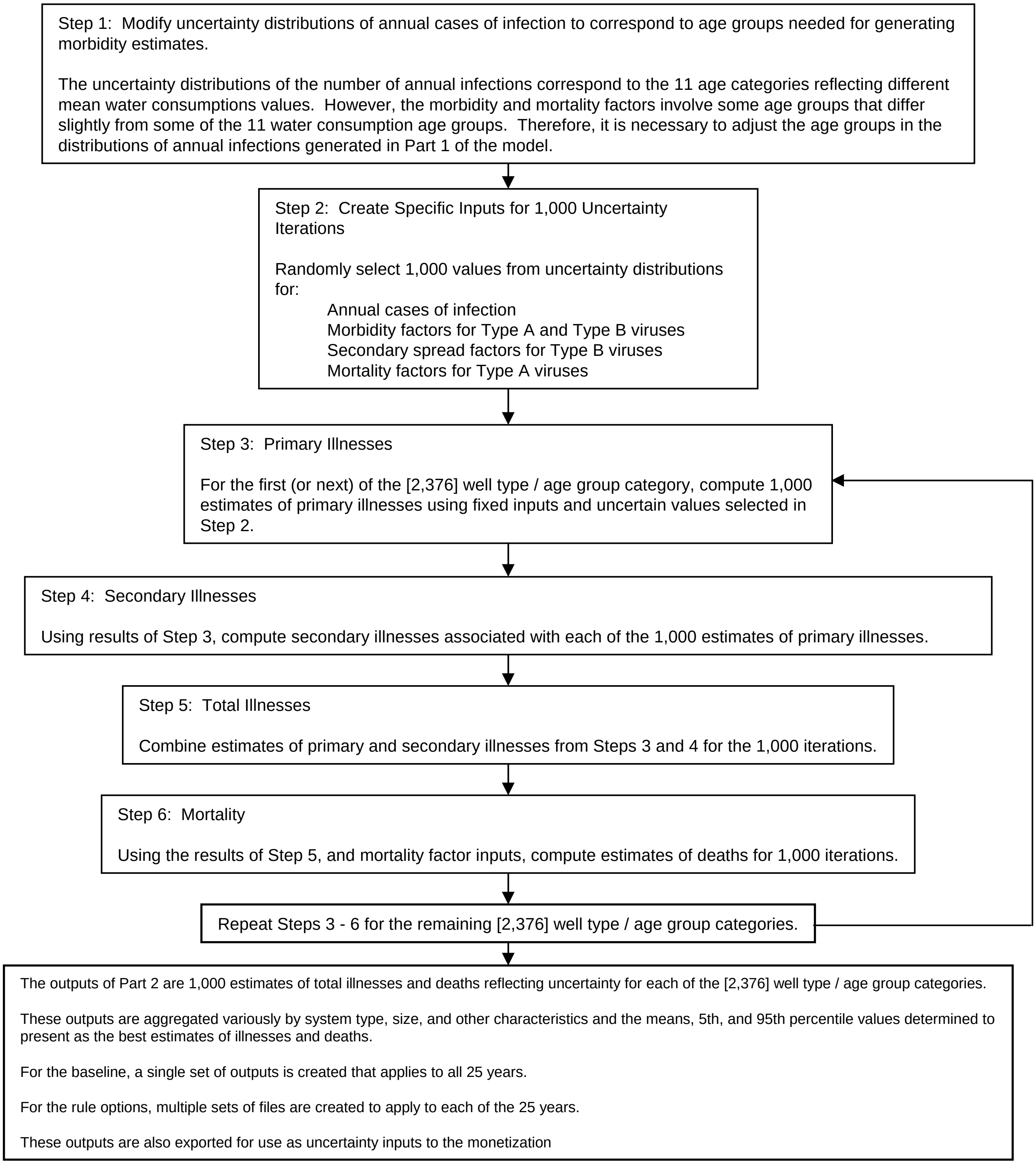
Input Data:

The distributions of annual cases of infection for each of the 2,376 well type / age group catergories generated in Step 1 (uncertainty)

Distributions for morbidity factors for Type A and Type B viruses (uncertainty)

Secondary spread factors for Type A (fixed value)
Distribution of secondary spread factors for Type B viruses (uncertainty)

Distribution for mortality factors for Type A viruses (uncertainty)
Mortality factors for Type B viruses (fixed values, vary for 2 age groups)



Step 1: Modify uncertainty distributions of annual cases of infection to correspond to age groups needed for generating morbidity estimates.

The uncertainty distributions of the number of annual infections correspond to the 11 age categories reflecting different mean water consumptions values. However, the morbidity and mortality factors involve some age groups that differ slightly from some of the 11 water consumption age groups. Therefore, it is necessary to adjust the age groups in the distributions of annual infections generated in Part 1 of the model.

Step 2: Create Specific Inputs for 1,000 Uncertainty Iterations

Randomly select 1,000 values from uncertainty distributions for:

- Annual cases of infection
- Morbidity factors for Type A and Type B viruses
- Secondary spread factors for Type B viruses
- Mortality factors for Type A viruses

Step 3: Primary Illnesses

For the first (or next) of the [2,376] well type / age group category, compute 1,000 estimates of primary illnesses using fixed inputs and uncertain values selected in Step 2.

Step 4: Secondary Illnesses

Using results of Step 3, compute secondary illnesses associated with each of the 1,000 estimates of primary illnesses.

Step 5: Total Illnesses

Combine estimates of primary and secondary illnesses from Steps 3 and 4 for the 1,000 iterations.

Step 6: Mortality

Using the results of Step 5, and mortality factor inputs, compute estimates of deaths for 1,000 iterations.

Repeat Steps 3 - 6 for the remaining [2,376] well type / age group categories.

The outputs of Part 2 are 1,000 estimates of total illnesses and deaths reflecting uncertainty for each of the [2,376] well type / age group categories.

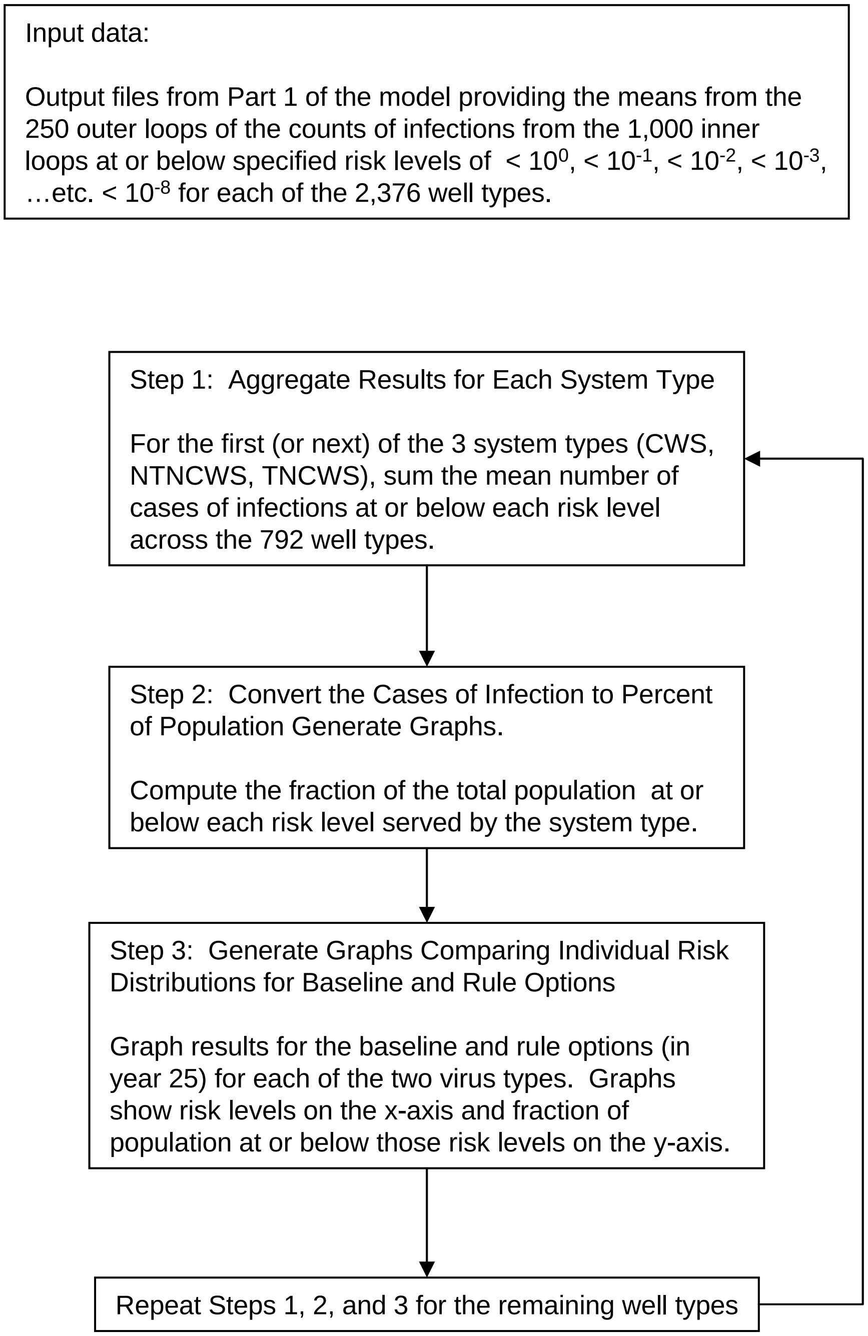
These outputs are aggregated variously by system type, size, and other characteristics and the means, 5th, and 95th percentile values determined to present as the best estimates of illnesses and deaths.

For the baseline, a single set of outputs is created that applies to all 25 years.

For the rule options, multiple sets of files are created to apply to each of the 25 years.

These outputs are also exported for use as uncertainty inputs to the monetization

Part 3 – Derivation of Individual Risk Distributions



Input data:

Output files from Part 1 of the model providing the means from the 250 outer loops of the counts of infections from the 1,000 inner loops at or below specified risk levels of $< 10^{0}$, $< 10^{-1}$, $< 10^{-2}$, $< 10^{-3}$, …etc. $< 10^{-8}$ for each of the 2,376 well types.

Step 1: Aggregate Results for Each System Type

For the first (or next) of the 3 system types (CWS, NTNCWS, TNCWS), sum the mean number of cases of infections at or below each risk level across the 792 well types.

Step 2: Convert the Cases of Infection to Percent of Population Generate Graphs.

Compute the fraction of the total population at or below each risk level served by the system type.

Step 3: Generate Graphs Comparing Individual Risk Distributions for Baseline and Rule Options

Graph results for the baseline and rule options (in year 25) for each of the two virus types. Graphs show risk levels on the x-axis and fraction of population at or below those risk levels on the y-axis.

Repeat Steps 1, 2, and 3 for the remaining well types

Description of Methodology for Estimating Risk Reductions (for Parts 1 – 3)

The methodology for estimating the reduction in risk for the regulatory alternatives builds upon the approach and assumptions used to establish the baseline risk as described in detail in Section 5.2.5 of the EA and summarized in the preceding flowcharts. The primary difference between the modeling for estimating the baseline risk model and the modeling for estimating the risk reduction from a given regulatory alternative is that the latter incorporates a change in the concentration of viral pathogens reaching the finished drinking water of the exposed population. These changes reflect either a reduction in pathogen concentration between source water and finished water due to disinfection or the complete elimination of the pathogen in the finished water from other non-treatment corrective actions addressing the source water contamination. In addition to accounting for the magnitude of pathogen exposure reduction, an important component of the risk reduction modeling is to account for the timing of when those reductions occur over a 25 year analysis timeframe following promulgation of the rule.

As discussed in the description of the baseline risk analysis in Section 5.2.5.1, each well in the simulation process is designated as either having a virus present at some time or never having a virus present based on the P_{well} probability. Also, for those wells having some viral occurrence, values are assigned for P_{sample} and for the virus concentration. The risk reduction part of the model uses the exact same simulated wells as those generated in the baseline risk part of the model.

For the sake of efficiency in implementing the simulation modeling process, those wells designated as never having a virus present are recognized as having zero risk reduction potential and are counted as such in the model outputs, but are not run through the detailed steps of the risk reduction model.

For those wells that do have a virus present, the risk reduction model answers the following three questions:

1) Is a corrective action performed on this well as a result of the regulatory alternative being considered?

2) What is the finished water virus concentration following corrective action?

3) In what year following rule implementation is the corrective action performed?

The risk reduction model then processes the reduced virus concentrations through the dose response functions for infectivity, morbidity and mortality as in the baseline risk assessment.

In the baseline risk analysis, the primary outputs are estimates of annual cases of illness and deaths due to endemic infection from Type A and Type B viruses, and these are assumed to be the same for each of the 25 years following rule promulgation. The outputs from the risk reduction model are the same - the cases of illness and death that remain in each of the 25 years following rule promulgation. These are the remaining cases each year resulting from the virus concentrations that remain after the corrective actions are performed. The risk reductions, in terms of cases of illness and deaths avoided, are then obtained by subtracting the cases remaining after the rule from the baseline cases.

Estimates of cases avoided calculated for all of the individual wells are aggregated across all wells to arrive at the total national estimates of risk reduction. In addition, some of the assumptions and data used in the risk reduction model are uncertain and are therefore input as uncertainty distributions. As a result of the uncertainty reflected in those inputs, together with the uncertainty reflected in other inputs to the baseline risk model that are also carried into the risk reduction model, the output of the model is a range of values of cases avoided. The range is used by EPA to determine the expected value and the 90 percent confidence bounds on that expected value.

The following sections describe in more detail the specific assumptions and inputs–including considerations of uncertainty–that are used to model risk reduction for each of the four rule alternatives at the individual well level and the aggregation of those well-level estimates to obtain the overall national estimates of risk reduction.

Alternative 1: Sanitary Survey Only

Regulatory Alternative 1 includes only sanitary surveys. The Sanitary Survey rule alternative applies to all ground water wells, including those wells that are currently disinfecting and meeting 4-log reductions. As described in the baseline information in Chapter 4 and in the estimation of the baseline risk, all wells are stratified into 8 major categories that reflect the 2x2x2 (=8) combinations of the well characteristics of: Disinfecting or Nondisinfecting; More Vulnerable or Less Vulnerable; and Proper or Improper well construction.

As discussed in Chapter 4 (Section 4.3.3), the fraction of wells considered More Vulnerable varies from 0% to approximately 7% as a function of systems system size and type. The average (weighted by number of systems) is that about 2.5% are in the More Vulnerable stratum (the remaining 97.5% are, therefore, in the Less Vulnerable stratum). To estimate the benefits from correcting significant deficiencies, each of these strata must be further defined in regards to well construction.

Construction status of a well (i.e., whether a well is properly or improperly constructed) is estimated based on ASDWA survey data (ASDWA, 1997). Those wells identified as improperly constructed are likely to be identified by states during a sanitary survey. Different percentages of improper construction are estimated based on historical total or fecal coliform detections. EPA believes that a history of detection of these contaminants is indicative of wells that fall into the More Vulnerable classification within the benefits model. The percentages of properly and improperly constructed wells are estimated as follows.

Less vulnerable wells - The ASDWA survey of States found that of community GWSs with no TC or fecal coliform detections, 83.6 percent of the systems had wells that were constructed according to State standards. Thus, 16.4 percent of systems had wells identified by State officials as not being constructed to State standards and are considered to be improperly constructed.

More vulnerable wells - The same survey found that of community GWSs with TC detections, but no fecal coliform detections, 217 of 277 systems had wells constructed according to State standards. A third group consisted of systems with positive fecal coliform detections, of which 164 of 231 systems had wells constructed according to State standards. Thus, for systems with TC or fecal coliform detections, 381 of 508 systems (75.0 percent) had wells that were constructed according to State standards. Therefore, 25.0 percent of systems had wells identified by State officials as not being constructed to State standards and are considered to be improperly constructed.

The combination of the vulnerability and well construction estimates described above can be used to approximate the percent of all wells having virus present that are expected to be identified and corrected by sanitary surveys. To arrive at this estimate, the percent of all wells that are improperly constructed is first calculated as the weighted average for the More and Less Vulnerable strata as:

- More vulnerable (2.5%), Improperly constructed (25.0%):
  2.5% * 25.0% = 0.6%

- Less vulnerable (97.5%), Improperly constructed (16.4%):
  97.5% * 16.4% = 16.0%

The total fraction of all wells that are improperly constructed is the sum of these, which is 16.6%.

It is assumed that the sanitary survey provisions of the ground water rule will result in identifying some (but not all) wells that are improperly constructed. It is assumed that corrective actions will be performed on those improperly constructed wells. Specifically, EPA has estimated that for those wells that are improperly constructed and also have a virus present, 50% will be identified and the contamination eliminated by a corrective action. To recognize the uncertainty in this estimate of the effectiveness of sanitary surveys, EPA has assumed a uniform distribution of 40% to 60% (mean = 50%). Therefore, as a central value, it is expected that the sanitary survey alternative of the rule will result in corrective actions being performed and contamination eliminated at approximately half of the 16.6% of all wells that are improperly constructed, which is 8.3% of all wells. Therefore, it can be estimated that this rule alternative will result in the reduction of 8.3% of the baseline cases of illnesses and deaths per year by the 25th year after rule promulgation.

For those wells that have virus present in the source water that are caught by a sanitary survey, the corrective action is assumed to eliminate the virus completely. Therefore, the finished water concentration as well as the source water concentration for these wells is set to zero for the risk reduction calculations for those wells. While the fraction of wells corrected by sanitary survey is the same for both the disinfecting and the nondisinfecting strata, almost all of the risk reduction (i.e., cases avoided) from sanitary surveys will be from the nondisinfecting wells. This is because for the disinfecting wells that are currently achieving 4-log removal, most of the virus present in the source water is already being inactivated so that the incremental risk reduction from eliminating the source entirely is very small and contributes very little to the total benefits achieved. Nevertheless, the risk reduction for disinfecting wells that is achieved through sanitary surveys is calculated in the risk reduction model for completeness sake.

With respect to when this reduction in virus concentration and risk occurs, it is assumed that identifying the (approximately) 8.3% of wells that are improperly constructed wells and performing a corrective action on them as a result of sanitary surveys will occur across the entire 25 year analysis period. It is assumed that no corrective actions will occur in the first three years, and that all of the corrective actions performed will be evenly distributed across the remaining years. Therefore, in the benefits model, each well that undergoes a corrective action from a sanitary survey is assigned a year between year 4 and year 25 with equal probability of it occurring in any one of the years in the time period.

Alternative 2: Sanitary Survey + Triggered Monitoring

Regulatory alternative 2 includes both sanitary surveys and triggered monitoring. The sanitary survey component of the modeling is carried out as described above. For those wells that are captured by a sanitary survey, the information generated for improperly constructed wells in the sanitary survey component of the model regarding the year in which any corrective action is performed and the virus concentration of zero for the years following the corrective action is stored.

The triggered monitoring component of the model applies only to the nondisinfecting subset of wells and any wells that are applying disinfectant but not achieving 4-log removal of viruses. For the wells that are currently achieving 4-log removal, the sanitary survey requirements still apply and the output developed in that part of the model as described above are retained for those wells For the triggered monitoring component of the risk reduction analysis, each well goes through a 2-step process. In the first step of the process, estimates are made of the number of TC positives–and therefore the number of source water indicator samples–that occur during the 22 years between year 4 and year 25 (it is assumed that no corrective actions will be taken during the first 3 years after rule implementation). The number of TC positives expected per year for each well of a given type and size are obtained from the DV data as described in chapter 4 (Section 4.2.7). The total number of TC positives expected through year 25 is then calculated as the number TC positives per year times 22. If, for example, a well is in the CWS size 10,000-50,000 category, the DV data indicate that these wells average 2.21 TC positives per year; over 22 years, then, it is expected that these wells will have 48.6 TC positives and therefore take up to 49 source water indicator samples between years 4 and 25.

In the second step of the process, a simulation is performed to determine which, if any, of the indicator samples taken through year 25 is the first positive indicator result. As described in Chapter 4, in each uncertainty loop of the risk reduction model a set of values for both virus and indicator hit rates is selected. Included among this set of values is the probability that the first positive of an indicator will occur on a given assay number (contingent on these assays being performed in wells that are known to have a virus present at some time). Exhibit 4.27 showed the probability of the first indicator positive occurring on a given assays for the median and the 5th and 95th percentiles of a sample of 1,000 of these uncertainty sets of occurrence values. The curve for the median set of values shown in that exhibit indicates that there is about a 40% probability that the first indicator positive will occur on or before the 49th assay. The data for each uncertainty set provides these cumulative probabilities of observing the first positive on or before each specific assay number. In the risk reduction model, a random value between 0 and 1 is generated for each well. That value is used as a look-up value to determine what assay number would produce the first positive.

For example, if the curve shown as the median data set in Exhibit 4.27 were the set of values being used for a particular uncertainty loop, and the random number between 0 and 1 generated for a well in the CWS size 10,000-50,000 category were 0.25, the look-up function would indicate that the first indicator positive would occur on assay number 8. Since these wells are expected to take 48.6 indicator assays over the 22 year period, the 8th assay would occur in the 6th year (48.6 / 8 ~ 6). Since there are no samples taken in years 1 through 3, the 6th year of sampling corresponds to year 9 of the 25 year modeling period. Therefore, this well would be “caught” by triggered monitoring in year 9. This prediction is then compared to the year in which the well is captured (if it is) by the sanitary survey provisions. The corrective action is assigned to the rule provision (SS or TM) that occurs the earliest in the 25 year period. If both occur in the same year, one of the two is selected randomly.

Based on the number of TC positives expected per well across all well types and sizes, together with the expected values of indicator positives as a function of assay number across all of the uncertainty sets available to draw from for the simulation model, it can be estimated that approximately one-third (33%) of nondisinfecting wells with virus present should be caught and corrected by the triggered monitoring provision of the rule by the 25th year of the modeling timeframe.

Because there are some nondisinfecting wells that will be caught in the simulation model by both sanitary survey and triggered monitoring (where the one occurring earliest is selected for corrective action), the total wells ultimately caught by both components of this rule alternative will be less than the sum of the two individual components (i.e., ~8.3% for SS and 27.5% for TM). The expected fraction of nondisinfecting wells that are captured by either SS or TM can be estimated from the sum of these minus the product (to account for the overlap):

$$(8.3\% + 27.5\%) - (8.3\% * 27.5\%) = 33.5\%$$

Therefore, the SS + TM alternative should, by the 25th year after rule promulgation, result in corrective actions being performed at approximately 33.5% of all non-disinfecting wells and 8.3% of all (4-log) disinfecting wells that have virus present in their source water. Because most of the baseline risk is found in nondisinfecting wells, it is also, therefore, expected that this rule will result in approximately a 33.5% reduction in the baseline cases of illness and death.

Alternative 3: Sanitary Survey + Triggered Monitoring + Assessment Monitoring

Regulatory alternative 3 builds upon alternative 2 by adding a period of source water assessment monitoring for those wells that are not currently disinfecting to 4-log virus removal and that are identified by the States as located in a sensitive aquifer.

As discussed in Chapter 4 (Section 4.3.6), it is estimated that 15% of the ground water wells are located in sensitive aquifers. Therefore, for the 85% of ground water wells that are not located in sensitive aquifers, this regulatory alternative is identical to Alternative 2 described above. For the 15% that are in sensitive aquifers, the requirements are that–in addition to performing sanitary surveys and taking source water indicator assays from triggered monitoring–they must also perform indicator assays for 12 source water samples. It is assumed that these samples will be taken monthly during year 6 for CWSs, and monthly during year 8 for NTNCWS. For TNCWS, it is assumed that these 12 assays will be performed quarterly across years 6, 7, and 8.

The probability of observing an indicator positive in one of these 12 samples is taken from the same set of probabilities of indicator positives as a function of the number of assays performed as described in the preceding section on TM and in Chapter 4. As shown in Exhibit 4.27, the central tendency value across all uncertainty sets indicates that approximately 30% of wells with virus present will result in an indicator positive within the first 12 indicator assays. In the benefits modeling, it was assumed that the capture rate of wells from assessment monitoring would correspond to the probabilities associated with those first 12 indicator assays. This is recognized as likely resulting in an overestimate of the number of wells caught by assessment monitoring for the reasons discussed below.

It is important to note that the 12 assays that are conducted for assessment monitoring are not necessarily the first 12 assays that will be conducted for those wells performing assessment monitoring. In many cases, and perhaps most, there will have been source water indicator samples taken in response to

TC positives occurring prior to the beginning of the assessment monitoring period. Because the probability of getting the first positive indicator result decreases with each additional assay (refer to Exhibit 4.27) the actual probability that a given well will get caught by one of the 12 assessment monitoring samples depends upon how many triggered monitoring indicator assays were performed (which would all have been negative) prior to the beginning of the assessment monitoring assays. The more triggered monitoring samples taken, the less likely it is that the additional 12 assessment monitoring assays will produce a positive result. For example, assume a well has taken 3 triggered monitoring samples (with negative results) prior to the 12 assessment monitoring samples. The expected value of the probability that a positive result will have been obtained in those first 3 samples is 16.6%, and the expected value of the probability that a positive result will have been obtained in the first 15 samples is 32.5% (that is, the 3 triggered plus 12 assessment samples).

Therefore the, incremental probability of observing an indicator positive from those additional 12 samples is only about 16%. Assume, however, that a well has taken 20 triggered monitoring samples (with negative results) prior to the 12 assessment monitoring samples. The expected value of the probability that a positive result will have been obtained in those first 20 samples is 34.9%, and the expected value of the probability that a positive result will have been obtained in the first 32 samples is 38.4% (that is, the 20 triggered plus 12 assessment samples). Therefore the, incremental probability of observing an indicator positive from those additional 12 samples in this case is only about 3.5%. Since most wells will have some triggered monitoring events prior to the beginning of any assessment monitoring (and more so for the larger systems having more population exposed) EPA believes that the simplifying assumption used in the benefits model results in an overestimate of cases avoided from assessment monitoring.

The number of the additional wells captured by this rule option is, therefore, a function of the fraction of wells that do assessment monitoring in addition to the triggered monitoring and sanitary surveys plus the fraction of wells that only do triggered monitoring and sanitary surveys as described in the preceding section.

As shown in Chapter 8, Exhibit 8.8, the final GWR (sanitary survey + triggered monitoring), the annual average cases avoided is 41,868 while for Alternative 3 (sanitary survey + triggered monitoring + assessment monitoring) the annual average cases avoided is 45,419. Therefore, Alternative 3 is estimated to result in about 8.5% more cases avoided annual than the final GWR. However, as indicated above, EPA believes the benefits model produces overestimate of the cases avoided from assessment monitoring for the reasons discussed above.

Alternative 4: Across the Board Disinfection

For this rule alternative, it is assumed that all wells not currently achieving 4-log disinfection will do so beginning in year 5 after rule promulgation. No other rule components are considered. That is, viral levels will be reduced by 4 logs for all wells not doing any disinfection, and from 2 logs to 4 logs for those currently doing less than 4-log disinfection. As a result, it is expected that all wells not currently achieving 4 logs disinfection and with virus present will be captured. The risk reduction, accounting for no changes among those currently achieving 4 logs, an additional 2 log reduction in risk for those currently disinfecting to only 2 logs, and 4 log reductions for those not currently disinfecting will result in over 99.9% risk reduction of the baseline illnesses.

Appendix H
Cost Effectiveness Analysis Using a Quality-Adjusted Life Years Approach

Appendix H
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H.1 Introduction

This Appendix provides a description and results of an experimental approach to developing a cost effectiveness analysis (CEA) for the Ground Water Rule (GWR) using quality-adjusted life years (QALYs). A previous regulatory impact analysis for the Final Clean Air Interstate Rule (CAIR, Appendix G, 2005) also explored using QALYs, and a similar methodology was applied to the Stage 2 DBPR EA and the LT2ESWTR EA, promulgated in Dec. 2005 (Appendices N and U, respectively). Significant language from the CAIR report is used in this Appendix, even though it is not always directly cited.

H.1.1 Cost-effectiveness analysis

Benefit-cost analysis (BCA) and CEA each provide different, but potentially complementary, information for decision-makers. Health-based CEA has been used to analyze numerous health interventions but has not been widely adopted as a tool to analyze environmental policies. Analyses of environmental regulations have typically used benefit-cost analysis (BCA) to characterize impacts on social welfare. BCA allows for aggregation of the benefits of reducing mortality and morbidity risks with other monetized benefits of increasing water quality. One of the great advantages of the benefit-cost paradigm is that a wide range of quantifiable benefits can be compared to costs to evaluate the economic efficiency of particular actions. However, an alternative paradigm such as CEA has also been used. CEA involves estimation of the costs per unit of benefit (e.g., lives or life years saved) and may incorporate preference-based measures of effectiveness, such as QALYs.

Prior to 2003, CEA has not been required under Executive Order 12866 or EPA guidance. The Office of Management and Budget (OMB), however, in its September 2003 update to Circular A-4 interpreting the requirements of Executive Order 12866, states that executive agencies should

> … prepare a CEA for all major rulemakings for which the primary benefits are improved public health and safety to the extent that a valid effectiveness measure can be developed to represent expected health and safety outcomes.[1]

Pursuant to this requirement, in 2003 OMB's Office of Information and Regulatory Affairs requested that the Institute of Medicine (IOM), a member institution of the National Academies of Science, investigate the application of CEA to government regulatory analysis. In response, the IOM established the Committee to Evaluate Measures of Health Benefits for Environmental, Health, and Safety Regulation to assess the scientific validity, ethical implications, and practical utility of a wide range of effectiveness measures used or proposed in CEA. The committee issued its report in January 2006. The groundwater CEA was largely completed prior to the IOM report and, in its current form, does not reflect all of the IOM's recommendations.

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[1] Office of Management and Budget Circular A-4, September 17, 2003, p. 9.

CEA has been used for comparing programs that have similar goals, for example, alternative medical interventions or treatments that can save a life or cure a disease. Specifically, QALY-based CEA has been widely adopted within the health economics literature (Neumann, 2003; Gold et al., 1996) and in the analysis of public health interventions (US FDA, 2004). In addition, the World Health Organization has adopted the use of disability-adjusted life years, a variant on QALYs, to assess the global burden of disease due to different causes, including environmental pollution (Murray et al., 2002; de Hollander et al., 1999). The U.S. Public Health Service Panel on Cost Effectiveness in Health and Medicine recommended using QALYs when evaluating medical and public health programs that primarily reduce both mortality and morbidity (Gold et al., 1996).

The use of health preference indices, such as QALYs, to characterize the effectiveness of health and safety based rules has a number of useful attributes, particularly in cases where benefits are difficult to monetize. For the benefit-cost component of analyses that affect human health, EPA typically relies on estimates of willingness to pay for health risk reduction to determine the net benefits of different policy options. In contrast, health economists often rely on cost-effectiveness analysis to compare alternative approaches, using indices to rank preferences for different types of risk reductions. In these studies, analysts calculate the ratio of an outcome (or effect) measure to costs, then rank the options based on these ratios.

Environmental quality improvements may have multiple health and ecological benefits, making application of CEA more difficult. For the GWR, CEA can provide a framework for analysis: nonhealth benefits are few, and all of the quantified benefits come from health effects. Therefore, EPA is including in the GWR EA a preliminary and experimental application of the QALYs approach to CEA.

H.1.2 QALY methodology

When using a QALY rating system, health quality ranges from 0 to 1.0, where 1.0 may represent full health, 0 death, and numbers in between (e.g., 0.8) represent an impaired condition. QALYs assume that duration and quality of life are interchangeable, or “equivalent”, so that 1 year spent in perfect health is equivalent to 2 years spent with a quality of life that is half that of perfect health.

QALYs can be used to evaluate environmental rules under certain circumstances, although some very strong assumptions apply. These assumptions are embedded in the QALY analytical framework on which a QALYs application is predicated. As noted in the QALY literature, this analytical tool is consistent with the utility theory that underlies most of economics only if one imposes several restrictive assumptions, including independence between longevity and quality of life in the utility function, risk neutrality with respect to years of life (which implies that the utility function is linear), and constant proportionality in trade-offs between quality and quantity of life (Pliskin, Shepard, and Weinstein, 1980; Bleichrodt, Wakker, and Johannesson, 1996). To the extent that these assumptions are not consistent with actual preferences, the QALY approach will not provide results that are consistent with a benefit-cost analysis based on the Kaldor-Hicks criterion.[2]

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[2] The Kaldor-Hicks efficiency criterion requires that the “winners” in a particular case be potentially able to compensate the “losers” such that total societal welfare improves. In this case, it is sufficient that total benefits exceed total costs of the regulation. This is also known as a potential Pareto improvement, because gains could be allocated such that at least one person in society would be better off while no one would be worse off.

Even if the assumptions are reasonably consistent with reality, there are no guarantees that the option with the largest QALYs saved per dollar cost will satisfy the Kaldor-Hicks criterion (i.e., generate a potential Pareto improvement [Garber and Phelps, 1997]) because QALYs represent an average valuation of health states rather than the sum of societal willingness to pay (WTP).

However, benefit-cost analysis based on WTP is not without potentially troubling underlying structures as well because it incorporates the ability to pay (and thus the potential for equity concerns) and the notion of consumer sovereignty (which emphasizes wealth effects). Exhibit H.1 compares the two approaches across a number of parameters. For the most part, WTP allows parameters to be determined empirically, while the QALY approach imposes some conditions a priori.

Exhibit H.1 Comparison of QALY and WTP Approaches

Parameter	QALY	WTP
Risk aversion	Risk neutral	Empirically determined
Relation of duration and quality	Independent	Empirically determined
Proportionality of duration/ quality trade-off	Constant	Variable
Treatment of time/age in utility function	Unit linear in time	Empirically determined
Preferences	Community/Individual	Individual
Source of preference data	Stated	Revealed and stated
Treatment of income and prices	Not explicitly considered	Constrains choices

Source: Exhibit G-1, p. G-11, CAIR RIA

The QALYs analysis in this appendix accounts for the loss in quality of life without consideration of the initial health state and summarizes life years saved for the entire population. In some CEAs (Cohen, Hammitt, and Levy, 2003; Coyle et al., 2003), analysts have adjusted the number of life years saved to reflect that

1) the general public is not in perfect health and thus “healthy” life years are less than total life years saved; and
2) those affected by pollution may be in a worse health state than the general population and therefore will not gain as many “healthy” life years, adjusted for quality, from a pollution reduction.

Such adjustments would raise a number of serious ethical issues. Proponents of QALYs have promoted the nondiscriminatory nature of QALYs in evaluating improvements in quality of life (e.g., an improvement from a score of 0.2 to 0.4 is equivalent to an improvement from 0.8 to 1.0), so the starting health status does not affect the evaluation of interventions that improve quality of life. However, for life-extending interventions, the gains in QALYs will be directly proportional to the baseline health state (e.g., an individual with a 30-year life expectancy and a starting health status of 0.5 will gain exactly half the QALYs of an individual with the same life expectancy and a starting health status of 1.0 for a similar life-extending intervention). This is troubling because it imposes an additional penalty for those already suffering from disabling conditions.

OMB (2003) has recognized this issue in its Circular A-4 guidance, which includes the following statement.

> When CEA is performed in specific rulemaking contexts, you should be prepared to make appropriate adjustments to ensure fair treatment of all segments of the population. Fairness is important in the choice and execution of effectiveness measures. For example, if QALYs are used to evaluate a lifesaving rule aimed at a population that happens to experience a high rate of disability (i.e., where the rule is not designed to affect the disability), the number of life years saved should not necessarily be diminished simply because the rule saves the lives of people with life-shortening disabilities. Both analytic simplicity and fairness suggest that the estimated number of life years saved for the disabled population should be based on average life expectancy information for the relevant age cohorts. More generally, when numeric adjustments are made for life expectancy or quality of life, analysts should prefer use of population averages rather than information derived from subgroups dominated by a particular demographic or income group. (p. 13)

Because of the fairness concerns discussed above, this analysis does not reduce the number of life years saved to reflect any differences in underlying health status; rather, EPA assigns a weight of 1.0 to all direct gains in life years. This estimate has been combined with the QALYs saved from avoided cases of morbidity to yield a total life years saved from avoided cases. The resulting effectiveness measure has been termed “Morbidity Inclusive Life Years” (MILYs) in the regulatory impact analysis for the Final CAIR Rule (2005). The Stage 2 DBPR and the LT2ESWTR used the same terminology, and it is applied to this analysis for the GWR as well.

H.1.3 Concerns about the use of QALYs to evaluate environmental regulation

EPA is still evaluating the appropriate methods for application of CEA to environmental regulations. To summarize, benefit-cost analysis has been the preferred method of choosing among regulatory alternatives in terms of economic efficiency for environmental regulations. Most environmental regulations have multiple categories of benefits, and environmental economists have preferred to aggregate results in terms of monetary net benefits. QALY-based analyses also have not been as accepted in the environmental economics literature because of concerns about the theoretical consistency of QALYs with individual preferences (Hammitt, 2002), treatment of benefits other than human health, and a number of other factors (Freeman, Hammitt, and De Civita, 2002). Concerns with the standard QALY methodology include consistency of CEA indices across multiple contexts; the treatment of people with fewer years to live (the elderly); fairness to people with preexisting conditions that may lead to reduced life expectancy and reduced quality of life; and how the analysis should best account for nonhealth benefits.

As an illustration of one of the major issues in ensuring consistency across CEAs conducted in multiple contexts, it is useful to examine the degree of variability across QALY calibration methodologies. A study by Erik Nord (Nord, 1999) examined differences in the health-state scores that would result by application of a wide range of multi-attribute utility instruments. One of these instruments, the York EuroQoL Time Trade-off Tariff, utilized the Time Trade-off (TTO) valuation technique that which was also used for deriving the QALY scores applied to this analysis (see Section H.2.1.1.1). The results of the Nord study are summarized in Exhibit H.2 below.

One interpretation of the data in Exhibit H.2 is that the variability in QALY estimates across methods suggests that great care must be taken when comparing the results of CEAs that utilize different QALY scoring systems. An alternative view is that the scoring systems may themselves be ideally suited to specific types of effects, and therefore comparisons across scales are meaningless (e.g., some argue the Quality of Well Being Scale is best for acute effects because it specifically addresses symptoms, while other techniques may be better suited for injuries, life-threatening chronic conditions, and chronic conditions where severity may vary over time). There are likely other interpretations of these results as well. The main point is that comparisons to other CEAs must make explicit consideration of standardization issues such as the use of QALY estimation methods.

Exhibit H.2 Health-State Scores According to Rules of Thumb and Different Multi-Attribute Utility Instruments

Instrument	Problem Level		
	Severe	**Considerable**	**Moderate**
Rules of Thumb	.65 - .85	.90 - .94	.98 - .995
QWB	.45 - .55	.65 - .70	<.80
HUM1	.10 - .20	.30 - .40	<.85
HUM2	0.4	0.7	.90 - .94
EuroQol	0.2	0.6	0.7
York EuroQol (TTO)	.20 - .25	.40 - .50	0.8
IHQL (3D)	.50 - .70	.75 - .85	.89 - .93
IHQL (complex)	.70 - .75	.80 - .90	.90 - .94
15 D	0.77	0.86	.91 - .93
Rosser-Kind	0.68	0.94	.97 - .98

Source: Nord (1999). Note that the estimates in this table represent health state scores, rather than QALY decrements from a baseline health state.

The GWR EA includes the following MILYs-based analysis to illustrate one potential approach for conducting a CEA. This is an experimental application, and EPA is still evaluating the appropriate methods for applying CEA to environmental regulations with multiple outcomes. The methodology presented in this section is not intended to stand as precedent for either future water quality regulations or other EPA regulations: the appropriateness of MILYs (or QALYs) based CEA should be evaluated on a case-by-case basis.

This analysis calculates the MILYs saved using a quality of life decrement for rotavirus illness and the estimated number of such illnesses to be avoided by implementation of the GWR, as presented in the GWR EA. Additionally, the same decrement for a rotavirus illness is applied to the more severe Type B illnesses avoided, although the Agency uses echovirus to represent Type B illnesses in the main EA . This is an underestimate of QALYs saved for avoidance of Type B illnesses because Type B illnesses are known to be more severe on average than Type A.[3] However, this method is considered the best approach based on available information, which will be described in Section H.2.1.1.1 below.

The remainder of this Appendix provides the step-by-step development of a MILY-based measure of the cost-effectiveness of the GWR in the following order:

1) Development of the MILY denominator. This includes determination of an appropriate QALY decrement and its application to cases of morbidity; the calculation of life years saved from avoided cases of mortality; and integration of morbidity and mortality life years saved into a total life years saved denominator (MILY).

2) Development of the cost numerator. Costs are composed of the regulatory costs minus the costs for medical treatment and time losses that are avoided by prevention of cases.

3) Finally, integration of the numerator and denominator to yield a cost-per-MILY saved ratio.

H.2 Methods

Promulgation of the GWR is expected to achieve reductions in viral concentrations in drinking water and in the incidence of Type A illnesses such as rotavirus illness and Type B illnesses, thereby avoiding the associated decrements to patients' quality of life, and in some cases death. To capture the benefits of reduction in Types A and B illnesses in a measure of cost effectiveness, cases of illness to be avoided are converted into a life years equivalent (QALYs) so that they can be combined with the direct gains in life expectancy from avoided premature mortality (Section H.2.1.2). Other nonquantified benefits from items such as reduction of bacterial contamination and improvements in the consistency of performance of disinfection and distribution systems (as described in Chapter 5) are expected to be significant. However, because they are not monetized, these benefits are not included in the quantified QALY analysis.

The first step in the development of a cost-per-MILY ratio in this CEA is to determine the QALY decrement per case avoided to be used in calculating the MILYs denominator. A QALY decrement is the *time-equivalent* by which a person*s years of life are reduced by the loss of quality of life due to illness. EPA reviewed the health literature to determine an appropriate QALY decrement, as described further in Section H.2.1.1.1.

The QALY decrement is then used to derive the total QALYs saved across the population from a reduction in morbidity related to drinking water contaminated with Type A viruses such as rotavirus (Section H.2.1.1.2). The QALYs saved are added to the life years saved from reductions in premature mortality from avoided fatal cases of such illnesses, resulting in an estimate of MILYs. An estimate of MILYs saved is the effectiveness measure (denominator) in the cost-per-MILY ratio of this CEA.

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[3] Additionally, the QALYs saved as calculated in this Appendix are an underestimate for both Type A and Type B illnesses, as they are based solely on the number of rotavirus and echovirus cases avoided, and don't account for the avoidance of illness due to co-pathogens in the source waters. These and other unquantified benefits to the GWR are described in Ch. 5, Section 5.1.2, of the EA.

The numerator of the cost-per-MILY saved measure is the cost of the regulation minus certain costs associated with the illness to be avoided through rule implementation. The process of determining these avoided costs and the resulting net cost numerator is described in Section H.2.2 below.

The numerator and denominator are integrated to estimate the cost effectiveness of the regulatory alternatives in terms of net cost per MILY saved (Section H.2.3).

H.2.1 The CEA Denominator: Deriving MILYs

The QALY calculation for morbidity requires three elements:[4]

1) Estimated change in incidence of the health condition (cases avoided),
2) Duration of the health condition (estimated time-in-state), and
3) Quality of life decrement due to the condition.

The first element is derived using the health impact function approach, which requires computing an estimate of the number of rotavirus illness cases avoided through rule promulgation. EPA calculates this estimate in the main EA, and presents the results in Ch. 5, Exhibit 5.16. The second element is based on the medical literature for each health condition. This estimate is compiled in the main EA and presented in Appendix A, Exhibits A.1 and A.3. The third element is derived in this appendix by the methods described in the following section (H.2.1.1).

H.2.1.1 Equivalent life years saved from avoided cases of morbidity

Calculating equivalent life years saved from avoided cases of morbidity involves developing a QALY decrement and applying this to cases of illness avoided. The QALY decrement converts a decrease in quality of life due to illness to a time-equivalent. In this CEA, a small number of cases of Type A and Type B acute illness become fatal; an estimate of the number of life years saved for avoiding these cases is calculated separately, in Section H.2.1.2.

H.2.1.1.1 Developing the QALY decrement

There are multiple steps to developing a QALY decrement per case avoided in a CEA. First, the Agency reviews and describes the health effect of interest, i.e., the illness to be avoided; the primary analysis of this EA uses rotavirus and echovirus to represent the health effects for two classes of illness, Type A viruses and Type B viruses, respectively. Second, the Agency conducts a literature review for QALY-based health preference index scores for the relevant health effects. Last, the Agency selects and presents the QALY decrements for each health effect, based on the literature research. The final QALY decrements for Type A and Type B illnesses are then applied to the estimate of non-fatal and fatal cases

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[4] In some QALY calculations, two other elements are required: the quality of life weight with the health condition and the quality of life weight without the health condition (i.e., the baseline health state). These elements would be derived from the medical cost-effectiveness and cost-utility literature. In this CEA, however, these are immaterial because there is no adjustment of benefits for differing baselines of health in the population: the health gain is assumed the same for all individuals.

avoided in each class of illness. These QALY decrements do not include nonquantified benefits, which for the GWR are expected to be significant.

H.2.1.1.1.1 Determining the Appropriate Health Endpoints

Rotavirus

EPA has selected rotavirus to represent Type A waterborne viral pathogens for the Ground Water Rule risk assessment. Generally, Type A viruses are highly infectious viruses that cause gastroenteritis, resulting in symptoms that include vomiting, watery diarrhea, fever, and abdominal pain. Although they are highly infectious, Type A viruses generally lead to mild, non-life-threatening illnesses. In modeling the Ground Water Rule, EPA has assumed that the duration of illness is approximately 2.5 to 5 days (Appendix A, Exhibit A.1) for Type A illnesses.

The elderly and the immunocompromised are also at greater risk than the general population of experiencing severe health effects due to rotavirus infection. EPA has calculated specific cost-of-illness estimates for the immunocompromised, as the duration of their infection tends to be longer than that of the non-immunocompromised. Furthermore, the COI for Type A illnesses are specified by age group.

Echoviruses

For the Ground Water Rule risk assessment, EPA has selected echoviruses to represent Type B waterborne viral pathogens, which are not highly infectious but result in more severe illness than Type A viruses. The echoviruses group includes 28 viruses that belong to the enterovirus classification. Other enteroviruses include the coxsackie viruses and the polio viruses, although because polio has been eliminated in the United States, the remainder of this discussion focuses on non-polio enteroviruses. Many people infected with an enterovirus are asymptomatic, although enteroviruses do cause approximately 10 million infections in the United States each year. Children and adolescents tend to be more susceptible to illness from enterovirus infection, as they are less likely to have antibodies than adults. Adults without prior immunity to a particular enterovirus may become ill as well.

According to the Centers for Disease Control, symptomatic enterovirus infection generally manifests as mild upper respiratory illness, a flu-like illness with fever and muscle aches, or an illness with a rash (sometimes called Hand, Foot, and Mouth disease). Occasionally, enterovirus infection can cause viral meningitis, myocarditis (an inflammation of the heart muscle that sometimes leads to heart failure), encephalitis, or polio-like paralysis. Viral meningitis is serious but rarely fatal in the immunocompetent population; symptoms last from 7 to 10 days and the patient recovers completely. Individuals with encephalitis or paralysis do not recover fully, and individuals who experience heart failure but do not die may also have long-term complications. Some experts believe that enterovirus infections can contribute to juvenile-onset diabetes mellitus, a chronic condition. In addition, enterovirus infection may be fatal to some infants. EPA estimates for this EA that approximately 1 percent of Type B illnesses will be severe (see Ch. 5 for discussion).

In modeling the Ground Water Rule, EPA has classified infection with an echovirus into three levels of severity based on a requirement for: no medical care, a doctor visit with no hospitalization, or hospitalization. For individuals of all ages, EPA has assumed a constant distribution of illness across these severity levels, equal to 93 percent, 6 percent, and 1 percent of cases, respectively; and a duration of illness that is 3 days, 5 days or 7 days, respectively (ranges for these means are shown in Appendix A, Exhibit A.3).

EPA has assumed that a mild case (i.e., no medical care) of echovirus infection is associated with nonspecific febrile illness, respiratory illness, and gastrointestinal illness. Moderate and severe cases (i.e., requiring a doctor visit and hospitalization, respectively) of echovirus infection are presumed to manifest as aseptic (viral) meningitis; severe cases may also lead to myopericarditis. This is a term that encompasses both myocarditis (inflamation of the heart muscle) and pericarditis (inflammation of the pericardium, which is the membrane that surrounds the heart). Most people with myocarditis or pericarditis experience breathing discomfort, chest pain, fever, and malaise. According to one estimate, approximately 10 to 30 percent of cases of myopericarditis lead to long-term heart damage and/or abnormalities and 5 percent of cases are fatal.

Among young children, infection with an echovirus is more likely to have serious consequences. EPA has assumed that about 1 percent of cases of echovirus infection among infants under 1 month old are fatal. Meningitis is an inflammation of the tissue surrounding the brain and the spinal cord, while encephalitis is an inflammation of the brain itself. Although bacterial meningitis can be very dangerous, individuals with viral meningitis usually recover fully. In contrast, viral encephalitis is a very severe condition that can be fatal or can cause permanent nervous system damage. EPA has assumed that such cases last 5 days, with a range from 2 to a minimum of 7 days (ranging as high as 12 days for patients <1 year old).

For all age groups, EPA assumes that 93 percent of cases require no medical care, and illness tends to last for 3 days, with a range of 1 to 6 days. EPA assumes that 6 percent of cases require a doctor visit (associated with viral meningitis) but no hospitalization and last for 5 days, with a range of 2 to a minimum of 7 days. Finally, 1 percent of cases require hospitalization (associated with viral meningitis and myopericarditis) and last for 7 days, with a range from 2 to 14 days.

The elderly and the immunocompromised are also at greater risk than the general population of experiencing severe health effects due to infection with an echovirus. EPA has calculated specific cost-of-illness estimates for the immunocompromised, as the duration of their infection tends to be longer than that of the non-immunocompromised.

H.2.1.1.1.2 How Much Do Rotavirus and Echovirus Illnesses Affect Quality of Life?

There are three methods by which a decrease in quality of life due to illness is quantified in the form of a QALY decrement: “direct elicitation,” “standardized questionnaire,” and “database research.” The first involves primary research, where subjects in a survey setting are asked to express preferences for specific health states expressed on the 0 to 1 interval, where 0 represents death and 1 represents perfect health. Most of these studies apply a time-tradeoff, standard gamble, or rating scale elicitation technique; sometimes multiple methods are applied. The more rigorous time-tradeoff and standard gamble techniques are typically considered to yield more reliable estimates than the rating scale technique (Gold, Stevenson, and Fryback, 2002). The direct elicitation method can be administered to samples of patients with a given condition, to the general population (known as “community” samples), or to expert panels.

The second method, “standardized questionnaire,” also involves some primary survey work, but is simpler to implement than the direct elicitation approaches. This method involves administering a standardized set of questions that evaluate multiple aspects of an individual's health, including mobility, degree of pain, and ability to provide care to oneself, and then using the answers to generate a QALY score on the 0 to 1 scale. The QALY score is estimated using a formula, generated through prior calibration work, for translating specific combinations of questionnaire answers. The formula is questionnaire specific. This method can also be administered to different types of samples. Because of its ease of use, many applications of this technique are conducted as an integral part of clinical trials for specific treatment regimens. This facilitates calculating cost-effectiveness of various treatments of the patient populations that are the subjects of the clinical trial. Occasionally, the standardized questionnaire method is applied by study authors themselves, relying on their own expert judgment.

EPA adopted the third and simplest method, "database research," for use in this CEA, using values from existing literature and requiring no new primary research. Several databases have been developed to facilitate these literature searches; the most extensive is the Cost-Effectiveness Analysis database developed by researchers at Harvard University School of Public Health.[5] As noted below, EPA used this database, supplemented by broader literature searches, to identify studies that include QALY scores for the health effects of rotavirus illness.

Using existing literature requires some care in documenting the technique used to conduct the study, the nature of the sample, and the match between the severity and duration of the health effect studied and the health effect linked to drinking water contamination. The Agency's criteria for selecting the highest-quality studies include the following:

1) Where available, EPA generally prefers studies administered to community-based samples. These samples best match the attributes of the general population that is exposed to and potentially at risk of health consequences from drinking water contaminants. Where community-based studies are not available, the Agency generally prefers patient samples, followed by expert panels and author judgement.

2) Where available, EPA generally prefers directly administered time-trade-off (TTO) or standard gamble studies over studies that administer a standardized questionnaire. In some cases, however, direct method studies have very small sample sizes or other major methodological shortcomings. In these cases, the Agency uses its judgement to select a study that provides the most reliable estimate, or look for consistency of results across several studies to guide the selection process. EPA selected QALY decrements for this CEA that were developed using the TTO technique, as will be discussed in the next section on literature for rotavirus.

3) The Agency attempts to select studies with the best match to the health endpoint of interest. In cases where the match is not good, because of differences in severity or duration of effect, for example, EPA may favor use of studies that provide sufficient documentation to adjust the estimates to better the match the severity and duration of interest.

The development of the QALY decrement (described above) is diagramed in Exhibit H.3 below.

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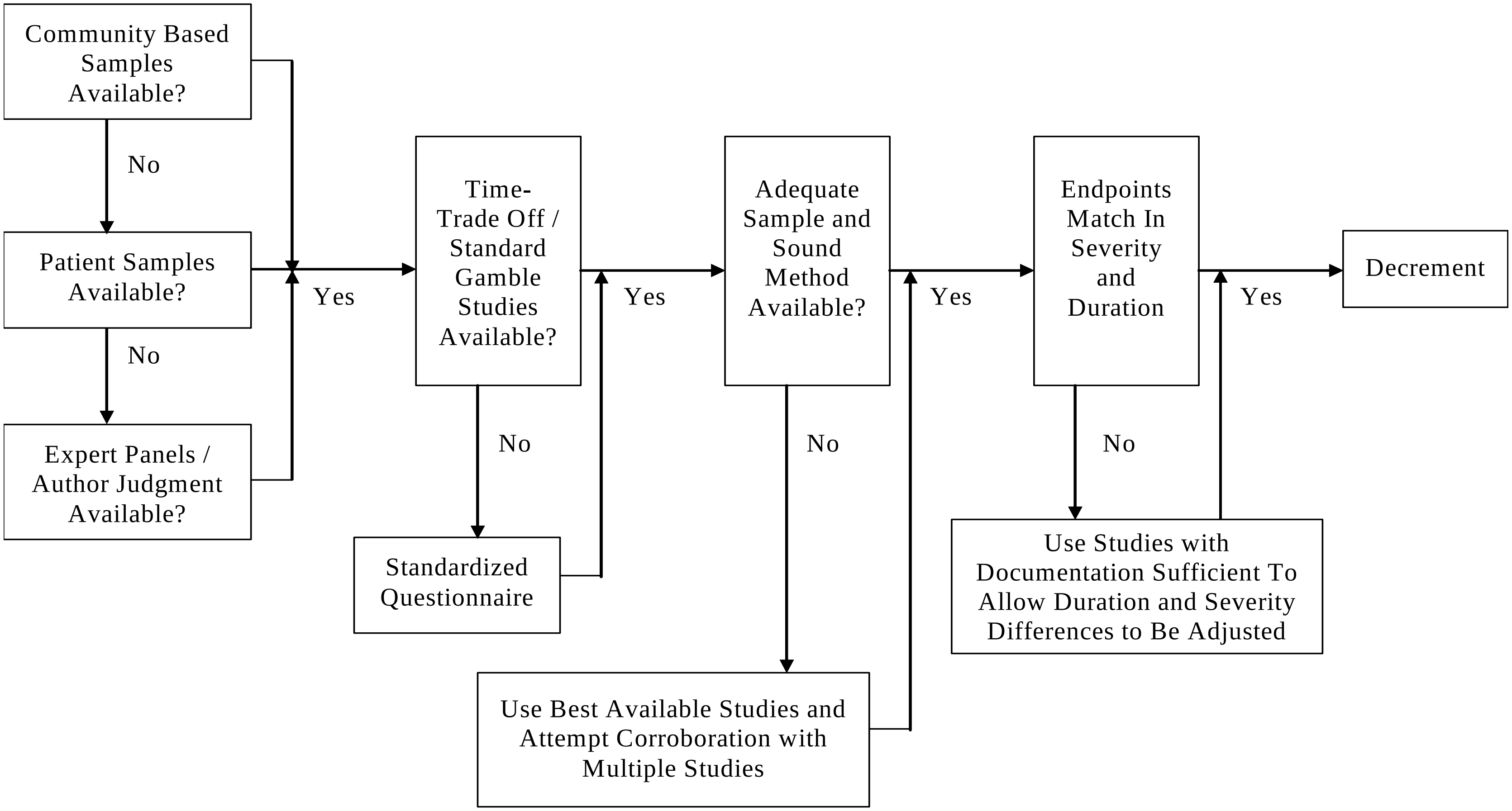
[5] The Harvard CEA database is available online at the following URL: http://www.hcra.harvard.edu/pdf/preferencescores.pdf. Two versions of the database are available, containing citations with publication dates through 1997. (www.hsph.Harvard.edu/cearegistry/data/phase1preferenceweights.pdf), and containing citations with publication dates from 1998 through 2001 (www.hsph.Harvard.edu/cearegistry/data/phase2preferenceweights.pdf).

Exhibit H.3 QALY Decrement Development



H.2.1.1.1.3 Literature Review Methodology

The literature search was conducted using PubMed and EBSCO Host. PubMed is a database of journal abstracts maintained by the National Library of Medicine. The database contains over 15 million citations for biomedical articles back to the 1950s, including abstracts covered by Medline and OldMedline. EBSCO Host is a private service that includes three databases: Business Source Corporate, Regional Business News, and Knight Ridder. These three databases provide coverage of approximately 3,000 magazines, academic journals, and newspapers, including many economics journals such as *Risk Analysis* and *PharmacoEconomics*, with some publications dating back as far as 1965. Date constraints were not applied to any of the database searches.

Because of the medical specificity of PubMed, searching on the terms “quality adjusted life years” or “cost-utility” yielded cost-effectiveness studies with QALY estimates for a broad range of health end-points. Due to the large number of results, these search terms were coupled with each specific health end point to focus the results on the health states of relevance to the rule-making.

Perhaps because EBSCO focuses on business and economics rather than medicine, a search of EBSCO using the terms “quality adjusted life year” and “cost-utility” yielded few health-specific QALY studies, especially for the health end-points of relevance to this rulemaking. As a result, “cost-effectiveness” was also used as a search-term for EBSCO Host. This term produced a large number of results. To narrow the search, “cost-effectiveness” was coupled with each specific health end-point, as was done in the PubMed searches.

Rotavirus

EPA found four relevant studies that had developed QALY scores for rotavirus infection or related symptoms:

- an Institute of Medicine (2000) evaluation of a rotavirus vaccine;
- a Food and Drug Administration (2005) internal evaluation; and
- two studies cited in The Harvard CEA Database, Anderson and Moser (1985) and Cook et al. (1994).

The first study was conducted in 2000, by a panel convened by the Institute of Medicine (IOM). The IOM panel published a QALY-based analysis of numerous vaccines, including one that prevents rotavirus illness. The panel assumed that all rotavirus infections occur in children up to 4 years old and that illness causes 8 days of acute diarrhea. It assigned a QALY score to rotavirus using the Health Utilities Index Mark II (HUI-II). The HUI-II is a scale that rates morbidity across seven health attributes: sensation, mobility, emotion, cognition, self-care, pain, and fertility. The values embedded in the HUI-II are derived from the responses of a random sample of Canadian parents. The panel developed a description of the health effects associated with rotavirus by surveying experts, and then used this description to score rotavirus on the HUI-II.

Using this expert judgment process, the panel assigned a QALY score of 0.75 to rotavirus illness. Presuming that children aged 0-4 are generally close to perfect health, this implies a decrement of 0.25. However, in its calculations the IOM panel used a Canadian study to determine baseline health scores for individuals age 15 and up. The panel then assumed that individuals from 0 to 4 years old have the same baseline health as those ages 15 to 24; this produces an age-adjusted QALY score of 0.69 (baseline health, 0.92, multiplied by the QALY score, 0.75). This would imply a decrement of 0.23, as the IOM calculates the decrement as the baseline health minus an age-adjusted QALY score (0.23 = 0.92 - 0.69).

In the second study, the FDA used a system similar to the HUI-II, called the Quality of Well-Being Scale (QWB), to assess the quality-of-life impacts of health conditions. The QWB Scale is used to generate a quality-of-life score by combining the impact of functional limitations with the impact of symptoms on quality of life, ultimately weighted by the duration of time with those symptoms. Because of its focus on specific symptoms in addition to functional limitations, the Quality of Well-Being Scale is considered by some observers to be well-suited for analysis of acute effects. The calibration scheme reflected in the Quality of Well-Being Scale was determined by clinical judgement (i.e., a panel of doctors); the FDA has used its own internal expertise to assign symptoms and description of functional ability to patients with various illnesses.

FDA used this system to provide QALY scores for a recent Regulatory Impact Analysis of bioterrorism rules (2004) involving gastrointestinal illnesses. The FDA bioterror rule analysis did not include rotavirus. However, FDA has used the QALY scores from the bioterror analysis to conduct internal examinations of rotavirus infection, as part of a project called The Annual Health Cost of Food-Related Illness (2005). FDA applied a QALY score of 0.51 to mild and moderate cases of rotavirus illness and 0.48 to severe cases of rotavirus illness that require hospitalization. Using a baseline health of 1.0, this implies a decrement of 0.49 for mild and moderate cases and 0.52 for severe cases.

EPA found that the description of mild/moderate cases of gastrointestinal illness from the bioterror rule sounds comparable to rotavirus illness. Mild and moderate cases are assumed to include sick or upset stomach, vomiting or loose bowel movement, with or without chills, or aching all over; inability to drive or ride in a car or use public transportation without help; limited social activity, though able to perform self-care activities; and confinement to the bed, chair, or couch most of the day. The description of a severe case of gastrointestinal illness is similar to that for mild and moderate cases; the only difference is that severe cases require hospitalization.

The Harvard CEA database contains two studies that provide QALY scores for symptoms similar to those experienced by individuals infected with rotavirus. These two studies, Anderson and Moser (1985) and Cook et al. (1994), are catalogued under "Nausea, Vomiting, and Bowel" health effects in the Harvard CEA database.

Cook et al. (1994) use a TTO study to compare the cost-effectiveness of three gallstone treatments. The authors surveyed patients to determine the quality-of-life impact of the treatment protocols' side effects, some of which are similar to rotavirus illness. Cook et al. propose the following QALY scores: 0.81 for severe diarrhea, 0.68 for severe diarrhea with moderate pain, and 0.47 for severe diarrhea with severe pain and nausea. The article provides a more detailed description of only the most severe health state, which is defined as: "2 or 3 attacks of continuous agonizing pain," lasting from a half hour to four hours; "uncontrollable diarrhea 2 or 3 times a week," which is very painful once a week; and "nausea for a few hours once a week".

The study calculates QALY scores for two reference time periods (12 years and 1 year) and finds no statistically significant difference between the two sets of values when viewed in comparable terms, which suggests that the QALY scores are invariant to the length of illness.

The second study from the Harvard CEA database, Anderson and Moser (1985), uses a QWB scale to develop QALY decrements for parasitic illnesses, such as entamoeba histolytica, ascaris lumbircoides, and necetor americanus. The description of the health state associated with the first parasite, entamoeba histolytica, is similar to the description of rotavirus infection: "sick of upset stomach, vomiting or loose bowel movement, with or without fever, chills, or aching all over." Anderson and Moser apply a QALY decrement of 0.572 to entamoeba histolytica. This study's methodology is very similar to that used by the FDA, which also used the QWB scale to develop a QALY decrement ranging from 0.49 to 0.52.

The QALY decrements derived in the four studies described above are shown in Exhibit H.4.

Exhibit H.4 Summary of QALY Estimates and Decrements for Rotavirus Illness

Health Effect or Symptom Complex	**Baseline**	**QALY Score**	**Decrement**	**Time in State**	**Type**	**Source**
rotavirus illness, children ages 0-4	1 0.92	0.75 0.69	0.25 0.23	8 days	Expert judgement, HUI-II	IOM (2000)
mild rotavirus illness	1	0.51	0.49	4 to 8 days	Expert judgement, QWB	FDA (2004, 2005)
moderate rotavirus illness	1	0.51	0.49	4 to 8 days		
severe rotavirus illness	1	0.48	0.52	5 to 9 days		
sick of upset stomach, vomiting or loose bowel movement, with or without fever, chills, or aching all over	1	0.428	0.572	5 days	Expert judgement, QWB	Anderson and Moser (1985)
severe diarrhea	1	0.81	0.19	invariant to duration	Time-tradeoff, patient-based	Cook *et al.* (1994)
severe diarrhea w/ moderate pain	1	0.68	0.32			
severe diarrhea with severe pain and nausea	1	0.47	0.53			

Echoviruses

EPA's literature review did not discover any QALY scores developed specifically for infection with an echovirus. The Agency expanded the search to include enteroviruses, coxsackievirus, and poliovirus, to no avail. In addition, neither the EBSCO and PubMed databases nor the Harvard CEA database contain QALY scores for most of the sequelae associated with an infection with an echovirus: aseptic meningitis, exanthum, herpangina, myopericarditis, nonspecific febrile illness, and pleurodynia. The database does contain a score for fulminant hepatitis, which is similar to the condition used in the EA, "sepsis-like illness with hepatitis," although by itself this is not enough information for developing a composite QALY score. The CEA database did contain a value for bacterial meningitis, but bacterial meningitis is much more severe than aseptic (viral) meningitis.

H.2.1.1.1.4 Literature Review Conclusions

Lost life years for fatal cases of rotavirus and echoviruses will be calculated based on a mortality incidence analysis that will attribute to each statistical death an age at death and, from that, calculate a remaining life expectancy absent the ground water contamination-related death. Each lost life year should be assigned a QALY equivalent score of 1.0 for incorporation in the effectiveness denominator.

The remainder of this section explains the Agency's methods for incorporating a total QALY decrement for each incident of morbidity, including morbidity preceding mortality.

Rotavirus

EPA considered three possible options for evaluating the quality-of-life impacts of infection with rotavirus. The first two options would use a single average case severity level, and would require determining with which of two studies the Agency's assumptions on severity of illness were more closely aligned– the FDA study (2005) or Cook et al. (1994). The third option, and the option EPA chose, involves using the high and low estimated decrements from the Cooke et al. study as a range, forgoing the need to determine one average-case severity level.

First, EPA considered applying the values derived by the FDA for use in its Annual Health Cost of Food-Related Illness (2005) project– 0.49 for mild and moderate cases and 0.52 for severe cases. The Agency believes that of the three QALY decrements for rotavirus infection derived from an expert judgement process, the FDA value is the most robust. The FDA used the same quality-of-life scale as Anderson and Moser (1985); the Agency prefers the FDA study because the values have already been used in the FDA bioterror rule and in EPA's Long Term 2 Enhanced Surface Water Treatment Rule. The QALY decrement from the FDA project is preferable to the score from the IOM report, because there is relatively little documentation available on the derivation of the QALY score in the IOM report.

Second, EPA considered using a QALY decrement derived from Cook et al (1994). Of the four studies identified in its literature review, this is the only direct survey of patient preferences. Cook et al. provide three different decrements: 0.19 for severe diarrhea; 0.32 for severe diarrhea with moderate pain; and 0.53 for severe diarrhea with pain and nausea. If all of the cases in the EA are homogenous and relatively severe, then the Cook et al. study would suggest a QALY decrement, 0.53, that is very similar to that used by the FDA project (0.49 to 0.52). If most cases do not involve nausea, then Cook et al.

would suggest that a more appropriate decrement for these cases would be 0.32. Similarly, if most cases are not associated with abdominal pain, then the smallest decrement from Cook et al. (0.19) may be appropriate.

Third, EPA noted that the Cook et al. decrement is similar to the FDA study for the most severe cases and smaller than the FDA decrements for mild and moderate cases. Therefore, EPA decided to apply the range from Cook et al.(0.19 to 0.53 Quality Adjusted Life Days per day of illness) as a reasonable sensitivity analysis of a decrement based on available literature.

Echovirus

The literature did not provide a QALY decrement for an echovirus illness. Hence the Agency considered developing a composite QALY decrement for echovirus illness based on the virus' sequelae, however, many of the sequelae also did not have decrements presented in the literature.

Therefore, based on the best available information, EPA chose to apply the rotavirus illness decrement to Type B cases in addition to Type A cases. Since Type B illnesses are generally more severe than those of Type A, this is an underestimate of the quality of life decrement due to an average Type B illness, and the Agency acknowledges that it results in a low estimate of QALYs saved from avoided Type B illnesses.

Estimating Time-in-State

The time in state, or duration, of these acute illnesses is presented in the GWR EA (see Chapter 5 and Appendix A) and is used in this CEA to determine an average QALY decrement that is weighted by the percent occurrence of cases in each category (by age and severity, presented in Exhibits H.5a-b) and their respective duration estimates (Exhibit H.6).

The next section of this Appendix applies the rotavirus illness QALY decrement to all estimated cases of Type A and B illnesses (morbidity) that the GWR is expected to prevent.

Exhibit H.5a Duration Per Average Case of Type A Illness

Age	Duration (days)	% Cases by Age	Weighted Duration (days)	% Cases in Healthy and Immuno-compromised Populations	Final Weighted Average Duration[1] (days)
	A	B	C = A * B	D	E = C * D
Healthy Population					
< 2 yrs[2]	3.0	4%	0.13		
2 - < 5 yrs[2]	3.0	2%	0.07		
5 to < 16 yrs	3.0	11%	0.34		
? 16 yrs	2.5	82%	2.05		
Total		100%	2.59	99.7%	2.58
Immunocompromised Population					
< 2 yrs	5.0	4%	0.21		
2 to < 5 yrs	3.0	2%	0.07		
5 to < 16 yrs	3.0	11%	0.34		
? 16 yrs	2.5	82%	2.05		
Total		100%	2.67	0.3%	0.01
Total					**2.59**

Notes: In the GWR EA, rotavirus is used as a representative illness for calculating cases of Type A illnesses to be avoided by rule implementation. Days of illness are the days ill due to a case of rotavirus infection.

[1] A weighted average duration for all Type A illness cases to be avoided by the GWR is derived by multiplying the duration of symptoms in each age group, for both the Healthy and Immunocompromised populations, by the corresponding percentage of cases in each age group; the result is multiplied by the percentage of healthy vs. immunocompromised patients, which is estimated in the primary analysis of the GWR EA to be 98.4% and 1.6%, respectively. The results for the two populations are summed to yield the duration, in days, for a weighted average case.

[2] Duration of symptoms for ages <5 yrs in the healthy population are a weighted average (taken from Exhibit A.1) between the inpatient (1.4% of cases) and the group of No Medical Care/Outpatient (100% - 1.4% = 98.6% of cases) =(.014 * 5 days) + (.986 * 3 days) = 3.03 days.

Sources:	Column A - Appendix A, Exhibit A.1
	Column B - GWR model output
	Column D - Exhibit 5.4

Exhibit H.5b Duration Per Average Case of Type B Illness

Age	Duration (days)	% Cases by Age	Weighted Duration (days)	% Cases by Severity Level	Final Weighted Average Duration[1] (days)
	A	B	C = A * B	D	E = C * D
Cases Not Requiring Medical Care					
< 1 yr	3.0	0.1%	0.00		
1 to < 5 yrs	3.0	7%	0.22		
5 to < 16 yrs	3.0	14%	0.42		
? 16 yrs	3.0	78%	2.35		
Total		100%	3.00	93%	2.79
Cases Requiring Doctor Visit					
< 1 yr	5.0	0.1%	0.01		
1 to < 5 yrs	5.0	7%	0.37		
5 to < 16 yrs	5.0	14%	0.70		
? 16 yrs	5.0	78%	3.91		
Total		100%	5.00	6%	0.3
Cases Requiring Hospitalization					
< 1 yr	7.0	0.1%	0.01		
1 to < 5 yrs	7.0	7%	0.52		
5 to < 16 yrs	7.0	14%	0.99		
? 16 yrs	7.0	78%	5.48		
Total		100%	7.00	1%	0.07
Total Weighted Duration[1]					**3.16**

Notes: In the GWR EA, rotavirus is used as a representative illness for calculating cases of Type A illnesses to be avoided by rule implementation. Days of illness are the days ill due to a case of rotavirus infection.

[1] A weighted average duration for all Type B illness cases to be avoided by the GWR is derived by multiplying the duration of symptoms in each age group, for each severity level (No Medical Care, Doctor, and Hospitalization), by the corresponding percentage of cases in each age group; the result is multiplied by the percentage of patients in each severity level, which is estimated to be 93%, 6%, and 1%, respectively. The results for the three patient populations are summed to yield the duration, in days, for a weighted average case.

Sources:	Column A - Appendix A, Exhibit A.1
	Column B - GWR model output
	Column D - Exhibit 5.4

Exhibit H.6 Average QALY Loss Per Case of Type A and Type B Illness

Type of Illness	Type of Decrement Estimate[1]	QALYs Annual Decrement[2] (per year)	Weighted Avg Duration of Illness (days)	Weighted Avg QALYs Decrement (life years)
		A	B	C = A * B/365
Type A	Low	0.19	2.59	0.0013
	High	0.53	2.59	0.0038
Type B	Low	0.19	3.16	0.0016
	High	0.53	3.16	0.0046

[1] A low and high estimate of QALYs is calculated based on the range of decrements for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). Using the range provides a sensitivity analysis that allows for cases that cover a range in severity.

[2] In the GWR EA, rotavirus is used as a representative illness and indicator for Type A viruses, and echovirus for the Type B viruses. In this CEA, a quality of life decrement for symptoms of rotavirus illness is used to calculate the QALYs saved for avoided illnesses of both Type A and Type B based on best available information. The rotavirus decrement serves as a low estimate for Type B illnesses because illnesses of Type B would generally be more severe and therefore have a larger QALY decrement than those of Type A.

Source: Column A - QALY decrement: Cook et al. (1994)
Column B - Exhibit H.5a-b

H.2.1.1.2 Applying the QALY decrement to cases of morbidity

An estimate of the number of Type A and Type B illness cases that promulgation of the GWR is expected to avoid is developed in the EA of this rule. Rotavirus cases are used as a proxy for Type A illnesses avoided, and echovirus cases for Type B. EPA realizes that the benefit of avoiding these cases represents only a portion of the benefits of implementing the GWR (see Footnote 4 of this Appendix and Ch. 5, Section 5.4, of the primary analysis).

The number of cases avoided as presented in this Appendix is less than the number shown in the primary EA because EPA discounts the cases in this Appendix (which are used to calculate the MILYs that comprise the denominator in the CEA ratio).

The current consensus in health economics is that discounting should be done to both the numerator of a CEA ratio (usually in dollars) and the denominator (usually in terms of an effect such as number of cases avoided). OMB agrees with this position, and presents the following discussion in Circular A-4:

> When future benefits or costs are health-related, some have questioned whether discounting is appropriate, since the rationale for discounting money may not appear to apply to health. It is true that lives saved today cannot be invested in a bank to save more lives in the future. But the resources that would have been used to save those lives can be invested to earn a higher payoff in future lives saved. People have been observed to prefer health gains that occur immediately to identical health gains that occur in the future. Also, if future health gains are not discounted while future costs are, then the

> following perverse result occurs: an attractive investment today in future health improvement can always be made more attractive by delaying the investment. For such reasons, there is a professional consensus that future health effects, including both benefits and costs, should be discounted at the same rate. This consensus applies to both BCA and CEA. (p. 34)

Furthermore, because some of the implementation and monitoring costs occur before any health benefits are realized, the overall CEA results are sensitive to the discount rate used. EPA and OMB guidance documents suggest discount rates of 3 and 7 percent. A 3 percent discount rate reflects the accepted "social rate of time preference" and is consistent with recommendations of both the U.S. Public Health Service Panel on Cost Effectiveness in Health and Medicine and the NAS panel on CEA (Gold et al., 1996). To examine the impact of the choice of discount rate, EPA also calculates all values of this CEA using a 7 percent rate, consistent with an "opportunity cost of capital" concept to reflect the time value of resources directed to meet regulatory requirements, as recommended by OMB guidance. Further discussion of this topic appears in Chapter 7 of Gold et al. (1996) and in Chapter 6 of the EPA Guidelines for Economic Analysis.

Finally, using the equations below, the annualized estimate of rotavirus illness cases avoided is multiplied by the QALY decrement per case to yield a total estimated number of QALYs saved (Exhibits H.7a-b). [6]

Low estimate: (0.0013 QALYs per case) X (annualized rotavirus illness cases)
High estimate: (0.0038 QALYs per case) X (annualized rotavirus illness cases)

The low and high estimates represent the range of severity of illness documented in the study by Cook et al., as described previously in *Literature Review Methodology* (Section H.2.1).

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[6] Note that EPA assumes that the morbidity effects associated with fatal and non-fatal cases are the same.

Exhibit H.7a QALYs Saved for Avoided Morbidity Related to Type A Viruses[1] (All Ages)

Rule Alternative	Annualized Cases Avoided		Morbidity-Related QALYs[2] (years)				Morbidity-Related QALYs for Cases Avoided	
	Non-Fatal	Fatal	Non-Fatal Cases		Fatal Cases			
			Low	High	Low	High	Low	High
	A	B	C=A*0.0013	D=A*0.0038	E=B*0.0013	F=B*0.0038	G = C + E	H = D + F
3% Discount Rate								
A1	6,194	0.0	8	23	0.0001	0.0002	8	23
A2	36,689	0.2	49	138	0.0003	0.0009	49	138
A3	39,931	0.3	54	150	0.0004	0.0010	54	150
A4	141,650	0.9	191	533	0.0013	0.0035	191	533
7% Discount Rate								
A1	5,151	0.0	7	19	0.0000	0.0001	7	19
A2	32,773	0.2	44	123	0.0003	0.0008	44	123
A3	35,754	0.2	48	135	0.0003	0.0009	48	135
A4	132,709	0.9	179	499	0.0012	0.0033	179	499

[1] In the GWR EA, rotavirus is used as a representative illness and indicator for the Type A viruses.

[2] A low and high estimate of QALYs is calculated based on the range of decrements for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). The decrements shown for low and high estimate here (.0013 and .0038) are multiplied by the duration of an average Type B illness.

Sources: Columns C - F: QALY decrement
Columns A and B: Ch. 5, Exhibit 5.16

Exhibit H.7b QALYs Saved for Avoided Morbidity Related to Type B Viruses[1] (All Ages)

Rule Alternative	Annualized Cases Avoided		Morbidity-Related QALYs[2] (years)				Morbidity-Related QALYs for Cases Avoided	
			Non-Fatal Cases		Fatal Cases			
	Non-Fatal	Fatal	Low	High	Low	High	Low	High
	A	B	C = A * 0.0016	D = A * 0.0046	E = B * 0.0016	F = B * 0.0046	G = C + E	H = D + F
3% Discount Rate								
A1	425	0.1	1	2	0.0001	0.0004	1	2
A2	2,259	0.4	4	10	0.0007	0.0021	4	10
A3	2,410	0.5	4	11	0.0008	0.0022	4	11
A4	8,111	1.6	13	37	0.0027	0.0075	13	37
7% Discount Rate								
A1	351	0.1	1	2	0.0001	0.0003	1	2
A2	2,021	0.4	3	9	0.0007	0.0018	3	9
A3	2,160	0.4	4	10	0.0007	0.0020	4	10
A4	7,599	1.5	12	35	0.0025	0.0070	13	35

[1] In the GWR EA, echovirus is used as a representative illness and indicator for the Type B viruses, and rotavirus for Type A. In this CEA, rotavirus is used as a lower bound estimate for Type B illnesses (the range of Low to High QALYs presented here is a lower bound on a range that would be expected with Type B illnesses) based on best available information.

[2] A low and high estimate of QALYs is calculated based on the range of decrements for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). The decrements shown for low and high estimate here (.0016 and .0046) are multiplied by the duration of an average Type B illness.

Sources: Columns C - F: QALY decrement
Columns A and B: Ch. 5, Exhibit 5.16

H.2.1.2 Life years saved from avoided cases of premature mortality

As shown in the previous section, the denominator of the CEA ratio includes QALYs saved (in the form of life year equivalents) from avoided morbidity in non-fatal cases of rotavirus illness. Additionally, it includes life years saved that are associated with the morbidity for avoided fatal cases. A different method applies for calculating life years saved from avoided premature mortality, as this section will show. This computation, which does not involve a QALY decrement, is simply the aggregate number of projected life years saved for people who would die prematurely from rotavirus illness without the regulation.

Using the quantity of fatal cases avoided by each multi-year age group as estimated by the GWR model, this analysis allocates those deaths evenly across the years within the age group using the following calculation.

$$\text{cases avoided}_n = (\text{cases avoided})_I \div (A_2 - A_1)$$

where n = year in age interval
I = age interval from A_1 to A_2
A_1 = Youngest age in age interval I
A_2 = Oldest age in age interval I

For example, 0.2 deaths were prevented for the age group 16 to 65 years (using cases annualized at a 3 percent discount rate); 0.2 deaths/(65 - 16) years = .004 deaths avoided per year in the 16 to 65 age group.

Next, the cases avoided for each year *y* are multiplied by the average life expectancy remaining for each single-year age group *n*. Last, total life years saved for each age *n* are summed to produce a total life years saved for the population. EPA presents these results in Exhibits H.8a-h for the Final GWR and each Alternative, and provides a summary of results in Exhibit H.9.

Exhibit H.8a Annualized Life-Years Saved for Avoided Premature Mortality, Type A Illness, Alternative 1 *(Continued on next page)*

		3% Discount Rate		7% Discount Rate	
Age Group	Life Expectancy (years)	Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
Under 1 year	76.9	0.001	0.067	0.001	0.056
1 year	76.4	0.001	0.067	0.000	0.000
2 years	75.4	0.000	0.024	0.000	0.020
3 years	74.5	0.000	0.023	0.000	0.019
4 years	73.5	0.000	0.023	0.000	0.019
5 years	72.5	0.000	0.031	0.000	0.019
6 years	71.5	0.000	0.030	0.000	0.019
7 years	70.5	0.000	0.030	0.000	0.018
8 years	69.5	0.000	0.030	0.000	0.018
9 years	68.6	0.000	0.029	0.000	0.018
10 years	67.6	0.000	0.029	0.000	0.018
11 years	66.6	0.000	0.028	0.000	0.017
12 years	65.6	0.000	0.028	0.000	0.017
13 years	64.6	0.000	0.027	0.000	0.017
14 years	63.6	0.000	0.027	0.000	0.017
15 years	62.6	0.000	0.027	0.000	0.016
16 years	61.7	0.001	0.036	0.000	0.030
17 years	60.7	0.001	0.035	0.000	0.029
18 years	59.7	0.001	0.035	0.000	0.029
19 years	58.8	0.001	0.034	0.000	0.028
20 years	57.8	0.001	0.033	0.000	0.028
21 years	56.9	0.001	0.033	0.000	0.027
22 years	55.9	0.001	0.032	0.000	0.027
23 years	55.0	0.001	0.032	0.000	0.026
24 years	54.0	0.001	0.031	0.000	0.026
25 years	53.1	0.001	0.031	0.000	0.026
26 years	52.1	0.001	0.030	0.000	0.025
27 years	51.2	0.001	0.030	0.000	0.025
28 years	50.2	0.001	0.029	0.000	0.024
29 years	49.3	0.001	0.029	0.000	0.024
30 years	48.3	0.001	0.028	0.000	0.023
31 years	47.4	0.001	0.027	0.000	0.023
32 years	46.5	0.001	0.027	0.000	0.022
33 years	45.5	0.001	0.026	0.000	0.022
34 years	44.6	0.001	0.026	0.000	0.021
35 years	43.6	0.001	0.025	0.000	0.021
36 years	42.7	0.001	0.025	0.000	0.021
37 years	41.7	0.001	0.024	0.000	0.020
38 years	40.8	0.001	0.024	0.000	0.020
39 years	39.9	0.001	0.023	0.000	0.019
40 years	38.9	0.001	0.023	0.000	0.019
41 years	38.0	0.001	0.022	0.000	0.018
42 years	37.1	0.001	0.021	0.000	0.018
43 years	36.2	0.001	0.021	0.000	0.017
44 years	35.3	0.001	0.020	0.000	0.017
45 years	34.4	0.001	0.020	0.000	0.017
46 years	33.5	0.001	0.019	0.000	0.016
47 years	32.6	0.001	0.019	0.000	0.016
48 years	31.7	0.001	0.018	0.000	0.015
49 years	30.8	0.001	0.018	0.000	0.015
50 years	30.0	0.001	0.017	0.000	0.014

Exhibit H.8a Annualized Life-Years Saved from Avoided Premature Mortality, Type A Illness, Alternative 1 *(Continued)*

		3% Discount Rate		7% Discount Rate	
Age Group	Life Expectancy (years)	Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
51 years	29.1	0.001	0.017	0.000	0.014
52 years	28.2	0.001	0.016	0.000	0.014
53 years	27.4	0.001	0.016	0.000	0.013
54 years	26.5	0.001	0.015	0.000	0.013
55 years	25.7	0.001	0.015	0.000	0.012
56 years	24.8	0.001	0.014	0.000	0.012
57 years	24.0	0.001	0.014	0.000	0.012
58 years	23.2	0.001	0.013	0.000	0.011
59 years	22.4	0.001	0.013	0.000	0.011
60 years	21.6	0.001	0.013	0.000	0.010
61 years	20.9	0.001	0.012	0.000	0.010
62 years	20.1	0.001	0.012	0.000	0.010
63 years	19.3	0.001	0.011	0.000	0.009
64 years	18.6	0.001	0.011	0.000	0.009
65 years	17.9	0.000	0.003	0.000	0.002
66 years	17.2	0.000	0.003	0.000	0.002
67 years	16.4	0.000	0.003	0.000	0.002
68 years	15.8	0.000	0.002	0.000	0.002
69 years	15.1	0.000	0.002	0.000	0.002
70 years	14.4	0.000	0.002	0.000	0.002
71 years	13.8	0.000	0.002	0.000	0.002
72 years	13.1	0.000	0.002	0.000	0.002
73 years	12.5	0.000	0.002	0.000	0.002
74 years	11.9	0.000	0.002	0.000	0.002
75 years	11.3	0.000	0.002	0.000	0.001
76 years	10.7	0.000	0.002	0.000	0.001
77 years	10.2	0.000	0.002	0.000	0.001
78 years	9.6	0.000	0.001	0.000	0.001
79 years	9.1	0.000	0.001	0.000	0.001
80 years	8.6	0.000	0.001	0.000	0.001
81 years	8.1	0.000	0.001	0.000	0.001
82 years	7.6	0.000	0.001	0.000	0.001
83 years	7.2	0.000	0.001	0.000	0.001
84 years	6.7	0.000	0.001	0.000	0.001
85 years	6.3	0.000	0.001	0.000	0.001
86 years	6.0	0.000	0.001	0.000	0.001
87 years	5.6	0.000	0.001	0.000	0.001
88 years	5.3	0.000	0.001	0.000	0.001
89 years	5.0	0.000	0.001	0.000	0.001
90 years	4.7	0.000	0.001	0.000	0.001
91 years	4.4	0.000	0.001	0.000	0.001
92 years	4.1	0.000	0.001	0.000	0.001
93 years	3.9	0.000	0.001	0.000	0.000
94 years	3.7	0.000	0.001	0.000	0.000
95 years	3.5	0.000	0.001	0.000	0.000
96 years	3.3	0.000	0.001	0.000	0.000
97 years	3.1	0.000	0.000	0.000	0.000
98 years	2.9	0.000	0.000	0.000	0.000
99 years	2.7	0.000	0.000	0.000	0.000
>=100 years	2.6	0.000	0.000	0.000	0.000
Total		0.041	1.7	0.033	1.3

Notes: Columns B and D: The GWR model generates the allocation of deaths by age interval: <2 yrs (4%), 2 - 4 yrs (2%), 5 - 15 (11%), 16 - 64 (69%), and 65 - 100 (14%). For each age, the following is calculated: (annualized deaths avoided) x (% deaths in age interval) / (no. years in interval).

Sources: Column A: National Vital Statistics Reports, Vol. 51, No. 3, December 29, 2002, "Life table for the total population: United States, 2000". Columns B and D: GWR model output.

Exhibit H.8b Annualized Life-Years Saved for Avoided Premature Mortality, Type A Illness, Alternative 2 *(Continued on next page)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
Under 1 year	76.9	0.005	0.402	0.005	0.359
1 year	76.4	0.005	0.399	0.005	0.357
2 years	75.4	0.002	0.141	0.002	0.126
3 years	74.5	0.002	0.139	0.002	0.124
4 years	73.5	0.002	0.137	0.002	0.123
5 years	72.5	0.003	0.184	0.002	0.164
6 years	71.5	0.003	0.181	0.002	0.162
7 years	70.5	0.003	0.179	0.002	0.160
8 years	69.5	0.003	0.176	0.002	0.157
9 years	68.6	0.003	0.174	0.002	0.155
10 years	67.6	0.003	0.171	0.002	0.153
11 years	66.6	0.003	0.169	0.002	0.151
12 years	65.6	0.003	0.166	0.002	0.149
13 years	64.6	0.003	0.164	0.002	0.146
14 years	63.6	0.003	0.161	0.002	0.144
15 years	62.6	0.003	0.159	0.002	0.142
16 years	61.7	0.003	0.211	0.003	0.188
17 years	60.7	0.003	0.207	0.003	0.185
18 years	59.7	0.003	0.204	0.003	0.182
19 years	58.8	0.003	0.201	0.003	0.179
20 years	57.8	0.003	0.198	0.003	0.176
21 years	56.9	0.003	0.194	0.003	0.174
22 years	55.9	0.003	0.191	0.003	0.171
23 years	55.0	0.003	0.188	0.003	0.168
24 years	54.0	0.003	0.185	0.003	0.165
25 years	53.1	0.003	0.181	0.003	0.162
26 years	52.1	0.003	0.178	0.003	0.159
27 years	51.2	0.003	0.175	0.003	0.156
28 years	50.2	0.003	0.172	0.003	0.153
29 years	49.3	0.003	0.168	0.003	0.150
30 years	48.3	0.003	0.165	0.003	0.147
31 years	47.4	0.003	0.162	0.003	0.145
32 years	46.5	0.003	0.159	0.003	0.142
33 years	45.5	0.003	0.155	0.003	0.139
34 years	44.6	0.003	0.152	0.003	0.136
35 years	43.6	0.003	0.149	0.003	0.133
36 years	42.7	0.003	0.146	0.003	0.130
37 years	41.7	0.003	0.143	0.003	0.127
38 years	40.8	0.003	0.139	0.003	0.125
39 years	39.9	0.003	0.136	0.003	0.122
40 years	38.9	0.003	0.133	0.003	0.119
41 years	38.0	0.003	0.130	0.003	0.116
42 years	37.1	0.003	0.127	0.003	0.113
43 years	36.2	0.003	0.124	0.003	0.111
44 years	35.3	0.003	0.121	0.003	0.108
45 years	34.4	0.003	0.118	0.003	0.105
46 years	33.5	0.003	0.114	0.003	0.102
47 years	32.6	0.003	0.111	0.003	0.100
48 years	31.7	0.003	0.108	0.003	0.097
49 years	30.8	0.003	0.105	0.003	0.094
50 years	30.0	0.003	0.103	0.003	0.092

Exhibit H.8b Annualized Life-Years Saved for Avoided Premature Mortality, Type A Illness, Alternative 2 *(Continued)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
51 years	29.1	0.003	0.099	0.003	0.089
52 years	28.2	0.003	0.096	0.003	0.086
53 years	27.4	0.003	0.094	0.003	0.084
54 years	26.5	0.003	0.091	0.003	0.081
55 years	25.7	0.003	0.088	0.003	0.078
56 years	24.8	0.003	0.085	0.003	0.076
57 years	24.0	0.003	0.082	0.003	0.073
58 years	23.2	0.003	0.079	0.003	0.071
59 years	22.4	0.003	0.077	0.003	0.068
60 years	21.6	0.003	0.074	0.003	0.066
61 years	20.9	0.003	0.071	0.003	0.064
62 years	20.1	0.003	0.069	0.003	0.061
63 years	19.3	0.003	0.066	0.003	0.059
64 years	18.6	0.003	0.064	0.003	0.057
65 years	17.9	0.001	0.016	0.001	0.014
66 years	17.2	0.001	0.016	0.001	0.014
67 years	16.4	0.001	0.015	0.001	0.013
68 years	15.8	0.001	0.014	0.001	0.013
69 years	15.1	0.001	0.014	0.001	0.012
70 years	14.4	0.001	0.013	0.001	0.012
71 years	13.8	0.001	0.012	0.001	0.011
72 years	13.1	0.001	0.012	0.001	0.011
73 years	12.5	0.001	0.011	0.001	0.010
74 years	11.9	0.001	0.011	0.001	0.010
75 years	11.3	0.001	0.010	0.001	0.009
76 years	10.7	0.001	0.010	0.001	0.009
77 years	10.2	0.001	0.009	0.001	0.008
78 years	9.6	0.001	0.009	0.001	0.008
79 years	9.1	0.001	0.008	0.001	0.007
80 years	8.6	0.001	0.008	0.001	0.007
81 years	8.1	0.001	0.007	0.001	0.007
82 years	7.6	0.001	0.007	0.001	0.006
83 years	7.2	0.001	0.007	0.001	0.006
84 years	6.7	0.001	0.006	0.001	0.005
85 years	6.3	0.001	0.006	0.001	0.005
86 years	6.0	0.001	0.005	0.001	0.005
87 years	5.6	0.001	0.005	0.001	0.005
88 years	5.3	0.001	0.005	0.001	0.004
89 years	5.0	0.001	0.005	0.001	0.004
90 years	4.7	0.001	0.004	0.001	0.004
91 years	4.4	0.001	0.004	0.001	0.004
92 years	4.1	0.001	0.004	0.001	0.003
93 years	3.9	0.001	0.004	0.001	0.003
94 years	3.7	0.001	0.003	0.001	0.003
95 years	3.5	0.001	0.003	0.001	0.003
96 years	3.3	0.001	0.003	0.001	0.003
97 years	3.1	0.001	0.003	0.001	0.003
98 years	2.9	0.001	0.003	0.001	0.002
99 years	2.7	0.001	0.002	0.001	0.002
>=100 years	2.6	0.001	0.002	0.001	0.002
Total		0.244	10.0	0.218	8.9

Notes: Columns B and D: The GWR model generates the allocation of deaths by age interval: <2 yrs (4%), 2 - 4 yrs (2%), 5 - 15 (11%), 16 - 64 (69%), and 65 - 100 (14%). For each age, the following is calculated: (annualized deaths avoided) x (% deaths in age interval) / (no. years in interval).

Sources: Column A: National Vital Statistics Reports, Vol. 51, No. 3, December 29, 2002, "Life table for the total population: United States, 2000". Columns B and D: GWR model output.

Exhibit H.8c Annualized Life-Years Saved for Avoided Premature Mortality, Type A Illness, Alternative 3 *(Continued on next page)*

		3% Discount Rate		7% Discount Rate	
Age Group	Life Expectancy (years)	Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
Under 1 year	76.9	0.006	0.437	0.005	0.391
1 year	76.4	0.006	0.434	0.005	0.388
2 years	75.4	0.002	0.153	0.002	0.137
3 years	74.5	0.002	0.151	0.002	0.136
4 years	73.5	0.002	0.149	0.002	0.134
5 years	72.5	0.003	0.200	0.002	0.179
6 years	71.5	0.003	0.197	0.002	0.176
7 years	70.5	0.003	0.194	0.002	0.174
8 years	69.5	0.003	0.191	0.002	0.171
9 years	68.6	0.003	0.189	0.002	0.169
10 years	67.6	0.003	0.186	0.002	0.167
11 years	66.6	0.003	0.183	0.002	0.164
12 years	65.6	0.003	0.181	0.002	0.162
13 years	64.6	0.003	0.178	0.002	0.159
14 years	63.6	0.003	0.175	0.002	0.157
15 years	62.6	0.003	0.172	0.002	0.154
16 years	61.7	0.004	0.230	0.003	0.206
17 years	60.7	0.004	0.226	0.003	0.202
18 years	59.7	0.004	0.222	0.003	0.199
19 years	58.8	0.004	0.219	0.003	0.196
20 years	57.8	0.004	0.215	0.003	0.193
21 years	56.9	0.004	0.212	0.003	0.190
22 years	55.9	0.004	0.208	0.003	0.186
23 years	55.0	0.004	0.205	0.003	0.183
24 years	54.0	0.004	0.201	0.003	0.180
25 years	53.1	0.004	0.198	0.003	0.177
26 years	52.1	0.004	0.194	0.003	0.174
27 years	51.2	0.004	0.191	0.003	0.171
28 years	50.2	0.004	0.187	0.003	0.167
29 years	49.3	0.004	0.183	0.003	0.164
30 years	48.3	0.004	0.180	0.003	0.161
31 years	47.4	0.004	0.176	0.003	0.158
32 years	46.5	0.004	0.173	0.003	0.155
33 years	45.5	0.004	0.169	0.003	0.152
34 years	44.6	0.004	0.166	0.003	0.149
35 years	43.6	0.004	0.162	0.003	0.145
36 years	42.7	0.004	0.159	0.003	0.142
37 years	41.7	0.004	0.155	0.003	0.139
38 years	40.8	0.004	0.152	0.003	0.136
39 years	39.9	0.004	0.148	0.003	0.133
40 years	38.9	0.004	0.145	0.003	0.130
41 years	38.0	0.004	0.141	0.003	0.127
42 years	37.1	0.004	0.138	0.003	0.124
43 years	36.2	0.004	0.135	0.003	0.121
44 years	35.3	0.004	0.131	0.003	0.118
45 years	34.4	0.004	0.128	0.003	0.115
46 years	33.5	0.004	0.125	0.003	0.112
47 years	32.6	0.004	0.121	0.003	0.109
48 years	31.7	0.004	0.118	0.003	0.106
49 years	30.8	0.004	0.115	0.003	0.103
50 years	30.0	0.004	0.112	0.003	0.100

Exhibit H.8c Annualized Life-Years Saved for Avoided Premature Mortality, Type A Illness, Alternative 3 *(Continued)*

		3% Discount Rate		7% Discount Rate	
Age Group	Life Expectancy (years)	Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
51 years	29.1	0.004	0.108	0.003	0.097
52 years	28.2	0.004	0.105	0.003	0.094
53 years	27.4	0.004	0.102	0.003	0.091
54 years	26.5	0.004	0.099	0.003	0.088
55 years	25.7	0.004	0.096	0.003	0.086
56 years	24.8	0.004	0.092	0.003	0.083
57 years	24.0	0.004	0.089	0.003	0.080
58 years	23.2	0.004	0.086	0.003	0.077
59 years	22.4	0.004	0.083	0.003	0.075
60 years	21.6	0.004	0.080	0.003	0.072
61 years	20.9	0.004	0.078	0.003	0.070
62 years	20.1	0.004	0.075	0.003	0.067
63 years	19.3	0.004	0.072	0.003	0.064
64 years	18.6	0.004	0.069	0.003	0.062
65 years	17.9	0.001	0.018	0.001	0.016
66 years	17.2	0.001	0.017	0.001	0.015
67 years	16.4	0.001	0.016	0.001	0.014
68 years	15.8	0.001	0.016	0.001	0.014
69 years	15.1	0.001	0.015	0.001	0.013
70 years	14.4	0.001	0.014	0.001	0.013
71 years	13.8	0.001	0.014	0.001	0.012
72 years	13.1	0.001	0.013	0.001	0.012
73 years	12.5	0.001	0.012	0.001	0.011
74 years	11.9	0.001	0.012	0.001	0.011
75 years	11.3	0.001	0.011	0.001	0.010
76 years	10.7	0.001	0.011	0.001	0.009
77 years	10.2	0.001	0.010	0.001	0.009
78 years	9.6	0.001	0.009	0.001	0.008
79 years	9.1	0.001	0.009	0.001	0.008
80 years	8.6	0.001	0.008	0.001	0.008
81 years	8.1	0.001	0.008	0.001	0.007
82 years	7.6	0.001	0.007	0.001	0.007
83 years	7.2	0.001	0.007	0.001	0.006
84 years	6.7	0.001	0.007	0.001	0.006
85 years	6.3	0.001	0.006	0.001	0.006
86 years	6.0	0.001	0.006	0.001	0.005
87 years	5.6	0.001	0.006	0.001	0.005
88 years	5.3	0.001	0.005	0.001	0.005
89 years	5.0	0.001	0.005	0.001	0.004
90 years	4.7	0.001	0.005	0.001	0.004
91 years	4.4	0.001	0.004	0.001	0.004
92 years	4.1	0.001	0.004	0.001	0.004
93 years	3.9	0.001	0.004	0.001	0.003
94 years	3.7	0.001	0.004	0.001	0.003
95 years	3.5	0.001	0.003	0.001	0.003
96 years	3.3	0.001	0.003	0.001	0.003
97 years	3.1	0.001	0.003	0.001	0.003
98 years	2.9	0.001	0.003	0.001	0.003
99 years	2.7	0.001	0.003	0.001	0.002
>=100 years	2.6	0.001	0.003	0.001	0.002
Total		0.27	10.8	0.24	9.7

Notes: Columns B and D: The GWR model generates the allocation of deaths by age interval: <2 yrs (4%), 2 - 4 yrs (2%), 5 - 15 (11%), 16 - 64 (69%), and 65 - 100 (14%). For each age, the following is calculated: (annualized deaths avoided) x (% deaths in age interval) / (no. years in interval).

Sources: Column A: National Vital Statistics Reports, Vol. 51, No. 3, December 29, 2002, "Life table for the total population: United States, 2000". Columns B and D: GWR model output.

Exhibit H.8d Annualized Life-Years Saved for Avoided Premature Mortality, Type A Illness, Alternative 4 *(Continued on next page)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
Under 1 year	76.9	0.020	1.543	0.019	1.446
1 year	76.4	0.020	1.533	0.019	1.436
2 years	75.4	0.007	0.540	0.007	0.506
3 years	74.5	0.007	0.533	0.007	0.500
4 years	73.5	0.007	0.526	0.007	0.493
5 years	72.5	0.010	0.703	0.009	0.659
6 years	71.5	0.010	0.694	0.009	0.650
7 years	70.5	0.010	0.684	0.009	0.641
8 years	69.5	0.010	0.674	0.009	0.632
9 years	68.6	0.010	0.665	0.009	0.623
10 years	67.6	0.010	0.656	0.009	0.614
11 years	66.6	0.010	0.646	0.009	0.605
12 years	65.6	0.010	0.636	0.009	0.596
13 years	64.6	0.010	0.627	0.009	0.587
14 years	63.6	0.010	0.617	0.009	0.578
15 years	62.6	0.010	0.607	0.009	0.569
16 years	61.7	0.013	0.816	0.012	0.764
17 years	60.7	0.013	0.802	0.012	0.752
18 years	59.7	0.013	0.789	0.012	0.739
19 years	58.8	0.013	0.777	0.012	0.728
20 years	57.8	0.013	0.764	0.012	0.716
21 years	56.9	0.013	0.752	0.012	0.705
22 years	55.9	0.013	0.739	0.012	0.692
23 years	55.0	0.013	0.727	0.012	0.681
24 years	54.0	0.013	0.714	0.012	0.669
25 years	53.1	0.013	0.702	0.012	0.658
26 years	52.1	0.013	0.689	0.012	0.645
27 years	51.2	0.013	0.677	0.012	0.634
28 years	50.2	0.013	0.664	0.012	0.622
29 years	49.3	0.013	0.652	0.012	0.611
30 years	48.3	0.013	0.638	0.012	0.598
31 years	47.4	0.013	0.627	0.012	0.587
32 years	46.5	0.013	0.615	0.012	0.576
33 years	45.5	0.013	0.601	0.012	0.563
34 years	44.6	0.013	0.590	0.012	0.552
35 years	43.6	0.013	0.576	0.012	0.540
36 years	42.7	0.013	0.564	0.012	0.529
37 years	41.7	0.013	0.551	0.012	0.516
38 years	40.8	0.013	0.539	0.012	0.505
39 years	39.9	0.013	0.527	0.012	0.494
40 years	38.9	0.013	0.514	0.012	0.482
41 years	38.0	0.013	0.502	0.012	0.471
42 years	37.1	0.013	0.490	0.012	0.459
43 years	36.2	0.013	0.478	0.012	0.448
44 years	35.3	0.013	0.467	0.012	0.437
45 years	34.4	0.013	0.455	0.012	0.426
46 years	33.5	0.013	0.443	0.012	0.415
47 years	32.6	0.013	0.431	0.012	0.404
48 years	31.7	0.013	0.419	0.012	0.393
49 years	30.8	0.013	0.407	0.012	0.381
50 years	30.0	0.013	0.397	0.012	0.372

Exhibit H.8d Annualized Life-Years Saved for Avoided Premature Mortality, Type A Illness, Alternative 4, *(Continued)*

		3% Discount Rate		7% Discount Rate	
Age Group	Life Expectancy (years)	Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
51 years	29.1	0.013	0.385	0.012	0.360
52 years	28.2	0.013	0.373	0.012	0.349
53 years	27.4	0.013	0.362	0.012	0.339
54 years	26.5	0.013	0.350	0.012	0.328
55 years	25.7	0.013	0.340	0.012	0.318
56 years	24.8	0.013	0.328	0.012	0.307
57 years	24.0	0.013	0.317	0.012	0.297
58 years	23.2	0.013	0.307	0.012	0.287
59 years	22.4	0.013	0.296	0.012	0.277
60 years	21.6	0.013	0.286	0.012	0.267
61 years	20.9	0.013	0.276	0.012	0.259
62 years	20.1	0.013	0.266	0.012	0.249
63 years	19.3	0.013	0.255	0.012	0.239
64 years	18.6	0.013	0.246	0.012	0.230
65 years	17.9	0.004	0.063	0.003	0.059
66 years	17.2	0.004	0.060	0.003	0.056
67 years	16.4	0.004	0.057	0.003	0.054
68 years	15.8	0.004	0.055	0.003	0.052
69 years	15.1	0.004	0.053	0.003	0.050
70 years	14.4	0.004	0.050	0.003	0.047
71 years	13.8	0.004	0.048	0.003	0.045
72 years	13.1	0.004	0.046	0.003	0.043
73 years	12.5	0.004	0.044	0.003	0.041
74 years	11.9	0.004	0.042	0.003	0.039
75 years	11.3	0.004	0.040	0.003	0.037
76 years	10.7	0.004	0.037	0.003	0.035
77 years	10.2	0.004	0.036	0.003	0.033
78 years	9.6	0.004	0.034	0.003	0.031
79 years	9.1	0.004	0.032	0.003	0.030
80 years	8.6	0.004	0.030	0.003	0.028
81 years	8.1	0.004	0.028	0.003	0.027
82 years	7.6	0.004	0.027	0.003	0.025
83 years	7.2	0.004	0.025	0.003	0.024
84 years	6.7	0.004	0.023	0.003	0.022
85 years	6.3	0.004	0.022	0.003	0.021
86 years	6.0	0.004	0.021	0.003	0.020
87 years	5.6	0.004	0.020	0.003	0.018
88 years	5.3	0.004	0.019	0.003	0.017
89 years	5.0	0.004	0.018	0.003	0.016
90 years	4.7	0.004	0.016	0.003	0.015
91 years	4.4	0.004	0.015	0.003	0.014
92 years	4.1	0.004	0.014	0.003	0.013
93 years	3.9	0.004	0.014	0.003	0.013
94 years	3.7	0.004	0.013	0.003	0.012
95 years	3.5	0.004	0.012	0.003	0.011
96 years	3.3	0.004	0.012	0.003	0.011
97 years	3.1	0.004	0.011	0.003	0.010
98 years	2.9	0.004	0.010	0.003	0.010
99 years	2.7	0.004	0.009	0.003	0.009
>=100 years	2.6	0.004	0.009	0.003	0.009
Total		0.942	38.4	0.883	36.0

Notes: Columns B and D: The GWR model generates the allocation of deaths by age interval: <2 yrs (4%), 2 - 4 yrs (2%), 5 - 15 (11%), 16 - 64 (69%), and 65 - 100 (14%). For each age, the following is calculated: (annualized deaths avoided) x (% deaths in age interval) / (no. years in interval).

Sources: Column A: National Vital Statistics Reports, Vol. 51, No. 3, December 29, 2002, "Life table for the total population: United States, 2000". Columns B and D: GWR model output.

Exhibit H.8e Annualized Life-Years Saved for Avoided Premature Mortality, Type B Illness, Alternative 1 *(Continued on next page)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
Under 1 year	76.9	0.002	0.137	0.001	0.113
1 year	76.4	0.002	0.136	0.000	0.000
2 years	75.4	0.001	0.048	0.001	0.040
3 years	74.5	0.001	0.048	0.001	0.039
4 years	73.5	0.001	0.047	0.001	0.039
5 years	72.5	0.001	0.063	0.001	0.038
6 years	71.5	0.001	0.062	0.001	0.038
7 years	70.5	0.001	0.061	0.001	0.037
8 years	69.5	0.001	0.061	0.001	0.037
9 years	68.6	0.001	0.060	0.001	0.036
10 years	67.6	0.001	0.059	0.001	0.036
11 years	66.6	0.001	0.058	0.001	0.035
12 years	65.6	0.001	0.057	0.001	0.035
13 years	64.6	0.001	0.056	0.001	0.034
14 years	63.6	0.001	0.055	0.001	0.034
15 years	62.6	0.001	0.055	0.001	0.033
16 years	61.7	0.001	0.073	0.001	0.060
17 years	60.7	0.001	0.072	0.001	0.059
18 years	59.7	0.001	0.071	0.001	0.058
19 years	58.8	0.001	0.070	0.001	0.058
20 years	57.8	0.001	0.069	0.001	0.057
21 years	56.9	0.001	0.067	0.001	0.056
22 years	55.9	0.001	0.066	0.001	0.055
23 years	55.0	0.001	0.065	0.001	0.054
24 years	54.0	0.001	0.064	0.001	0.053
25 years	53.1	0.001	0.063	0.001	0.052
26 years	52.1	0.001	0.062	0.001	0.051
27 years	51.2	0.001	0.061	0.001	0.050
28 years	50.2	0.001	0.060	0.001	0.049
29 years	49.3	0.001	0.058	0.001	0.048
30 years	48.3	0.001	0.057	0.001	0.047
31 years	47.4	0.001	0.056	0.001	0.046
32 years	46.5	0.001	0.055	0.001	0.046
33 years	45.5	0.001	0.054	0.001	0.045
34 years	44.6	0.001	0.053	0.001	0.044
35 years	43.6	0.001	0.052	0.001	0.043
36 years	42.7	0.001	0.051	0.001	0.042
37 years	41.7	0.001	0.049	0.001	0.041
38 years	40.8	0.001	0.048	0.001	0.040
39 years	39.9	0.001	0.047	0.001	0.039
40 years	38.9	0.001	0.046	0.001	0.038
41 years	38.0	0.001	0.045	0.001	0.037
42 years	37.1	0.001	0.044	0.001	0.036
43 years	36.2	0.001	0.043	0.001	0.035
44 years	35.3	0.001	0.042	0.001	0.035
45 years	34.4	0.001	0.041	0.001	0.034
46 years	33.5	0.001	0.040	0.001	0.033
47 years	32.6	0.001	0.039	0.001	0.032
48 years	31.7	0.001	0.038	0.001	0.031
49 years	30.8	0.001	0.037	0.001	0.030
50 years	30.0	0.001	0.036	0.001	0.029

Exhibit H.8e Annualized Life-Years Saved for Avoided Premature Mortality, Type B Illness, Alternative 1 *(Continued)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
51 years	29.1	0.001	0.035	0.001	0.029
52 years	28.2	0.001	0.033	0.001	0.028
53 years	27.4	0.001	0.032	0.001	0.027
54 years	26.5	0.001	0.031	0.001	0.026
55 years	25.7	0.001	0.030	0.001	0.025
56 years	24.8	0.001	0.029	0.001	0.024
57 years	24.0	0.001	0.028	0.001	0.024
58 years	23.2	0.001	0.028	0.001	0.023
59 years	22.4	0.001	0.027	0.001	0.022
60 years	21.6	0.001	0.026	0.001	0.021
61 years	20.9	0.001	0.025	0.001	0.020
62 years	20.1	0.001	0.024	0.001	0.020
63 years	19.3	0.001	0.023	0.001	0.019
64 years	18.6	0.001	0.022	0.001	0.018
65 years	17.9	0.000	0.006	0.000	0.005
66 years	17.2	0.000	0.005	0.000	0.004
67 years	16.4	0.000	0.005	0.000	0.004
68 years	15.8	0.000	0.005	0.000	0.004
69 years	15.1	0.000	0.005	0.000	0.004
70 years	14.4	0.000	0.005	0.000	0.004
71 years	13.8	0.000	0.004	0.000	0.004
72 years	13.1	0.000	0.004	0.000	0.003
73 years	12.5	0.000	0.004	0.000	0.003
74 years	11.9	0.000	0.004	0.000	0.003
75 years	11.3	0.000	0.004	0.000	0.003
76 years	10.7	0.000	0.003	0.000	0.003
77 years	10.2	0.000	0.003	0.000	0.003
78 years	9.6	0.000	0.003	0.000	0.002
79 years	9.1	0.000	0.003	0.000	0.002
80 years	8.6	0.000	0.003	0.000	0.002
81 years	8.1	0.000	0.003	0.000	0.002
82 years	7.6	0.000	0.002	0.000	0.002
83 years	7.2	0.000	0.002	0.000	0.002
84 years	6.7	0.000	0.002	0.000	0.002
85 years	6.3	0.000	0.002	0.000	0.002
86 years	6.0	0.000	0.002	0.000	0.002
87 years	5.6	0.000	0.002	0.000	0.001
88 years	5.3	0.000	0.002	0.000	0.001
89 years	5.0	0.000	0.002	0.000	0.001
90 years	4.7	0.000	0.001	0.000	0.001
91 years	4.4	0.000	0.001	0.000	0.001
92 years	4.1	0.000	0.001	0.000	0.001
93 years	3.9	0.000	0.001	0.000	0.001
94 years	3.7	0.000	0.001	0.000	0.001
95 years	3.5	0.000	0.001	0.000	0.001
96 years	3.3	0.000	0.001	0.000	0.001
97 years	3.1	0.000	0.001	0.000	0.001
98 years	2.9	0.000	0.001	0.000	0.001
99 years	2.7	0.000	0.001	0.000	0.001
>=100 years	2.6	0.000	0.001	0.000	0.001
Total		0.084	3.4	0.066	2.6

Notes: Columns B and D: The GWR model generates the allocation of deaths by age interval: <2 yrs (4%), 2 - 4 yrs (2%), 5 - 15 (11%), 16 - 64 (69%), and 65 - 100 (14%). For each age, the following is calculated: (annualized deaths avoided) x (% deaths in age interval) / (no. years in interval).

Sources: Column A: National Vital Statistics Reports, Vol. 51, No. 3, December 29, 2002, "Life table for the total population: United States, 2000". Columns B and D: GWR model output.

Exhibit H.8f: Annualized Life-Years Saved for Avoided Premature Mortality, Type B Illness, Alternative 2 *(Continued on next page)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
Under 1 year	76.9	0.010	0.739	0.009	0.660
1 year	76.4	0.010	0.734	0.009	0.656
2 years	75.4	0.003	0.259	0.003	0.232
3 years	74.5	0.003	0.256	0.003	0.229
4 years	73.5	0.003	0.253	0.003	0.226
5 years	72.5	0.005	0.338	0.004	0.302
6 years	71.5	0.005	0.333	0.004	0.298
7 years	70.5	0.005	0.328	0.004	0.294
8 years	69.5	0.005	0.324	0.004	0.289
9 years	68.6	0.005	0.320	0.004	0.286
10 years	67.6	0.005	0.315	0.004	0.282
11 years	66.6	0.005	0.310	0.004	0.277
12 years	65.6	0.005	0.306	0.004	0.273
13 years	64.6	0.005	0.301	0.004	0.269
14 years	63.6	0.005	0.296	0.004	0.265
15 years	62.6	0.005	0.292	0.004	0.261
16 years	61.7	0.006	0.387	0.006	0.346
17 years	60.7	0.006	0.381	0.006	0.341
18 years	59.7	0.006	0.375	0.006	0.335
19 years	58.8	0.006	0.369	0.006	0.330
20 years	57.8	0.006	0.363	0.006	0.325
21 years	56.9	0.006	0.357	0.006	0.320
22 years	55.9	0.006	0.351	0.006	0.314
23 years	55.0	0.006	0.345	0.006	0.309
24 years	54.0	0.006	0.339	0.006	0.303
25 years	53.1	0.006	0.333	0.006	0.298
26 years	52.1	0.006	0.327	0.006	0.293
27 years	51.2	0.006	0.322	0.006	0.288
28 years	50.2	0.006	0.315	0.006	0.282
29 years	49.3	0.006	0.310	0.006	0.277
30 years	48.3	0.006	0.303	0.006	0.271
31 years	47.4	0.006	0.298	0.006	0.266
32 years	46.5	0.006	0.292	0.006	0.261
33 years	45.5	0.006	0.286	0.006	0.256
34 years	44.6	0.006	0.280	0.006	0.250
35 years	43.6	0.006	0.274	0.006	0.245
36 years	42.7	0.006	0.268	0.006	0.240
37 years	41.7	0.006	0.262	0.006	0.234
38 years	40.8	0.006	0.256	0.006	0.229
39 years	39.9	0.006	0.251	0.006	0.224
40 years	38.9	0.006	0.244	0.006	0.218
41 years	38.0	0.006	0.239	0.006	0.213
42 years	37.1	0.006	0.233	0.006	0.208
43 years	36.2	0.006	0.227	0.006	0.203
44 years	35.3	0.006	0.222	0.006	0.198
45 years	34.4	0.006	0.216	0.006	0.193
46 years	33.5	0.006	0.210	0.006	0.188
47 years	32.6	0.006	0.205	0.006	0.183
48 years	31.7	0.006	0.199	0.006	0.178
49 years	30.8	0.006	0.193	0.006	0.173
50 years	30.0	0.006	0.188	0.006	0.168

Exhibit H.8f Annualized Life-Years Saved for Avoided Premature Mortality, Type B Illness, Alternative 2 *(Continued)*

		3% Discount Rate		7% Discount Rate	
Age Group	Life Expectancy (years)	Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
51 years	29.1	0.006	0.183	0.006	0.163
52 years	28.2	0.006	0.177	0.006	0.158
53 years	27.4	0.006	0.172	0.006	0.154
54 years	26.5	0.006	0.166	0.006	0.149
55 years	25.7	0.006	0.161	0.006	0.144
56 years	24.8	0.006	0.156	0.006	0.139
57 years	24.0	0.006	0.151	0.006	0.135
58 years	23.2	0.006	0.146	0.006	0.130
59 years	22.4	0.006	0.141	0.006	0.126
60 years	21.6	0.006	0.136	0.006	0.121
61 years	20.9	0.006	0.131	0.006	0.117
62 years	20.1	0.006	0.126	0.006	0.113
63 years	19.3	0.006	0.121	0.006	0.108
64 years	18.6	0.006	0.117	0.006	0.104
65 years	17.9	0.002	0.030	0.001	0.027
66 years	17.2	0.002	0.029	0.001	0.026
67 years	16.4	0.002	0.027	0.001	0.024
68 years	15.8	0.002	0.026	0.001	0.024
69 years	15.1	0.002	0.025	0.001	0.022
70 years	14.4	0.002	0.024	0.001	0.021
71 years	13.8	0.002	0.023	0.001	0.021
72 years	13.1	0.002	0.022	0.001	0.019
73 years	12.5	0.002	0.021	0.001	0.019
74 years	11.9	0.002	0.020	0.001	0.018
75 years	11.3	0.002	0.019	0.001	0.017
76 years	10.7	0.002	0.018	0.001	0.016
77 years	10.2	0.002	0.017	0.001	0.015
78 years	9.6	0.002	0.016	0.001	0.014
79 years	9.1	0.002	0.015	0.001	0.014
80 years	8.6	0.002	0.014	0.001	0.013
81 years	8.1	0.002	0.013	0.001	0.012
82 years	7.6	0.002	0.013	0.001	0.011
83 years	7.2	0.002	0.012	0.001	0.011
84 years	6.7	0.002	0.011	0.001	0.010
85 years	6.3	0.002	0.010	0.001	0.009
86 years	6.0	0.002	0.010	0.001	0.009
87 years	5.6	0.002	0.009	0.001	0.008
88 years	5.3	0.002	0.009	0.001	0.008
89 years	5.0	0.002	0.008	0.001	0.007
90 years	4.7	0.002	0.008	0.001	0.007
91 years	4.4	0.002	0.007	0.001	0.007
92 years	4.1	0.002	0.007	0.001	0.006
93 years	3.9	0.002	0.006	0.001	0.006
94 years	3.7	0.002	0.006	0.001	0.006
95 years	3.5	0.002	0.006	0.001	0.005
96 years	3.3	0.002	0.005	0.001	0.005
97 years	3.1	0.002	0.005	0.001	0.005
98 years	2.9	0.002	0.005	0.001	0.004
99 years	2.7	0.002	0.004	0.001	0.004
>=100 years	2.6	0.002	0.004	0.001	0.004
Total		0.448	18.3	0.401	16.4

Notes: Columns B and D: The GWR model generates the allocation of deaths by age interval: <2 yrs (4%), 2 - 4 yrs (2%), 5 - 15 (11%), 16 - 64 (69%), and 65 - 100 (14%). For each age, the following is calculated: (annualized deaths avoided) x (% deaths in age interval) / (no. years in interval).

Sources: Column A: National Vital Statistics Reports, Vol. 51, No. 3, December 29, 2002, "Life table for the total population: United States, 2000". Columns B and D: GWR model output.

Exhibit H.8g Annualized Life-Years Saved for Avoided Premature Mortality, Type B Illness, Alternative 3 *(Continued on next page)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
Under 1 year	76.9	0.010	0.788	0.009	0.706
1 year	76.4	0.010	0.782	0.009	0.701
2 years	75.4	0.004	0.276	0.003	0.248
3 years	74.5	0.004	0.273	0.003	0.245
4 years	73.5	0.004	0.269	0.003	0.241
5 years	72.5	0.005	0.360	0.004	0.323
6 years	71.5	0.005	0.355	0.004	0.318
7 years	70.5	0.005	0.350	0.004	0.314
8 years	69.5	0.005	0.345	0.004	0.309
9 years	68.6	0.005	0.341	0.004	0.305
10 years	67.6	0.005	0.336	0.004	0.301
11 years	66.6	0.005	0.331	0.004	0.296
12 years	65.6	0.005	0.326	0.004	0.292
13 years	64.6	0.005	0.321	0.004	0.287
14 years	63.6	0.005	0.316	0.004	0.283
15 years	62.6	0.005	0.311	0.004	0.279
16 years	61.7	0.007	0.414	0.006	0.371
17 years	60.7	0.007	0.407	0.006	0.365
18 years	59.7	0.007	0.401	0.006	0.359
19 years	58.8	0.007	0.395	0.006	0.354
20 years	57.8	0.007	0.388	0.006	0.348
21 years	56.9	0.007	0.382	0.006	0.342
22 years	55.9	0.007	0.375	0.006	0.336
23 years	55.0	0.007	0.369	0.006	0.331
24 years	54.0	0.007	0.362	0.006	0.325
25 years	53.1	0.007	0.356	0.006	0.319
26 years	52.1	0.007	0.350	0.006	0.313
27 years	51.2	0.007	0.344	0.006	0.308
28 years	50.2	0.007	0.337	0.006	0.302
29 years	49.3	0.007	0.331	0.006	0.297
30 years	48.3	0.007	0.324	0.006	0.291
31 years	47.4	0.007	0.318	0.006	0.285
32 years	46.5	0.007	0.312	0.006	0.280
33 years	45.5	0.007	0.305	0.006	0.274
34 years	44.6	0.007	0.299	0.006	0.268
35 years	43.6	0.007	0.293	0.006	0.262
36 years	42.7	0.007	0.287	0.006	0.257
37 years	41.7	0.007	0.280	0.006	0.251
38 years	40.8	0.007	0.274	0.006	0.245
39 years	39.9	0.007	0.268	0.006	0.240
40 years	38.9	0.007	0.261	0.006	0.234
41 years	38.0	0.007	0.255	0.006	0.229
42 years	37.1	0.007	0.249	0.006	0.223
43 years	36.2	0.007	0.243	0.006	0.218
44 years	35.3	0.007	0.237	0.006	0.212
45 years	34.4	0.007	0.231	0.006	0.207
46 years	33.5	0.007	0.225	0.006	0.202
47 years	32.6	0.007	0.219	0.006	0.196
48 years	31.7	0.007	0.213	0.006	0.191
49 years	30.8	0.007	0.207	0.006	0.185
50 years	30.0	0.007	0.201	0.006	0.180

Exhibit H.8g Annualized Life-Years Saved for Avoided Premature Mortality, Type B Illness, Alternative 3 *(Continued)*

		3% Discount Rate		7% Discount Rate	
Age Group	Life Expectancy (years)	Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
51 years	29.1	0.007	0.195	0.006	0.175
52 years	28.2	0.007	0.189	0.006	0.170
53 years	27.4	0.007	0.184	0.006	0.165
54 years	26.5	0.007	0.178	0.006	0.159
55 years	25.7	0.007	0.172	0.006	0.155
56 years	24.8	0.007	0.166	0.006	0.149
57 years	24.0	0.007	0.161	0.006	0.144
58 years	23.2	0.007	0.156	0.006	0.140
59 years	22.4	0.007	0.150	0.006	0.135
60 years	21.6	0.007	0.145	0.006	0.130
61 years	20.9	0.007	0.140	0.006	0.126
62 years	20.1	0.007	0.135	0.006	0.121
63 years	19.3	0.007	0.130	0.006	0.116
64 years	18.6	0.007	0.125	0.006	0.112
65 years	17.9	0.007	0.120	0.002	0.029
66 years	17.2	0.002	0.031	0.002	0.027
67 years	16.4	0.002	0.029	0.002	0.026
68 years	15.8	0.002	0.028	0.002	0.025
69 years	15.1	0.002	0.027	0.002	0.024
70 years	14.4	0.002	0.026	0.002	0.023
71 years	13.8	0.002	0.025	0.002	0.022
72 years	13.1	0.002	0.023	0.002	0.021
73 years	12.5	0.002	0.022	0.002	0.020
74 years	11.9	0.002	0.021	0.002	0.019
75 years	11.3	0.002	0.020	0.002	0.018
76 years	10.7	0.002	0.019	0.002	0.017
77 years	10.2	0.002	0.018	0.002	0.016
78 years	9.6	0.002	0.017	0.002	0.015
79 years	9.1	0.002	0.016	0.002	0.014
80 years	8.6	0.002	0.015	0.002	0.014
81 years	8.1	0.002	0.014	0.002	0.013
82 years	7.6	0.002	0.014	0.002	0.012
83 years	7.2	0.002	0.013	0.002	0.011
84 years	6.7	0.002	0.012	0.002	0.011
85 years	6.3	0.002	0.011	0.002	0.010
86 years	6.0	0.002	0.011	0.002	0.010
87 years	5.6	0.002	0.010	0.002	0.009
88 years	5.3	0.002	0.009	0.002	0.008
89 years	5.0	0.002	0.009	0.002	0.008
90 years	4.7	0.002	0.008	0.002	0.007
91 years	4.4	0.002	0.008	0.002	0.007
92 years	4.1	0.002	0.007	0.002	0.007
93 years	3.9	0.002	0.007	0.002	0.006
94 years	3.7	0.002	0.007	0.002	0.006
95 years	3.5	0.002	0.006	0.002	0.006
96 years	3.3	0.002	0.006	0.002	0.005
97 years	3.1	0.002	0.006	0.002	0.005
98 years	2.9	0.002	0.005	0.002	0.005
99 years	2.7	0.002	0.005	0.002	0.004
>=100 years	2.6	0.002	0.005	0.002	0.004
Total		0.484	19.6	0.429	17.5

Notes: Columns B and D: The GWR model generates the allocation of deaths by age interval: <2 yrs (4%), 2 - 4 yrs (2%), 5 - 15 (11%), 16 - 64 (69%), and 65 - 100 (14%). For each age, the following is calculated: (annualized deaths avoided) x (% deaths in age interval) / (no. years in interval).

Sources: Column A: National Vital Statistics Reports, Vol. 51, No. 3, December 29, 2002, "Life table for the total population: United States, 2000". Columns B and D: GWR model output.

Exhibit H.8h Annualized Life-Years Saved for Avoided Premature Mortality, Type B Illness, Alternative 4 *(Continued on next page)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
Under 1 year	76.9	0.035	2.670	0.033	2.501
1 year	76.4	0.035	2.653	0.033	2.485
2 years	75.4	0.012	0.934	0.012	0.875
3 years	74.5	0.012	0.923	0.012	0.864
4 years	73.5	0.012	0.910	0.012	0.853
5 years	72.5	0.017	1.217	0.016	1.140
6 years	71.5	0.017	1.200	0.016	1.124
7 years	70.5	0.017	1.183	0.016	1.109
8 years	69.5	0.017	1.166	0.016	1.093
9 years	68.6	0.017	1.151	0.016	1.079
10 years	67.6	0.017	1.135	0.016	1.063
11 years	66.6	0.017	1.118	0.016	1.047
12 years	65.6	0.017	1.101	0.016	1.031
13 years	64.6	0.017	1.084	0.016	1.016
14 years	63.6	0.017	1.067	0.016	1.000
15 years	62.6	0.017	1.051	0.016	0.984
16 years	61.7	0.023	1.411	0.021	1.322
17 years	60.7	0.023	1.388	0.021	1.301
18 years	59.7	0.023	1.365	0.021	1.279
19 years	58.8	0.023	1.345	0.021	1.260
20 years	57.8	0.023	1.322	0.021	1.238
21 years	56.9	0.023	1.301	0.021	1.219
22 years	55.9	0.023	1.278	0.021	1.198
23 years	55.0	0.023	1.258	0.021	1.178
24 years	54.0	0.023	1.235	0.021	1.157
25 years	53.1	0.023	1.214	0.021	1.138
26 years	52.1	0.023	1.192	0.021	1.116
27 years	51.2	0.023	1.171	0.021	1.097
28 years	50.2	0.023	1.148	0.021	1.076
29 years	49.3	0.023	1.128	0.021	1.056
30 years	48.3	0.023	1.105	0.021	1.035
31 years	47.4	0.023	1.084	0.021	1.016
32 years	46.5	0.023	1.063	0.021	0.996
33 years	45.5	0.023	1.041	0.021	0.975
34 years	44.6	0.023	1.020	0.021	0.956
35 years	43.6	0.023	0.997	0.021	0.934
36 years	42.7	0.023	0.977	0.021	0.915
37 years	41.7	0.023	0.954	0.021	0.894
38 years	40.8	0.023	0.933	0.021	0.874
39 years	39.9	0.023	0.913	0.021	0.855
40 years	38.9	0.023	0.890	0.021	0.834
41 years	38.0	0.023	0.869	0.021	0.814
42 years	37.1	0.023	0.848	0.021	0.795
43 years	36.2	0.023	0.828	0.021	0.776
44 years	35.3	0.023	0.807	0.021	0.756
45 years	34.4	0.023	0.787	0.021	0.737
46 years	33.5	0.023	0.766	0.021	0.718
47 years	32.6	0.023	0.746	0.021	0.699
48 years	31.7	0.023	0.725	0.021	0.679
49 years	30.8	0.023	0.704	0.021	0.660
50 years	30.0	0.023	0.686	0.021	0.643

Exhibit H.8h Annualized Life-Years Saved for Avoided Premature Mortality, Type B Illness, Alternative 4 *(Continued)*

Age Group	Life Expectancy (years)	3% Discount Rate		7% Discount Rate	
		Annualized Deaths Avoided	Annualized Life-Years Saved	Annualized Deaths Avoided	Annualized Life-Years Saved
	A	B	C = A * B	D	E = A * D
51 years	29.1	0.023	0.666	0.021	0.624
52 years	28.2	0.023	0.645	0.021	0.604
53 years	27.4	0.023	0.627	0.021	0.587
54 years	26.5	0.023	0.606	0.021	0.568
55 years	25.7	0.023	0.588	0.021	0.551
56 years	24.8	0.023	0.567	0.021	0.531
57 years	24.0	0.023	0.549	0.021	0.514
58 years	23.2	0.023	0.531	0.021	0.497
59 years	22.4	0.023	0.512	0.021	0.480
60 years	21.6	0.023	0.494	0.021	0.463
61 years	20.9	0.023	0.478	0.021	0.448
62 years	20.1	0.023	0.460	0.021	0.431
63 years	19.3	0.023	0.441	0.021	0.414
64 years	18.6	0.023	0.425	0.021	0.399
65 years	17.9	0.006	0.108	0.006	0.102
66 years	17.2	0.006	0.104	0.006	0.098
67 years	16.4	0.006	0.099	0.006	0.093
68 years	15.8	0.006	0.096	0.006	0.090
69 years	15.1	0.006	0.091	0.006	0.086
70 years	14.4	0.006	0.087	0.006	0.082
71 years	13.8	0.006	0.084	0.006	0.078
72 years	13.1	0.006	0.079	0.006	0.074
73 years	12.5	0.006	0.076	0.006	0.071
74 years	11.9	0.006	0.072	0.006	0.068
75 years	11.3	0.006	0.068	0.006	0.064
76 years	10.7	0.006	0.065	0.006	0.061
77 years	10.2	0.006	0.062	0.006	0.058
78 years	9.6	0.006	0.058	0.006	0.054
79 years	9.1	0.006	0.055	0.006	0.052
80 years	8.6	0.006	0.052	0.006	0.049
81 years	8.1	0.006	0.049	0.006	0.046
82 years	7.6	0.006	0.046	0.006	0.043
83 years	7.2	0.006	0.044	0.006	0.041
84 years	6.7	0.006	0.041	0.006	0.038
85 years	6.3	0.006	0.038	0.006	0.036
86 years	6.0	0.006	0.036	0.006	0.034
87 years	5.6	0.006	0.034	0.006	0.032
88 years	5.3	0.006	0.032	0.006	0.030
89 years	5.0	0.006	0.030	0.006	0.028
90 years	4.7	0.006	0.028	0.006	0.027
91 years	4.4	0.006	0.027	0.006	0.025
92 years	4.1	0.006	0.025	0.006	0.023
93 years	3.9	0.006	0.024	0.006	0.022
94 years	3.7	0.006	0.022	0.006	0.021
95 years	3.5	0.006	0.021	0.006	0.020
96 years	3.3	0.006	0.020	0.006	0.019
97 years	3.1	0.006	0.019	0.006	0.018
98 years	2.9	0.006	0.018	0.006	0.016
99 years	2.7	0.006	0.016	0.006	0.015
>=100 years	2.6	0.006	0.016	0.006	0.015
Total		1.630	66.5	1.527	62.3

Notes: Columns B and D: The GWR model generates the allocation of deaths by age interval: <2 yrs (4%), 2 - 4 yrs (2%), 5 - 15 (11%), 16 - 64 (69%), and 65 - 100 (14%). For each age, the following is calculated: (annualized deaths avoided) x (% deaths in age interval) / (no. years in interval).

Sources: Column A: National Vital Statistics Reports, Vol. 51, No. 3, December 29, 2002, "Life table for the total population: United States, 2000". Columns B and D: GWR model output.

Exhibit H.9 Life Years Saved for Avoided Cases of Premature Mortality from Type A and Type B Illnesses

Rule Alternative	Annualized Life-Years Saved		Total
	Type A	Type B	
	A	B	C = A + B
3% Discount Rate			
A1	2	3	5
A2	10	18	28
A3	11	20	30
A4	38	66	105
7% Discount Rate			
A1	1	3	4
A2	9	16	25
A3	10	18	27
A4	36	62	98

Notes: Based on cases avoided that are annualized over the 25-year period of analysis. Total may not add due to rounding. In the GWR EA, rotavirus is used as a representative illness and indicator for the Type A Viruses and echovirus for Type B illness. In this CEA, a rotavirus illness decrement is used to calculate QALYs for Type A cases, and to calculate a lower bound estimate of QALYs for Type B Illness.

Sources: Columns A and B from Exhibits H.8a - h

H.2.1.3 MILYs saved from reduced morbidity and premature mortality for avoided cases of Types A and B illness

The use of QALYs allows for integration of life year equivalents saved from avoided morbidity (quality adjusted life years) with life years saved by avoidance of premature mortality (life years). As mentioned in the Introduction to this Appendix, this measure is referred to in this CEA as “Morbidity Inclusive Life Years” (MILYs). As the Agency describes in Section H.1.2, and as applied in the CAIR analysis, EPA assumes for this CEA that all individuals start with a baseline quality of life equal to 1.0: No deduction is made from life years saved to account for individual differences in baseline health or functionality in the population.

MILYs are calculated as follows (values are annualized):

MILYs = (QALYs saved from avoided morbidity) + (life years saved from avoided mortality)

for each regulatory alternative.

Based on a 3 percent discount rate, the MILYs saved are highest in Alternative 4 and lowest in Alternative 1, and the final GWR saves approximately 6 to 6.5 times more MILYs than Alternative 1 and approximately 9 to 11 percent more than Alternative 2 (using ECOI and TCOI approaches, respectively). This comparison using a 7 percent discount rate exhibits a similar pattern (Exhibit H.10).

Exhibit H.10 MILYs[1] for Morbidity and Mortality of Type A and B Illnesses by Rule Alternative

Rule Alternative	MILYs Type A Illness		MILYs Type B Illness		Total MILYs	
	Low	High	Low	High	Low	High
	A	B	C	D	E = A+ C	F = B + D
3% Discount Rate						
A1	10	25	4	5	14	30
A2	59	148	22	29	81	177
A3	65	161	24	31	88	192
A4	230	571	80	104	309	675
7% Discount Rate						
A1	8	21	3	4	11	25
A2	53	132	20	26	73	158
A3	58	144	21	27	79	172
A4	215	535	75	97	290	633

Notes: Numbers are annualized over the 25-year period of analysis. In the GWR EA, rotavirus is used as a representative illness and indicator for the Type A Viruses and echovirus for Type B illness. In this CEA, a rotavirus illness decrement is used to calculate QALYs for Type A cases, and to calculate a lower bound estimate of QALYs for Type B cases.

[1] MILYs (morbidity inclusive life years) are the sum of QALYs saved (Exhibits H.7a - b) from avoided morbidity and life-years saved from avoided mortality (Exhibit H.9).

Source: Exhibits H.7a-b and H.9

H.2.2 The CEA Numerator: Deriving Net Cost

The avoidance of time losses and medical costs associated with the illnesses to be avoided by implementation of the GWR comprise the cost of illness (COI) to be subtracted from the rule's cost. These values are developed based on information about these losses and consideration of the elicitation process used by Cook et al. to develop the QALY decrements on which the MILYs denominator is based. The COI per case is multiplied by the number of cases avoided and this amount is subtracted from the regulation costs to calculate a net cost numerator for the cost-per-MILYs saved ratio.

H.2.2.1 Identifying costs to be subtracted from the numerator

The numerator in any cost-effectiveness calculation is an estimate of the relevant costs to achieve the change in health state characterized by the effectiveness measure. For environmental decision-making, regulatory costs of particular options are the appropriate starting point for defining the numerator in a cost-effectiveness assessment of environmental improvement options.

In medical CEAs, net costs of disease treatment are included in the numerator for those interventions involving treatment. In the environmental protection context, the handling of disease treatment costs depends on the scope of the effectiveness measure. If the QALY score reflects a health state after treatment is administered, then the costs of treatment necessary to achieve that health state must

be subtracted from the regulatory costs to yield the net cost of avoiding a QALY decrement.[7]
In 1997, the Panel on Cost-Effectiveness in Health and Medicine published, in the journal *Health Economics*,[8] a paper supporting that lost paid work time that is a loss *to the individual* (e.g., lost market compensation, lost ability to complete uncompensated work, and lost leisure time) might best be assumed to be reflected in a full and complete QALY score. In other words, elicitees, or experts assessing quality of life for patients, are likely to have considered these effects in the quality of life score they report. However, Cook et al. performed a separate COI analysis from the TTO study that generated the QALY decrements that are used in this analysis, indicating that participants did not consider these costs in the elicitation process.

The Cook et al. COI analysis accounted for costs associated with gallstone treatments in addition to the rotavirus symptoms that apply to this analysis. The authors include in their cost analysis the medical costs, patient transport costs, professional and informal care (caregiver) costs, and a patient's paid work and home duties losses/costs. Therefore, this analysis uses the Cook et al. decrements, but adopts the COI estimates directly from the GWR EA (Exhibits 5.18 and 5.19), which account for symptoms of rotavirus and echovirus illnesses.

After identifying the appropriate costs to subtract from the numerator, the Agency discounts the medical costs and time losses over the 25-year period of analysis. For each subsequent year after Year 1, the present value (PV) of the medical cost stream is discounted by 3 percent and 7 percent to account for the time preference for normal goods. In contrast, time losses are first increased in value to account for income increases and then discounted. Additionally, time losses are valued using two different approaches, Enhanced and Traditional (explained in the following section), while medical costs are the same for both approaches.

Valuing Time Losses

Time losses to the patient that are associated with cases of Type A or B illness may include (1) a reduction in time (hours) engaged in normal activities and (2) an additional loss of productivity (or effectiveness) that occurs even when the ill individual continues to engage in normal activities (“*presenteeism*”). Reductions in time (or hours) would result, for example, when an ill individual spends time on doctor visits, bed rest, or in the hospital rather than engaging in normal market and non-market work. Additionally, a portion of time may be spent by a family member or friend in caring for a patient at home.

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[7] Subtracting costs from the numerator is not appropriate when the same costs are considered by participants (elicitees) in the QALY elicitation process. If the costs are already reflected as a component of the QALY decrement, the denominator of the cost-per-MILY measure will also account for them, and subtracting them from regulatory costs in the numerator would, in effect, be double-counting the cost avoidance. Therefore, selection of appropriate costs to subtract from the numerator requires careful consideration of the QALY decrement used in the analysis.

[8] See Milton C. Weinstein, Joanna E. Siegel, Alan M. Garber, Joseph Lipscomb, Bryan R. Luce, Willard G. Manning, Jr., and George W. Torrance, Productivity Costs, Time Costs and Health-related Quality of Life: A Response to the Erasmus Group, *Health Economics*, 6:505-510, 1997.

Time losses are assigned a value so that they can be combined with medical costs. As in the LT2ESWTR, this analysis employs two approaches to value time losses. One approach, the Traditional Cost of Illness (COI), is based on the human capital approach typically applied in COI studies, focusing on the effect of illness on labor productivity (as measured by work time lost). Another approach, the Enhanced COI, attempts to provide a more complete estimate of the social welfare impacts of time losses due to illness based on the existing data and literature.

In the Enhanced COI estimate, these values are applied to both complete losses of time (time spent in illness-related activities rather than normal activities), as well as to partial losses (time spent in normal activities that are less productive or pleasurable than in the absence of illness). After calculating the mean duration of illness, data on the days with reduced productivity can be derived by subtracting the mean number of days lost (where no work is done) from the mean duration of illness. Consistent with the method of application in the LT2ESWTR EA and the Stage 2 DBPR, this analysis assumes that the dollar value (i.e., the utility loss, estimated based on opportunity costs) of this reduction is equal to the reduction in productivity multiplied by the relevant dollar-per-hour value (see Appendix A of the GWR EA for COI detail). Also consistent with those analyses, presenteeism is accounted for only in the Enhanced COI, not in the Traditional COI approach. Using the Enhanced approach, the Agency values lost leisure time and non-market work time at 60 percent of the rate at which it values market work time. In the Traditional COI estimate, these values are applied only to complete losses of time (time spent in illness-related activities rather than normal activities), because less productive time is not included.

In a social welfare context, the value of marginal changes in market work time has two components: (1) the value of the time loss to that individual, and (2) any additional value to the rest of society. In this analysis, lost market work is valued at the median gross (pre-tax) wage rate plus benefits, also referred to as total compensation or employer's costs.[9] This approach is most representative of the full social impact of lost work time because it incorporates both the loss to the individual in terms of lost income and the loss to society in terms of reduced tax revenue or decreased production of goods and services.

This approach recognizes that, when an individual misses work or is less productive due to illness, he or she loses the associated utility. This loss, in part, is measured by income, which the individual can trade for goods and services. However, income is an incomplete measure of value, because the individual may derive utility from working that exceeds post-tax wages or take home pay. Hence the post-tax wage rates provide a lower bound estimate of the value of paid work time from the individual perspective.

This approach also recognizes that the employer (and society) loses the value of the individual's productivity, and that this value exceeds the value of the post-tax wages received by the employee. From the employer's perspective, the value of the individual's productivity is equal at minimum to his or her total compensation (pre-tax wages plus benefits). This perspective is similar to that of the human capital

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[9] Embedded in this approach are a number of assumptions regarding the operations of the labor market and the factors that influence individual choice. In addition, the actual effect of missed work time will vary depending on how individuals are compensated; e.g., on whether they are salaried or hourly employees and on whether they receive sick leave or disability payments. For example, if the individual has access to paid sick leave, a marginal loss of work time (within certain limits) will not result in an immediate loss of income. However, a loss will accrue to the employer, who must pay wages without the benefit of the worker's productivity. The individual also has the ability to save this sick leave for another time.

approach, which assumes that an employer would not pay more to an employee, in salary plus benefits, than that employee is worth to the company (i.e., the value of the employee's marginal product) and hence to society.[10] Some of this value is reflected in the employee's take home pay, and the remainder accrues in terms of taxes paid and reflects the value of product created above and beyond what is reflected in pre-tax wages.[11]

The U.S. Census Bureau compiles data on weekly hours worked, and loss of work hours is a key loss category used in this analysis. For the year 2002, that figure was 39.2 hours per week for the civilian noninstitutional population 16 years old or older who are working full or part-time.[12] This figure excludes those employed but not working because of vacations, illness, strikes, etc.; noncivilians; institutionalized persons; and those in the labor pool but unemployed. This group of workers includes about 60.3 percent of the population in this age range.[13] Over the whole population, the average lost work hours per day of illness is, therefore, about 3.4 hours.[14]

Summary of Valuation of Lost Time

The costs that would normally be incurred and which rule implementation is expected to avoid should be subtracted from the regulatory costs which comprise the numerator. The QALY decrement used in this analysis does not appear to include patients' consideration of treatment costs. As the Agency interprets Cook et al., their QALY score does not reflect the impact of these expenses, as information on costs was gathered in a separate section of their QALY questionnaire. As a result, subtraction of direct and indirect treatment costs from the numerator is consistent with the information reflected in the QALY denominator. This includes medical costs associated with Type A and B illness and certain time losses for patients and caregivers.[15] Time losses include: lost paid work time, lost caregiver time, and reduced productivity while on the job (presenteeism). The qualified costs do not include: unpaid lost market work

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[10] A number of COI studies use lost earnings to estimate indirect costs. For example, the total compensation approach is used in Buzby et al. (1996), Rice et al. (1992), and Waitzman et al. (1996).

[11] For a recent discussion that indicates that illness-related losses of work time can substantially exceed the wage rate, see: Pauley et al. (2002).

[12] Based on annual average of monthly figures, U.S. Census Bureau, Statistical Abstract of the United States, 2003, Table No. 602, sourced to U.S. Bureau of Labor Statistics, Employment and Earnings, monthly, January 2003 issue, and based on the Current Population Survey.

[13] Derived from the estimate of 131,019 thousand people at work (year 2002, based on annual average of monthly figures, U.S. Census Bureau, Statistical Abstract of the United States, 2003, Table No. 602, sourced to U.S. Bureau of Labor Statistics, Employment and Earnings, monthly, January 2003 issue, and based on the Current Population Survey) of the 217,570 thousand people in this age range (year 2002, based on annual average of monthly figures, U.S. Census Bureau, Statistical Abstract of the United States, 2003, Table No. 587, sourced to U.S. Bureau of Labor Statistics, Bulletin 2307 and Employment and Earnings, monthly, January issues; Monthly Labor Review, November 2001; and based on the Current Population Survey). 131,091 thousand/ 217,570 thousand = 60.3 percent.

[14] 39.2 hours/week ÷ 7 days/week x (131,091 thousand persons working/ 217,570 thousand persons of working age)=3.4 hours/day.

[15] Note that the Agency values time loss for patients at the same rate regardless of the patient's age and whether the lost time is for remunerative work or school-related activities.

time, lost leisure time, or lost non-market productivity. In addition, caregiver time losses in the Traditional approach exclude leisure time losses and value non-market work time at one half that of the Enhanced approach. The remaining exhibits of this Appendix present results using both the Enhanced and the Traditional approach. The details of the derivation of the COI estimates are described in Chapter 5 and Appendix A of the GWR EA.

In summary, the subtraction from the numerator (of the cost effectiveness ratio) of appropriate costs results in the following calculation:

Net Cost = $C_{t,n}$ - ($\text{Avoided}_{t,n}$ x $\text{COI}_{t,a}$)

Where C = Total compliance cost of rule
t = Type of Illness (Type A or B)
n = Rule Alternative (1,2,4, or the final GWR)
Avoided = Number of cases of Type A or B illness avoided by rule alternative n
COI = The sum of the medical cost of Type A or B illness and lost time costs per case avoided and
a = age group.

Weighted Cost of Illness

The costs of illness associated with the Type A and Type B illnesses to be avoided by GWR implementation are based on COI estimates for rotavirus (Type A) and echovirus (Type B) illnesses. These costs, both in terms of time losses and medical care required, vary across age groups, individual health status for Type A (cases in immunocompromised individuals tend to be more severe and require more care), and severity of cases for Type B (requires no medical care, doctor visit required, or hospitalization). To simplify the calculations across these COI subgroups, a weighted COI is calculated using the percentage of cases in each subgroup, as shown in Exhibits H.11a-b. As described in the previous section, the derivation of the COI estimates is presented in Ch. 5 and Appendix A of the GWR EA.

H.2.2.2 Calculating costs by year to be subtracted from regulatory costs

The value of lost time can increase or decrease over time, depending on the change in real income. Using data on income growth from the Bureau of Labor Statistics, the income lost over the 25-year period of analysis is increased to reflect that real income growth. Benefits derived from medical costs are not adjusted for changes in real income over time, because medical costs do not necessarily have a direct or indirect link with income. The cost adjustment per case is calculated for each year using the following equation.

Annual Cost Adjustment Per Case =

Type A cases: $[(B + 1)_i \text{ x (Lost Time Costs)}_{i-1}] + \$19$

Type B cases: $[(B + 1)_i \text{ x (Lost Time Costs)}_{i-1}] + \$65$

Where *B* is the real income increase factor,

i = year 1 to 25,
Lost Time Costs = Indirect Weighted COI, and
$19 (or $65) = Direct Weighted COI (Medical costs), for Type A illnesses (and Type B illnesses).

The Annual Cost Adjustment Per Case is calculated in Exhibits H.12a-b, where it is then multiplied by discounted cases, as shown in the following section.

H.2.2.3 Calculating total cost adjustment to regulatory costs based upon cases of rotavirus illness avoided

To calculate a total cost adjustment (i.e., subtraction) to the regulatory costs that comprise the numerator of the CE ratio, the Annual Cost Adjustment Per Case developed in the preceding section is applied to cases avoided annually over the 25-year period of analysis (Exhibits H.12a - p). As described in Ch. 5 of the EA, the primary analysis quantifies a limited portion of the total anticipated benefits of the Rule. Section 5.4.3.2 presents a discussion of nonquantified benefits and estimates a portion of their value, based on bacterial illnesses avoided, at four times the primary analysis benefits (for a benefits total that is five times the primary benefits). Having benefits valued at five times the primary analysis estimates would significantly increase the Cost Adjustment to the rule cost.

First, the number of cases avoided for each year (years 1 through 25) is discounted back to Year 1 of the analysis to account for the time preference for normal goods (such as avoiding illness). Next, these cases are multiplied by the Cost Adjustment per case for each year (years 1 through 25):

$$\text{Total Cost Adjustment}_n = (\text{Discounted Cases}_{i,n} \text{ x Cost Adjustment}_i)$$

for i = year 1 to 25, and
n = regulatory alternative.

This calculation is made using a 3 percent and a 7 percent discount rate. The final GWR is the second most stringent alternative and reduces risk proportionally; therefore, it has the second highest cost adjustment, which reflects its potential for avoiding lost time and medical costs due to illness.

Exhibit H.11a Weighted[1] Cost of Illness Per Case Avoided, Type A Illness

					Weighted COI				
	% Cases by Age	Indirect			Indirect			Total	
		ECOI	TCOI	Direct COI	ECOI	TCOI	Direct COI	ECOI	TCOI
Age	A	B	C	D	E = A*B	F = A * C	G = A * D	H = E + G	I = F + G
Healthy Population (99.7%)									
< 2 years	4%	$ 1,293	$ 258	$ 97	$ 55	$ 11	$ 4	$ 59	$ 15
2 to < 5 yrs	2%	$ 1,293	$ 258	$ 82	$ 29	$ 6	$ 2	$ 31	$ 8
5 to < 16 yrs	11%	$ 641	$ 128	$ -	$ 73	$ 14	$ -	$ 73	$ 14
? 16 yrs	82%	$ 103	$ 39	$ -	$ 85	$ 32	$ -	$ 85	$ 32
Total	100%				$ 242	$ 63	$ 6	$ 248	$ 69
Immunocompromised Population (0.3%)									
< 2 years	4%	$ 2,136	$ 426	$ 4,486	$ 91	$ 18	$ 191	$ 282	$ 209
2 to < 5 yrs	2%	$ 1,281	$ 255	$ 4,486	$ 29	$ 6	$ 102	$ 131	$ 108
5 to < 16 yrs	11%	$ 1,281	$ 255	$ 4,453	$ 145	$ 29	$ 504	$ 649	$ 533
? 16 yrs	82%	$ 569	$ 213	$ 4,453	$ 468	$ 175	$ 3,658	$ 4,125	$ 3,833
Total	100%				$ 733	$ 228	$ 4,455	$ 5,188	$ 4,683
Total Weighted Average COI[1]					$ 243	$ 63	$ 19	$ 263	$ 83

Notes: In the GWR EA, rotavirus is used as a representative illness for calculating cases of Type A illnesses to be avoided by rule implementation. Indirect COI includes costs of time losses related to illness. Direct COI includes medical costs.

[1] A weighted average COI for all Type A illness cases to be avoided by the GWR is derived by multiplying the duration of symptoms in each age group, for both the Healthy and Immunocompromised populations, by the corresponding percentage of cases in each age group; the result is multiplied by the percentage of healthy vs. immunocompromised patients, which is estimated in the primary analysis of the GWR EA to be 99.7% and 0.3%, respectively. The results for the two populations are summed to yield the COI, in days, for a weighted average case.

Sources: Column A - GWR model output
Columns B,C,D - Exhbits 5.18 and 5.19

Exhibit H.11b Weighted[1] Cost of Illness Per Case Avoided, Type B Illness

					Weighted COI				
	% Cases by Age	Indirect			Indirect			Total	
		ECOI	TCOI	Direct COI	ECOI	TCOI	Direct COI	ECOI	TCOI
Age	A	B	C	D	E = A*B	F = A * C	G = A * D	H = E + G	I = F + G
Cases Not Requiring Medical Care (93%)									
< 1 yr	0.1%	$ 1,281	$ 255	$ -	$ 2	$ 0	$ -	$ 2	$ 0
1 to < 5 yrs	7%	$ 1,281	$ 255	$ -	$ 96	$ 19	$ -	$ 96	$ 19
5 to < 16 yrs	14%	$ 641	$ 128	$ -	$ 90	$ 18	$ -	$ 90	$ 18
? 16 yrs	78%	$ 336	$ 126	$ -	$ 263	$ 98	$ -	$ 263	$ 98
Total	100%				$ 451	$ 136	$ -	$ 451	$ 136
Cases Requiring Doctor Visit (6%)									
< 1 yr	0.1%	$ 2,136	$ 426	$ 181	$ 3	$ 1	$ 0	$ 3	$ 1
1 to < 5 yrs	7%	$ 2,136	$ 426	$ 181	$ 160	$ 32	$ 14	$ 173	$ 45
5 to < 16 yrs	14%	$ 2,136	$ 426	$ 181	$ 301	$ 60	$ 25	$ 326	$ 85
? 16 yrs	78%	$ 1,139	$ 426	$ 181	$ 892	$ 333	$ 142	$ 1,033	$ 475
Total	100%				$ 1,355	$ 426	$ 181	$ 1,536	$ 606
Cases Requiring Hospitalization (1%)									
< 1 yr	0.1%	$ 2,990	$ 596	$ 23,431	$ 4	$ 1	$ 31	$ 35	$ 32
1 to < 5 yrs	7%	$ 2,990	$ 596	$ 9,187	$ 224	$ 45	$ 688	$ 911	$ 732
5 to < 16 yrs	14%	$ 2,990	$ 596	$ 5,036	$ 421	$ 84	$ 709	$ 1,130	$ 793
? 16 yrs	78%	$ 1,595	$ 596	$ 5,036	$ 1,249	$ 467	$ 3,943	$ 5,192	$ 4,410
Total	100%				$ 1,897	$ 596	$ 5,371	$ 7,269	$ 7,865
Total Weighted Average COI[1]					$ 520	$ 158	$ 65	$ 585	$ 241

Notes: In the Ground Water Rule EA, rotavirus is used as a representative illness for calculating cases of Type A illnesses to be avoided by rule implementation. Indirect COI includes costs of time losses related to illness. Direct COI includes medical costs.

[1] A weighted average COI for all Type B illness cases to be avoided by the GWR is derived by multiplying the duration of symptoms in each age group, for each severity level (No Medical Care, Doctor, and Hospitalization), by the corresponding percentage of cases in each age group; the result is multiplied by the percentage of patients in each severity level, which is estimated to be 93%, 6%, and 1%, respectively. The results for the three patient populations are summed to yield the COI, in days, for a weighted average case.

Sources: Column A - GWR model output
Columns B,C,D - Exhbits 5.18 and 5.19

Exhibit H.12a Cost Adjustment for Type A Illness, Alternative 1, 3 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.03^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 243	$ 63	$ 19	$ -	$ -
2008	-	-	2.3%	$ 249	$ 65	$ 19	$ -	$ -
2009	-	-	3.9%	$ 259	$ 67	$ 19	$ -	$ -
2010	768	703	3.3%	$ 267	$ 70	$ 19	$ 0	$ 0
2011	1,667	1,481	2.3%	$ 274	$ 71	$ 19	$ 0	$ 0
2012	2,371	2,045	1.9%	$ 279	$ 73	$ 19	$ 1	$ 0
2013	3,064	2,566	2.0%	$ 284	$ 74	$ 19	$ 1	$ 0
2014	3,715	3,021	2.0%	$ 290	$ 76	$ 19	$ 1	$ 0
2015	4,397	3,471	1.8%	$ 295	$ 77	$ 19	$ 1	$ 0
2016	5,001	3,833	1.7%	$ 300	$ 78	$ 19	$ 1	$ 0
2017	5,836	4,343	1.7%	$ 305	$ 79	$ 19	$ 1	$ 0
2018	6,330	4,573	1.7%	$ 310	$ 81	$ 19	$ 2	$ 0
2019	6,825	4,787	1.7%	$ 315	$ 82	$ 19	$ 2	$ 0
2020	7,484	5,096	1.7%	$ 320	$ 84	$ 19	$ 2	$ 1
2021	8,147	5,386	1.7%	$ 326	$ 85	$ 19	$ 2	$ 1
2022	8,719	5,596	1.7%	$ 331	$ 86	$ 19	$ 2	$ 1
2023	9,514	5,929	1.7%	$ 337	$ 88	$ 19	$ 2	$ 1
2024	10,209	6,176	1.7%	$ 342	$ 89	$ 19	$ 2	$ 1
2025	10,829	6,361	1.7%	$ 348	$ 91	$ 19	$ 2	$ 1
2026	11,739	6,694	1.7%	$ 354	$ 92	$ 19	$ 3	$ 1
2027	12,191	6,750	1.7%	$ 360	$ 94	$ 19	$ 3	$ 1
2028	13,037	7,008	1.7%	$ 366	$ 96	$ 19	$ 3	$ 1
2029	13,799	7,201	1.7%	$ 373	$ 97	$ 19	$ 3	$ 1
2030	14,431	7,312	1.7%	$ 379	$ 99	$ 19	$ 3	$ 1
2031	15,279	7,516	1.7%	$ 386	$ 101	$ 19	$ 3	$ 1
						25 Year PV	$ 23	$ 7
						25 Year Annualized Value	$ 1	$ 0

Notes: Values are in 2003$. In the Ground Water Rule EA, rotavirus is used as a representative illness for the Type A Viruses. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12b Cost Adjustment for Type B Illness, Alternative 1, 3 Percent Discount Rate

Year *n*	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
	–	B = A/1.03^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 520	$ 158	$ 65	$ -	$ -
2008	-	-	2.3%	$ 532	$ 162	$ 65	$ -	$ -
2009	-	-	3.9%	$ 553	$ 168	$ 65	$ -	$ -
2010	36	33	3.3%	$ 571	$ 173	$ 65	$ 0.0	$ 0.0
2011	121	107	2.3%	$ 585	$ 177	$ 65	$ 0.1	$ 0.0
2012	159	137	1.9%	$ 595	$ 181	$ 65	$ 0.1	$ 0.0
2013	185	155	2.0%	$ 607	$ 184	$ 65	$ 0.1	$ 0.0
2014	210	171	2.0%	$ 619	$ 188	$ 65	$ 0.1	$ 0.0
2015	267	211	1.8%	$ 630	$ 191	$ 65	$ 0.1	$ 0.1
2016	300	230	1.7%	$ 641	$ 194	$ 65	$ 0.2	$ 0.1
2017	374	279	1.7%	$ 651	$ 198	$ 65	$ 0.2	$ 0.1
2018	397	287	1.7%	$ 662	$ 201	$ 65	$ 0.2	$ 0.1
2019	530	372	1.7%	$ 673	$ 204	$ 65	$ 0.3	$ 0.1
2020	566	385	1.7%	$ 684	$ 208	$ 65	$ 0.3	$ 0.1
2021	608	402	1.7%	$ 696	$ 211	$ 65	$ 0.3	$ 0.1
2022	627	402	1.7%	$ 708	$ 215	$ 65	$ 0.3	$ 0.1
2023	679	423	1.7%	$ 720	$ 218	$ 65	$ 0.3	$ 0.1
2024	752	455	1.7%	$ 732	$ 222	$ 65	$ 0.4	$ 0.1
2025	767	451	1.7%	$ 744	$ 226	$ 65	$ 0.4	$ 0.1
2026	819	467	1.7%	$ 757	$ 230	$ 65	$ 0.4	$ 0.1
2027	835	462	1.7%	$ 770	$ 234	$ 65	$ 0.4	$ 0.1
2028	901	484	1.7%	$ 783	$ 238	$ 65	$ 0.4	$ 0.1
2029	929	485	1.7%	$ 797	$ 242	$ 65	$ 0.4	$ 0.1
2030	954	483	1.7%	$ 810	$ 246	$ 65	$ 0.4	$ 0.2
2031	1,056	520	1.7%	$ 824	$ 250	$ 65	$ 0.5	$ 0.2
						25 Year PV	$ 4	$ 1
						25 Year Annualized Value	$ 0.2	$ 0.1

Note: Values are in 2003$. A decrement for rotavirus illness was the best available data for Type A illnesses as well as Type B, and is used as a low estimate for Type B Illnesses, which are known to be generally more severe than those of Type A. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12c Cost Adjustment for Type A Illness, Alternative 2, 3 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.03^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 243	$ 63	$ 19	$ -	$ -
2008	-	-	2.3%	$ 249	$ 65	$ 19	$ -	$ -
2009	-	-	3.9%	$ 259	$ 66	$ 19	$ -	$ -
2010	10,626	9,724	3.3%	$ 267	$ 68	$ 19	$ 3	$ 1
2011	18,737	16,647	2.3%	$ 274	$ 70	$ 19	$ 5	$ 1
2012	27,973	24,130	1.9%	$ 279	$ 71	$ 19	$ 7	$ 2
2013	31,950	26,758	2.0%	$ 284	$ 73	$ 19	$ 8	$ 2
2014	35,297	28,699	2.0%	$ 290	$ 74	$ 19	$ 9	$ 3
2015	39,013	30,797	1.8%	$ 295	$ 76	$ 19	$ 10	$ 3
2016	40,828	31,291	1.7%	$ 300	$ 78	$ 19	$ 10	$ 3
2017	42,864	31,895	1.7%	$ 305	$ 80	$ 19	$ 10	$ 3
2018	44,080	31,845	1.7%	$ 310	$ 82	$ 19	$ 10	$ 3
2019	46,196	32,401	1.7%	$ 315	$ 83	$ 19	$ 11	$ 3
2020	47,826	32,567	1.7%	$ 320	$ 85	$ 19	$ 11	$ 3
2021	48,872	32,310	1.7%	$ 326	$ 87	$ 19	$ 11	$ 3
2022	50,247	32,252	1.7%	$ 331	$ 89	$ 19	$ 11	$ 4
2023	51,328	31,986	1.7%	$ 337	$ 91	$ 19	$ 11	$ 4
2024	52,978	32,052	1.7%	$ 342	$ 94	$ 19	$ 12	$ 4
2025	53,835	31,623	1.7%	$ 348	$ 96	$ 19	$ 12	$ 4
2026	55,032	31,384	1.7%	$ 354	$ 98	$ 19	$ 12	$ 4
2027	55,931	30,968	1.7%	$ 360	$ 100	$ 19	$ 12	$ 4
2028	56,936	30,606	1.7%	$ 366	$ 102	$ 19	$ 12	$ 4
2029	57,935	30,236	1.7%	$ 373	$ 105	$ 19	$ 12	$ 4
2030	58,442	29,612	1.7%	$ 379	$ 107	$ 19	$ 12	$ 4
2031	59,126	29,086	1.7%	$ 386	$ 110	$ 19	$ 12	$ 4
25 Year PV							$ 142	$ 44
25 Year Annualized Value							$ 8	$ 3

Notes: Values are in 2003$. In the Ground Water Rule EA, rotavirus is used as a representative illness for the Type A Viruses. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12d Cost Adjustment for Type B Illness, Alternative 2, 3 Percent Discount Rate

Year *n*	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment ECOI	Cost Adjustment TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
	–	B = A/1.03^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 520	$ 158	$ 65	$ -	$ -
2008	-	-	2.3%	$ 532	$ 162	$ 65	$ -	$ -
2009	-	-	3.9%	$ 553	$ 168	$ 65	$ -	$ -
2010	746	683	3.3%	$ 571	$ 173	$ 65	$ 0	$ 0.2
2011	1,277	1,134	2.3%	$ 585	$ 177	$ 65	$ 1	$ 0.3
2012	1,735	1,497	1.9%	$ 595	$ 181	$ 65	$ 1	$ 0.4
2013	1,935	1,620	2.0%	$ 607	$ 184	$ 65	$ 1	$ 0.4
2014	2,082	1,693	2.0%	$ 619	$ 188	$ 65	$ 1	$ 0.4
2015	2,332	1,841	1.8%	$ 630	$ 191	$ 65	$ 1	$ 0.5
2016	2,401	1,840	1.7%	$ 641	$ 194	$ 65	$ 1	$ 0.5
2017	2,619	1,949	1.7%	$ 651	$ 198	$ 65	$ 1	$ 0.5
2018	2,720	1,965	1.7%	$ 662	$ 201	$ 65	$ 1	$ 0.5
2019	2,892	2,028	1.7%	$ 673	$ 204	$ 65	$ 1	$ 0.5
2020	2,999	2,042	1.7%	$ 684	$ 208	$ 65	$ 2	$ 0.6
2021	3,058	2,022	1.7%	$ 696	$ 211	$ 65	$ 2	$ 0.6
2022	3,110	1,996	1.7%	$ 708	$ 215	$ 65	$ 2	$ 0.6
2023	3,165	1,972	1.7%	$ 720	$ 218	$ 65	$ 2	$ 0.6
2024	3,275	1,982	1.7%	$ 732	$ 222	$ 65	$ 2	$ 0.6
2025	3,340	1,962	1.7%	$ 744	$ 226	$ 65	$ 2	$ 0.6
2026	3,387	1,931	1.7%	$ 757	$ 230	$ 65	$ 2	$ 0.6
2027	3,441	1,905	1.7%	$ 770	$ 234	$ 65	$ 2	$ 0.6
2028	3,489	1,875	1.7%	$ 783	$ 238	$ 65	$ 2	$ 0.6
2029	3,518	1,836	1.7%	$ 797	$ 242	$ 65	$ 2	$ 0.6
2030	3,549	1,798	1.7%	$ 810	$ 246	$ 65	$ 2	$ 0.6
2031	3,583	1,763	1.7%	$ 824	$ 250	$ 65	$ 2	$ 0.6
						25 Year PV	$ 19	$ 7
						25 Year Annualized Value	$ 1	$ 0.4

Note: Values are in 2003$. A decrement for rotavirus illness was the best available data for Type A illnesses as well as Type B, and is used as a low estimate for Type B Illnesses, which are known to be generally more severe than those of Type A. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12e Cost Adjustment for Type A Illness, Alternative 3, 3 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	% Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment[1]	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.03^(*n*-2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 243	$ 63	$ 19	$ -	$ -
2008	-	-	2.3%	$ 249	$ 65	$ 19	$ -	$ -
2009	-	-	3.9%	$ 259	$ 67	$ 19	$ -	$ -
2010	10,626	9,724	3.3%	$ 267	$ 70	$ 19	$ 3	$ 1
2011	18,737	16,647	2.3%	$ 274	$ 71	$ 19	$ 5	$ 2
2012	31,833	27,459	1.9%	$ 279	$ 73	$ 19	$ 8	$ 3
2013	35,930	30,090	2.0%	$ 284	$ 74	$ 19	$ 9	$ 3
2014	40,114	32,616	2.0%	$ 290	$ 76	$ 19	$ 10	$ 3
2015	43,765	34,549	1.8%	$ 295	$ 77	$ 19	$ 11	$ 3
2016	45,483	34,859	1.7%	$ 300	$ 78	$ 19	$ 11	$ 3
2017	47,364	35,243	1.7%	$ 305	$ 79	$ 19	$ 11	$ 3
2018	48,651	35,147	1.7%	$ 310	$ 81	$ 19	$ 12	$ 4
2019	50,657	35,530	1.7%	$ 315	$ 82	$ 19	$ 12	$ 4
2020	52,189	35,538	1.7%	$ 320	$ 84	$ 19	$ 12	$ 4
2021	53,203	35,173	1.7%	$ 326	$ 85	$ 19	$ 12	$ 4
2022	54,534	35,003	1.7%	$ 331	$ 86	$ 19	$ 12	$ 4
2023	55,553	34,619	1.7%	$ 337	$ 88	$ 19	$ 12	$ 4
2024	57,115	34,556	1.7%	$ 342	$ 89	$ 19	$ 13	$ 4
2025	57,957	34,044	1.7%	$ 348	$ 91	$ 19	$ 13	$ 4
2026	59,060	33,681	1.7%	$ 354	$ 92	$ 19	$ 13	$ 4
2027	59,979	33,209	1.7%	$ 360	$ 94	$ 19	$ 13	$ 4
2028	60,921	32,748	1.7%	$ 366	$ 96	$ 19	$ 13	$ 4
2029	61,908	32,309	1.7%	$ 373	$ 97	$ 19	$ 13	$ 4
2030	62,351	31,593	1.7%	$ 379	$ 99	$ 19	$ 13	$ 4
2031	62,971	30,978	1.7%	$ 386	$ 101	$ 19	$ 13	$ 4
						25 Year PV	$ 154	$ 47
						25 Year Annualized Value	$ 9	$ 3

Notes: Values are in 2003$. In the Ground Water Rule EA, rotavirus is used as a representative illness for the Type A Viruses. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12f Cost Adjustment for Type B Illness, Alternative 3, 3 Percent Discount Rate

Year *n*	Undiscounted Cases Avoided	Discounted Cases Avoided	% Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment ECOI	Cost Adjustment TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
	–	B = A/1.03^(*n*-2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 520	$ 158	$ 65	$ -	$ -
2008	-	-	2.3%	$ 532	$ 162	$ 65	$ -	$ -
2009	-	-	3.9%	$ 553	$ 168	$ 65	$ -	$ -
2010	746	683	3.3%	$ 571	$ 173	$ 65	$ 0	$ 0
2011	1,277	1,134	2.3%	$ 585	$ 177	$ 65	$ 1	$ 0
2012	1,949	1,681	1.9%	$ 595	$ 181	$ 65	$ 1	$ 0
2013	2,147	1,798	2.0%	$ 607	$ 184	$ 65	$ 1	$ 0
2014	2,301	1,871	2.0%	$ 619	$ 188	$ 65	$ 1	$ 0
2015	2,545	2,009	1.8%	$ 630	$ 191	$ 65	$ 1	$ 1
2016	2,616	2,005	1.7%	$ 641	$ 194	$ 65	$ 1	$ 1
2017	2,819	2,098	1.7%	$ 651	$ 198	$ 65	$ 2	$ 1
2018	2,925	2,113	1.7%	$ 662	$ 201	$ 65	$ 2	$ 1
2019	3,099	2,173	1.7%	$ 673	$ 204	$ 65	$ 2	$ 1
2020	3,204	2,182	1.7%	$ 684	$ 208	$ 65	$ 2	$ 1
2021	3,261	2,156	1.7%	$ 696	$ 211	$ 65	$ 2	$ 1
2022	3,313	2,127	1.7%	$ 708	$ 215	$ 65	$ 2	$ 1
2023	3,355	2,091	1.7%	$ 720	$ 218	$ 65	$ 2	$ 1
2024	3,458	2,092	1.7%	$ 732	$ 222	$ 65	$ 2	$ 1
2025	3,521	2,068	1.7%	$ 744	$ 226	$ 65	$ 2	$ 1
2026	3,567	2,034	1.7%	$ 757	$ 230	$ 65	$ 2	$ 1
2027	3,619	2,004	1.7%	$ 770	$ 234	$ 65	$ 2	$ 1
2028	3,673	1,975	1.7%	$ 783	$ 238	$ 65	$ 2	$ 1
2029	3,701	1,931	1.7%	$ 797	$ 242	$ 65	$ 2	$ 1
2030	3,723	1,887	1.7%	$ 810	$ 246	$ 65	$ 2	$ 1
2031	3,753	1,846	1.7%	$ 824	$ 250	$ 65	$ 2	$ 1
						25 Year PV	$ 21	$ 7
						25 Year Annualized Value	$ 1	$ 0

Note: Values are in 2003$. A decrement for rotavirus illness was the best available data for Type A illnesses as well as Type B, and is used as a low estimate for Type B Illnesses, which are known to be generally more severe than those of Type A. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12g Cost Adjustment for Type A Illness, Alternative 4, 3 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.03^(*n*-2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 243	$ 63	$ 19	$ -	$ -
2008	-	-	2.3%	$ 249	$ 65	$ 19	$ -	$ -
2009	-	-	3.9%	$ 259	$ 67	$ 19	$ -	$ -
2010	-	-	3.3%	$ 267	$ 70	$ 19	$ -	$ -
2011	174,849	155,351	2.3%	$ 274	$ 71	$ 19	$ 45	$ 14
2012	174,849	150,826	1.9%	$ 279	$ 73	$ 19	$ 45	$ 14
2013	174,849	146,433	2.0%	$ 284	$ 74	$ 19	$ 44	$ 14
2014	174,849	142,168	2.0%	$ 290	$ 76	$ 19	$ 44	$ 13
2015	174,849	138,027	1.8%	$ 295	$ 77	$ 19	$ 43	$ 13
2016	174,849	134,007	1.7%	$ 300	$ 78	$ 19	$ 43	$ 13
2017	174,849	130,104	1.7%	$ 305	$ 79	$ 19	$ 42	$ 13
2018	174,849	126,314	1.7%	$ 310	$ 81	$ 19	$ 42	$ 13
2019	174,849	122,635	1.7%	$ 315	$ 82	$ 19	$ 41	$ 12
2020	174,849	119,063	1.7%	$ 320	$ 84	$ 19	$ 40	$ 12
2021	174,849	115,596	1.7%	$ 326	$ 85	$ 19	$ 40	$ 12
2022	174,849	112,229	1.7%	$ 331	$ 86	$ 19	$ 39	$ 12
2023	174,849	108,960	1.7%	$ 337	$ 88	$ 19	$ 39	$ 12
2024	174,849	105,786	1.7%	$ 342	$ 89	$ 19	$ 38	$ 11
2025	174,849	102,705	1.7%	$ 348	$ 91	$ 19	$ 38	$ 11
2026	174,849	99,714	1.7%	$ 354	$ 92	$ 19	$ 37	$ 11
2027	174,849	96,810	1.7%	$ 360	$ 94	$ 19	$ 37	$ 11
2028	174,849	93,990	1.7%	$ 366	$ 96	$ 19	$ 36	$ 11
2029	174,849	91,252	1.7%	$ 373	$ 97	$ 19	$ 36	$ 11
2030	174,849	88,594	1.7%	$ 379	$ 99	$ 19	$ 35	$ 10
2031	174,849	86,014	1.7%	$ 386	$ 101	$ 19	$ 35	$ 10
25 Year PV							$ 556	$ 169
25 Year Annualized Value							$ 32	$ 10

Notes: Values are in 2003$. In the Ground Water Rule EA, rotavirus is used as a representative illness for the Type A Viruses. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12h Cost Adjustment for Type B Illness, Alternative 4, 3 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.03^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 520	$ 158	$ 65	$ -	$ -
2008	-	-	2.3%	$ 532	$ 162	$ 65	$ -	$ -
2009	-	-	3.9%	$ 553	$ 168	$ 65	$ -	$ -
2010	0	0	3.3%	$ 571	$ 173	$ 65	$ -	$ -
2011	10,011	8,895	2.3%	$ 585	$ 177	$ 65	$ 6	$ 2
2012	10,011	8,636	1.9%	$ 595	$ 181	$ 65	$ 6	$ 2
2013	10,011	8,384	2.0%	$ 607	$ 184	$ 65	$ 6	$ 2
2014	10,011	8,140	2.0%	$ 619	$ 188	$ 65	$ 6	$ 2
2015	10,011	7,903	1.8%	$ 630	$ 191	$ 65	$ 5	$ 2
2016	10,011	7,673	1.7%	$ 641	$ 194	$ 65	$ 5	$ 2
2017	10,011	7,449	1.7%	$ 651	$ 198	$ 65	$ 5	$ 2
2018	10,011	7,232	1.7%	$ 662	$ 201	$ 65	$ 5	$ 2
2019	10,011	7,022	1.7%	$ 673	$ 204	$ 65	$ 5	$ 2
2020	10,011	6,817	1.7%	$ 684	$ 208	$ 65	$ 5	$ 2
2021	10,011	6,619	1.7%	$ 696	$ 211	$ 65	$ 5	$ 2
2022	10,011	6,426	1.7%	$ 708	$ 215	$ 65	$ 5	$ 2
2023	10,011	6,239	1.7%	$ 720	$ 218	$ 65	$ 5	$ 2
2024	10,011	6,057	1.7%	$ 732	$ 222	$ 65	$ 5	$ 2
2025	10,011	5,881	1.7%	$ 744	$ 226	$ 65	$ 5	$ 2
2026	10,011	5,709	1.7%	$ 757	$ 230	$ 65	$ 5	$ 2
2027	10,011	5,543	1.7%	$ 770	$ 234	$ 65	$ 5	$ 2
2028	10,011	5,382	1.7%	$ 783	$ 238	$ 65	$ 5	$ 2
2029	10,011	5,225	1.7%	$ 797	$ 242	$ 65	$ 4	$ 2
2030	10,011	5,073	1.7%	$ 810	$ 246	$ 65	$ 4	$ 2
2031	10,011	4,925	1.7%	$ 824	$ 250	$ 65	$ 4	$ 2
						25 Year PV	$ 70	$ 26
						25 Year Annualized Value	$ 4	$ 1

Note: Values are in 2003$. A decrement for rotavirus illness was the best available data for Type A illnesses as well as Type B, and is used as a low estimate for Type B Illnesses, which are known to be generally more severe than those of Type A. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12i Cost Adjustment for Type A Illness, Alternative 1, 7 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment ECOI	Cost Adjustment TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.07^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 243	$ 63	$ 19	$ -	$ -
2008	-	-	2.3%	$ 249	$ 65	$ 19	$ -	$ -
2009	-	-	3.9%	$ 259	$ 67	$ 19	$ -	$ -
2010	768	627	3.3%	$ 267	$ 70	$ 19	$ 0	$ 0
2011	1,667	1,271	2.3%	$ 274	$ 71	$ 19	$ 0	$ 0
2012	2,371	1,690	1.9%	$ 279	$ 73	$ 19	$ 1	$ 0
2013	3,064	2,042	2.0%	$ 284	$ 74	$ 19	$ 1	$ 0
2014	3,715	2,314	2.0%	$ 290	$ 76	$ 19	$ 1	$ 0
2015	4,397	2,559	1.8%	$ 295	$ 77	$ 19	$ 1	$ 0
2016	5,001	2,720	1.7%	$ 300	$ 78	$ 19	$ 1	$ 0
2017	5,836	2,967	1.7%	$ 305	$ 79	$ 19	$ 1	$ 0
2018	6,330	3,007	1.7%	$ 310	$ 81	$ 19	$ 1	$ 0
2019	6,825	3,031	1.7%	$ 315	$ 82	$ 19	$ 1	$ 0
2020	7,484	3,106	1.7%	$ 320	$ 84	$ 19	$ 1	$ 0
2021	8,147	3,160	1.7%	$ 326	$ 85	$ 19	$ 1	$ 0
2022	8,719	3,160	1.7%	$ 331	$ 86	$ 19	$ 1	$ 0
2023	9,514	3,223	1.7%	$ 337	$ 88	$ 19	$ 1	$ 0
2024	10,209	3,232	1.7%	$ 342	$ 89	$ 19	$ 1	$ 0
2025	10,829	3,204	1.7%	$ 348	$ 91	$ 19	$ 1	$ 0
2026	11,739	3,246	1.7%	$ 354	$ 92	$ 19	$ 1	$ 0
2027	12,191	3,151	1.7%	$ 360	$ 94	$ 19	$ 1	$ 0
2028	13,037	3,149	1.7%	$ 366	$ 96	$ 19	$ 1	$ 0
2029	13,799	3,115	1.7%	$ 373	$ 97	$ 19	$ 1	$ 0
2030	14,431	3,044	1.7%	$ 379	$ 99	$ 19	$ 1	$ 0
2031	15,279	3,012	1.7%	$ 386	$ 101	$ 19	$ 1	$ 0
25 Year PV							$ 13	$ 4
25 Year Annualized Value							$ 1	$ 0

Notes: Values are in 2003$. In the Ground Water Rule EA, rotavirus is used as a representative illness for the Type A Viruses. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12j Cost Adjustment for Type B Illness, Alternative 1, 7 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.07^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 520	$ 158	$ 65	$ -	$ -
2008	-	-	2.3%	$ 532	$ 162	$ 65	$ -	$ -
2009	-	-	3.9%	$ 553	$ 168	$ 65	$ -	$ -
2010	36	30	3.3%	$ 571	$ 173	$ 65	$ 0.0	$ 0.01
2011	121	92	2.3%	$ 585	$ 177	$ 65	$ 0.1	$ 0.02
2012	159	113	1.9%	$ 595	$ 181	$ 65	$ 0.1	$ 0.03
2013	185	123	2.0%	$ 607	$ 184	$ 65	$ 0.1	$ 0.03
2014	210	131	2.0%	$ 619	$ 188	$ 65	$ 0.1	$ 0.03
2015	267	156	1.8%	$ 630	$ 191	$ 65	$ 0.1	$ 0.04
2016	300	163	1.7%	$ 641	$ 194	$ 65	$ 0.1	$ 0.04
2017	374	190	1.7%	$ 651	$ 198	$ 65	$ 0.1	$ 0.05
2018	397	188	1.7%	$ 662	$ 201	$ 65	$ 0.1	$ 0.05
2019	530	235	1.7%	$ 673	$ 204	$ 65	$ 0.2	$ 0.06
2020	566	235	1.7%	$ 684	$ 208	$ 65	$ 0.2	$ 0.06
2021	608	236	1.7%	$ 696	$ 211	$ 65	$ 0.2	$ 0.07
2022	627	227	1.7%	$ 708	$ 215	$ 65	$ 0.2	$ 0.06
2023	679	230	1.7%	$ 720	$ 218	$ 65	$ 0.2	$ 0.07
2024	752	238	1.7%	$ 732	$ 222	$ 65	$ 0.2	$ 0.07
2025	767	227	1.7%	$ 744	$ 226	$ 65	$ 0.2	$ 0.07
2026	819	227	1.7%	$ 757	$ 230	$ 65	$ 0.2	$ 0.07
2027	835	216	1.7%	$ 770	$ 234	$ 65	$ 0.2	$ 0.06
2028	901	217	1.7%	$ 783	$ 238	$ 65	$ 0.2	$ 0.07
2029	929	210	1.7%	$ 797	$ 242	$ 65	$ 0.2	$ 0.06
2030	954	201	1.7%	$ 810	$ 246	$ 65	$ 0.2	$ 0.06
2031	1,056	208	1.7%	$ 824	$ 250	$ 65	$ 0.2	$ 0.07
						25 Year PV	$ 2	$ 1
						25 Year Annualized Value	$ 0.11	$ 0.04

Note: Values are in 2003$. A decrement for rotavirus illness was the best available data for Type A illnesses as well as Type B, and is used as a low estimate for Type B Illnesses, which are known to be generally more severe than those of Type A. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12k Cost Adjustment for Type A Illness, Alternative 2, 7 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.07^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 243	$ 63	$ 19	$ -	$ -
2008	-	-	2.3%	$ 249	$ 65	$ 19	$ -	$ -
2009	-	-	3.9%	$ 259	$ 67	$ 19	$ -	$ -
2010	10,626	8,674	3.3%	$ 267	$ 70	$ 19	$ 2	$ 1
2011	18,737	14,294	2.3%	$ 274	$ 71	$ 19	$ 4	$ 1
2012	27,973	19,945	1.9%	$ 279	$ 73	$ 19	$ 6	$ 2
2013	31,950	21,290	2.0%	$ 284	$ 74	$ 19	$ 6	$ 2
2014	35,297	21,981	2.0%	$ 290	$ 76	$ 19	$ 7	$ 2
2015	39,013	22,706	1.8%	$ 295	$ 77	$ 19	$ 7	$ 2
2016	40,828	22,207	1.7%	$ 300	$ 78	$ 19	$ 7	$ 2
2017	42,864	21,790	1.7%	$ 305	$ 79	$ 19	$ 7	$ 2
2018	44,080	20,942	1.7%	$ 310	$ 81	$ 19	$ 7	$ 2
2019	46,196	20,512	1.7%	$ 315	$ 82	$ 19	$ 7	$ 2
2020	47,826	19,846	1.7%	$ 320	$ 84	$ 19	$ 7	$ 2
2021	48,872	18,953	1.7%	$ 326	$ 85	$ 19	$ 7	$ 2
2022	50,247	18,212	1.7%	$ 331	$ 86	$ 19	$ 6	$ 2
2023	51,328	17,387	1.7%	$ 337	$ 88	$ 19	$ 6	$ 2
2024	52,978	16,771	1.7%	$ 342	$ 89	$ 19	$ 6	$ 2
2025	53,835	15,928	1.7%	$ 348	$ 91	$ 19	$ 6	$ 2
2026	55,032	15,217	1.7%	$ 354	$ 92	$ 19	$ 6	$ 2
2027	55,931	14,454	1.7%	$ 360	$ 94	$ 19	$ 5	$ 2
2028	56,936	13,751	1.7%	$ 366	$ 96	$ 19	$ 5	$ 2
2029	57,935	13,077	1.7%	$ 373	$ 97	$ 19	$ 5	$ 2
2030	58,442	12,328	1.7%	$ 379	$ 99	$ 19	$ 5	$ 1
2031	59,126	11,656	1.7%	$ 386	$ 101	$ 19	$ 5	$ 1
						25 Year PV	$ 86	$ 26
						25 Year Annualized Value	$ 5	$ 2

Notes: Values are in 2003$. In the Ground Water Rule EA, rotavirus is used as a representative illness for the Type A Viruses. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12l Cost Adjustment for Type B Illness, Alternative 2, 7 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.07^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 520	$ 158	$ 65	$ -	$ -
2008	-	-	2.3%	$ 532	$ 162	$ 65	$ -	$ -
2009	-	-	3.9%	$ 553	$ 168	$ 65	$ -	$ -
2010	746	609	3.3%	$ 571	$ 173	$ 65	$ 0	$ 0.1
2011	1,277	974	2.3%	$ 585	$ 177	$ 65	$ 1	$ 0.2
2012	1,735	1,237	1.9%	$ 595	$ 181	$ 65	$ 1	$ 0.3
2013	1,935	1,289	2.0%	$ 607	$ 184	$ 65	$ 1	$ 0.3
2014	2,082	1,297	2.0%	$ 619	$ 188	$ 65	$ 1	$ 0.3
2015	2,332	1,357	1.8%	$ 630	$ 191	$ 65	$ 1	$ 0.3
2016	2,401	1,306	1.7%	$ 641	$ 194	$ 65	$ 1	$ 0.3
2017	2,619	1,331	1.7%	$ 651	$ 198	$ 65	$ 1	$ 0.3
2018	2,720	1,292	1.7%	$ 662	$ 201	$ 65	$ 1	$ 0.3
2019	2,892	1,284	1.7%	$ 673	$ 204	$ 65	$ 1	$ 0.3
2020	2,999	1,244	1.7%	$ 684	$ 208	$ 65	$ 1	$ 0.3
2021	3,058	1,186	1.7%	$ 696	$ 211	$ 65	$ 1	$ 0.3
2022	3,110	1,127	1.7%	$ 708	$ 215	$ 65	$ 1	$ 0.3
2023	3,165	1,072	1.7%	$ 720	$ 218	$ 65	$ 1	$ 0.3
2024	3,275	1,037	1.7%	$ 732	$ 222	$ 65	$ 1	$ 0.3
2025	3,340	988	1.7%	$ 744	$ 226	$ 65	$ 1	$ 0.3
2026	3,387	936	1.7%	$ 757	$ 230	$ 65	$ 1	$ 0.3
2027	3,441	889	1.7%	$ 770	$ 234	$ 65	$ 1	$ 0.3
2028	3,489	843	1.7%	$ 783	$ 238	$ 65	$ 1	$ 0.3
2029	3,518	794	1.7%	$ 797	$ 242	$ 65	$ 1	$ 0.2
2030	3,549	749	1.7%	$ 810	$ 246	$ 65	$ 1	$ 0.2
2031	3,583	706	1.7%	$ 824	$ 250	$ 65	$ 1	$ 0.2
						25 Year PV	$ 12	$ 4
						25 Year Annualized Value	$ 1	$ 0.2

Note: Values are in 2003$. A decrement for rotavirus illness was the best available data for Type A illnesses as well as Type B, and is used as a low estimate for Type B Illnesses, which are known to be generally more severe than those of Type A. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12m Cost Adjustment for Type A Illness, Alternative 3, 7 Percent Discount Rate

Year *n*	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
	–	B = A/1.07^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 243	$ 63	$ 19	$ -	$ -
2008	-	-	2.3%	$ 249	$ 65	$ 19	$ -	$ -
2009	-	-	3.9%	$ 259	$ 67	$ 19	$ -	$ -
2010	10,626	8,674	3.3%	$ 267	$ 70	$ 19	$ 2	$ 1
2011	18,737	14,294	2.3%	$ 274	$ 71	$ 19	$ 4	$ 1
2012	31,833	22,696	1.9%	$ 279	$ 73	$ 19	$ 7	$ 2
2013	35,930	23,941	2.0%	$ 284	$ 74	$ 19	$ 7	$ 2
2014	40,114	24,981	2.0%	$ 290	$ 76	$ 19	$ 8	$ 2
2015	43,765	25,472	1.8%	$ 295	$ 77	$ 19	$ 8	$ 2
2016	45,483	24,740	1.7%	$ 300	$ 78	$ 19	$ 8	$ 2
2017	47,364	24,077	1.7%	$ 305	$ 79	$ 19	$ 8	$ 2
2018	48,651	23,114	1.7%	$ 310	$ 81	$ 19	$ 8	$ 2
2019	50,657	22,492	1.7%	$ 315	$ 82	$ 19	$ 8	$ 2
2020	52,189	21,657	1.7%	$ 320	$ 84	$ 19	$ 7	$ 2
2021	53,203	20,633	1.7%	$ 326	$ 85	$ 19	$ 7	$ 2
2022	54,534	19,766	1.7%	$ 331	$ 86	$ 19	$ 7	$ 2
2023	55,553	18,818	1.7%	$ 337	$ 88	$ 19	$ 7	$ 2
2024	57,115	18,081	1.7%	$ 342	$ 89	$ 19	$ 7	$ 2
2025	57,957	17,147	1.7%	$ 348	$ 91	$ 19	$ 6	$ 2
2026	59,060	16,331	1.7%	$ 354	$ 92	$ 19	$ 6	$ 2
2027	59,979	15,500	1.7%	$ 360	$ 94	$ 19	$ 6	$ 2
2028	60,921	14,713	1.7%	$ 366	$ 96	$ 19	$ 6	$ 2
2029	61,908	13,973	1.7%	$ 373	$ 97	$ 19	$ 5	$ 2
2030	62,351	13,153	1.7%	$ 379	$ 99	$ 19	$ 5	$ 2
2031	62,971	12,415	1.7%	$ 386	$ 101	$ 19	$ 5	$ 1
						25 Year PV	$ 94	$ 29
						25 Year Annualized Value	$ 5	$ 2

Notes: Values are in 2003$. In the Ground Water Rule EA, rotavirus is used as a representative illness for the Type A Viruses. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12n Cost Adjustment for Type B Illness, Alternative 3, 7 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.07^(*n* -2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 520	$ 158	$ 65	$ -	$ -
2008	-	-	2.3%	$ 532	$ 162	$ 65	$ -	$ -
2009	-	-	3.9%	$ 553	$ 168	$ 65	$ -	$ -
2010	746	609	3.3%	$ 571	$ 173	$ 65	$ 0	$ 0.1
2011	1,277	974	2.3%	$ 585	$ 177	$ 65	$ 1	$ 0.2
2012	1,949	1,390	1.9%	$ 595	$ 181	$ 65	$ 1	$ 0.3
2013	2,147	1,430	2.0%	$ 607	$ 184	$ 65	$ 1	$ 0.4
2014	2,301	1,433	2.0%	$ 619	$ 188	$ 65	$ 1	$ 0.4
2015	2,545	1,482	1.8%	$ 630	$ 191	$ 65	$ 1	$ 0.4
2016	2,616	1,423	1.7%	$ 641	$ 194	$ 65	$ 1	$ 0.4
2017	2,819	1,433	1.7%	$ 651	$ 198	$ 65	$ 1	$ 0.4
2018	2,925	1,390	1.7%	$ 662	$ 201	$ 65	$ 1	$ 0.4
2019	3,099	1,376	1.7%	$ 673	$ 204	$ 65	$ 1	$ 0.4
2020	3,204	1,329	1.7%	$ 684	$ 208	$ 65	$ 1	$ 0.4
2021	3,261	1,265	1.7%	$ 696	$ 211	$ 65	$ 1	$ 0.3
2022	3,313	1,201	1.7%	$ 708	$ 215	$ 65	$ 1	$ 0.3
2023	3,355	1,137	1.7%	$ 720	$ 218	$ 65	$ 1	$ 0.3
2024	3,458	1,095	1.7%	$ 732	$ 222	$ 65	$ 1	$ 0.3
2025	3,521	1,042	1.7%	$ 744	$ 226	$ 65	$ 1	$ 0.3
2026	3,567	986	1.7%	$ 757	$ 230	$ 65	$ 1	$ 0.3
2027	3,619	935	1.7%	$ 770	$ 234	$ 65	$ 1	$ 0.3
2028	3,673	887	1.7%	$ 783	$ 238	$ 65	$ 1	$ 0.3
2029	3,701	835	1.7%	$ 797	$ 242	$ 65	$ 1	$ 0.3
2030	3,723	785	1.7%	$ 810	$ 246	$ 65	$ 1	$ 0.2
2031	3,753	740	1.7%	$ 824	$ 250	$ 65	$ 1	$ 0.2
						25 Year PV	$ 13	$ 5
						25 Year Annualized Value	$ 1	$ 0.3

Note: Values are in 2003$. A decrement for rotavirus illness was the best available data for Type A illnesses as well as Type B, and is used as a low estimate for Type B Illnesses, which are known to be generally more severe than those of Type A. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12o Cost Adjustment for Type A Illness, Alternative 4, 7 Percent Discount Rate

Year *n*	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
	–	B = A/1.07^(*n*-2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 243	$ 63	$ 19	$ -	$ -
2008	-	-	2.3%	$ 249	$ 65	$ 19	$ -	$ -
2009	-	-	3.9%	$ 259	$ 67	$ 19	$ -	$ -
2010	-	-	3.3%	$ 267	$ 70	$ 19	$ -	$ -
2011	174,849	133,391	2.3%	$ 274	$ 71	$ 19	$ 39	$ 12
2012	174,849	124,665	1.9%	$ 279	$ 73	$ 19	$ 37	$ 11
2013	174,849	116,509	2.0%	$ 284	$ 74	$ 19	$ 35	$ 11
2014	174,849	108,887	2.0%	$ 290	$ 76	$ 19	$ 34	$ 10
2015	174,849	101,764	1.8%	$ 295	$ 77	$ 19	$ 32	$ 10
2016	174,849	95,106	1.7%	$ 300	$ 78	$ 19	$ 30	$ 9
2017	174,849	88,884	1.7%	$ 305	$ 79	$ 19	$ 29	$ 9
2018	174,849	83,069	1.7%	$ 310	$ 81	$ 19	$ 27	$ 8
2019	174,849	77,635	1.7%	$ 315	$ 82	$ 19	$ 26	$ 8
2020	174,849	72,556	1.7%	$ 320	$ 84	$ 19	$ 25	$ 7
2021	174,849	67,809	1.7%	$ 326	$ 85	$ 19	$ 23	$ 7
2022	174,849	63,373	1.7%	$ 331	$ 86	$ 19	$ 22	$ 7
2023	174,849	59,227	1.7%	$ 337	$ 88	$ 19	$ 21	$ 6
2024	174,849	55,353	1.7%	$ 342	$ 89	$ 19	$ 20	$ 6
2025	174,849	51,731	1.7%	$ 348	$ 91	$ 19	$ 19	$ 6
2026	174,849	48,347	1.7%	$ 354	$ 92	$ 19	$ 18	$ 5
2027	174,849	45,184	1.7%	$ 360	$ 94	$ 19	$ 17	$ 5
2028	174,849	42,228	1.7%	$ 366	$ 96	$ 19	$ 16	$ 5
2029	174,849	39,466	1.7%	$ 373	$ 97	$ 19	$ 15	$ 5
2030	174,849	36,884	1.7%	$ 379	$ 99	$ 19	$ 15	$ 4
2031	174,849	34,471	1.7%	$ 386	$ 101	$ 19	$ 14	$ 4
						25 Year PV	$ 355	$ 108
						25 Year Annualized Value	$ 20	$ 6

Notes: Values are in 2003$. In the Ground Water Rule EA, rotavirus is used as a representative illness for the Type A Viruses. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

Exhibit H.12p Cost Adjustment for Type B Illness, Alternative 4, 7 Percent Discount Rate

	Undiscounted Cases Avoided	Discounted Cases Avoided	%Change in Income (Real GDP per Capita)	Lost Time w/Growth Factor (ECOI)	Lost Time w/Growth Factor (TCOI)	Direct Medical Costs	Cost Adjustment	
							ECOI	TCOI
	A	B	C	D	E	F	G	H
				($)			(Million $)	
Year *n*	–	B = A/1.07^(*n*-2006)	–	(1+C) * Prior Year's Lost Time		–	G = (B * (D + F))/10^6	G = (B * (E + F))/10^6
2007	-	-	Base Year	$ 520	$ 158	$ 65	$ -	$ -
2008	-	-	2.3%	$ 532	$ 162	$ 65	$ -	$ -
2009	-	-	3.9%	$ 553	$ 168	$ 65	$ -	$ -
2010	-	-	3.3%	$ 571	$ 173	$ 65	$ -	$ -
2011	10,011	7,638	2.3%	$ 585	$ 177	$ 65	$ 5	$ 2
2012	10,011	7,138	1.9%	$ 595	$ 181	$ 65	$ 5	$ 2
2013	10,011	6,671	2.0%	$ 607	$ 184	$ 65	$ 4	$ 2
2014	10,011	6,235	2.0%	$ 619	$ 188	$ 65	$ 4	$ 2
2015	10,011	5,827	1.8%	$ 630	$ 191	$ 65	$ 4	$ 1
2016	10,011	5,446	1.7%	$ 641	$ 194	$ 65	$ 4	$ 1
2017	10,011	5,089	1.7%	$ 651	$ 198	$ 65	$ 4	$ 1
2018	10,011	4,756	1.7%	$ 662	$ 201	$ 65	$ 3	$ 1
2019	10,011	4,445	1.7%	$ 673	$ 204	$ 65	$ 3	$ 1
2020	10,011	4,154	1.7%	$ 684	$ 208	$ 65	$ 3	$ 1
2021	10,011	3,883	1.7%	$ 696	$ 211	$ 65	$ 3	$ 1
2022	10,011	3,629	1.7%	$ 708	$ 215	$ 65	$ 3	$ 1
2023	10,011	3,391	1.7%	$ 720	$ 218	$ 65	$ 3	$ 1
2024	10,011	3,169	1.7%	$ 732	$ 222	$ 65	$ 3	$ 1
2025	10,011	2,962	1.7%	$ 744	$ 226	$ 65	$ 2	$ 1
2026	10,011	2,768	1.7%	$ 757	$ 230	$ 65	$ 2	$ 1
2027	10,011	2,587	1.7%	$ 770	$ 234	$ 65	$ 2	$ 1
2028	10,011	2,418	1.7%	$ 783	$ 238	$ 65	$ 2	$ 1
2029	10,011	2,260	1.7%	$ 797	$ 242	$ 65	$ 2	$ 1
2030	10,011	2,112	1.7%	$ 810	$ 246	$ 65	$ 2	$ 1
2031	10,011	1,974	1.7%	$ 824	$ 250	$ 65	$ 2	$ 1
						25 Year PV	$ 45	$ 16
						25 Year Annualized Value	$ 3	$ 1

Note: Values are in 2003$. A decrement for rotavirus illness was the best available data for Type A illnesses as well as Type B, and is used as a low estimate for Type B Illnesses, which are known to be generally more severe than those of Type A. Detail may not sum to totals due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase .

Sources: Column A: Ch. 5, Exhibit 5.16.

Column C: 2003 real GDP from Bureau of Economic Analysis, subsequent years calculated based on percent change projections from Congressional Budget Office (January 26, 2004). Projections for years beyond 2014 based on percent change reported for 2014 based on available information. Population projections used in assessing GDP on a per capital basis are from US Census Bureau (NP-T1: Middle Series).

Columns D, E: Base Year value from Exhibit 5.a; 2007 - 2030 values calculated as shown above.

Column F: Exhibit H.5.a

H.2.2.4 Calculating the net cost numerator

The Total Cost Adjustment in annualized terms was calculated for each regulatory alternative in Section H.2.2.3 (all values were annualized). Exhibit H.13 subtracts the Total Cost Adjustment specific to each alternative from the regulatory costs for that alternative, at 3 percent and 7 percent discount rates.

Using a 3 percent discount rate and the ECOI approach, the lowest Net Cost is associated with the least stringent alternative (Alternative 1) and the highest with the most stringent (Alternative 4). Results based upon TCOI approach exhibit a similar pattern.

Exhibit H.13 Net Cost for All Rule Alternatives, 3 and 7 Percent Discount Rates

Rule Alternative	Rule Cost	Cost Adjustment[1]				Net Cost	
		Type A Illness		Type B Illness			
		ECOI	TCOI	ECOI	TCOI	ECOI	TCOI
	(Million $)						
	A	B	C	D	E	F = A - (B+D)	G = A - (C+E)
	3 Percent						
A1	$ 15	$ 1	$ 0	$ 0	$ 0	$ 14	$ 15
A2	$ 62	$ 8	$ 3	$ 1	$ 0	$ 53	$ 59
A3	$ 68	$ 9	$ 3	$ 1	$ 0	$ 58	$ 65
A4	$ 686	$ 32	$ 10	$ 4	$ 1	$ 650	$ 675
	7 Percent						
A1	$ 15	$ 1	$ 0	$ 0	$ 0	$ 14	$ 15
A2	$ 62	$ 5	$ 2	$ 1	$ 0	$ 57	$ 61
A3	$ 69	$ 5	$ 2	$ 1	$ 0	$ 63	$ 67
A4	$ 665	$ 20	$ 6	$ 3	$ 1	$ 642	$ 658

Notes: Numbers are annualized. Detail may not sum to total due to independent rounding.

[1] A cost adjustment is the value of direct (medical) and indirect (time losses) costs that are saved when an illness of Type A or B is avoided. These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment to increase and the net rule cost to decrease .

Sources: Column A: Ch. 6, Exhibit 6.30
Columns B - E: Exhibits H.12a-o

H.2.3 Cost Effectiveness Based on Avoided Cases of Type A and Type B Illness

The CEA ratio is the average cost per MILY saved by each regulatory alternative. In Exhibit H.14, the Net Cost estimates developed in Section H.2.2 are divided by the MILYs saved for each alternative to yield this ratio. The cost per MILY ratios for the Final GWR and Alternative 3 are similar ($297,396 and $301,571 using the high decrement estimate, and $644,893 and $654,928 using the low decrement estimate, respectively; a 3 percent discount rate; and the ECOI approach). The cost per MILY of the Final GWR is approximately $4,000 to $11,000 (using high and low decrement estimates and the ECOI and TCOI approaches) less than that of Alternative 3, which is the next most cost effective option. Using a 7 percent discount rate and the ECOI or TCOI approach, the cost per MILY of the Final GWR is approximately $9,000 to $22,000 less than that of the next most cost effective option, Alternative 3. The cost per MILY of the Final GWR is approximately $157,000 to $328,000 less than the third most cost effective option, Alternative 1 (using high and low decrement estimates and the ECOI and TCOI approaches). The highest cost per MILY is associated with Alternative 4: approximately $963,000 to $2,200,000 per MILY using the high and low decrement estimates, a 3 percent discount rate, and the ECOI approach.

Although the U.S. Public Health Service Panel on Cost Effectiveness in Health and Medicine did not recommend a cost-effectiveness threshold for generalized use, it may be useful to identify cost thresholds that some have used in comparing life saving or quality-of-life-improving interventions. The Harvard Cost Utility Analysis database presents a median cost-utility ratio of $31,000 per QALY (or MILY) (2002$) for respiratory and cardiovascular interventions, while Tengs et al. (1995) report a median cost per life-year saved for life-saving interventions of $48,000 (1993$). The health economics literature sometimes uses either $50,000 or $100,000 per QALY (or MILY) as a threshold, with ratios less than these values considered de facto cost effective. However, it is important to recognize that these thresholds are arbitrary values, often derived by reference to the cost per QALY for interventions that public health specialists agree are justified. In general, EPA recommends that decisions as to whether a specific control strategy is justified should be based on a complete comparison of benefits and costs. The cost per MILY ratios presented in this analysis are greater than these thresholds; however, these estimates do not consider nonquantified benefits.

In the primary analysis of this EA, the benefits are expected to extend beyond those quantified for Types A and B viral illnesses. Equivalently, if this analysis were to incorporate QALY decrements and account for additional viral or bacterial illnesses, the MILYs saved would increase. A discussion of nonquantified benefits is presented in Chapters 5 and 8 of this EA (sections 8.41 and 5.4.3). The estimated benefits from avoiding bacterial illnesses based on waterborne bacterial outbreak cases and associated hospitalization rates are estimated to be five times the benefits estimated in the primary analysis.

Cost effectiveness can be considered further with an incremental CEA, which describes how much additional benefit is saved per additional unit cost expended from one alternative to the next. The incremental gain (in MILYs) of a first alternative (in a series of increasingly stringent alternatives) is equivalent to the CEA ratio of that alternative and captures the large amount of benefits achieved by having a rule (compared to the status quo). The differences between subsequent rule alternatives are narrower by comparison. Alternatives 2 (the Final GWR), 3, and 4 show a pattern of increasing incremental cost with increasing stringency when using either the ECOI or TCOI approach and 3 and 7 percent discount rates. When comparing the incremental cost per MILY (Exhibit H.15) to the thresholds (i.e., $50,000 and $100,000) described above, each alternative is greater than these thresholds.

An additional analysis that can be performed is a breakeven analysis. This analysis uses the arbitrary threshold estimates discussed above ($50,000 and $100,000 per MILY) and the MILYs calculated in Section H.2.1.3 to calculate a maximum rule cost that would break even with the costs allowed by these thresholds. Exhibits H.16a-d present two estimates of the break even cost of the rule alternatives based on the lower and higher estimates of rotavirus illness decrements as discussed in section H.2.1; the lower, more stringent break even cost estimate reflects the lower (for less severe illness) rotavirus decrement estimate. For example, using a threshold of $100,000 per MILY expenditure and a 3 percent discount rate, a Final Rule cost lower than $8 million to $18 million (based on the lower and higher estimates, respectively, of a rotavirus illness decrement) would break even. At approximately $53 million and $59 million (using the ECOI and TCOI approaches, respectively), the net cost of the Final GWR is higher than this range. Similarly, the net costs for the other alternatives are higher than their break even costs.

For each of the cost effectiveness measures described above, the costs of the Final GWR and its alternatives A1, A3, and A4 are higher than the cost effective thresholds of $50,000 and $100,000 cost per MILY. However, the inclusion of benefits beyond the Type A and B viral illnesses could significantly increase the cost effectiveness of each alternative. In Chapters 5 and 8 of the EA, an estimate based only on avoided deaths and hospitalization costs for outbreaks of waterborne bacterial illness suggests an increase by a multiple 5 of the primary analysis benefits. The increase in cost effectiveness based on a fuller accounting of MILYs saved from additional illnesses avoided by the Final GWR and alternatives would not necessarily be directly equivalent to the increase in the primary benefits. However, the estimate of a portion of costs potentially avoided for bacterial illnesses indicates that the additional MILYs saved (and the increase in cost effectiveness) could be significant when other waterborne illnesses are considered.

Exhibit H.14a Cost Effectiveness Analysis By Rule Alternative, 3 Percent Discount Rate

	Net Rule Cost		MILYs [1]		Cost per MILY [1]			
					ECOI		TCOI	
	ECOI	TCOI	Low	High	Low	High	Low	High
	(Million $)		(Years)		($)			
Rule Alternative	A	B	C	D	E = A * 10^6/D	F = A * 10^6/C	E = B * 10^6/D	E = B * 10^6/C
A1	$ 14	$ 15	14	30	$ 453,911	$ 972,530	$ 488,941	$ 1,047,583
A2	$ 53	$ 59	81	177	$ 297,396	$ 644,893	$ 333,153	$ 722,430
A3	$ 58	$ 65	88	192	$ 301,571	$ 654,928	$ 337,688	$ 733,364
A4	$ 650	$ 675	309	675	$ 963,307	$ 2,102,460	$ 1,000,044	$ 2,182,638

Note: Values are annualized. Results shown are combined for Types A and B illnesses avoided.

[1] Results are based on a low and high QALY decrement for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). At the high end, they are consistent with FDA estimates based on expert judgement; having the low and high estimates provides a sensitivity analysis that allows for cases that cover a range in severity.

These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment (Ex. 12a-p) to increase. This would cause a decrease in net rule cost and the Cost per MILY (increasing the cost effectiveness of the Rule).

Sources: Columns A,B: Exhibit H.13
Columns C,D: Exhibit H.10

Exhibit H.14b Cost Effectiveness Analysis By Rule Alternative, 7 Percent Discount Rate

	Net Rule Cost		MILYs [1]		Cost per MILY [1]			
					ECOI		TCOI	
	ECOI	TCOI	Low	High	Low	High	Low	High
	(Million $)		(Years)		($)			
Rule Alternative	A	B	C	D	E = A * 10^6/C	F = A * 10^6/D	E = B * 10^6/C	E = B * 10^6/D
A1	$ 14	$ 15	11	25	$ 581,410	$ 1,268,781	$ 605,595	$ 1,321,558
A2	$ 57	$ 61	73	158	$ 359,042	$ 778,482	$ 383,582	$ 831,691
A3	$ 63	$ 67	79	172	$ 368,296	$ 800,181	$ 392,878	$ 853,588
A4	$ 642	$ 658	290	633	$ 1,015,469	$ 2,216,305	$ 1,040,460	$ 2,270,848

Note: Values are annualized. Results shown are combined for Types A and B illnesses avoided.

[1] Results are based on a low and high QALY decrement for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). At the high end, they are consistent with FDA estimates based on expert judgement; having the low and high estimates provides a sensitivity analysis that allows for cases that cover a range in severity.

These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment (Ex. 12a-p) to increase. This would cause a decrease in net rule cost and the Cost per MILY (increasing the cost effectiveness of the Rule).

Sources: Columns A,B: Exhibit H.13
Columns C,D: Exhibit H.10

Exhibit H.15a Incremental Cost Effectiveness Analysis By Rule Alternative, 3 Percent Discount Rate

	Net Cost		MILYs[1]		Incremental Net Cost		Incremental MILYs[1]		Incremental Cost per MILY[1]			
									ECOI		TCOI	
	ECOI	TCOI	Low	High	ECOI	TCOI	Low	High	Low	High	Low	High
	(Million $)		(Year *n*)		(Million $)		(Years)		($)			
Rule Alternative	A	B	C	D	$E = A_n - A_{(n-1)}$	$F = B_n - B_{(n-1)}$	$G = C_n - C_{(n-1)}$	$H = D_n - D_{(n-1)}$	$I=E*10^6/H$	$J=E*10^6/G$	M = F/H	N = F/G
A1	$ 14	$ 15	14	30	$ 14	$ 15	14	30	$ 453,911	$ 972,530	$ 488,941	$ 1,047,583
A2	$ 53	$ 59	81	177	$ 39	$ 44	67	146	$ 264,896	$ 575,864	$ 300,804	$ 653,924
A3	$ 58	$ 65	88	192	$ 5	$ 6	7	15	$ 350,422	$ 774,647	$ 390,760	$ 863,819
A4	$ 650	$ 675	309	675	$ 593	$ 610	221	483	$ 1,225,892	$ 2,680,863	$ 1,262,874	$ 2,761,738

Note: Values are annualized. Results shown are combined for Types A and B illnesses avoided.

[1] Results are based on a low and high QALY decrement for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). At the high end, they are consistent with FDA estimates based on expert judgement; having the low and high estimates provides a sensitivity analysis that allows for cases that cover a range in severity.

These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment (Ex. 12a-p) to increase. This would cause a decrease in net rule cost and the Incremental Net Cost per MILY (increasing the cost effectiveness of the Rule).

Sources: Columns A - D, Exhibit H.14a

Exhibit H.15b Incremental Cost Effectiveness Analysis By Rule Alternative, 7 Percent Discount Rate

	Net Cost		MILYs[1]		Incremental Net Cost		Incremental MILYs[1]		Incremental Cost per MILY[1]			
									ECOI		TCOI	
	ECOI	TCOI	Low	High	ECOI	TCOI	Low	High	Low	High	Low	High
	(Million $)		(Year *n*)		(Million $)		(Years)		($)			
Rule Alternative	A	B	C	D	$E = A_n - A_{(n-1)}$	$F = B_n - B_{(n-1)}$	$G = C_n - C_{(n-1)}$	$H = D_n - D_{(n-1)}$	I = E/H	J = E/G	M = F/H	N = F/G
A1	$ 14	$ 15	11	25	$ 14	$ 15	11	25	$ 581,410	$ 1,268,781	$ 605,595	$ 1,321,558
A2	$ 57	$ 61	73	158	$ 42	$ 46	61	133	$ 317,480	$ 687,541	$ 342,087	$ 740,831
A3	$ 63	$ 67	79	172	$ 7	$ 7	6	14	$ 473,999	$ 1,054,463	$ 499,043	$ 1,110,177
A4	$ 642	$ 658	290	633	$ 579	$ 591	211	461	$ 1,256,582	$ 2,747,203	$ 1,281,726	$ 2,802,173

Note: Values are annualized. Results shown are combined for Types A and B illnesses avoided.

[1] Results are based on a low and high QALY decrement for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). At the high end, they are consistent with FDA estimates based on expert judgement; having the low and high estimates provides a sensitivity analysis that allows for cases that cover a range in severity.

These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment (Ex. 12a-p) to increase. This would cause a decrease in net rule cost and the Incremental Net Cost per MILY (increasing the cost effectiveness of the Rule).

Sources: Columns A - D, Exhibit H.14b

Exhibit H.16a Breakeven Analysis By Rule Alternative, 3 Percent Discount Rate, $50,000 Per MILY Threshold

Rule Alternative	MILYs [1]		Breakeven Cost Assuming $50,000/MILY Threshold [1]		Net Cost	
	Low	High	Low	High	ECOI	TCOI
	(Years)		(Million $)			
	A	B	$C = \$50,000*A/10^6$	$D = \$50,000*B/10^6$	E	F
A1	14	30	$ 1	$ 2	$ 14	$ 15
A2	81	177	$ 4	$ 9	$ 53	$ 59
A3	88	192	$ 4	$ 10	$ 58	$ 65
A4	309	675	$ 15	$ 34	$ 650	$ 675

Note: Values are annualized. Results shown are combined for Types A and B illnesses avoided.

[1] Results are based on a low and high QALY decrement for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). At the high end, they are consistent with FDA estimates based on expert judgement; having the low and high estimates provides a sensitivity analysis that allows for cases that cover a range in severity.

These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment (Ex. 12a-p) to increase. This would cause an increase in MILYs, a decrease in net rule cost, and an increase in the breakeven cost (increasing the cost effectiveness of the Rule).

Sources: Columns A,B - Exhibit H.10; Columns E,F - Exhibit H.13

Exhibit H.16b Breakeven Analysis By Rule Alternative, 3 Percent Discount Rate, $100,000 Per MILY Threshold

Rule Alternative	MILYs [1]		Breakeven Cost Assuming $100,000/MILY Threshold [1]		Net Cost	
	Low	High	Low	High	ECOI	TCOI
	(Years)		(Million $)			
	A	B	$C = \$100,000*A/10^6$	$D = \$100,000*B/10^6$	E	F
A1	14	30	$ 1	$ 3	$ 14	$ 15
A2	81	177	$ 8	$ 18	$ 53	$ 59
A3	88	192	$ 9	$ 19	$ 58	$ 65
A4	309	675	$ 31	$ 68	$ 650	$ 675

Note: Values are annualized. Results shown are combined for Types A and B illnesses avoided.

[1] Results are based on a low and high QALY decrement for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). At the high end, they are consistent with FDA estimates based on expert judgement; having the low and high estimates provides a sensitivity analysis that allows for cases that cover a range in severity.

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Sources: Columns A,B - Exhibit H.10; Columns E,F - Exhibit H.13

Exhibit H.16c Breakeven Analysis By Rule Alternative, 7 Percent Discount Rate, $50,000 Per MILY Threshold

Rule Alternative	MILYs[1]		Breakeven Cost Assuming \$50,000/MILY Threshold[1]		Net Cost	
	Low	High	Low	High	ECOI	TCOI
	(Years)		(Million $)			
	A	B	$C=\$50,000*A/10^6$	$D=\$50,000*B/10^6$	E	G
A1	11	25	$ 1	$ 1	$ 14	$ 15
A2	73	158	$ 4	$ 8	$ 57	$ 61
A3	79	172	$ 4	$ 9	$ 63	$ 67
A4	290	633	$ 14	$ 32	$ 642	$ 658

Note: Values are annualized. Results shown are combined for Types A and B illnesses avoided.

[1] Results are based on a low and high QALY decrement for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). At the high end, they are consistent with FDA estimates based on expert judgement; having the low and high estimates provides a sensitivity analysis that allows for cases that cover a range in severity.

These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment (Ex. 12a-p) to increase. This would cause an increase in MILYs, a decrease in net rule cost, and an increase in the breakeven cost (increasing the cost effectiveness of the Rule).

Sources: Columns A,B - Exhibit H.10; Columns E,F - Exhibit H.13

Exhibit H.16d Breakeven Analysis By Rule Alternative, 7 Percent Discount Rate, $100,000 Per MILY Threshold

Rule Alternative	MILYs[1]		Breakeven Cost Assuming \$100,000/MILY Threshold[1]		Net Cost	
	Low	High	Low	High	ECOI	TCOI
	(Years)		(Million $)			
	A	B	$C = \$100,000*A/10^6$	$D = \$100,000*B/10^6$	E	F
A1	11	25	$ 1	$ 2	$ 14	$ 15
A2	73	158	$ 7	$ 16	$ 57	$ 61
A3	79	172	$ 8	$ 17	$ 63	$ 67
A4	290	633	$ 29	$ 63	$ 642	$ 658

Note: Values are annualized. Results shown are combined for Types A and B illnesses avoided.

[1] Results are based on a low and high QALY decrement for rotavirus-like symptoms presented in Cook et al. (1994). Cook et al. decrements ranged from 0.19 for the mildest case to 0.53 for the most severe (0.32 for the moderate cases). At the high end, they are consistent with FDA estimates based on expert judgement; having the low and high estimates provides a sensitivity analysis that allows for cases that cover a range in severity.

These estimates represent only the quantifiable benefits of the GWR. The unquantified benefits are expected to compose a significant portion of the overall benefits of the Rule (Section 5.4 of Ch. 5 of the EA) and would cause the Cost Adjustment (Ex. 12a-p) to increase. This would cause an increase in MILYs, a decrease in net rule cost, and an increase in the breakeven cost (increasing the cost effectiveness of the Rule).

Sources: Columns A,B - Exhibit H.10; Columns E,F - Exhibit H.13

H.3 Conclusions

In this CEA, the most protective alternative has the highest cost per MILY (Alternative 4). The Final Rule and Alternative 3 perform similarly by the measures of cost effectiveness presented in section H.2.3, although the Final Rule is slightly more cost effective than the Alternative 3.

Important considerations in reviewing the cost effectiveness of the rule include:

1) This CEA uses a quality of life decrement (for rotavirus illness) that underestimates the value of avoiding Type B illnesses (explained in Section H.2);

2) The nonquantified benefits, described in Ch. 5 of this EA, are also not included in this CEA (e.g., illness due to co-occurring pathogens which the GWR will avoid are not counted); and

3) The nonquantified benefits are estimated to be significant (See sections 8.41 and 5.4.3).

In the health field, where QALYs analysis was originally developed, a common usage for CEA measures is as an entry in a "league table" that ranks the relative cost-effectiveness of multiple interventions. The main difficulty in constructing such a table is ensuring consistency of methodology in all the values being compared. The variation in QALY decrements renders comparisons across rulemakings difficult to the extent that disparate QALY scales and decrements are used, as discussed in Section H.1.0.

In addition, while QALYs are used extensively in the economic evaluation of medical interventions (Gold et al., 1996), they have not been widely used in evaluating environmental health regulations. A number of specific issues arise with the use of QALYs in evaluating environmental programs that affect a broad and heterogeneous population and that provide both health and nonhealth benefits. The U.S. Public Health Service report on cost-effectiveness in health and medicine notes the following:

> For decisions that involve greater diversity in interventions and the people to whom they apply, cost-effectiveness ratios continue to provide essential information, but that information must, to a greater degree, be evaluated in light of circumstances and values that cannot be included in the analysis. Individuals in the population will differ widely in their health and disability before the intervention, or in age, wealth, or other characteristics, raising questions about how society values gains for the more and less healthy, for young and old, for rich and poor, and so on. The assumption that all QALYs are of equal value is less likely to be reasonable in this context. (Gold et al., 1996, p. 11)

The use of QALYs (and MILYs) as a measure of effectiveness for environmental regulations is still developing, and while this analysis provides one such framework, the Agency notes that there are clearly many issues, both scientific and ethical, that need to be addressed with additional research.

Appendix I

Analysis of Total Coliform Hit Rates in Drinking Water Systems with Ground Water Sources

Appendix I
Analysis of Total Coliform Hit Rates in Drinking Water Systems With Ground Water Sources

I.1 Introduction

The frequency of samples that test positive for total coliform (TC+) in ground water, in the United States is an important driver in the analysis of the economic costs and benefits associated with the new Ground Water Rule (GWR). This Appendix is intended to expand upon the methodologies used to assess this frequency. The analyses described below use data collected as part of the Data Verification (DV) project, which verifies PWSs' data reported to the Federal Safe Drinking Water Information System (SDWIS/Fed). The state files collected during field visits to state offices report the number of total coliform samples taken to comply with the Total Coliform Rule (TCR) and the number that tested positive for total coliform. This project therefore provides an ideal source of data to estimate the frequency of TC+ test results in ground water used for drinking water, by system type and population served.

I.2 DV System Sampling and Data Collection Procedure

I.2.1 DV Study Purpose and Scope

Every public water system is required to submit data collection information to the Federal Safe Drinking Water Information System (SDWIS/Fed). To ensure accurate reporting of data, the DV Project verifies the information submitted to SDWIS/Fed by comparing it to the actual state files and databases. The SDWIS/Fed does capture the number of TC+ samples, but it does not capture the number of total samples taken. This information is collected, however, as part of the Data Verification field visits. Contractor staff conduct DV site visits to a portion of states each year, averaging about 15 states over each of the past few years, and have conducted DVs on United States territories and some direct implementation[1] (DI) programs, such as Region 8's DI program for Wyoming and Region 9's tribal DI program. The records of a stratified random sample of public water systems are reviewed during each visit.

I.2.2 Data Capture Forms and Data Collection

The development of a standardized "data capture" form for collecting TCR compliance data (a sample of a completed form is shown in Exhibit I.1) allows for collection of data from on-site files and databases for comparison with the SDWIS/Fed files. Each DV site visit reviews a specific compliance period, rather than a system's entire history. The data capture forms cover one year of TCR sampling data: the year preceding the most recent quarter of data uploaded to SDWIS/Fed. This information includes the number of totaled samples of total coliform, *E.coli*, and fecal coliform-positive samples, additional sampling resulting from positive samples, as well as monitoring, reporting, and maximum contaminant level (MCL) violations. Other data regarding the system are downloaded from SDWIS/Fed for the DV site visits and are available from other DV sheets (not shown). These data include the system name, SDWIS identification number, source water type, disinfection used, and the population served.

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[1] Direct Implementation (DI) refers to oversight of drinking water programs by EPA for those States that do not have primacy.

Exhibit I.1 TCR Data Capture Table Example

D. TOTAL COLIFORM RULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. Routine Samples Required	2	2	2	2	2	2	2	2	~~2~~ 5	2	2	2
2. Routine Samples Taken	2	2	2	2	2	2	2	2	5	2	1	2
3. M/R Vio - State (code)											NF	
4. M/R Vio - SDWIS (code)											NF	
5. M/R Vio - DV (code)											24	
6. No. of Routine Samples TC+/FC+								1TC+				
7. Repeat Samples Required								4				
8. Repeat Samples Taken								3				
9. M/R Vio - State (code)								26				
10. M/R Vio - SDWIS (code)								26				
11. M/R Vio - DV (code)								26				
12. Repeat Samples TC+/FC+(Y/N)								2TC+				
13. MCL Vio - State (code)								22				
14. MCL Vio - SDWIS (code)								22				
15. MCL Vio - DV (code)								22				

I.2.3 Sampling Actions

Designers of the DV project worked to create a dataset of sampling "actions"[2] taken by water systems on a state level, by system type[3], and within certain bounds of accuracy. These actions are sampled via clustered sampling. The protocol used to choose systems to get a representative sample was modified in the summer of 2004 to also sample by system size. In both protocols, the most recent version of the SDWIS/Fed universe was the source of the sample universe. The sample frame is representative of all systems, not just ground water systems; ground water systems are not a separate sub sample

I.2.4 DV System Selection

The DV project protocol uses a standardized table to determine sample sizes based on typical confidence and error tolerance levels (USEPA, 2003c). In the pre-2004 protocol, the desired level of confidence and tolerable level of error and the optimum sample size are established. For each system type, the protocol then calls for calculating the size of the entire population, equal to the total number of actions in the state. This number is generated by multiplying the number of systems in the state by the average number of actions per system. If the state files are decentralized and the DV team cannot visit all offices, the protocol is to use the total number of systems in the offices the team will visit rather than the total number of systems in the state. The sample size is then adjusted based on total number of actions in the state. A random sample of systems is pulled from SDWIS/Fed for each type of system (CWS, NTNCWS, and TNCWS).

The pre-2004 protocol did not take into account the population that the system served, and thus sampled mostly very small water systems since most systems are in this size category. The new protocol

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[2] "Actions" are violations the State detected and reported to SDWIS/Fed, violations the State detected but did not report to SDWIS/Fed, violations the State did not detect, and all inventory information required to be submitted to SDWIS/Fed.

[3] Public water systems are divided into three types: community water systems (CWS), nontransient noncommunity water systems (NTNCWS), and transient noncommunity water systems (TNCWS). Enough public water systems are sampled in each state to create a dataset representative of each system type within that state. Samples sets are stratified by system type because different system types have to adhere to different regulations.

balances two objectives; it samples systems to create a data set that can be manipulated to represent both the prevalence of different action occurrences and the correlation between actions and different system size categories.

The post-2004 protocol includes at least one very large system and creates a randomly selected sample from the other systems weighted by the size of the population served. Large systems are four times more likely than small systems to be chosen, while medium systems are twice as likely to be chosen (Exhibit I.2). A protocol that randomly sampled systems based purely on system size would be likely to include very few actions taken by small systems, while under the pre-2004 protocol it is unlikely that actions taken by very large systems will be represented in the sample. Therefore, the weighting method favors choosing larger systems, but not nearly to the extent of a weighting based purely on system size. As with the original protocol, samples for each water system type within each state are drawn separately. The desired level of confidence and acceptable error are also the same as in the pre-2004 protocol.

Exhibit I.2 Weighting System

Systems Size	Weight
≥1,000,000	At least one
10,000-999,999	4
3,301-9,999	2
≤3,300	1

Under both protocols, the desired confidence level and acceptable level of error varied from state to state. In states sampled using the pre-2004 protocol, the acceptable level of error was ±5 percent and the confidence level was 90 or 95 percent, with a 90 percent confidence level generally being selected. States sampled using the post-2004 protocol tended to have a confidence level of 95 percent and ±7 percent as the acceptable level of error. Texas, while sampling using the pre-2004 protocol, was only sampled to the 90 percent confidence level.

I.3 Total Coliform Sampling Database

For use in the GWR analysis, data capture forms for only ground water systems (no mixed systems or GWUDI systems) from the 53 most recent DVs for 47 State programs, one territorial program, and two EPA Regional DI programs were reviewed. Two states, New York and North Dakota, are not included in this review since forms for those states could not be located, and Wyoming was reviewed as a DI program. The Virgin Islands had no ground water systems included in their samples. Arkansas has no systems represented because only disinfecting systems or systems where it is not reported whether they disinfected were included in the DV sample. Four states, (Alaska, Colorado, Connecticut, and Illinois), Puerto Rico and Regional DI programs are also not included in this part of the analysis because necessary data regarding the percent of systems that do not disinfect are not available for these locations.

Three DVs of Florida are included in this review because Florida's files are decentralized, and biannual DVs over 6 years focused on different regions of Florida. These combined data give a more complete picture of TCR in Florida (although not all of Florida's regions have been reviewed).

All three PWS types—community, nontransient noncommunity, and transient noncommunity—are represented, except for the State of Michigan[4]. Disinfecting systems, systems with unknown disinfection methods, and those reporting zero samples taken in the compliance period were not included. Some groundwater systems treating to less than 4-logs by removal, inactivation, or State-approved combination of these technologies would be subject to triggered monitoring; however, these systems could not be distinguished from other disinfecting systems in the DV data. Therefore, only nondisinfecting systems were used in this part of the analysis. Systems that purchased and sold ground water, but had no disinfection responsibilities, are included only if they tested their water for contaminants.

The state programs reviewed are from different compliance periods (Exhibit I.3) and from one of the two sampling protocols described above (Exhibit I.4). An access database was created to store the information collected from the state files (Exhibit I.5).

Exhibit I.3 First Month of One Year of Data

Program	1 Year of Data	Program	1 Year of Data
Alabama	October, 2001	Nevada	April, 1999
Arizona	April, 2003	New Hampshire	October, 1999
California	October, 2000	New Jersey	January, 2002
Delaware	July, 2000	New Mexico	July, 2002
Florida	January, 1996 January, 1999 January, 2001	North Carolina	January, 2003
Georgia	April, 2000	Ohio	January, 2003
Hawaii	October, 2003	Oklahoma	July, 2003
Idaho	July, 2002	Oregon	January, 1999
Indiana	July, 1999	Pennsylvania	January, 2004 (draft)
Iowa	January, 2004 (draft)	Rhode Island	April, 2002
Kansas	April, 2000	South Carolina	April, 2003
Kentucky	April, 2002	South Dakota	October, 2001
Louisiana	January, 2004 (draft)	Tennessee	January, 2002
Maine	January, 2004 (draft)	Texas	July, 2003
Maryland	January, 2002	Utah	July, 2003
Massachusetts	July, 2003	Vermont	January, 2001
Michigan	July, 2001(CWSs only)	Virginia	July, 2003
Minnesota	April, 2001	Washington	January, 2003
Mississippi	October, 2002	West Virginia	April, 2004 (draft)
Missouri	October, 2002	Wisconsin	April, 2004 (draft)
Montana	July, 2000	Wyoming	January, 2004 (draft)
Nebraska	January, 1999		

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[4] Michigan delegates all noncommunity supervision to local health departments, which have not yet been subject to a data verification site visit when the database was compiled.

Exhibit I.4 States Using Original or Second Sampling Protocols

Using Original (Pre-2004) Protocol					Using Second (Post-2004) Protocol	
AL	IN	MS	NM	SD	HI	TX
AZ	KS	MO	NC	TN	IA	VA
CA	KY	MT	OH	UT	LA	WI
DE	MD	NE	OK	VT	ME	WV
FL	MA	NV	OR	WA	PA	WY
GA	MI	NH	RI			
ID	MN	NJ	SC			

Exhibit I.5 TCR Access Database Data Fields

Data Fields in the TCR Database	
Responsible US EPA Region	Routine Samples Total Coliform Positive
State, Territory, or Regional Tribe Acronym	Routine Samples Fecal Coliform Positive
SDWIS ID	Routine Samples Positive for E. Coli
System Name	Repeat Samples Total Coliform Positive
Primary System Business	Repeat Samples Fecal Coliform Positive
System Type	Repeat Samples Positive for E. Coli
Activity Status	Number of Routine Major M/R Violations
Population	Number of Routine Minor M/R Violations
Disinfection	Number of Repeat Major M/R Violations
First Month of Data Review Period	Number of Repeat Minor M/R Violations
Routine Samples Required Federally	Number of Acute MCL Violations
Routine Samples Required by the State	Number of Monthly MCL Violations
Routine Samples Taken	Data Entry Initials
Repeat Samples Taken	QA Reviewer Initials

There are several anomalies in the data. Some states, such as Texas, require all systems to disinfect, but one nondisinfecting wholesale distributor is included because it took TCR samples. In Iowa and Ohio, several systems are labeled as employing "innovative" disinfection. Compilers of this database believe this term is actually chlorine disinfection and an error in the original SDWIS database populated this field with the term "innovative" erroneously. The disinfection methods employed by less than 1 percent of the systems in the survey were not available (Exhibit I.6). Of these systems, one is in Arkansas and 18 are in Ohio.

Exhibit I.6 Number of Systems with Unreported Disinfection Methods

Population Served	Systems with unreported disinfection methods
=100	11
101-500	5
501-1,000	3
1,001-3,300	0
3,301-10K	0
10,001-50K	0
50,001-100K	0
100,001-1 Million	0
> 1 Million	0

I.4 TC-Positive Hit Rate Analysis for the EA

I.4.1 Weighting Scheme

For this analysis, the data are broken down into categories: state, type of PWS (community, nontransient noncommunity, and transient noncommunity), and system size (initially in 8 size categories, but eventually combined into two categories). Since the DV study has only been conducted on a portion of the total groundwater systems in the United States, the analysis utilized a weighting system to make the data more nationally representative.

One of the pieces of information needed for the weighting factors is the total number of systems in each category. Data on the number of systems by type, size, and state are pulled from the SDWIS/Fed inventory 2004, 4th Quarter. The inventory does not offer easy access to or complete information on the number of systems that did not disinfect[5], and so these values are estimated using a 1996 EPA study[6]. Multiplying the percent nondisinfecting from the EPA study by the SDWIS/Fed number of systems yielded the total number of nondisinfecting systems for each state. Occasionally, this calculation resulted in fewer systems than have been sampled in the DV study, especially in the larger size categories where so few systems exist. In cases where the DV data contained more systems than the calculation yielded, the number of systems in the DV study was used as the total number of systems since this was considered the more accurate estimate.

For each weighting category, the number of DV systems, the number of TC samples taken, and the number of TC+ samples were tallied from the DV database. The raw hit rates are derived by dividing the total TC+ samples by the total number of DV samples. These raw hit rates are then weighted based on the estimated number of total samples taken in each weighting category, calculated by multiplying the

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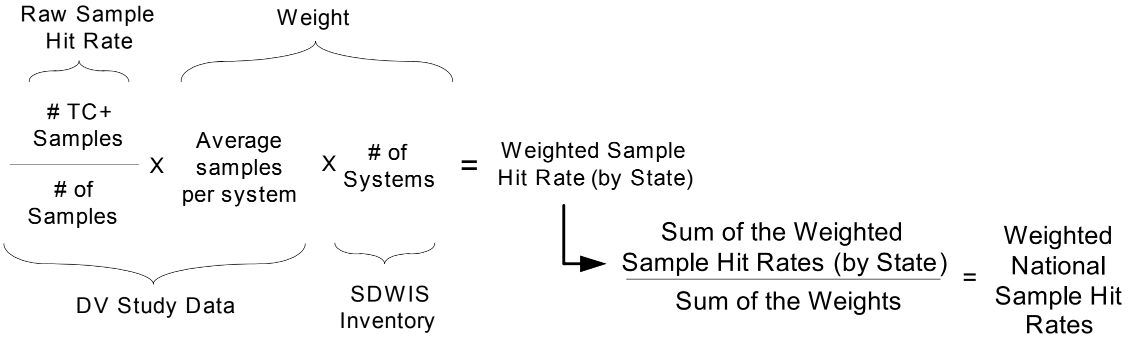
[5] The type of disinfection used by the systems in the DV project is drawn from SDWIS/Fed (and checked against state files), but such an effort for all systems has not been performed. States are now required to submit this information in SDWIS/fed and so more complete information will be available in the future, although the compiling of these data is not straightforward because disinfection practices are not listed as part of the overall system information, but are linked to entry points.

[6] Merkle JC. and Macler BA. 1996. *Ground Water Disinfection and Protective Practices in the United States.* Washington (DC): US EPA.

average number of samples taken per system[7] by the total number of systems. These weights give an estimate of the current sampling patterns in place and reflect differences in the number of systems in different size categories and differences in state requirements for sampling. The weighted national hit rate for each weighting category (size and type of system) is derived by multiplying each raw hit rate by its weight (the total number of samples), summing the weighted hit rates, and dividing by the sum of the weights:



I.4.2 Size Categories

The above calculations were done for each of the nine size categories typically used in Federal regulations. However, the results of this analysis revealed some anomalies in the data that led to the decision to group systems into two size categories—those serving above and below 1,000 people.

First, the DV data revealed no total coliform positive samples in the two noncommunity DV systems serving over 3,300 people (one NTNCWS and one TNCWS). Thus, any grouping that used 3,300 or 10,000 persons served as a lower boundary would have produced the anomaly of no TC contamination in those systems, based on data from only one system. Further, since these data are from the DV study, only 1 year of data are examined for each of these two systems. Assuming that contamination was never possible, therefore, seemed imprudent. This analysis sets the boundary at 1,000 people served, still results in small samples (only eight NTNCWSs and eight TNCWSs), but has the benefit of providing some nonzero estimates of hit rates for these larger systems.

Second, there are obvious breakpoints in terms of population size. For CWSs, that breakpoint is at 1,000 people served; the three smallest categories have hit rates over 2 percent and larger systems have hit rates less than 1 percent. A similar break occurs in the data for noncommunity systems serving 3,300 people, but including the category of 3,300 served would introduce a sample size of one and a zero hit rate for the remaining categories for both NTNCWSs and TNCWSs.

Third, at this boundary (above and below 1,000 people served), the confidence intervals (discussed in further detail in the next section) are acceptable given the uncertainties in the data. The confidence intervals show a narrow range for small systems (± 4 percent). For the bigger systems, the confidence intervals are larger, (± 11 to 29 percent) given the small sample size. There is no way to improve the confidence intervals without combining them with categories of smaller systems, which would introduce summary data that would be inconsistent with the patterns seen in the data by individual size category. There are few nondisinfecting ground water systems serving over 1,000 people— only

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[7] The average number of samples taken per system is the sum of all samples taken by systems in the DV sample divided by the total number of systems in the sample.

about 13 percent of CWSs, and less than 2 percent of both NTNCWSs and TNCWSs. For all these reasons, a size boundary of 1,000 people served is appropriate and used throughout the analysis.

I.4.3 Confidence Intervals

The result is that data pulled and summarized from the DV database for this analysis represent 43 states and span 1,252 water systems with 18,467 total coliform samples (Exhibit I.7).

Exhibit I.7
Number of Data Verification Systems and Samples Used in This Analysis, by Type of System and System Size

Type of System	System Size (Population Served)	Number of DV Systems	Number of DV Samples
CWS	≤1,000	325	4,553
	>1,000	50	7,902
NTNCWS	≤1,000	419	3,317
	>1,000	8	170
TNCWS	≤1,000	441	2,396
	>1,000	9	129

The confidence intervals for these hit rates are also approximated. They cannot be easily known with precision for several reasons. One reason is because the sources of data used are from different time periods. Another reason is that the percentage of systems in each state that do not disinfect are based on a 1996 study, and some discrepancies are noted with more current data (the DV data). As a result, this analysis uses an approximation of the confidence intervals at a 90 percent confidence level and assumes a percentage of 50 (the most conservative assumption possible when determining confidence intervals). The estimated intervals are approximate and the more realistic intervals are probably broader given that the TC samples are drawn from clustered, non-random samples.

The confidence intervals are estimated by comparing the number of DV systems sampled to the total number of systems. The number of total systems used for this estimate is the number of nondisinfecting systems used throughout the Economic Analysis (Exhibit 4.2). This includes systems in states that are not used in the derivation of the hit rates, but represents the total universe of systems that the hit rates are representing. Confidence intervals were calculated for a number of possible size categories; however, all calculations support the system point breakpoint of above/below 1,000 people served, discussed below. Exhibit I.8 shows the final calculated hit rates along with their approximate confidence intervals.

Exhibit I.8 Total Coliform Positive Hit Rates and Confidence Intervals

Type of System	Size of System (Population Served)	TC+ Hit Rate (per sample)	Approximate Confidence Interval (at 90 Confidence, Percentage 50)
CWS	≤1,000	2.72%	± 4%
	>1,000	0.71%	± 11%
NTNCWS	≤1,000	2.98%	± 4%
	>1,000	2.25%	± 29%
TNCWS	≤1,000	6.36%	± 4%
	>1,000	3.53%	± 27%

I.5 TC+ Samples

I.5.1 Estimate of Number of TC Samples

While the above analysis does calculate the total number of samples taken per year by type of system and size category, it does so for only a subset of the total groundwater systems in the United States. Therefore, the dataset for this step was expanded to include disinfecting systems and systems in states that had previously been excluded. The new dataset represents 2,774 system-years of data and 94,307 total coliform samples from 48 states, two Regional DI programs, and Puerto Rico[8].

However, even with the expanded data set, the data include relatively few noncommunity systems serving more than 1,000 people, and none at all for NTNCWS serving more than 50,000 people and TNCWS serving more than 10,000 people. In order to have data in all categories and to minimize the effect of sampling only a few large noncommunity systems, EPA grouped systems according to their baseline monitoring requirements under the TCR and weighed the number of samples by the number of systems subject to triggered monitoring. The average number of samples per system was then calculated by dividing the sum of the weighted number of samples by the sum of the number of systems subject to triggered monitoring. The estimated number of routine samples taken per system range from 7 to 1,496 per month (Exhibit I.9).

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[8] Alaska (DV data started 10/1/2001, pre-2004), Arkansas (DV data started 1/1/2002, pre-2004), Colorado (DV data started 4/1/2001, pre-2004), Connecticut (DV data started 4/1/2004, post-2004), Illinois (DV data started 7/1/2003, post-2004), Puerto Rico (DV data started 1/1/1999, pre-2004), R8 Tribal DI (DV data started 1/1/2004 draft, post-2004) and R9 Tribal DI (DV data started 1/1/2002, pre-2004).

Exhibit I.9 Estimated Number of Routine Total Coliform Samples Taken per System per Year, by Type and Size of System

System Type	Population Served	TCR Baseline # of Routine Samples per System	Estimated Number of Routine Samples per System
CWS	<100	12	14
	101-500	12	15
	500-1K	12	18
NTNCWS + TNCWS	<100	4	7
	101-500	4	8
	500-1K	4	9
CWS + NTNCWS + TNCWS	1011-3300	24	31
	3301-10K	84	82
	10,001-50K	360	311
	50,001-100K	960	924
	>100,001	2,520	1,496

Source: TCR baseline number of routine samples per system calculated in Chapter 4.

I.5.2 Estimate of Number of TC+ Samples

Finally, EPA was able to estimate the frequency of TC+ samples per year per system by multiplying the number of TC samples per year (from Exhibit I.9) by the probability of a TC+ sample (from Exhibit I.8). Exhibit I.10 shows these estimated frequencies.

Exhibit I.10 Estimated Number of TC+ Samples per System, per Year, by System Size and System Type

System Type	System Size (Population Served)							
	<100	101-500	501-1K	1,001-3,300	3,301-10K	10,001-50K	50,001-100K	>100K
CWS	0.38	0.41	0.49	0.22	0.58	2.2	6.6	10.6
NTNCWS	0.22	0.23	0.28	0.70	1.8	7.0	20.8	33.7
TNCWS	0.47	0.48	0.60	1.1	2.9	11.0	32.6	52.8

Appendix J
Changes in GWR Economic Analysis from Proposal to Final

J. 1 Introduction

In preparing the final Ground Water Rule Economic Analysis (EA), EPA made changes to the calculations of benefits and costs based on updated information that became available since development of the economic analysis for the proposed GWR. The Regulatory Impact Analysis (RIA) for the Proposed Ground Water Rule Document (USEPA, 2000h.) contains the proposed GWR economic analysis.

J. 2 Benefits

EPA conducted an updated literature search and refined the method for risk characterization and for calculating and valuing the reduction in illnesses and deaths due to the rule, as described in the following sections.

J.2.1 Hazard Identification

Key aspects that have remained the same

Both the proposed GWR RIA and the final EA identify acute and chronic illnesses (morbidity) and death (mortality) caused by viruses and bacteria as the primary adverse health effects (hazards) that are addressed by the GWR. (See Section 5.2.2 of the GWR EA.)

Both the proposed GWR RIA and the final EA focus on acute gastrointestinal illness and associated mortality caused by viruses resulting from endemic exposures as the health hazard endpoints that are quantified in the baseline risk assessment and in the risk reduction (benefits) analyses of the GWR.

Both the proposed GWR RIA and the final EA use two types of viruses to represent the hazard from a variety of viruses that may occur in drinking water from ground water sources. These are identified as Type A (relatively high infectivity, but generally lead to mild, non-life threatening illnesses) and Type B (less infectious than Type A, but result in more severe illnesses than Type A).

Both the proposed GWR RIA and the final EA identify the very young, the elderly, and the immunocompromised as sensitive subgroups with respect to the adverse health effects addressed by the GWR.

Key aspects that have changed

Although, as noted above, both the proposed GWR RIA and final EA use Type A and Type B viruses as categories to represent a variety of viruses that may occur in drinking water from ground water sources, the final EA is more restrictive with respect to the range of viruses represented.

In the hazard identification presented in the proposed GWR RIA, Type A viruses were intended to explicitly include Norwalk virus, the Norwalk-like or small round structured viruses (SRSV), calicivirus, adenovirus, astrovirus and other enteric viruses. In the final EA, Type A viruses are recognized as representing only a few strains of rotavirus.

Similarly, in the hazard identification presented in the proposed GWR RIA, Type B viruses were intended to include a range of enteroviruses including echovirus, coxsackie virus and hepatitis A virus (HAV). In the final EA, Type B viruses are recognized as representing only echoviruses.

J.2.2 Exposure Assessment

Key aspects that have remained the same

Both the proposed GWR RIA and the final EA do the following:

- Focus on the occurrence of Type A and Type B viruses in source water for ground water systems.
- Address source water occurrence of Type A and Type B viruses in terms of a "hit rate" (probability that a given well ever has a virus) and a concentration (for those source waters that have virus present).

Additionally, both the proposed GWR RIA and the final EA consider the following:

- Two strata with respect to virus concentrations: a small fraction of wells that tend to have high virus concentrations in source water when virus is present; and the larger fraction of wells that tend to have relatively lower concentrations in source water when virus is present.
- Three levels of inactivation (disinfection) among ground water systems for reduction in virus concentrations between source water and finished water: none, 2-log inactivation, and 4-log inactivation.
- Finished water virus occurrence under normal operating conditions only (i.e., occurrence of viruses is not explicitly considered in relation to treatment failures or to distribution system deficiencies).
- Populations consuming ground water from CWS, NTNCWS, and TNCWS, with different days of water consumption per year for those exposed at these three types of systems.
- Individual daily water consumption as a function of age based on the CSFII water consumption data.

(See Section 5.2.3 of the GWR EA.)

Key aspects that have changed

Both the methodology for characterizing virus hit rates and the data sources used to derive them changed substantially between the proposed GWR RIA and the final EA.

- In the proposed GWR RIA, viral hit rates were based on data from two studies; in the final EA hit rates are based on data from 12 studies
- In the proposed GWR RIA, viral hit rates were derived primarily from cell culture data but were informed in the case of Type A viruses by PCR data; in the final EA hit rates were derived only from cell culture data
- The methodology used in the proposed GWR RIA to obtain hit rates was a frequentist approach and did not consider uncertainty; the methodology used in the final EA to obtain hit rates was a Bayesian approach and did include consideration of uncertainty.
- In the proposed GWR RIA, a well with a "hit" (virus positive) was assumed to have virus present at all times; in the final EA, a well with a "hit" is assumed to have virus present only a fraction of the time. The fraction of time present varies from one well to another.

The methodology for characterizing virus concentrations and the data sources used to changed between the proposed GWR RIA and the final EA

- In the proposed GWR RIA, virus concentrations were a function of whether a well was considered a "properly constructed well" (~83%) or "improperly constructed well" (~17%) based on data from the ASDWA (1998) Survey. Virus concentrations for the "properly constructed wells" were derived from the Abbaszadegan data; virus concentrations for "improperly constructed wells" (~17%) were derived from the Lieberman data. In both cases, those data were used to estimate parameters of lognormal distributions of virus concentrations (one for properly and one for improperly constructed wells) from which values were selected in the simulation analysis for entry points determined in the simulation to have a virus present. In the final EA, virus concentrations were a function of whether wells were "less vulnerable" (~97%) or "more vulnerable (~3%) to fecal contamination (based on TCR MCL violation data. Virus concentrations for the "less vulnerable wells" were derived from the Abbaszadegan and Lindsey data; virus concentrations for the "more vulnerable wells" were derived from the Lieberman data. In the final EA, the actual values from these studies were used in the simulation and selected randomly for those wells determined to have virus present at some time.

The approach to characterizing individual daily drinking water consumption changed between the proposed GWR RIA and final EA.

- In the proposed GWR RIA, two sets of water consumption data from the USDA Continuing Survey of Food Intake by Individuals (CSFII) were used: one set was based on "all sources, consumers only" with an overall mean of 1.24 L/day, used as the main analysis; the other set was based on "community water supply, all respondents" with an overall mean of 0.93 L/day and was used as a lower bound estimate. In the final EA, water consumption was based on a single set of water consumption data from CSFII for "all sources, all respondents" with an overall mean of 1.23 L/day.

- Both the proposed GWR RIA and the final EA included consideration of age-group specific daily water intake as provided by CSFII. The proposed GWR RIA collapsed age groups prior to calculating infectivity risk to correspond with the morbidity data age bins; the final EA used all CSFII age groups to calculate infectivity risk and applied these, as appropriate, to the morbidity age bins.
- In the proposed GWR RIA, no adjustment was made for bottled water consumption. In the final EA, the mean water consumption for each age group was multiplied by 0.87 to account for bottled water consumption (based on data for bottled water consumption from the same CSFII data).
- In the proposed GWR RIA, no adjustment was made for water consumption from noncommunity sources to account for these sources likely being only contributing to a portion of an individual's daily water intake. In the final EA, the daily water consumption values (after the bottled water adjustment) were further multiplied by 0.5 for NTNCWSs and by 0.4 for TNCWSs.

The approach for characterizing the days of water consumption per year and the number of individuals consuming water at TNCWSs changed between the proposed GWR RIA and the final EA.

- In the proposed GWR RIA, it was assumed that individuals consuming water at TNCWSs did so for 15 days per year. In the final EA, it was assumed that individuals consuming water at TNCWSs did so for 10 days per year.
- In the proposed GWR RIA, the population consuming water from TNCWSs was taken as the population reported in SDWIS as being served by TNCWSs (that is, the average per system in the various size categories). In the final EA, it was recognized that SDWIS reported number reflected the average population served during peak operating periods and that the total number of individuals consuming water over the course of a year (each for 10 days) is greater than the population served numbers reported in SDWIS. An adjustment was made to first recognize that during each month of operation there are 3 cohorts of individuals consuming water for 10 days each, and that TNCWSs typically operate 6 months per year (specifically, a range of 3 to 9 months and incorporated into the model as a uniform uncertainty distribution). Therefore, the population exposed at TNCWSs was determined by multiplying the SDWIS values by a factor in the range of 9 to 27 (i.e., 3 cohorts per month x 3 months to 3 cohorts per month x 9 months), averaging 18 (3 cohorts per month x 6 months).

J.2.3 Dose Response Relationships for Viruses (probability of infection, illness, secondary spread of illness, and mortality)

Key aspects that have remained the same

Both the proposed GWR RIA and the final EA use two "types" of viruses to represent the variety of viruses that may be present in fecally contaminated ground water. Type A viruses are those that are highly infectious, but with effects that are typically not severe. Type B viruses are less infectious than Type A, but produce illnesses that can be more severe than Type A.

Both the proposed GWR RIA and the final EA use dose response data from studies involving rotavirus to inform the analysis for Type A viruses, and from studies involving echovirus to inform the analysis for Type B viruses.

Both the proposed GWR RIA and the final EA use the same elements for the dose-response relationships of (1) probability of infection given ingestion; (2) probability of illnesses given infection from ingestion; (3) secondary spread of additional illnesses relative to illnesses due to direct ingestion; and (4) probability of death given illness. Generally, the same data sources were used in the proposed GWR RIA and final EA to estimate these relationships. However, with the exception of the secondary spread uncertainty distribution used for Type B viruses and the mortality factor for ages < 1 month for Type B viruses, both of which remained the same in the final EA as in the proposed GWR RIA, the specific values for these various factors and / or the ages to which they are applied have changed, and most values that were used as single "best estimates" in the proposed GWR RIA were incorporated as uncertainty distributions in the final EA. (See Section 5.2.4 of the GWR EA.)

Key aspects that have changed

Probability of infection:

- In the proposed GWR RIA, the form of the dose response function used for both Type A and Type B viruses was the Pareto approximation of the Beta Poisson dose response model. The two parameters of this model were estimated from the human challenge studies on rotavirus by Ward et al. 1986 for Type A viruses and on echovirus by Schiff et al 1984 for Type B viruses, and the parameter estimates used were Maximum Likelihood Estimates taken from Regli et al 1991. There was no uncertainty included in the parameter estimates for the proposed GWR RIA.
- In the final EA, the same two human challenge studies were used as the source of infectivity data. For Type A viruses, the dose response model used was an expected value form of the exact Beta Poisson model; for Type B viruses the Pareto approximation of the Beta Poisson was used (as in the proposal). In the final EA, the parameter estimates included consideration of uncertainty. A Markov Chain Monte Carlo (MCMC) procedure was used to obtain a large number (1,000) of parameter pairs for the expected value form of the exact Beta Poisson model for Type A viruses consistent with the underlying data. A bootstrap procedure was used to obtain 1,000 parameter pairs for the Pareto approximation of the Beta Poisson model for Type B viruses.
- The final EA also includes analyses using alternative infectivity dose response functions and subsets of the human challenge data focusing on those dose levels most closely approximating the exposure levels from drinking water.

Probability of Illness Given Infection (Morbidity):

- In the proposed GWR RIA, the probability of illness given infection for Type A viruses was 0.88 for ages < 2 years and 0.1 for all other ages. In the final EA, the probability of illness given infection for Type A viruses is a uniform uncertainty distribution of 0.10 – 0.88 for ages < 3 and a uniform uncertainty distribution of 0.10 – 0.50 for all other ages.

- In the proposed GWR RIA, the probability of illness given infection for Type B viruses was 0.5 for ages < 5 years, 0.57 for ages 5 to 16 years, and 0.33 for all other ages. In the final EA, the probability of illness given infection for Type B viruses is a uniform uncertainty distribution of 0.5 – 0.78 for ages < 5, a uniform uncertainty distribution of 0.12 – 0.57 for ages 5 – 19, and a uniform uncertainty distribution of 0.12 – 0.33 for all other ages.

Secondary Spread of Illness:

- In the proposed GWR RIA, the secondary spread rate for Type A viruses was an additional 0.55 illnesses for all primary illnesses of ages < 2. In the final EA this value was applied to primary illness of ages < 3.

Probability of Death Given Illness (Mortality):

- In the proposed GWR RIA, for Type A viruses the probability of death given an illness was $7.3*10^{-6}$. In the final EA, the probability of death given an illness for Type A viruses is a uniform uncertainty distribution of $5.7*10^{-6}$ to $7.3*10^{-6}$.
- In the proposed GWR RIA, for Type B viruses the probability of death given an illness was $4.1*10^{-4}$ for all ages > 1 month. In the final EA, the probability of death is $2*10^{-2}$ for ages > 1 month, applied to the illnesses requiring hospitalization (which are 1% of all illnesses). (As noted above, the mortality factor for Type B viruses for ages < 1month, $9.2*10^{-3}$, did not change between the proposal and final EA.

J.2.4 Risk Characterization

Key aspects that have remained the same

Both the proposed GWR RIA and the final EA provide estimates of the baseline risk (that is, in the absence of the GWR) focusing primarily on the number of cases of endemic gastrointestinal illnesses per year due to source water viral contamination of public ground water systems.

Similarly, both the proposed GWR RIA and final EA provide estimates of the benefits of the GWR options in terms of the cases of endemic illnesses avoided per year resulting from corrective actions performed as a result of the rule.

Both the proposed GWR RIA and the final EA estimates of the baseline risk and benefits use a Monte Carlo simulation model to account for both variability and uncertainty.

Both the proposed GWR RIA and the final EA also provide information on the distribution of annual individual risk for baseline conditions.

In both the proposed GWR RIA and final EA, the assumptions and approach for estimating risk reduction (benefits) for Regulatory Alternative 1 – Sanitary Survey Only – have largely remained the same. In both the proposal and the EA, an estimate is made of the fraction of wells that are improperly constructed. In both cases, that estimate is approximately 17%, although the approach to arriving at that value is slightly different in the final EA. In both the proposal and the final EA, it is assumed that 50% (uniform uncertainty range of 40% to 60%) of improperly constructed wells that have virus present will have a significant deficiency identified. Correction of these deficiencies is assumed to eliminate virus exposure.

In both the proposed GWR RIA and the final EA, the assumptions and approach for estimating risk reduction (benefits) for Regulatory Alternative 4 – Across the Board Disinfection – have remained the same.

Key aspects that have changed

In the proposed GWR RIA, the estimate of the baseline risk includes estimates of illnesses due to treatment failures and distribution system contamination as part of the primary analysis. The proposed GWR RIA included reductions of illnesses due to these factors as part of the Sanitary Survey benefits. In the final EA, baseline illnesses due to treatment failures and distribution system contamination are not quantified nor are benefits from their reductions but, rather, are considered among the nonquantified benefits of the rule. (See Section 5.2.5 of the GWR EA.)

Relative to the proposed GWR RIA, the simulation modeling performed to estimate the baseline risk and benefits in the final EA is considerably more complex, includes many more values input as distributions, and provides outputs that can be disaggregated to a substantially higher level of detail.

In the proposed GWR RIA, the benefits (annual cases avoided) were estimated in terms of the expected benefits following full implementation of the rule options without explicit consideration of expected differences from year to year as the rules are implemented. In the final EA, the benefits are modeled to explicitly account for the timing when corrective actions occur reflecting both rule implementation schedules and the probability of identifying contaminated wells as a function of the number of indicator samples that a system may take for its wells over time and the probability of observing an indicator positive as a function of the number of assays performed.

The key changes with respect to estimating risk reduction (benefits) for the Triggered Monitoring provision of Regulatory Alternative 2 and the assessment monitoring provision of Regulatory Alternative 3 are summarized below:

- In the proposed GWR RIA, the effectiveness of triggered monitoring was based upon estimates derived from the Lieberman data on the co-occurrence of viruses and fecal indicators; this was done without specific consideration of the number of TC+ assays occurring per year to trigger source water monitoring. This approach led to an estimates that triggered monitoring would capture between 30% and 54% of viral illnesses due to source water contamination. In the final EA, the effectiveness of triggered monitoring is modeled more rigorously, using available Data Verification data to estimate the expected number of TC+ samples occurring per year by system type and size. Using the Pwell and Psample data for indicators derived from the occurrence analysis which considers co-occurrence of virus and E coli indicators, a simulation is carried out to determine which indicator sample following a TC+ will also be positive to determine whether and in what year each corrective action due to triggered monitoring occurs and the risk from exposure to viruses will be reduced or eliminated.

- In the proposed GWR RIA, the effectiveness of assessment monitoring (then referred to as routine monitoring) was based on assumptions that 15% of wells were in sensitive areas, between 20 and 50% of wells with pathogens present are in sensitive areas that will be subject to assessment monitoring, and that based upon data from Lieberman, between 71 and 100% of the wells with pathogens that are subject to assessment monitoring will be identified and corrective actions performed. In the final EA, it was also assumed that 15% of wells are in sensitive areas. There is no specific assumption, however, in the final EA on the presence of wells with pathogens in these sensitive areas. The effectiveness of assessment monitoring is modeled more rigorously in the final EA using the Pwell and Psample data for indicators derived from the occurrence analysis which considers co-occurrence of virus and E coli indicators in a simulation to determine whether and in what year an indicator positive will occur on one of the 12 samples assessment monitoring samples for a particular well resulting in corrective action being performed and the risk from exposure to viruses in those wells reduced or eliminated.

J.2.5 Monetization of Illnesses and Deaths Avoided

Key aspects that have remained the same

As in the proposed GWR RIA, the final EA assigns value to the illnesses and deaths avoided as a result of the rule based on measures of the direct (i.e., medical) and indirect (i.e., productivity and leisure time loss) cost of illness (COI) and the Value of a Statistical Life (VSL), respectively. The VSL is calculated as a triangular distribution in both analyses based on the same studies and resulting base year estimate. Both analyses quantify the value of only the acute, endemic illnesses and include only a qualitative discussion of the value of avoided chronic illnesses and outbreaks.

Key aspects that have changed

In the final EA, valuation was changed from the proposed GWR RIA in the following aspects:

- Discount rates of 3 percent and 7 percent were applied to benefits to represent the social discount rate and the opportunity cost of capital, respectively, consistent with OMB Circular A-4. (See Section 5.3.1.5 of the GWR EA.)
- The VSL was updated from 1999 to 2003 dollars. (See Section 5.3.1.2 of the GWR EA.)
- Benefits were shown in present value (2003 dollars) and were calculated separately for each of the 25 years; in the proposed GWR RIA, benefits were calculated as one annualized value for the 25 year analysis period. (See Section 5.3.1.3 and Appendix B of the GWR EA.)

- Based on an updated literature search, COI mean estimates were refined and ranges were developed for many of the estimates for indirect and direct costs for Type A and Type B illnesses, resulting in a triangular distribution rather than a point estimate. In particular, the new literature presented estimates that increased duration of illness from those used in the proposed GWR RIA, resulting in increased COI values for most categories of age for Type A and Type B illnesses. (See Section 5.3.1.1 of the GWR EA.)
- For Type A COI, the age groups were changed to reflect that neonates were no longer assigned a unique COI value for Type A valuation. For Type B COI, the designation of mild, moderate, and severe changed to one based on medical needs: no doctor required, doctor visit required, and hospitalization required. (See Section 5.3.1.1 of the GWR EA.)
- COI estimates were developed to represent a Traditional and Enhanced method of assessment. The proposed GWR RIA was closest to the Traditional method and was a smaller value than the Enhanced. (See Section 5.3.1.1 of the GWR EA.)
- A quantified estimate of the value of avoided bacterial illnesses was included only as an illustrative analysis in the “nonquantified benefits” section (Section 5.4 of the GWR EA); the proposed GWR RIA included this in the total quantified benefits.
- Discussion of the estimated value of avoided outbreaks was further developed in the final EA from the proposed GWR RIA, although it was maintained as an illustrative analysis in the “nonquantified benefits” section (Section 5.4 of the GWR EA) as in the proposed GWR RIA.

J.3 Costs

Key aspects that have remained the same

Costs were discounted in both the proposed GWR RIA and the final EA using both 3 percent (social) and 7 percent (opportunity cost of capital) discount rates.

Key aspects that have changed

Costs are calculated over a 25 year period of analysis to be consistent with the other SDWA rules; the proposed GWR RIA used a 20 year period based on the estimated time of depreciation. Also, costs in the final EA are calculated as annualized costs based on net present values; in the proposal, values were annualized without first calculating the present value. (See Section 6.3 of the GWR EA.)

J.3.1 Baseline Estimate of Fecal Indicator Occurrence

Key aspects that have remained the same

Both the proposed GWR RIA and the final EA draw upon fecal indicator occurrence data to derive estimates of the number of ground water wells that will be required to perform corrective actions as a result of triggered or assessment (routine) monitoring of source water.

Key aspects that have changed

In the proposed GWR RIA, the fecal indicator occurrence data used for triggered monitoring were from the Abbaszadegan study, and those used for assessment monitoring were from the Lieberman study. In the final EA, the fecal indicator occurrence data used for both triggered and assessment monitoring were from 15 studies combined in a Bayesian analysis that generated Pwell and Psample estimates for *E. Coli*. (See Section 4.3.2 of the GWR EA.)

J.3.2 Sanitary survey provisions

J.3.2.1 Basis for percentage of corrective actions

Key aspects that have remained the same

Under all of the regulatory options considered, all PWSs were required to perform the minimum requirement of conducting sanitary surveys and to correct any significant deficiencies found.

Key aspects that have changed

For the proposed GWR RIA, EPA based the estimate of percentages of systems (11-13%, depending on system sizes) having any uncorrected significant deficiencies on data from a survey conducted by the Association of State Drinking Water Administrators (ASDWA, 1998b). EPA applied these percentages to every survey cycle to estimate corrective action costs resulting from the GWR provision, resulting in a cumulative 60% of systems having significant deficiencies. This percentage included distribution system significant deficiencies.

In the final EA, the number of PWSs identifying a significant deficiency during a sanitary survey is determined based on survey data from the Association of State Drinking Water Administrators (ASDWA) (1997). Based on responses to the ASDWA survey, it was determined that 17% of systems had wells that were not constructed according to applicable State regulations. This estimate of significant deficiencies (17%) was applied equally in years 4 - 25 of the analysis, resulting in approximately 0.77% of systems annually (17% / 22 years) having been assigned a corrective action in each of those years. Due to high uncertainty, costs of corrective actions for deficiencies identified in distribution systems and treatment plants are not included in the final EA. (See Section 6.4.4 of the final GWR EA.)

J.3.2.2 Basis for types of corrective actions

Key aspects that have remained the same

The two corrective actions used in the final EA for costing are the same two that comprised a majority of actions under the proposal (i.e., replacing a sanitary well seal or rehabilitating an existing well).

Key aspects that have changed

For the proposal, EPA included several potential types of corrective actions, ranging from lower cost (e.g., fencing off or providing other limited access to infrastructure to protect wells, installation of pump block seals, pump block/well pad repair, or correcting runoff and drainage problems) to higher cost (e.g., drilling a new well or purchasing water from another supplier). The Agency selected two corrective actions for the final EA cost model – one lower in cost than the other – that focus on problems at the wellhead: (1) Replacing a sanitary well seal; and (2) Rehabilitating an existing well. To account for the uncertainty in the national estimate, a low and high cost estimate based on the estimated percent of systems using each of the two corrective actions (ratio of action 1 to action 2) was used: 60% / 40% and 40% / 60%, respectively (final EA Section 6.4.4).

J.3.2.3 Costs for sanitary surveys

Key aspects that have remained the same

Both the proposed GWR RIA and the final EA assumed that States and systems would incur additional costs for program maintenance and corrective action development if a significant deficiency was identified, and that those costs would increase with system size.

Key aspects that have changed

For the proposed GWR RIA, EPA used the same unit costs as the ones used in a previous economic analysis (Interim Enhanced Surface Water Treatment Rule (IESWTR)) for estimating costs of full sanitary surveys. Fifty percent of full survey costs was applied to all systems as the incremental costs resulting from the GWR sanitary survey provision. This percentage was used to account for the more comprehensive survey coverage (i.e., evaluation of eight elements) under the GWR than under existing requirements of the TCR.

For the final EA, EPA revised its cost analysis for conducting sanitary surveys based on new information from States. First, EPA revised its estimates for conducting full sanitary surveys specifically for GWS with and without treatment. Second, EPA estimated the number of additional full sanitary costs (including travel time costs) that would result from the higher frequency of sanitary surveys required under the GWR than the number currently being implemented. This number of additional sanitary surveys was multiplied by the sanitary survey unit costs to estimate national costs for this effect.

Third, for those sanitary surveys already being conducted, EPA estimated the percent of systems for which sanitary surveys would need to be increased in scope to ensure that all 8 elements were being implemented. Because all States currently have sanitary surveys in place under the IESWTR, TCR, or other State programs, most States are now conducting sanitary surveys at the frequencies and scope required by the GWR. (See Section 6.4.2 of the GWR EA.)

J.3.2.3.1 Systems

Key aspects that have remained the same

The proposed GWR RIA and final EA both assumed that systems would incur incremental costs for the increase in frequency and scope of surveys, as well as for the development of corrective action plans in the case of a significant deficiency.

Key aspects that have changed

The average hourly rates for technical and managerial staff were updated to 2003 dollars using the Employment Cost Index.

J.3.2.3.2 States

Key aspects that have remained the same

EPA assumed for both analyses that additional time would be spent by States in developing and maintaining a program to ensure system compliance with the GWR, and in reviewing and approving corrective action plans. Costs in both analyses were estimated using the full-time equivalent hourly rate for an average state employee times the number of labor hours estimated, which increased with system size.

Key aspects that have changed

State labor costs were increased to reflect updated labor rates from the 2001 State Drinking Water Needs Analysis and were converted to present day (2003) dollars using the Employment Cost Index.

J.3.3 Triggered Monitoring Provisions

J.3.3.1 Estimate of percent wells with corrective actions and implementation timing

Key aspects that have remained the same

For triggered monitoring provisions, EPA assumed no differences in the percent of wells implicated for sensitive vs. nonsensitive wells. Estimated TC occurrence in the Data Verification data was used to inform frequency of source water monitoring for triggered monitoring provisions.

Key aspects that have changed

For triggered monitoring, the proposed GWR RIA used enterococci data from the Abbaszadegan study as a basis for estimating the number of wells that would test positive for an indicator and perform corrective actions. It was assumed that all triggered monitoring positives would occur in the first year of triggered monitoring.

In the final EA, a two-step simulation modeling process was used. In the first step, an estimate of the probability that a well is TC+ based upon Data Verification data was used to determine if and when a triggered monitoring event occurs for a given well. For TC+ wells, a second step determines whether an indicator positive occurs based upon the modeling of Pwell and Psample for indicators from 13 of the occurrence studies. This procedure determines not only the percent of wells that do corrective actions as a result of triggered monitoring but also determines what year after rule implementation those corrective actions take place. (See Section 6.4.3 of the GWR EA.)

J.3.3.2 Compliance forecast of corrective actions

Key aspects that have remained the same

In the proposed GWR RIA and the final EA, the representative corrective actions remained the same. EPA used the same method for deriving the high estimate of percentage of systems that would choose a disinfection action. For entry points requiring corrective action, EPA assumed that the ratio of currently disinfecting to nondisinfecting was equivalent to the ratio of entry points disinfecting to less than 4-log to nondisinfecting. For those entry points already disinfecting (but to less than 4-log protection), the Agency assigned a corrective action based on probabilities adopted from an AWWA survey. For entry points that were currently not disinfecting, estimates were made as follows:

EPA derived a range estimate of the percent which would choose to disinfect (versus choosing a nontreatment action): the high end, *X* percent, was based on the percent of CWS currently disinfecting according to CWSS data.

Those estimated to choose not to disinfect were the balance of the percent (*X*) derived above (= 100% – *X*%).

The percent choosing a disinfecting corrective action were then assigned a treatment option from a range of 10 treatment options (including 5 treatments applied prior to filtration, 1 filtration method, and 4 treatments applied after filtration) based on the current distribution across treatment options in CWSS results (See Exhibit 4.7.).

Key aspects that have changed

For the proposed GWR RIA, EPA used point estimates for forecasting percentages of systems taking treatment (mainly installing disinfection) vs. nontreatment corrective actions that resulted from the source water monitoring provision. For instance, it was forecasted that 54.4% of systems serving fewer than 100 people and 11.8% of systems serving more than 100,000 people that need to take corrective actions would select nontreatment options, respectively, for the rule compliance.

For the final EA, EPA revised the compliance forecasts and estimated the uncertainty around compliance forecasts. EPA added an upper bound (90%) to nontreatment options and a lower bound (10%) to treatment options for the final rule. For instance, EPA forecasted that 54.4 – 90% of systems serving fewer than 100 people and 11.8 – 90% of systems serving more than 100,000 people will take nontreatment options. With such ranges, EPA estimated the corrective action costs with quantified uncertainties. (See Section 6.4.4 of the GWR EA.)

EPA also developed separate compliance monitoring estimates for all systems installing disinfection. EPA included the cost of adding interim disinfection for the systems taking nontreatment corrective actions due to a fecal indicator-positive ground water source sample.

J.3.3.3 Baseline disinfection rates

For the proposed GWR RIA, EPA based the estimate of community GWSs achieving 4-log inactivation of viruses (77 percent) on the data from the AWWA disinfection survey for community GWSs (AWWA, 1998a). Such an estimate is likely to bias the system disinfection rates upward. Also, the relatively small sample size for the survey contributed to the uncertainty for this estimate.

For the final EA, the existing 4-log disinfection rate was revised downward to 52 percent, by excluding those systems with insufficient information for making the log inactivation calculation. (See Section 6.4.5 of the GWR EA.)

J.3.4 Impacts of 5 repeat samples

Key aspects that have remained the same

No similar provision was included in the proposed GWR RIA

Key aspects that have changed

The final GWR requires five repeat samples to be taken, and one of the repeat samples must be fecal indicator-positive before corrective action is required, unless the State determines that corrective action should be taken following an initial fecal indicator-positive.

The Agency did not include the costs for taking five repeat samples following a positive source water sample. However, EPA overestimated the cost of triggered monitoring because it assumed all systems would take an additional sample beyond the current TCR requirements. However, many small systems (and most ground water systems are small) will be able to use one of their TCR samples to also comply with the GWR. Overall, the impact of not including the five repeat sample cost (approximately $200,000 per year) is much smaller than the overestimate of a few million dollars associated with the initial fecal indicator sampling cost already conducted for TCR monitoring. (See Sections 6.4.3 and 6.6 of the GWR EA.)

J.4 Hydrogeologic Sensitivity Assessments and Routine Monitoring

Key Aspects that Have Remained the Same

The rule provisions related to hydrogeologic sensitivity assessments and routine monitoring have changed and are discussed below.

Key Aspects that Have Changed

The term routine monitoring used in the proposed GWR RIA has been changed to assessment monitoring in the final GWR EA.

The preferred regulatory option in the proposed GWR RIA included provisions for states to conduct hydrogeologic sensitivity assessments (HSAs) to identify sensitive aquifers where wells would be required to conduct monthly source water sampling for fecal indicators; sampling could be reduced to quarterly (or waived) if no fecal indicators were identified after 12 months of sampling.

In the final EA, the final regulatory option does not include the requirements for HSAs or assessment monitoring. Regulatory Alternative 3, however, does include these provisions, with some modifications (e.g., after 12 months of source water monitoring with no fecal indicator positives, assessment monitoring ends without going to quarterly monitoring as in the proposal).

In the final GWR EA, assessment monitoring is presented as an optional provision of the rule for states to consider at wells determined to be most susceptible to fecal contamination. This optional provision also suggests that HSAs be used as a tool to identify high risk wells for assessment monitoring.

Appendix K
Costing Details for Alternatives 1, 3, and 4

This appendix provides costing details for alternatives not presented in the main text. Chapter 6 of this EA provides a discussion of the rule components and a detailed analysis of the corresponding costs for Alternative 2, the final rule alternative. Appendix D contains detailed cost breakouts for the final rule, and summary cost results for Alternatives 1, 3, and 4 in Exhibits D.6 through D.8. Details of the four main regulatory alternatives considered are provided in Chapter 3 of this EA, and a comparison of the quantified benefits and costs of each of the four regulatory alternatives for the GWR is found in Chapter 8 of this EA.

K.1 Costing Details for Alternative 1 and Alternative 4

Costing details for Alternative 1, the sanitary survey and corrective action alternative, are the same as the sanitary survey and corrective action details discussed in Chapter 6 of this EA and further detail is not provided in this appendix.

Under Alternative 4, the across-the-board disinfection alternative, which requires all public ground water systems to provide treatment to 4-log inactivation and/or removal of viruses, all systems must conduct compliance monitoring and States shall perform sanitary surveys. Under this alternative, all of the GWSs not providing 4-log treatment (including systems with less than 4-log virus treatment and without virus treatment) are required to employ treatment as a corrective action.

Costing details for sanitary surveys under Alternative 4 are the same as those discussed in Chapter 6 and further detail is not provided in this appendix. Also, compliance forecasts of treatment corrective actions for this alternative remain the same as ones presented Chapter 6 (Exhibit 6.21b, Steps 4 and 5) of this EA for systems with less than 4-log virus treatment. Furthermore, the assumptions and the procedures used for compliance monitoring cost estimates are the same as ones described in Chapter 6 of this EA.

K.2 Costing Details for Alternative 3 (Multi-Barrier Approach)

This section presents the methodology and unit costs used to derive national costs for systems and States to perform GWR related activities under the multi-barrier approach. Only costing details for the hydrogeological sensitivity assessment (HSA) and assessment source water monitoring components of Alternative 3, which are not provided in Chapter 6 of this EA, are discussed in this appendix. The costs associated with State oversight and administration varies among the different regulatory alternatives. However, these costs are estimated to be similar for Alternatives 2 and 3 because State oversight for monitoring activities is not expected to vary between Alternatives 2 and 3. Costing details for rule implementation and annual administration, sanitary surveys, triggered monitoring, corrective action (compliance forecast), and compliance monitoring provided in Chapter 6 of this EA are the same as those for Alternative 3, and therefore are not discussed in this appendix.

This appendix uses information from the baseline analysis in Chapter 4 of this EA as a starting point for analysis of PWSs subject to each rule requirement. Exhibits K.1 and K.2 present key baseline information and intermediate model outputs that are referenced throughout this section. Because many of the assumptions apply not to systems but to entry points, Exhibit K.1 uses both system and entry point estimates where appropriate. The numbers shown in these two exhibits are cost model outputs. The number of entry points implicated by triggered monitoring and corrective action requirements shown in Exhibit K.1 are slightly lower than those in Exhibit 6.5b in Chapter 6 of this EA since assessment monitoring captures some of the fecal contamination that would otherwise be captured by triggered monitoring.

Exhibit K.1 Summary of Rule Implications under the Multi-Barrier Approach

System Size	Systems Receiving Sanitary Survey	Systems with Corrective Actions for Significant Deficiencies	Entry Points Receiving HSAs	Entry Points with Assessment Monitoring	Entry Points with Corrective Actions for Assessment Monitoring	Entry Points with Triggered Monitoring	Entry Points with Corrective Actions for Triggered Monitoring	Entry Points with Viral Disinfection Increased from less than 4 logs to 4 logs	Previously Non-disinfecting Entry Points Taking Corrective Action	Entry Points with Incremental Compliance Monitoring
	A	B	C	D	E	F	G	H	I	J
Community Water Systems (CWSs)										
<100	12,843	2,187	10,233	3,706	319	12,791	1,045	390	973	270
101-500	14,358	2,439	11,848	4,305	370	14,809	1,344	969	745	307
501-1,000	4,649	789	4,468	1,621	141	5,585	509	384	265	113
1,001-3,300	5,910	1,005	7,125	2,592	222	8,906	598	454	366	150
3,301-10K	2,884	491	4,505	1,639	141	5,631	511	373	279	116
10,001-50K	1,444	246	3,484	1,264	64	4,355	596	551	108	55
50,001-100K	167	28	1,036	374	7	1,295	220	93	133	46
100,001-1 Million	103	17	599	218	3	749	134	94	42	21
> 1 Million	3	-	-	-	-	-	-	-	-	-
Nontransient Noncommunity Water Systems (NTNCWSs)										
<100	9,456	1,607	6,879	2,494	216	8,601	580	174	622	173
101-500	6,758	1,150	4,920	1,787	155	6,152	445	132	468	193
501-1,000	1,894	321	1,379	499	43	1,723	125	37	131	56
1,001-3,300	715	121	521	188	9	651	78	19	68	28
3,301-10K	73	12	53	19	1	66	9	2	8	3
10,001-50K	10	2	7	3	0	9	2	0	1	1
50,001-100K	1	0	1	0	0	1	0	0	0	0
100,001-1 Million	1	0	1	0	0	1	0	0	0	0
> 1 Million	-	-	-	-	-	-	-	-	-	-
Transient Noncommunity Water Systems (TNCWSs)										
<100	64,448	10,972	50,645	18,338	1,290	63,298	6,035	1,210	6,092	1,702
101-500	18,993	3,231	14,916	5,413	380	18,650	1,779	358	1,796	746
501-1,000	1,940	331	1,524	553	39	1,905	182	37	184	78
1,001-3,300	585	99	460	167	10	574	67	13	64	26
3,301-10K	74	13	58	21	1	73	11	2	10	4
10,001-50K	19	3	15	5	0	19	3	1	3	1
50,001-100K	1	0	1	0	0	1	0	0	0	0
100,001-1 Million	1	0	1	0	0	1	0	0	0	0
> 1 Million	-	-	-	-	-	-	-	-	-	-

Source: Cost Model Outputs

(J) Indicates number of entry points with treatment corrective actions.

(I) - (J) Indicates non treatment corrective actions.

Exhibit K.2 Annualized Costs to Systems and States for Meeting the GWR Provisions under the Multi-Barrier Approach ($Millions, 2003$)

		Rule Implementation & Annual Administration	Sanitary Surveys	Corrective Actions for Significant Deficiencies	HSAs	Assessment Monitoring	Corrective Actions for Assessment Monitoring	Triggered Monitoring	Corrective Actions for Triggered Monitoring	Compliance Monitoring	Total Costs
		A	B	C	D	E	F	G	H	I	J
3%											
Systems	**Mean**	$0.93	$0.21	$8.39	$0.00	$2.29	$5.31	$5.40	$22.47	$10.69	$55.66
	Lower Bound (5th %ile)	$0.93	$0.11	$5.83	$0.00	$1.59	$1.99	$5.29	$12.94	$3.39	$38.07
	Upper Bound (95th %ile)	$0.93	$0.31	$11.52	$0.00	$3.04	$9.76	$5.52	$33.73	$19.35	$76.34
States	**Mean**	$9.20	$1.44	$0.56	$0.37	$0.05	$0.07	$0.08	$0.43	$0.00	$12.22
	Lower Bound (5th %ile)	$9.20	$0.66	$0.52	$0.32	$0.01	$0.04	$0.06	$0.30	$0.00	$11.30
	Upper Bound (95th %ile)	$9.20	$2.22	$0.61	$0.41	$0.10	$0.12	$0.11	$0.58	$0.01	$13.11
Total	**Mean**	$10.13	$1.65	$8.95	$0.37	$2.34	$5.38	$5.49	$22.90	$10.70	$67.88
	Lower Bound (5th %ile)	$10.13	$0.77	$6.34	$0.32	$1.61	$2.02	$5.34	$13.23	$3.39	$49.37
	Upper Bound (95th %ile)	$10.13	$2.53	$12.13	$0.41	$3.13	$9.88	$5.63	$34.30	$19.35	$89.45
7%											
Systems	**Mean**	$1.33	$0.20	$8.06	$0.00	$2.71	$5.75	$5.36	$24.11	$9.58	$57.06
	Lower Bound (5th %ile)	$1.33	$0.11	$5.60	$0.00	$1.88	$2.17	$5.24	$14.23	$3.03	$39.56
	Upper Bound (95th %ile)	$1.33	$0.30	$11.07	$0.00	$3.60	$10.43	$5.47	$36.00	$17.50	$77.38
States	**Mean**	$9.18	$1.39	$0.54	$0.44	$0.06	$0.09	$0.10	$0.50	$0.01	$12.30
	Lower Bound (5th %ile)	$9.18	$0.63	$0.50	$0.39	$0.02	$0.04	$0.07	$0.34	$0.00	$11.40
	Upper Bound (95th %ile)	$9.18	$2.13	$0.59	$0.49	$0.12	$0.14	$0.13	$0.66	$0.01	$13.20
Total	**Mean**	$10.51	$1.59	$8.60	$0.44	$2.78	$5.84	$5.45	$24.60	$9.59	$69.36
	Lower Bound (5th %ile)	$10.51	$0.74	$6.10	$0.39	$1.90	$2.22	$5.31	$14.57	$3.04	$50.96
	Upper Bound (95th %ile)	$10.51	$2.43	$11.65	$0.49	$3.72	$10.57	$5.60	$36.66	$17.51	$90.58

Notes: Detail may not add to totals due to independent rounding and independent cost model runs.

Source: Cost Model Outputs

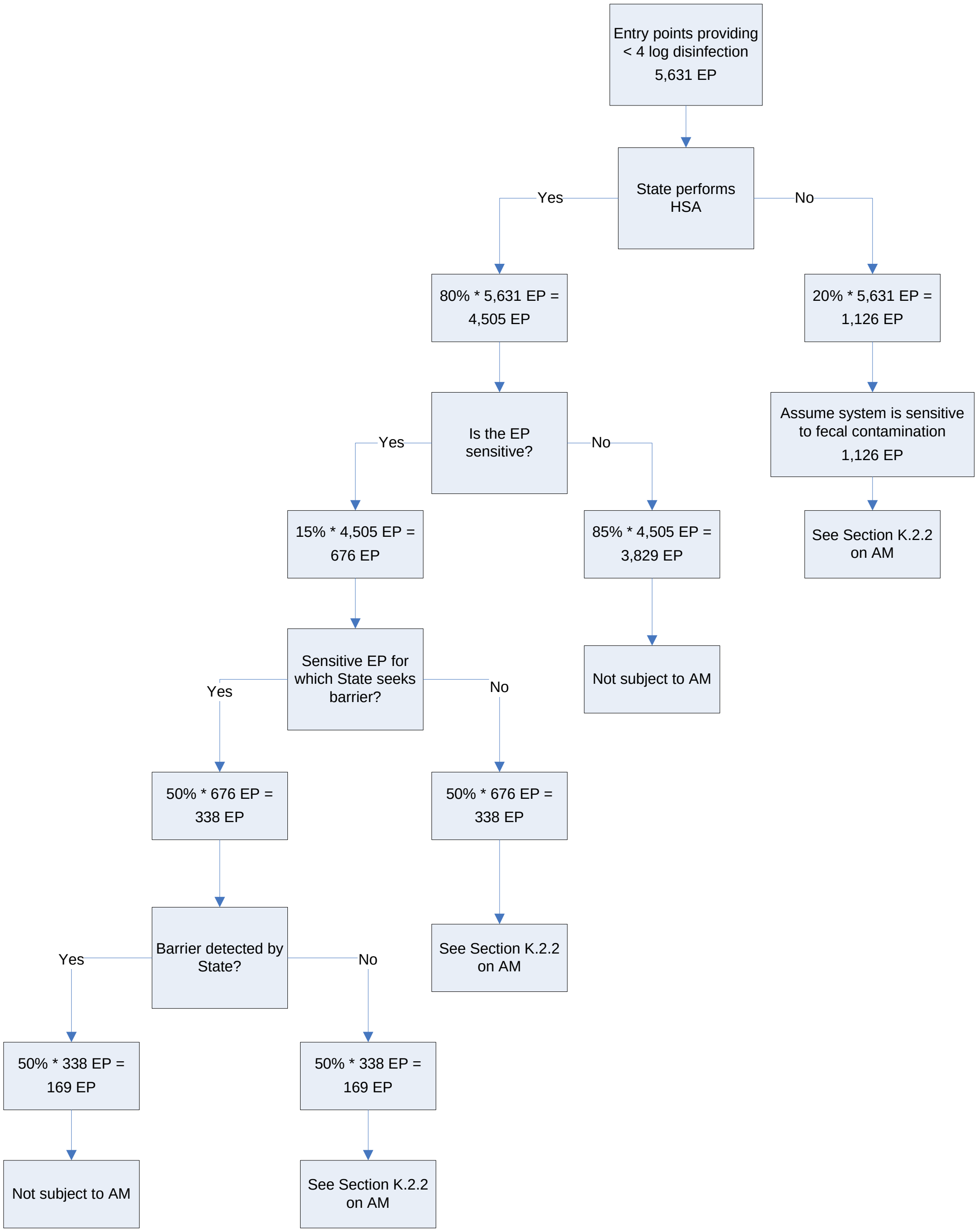
K.2.1 Hydrogeologic Sensitivity Assessment

PWSs

Under the multi-barrier approach, the GWR requires systems to provide the State with any pertinent information that allows the State to complete the HSA upon request. However, it is expected that such requests will be minimal and have a negligible cost impact on PWSs. Exhibit K.3 provides a schematic of the HSA process and assessment monitoring (AM) determination.

Exhibit K.3 Schematic of HSA Process

(Numbers based on 3,301 - 10,000 population category for CWSs)



Note: A total of 1,639 entry points from CWSs serving 3,301 to 10,000 people would be subject to assessment source water monitoring (see Section K.2.2 on assessment monitoring). Sum based on this schematic differs slightly from that shown in other exhibits due to rounding.

States

Under the multi-barrier approach, HSAs may be performed by States on each ground water source that does not rely on treatment to meet rule requirements. States can perform HSAs to determine if a system's source is sensitive to microbial contamination and requires assessment monitoring to ensure that there is no fecal contamination. As illustrated in Exhibit K.3, EPA assumes that a uniform distribution of 70 to 90 percent[1] of entry points (80% as mean) that do not provide 4-log treatment of viruses (using inactivation, removal, or State-approved combination of these technologies) before or at the first customer will undergo HSAs. EPA assumes that States will determine the remaining 20 percent (as mean) of entry points to do assessment source water monitoring. Of these assessed entry points, EPA estimates that States will determine that 15 percent are sensitive. The Agency based this assumption upon data collected for the Abbaszadegan et al. (2003) study. This study reported aquifer characterization information from well operators based on a checklist of aquifer types provided by the study investigators. EPA determined aquifer sensitivity based on the available information. EPA determined that 68 of the wells with aquifer characterization information would likely be determined by States to be wells in sensitive aquifers. All other wells, including those for which no aquifer characterization data were available were assumed to be wells in non-sensitive aquifers. States may choose not to conduct an HSA because it has determined that the setting from which ground water systems draw their water is known to be sensitive or the State has determined that the HSA is not an appropriate screening mechanism. The States must document the rationale for the decision in its primacy application. In this case, the aquifer is considered to be sensitive and the ground water source assumed to be "sensitive" to fecal contamination. Systems with aquifers located in hydrogeologically sensitive settings and lacking a hydrogeologic barrier are required, therefore, to conduct assessment source water monitoring. Exhibits K.4a and K.4b summarize the assumptions regarding systems undergoing HSAs and their sensitivity.

EPA estimated the time for States to locate existing hydrogeologic data, such as well construction records, and for a State assessor to inspect and review these data. The CWS burden per HSA is developed using an estimate of 2 hours per well. The 2 hour per well estimate is a national average. Some systems may require additional resources to perform an HSA (e.g., systems with wells distributed across a large distance and different aquifer types) while others may require less resources (e.g., systems with relatively compact well fields and drawing water from uniform aquifers). Further, it is expected that HSAs will be performed by hydrogeologists with an existing familiarity with the regional hydrogeology and relatively easy access to records that will aid in making assessments, minimizing the time required to make sensitivity determinations. Multiplying the estimated labor burden by the average number of wells per system (by system size) yields the burden per system. Finally, dividing the system burden by the number of entry points per system yields the assessment burden per entry point. The Agency assumes that per entry point costs for CWSs and NCWSs are equal. The average HSA costs generally increase as system size increases, ranging from under $70 per assessment for systems serving less than 1000 people to $238 per assessment for the entry points in systems serving more than 1,000,000 people. Exhibit K.4a also develops these costs.

As part of the process of determining the sensitivity of a ground water source, a State may look for the presence of a hydrogeologic barrier for initially sensitive entry points (see Exhibit K.3). Entry

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[1] Distribution parameters given in the text of this appendix describe those used in the Monte-Carlo simulation model. Where point estimates of results are presented in exhibits, the numbers presented are calculated based on the mean of the distribution described.

points drawing from aquifers that the State determines to have hydrogeologic barriers are not sensitive, and therefore not subject to assessment monitoring. EPA estimates that in 40 to 60 percent (uniform distribution) of the cases where States determine that an entry point is otherwise sensitive, States will also look for the presence of a hydrogeologic barrier, as shown in Exhibit K.4b. The Agency also estimates that 40 to 60 percent (uniform distribution) of the systems assessed for a barrier will find one. Because determining and documenting the presence of a hydrogeologic barrier is generally a difficult activity, EPA estimates the cost and burden for barrier determinations to be equal to the total cost and burden of performing an HSA. Exhibit K.4b shows the cost of barrier determinations.

Exhibit K.4a State Burden and Cost Estimates for Performing Hydrogeologic Sensitivity Assessments

			HSAs								
System Size (Population Served)	Entry Points Subject to HSAs	HSA Performed by State	Labor Cost (per hour)	HSA Labor per Well	Wells per System	Conduct HSA (hours/ system)	Entry Points per System	Conduct HSA (hours/ entry point)	Unit Cost	Total HSA Burden (hours)	Total HSA Cost
	A	B=0.8*A	C	D	E	F=D*E	G	H=F/G	I=C*H	J=B*H	K=B*I
Community Water Systems (CWSs)											
<100	12,791	10,233	$ 27.10	2	1.5	3.0	1.3	2.3	$ 62	23,394	$ 634,059
101-500	14,809	11,848	$ 27.10	2	2.0	4.0	1.6	2.5	$ 66	29,068	$ 787,840
501-1,000	5,585	4,468	$ 27.10	2	2.3	4.6	2.0	2.4	$ 64	10,519	$ 285,102
1,001-3,300	8,906	7,125	$ 27.10	2	3.1	6.2	2.4	2.6	$ 69	18,202	$ 493,324
3,301-10K	5,631	4,505	$ 27.10	2	4.6	9.2	3.2	2.9	$ 77	12,879	$ 349,072
10,001-50K	4,355	3,484	$ 27.10	2	9.8	19.6	5.6	3.5	$ 95	12,155	$ 329,440
50,001-100K	1,295	1,036	$ 27.10	2	16.1	32.2	11.3	2.9	$ 77	2,953	$ 80,033
100,001-1 Million	749	599	$ 27.10	2	49.9	99.8	12.4	8.1	$ 218	4,827	$ 130,816
> 1 Million	-	-	$ 27.10	2	49.9	99.8	11.4	8.8	$ 238	-	$ -
Total	**54,121**	**43,297**								**113,998**	**$ 3,089,687**
Nontransient Noncommunity Water Systems (NTNCWSs)											
<100	8,601	6,881	$ 27.10				1.0	2.3	$ 62	15,731	$ 426,354
101-500	6,152	4,922	$ 27.10				1.0	2.5	$ 66	12,075	$ 327,282
501-1,000	1,723	1,379	$ 27.10				1.0	2.4	$ 64	3,246	$ 87,964
1,001-3,300	651	521	$ 27.10				1.0	2.6	$ 69	1,330	$ 36,040
3,301-10K	66	53	$ 27.10				1.0	2.9	$ 77	152	$ 4,119
10,001-50K	9	7	$ 27.10				1.0	3.5	$ 95	25	$ 688
50,001-100K	1	1	$ 27.10				1.0	2.9	$ 77	2	$ 56
100,001-1 Million	1	1	$ 27.10				1.0	8.1	$ 218	6	$ 159
> 1 Million	-	-	NA				NA	NA	NA	NA	NA
Total	**17,204**	**13,763**								**32,567**	**$ 882,661**
Transient Noncommunity Water Systems (TNCWSs)											
<100	63,298	50,638	$ 27.10				1.0	2.3	$ 62	115,771	$ 3,137,734
101-500	18,650	14,920	$ 27.10				1.0	2.5	$ 66	36,607	$ 992,161
501-1,000	1,905	1,524	$ 27.10				1.0	2.4	$ 64	3,589	$ 97,263
1,001-3,300	574	460	$ 27.10				1.0	2.6	$ 69	1,174	$ 31,819
3,301-10K	73	58	$ 27.10				1.0	2.9	$ 77	166	$ 4,505
10,001-50K	19	15	$ 27.10				1.0	3.5	$ 95	52	$ 1,412
50,001-100K	1	1	$ 27.10				1.0	2.9	$ 77	2	$ 61
100,001-1 Million	1	1	$ 27.10				1.0	8.1	$ 218	6	$ 172
> 1 Million	-	-	NA				NA	NA	NA	NA	NA
Total	**84,521**	**67,617**								**157,367**	**$ 4,265,127**
All Total	**155,846**	**124,676**								**303,932**	**$ 8,237,475**

Notes: Detail may not add to totals due to independent rounding.
Calculations use means of distributions described in Section K.2.1.
NA Not applicable (no NCWSs of this size category).

Sources: (A) Number of entry points from Exhibit K.1
(C) Labor rates for staff hydrogeologist from Chapter 6, Exhibit 6.2 of GWR EA
(D,E,F) Well information not available for NCWSs. CWSs well data applied to NCWSs.
(D) Labor for conducing HSA includes time for travel, records review, wellhead inspection, and report preparation.
(E) Wells per system from US EPA Drinking Water Baseline Handbook (2001)
(G) Entry points per system from Chapter 4, Exhibit 4.3 of GWR EA
(H) Labor hours per entry point for NTNCWSs and TNCWSs based on EPA estimate of hours per entry point for CWSs.

Exhibit K.4b State Burden and Cost Estimates for Performing Hydrogeologic Barrier Determination

					Barrier Determination			
System Size (Population Served)	Sensitive Entry Points	Sensitive Entry Points for which State Seeks for Barrier	Sensitive Entry Points with Detected Barrier by State	Sensitive Entry Points without Detected Barrier by State	Barrier Determination (hours/entry point)	Unit Cost	Total Barrier Determination Burden	Total Barrier Determination Cost
	L=0.15*B	M=0.5*L	N=0.5*M	O=L-N	P=H	Q=C*P	R=M*P	S=M*Q
Community Water Systems (CWSs)								
<100	1,535	767	384	1,151	2.3	$ 62	1,755	$ 47,554
101-500	1,777	889	444	1,333	2.5	$ 66	2,180	$ 59,088
501-1,000	670	335	168	503	2.4	$ 64	789	$ 21,383
1,001-3,300	1,069	534	267	802	2.6	$ 69	1,365	$ 36,999
3,301-10K	676	338	169	507	2.9	$ 77	966	$ 26,180
10,001-50K	523	261	131	392	3.5	$ 95	912	$ 24,708
50,001-100K	155	78	39	117	2.9	$ 77	221	$ 6,003
100,001-1 Million	90	45	22	67	8.1	$ 218	362	$ 9,811
> 1 Million	-	-	-	-	8.8	$ 238	-	$ -
Total	**6,494**	**3,247**	**1,624**	**4,871**			**8,550**	**$ 231,727**
Nontransient Noncommunity Water Systems (NTNCWSs)								
<100	1,032	516	258	774	2.3	$ 62	1,180	$ 31,977
101-500	738	369	185	554	2.5	$ 66	906	$ 24,546
501-1,000	207	103	52	155	2.4	$ 64	243	$ 6,597
1,001-3,300	78	39	20	59	2.6	$ 69	100	$ 2,703
3,301-10K	8	4	2	6	2.9	$ 77	11	$ 309
10,001-50K	1	1	0	1	3.5	$ 95	2	$ 52
50,001-100K	0	0	0	0	2.9	$ 77	0	$ 4
100,001-1 Million	0	0	0	0	8.1	$ 218	0	$ 12
> 1 Million	-	-	-	-	NA	NA	NA	NA
Total	**2,064**	**1,032**	**516**	**1,548**			**2,443**	**$ 66,200**
Transient Noncommunity Water Systems (TNCWSs)								
<100	7,596	3,798	1,899	5,697	2.3	$ 62	8,683	$ 235,330
101-500	2,238	1,119	560	1,679	2.5	$ 66	2,746	$ 74,412
501-1,000	229	114	57	171	2.4	$ 64	269	$ 7,295
1,001-3,300	69	34	17	52	2.6	$ 69	88	$ 2,386
3,301-10K	9	4	2	7	2.9	$ 77	12	$ 338
10,001-50K	2	1	1	2	3.5	$ 95	4	$ 106
50,001-100K	0	0	0	0	2.9	$ 77	0	$ 5
100,001-1 Million	0	0	0	0	8.1	$ 218	0	$ 13
> 1 Million	-	-	-	-	NA	NA	NA	NA
Total	**10,142**	**5,071**	**2,536**	**7,607**			**11,803**	**$ 319,885**
All Total	**18,701**	**9,351**	**4,675**	**14,026**			**22,795**	**$ 617,811**

Notes: Detail may not add to totals due to independent rounding.
Calculations use means of distributions described in Section K.2.1.
NA Not applicable (no NCWSs of this size category).

Sources: (L) 15% is based on data from Abbaszadegan et al., 1999, 2003 and Abbaszadegan 2002.
(M) Mean number of sensitive entry points for which State seeks for barrier, from Section K.2.1 (50 percent is the arithmetic mean of 40 percent and 60 percent).
(N) Mean number of sensitive entry points with detected barrier by State, from Section K.2.1 (50 percent is the arithmetic mean of 40 percent and 60 percent).
(P) EPA estimates that the labor hours for determining the presence of a hydrogeologic barrier equal those to perform an HSA.

Annualized costs estimates for systems and States to perform HSAs are presented in Exhibit K.5.

Exhibit K.5 PWS and State Cost Estimates for HSA Performance

Annualized Costs for HSA Performance									
	Systems			**States**			**Total**		
	Mean	**Lower Bound (5th %ile)**	**Upper Bound (95th %ile)**	**Mean**	**Lower Bound (5th %ile)**	**Upper Bound (95th %ile)**	**Mean**	**Lower Bound (5th %ile)**	**Upper Bound (95th %ile)**
3%	$0.00	$0.00	$0.00	$0.37	$0.32	$0.41	$0.37	$0.32	$0.41
7%	$0.00	$0.00	$0.00	$0.44	$0.39	$0.49	$0.44	$0.39	$0.49

Notes: Detail may not add to totals due to independent rounding and independent cost model runs.

Source: Cost Model Outputs

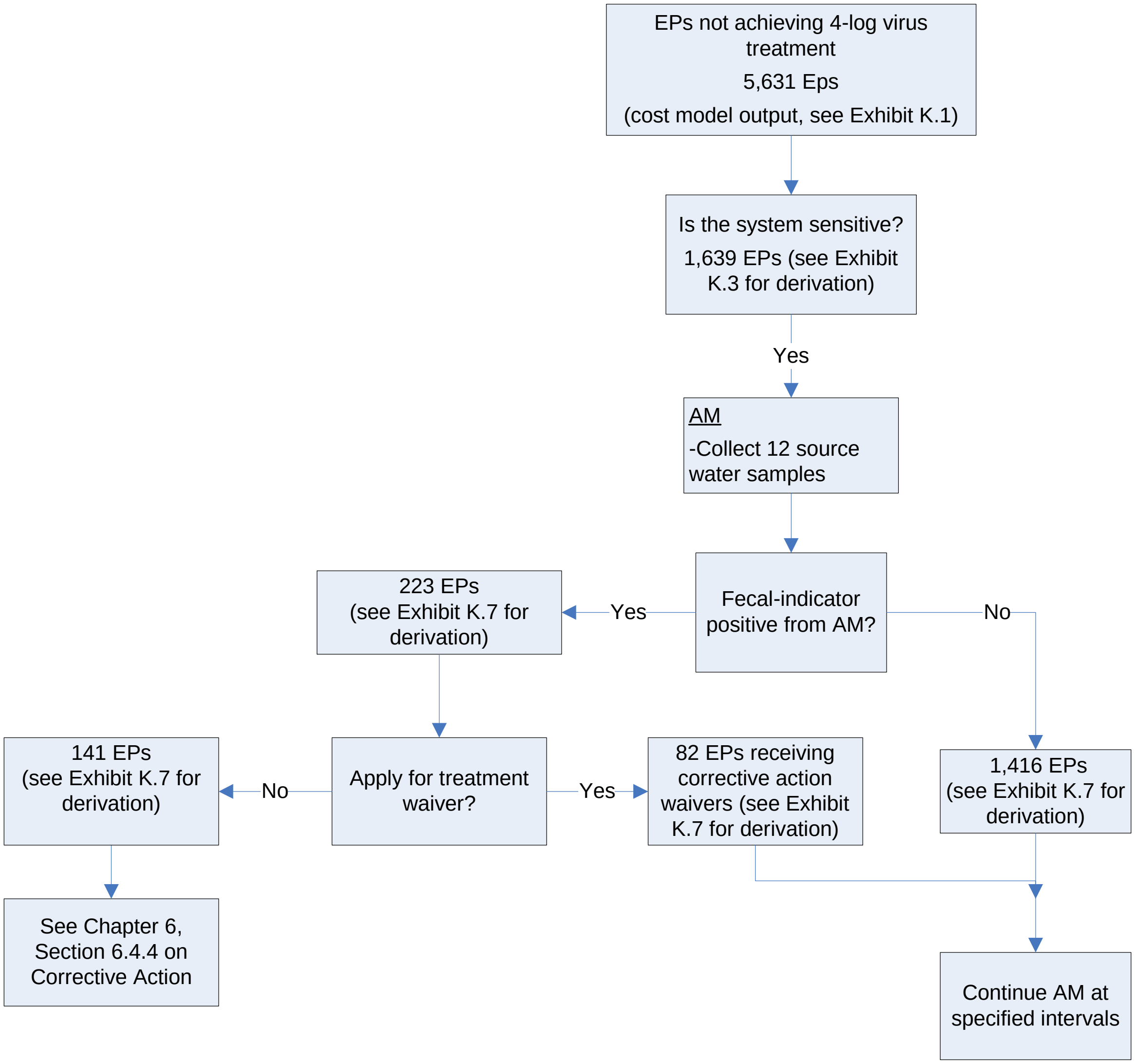
K.2.2 Assessment Source Water Monitoring

PWSs

The assessment source water monitoring provision requires sampling of those entry points that are determined to be sensitive based on the performance of HSAs, as well as those for which the State has not performed an HSA. Exhibit K.6 presents a schematic of the assessment monitoring process as applied in the cost model. Similar to triggered monitoring (described in Section 6.4.3 of Chapter 6 of this EA), several compliance assumptions were needed to model the cost of assessment monitoring. These assumptions are described below and summarized in Exhibit K.7 (entry points incurring costs) and Exhibit K.8 (unit costs).

Exhibit K.6 Schematic of Assessment Monitoring Process

(Numbers based on 3,301 - 10,000 population category for CWSs)



Frequency of Performing Assessment Monitoring: Entry points subject to assessment monitoring must collect and analyze at least 12 source water samples for the presence of fecal contamination using one of three possible indicators as selected by the State. One sample must be tested each month that the system is in operation. For costing purposes, EPA assumes that States will select *E. coli* as the indicator of contamination for analysis. EPA assumes for modeling purposes, that all CWSs and NTNCWSs conduct assessment monitoring on a monthly schedule in years 6 and 8 after rule implementation, respectively. Because of the seasonal nature of many TNCWSs, EPA assumes that the 12 assessment monitoring samples will be taken over 3 years (years 7-9 after rule implementation). Sampling costs for assessment monitoring are calculated by multiplying the annual number of assessment monitoring samples taken by the sampling unit costs presented Chapter 6, Exhibit 6.3 of this EA.

Percent of EPs Testing Positive: As discussed in Section K.2.1, it is estimated that 9.0 percent[2] of ground water entry points among those without 4-log virus treatment are determined to be hydrogeologically susceptible to fecal contamination. The cost model assumes that these entry points (in addition to being subject to sanitary surveys and taking source water indicator assays from triggered monitoring) must also perform indicator assays for 12 source water samples. It is assumed that these samples will be taken monthly during year 6 for CWSs, and monthly during year 8 for NTNCWS. For TNCWS, it is assumed that these 12 assays will be performed across years 6, 7, and 8.

The probability of observing an indicator positive in one of these 12 assessment monitoring samples is taken from the same set of probabilities of indicator positives as a function of the number of assays performed as described in Chapter 6, Section 6.4.3 on triggered monitoring and in Chapter 4 of this EA. As shown in Chapter 4, Exhibit 4.26, the central tendency value across all uncertainty sets indicates that approximately 11.2% of wells will result in an indicator positive within the first 12 indicator assays (95% confidence bounds of 8.1% to 15.0%).

It is important to note that the 12 assays that are conducted for assessment monitoring are not necessarily the first 12 assays that will be conducted for those wells performing assessment monitoring. In many cases, and perhaps most, there will have been source water indicator samples taken in response to TC positives occurring prior to the beginning of the assessment monitoring period. Because the probability of getting the first positive indicator result decreases with each additional assay (refer to Exhibit 4.26) the actual probability that a given well will get caught by one of the 12 assessment monitoring samples depends upon how many triggered monitoring indicator assays were performed (which would all have been negative) prior to the beginning of the assessment monitoring assays. The more triggered monitoring samples taken, the less likely it is that the additional 12 assessment monitoring assays will produce a positive result. For example, assume a well has taken 3 triggered monitoring samples (with negative results) prior to the 12 assessment monitoring samples. The expected value of the probability that a positive result will have been obtained in those first 3 samples is 6.0%, and the expected value of the probability that a positive result will have been obtained in the first 15 samples is 12.0% (that is, the 3 triggered plus 12 assessment samples). Therefore the, incremental probability of observing an indicator positive from those additional 12 samples is only about 6.0%. Assume, however, that a well has taken 20 triggered monitoring samples (with negative results) prior to the 12 assessment monitoring samples. The expected value of the probability that a positive result will have been obtained in those first 20 samples is 12.9%, and the expected value of the probability that a positive result will have been obtained in the first 32 samples is 14.1% (that is, the 20 triggered plus 12 assessment samples). Therefore

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[2] (0.8*0.15*0.5) + (0.8*0.15*0.5*0.5) = 0.09

the, incremental probability of observing an indicator positive from those additional 12 samples in this case is only about 1.2%. Since most wells will have some triggered monitoring events prior to the beginning of any assessment monitoring, the probability of observing an indicator positive in the one of the 12 assessment monitoring samples is less than would be expected if those samples were the first 12 taken at that well (that is, if no triggered monitoring occurred). In the cost model, the simulation process took this into account by assigning to each simulated well a number of triggered monitoring samples (based on the expected number of TC positive results occurring per year for wells of different types and sizes as discussed in Chapter 4).

Systems where an entry point tests positive for fecal contamination and does not receive a treatment waiver must perform a corrective action.

Systems must report all positive source water samples to the State. As with triggered monitoring, EPA estimates that this report will require, on average, 2.5 hours to complete and submit. EPA has developed and systems will have access to automated forms that will minimize the burden to systems in complying with this reporting requirement. Exhibit K.8 presents system unit costs for assessment monitoring reporting requirements.

Waiver from Corrective Action: A one-time treatment waiver exists for assessment source water monitoring. Once a PWS finds a single positive source water sample, it may take 5 repeat samples within 24 hours. If all five repeat samples are negative, and the system has no fecal indicator-positives among its required source water samples for that entry point since the last sanitary survey inspection, the system does not have to perform a corrective action at that time. To prepare and submit the waiver application, EPA estimates that systems will require 2.5 hours. As with other reporting requirements, EPA has developed and systems will have access to automated forms that will minimize the burden to systems in complying with this application process. For the purposes of this analysis, it is assumed that all PWSs that have a positive source water sample will apply for this one-time treatment waiver. It is assumed that every year in which assessment source water monitoring occurs, 0 to 10 percent of entry points will test positive in addition to those estimated above, but five repeat samples will test negative, and the systems will apply for and receive a treatment waiver for those samples.

Invalidation of Samples: The GWR allows a State to invalidate a positive source water sample if it believes that the positive is due to improper analysis. States may also invalidate positive source water samples that are due to circumstances not reflecting source water quality. Systems must resample after a sample is invalidated. For costing purposes, EPA estimates that States will invalidate a minimal number of samples, resulting in a negligible cost and burden.

States

State costs for assessment monitoring are assumed to be solely administrative. States incur costs to review several paperwork requirements: reports of positive samples; corrective action waiver applications; and sample invalidation documentation. With the exception of corrective action waivers, these reviews apply to both triggered and assessment monitoring requirements. Because of similarities in costing assumptions, the discussion provided in Chapter 6, Section 6.4.3 of this EA applies to both triggered and assessment monitoring. Under the multi-barrier approach, the GWR requires systems that find fecal contamination through triggered monitoring or assessment monitoring to perform corrective action. However, a one-time treatment waiver exists for assessment source water monitoring. To make this determination, States must review all waiver applications. For costing purposes, EPA estimates that each waiver application will take 3.5 hours to review, and using a labor cost of $33.61 per hour, EPA estimates a unit cost of $117.61 to review the report.

Exhibit K.7 Entry Points Incurring Assessment Monitoring Costs

System Size (Population Served)	Entry Points Monitoring; Initial Sampling	Entry Points Performing Corrective Actions	Corrective Action Waivers	Entry Points with Positive Assessment Monitoring Samples	Prepare Assessment Monitoring Report and Perform Repeat Sampling	Apply for Treatment Waiver
	A	B	C=0.05*A	D=B+C	E=D	F=C
Community Water Systems (CWSs)						
<100	3,706	319	185	504	504	185
101-500	4,305	370	215	586	586	215
501-1,000	1,621	141	81	222	222	81
1,001-3,300	2,592	222	130	352	352	130
3,301-10K	1,639	141	82	223	223	82
10,001-50K	1,264	64	63	127	127	63
50,001-100K	374	7	19	26	26	19
100,001-1 Million	218	3	11	14	14	11
> 1 Million	-	-	-	-	-	-
Totals	**15,721**	**1,267**	**786**	**2,053**	**2,053**	**786**
Nontransient Noncommunity Water Systems (NTNCWSs)						
<100	2,494	216	125	341	341	125
101-500	1,787	155	89	244	244	89
501-1,000	499	43	25	68	68	25
1,001-3,300	188	9	9	19	19	9
3,301-10K	19	1	1	2	2	1
10,001-50K	3	0	0	0	0	0
50,001-100K	0	0	0	0	0	0
100,001-1 Million	0	0	0	0	0	0
> 1 Million	-	-	-	-	-	-
Totals	**4,992**	**425**	**250**	**674**	**674**	**250**
Transient Noncommunity Water Systems (TNCWSs)						
<100	18,338	1,290	917	2,207	2,207	917
101-500	5,413	380	271	651	651	271
501-1,000	553	39	28	67	67	28
1,001-3,300	167	10	8	18	18	8
3,301-10K	21	1	1	2	2	1
10,001-50K	5	0	0	0	0	0
50,001-100K	0	0	0	0	0	0
100,001-1 Million	0	0	0	0	0	0
> 1 Million	-	-	-	-	-	-
Totals	**24,498**	**1,720**	**1,225**	**2,945**	**2,945**	**1,225**
Grand Total	**45,210**	**3,412**	**2,261**	**5,672**	**5,672**	**2,261**

Notes: Detail may not add to totals due to independent rounding.
Source: (A) Exhibit K.1, Column D
(B) Exhibit K.1, Column E

Exhibit K.8 PWS Unit Costs for Assessment Monitoring

	Reporting			Waiver Application		
System Size (Population Served)	Report Prep (hours) A	Labor Cost (per hour) B	Unit Cost C=A*B	Application Prep (hours) D	Labor Cost (per hour) E	Unit Cost F=D*E
Community Water Systems (CWSs)						
<100	2.5	$ 21.44	$ 53.60	2.5	$ 21.44	$ 53.60
101-500	2.5	$ 23.09	$ 57.73	2.5	$ 23.09	$ 57.73
501-1,000	2.5	$ 24.74	$ 61.85	2.5	$ 24.74	$ 61.85
1,001-3,300	2.5	$ 24.74	$ 61.85	2.5	$ 24.74	$ 61.85
3,301-10K	2.5	$ 30.51	$ 76.28	2.5	$ 30.51	$ 76.28
10,001-50K	2.5	$ 31.08	$ 77.70	2.5	$ 31.08	$ 77.70
50,001-100K	2.5	$ 31.08	$ 77.70	2.5	$ 31.08	$ 77.70
100,001-1 Million	2.5	$ 35.25	$ 88.12	2.5	$ 35.25	$ 88.12
> 1 Million	2.5	$ 35.25	$ 88.12	2.5	$ 35.25	$ 88.12
Nontransient Noncommunity Water Systems (NTNCWSs)						
<100	2.5	$ 21.44	$ 53.60	2.5	$ 21.44	$ 53.60
101-500	2.5	$ 23.09	$ 57.73	2.5	$ 23.09	$ 57.73
501-1,000	2.5	$ 24.74	$ 61.85	2.5	$ 24.74	$ 61.85
1,001-3,300	2.5	$ 24.74	$ 61.85	2.5	$ 24.74	$ 61.85
3,301-10K	2.5	$ 30.51	$ 76.28	2.5	$ 30.51	$ 76.28
10,001-50K	2.5	$ 31.08	$ 77.70	2.5	$ 31.08	$ 77.70
50,001-100K	2.5	$ 31.08	$ 77.70	2.5	$ 31.08	$ 77.70
100,001-1 Million	2.5	$ 35.25	$ 88.12	2.5	$ 35.25	$ 88.12
> 1 Million	NA	$ 35.25	NA	NA	$ 35.25	NA
Transient Noncommunity Water Systems (TNCWSs)						
<100	2.5	$ 21.44	$ 53.60	2.5	$ 21.44	$ 53.60
101-500	2.5	$ 23.09	$ 57.73	2.5	$ 23.09	$ 57.73
501-1,000	2.5	$ 24.74	$ 61.85	2.5	$ 24.74	$ 61.85
1,001-3,300	2.5	$ 24.74	$ 61.85	2.5	$ 24.74	$ 61.85
3,301-10K	2.5	$ 30.51	$ 76.28	2.5	$ 30.51	$ 76.28
10,001-50K	2.5	$ 31.08	$ 77.70	2.5	$ 31.08	$ 77.70
50,001-100K	2.5	$ 31.08	$ 77.70	2.5	$ 31.08	$ 77.70
100,001-1 Million	2.5	$ 35.25	$ 88.12	2.5	$ 35.25	$ 88.12
> 1 Million	NA	$ 35.25	NA	NA	$ 35.25	NA

Notes: Detail may not add to totals due to independent rounding.
NA = Not applicable (no NCWSs of this size category).
Source: (A,D) Labor hours for report preparation and waiver application preparation based on EPA experience with similar rule requirements.
(B,E,F) Labor rates from Chapter 6, Exhibit 6.1.

Annualized cost estimates for systems and States to perform assessment monitoring are presented in Exhibit K.9.

Exhibit K.9 PWS and State Cost Estimates for Performing Assessment Monitoring ($Millions, 2003$)

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Annualized Costs for Assessment Monitoring Performance									
	Systems			States			Total		
	Mean	Lower Bound (5th %ile)	Upper Bound (95th %ile)	Mean	Lower Bound (5th %ile)	Upper Bound (95th %ile)	Mean	Lower Bound (5th %ile)	Upper Bound (95th %ile)
3%	$2.29	$1.59	$3.04	$0.05	$0.01	$0.10	$2.34	$1.61	$3.13
7%	$2.71	$1.88	$3.60	$0.06	$0.02	$0.12	$2.78	$1.90	$3.72

Notes: Detail may not add to totals due to independent rounding and independent cost model runs.

Source: Cost Model Outputs

K.2.2.1 Assessment Monitoring Corrective Actions

All systems that detect fecal contamination in their source water must perform a corrective action. For costing purposes, EPA assumes that each indicator positive sample will correspond to either one entry point predicted to have corrective treatment or one well per entry point to have a nontreatment corrective action. Compliance forecasts of treatment corrective actions for this alternative remain the same as ones presented Chapter 6 (Exhibit 6.21b, Steps 1 thru 5) of this EA for systems without 4-log virus treatment and with less than 4-log virus treatment.

Annualized cost estimates for systems and States to perform assessment monitoring corrective actions are presented in Exhibit K.10.

Exhibit K.10 PWS and State Cost Estimates for Assessment Monitoring Corrective Actions Activities ($Millions, 2003$)

Annualized Costs for Assessment Monitoring Corrective Action Activities									
	Systems			States			Total		
	Mean	Lower Bound (5th %ile)	Upper Bound (95th %ile)	Mean	Lower Bound (5th %ile)	Upper Bound (95th %ile)	Mean	Lower Bound (5th %ile)	Upper Bound (95th %ile)
3%	$5.31	$1.99	$9.76	$0.07	$0.04	$0.12	$5.38	$2.02	$9.88
7%	$5.75	$2.17	$10.43	$0.09	$0.04	$0.14	$5.84	$2.22	$10.57

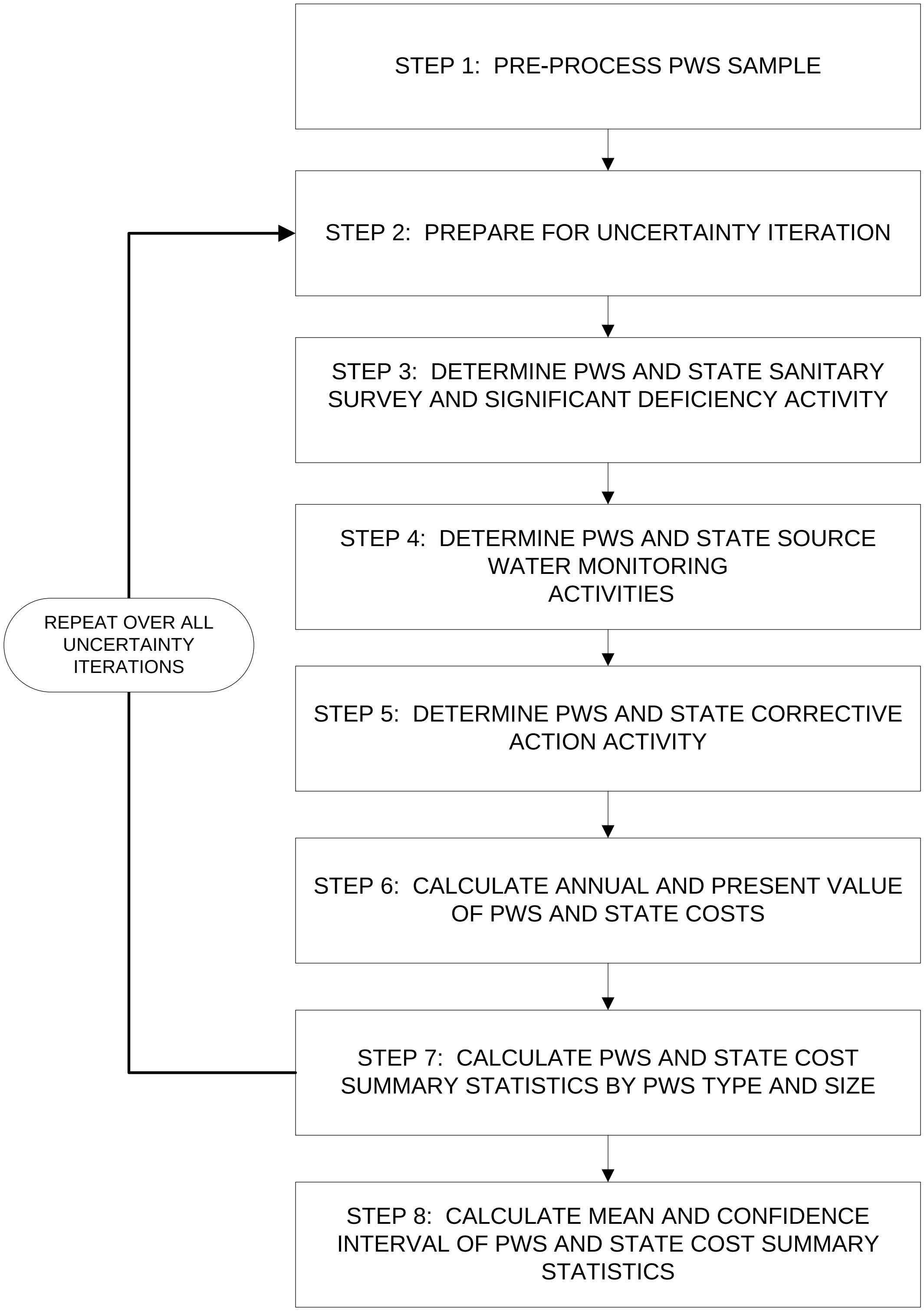
Notes: Detail may not add to totals due to independent rounding and independent cost model runs.

Source: Cost Model Outputs

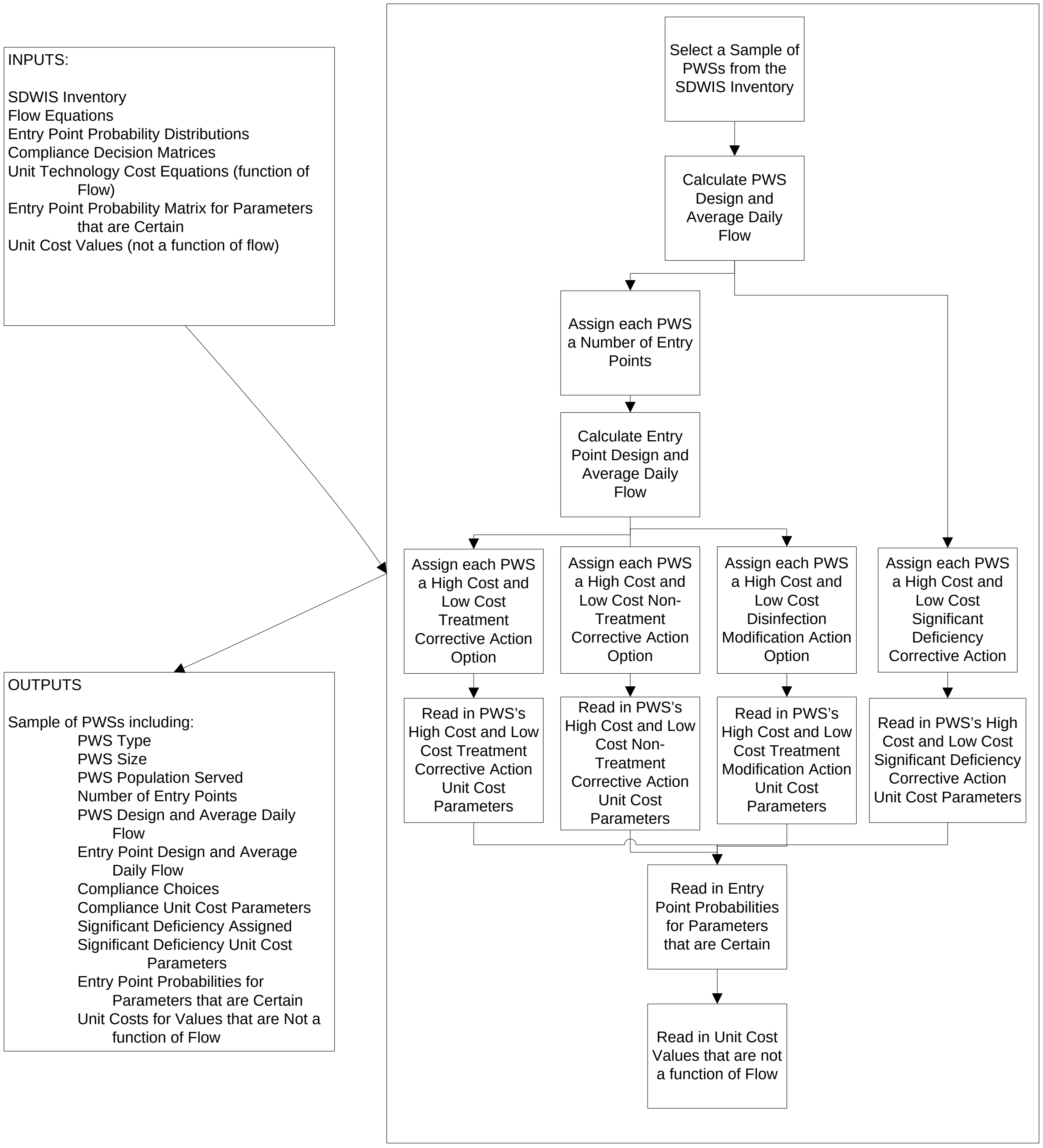
Appendix L

Summary Flowcharts for GWR Cost Model

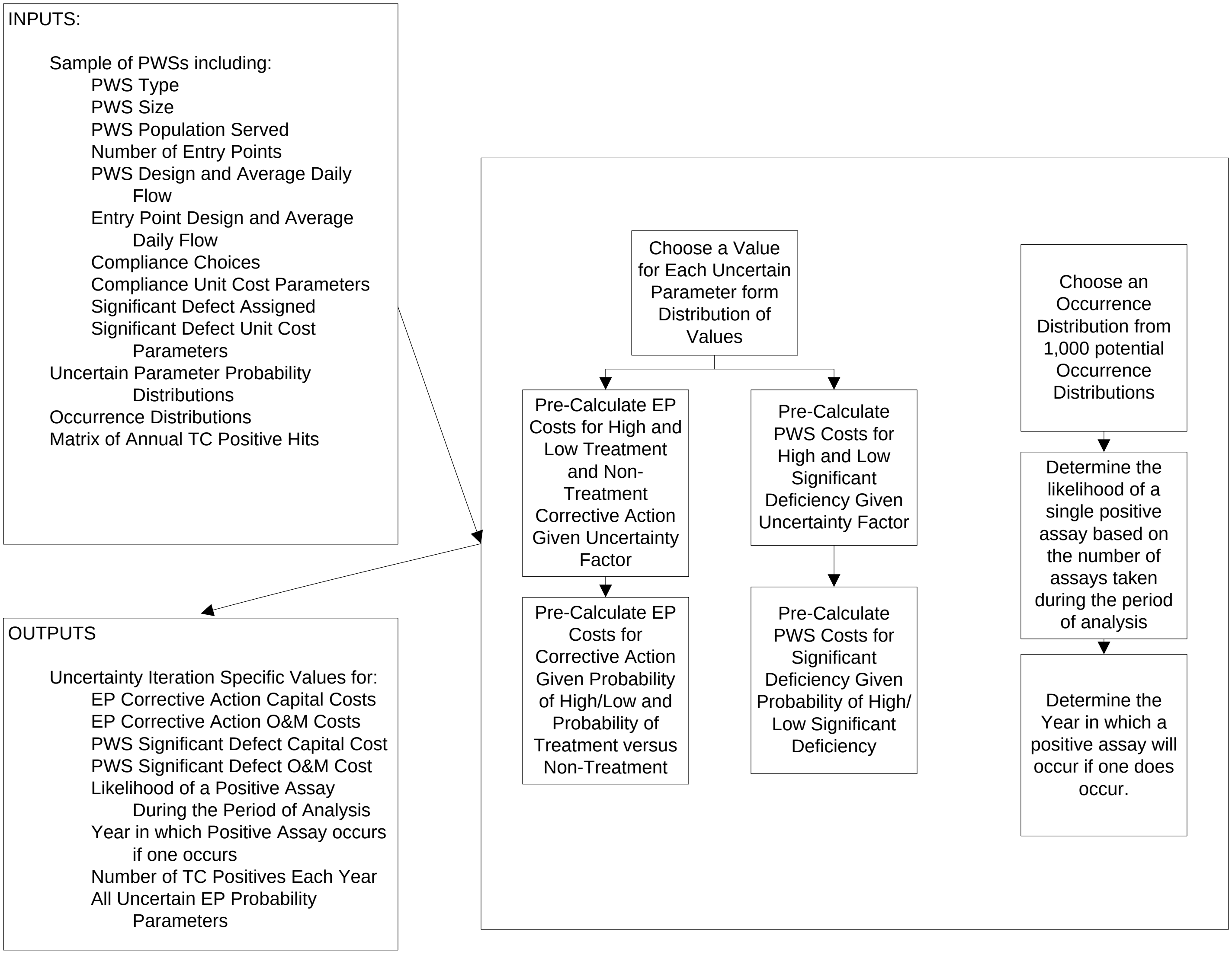
Appendix L
Summary Flowcharts for GWR Cost Model



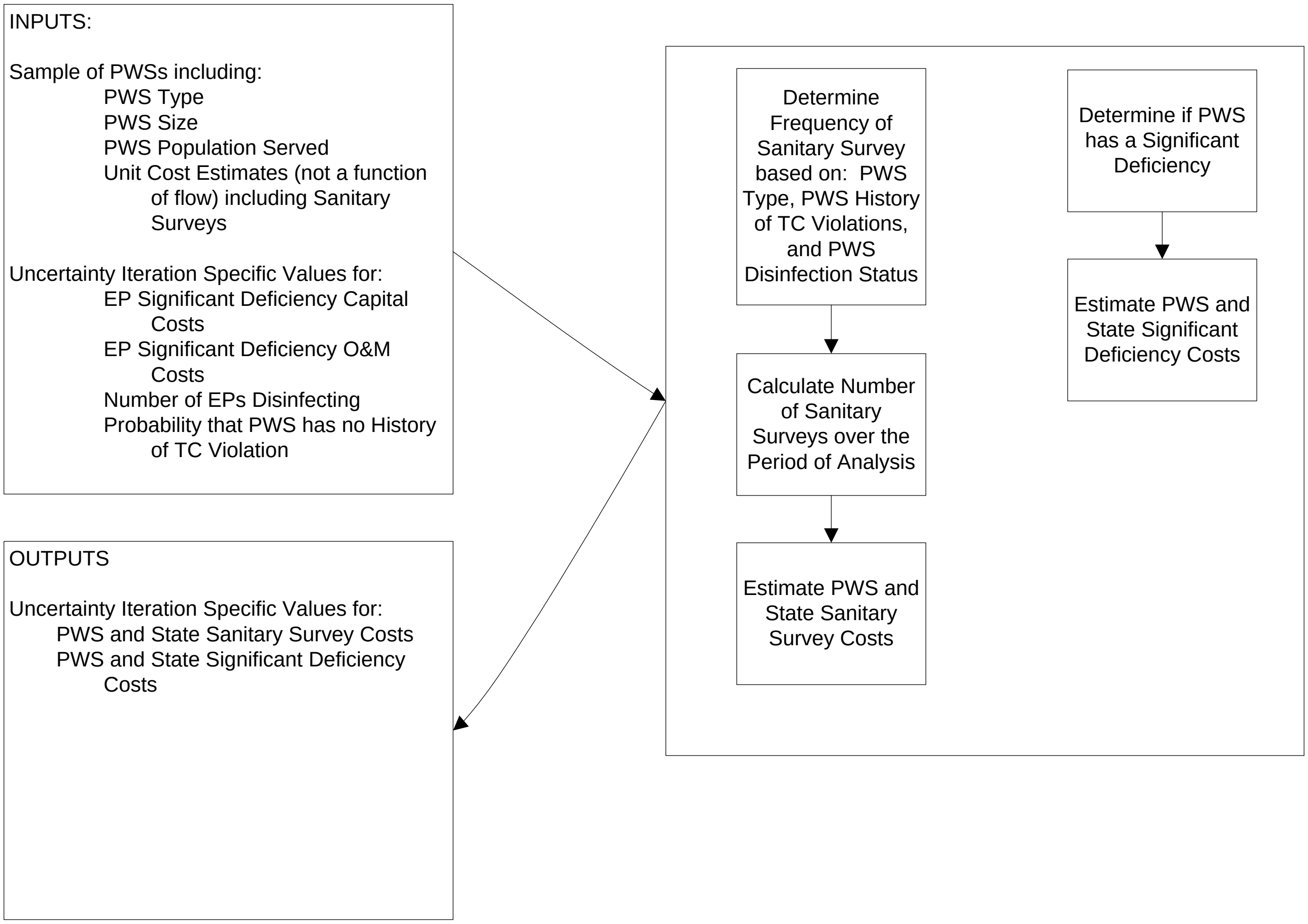
STEP 1: PRE-PROCESS PWS SAMPLE



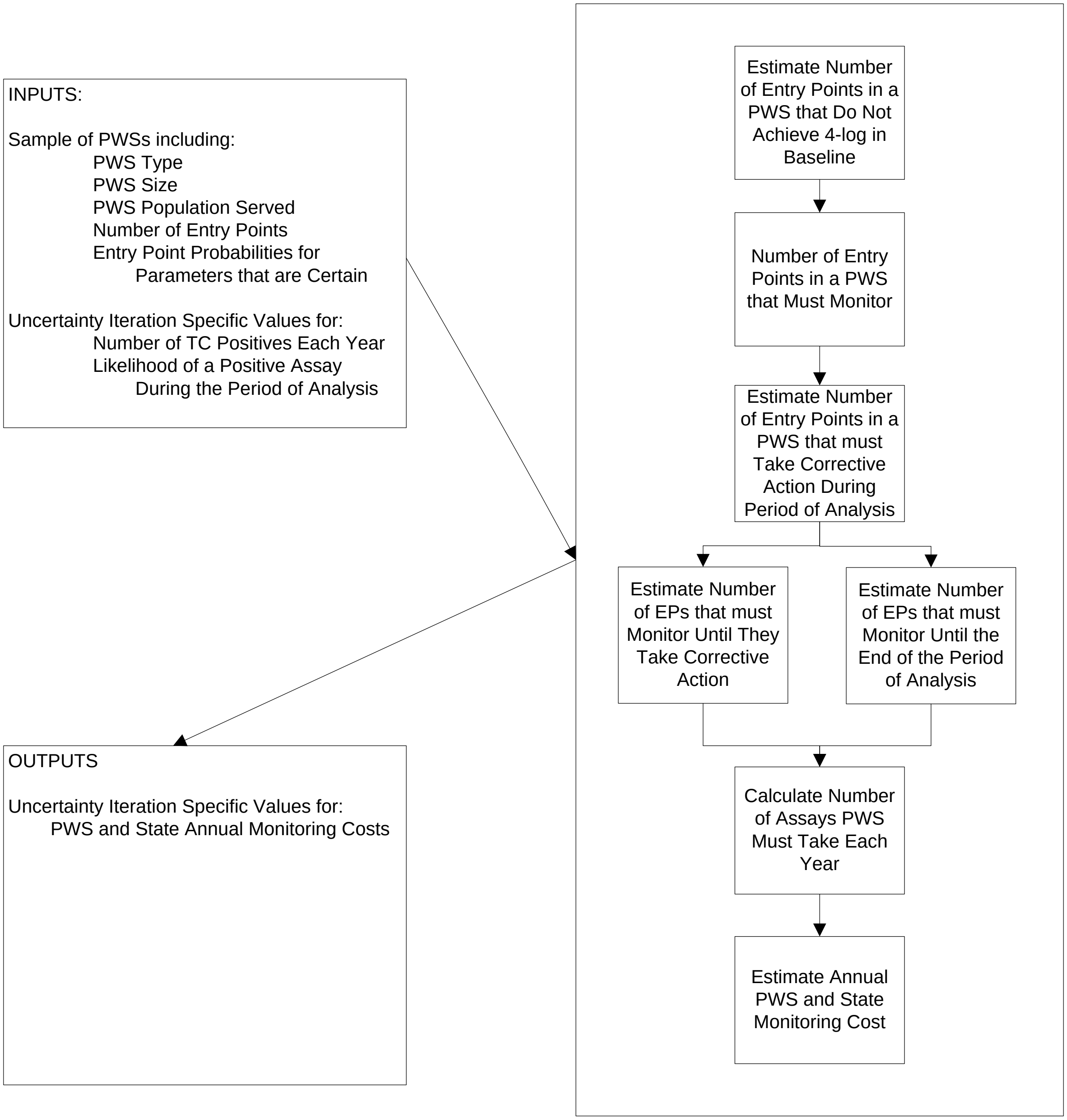
STEP 2: PREPARE FOR UNCERTAINTY ITERATION



STEP 3: DETERMINE PWS AND STATE SANITARY SURVEY AND SIGNIFICANT DEFICIENCY ACTIVITY



STEP 4: DETERMINE PWS AND STATE SOURCE WATER MONITORING ACTIVITIES



STEP 5: DETERMINE PWS AND STATE CORRECTIVE ACTION ACTIVITY