Variability of Differences between Two Approaches for Determining Ground-Water Discharge and Pumpage, Including Effects of Time Trends, Lower Arkansas River Basin, Southeastern Colorado, 1998–2002

By Brent M. Troutman, Patrick Edelmann, and Russell G. Dash

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Conversion Factors, Abbreviations, and Acronyms

Multiply	By	To obtain
acre-foot (acre-ft)	1,233	cubic meter
foot (ft)	0.3048	meter
gallon per minute (gal/min)	0.06309	liter per second
inch	2.54	centimeter
kilowatthour (kWh)	3,600,000	joule
kilowatthour per acre-foot	2,919	joule per cubic meter

The following terms, abbreviations, and acronyms are used in this report:

Colorado Division of Water Resources (CDWR)
Colorado Water Conservation Board (CWCB)
Interquartile range (IQR)
Power conversion coefficient (PCC)
Pumping water level (PWL) is the measurement of the depth to water in the well below the centerline of the discharge pipe, while the well is pumping, but after the water level had stabilized.
Southeastern Colorado Water Conservancy District (SECWCD)
Total dynamic head (TDH)
Totalizing flowmeter (TFM)
Ultrasonic thickness gage (UTG)
U.S. Geological Survey (USGS)

Method of portable flowmeter:
C (Collins flowmeter)
M (McCrometer flowmeter)
P (Polysonic flowmeter)

Make of inline totalizing flowmeter:
M (new McCrometer TFM)
S (new Signet TFM)
X (existing McCrometer TFM)
B (existing Badger TFM)

Type of discharge distribution system:
L (low-pressure)
O (open)
S (sprinkler)
C (complex)
CH (complex high)
CL (complex low)

Statistical models used for data analysis:

diffQ is log portable flowmeter discharge minus log totalizing flowmeter discharge

diffC is log PCC

diffL is log total power consumption for season minus log totalizing flowmeter pumpage for the same season

diffP is log total pumpage using PCC minus log total pumpage using totalizing flowmeter

Note: Log is the natural logarithm (base e).

Variables used in statistical models:

μ is the intercept term

α is the effect (fixed) for the portable flowmeter method

γ is the effect (fixed) for distribution system type

S is the effect (random) for site

Y is the effect (random) for an instantaneous flow or PCC measurement year

(SY) is the effect (random) for a year within site

Z is the year effect (random) for a year in which total power consumption was used to estimate pumpage

D is the effect (random) for date

t is measurement time (in fractional years, t=0 for Jan. 1, 1998 and t=0.5 for June 30, 1998)

A is the time-trend coefficient (random)

s is time when power consumption at the well was used to estimate pumpage (in years, s= 0 for 1998)

w is log of pumping water level at time of measurement (PWL)

$\overline{w}$ is average log PWL for a given site in a given year

$\overline{\overline{w}}$ is average log PWL for a given site

U is the PWL trend coefficient

u is the *diffP* lag time, defined as a difference between (s – t)

e is the random error term

E is the expected value (mean)

Var is the variance.

(Note: the subscripts $_{Q}$, $_{C,}$ and $_{L}$ associated with these variables in the text refer to the specific model—*diffQ, diffC, or diffL.*)

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Executive Summary

In the mid-1990s, the Colorado Division of Water Resources (CDWR) adopted rules governing measurement of tributary ground-water pumpage for the Arkansas River Basin. The rules allowed ground-water pumpage to be determined using one of two approaches— power conversion coefficient (PCC) or totalizing flowmeters (TFM). In addition, the rules allowed a PCC to be applied to the electrical power usage up to 4 years in the future to estimate ground-water pumpage. As a result of concerns about potential errors in applying the PCC approach forward in time, a study was done by the U.S. Geological Survey, in cooperation with the CDWR and Colorado Water Conservation Board, to evaluate the variability in differences in pumpage between the two approaches, including the effects of time trends.

During the study period (1998–2002), hydrologic conditions varied substantially as streamflow in the Arkansas River ranged from 928,500 acre-feet in 1999 to 205,780 acre-feet in 2002. Less streamflow decreased the amount of surface water diverted to agricultural lands; cumulative diversions in 2001 and 2002 were substantially less than diversions in 1998, 1999, and 2000. In general, depth to ground water increased as annual surface-water diversions decreased, and the depth of pumping water levels measured in 2001 and 2002 increased relative to depths of pumping water levels measured in 1998, 1999, and 2000.

Historically, changes in ground-water levels for wells in the Arkansas River alluvial aquifer from 1965 to 2001 have tended to be gradual. The gradual and relatively small changes in ground-water levels occurred even during periods of large variations in magnitude and timing of streamflow. Significant operational changes, such as construction and operation of Pueblo Reservoir, implementation of the Winter Water Storage Program, the 1980 operating plan for John Martin Reservoir, and implementation of the ground-water measurement rules, historically have had relatively small effects on ground-water levels. From 1965 to 2001, the mean annual streamflow ranged from less than 362,000 acre-feet at Arkansas River at Avondale during the 1977 drought to greater than 1,000,000 acre-feet during 1983. These data indicate that static ground-water levels in the study area tend to exhibit small variations over multidecadal time scales with a high degree of temporal correlation, and trends that appear approximately linear over shorter periods of time, such as 5-year periods, are not uncommon in such slowly varying time series even under highly varying hydrologic conditions.

This report compared measured ground-water pumpage using TFMs to computed ground-water pumpage using PCCs by developing statistical models of relations between explanatory variables, such as site, time, and pumping water level and dependent variables, which are based on discharge, PCC, and pumpage. Specifically, for the purposes of this report, four dependent variables—*diffP*, *diffC, diffL,* and *diffQ*—were analyzed: d*iffP* was defined as the natural log of total pumpage for a season using PCC minus the natural log of total pumpage for that season using TFM; *diffC* was defined as the natural log of the power conversion coefficient (PCC); *diffL* was defined as the natural log of total season power consumption minus the natural log TFM pumpage for the same season; and *diffQ* was defined as the natural log of portable flowmeter discharge minus the natural log of TFM discharge. Because of a property of logarithmic transforms, the variable *diffP* multiplied by 100 can be interpreted as a percent difference between pumpage estimated for a given season by the PCC and TFM approaches, and *diffQ* multiplied by 100 is a percent difference between portable and TFM instantaneous discharge. The variables *diffC* and *diffL* measure the relation between flow volume and power consumption; the difference between *diffC* and *diffL* is one of time scale: *diffC* is obtained using instantaneous values of power consumption and flow, whereas *diffL* is obtained using seasonally integrated values of power consumption and flow.

When differences in pumpage (*diffP*) were computed using PCC measurements and power consumption for the same year (1998–2002), the median *diffP,* depending on the year, ranged from +0.1 to –2.9 percent; the median *diffP* for the entire period was –1.5 percent. Most years showed a slight negative bias, indicating that pumpage computed with the PCC approach tended to be less than pumpage using TFMs when PCC measurements and power consumption for the same year were used. However, when *diffP* was computed using PCC measurements applied to the next year's power consumption, the median *diffP*

was –0.3 percent; and when PCC measurements were applied 2, 3, or 4 years into the future, median *diffPs* were +1.8 percent for a 2-year forward lag, +4.9 percent for a 3-year forward lag, and +5.3 percent for a 4-year forward lag indicating that pumpage computed with the PCC approach, as generally applied under the ground-water pumpage measurement rules by CDWR, tended to overestimate pumpage as compared to pumpage using TFMs when PCC measurement was applied to future years of measured power consumption. The best statistical estimate of the mean of the time trend indicated that there was about a 1.6-percent increase in *diffP* for each year increase in the lag time. For example, if a PCC measurement was made in one year and this PCC value was used to estimate pumpage two years after the PCC measurement was made, then *diffP* on the average would tend to be 3.2 percent more than if pumpage had been estimated in the same year the PCC measurement was made.

Because of the importance in quantifying the temporal variability, other independent analyses of year-to-year changes in the dependent variables were performed for the 5-year period of study. The analyses of *diffC* and *diffL* indicated that the relation between flow and power consumption was similar for short time scales (*diffC*) and yearly time scales (*diffL*). Generally a monotonically increasing trend with time occurred over the 5-year period for both models, and the average increase per year was close to the mean slopes of 1.5 and 1.7 percent for *diffC* and *diffL,* respectively. Individual year effects obtained by analyzing *diffP* data were similar to those indicated by the *diffC* and *diffL* data. As with the other time-trend analyses, there was about a 1.6 percent per year increase in *diffP* per year of lag between the time the PCC measurement was made and the year pumpage was estimated.

Additional analyses were performed in order to better understand the causes of the time trend. The time trend of 1.6 percent per year in *diffP* was obtained using a statistical model that included a pumping water-level (*PWL*) term as one of the explanatory variables, thus statistically correcting for changing *PWL*. Because *PWL* also tended to increase with time over this period, an estimate of the overall trend with time (uncorrected for *PWL* changes) was made by fitting a model without a *PWL* term, yielding a trend of about 2.2 percent per lag year for *diffP*. A separate analysis also was done incorporating a surface-water diversion term in the statistical model; this analysis rendered the time-trend term insignificant. This result indicates that the time trend in the models serves as a surrogate for other variables, some of which reflect underlying hydrologic conditions. A more precise explanation of the potential causes of the time trend was not obtained with the available data. However, the model results with the surface-water diversion term indicate that much of the trend of 2.2 percent per lag year in *diffP* results from applying a PCC to estimate pumpage under hydrologic conditions different from those under which the PCC was measured. There is no evidence to conclude that the increasing time trend determined in the data for this 5-year period would hold in the future, and it is feasible that future periods could exhibit downward trends or nonmonotonic variability.

Although detailed long-term analyses have not been performed for this report, historical static ground-water levels in the study area generally have exhibited small variations over multidecadal time scales with a high degree of temporal correlation, and monotonic trends that appear approximately linear over a 5-year period such as the one detected in this study are not uncommon in such slowly varying time series. Therefore, the approximately 2 percent per lag year trend determined in these data is expected to be a reasonable guideline for estimating potential errors in the PCC approach resulting from temporally varying hydrologic conditions between time of PCC measurement and pumpage estimation. Periodic PCC data are needed to determine actual future changes that may occur in *diffC.* A subset of this network could be used to quantify future changes in *diffP* that may occur.

Statistical modeling was used to evaluate the effect of changes in pumping water level on *diffC*, *diffL*, and *diffP*. Modeling of *diffC* indicated that PCCs tend to increase with pumping water level by about 1.3 percent per 10-percent increase in pumping water level, and dependence of *diffL* on pumping water level was similar to that for *diffC*. Likewise, modeling of *diffP* indicated that increasing the depth to water under which pumpage was estimated relative to the pumping water-level conditions under which the PCC was measured caused an increase in *diffP*, that is, an increase in pumpage estimated by the PCC approach relative to that measured by a TFM. Each 10-percent increase of pumping water level for the year in which pumpage was estimated relative to pumping water level when the PCC was measured caused a 1.0-percent increase in pumpage as estimated by the PCC approach. The average time trends and average pumping water level effects for the various statistical models are summarized in the table on page 3.

Under the ground-water pumpage measurement rules, CDWR allows the PCC approach to be used to estimate ground-water pumpage for complex sites provided PCCs are measured using the site's lowest total dynamic head. An analysis was done to evaluate the discharge distribution-system type effects on *diffP* and to quantify the differences in pumpage at complex sites depending on whether PCC measurements were made under low total dynamic head (*CL*) or high total dynamic head (*CH*) conditions. The *CL* effect indicated that pumpage estimated by the PCC method was 6 to 7 percent greater than that measured by a TFM for complex sites using a low total dynamic head PCC. Conversely, the *CH* effect indicated that pumpage estimated by the PCC method was 6 to 7 percent less than that measured by a TFM for complex sites if the PCC was computed under high total dynamic head conditions.

Comparisons also were made between total, or aggregated, pumpage for a network of wells as computed by the PCC approach and the TFM approach. Estimates of the mean and standard deviation of the difference in total network pumpage were determined using the two approaches as a function of number of sites in the network and of lag time between PCC measurement and pumpage estimation. As an example, for

[*PWL*, pumping water level; *s*, year when pumpage is estimated; [*t*], year when PCC is made;%, percent; log, natural logarithm; NA, not applicable; NS, mean is not significantly different from zero at the 5-percent significance level]

Statistical model	Average time trend effect	Average *PWL* effect	Remarks
diffP (where *s* not equal to [*t*], *PWL* is included in model)	1.6 % per lag year	1.0% per 10% *PWL* change	Differences between log of PCC pumpage and log of TFM pumpage.
diffP (where *PWL* is excluded from model)	2.2% per lag year	NA	Overall time trend. Determined without *PWL* in the model.
diffC (where *PWL* is included in model)	1.5% per year	1.3% per 10% *PWL* change	Log of the power conversion coefficient (PCC).
diffL (where *PWL* is included in model)	1.7% per year	0.92% per 10% *PWL* change	Differences between log of seasonally integrated power consumption and log of TFM pumpage for the same season.
diffQ (where *PWL* is included in model)	NS	NS	Differences between log of portable flowmeter discharge and log of TFM discharge.

100 wells and a lag of 4 years between PCC measurement and pumpage estimation, the mean difference was 9.8 percent of total network pumpage and the standard deviation was 2.3 percent of total network pumpage. Under the assumption of normality, there was a 95-percent probability that the difference between total network pumpage measured by the PCC approach and that measured using a TFM would be between 5.2 and 14.4 percent. These estimates were based on a bias of 2.2 percent per lag year estimated for the period 1998–2002 during which hydrologic conditions were known to have changed. Using the same assumptions, the estimated difference in total network pumpage for a 4-year lag for 1,000 wells would be between about 8.4 and 11.3 percent greater than pumpage measured using a TFM; the estimated difference in total network pumpage for a 3-year lag would be between about 6.1 and 8.8 percent greater than pumpage measured using a TFM; and the estimated difference in total network pumpage for a 2-year lag would be between about 3.9 and 6.4 percent greater than pumpage measured using a TFM.

Discharge measured with a TFM was compared with discharge measured by portable flowmeter using the dependent variable *diffQ*. The overall mean of *diffQ* using all three portable flowmeter methods was –0.015, or about 1.5 percent less than TFM measurements. Three types of portable flowmeter were used: a pitot tube/manometer device (method C), an ultrasonic flowmeter (method P), and a propeller-type meter (method M). Statistical modeling of *diffQ* revealed that there were significant differences among portable flowmeter methods. Portable flowmeter method P tended to be about 1.9 percent below average of all three methods, meaning that flowmeter method P tended to measure a smaller discharge than the TFM as compared to other portable sampling methods. Discharge measured using method C was about 1.7 percent above average as compared to other portable sampling methods, and method M was about average. The median *diffQ* value for methods C, M, and P was 0.5 percent, –0.6 percent, and –4 percent, respectively. Overall, portable flowmeter discharge measurements made with method C provided the smallest differences in *diffQ*. Portable flowmeter discharge measurements made with method P provided the largest differences in *diffQ* and indicated a fairly strong negative bias, or a tendency to underestimate discharge with respect to TFMs.

The variable *diffQ* indicated no observable persistent temporal trends when all sites were combined; however, individual sites often exhibited upward or downward temporal trends that were modeled with random time slopes. Pumping water level accounted for only a negligible amount of the variance of *diffQ*, indicating that pumping water level had very little influence on differences in discharge. Overall, the quality of discharge measurements associated with TFMs did not degrade over time (1998–2002); however, problems did occur with some TFMs. CDWR staff documented 27 problems with TFMs during 1998–2002. Equipment problems, including debris clogs and reasons unknown, occasionally resulted in loss of TFM data. Debris clogs in the meter components generally were observed early in the irrigation season during startup operations.

Abstract

In the mid-1990s, the Colorado Division of Water Resources (CDWR) adopted rules governing measurement of tributary ground-water pumpage for the Arkansas River Basin. The rules allowed ground-water pumpage to be determined using one of two approaches—power conversion coefficient (PCC) or totalizing flowmeters (TFM). In addition, the rules allowed a PCC to be applied to the electrical power usage up to 4 years in the future to estimate ground-water pumpage.

As a result of concerns about potential errors in applying the PCC approach forward in time, a study was done by the U.S. Geological Survey, in cooperation with CDWR and Colorado Water Conservation Board, to evaluate the variability in differences in pumpage between the two approaches, including the effects of time trends.

This report compared measured ground-water pumpage using TFMs to computed ground-water pumpage using PCCs by developing statistical models of relations between explanatory variables, such as site, time, and pumping water level, and dependent variables, which are based on discharge, PCC, and pumpage. When differences in pumpage (*diffP*) were computed using PCC measurements and power consumption for the same year (1998–2002), the median *diffP,* depending on the year, ranged from +0.1 to –2.9 percent; the median *diffP* for the entire period was –1.5 percent. However, when *diffP* was computed using PCC measurements applied to the next year's power consumption, the median *diffP* was –0.3 percent; and when PCC measurements were applied 2, 3, or 4 years into the future, median *diffPs* were +1.8 percent for a 2-year forward lag and +5.3 percent for a 4-year forward lag, indicating that pumpage computed with the PCC approach, as generally applied under the ground-water pumpage measurement rules by CDWR, tended to overestimate pumpage as compared to pumpage using TFMs when PCC measurement was applied to future years of measured power consumption.

Analyses were done to better understand the causes of the time trend; an estimate of the overall trend with time (uncorrected for pumping water-level changes) yielded a trend of about 2.2 percent per lag year for *diffP*. A separate analysis that incorporated a surface-water diversion term in the statistical model rendered the time-trend term insignificant, indicating that the time trend in the models served as a surrogate for other variables, some of which reflect underlying hydrologic conditions. A more precise explanation of the potential causes of the time trend was not obtained with the available data. However, the model results with the surface-water diversion term indicate that much of the trend of 2.2 percent per lag year in *diffP* resulted from applying a PCC to estimate pumpage under hydrologic conditions different from those under which the PCC was measured. Although there is no evidence to conclude that the upward time trend determined in the data for this 5-year period would hold in the future, historical static ground-water levels in the study area generally have exhibited small variations over multidecadal time scales. Therefore, the approximately 2 percent per lag year trend determined in these data is expected to be a reasonable guideline for estimating potential errors in the PCC approach resulting from temporally varying hydrologic conditions between time of PCC measurement and pumpage estimation.

Comparisons also were made between total, or aggregated, pumpage for a network of wells as computed by the PCC approach and the TFM approach. For 100 wells and a lag of 4 years between PCC measurement and pumpage estimation, there was a 95-percent probability that the difference between total network pumpage measured by the PCC approach and that measured using a TFM would be between 5.2 and 14.4 percent. These estimates were based on a bias of 2.2 percent per lag year estimated for the period 1998–2002 during which hydrologic conditions were known to have changed. Using the same assumptions, the estimated difference in total network pumpage for a 4-year lag for 1,000 wells would be between about 8.4 and 11.3 percent greater than pumpage measured using a TFM; the estimated difference in total network pumpage for a 2-year lag would be between about 3.9 and 6.4 percent greater than pumpage measured using a TFM.

Introduction

Ground-water pumpage is needed for many hydrologic and water-management studies. Two approaches used to estimate ground-water pumpage include (1) metered discharge, and (2) a power conversion coefficient (PCC) approach. The metered discharge approach uses a totalizing flowmeter (TFM) to directly measure instantaneous discharge and cumulates the volume of water pumped at a well. The PCC approach uses measurements of instantaneous well discharge and electrical power consumption at the well to compute the volume of water pumped. Electrical power consumption is related directly to the amount of pumped water, pump efficiency, pressure head, and the total lift of water. Total lift is the sum of static water level, drawdown, and discharge pressure head.

In Colorado, ground water that is part of the stream-aquifer system is classified as tributary water. In general, streams in the Arkansas River Basin are in hydraulic connection with aquifers. Withdrawals of ground water are administered within the priority system by Colorado Division of Water Resources (CDWR) to minimize the effect of junior wells on senior surface-water rights. Substantial ground-water development in the lower Arkansas River Basin between Pueblo and the Colorado-Kansas State line began in the 1950s (Major and others, 1970), and by 1980 more than 2,900 irrigation wells tapped the unconfined valley-fill aquifer of the Arkansas River. In 1995, the U.S. Supreme Court found that pumping wells in the Arkansas River Basin had affected the flow of usable water to the State line and required that out-of-priority depletions by pumping wells be replaced by augmentation plans.

Beginning in 1994, the CDWR adopted measurement rules and regulations (Office of the State Engineer, 1994 and 1996) that required well owners in the Arkansas River Basin in Colorado to report how much ground water was pumped monthly by each well that discharged greater than 50 gal/min. The rules allowed for two approaches to be used: (1) a well owner could install a TFM on the well; or (2) if the well was electric powered, have the well tested to determine a PCC that would relate the number of kilowatt hours used to pump an acre-ft of ground water. The rules specified that the TFM or PCC rating must be checked at least once every 4 years by a person approved by the State Engineer. Thus, the rules allowed a PCC to be applied to the electrical power usage up to 4 years in the future to estimate ground-water pumpage. Additionally, the rules allowed the PCC approach to be used to estimate ground-water pumpage for complex sites provided PCCs were measured using the site's lowest total dynamic head, which, theoretically, would result in an overestimate of actual ground-water pumpage. The use of PCCs to estimate ground-water pumpage from wells is most accurate when the relation of well discharge to power demand remains stable. Over time, hydrologic and pump operating conditions may change, thus altering the relation between discharge and power demand. Depth to ground water may increase during a drought or after an extended period of pumping, or the pump efficiency may decrease as the irrigation system ages. These well operations can result in variations in the PCC over time and can result in errors when using the PCC approach to estimate ground-water pumpage. The effect of varying pumping lift and temporal variability of PCCs on the accuracy of ground-water pumpage is not well known. There also have been concerns about the long-term reliability of TFMs. Specifically, there have been concerns about the accuracy of the inline flowmeters as a result of excessive wear or malfunctions during operation.

In 1999, the U.S. Geological Survey (USGS), in cooperation with the CDWR, completed a study that compared these two approaches for determining ground-water discharge and pumpage (Dash and others, 1999). Ground-water discharge is the instantaneous flow being discharged from the well in gallons per minute, and ground-water pumpage is the total volume of water pumped from the well in acre-feet. This study used data collected from 105 randomly selected irrigation wells completed in the alluvial aquifer of the Arkansas River Basin between Pueblo, Colorado, and the Colorado-Kansas State line (fig. 1). This study was based largely on 1 year of data. Analysis of 747 paired measurements indicated no mean difference in instantaneous discharge between portable flowmeters and TFMs. The mean difference in 553 paired ground-water pumpage estimates made in 1998 was 0.01 percent for the network of study wells. About 80 percent of the individual site differences in discharge and pumpage measurements were less than 10 percent (Dash and others, 1999).

Because the USGS study was based largely on data collected for about 1 year, robust evaluations of temporal variations in PCCs, long-term variations in TFMs, and temporal variations in differences between the two approaches for determining ground-water pumpage were not done. However, a limited analysis of available CDWR-approved PCC data collected over time indicated that the PCC may vary substantially between years and may contribute to errors when estimating pumpage for multiple years using a single previously measured PCC. Overall, data were insufficient to adequately address potential errors associated with the temporal variability in PCCs or the reliability of using PCCs over a 4-year period to determine ground-water pumpage. Various site characteristics, including method of discharge measurement, manufacture make of TFM, type of discharge distribution system, and changes in pumping water level were evaluated as sources of variation in ground-water pumpage. In 1999 the USGS, in cooperation with CDWR and Colorado Water Conservation Board (CWCB), began a second phase of the study to collect additional data and evaluate variations of differences in discharge and pumpage between PCCs and TFMs for multiple years, including an analysis of time trends and other sources of variation in pumpage estimates.

Purpose and Scope

This report evaluates variability in the differences between two approaches used to determine ground-water pumpage—metered discharge using TFMs and electrical power consumption using PCCs. The report compares measured pumpage using TFMs to computed pumpage using PCCs by developing statistical models of relations between explanatory (independent) variables, such as site, time, and pumping water level and dependent variables that are based on discharge, PCC, and pumpage. Specifically, the report evaluates the following:

1. Variability of differences in instantaneous discharge between a TFM and portable flowmeters used with the PCC, including an evaluation of time trends and effects of changes in pumping water levels;
2. variability of PCCs, including an evaluation of time trends and effects of changes in pumping water levels;
3. variability of differences in ground-water pumpage estimated with the TFM and PCC approaches, including an evaluation of time trends and effects of changes in pumping water levels;
4. year-to-year variability of differences in ground-water pumpage estimated with the TFM and PCC approaches; and
5. aggregated differences in total pumpage estimated by the two approaches for a network of wells.

This report contains data collected by CDWR during 1998–2002 from a network of wells that were originally identified as part of the phase I study (Dash and others, 1999). Reductions in the network occurred during 1998–2002; the number of wells and the number of site visits varied (figs. 1*A*–1*E*). In 1998, data collected from 81 of the wells were used for the second phase of the study. The number of wells measured in subsequent years varied as follows: 70 wells in 1999, 72 wells in 2000, 61 wells in 2001, and 58 wells in 2002. The number of wells varied annually for a variety of reasons: (1) some well owners preferred to cease participation in the study and removed the TFM from their well after 1998; (2) because one of the primary purposes of the second phase of the study was to determine temporal variability in the differences in pumpage, sites were dropped from the well network if the discharge system was reconfigured or if the TFM was broken and not repaired; and (3) sites also were eliminated if the well was not pumped after 1998.

Description of Study Area and Hydrologic Setting

The Arkansas River alluvial aquifer between Pueblo and the Colorado-Kansas State line consists of unconsolidated fine sand near the surface, grading to coarse sand and gravel at the base, with minor beds of confining clay. The alluvial aquifer is in hydraulic connection with the Arkansas River along the main stem and its major perennial tributaries. Ground-water recharge

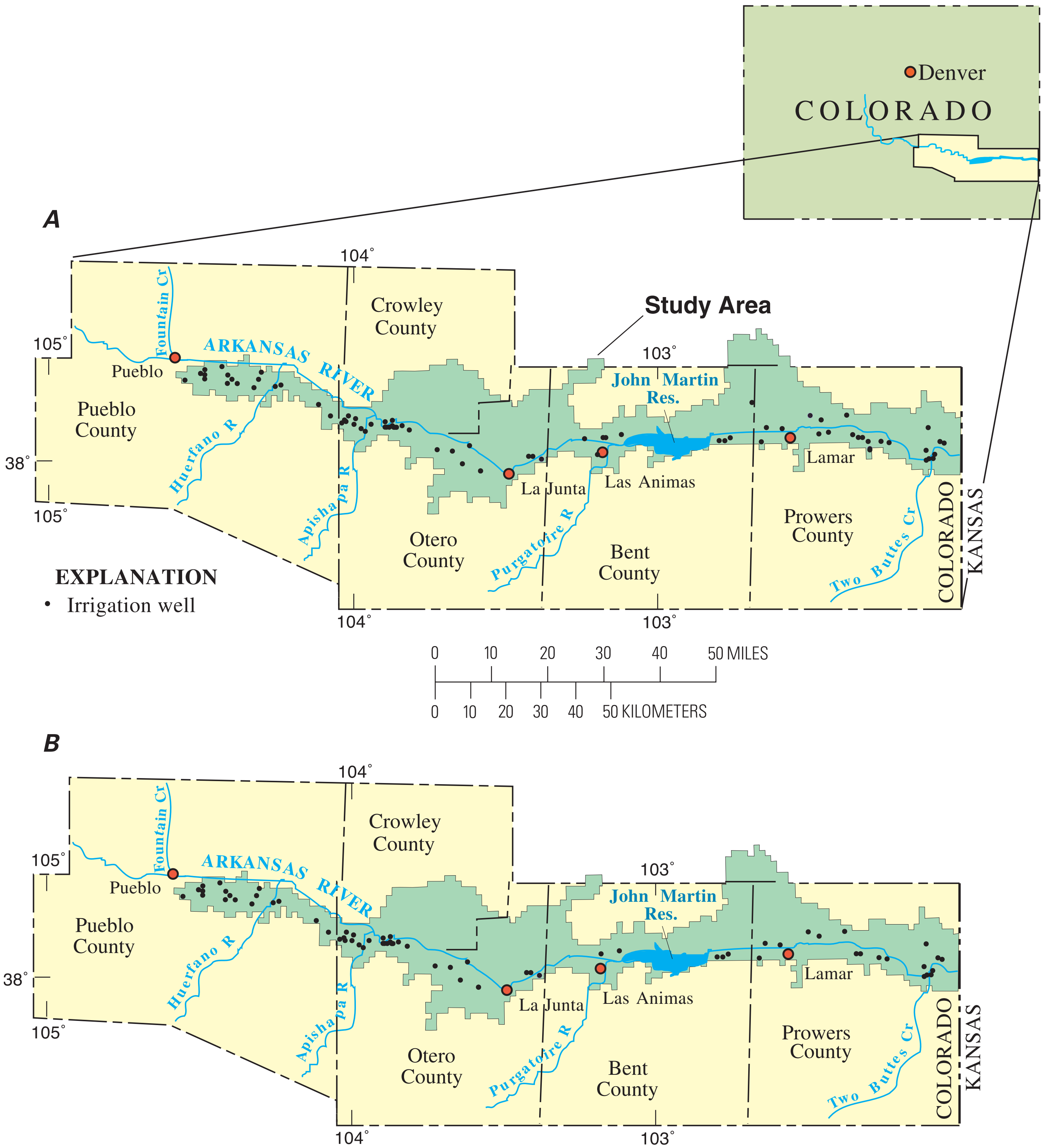


Figure 1. Location of study area and irrigation wells used in the study during years (*A*) 1998, (*B*) 1999, (*C*) 2000, (*D*) 2001, and (*E*) 2002.

is mostly from leakage and percolation of water diverted from surface-water systems. Ground water moves toward and discharges to the principal streams. The principal use of water in the area is for crop irrigation.

Between 1998 and 2002, streamflow in the Arkansas River varied substantially. Annual flows measured at Arkansas River near Avondale (USGS station 07109500) ranged from 928,500 acre-ft in 1999 to 205,780 acre-ft in 2002. In 1999, the annual flow was 26 percent greater than the long-term annual average; in 2002, the annual flow was 70 percent less than the long-term annual average. Beginning in July 2000, streamflows were consistently less than the mean flow. Decreased streamflow affected the amount of surface-water diversions; cumulative diversions in 2001 and 2002 were about 35 percent and about 70 percent less than diversions in 1998, 1999, and 2000. Significant correlations ($p<0.05$) were detected between surface-water diversion volumes and pumping-water levels measured in wells completed on lands irrigated by surface-water diversions. More than two-thirds of the wells had correlation coefficients of 0.7 or greater, indicating that 50 percent or more of the variations in pumping-water levels were associated with the amount of surface water diverted to nearby croplands. The variability in static-water levels measured during 1998–2002 in the network of study wells is shown in figure 2. Static-water levels are measurements of depth to ground water when the well is not pumping. These data were collected after the irrigation season in both years and show that depth to water in the majority of wells (72 percent) increased by more than 10 percent. In addition, static water levels measured in 44 of 62 wells as part of a cooperative program between the USGS and Southeastern Colorado Water Conservancy District (SECWCD) showed water-level declines during 1998–2002. Twenty-eight percent of the wells measured during 1998–2002 recorded the deepest depths to water for the period of record (generally before 1966). Prior to 1998, more than 60 percent of these wells indicated little to no change as compared to measurements made between the mid-1960s and the early 1970s. In addition, Steger (2002) indicated that changes in ground-water levels for 35 wells in the Arkansas River alluvial aquifer from 1965 to 2001 tended to be gradual. The gradual and relatively small changes in ground-water levels occurred even during periods of large variations in magnitude and timing of streamflow. Significant operational changes, such

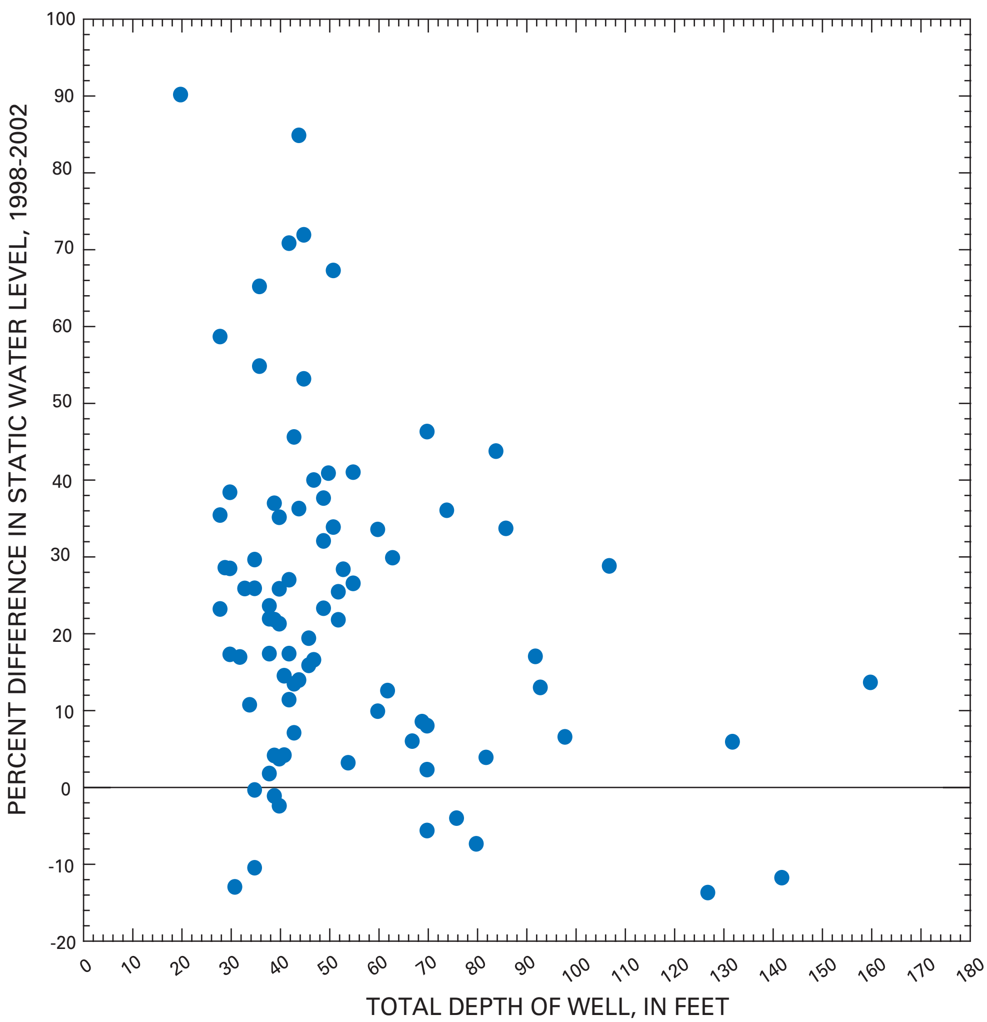


Figure 2. Percent differences in static water level in relation to depth of well, 1998–2002.

as construction and operation of Pueblo Reservoir, implementation of the Winter Water Storage Program, the 1980 operating plan for John Martin Reservoir, and implementation of the ground-water measurement rules (Office of the State Engineer, 1994 and 1996), historically have had relatively small effects on ground-water levels. From 1965–2001, the mean annual streamflow ranged from less than 362,000 acre-ft at Arkansas River at Avondale during the 1977 drought to greater than 1,000,000 acre-ft during 1983. These data indicate that static ground-water levels in the study area tend to exhibit small variations over multidecadal time scales with a high degree of temporal correlation, and trends that appear approximately linear over shorter periods of time, such as 5-year periods, are not uncommon in such slowly varying time series even under highly varying hydrologic conditions. Although water levels have tended to respond gradually to extreme hydrologic events (very wet and very dry years), water levels are influenced by streamflow and the amount of surface water that is available for irrigation. In drought years, water-level declines have occurred where surface-water availability was reduced for irrigation. Annual variations in pumping-water levels measured during 1998–2002 are shown in figure 3. Pumping-water levels are measurements of depth to ground water when the well is pumping, and in this report, were measured as the distance, in feet, from the centerline of the discharge pipe to the depth to ground water. The pumping-water level (*PWL*) used in this report represents the depth to water in a pumping well after the water level had stabilized according to the ground-water measurement rules

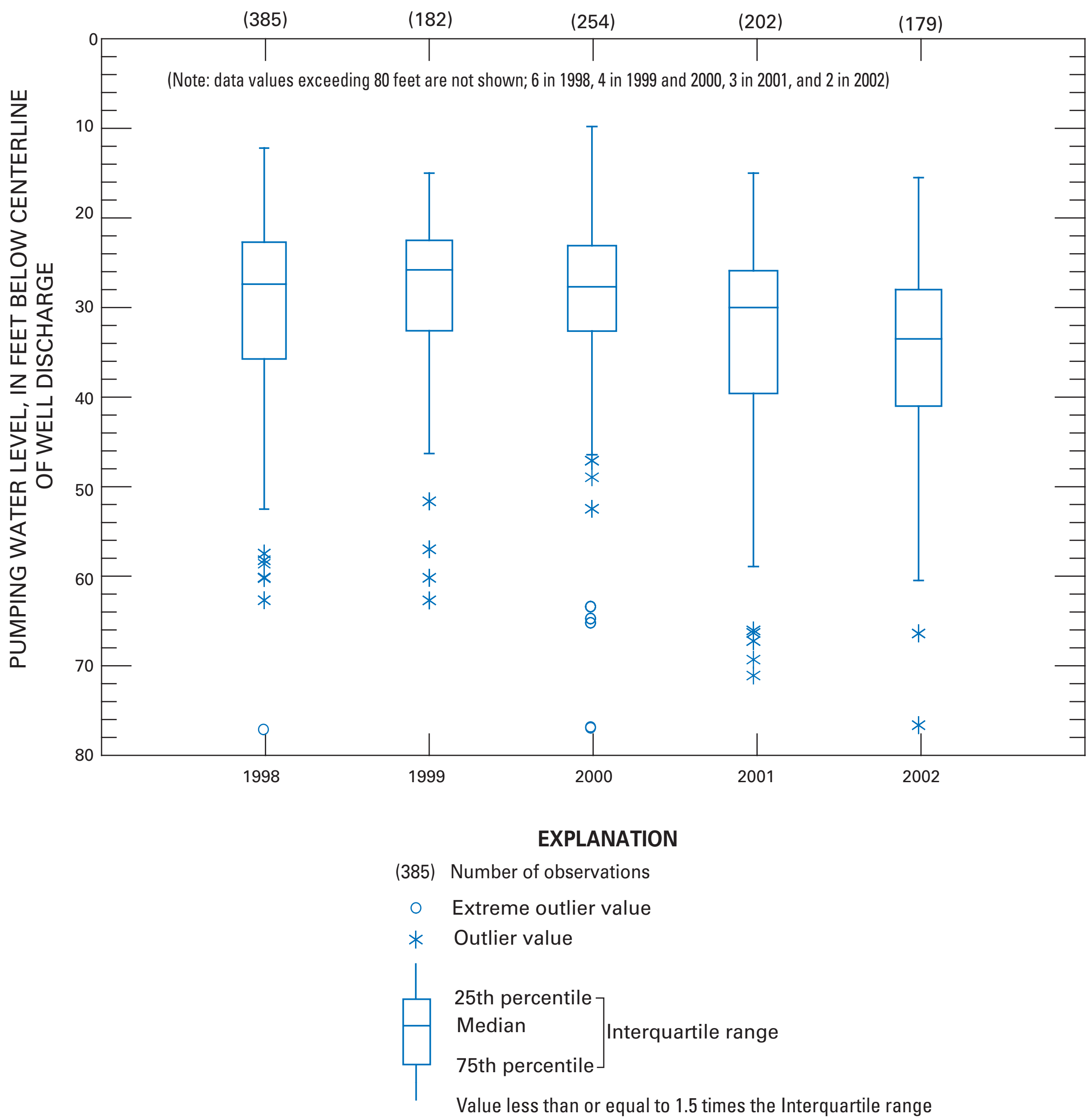


Figure 3. Variations in pumping water levels for network wells by year, 1998–2002.

(Office of the State Engineer, 1994 and 1996). In general, depth-to-water levels in pumping wells measured in 2001 and 2002 were greater than depth-to-water levels measured during 1998–2000.

Acknowledgments

This report is possible because of the continued data collection by CDWR—Division II personnel who measured and processed well measurements on an ongoing basis. The authors extend thanks to the many private landowners in the Arkansas River Valley who allowed their irrigation wells to be used in this study.

Methods of Investigation

In 1997, CDWR identified more than 1,300 large-capacity irrigation wells with electrical pumps in the study area (wells that discharge more than 50 gal/min) for which the PCC approach might be used to determine ground-water pumpage under the amended rules established by the Office of the State Engineer (1996). A computer program (Scott, 1990) was used to randomly select candidate wells for the TFM/PCC evaluation. Each candidate well was reviewed by CDWR and inventoried to determine its suitability for inclusion in the study. Ultimately, 106 wells were selected, and each well was assigned a site number from 1 to 106. Shortly after the 106-well network was selected, one well was eliminated from the network. Eleven wells had TFMs already installed; in all other wells, new TFMs were installed in a full-flowing section of water pipe on the discharge side of the pump where the measurement of discharge was made. Because one of the primary purposes of the second phase of the study was to determine temporal variability in the differences in pumpage, data from 81 of the wells measured in 1998 were used for the second phase of the study. As stated previously, other reductions in the network occurred during the study period. Several different types or makes of TFMs were used during the study, including propeller flowmeters (make M, make X, make B) and a rotating-blade flowmeter (make S). Accuracy of different types of TFMs installed to manufacturer's specifications generally is reported to be within 2 to 3 percent when operated within the design range of discharge.

Each well in the study network was classified by discharge distribution-system type characteristics. During the study, four major types were identified. The network included open-discharge (type O), low-pressure (type L), sprinkler (type S), and complex (type C) discharge distribution systems. For data-analysis purposes, site measurements made at type C wells were divided into two additional types to reflect total dynamic head (TDH) operating conditions; complex high (type CH) and complex low (type CL). The type of discharge distribution system being used at each well was verified onsite before making subsequent measurements.

During 1999–2002, data were collected in the same manner as the data collected during 1998 (Dash and others, 1999). During each site visit, instantaneous flow rate was determined by reading the odometer dial of the TFM and timing the index pointer for one complete revolution, then dividing the total volume by the elapsed time; the procedure was repeated nine more times, resulting in an average of the 10 values for the recorded instantaneous TFM discharge. The volume of water pumped between site visits was determined by recording the register dials of the TFM at the beginning of each visit. The total volume of water pumped at a study site was determined as the difference between TFM readings made at the beginning and the end of the selected monitoring period. Independent instantaneous discharges were measured concurrently by using at least one of three commercially available portable flowmeters: a pitot tube/manometer device (method C), an ultrasonic flowmeter (method P), and a propeller-type meter (method M). More detailed information about each type of portable flowmeter used in the study is provided in Dash and others (1999). These portable flowmeters provided three different measurement techniques to determine the average velocity of water flowing through the discharge pipe. The average velocity, multiplied by the cross-sectional area of the discharge pipe, was used to compute the discharge in gallons per minute. Whenever possible, discharge measurements using all three types of portable flowmeters were made at each site. The collection of multiple discharge measurements allowed for verification and explanation of any unusual discharge data collected in the field. All discharge and power-demand measurements were collected in the same time interval after the pumping water level in the well had stabilized (Office of the State Engineer, 1996).

To compute well discharge for two of the three portable flowmeters (method M and method P), the inside pipe diameter was needed. Throughout the study, the wall thickness of discharge pipes was measured using an ultrasonic thickness gage (UTG). A coupling compound was applied to the section of discharge pipe to be measured; the UTG probe was placed on the pipe surface, and the wall thickness was determined. A test block was mounted to the UTG for field calibration and ensured correct operation of the instrument and probe. The outside circumference of the discharge pipe was determined using a thin, flexible metal tape.

Method M and method P portable flowmeters used in the study were tested annually at the Great Plains Meter, Inc., facility in Aurora, Neb. The results of the wet-flow calibration checks indicated the accuracies for the portable flowmeters and the performance expected of these meters under optimal conditions. The portable flowmeters used in the study were tested before the start of each irrigation season and again following the final 2002 irrigation season. The discharge measured by the method M portable flowmeter ranged from 98 to 102 percent of the known laboratory discharge. The rate of flow used during these tests ranged from about 100 gal/min for the 4-inch flowmeter to about 1,680 gal/min for the 10-inch flowmeter. The discharge measured by the method P portable flowmeter ranged from 97 to 116 percent of the known discharge for flows that ranged from 520 to about 810 gal/min. The test facility did not make any calibration adjustments to either the method M or the method P portable flowmeters. The flows measured by portable flowmeters in this study generally were within the limits of reliability provided by the test facility.

During the 1998–2002 irrigation seasons, the number of PCC measurements made by CDWR personnel during a single site visit ranged from one to three, depending on the conditions and the number of different portable flowmeters that could be used at the site. The PCC is defined as the number of kilowatt hours required to pump 1 acre-ft of water, and combines a concurrent measurement of well discharge (in gallons per minute) with the power demand of the pump (in kilowatts). Electrical power meters contain a disk that revolves as electricity passes through the meter. During a field test, the meter disk was timed with a stopwatch for at least 10 complete disk revolutions to measure the rate per revolution. This timing measurement was repeated three times and used to determine the average rate of a disk revolution.

Power demand, in kilowatts, was calculated from the equation:

$$\text{power demand} = (\text{rate}) \times (3.6) \times (\text{Kh factor}), \qquad (1)$$

where

rate is the average rate of disk revolution, in revolutions per second,

3.6 is the conversion factor (kilowatt seconds per watthour), and

Kh factor is the watthours per revolution (imprinted on the front of power meter).

The PCC, in kilowatthours per acre-foot, then is calculated from the equation:

$$\text{PCC} = (\text{power demand}) \times (5{,}433)/(\text{well discharge}), \qquad (2)$$

where

5,433 is the conversion factor (in gallon hours per acre-foot minutes), and

well discharge is the instantaneous ground-water discharge, in gallons per minute.

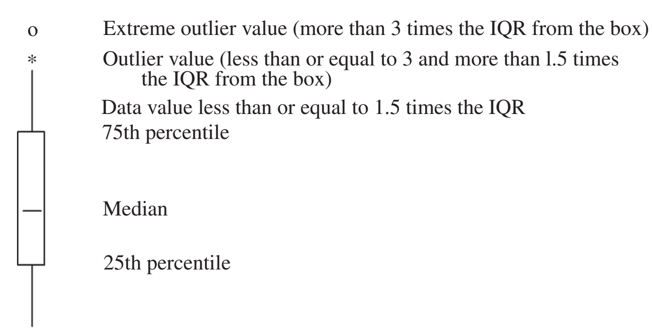
A new PCC rating was calculated at a well each time a measurement of instantaneous discharge and power demand was made. The PCCs were applied to the total annual power consumption recorded between the initial and final electric meter readings made by CDWR at the site during each irrigation season to estimate ground-water pumpage by year. Pumpage differences were computed by subtracting the pumpage associated with the PCC approach at each well from the total pumpage associated with the TFM for the same monitoring periods.

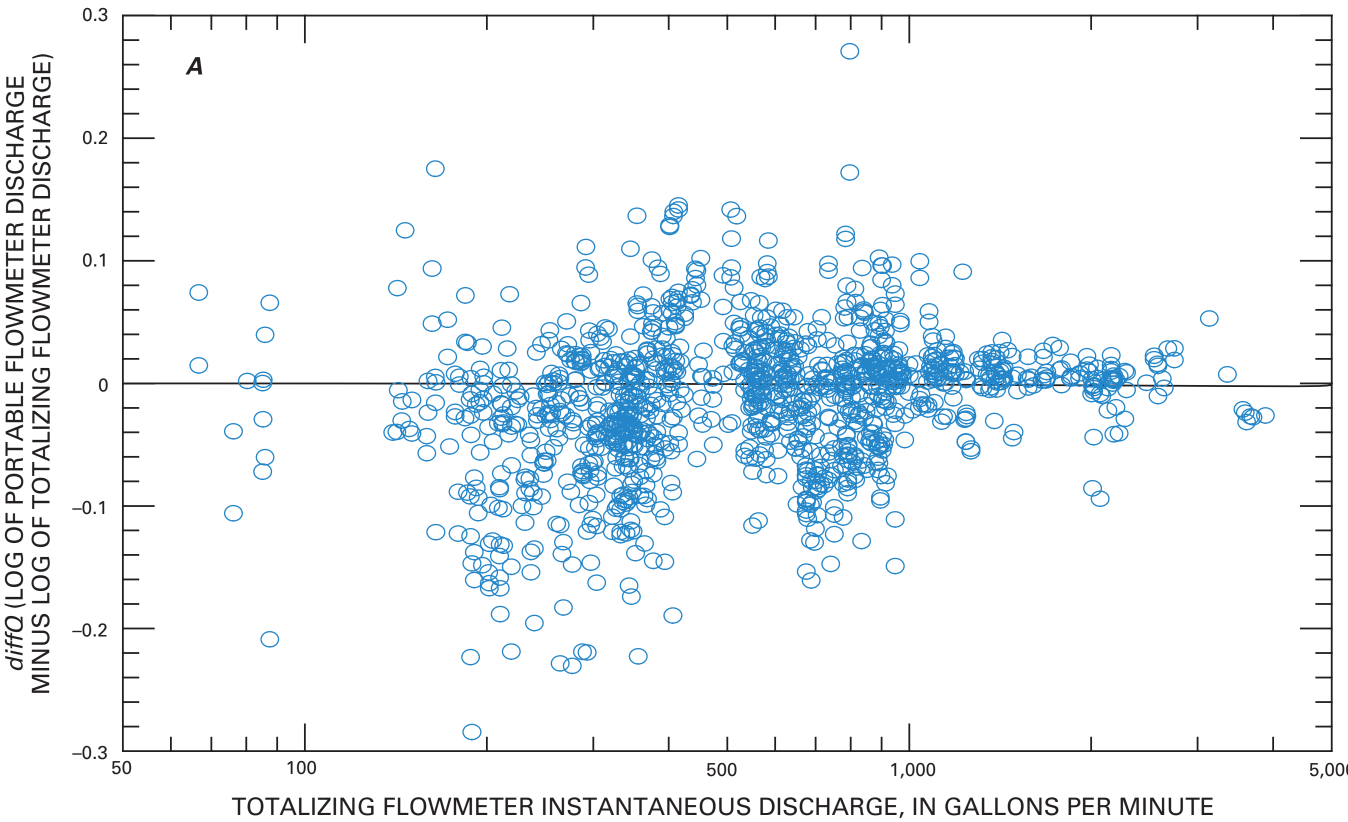
In this report, the PCC analysis at complex discharge distribution system type differed from the weighted PCC analysis used at complex sites in the earlier USGS phase I study (Dash and others, 1999). In June 2000, the CDWR revised the policy for a complex system using the PCC method to accept the lowest operating PCC for calculating pumpage from the well (Office of the State Engineer, 2000). The lowest PCC occurs when a well is discharging under the condition of lowest total lift or total dynamic head (TDH) at the pump. Sites classified as complex wells by CDWR can vary the TDH at the pump outlet during a single irrigation season. This change in TDH may result from multiple wells that discharge into a common pipeline, a pipeline with multiple outlet locations, or wells where the method of water delivery varies between different types of distribution systems, such as open-discharge, low-pressure gated pipe, or sprinkler systems.

Quality-control procedures were similar to the phase I study (Dash and others, 1999). The field data collected and processed by CDWR were transmitted electronically and in paper files to the USGS for review and analysis. USGS personnel periodically visited TFM sites with CDWR personnel to observe onsite data collection and to ensure that techniques were consistent and correct. During each measurement, critical site information was verified and essential test information was recorded on CDWR field forms. The USGS reviewed tabulations for completeness and consistency with established collection procedures. About 10 percent of the electronic data was checked against copies of the original field forms, and all received data were scrutinized for anomalies.

Raw data and data transformed to natural logarithms were reviewed using scatterplots, histograms, and boxplots to evaluate measurements, identify anomalous data, and obtain preliminary indications of appropriateness of the logarithmic transformation. Differences in discharge or pumpage were computed by subtracting the natural logarithm of well discharge or pumpage associated with the PCC approach from the natural logarithm of the well discharge or pumpage associated with the TFM. Henceforth, the term log will be used to refer to natural logarithm. Plots of the resulting differences for discharge are shown in figure 4*A* and for pumpage in figure 4*B*. These plots indicate there was a small proportion of differences in pumpage that tended to be outside the range of the majority of the data. Before data were discarded, anomalous data were reviewed by referencing written field documentation, or by doing additional statistical analysis, or both. Examination of residuals after statistical models were developed resulted in elimination of 30 values or seven site-year combinations from the data set. A detailed discussion of outliers is provided in the "Supplemental Information" section at the back of this report.

Boxplots graphically show the variability among data sets, unusual values, and selected summary statistics. An example of a boxplot is shown below:





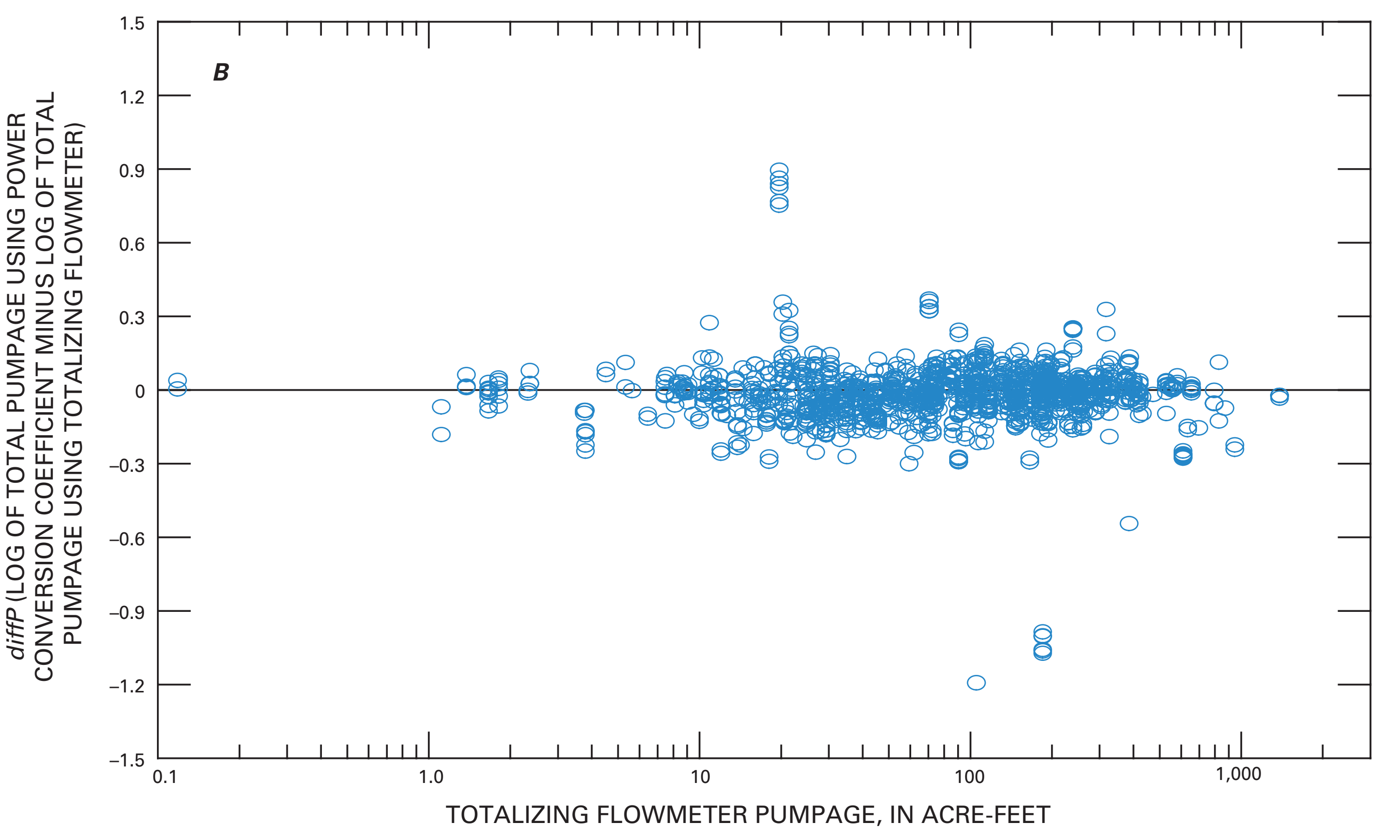


Figure 4. (*A*) Relation of *diffQ* to totalizing flowmeter instantaneous discharge, and (*B*) relation of *diffP* to totalizing flowmeter pumpage.

The horizontal line within the box represents the median value (50 percent of the data are greater than this value and 50 percent of the data are less than this value). The lower horizontal line of the box is the 25th percentile or lower quartile (25 percent of the data are less than this value). The upper horizontal line of the box is the 75th percentile or upper quartile (75 percent of the data are less than this value). The interquartile range (IQR) contains the values between the 25th and 75th percentiles and is the difference between the 25th and 75th percentiles. The bottom of the vertical line on the boxplot is the smallest value within 1.5 times the IQR of the box. The top of the vertical line on the boxplot is the largest value within 1.5 times the IQR of the box. Outlier values are greater than 1.5 times the IQR from the box, and extreme outlier values are greater than 3 times the IQR from the box.

Methods of Statistical Analysis

Statistical models are used to examine the relation between certain dependent variables of interest and certain explanatory variables that are expected to be important in influencing the dependent variables. In applying these statistical models, assumptions usually are made, such as normality and constancy of variance of the modeled dependent variables for different values of the explanatory variables. Selecting the appropriate dependent variables for analysis was required to develop the statistical models, followed by defining the explanatory variables that were believed to be important in explaining the variability of the dependent variables.

Dependent Variables

The four dependent variables selected for analysis in this report are *diffQ, diffC, diffL,* and *diffP* and are defined as follows:

$$diffQ = \log \tilde{Q} - \log Q$$

$$diffC = \log \text{PCC}$$

$$diffL = \log L - \log P$$

$$diffP = \log \tilde{P} - \log P$$

where

log is the natural logarithm (base e),

$\tilde{Q}$ is portable flowmeter instantaneous discharge (gallons per minute),

Q is TFM instantaneous discharge (gallons per minute),

PCC is power conversion coefficient from equation 2 (kilowatthours per acre-foot),

L is total power consumption for season (kilowatthours),

$\tilde{P} = \frac{L}{PCC}$, which is total pumpage for season using PCC method (acre-feet),

P is total pumpage for season using TFM (acre-feet).

The variable *diffC* is therefore just the log of the PCC value as computed by equation 2. Also, *diffP*, the main variable of interest in this report, is the difference in log-transformed pumpage computed by the PCC and TFM approaches and is related to *diffC* and *diffL* by

$$diffP = diffL - diffC \,. \tag{3}$$

The PCC is essentially a ratio between power consumption and pumpage over a very short period of time (instantaneous), so that *diffC* and *diffL* are seen to have similar definitions. The difference between *diffC* and *diffL* is one of time scale; *diffC* is obtained using essentially instantaneous values of power consumption and flow, whereas *diffL* is obtained using seasonally integrated values of power consumption and flow. The variable *diffQ* also compares two instantaneous flows, and *diffP* mixes time scales by using instantaneous PCC to estimate seasonal pumpage. Because of the similarity in definitions of *diffC* and *diffL*, these models provide additional information needed to evaluate the compensating effects that occur in their difference, *diffP*.

Explanatory Variables

Explanatory variables were developed after selection of the dependent variables. The explanatory variables characterize conditions under which a measurement of a dependent variable was made. Incorporation of the explanatory variables in a statistical model for the dependent variable enables an assessment of the effect of this explanatory variable on the dependent variable. For example, one explanatory variable used in this report is the portable flowmeter measurement method. As discussed previously, three methods were used in this study and were identified as C, P, and M. When a method is used as an explanatory variable in the model for *diffQ*, for example, it can be determined if there is any significant difference in *diffQ* resulting from the use of different methods. In this report, a statistically significant finding, unless otherwise denoted, is significant at the 5-percent significance level ($p<0.05$). In addition, the explanatory variables in the statistical models are considered either quantitative or qualitative. Quantitative variables have a numerical value that specifies some quantity, whereas qualitative variables are used to define different categories. Pumping water-level measurement is an example of a quantitative variable, and the portable flowmeter measurement method is an example of a qualitative variable. The models used in this report have incorporated both types of variables. The statistical technique known as regression analysis typically uses quantitative explanatory variables, the technique known as analysis of variance uses qualitative explanatory variables, and the technique known as analysis of covariance combines both. Therefore, the statistical methodology used in this report may be referred to as analysis of covariance, although this terminology usually refers to statistical models that are not as complex as the ones used in this report. Analysis of covariance combines features of simple linear regression with analysis of variance. Analysis of covariance is used to assess the statistical significance of mean differences among variables and explains the amount of variation in the dependent variables *diffQ*, *diffC*, *diffL*, and *diffP* that is attributable to each of the explanatory variables.

The number of categories associated with a qualitative variable is referred to as the number of “levels” for that variable. For example, there are three levels for the portable flowmeter measurement method (C, P, and M), which is a qualitative variable. Qualitative variables in modeling may be classified further as having either fixed or random effects (Snedecor and Cochran, 1967). Fixed effects are regarded as fixed but unknown quantities to be estimated, but random effects are regarded as varying randomly (for example, from site to site), so that interest focuses on estimating properties (such as the variance) of the probability distribution of the effects. Both fixed and random effects are used in the models in this report. The various explanatory variables that are included in the statistical models, together with the symbols used, the type of variable, and the levels for the qualitative variables are listed in table 1.

A brief description of these explanatory variables and some remarks on their usage are given here:

1. Portable flowmeter measurement method (Method). This variable accounts for the tendency for measurements made with one method to differ from those made with another method.
2. Type of discharge distribution system (Type). This variable accounts for the tendency for measurements made for one type of discharge system to be different from those made for another type.
3. Site (*S*). This variable accounts for the tendency for measurements at one site to differ systematically from measurements at other sites. For example, if measurements at a given site have a tendency to be larger than average, the site effect at this site will be positive, and including this qualitative variable enables the model to account for this.
4. Year (*Y* or *Z*). This variable accounts for the tendency of measurements made in one year to differ systematically from measurements made in another year. When modeling pumpage differences (*diffP*), it will be necessary to have two year-effect terms, one for the year in which the PCC measurement was made (this is year-effect *Y* in table 1) and one for the year in which electrical power consumption was used to estimate pumpage (this is year-effect *Z*).
5. Site/Year (*SY*). This is a site/year “interaction” term that accounts for site-specific year-to-year variation. That is, the site variable (*S*) represents an average effect at a given site for all years, and the year variable (*Y* or *Z*) represents an average effect for a given year at all sites; but this site/year term represents the tendency for measurements made for a given site/year combination to deviate from the site and year average effects.
6. Date (*D*). This variable accounts for the tendency of measurements made on a given date at a given site to differ systematically from measurements made on a different date at the same site.
7. Time (*t* or *s*). This variable enters the models as a linear trend term in time. It accounts for the tendency for measurements to change systematically over the period of record, increasing or decreasing linearly with time. The magnitude of the time trend is determined by a coefficient that is the slope of the line when the dependent variable is plotted in relation to time. This coefficient represents the rate of change of the dependent variable with respect to time. This coefficient will be made random in the models, meaning that the coefficient

Table 1. Explanatory variables for statistical models.

[Log PWL, log of pumping water level; --, not applicable; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; L, low pressure; O, open; S, sprinkler; CH, complex high; CL, complex low]

Variable	Symbol	Type	Levels
Method	α	fixed qualitative	C, P, M
Type	γ	fixed qualitative	L, O, S, CH, CL
Site	*S*	random qualitative	one for each site
Year	*Y* or *Z*	random qualitative	one for each year
Site/Year	*SY*	random qualitative	one for each site-year combination
Date	*D*	random qualitative	one for each site-date combination
Time	*t* or *s*	quantitative	--
Log PWL	*w*	quantitative	--

8. may vary randomly from site to site. Also, when modeling *diffP*, it will be necessary to consider two times; one (t in table 1) for when the PCC measurement was made, and one (s in table 1) for the year electrical power consumption was used to estimate pumpage.
9. Pumping water level (PWL). This variable accounts for the tendency for measurements to change systematically with pumping water-level changes. In the statistical models, a logarithmic transformation was made on pumping water level; this variable is expressed in the models as a deviation from an average value. There is, as with the time explanatory variable, a coefficient associated with this term, which can vary randomly from site to site.

Four of these explanatory variables (Year [*Y*], Site/Year [*SY*], Date [*D*], and Time [*t* or *s*]) were included to facilitate assessment of temporal variability. The time variable enables the models to evaluate tendencies to increase or decrease monotonically with time over the period of interest, and the date and year variables, including the Site/Year variable enable the models to estimate the tendency for measurements that are close together in time to be correlated. For example, measurements made on the same date may tend to be more similar than measurements on two different dates, so the date variable accounts for this.

The statistical modeling thus is based on expressing the dependent variables in terms of the explanatory variables and an error term, which accounts for unexplained variability of the dependent variable. The magnitude of the variance of the error term relative to the total variability of the dependent variable provides an indication of how much of the variability in the dependent variable is accounted for by the explanatory variables. The statistical fitting procedure used to estimate unknown parameters (fixed effects and variances) in the models is restricted maximum likelihood estimation, using the software package SPLUS (Mathsoft, 1998).

Statistical Models for Discharge and Power Conversion Coefficients

The statistical models for discharge and power conversion coefficients are

$$diffQ = \mu_Q + \alpha_Q + S_Q + Y_Q + (SY)_Q + D_Q + A_Q t + U_Q(w - \overline{\overline{w}}) + e_Q \quad (4)$$

$$diffC = \mu_C + \alpha_C + \gamma_C + S_C + Y_C + (SY)_C + D_C + A_C t + U_C(w - \overline{\overline{w}}) + e_C \quad (5)$$

$$diffL = \mu_L + \gamma_L + S_L + Z_L + A_L s + U_L(\overline{w} - \overline{\overline{w}}) + e_L \quad (6)$$

where

μ is the intercept term,

α is the effect (fixed) for the portable flowmeter method (C, M, P),

γ is the effect (fixed) for discharge distribution system type (L, O, S, CH, CL),

S is the effect (random) for site,

Y is the effect (random) for an instantaneous flow or PCC measurement year,

(SY) is the effect (random) for a year within site,

Z is the year effect (random) for a year in which total power consumption was used to estimate pumpage,

D is the effect (random) for date,

A is the time-trend coefficient (random),

t is measurement time (in fractional years, t=0 for January 1, 1998 and t=0.5 for June 30, 1998),

s is time when power consumption at the well was used to estimate pumpage (in years, s=0 for 1998),

U is the pumping water level coefficient,

w is log of pumping water level at time of measurement (PWL),

$\overline{\overline{w}}$ is average log PWL for a given site,

$\overline{w}$ is average log PWL for a given site in a given year, and

e is the random error term.

(Note: the subscripts $_{Q}$, $_{C}$, and $_{L}$ associated with these variables refer to the specific model – *diffQ, diffC, or diffL.*)

The fixed effect term, α, models the differences in the dependent variables caused by differences in portable flowmeter method (three levels: C, M, and P) and the fixed effect term, γ, accounts for differences caused by discharge distribution system type (five levels: L, O, S, CH, and CL). All sites were classified as L, O, S, or complex. Measurements of d*iffC* at complex sites were assigned a CH or CL level depending on whether the PCC measurement was made at a high or low TDH. For the *diffL* model, a site-year was classified as CH or CL on the basis of whether the first PCC measurement for that site-year was made under high or low TDH. Initially, a fixed effect term for TFM make was included in the *diffQ*, *diffC*, and *diffL* models as in the Phase I study (Dash and others, 1999). Similarly, the fixed effect term for the distribution system type (γ) was included in the *diffQ* model. However, data analyses using these initial models indicated that TFM make was statistically insignificant for *diffQ*, *diffC*, and *diffL* models; the fixed effect term for the distribution system type (γ) was statistically insignificant for the *diffQ* model. Therefore, these variables were not included in the final models.

The time-trend term, *t*, in the *diffQ* and *diffC* models was included to account for the observed tendency for *diffQ* and *diffC* to show a systematic linear trend with time. This trend changes from site to site, so the slope, or coefficient, of the time-trend line, variable *A*, is a random effect that varies randomly from site to site. As a result, the models for *diffQ*, *diffC*, and *diffL* are treated as random slope models. Similarly, because PWL varied during the course of the study, it was important to evaluate the tendency for *diffQ* and *diffC* to change systematically with PWL. The term involving log of PWL, *w*, accounts for this tendency. In the *diffQ* and *diffC* models, the trend effect of PWL is represented as a coefficient, U , multiplied by $w-\overline{\overline{w}}$, where *w* is the log of *PWL* and $\overline{\overline{w}}$ is the site-average log of PWL. Thus, by setting $w=\overline{\overline{w}}$, or $w-\overline{\overline{w}}=0$, *diffQ* and *diffC* can be evaluated for average PWL conditions. The coefficient *U* is random—varying randomly from site to site.

A time-trend term exists in the *diff*L model, similar to the time-trend term in the *diffQ* and *diffC* models, but time in this model is denoted by the variable, *s*, which stands for year in which total power and pumpage were measured. The coefficient A_L is allowed to vary randomly from site to site. Also, in the *diffL* model, the effect of PWL enters as a linear term in $\overline{w}-\overline{\overline{w}}$, where $\overline{w}$ is average log PWL for a given site in a given year. Thus, there is only one *diffL* value per site per year, and similarly, there is one associated $\overline{w}$ value per site per year. Therefore, the model was expressed in terms of the difference of $\overline{w}$ from the overall site average $\overline{\overline{w}}$.

The random factor *S* in all three models (eqs. 4, 5, and 6) accounts for the site-to-site variation of the “intercept” of the linear models, and the random factors *Y* and *Z* account for year-to-year variation. The variable *S* measures the tendency for data at one site to differ systematically from data at another site, and *Y* and *Z* measure an analogous tendency for different years. The distinction between *Y* and *Z* is similar to that between *t* and *s*; *Y* is the year effect corresponding to a portable flowmeter or PCC measurement, and *Z* is the year effect corresponding to a period in which total power consumption and annual pumpage were measured. For the *diffQ* and *diffC* models, while *S* represents site variation across all years, and *Y* represents yearly variation across all sites, the random factor *(SY)* is an interaction term representing site-specific year-to-year variation. Finally, there also was a tendency for *diffQ* and *diffC* data collected on one day to exhibit a difference from data collected on a different day at the same site in the same year; this tendency is measured by the date effect, *D*.

The statistical assumptions made in the analyses are: All random variables are assumed to be normally distributed, and all except *A* and *U* have mean of zero. The explanatory site variables in the *diffQ* model that can vary randomly from site to site are denoted by $V_Q=(S_Q,A_Q,U_Q)$. In the *diffQ* model, the V_Q is assumed to be independent and identically distributed (i.i.d.), the Y_Q are i.i.d, the $(SY)_Q$ are i.i.d., the e_Q are i.i.d.; V_Q , Y_Q , $(SY)_Q$, and e_Q are further assumed to be independent of each other. Note that the three site variables making up V_Q may not be independent of each other. Analogous assumptions are made for the *diffC* and *diffL* models.

The main purposes of the *diffQ, diffC,* and *diffL* statistical analyses were to obtain: (1) estimates of the fixed effects, and (2) estimates of the means and variances for the random effects that included time trends and trends in PWL.

Statistical Models for Pumpage Differences

The equation for *diffP* in equation 3 contains two different times: time *t*, when the portable flowmeter measurement was used to obtain a PCC, and time *s*, the year for which power consumption was used to estimate pumpage. Time *t* is incorporated in the equation for *diffC*, and time *s* is incorporated in the equation for *diffL*; therefore, *diffP* contains both *s* and *t*.

Currently (2004), under the rules adopted and subsequently amended by CDWR for measurement of tributary ground-water diversions in the Arkansas River Basin, a PCC could be applied to the electrical power usage up to 4 years in the future to estimate ground-water pumpage (Office of State Engineer, 1994, 1996). One of the main purposes of this study was to evaluate the effect of this lag (the difference between *s* and *t*) on differences in pumpage (*diffP*) between the PCC and TFM methods. Toward this purpose, a new variable, *u,* was defined as the difference between *s* and *t,* which represents the lag time; therefore, *diffP* will be expressed in terms of *u* rather than *s* and *t*.

To obtain a statistical model for *diffP*, the variables in the *diffC* and *diffL* models were substituted in equation 3. In the combined model, there is an assumption of independence of the random effects. However, *diffC* and *diffL* each have year effects, *Y* and *Z*, that are unlikely to be independent of each other unless *diffC* and *diffL* are associated with different years. Thus, two different cases must be distinguished. For a PCC measurement made at a time *t*, a notation of $[t]$ will be used to represent the year in which the measurement was made, and *s* represents the year in which the power consumption at the well was used and pumpage was estimated. The two different cases are therefore:

case (i). $s\neq[t]$ (PCC measured and pumpage estimated in different years).

case (ii). $s=[t]$ (PCC measured and pumpage estimated in the same year).

Considering case (i) first, substituting the models for *diffL* (eq. 6) and *diffC* (eq. 5) into equation 3 and removing statistically insignificant terms as described later in this section yields

$$diffP=\mu_P+\alpha_P+\gamma_P+S_P+Y_P+(SY)_P+ Z_P+(SZ)_P+D_P+A_Pu+U_P(\overline{w}-w)+e_P \qquad (7)$$

where

diffP model variables can be expressed by the differences in the *diffL* and *diffC* variables as follows:

$$\mu_P = \mu_L - \mu_C$$

$$\alpha_P = -\alpha_C$$

$$\gamma_P = \gamma_L - \gamma_C$$

$$S_P = S_L - S_C$$

$$Y_P = -Y_C$$

$$(SY)_P = -(SY)_C$$

$$Z_P = Z_L$$

$$(SZ)_P = e_L$$

$$D_P = -D_C$$

$$A_P = A_L$$

$$U_P = U_L$$

and

$$e_P = -e_C\ .$$

In this model, there are two terms for the year effect, Y_P (representing the year in which the PCC value was measured) and Z_P (representing the year in which power consumption was used to estimate pumpage). Note, because all of the random site-year effect in the *diffP* model for the year in which pumpage was estimated comes from the error term in the *diffL* model, $(SZ)_P = e_L$. Also, two terms were omitted from this model because they were statistically insignificant. The first term omitted was $(A_L - A_C)t$; presence of this term would mean that time trends in *diffP* are a function not only of the lag time *u* but also of the time *t* when the PCC measurement was made. The fact that this term proved very small in the data analyses reflects the fact that A_L and A_C are highly positively correlated. The second term omitted was $(U_L - U_C)(\overline{w} - \overline{\overline{w}})$, which was small because of the high positive correlation between U_C and U_L. The *PWL* dependence in the final *diffP* model (eq. 7) is only through $\overline{w} - w$, the difference between $\overline{w}$ (average log *PWL* for the site and year when power consumption was used to estimate pumpage) and *w* (the log *PWL* when the PCC was calculated). The difference $\overline{w} - w$ can be interpreted as a "lag" in *PWL* conditions just as *u* represents a lag in time.

Next consider case (ii). The model for *diffP* may in this case be written as

$$diffP = \mu_P + \alpha_P + \gamma_P + S_P + Y_P' + (SY')_P + D_P + A_P u + U_P(\overline{w} - w) + e_P \qquad (8)$$

where

$$Y_P' = Z_L - Y_C$$

and

$$(SY')_P = e_L - (SY)_C\ .$$

In this case, the term Y_P' is a year effect representing the combined effects of Z_L and Y_C; and $(SY')_P$ represents the combined effects of e_L and $(SY)_C$. The time-trend term (*t*) is statistically insignificant and has been omitted.

There are two ways to obtain estimates for the parameters in the *diffP* model. One is to use the fitted models for *diffC* and *diffL*. The second is to use *diffP* data to fit the model for equation 7 where ($s \neq [t]$) and for equation 8 where ($s = [t]$) directly. That is, at each site, PCC values were obtained for a set of measurement times (*t*) and total electrical power consumption for a set of years (*s*). The *diffP* data were obtained by applying each PCC value to each total electrical power consumption value by using all possible combinations of *t* and *s*. When fitting the equation 7 model or the equation 8 model using *diffP* data, the assumption of independence of the errors e_P must be met. This assumption is met for the *diffP* data with $s = [t]$ because the *diffC* errors, e_C, are assumed to be independent and $e_P = -e_C$, indicating that the *diffP* errors, e_P, also are independent. However, for the *diffP* data for which $s \neq [t]$, the assumption of independence of the errors, e_P, is violated if all possible combinations of PCC values and total power consumption are used. This assumption is violated because e_C will be the same for all the *diffP* values for which the same PCC value is used. To overcome this problem, the *diffP* data set for $s \neq [t]$ was compiled by associating each PCC measurement at a site with only one total power consumption value in a randomly chosen year different from the year in which the PCC measurement was made.

In summary, three sets of estimation results will be shown for *diffP*. Comparing these three sets of results will provide a valuable crosscheck on consistency. The three sets of results are:

1. Results obtained using *diffP* data under case (i) ($s \neq [t]$), fitting the model for equation 7. For these results each PCC measurement is associated with one total power consumption value in a randomly chosen year different from the year in which the PCC measurement was made.
2. Results obtained using *diffP* data under case (ii) ($s = [t]$), fitting the model for equation 8.

3. Results obtained using the individually fitted *diffC* and *diffL* models.

The main purposes of the *diffP* statistical analysis was to obtain: (1) estimates of fixed effects, and (2) estimates of the means and variances for the random effects which included time trends and pumping water level (PWL) trends.

Estimation of Year-to-Year Variability

Estimation of year-to-year variability was one of the most important goals in this report because understanding this variability was crucial to determining whether PCCs obtained in one year could be accurately applied in other years. The two explanatory terms in the statistical models presented above that enable an assessment of this variability are the year (Y, Z, Y') and time-trend (t, s, and u) terms. In the models described above, the year terms are random variables with a mean of zero indicating that all the systematic year-to-year variation is represented in the time-trend terms. However, the interpretation of the time-trend term is complicated by the fact that the models also include a PWL term, and PWL also may change systematically with time. Therefore, the effects of time trend and PWL must be considered together.

If a power conversion coefficient estimated in 1 year was applied to estimate pumpage several years in the future, then a time trend would mean that conditions had changed between the time of PCC measurement and pumpage estimation (the difference in these times is the lag u in equations (7) and (8)) so that a bias may be introduced in estimating pumpage. This turns out to be a crucial issue for the data set analyzed in this report because hydrologic conditions did change systematically over the period of data collection, and this is reflected as significant time-trend terms in the statistical models.

If a time trend is present, some interpretation must be given to the meaning of this trend before any predictions of future trends (after the period of data collection in this report) can be made. It is important to recognize that there are reasons for any time trend and that detailed data on certain variables (such as climate, water availability, and ground-water conditions) might allow a definitive assessment of the reasons for the trend. Hence, the time-trend term in the statistical models should be regarded as a surrogate for these other variables, and if extensive data on these other variables were available and incorporated in the models, it probably would not be necessary to include the time-trend term. In the analyses done in this report, detailed data on PWL were available, and incorporation of this term in the statistical models accounted for some of the systematic change through time for this data set; and yet, the time-trend term in many of the analyses still appeared to be a significant predictor over and above PWL. In addition, some of the physical reasons underlying the variability in PWL and trends through time might be similar; thus, the PWL and time-trend terms, in part, may be reflecting some of the same causative factors. On the other hand, there may be factors resulting in a time trend that may be unrelated to variation in PWL. For example, variations in *diffP* that are associated with a progressive decline of TFM accuracy over a period of years due to clogging or wear and tear would be unrelated to variations in PWL. In summary, there is some uncertainty about the cause of time trends in the data analyzed in this report, and this uncertainty must be kept in mind when trying to extrapolate the results in this report to make future predictions.

The time-trend terms in the statistical models (eqs. 4–8) that are associated with the time variables (t, s, and u) were assumed to be linear. This implies that average changes from one year to the next are constant over a period of several years. This is a reasonable way to approximate, over short periods of time (several years), the gradual changes that have occurred in multidecadal static ground-water levels in the study area (Steger, 2002). However, changes through time may not be truly linear; thus, the assumption of linearity represents an approximation of the actual temporal changes over the 5-year study period. This oversimplifying assumption can be evaluated independently and in more detail by analyzing the year-effect variables (Y, Z, Y') on the time trend. Recall variable Y represents the year the PCC was made, variable Z represents the year the power consumption was used to estimate pumpage, and variable Y' represents the combined effects of Z_L and Y_C. In the discussion so far, these variables have been made random with a mean of zero, so that data analysis provides an estimate of the variance of these terms. In order to use the year effects to extract more information about year-to-year variability, additional data analyses were performed in which Y, Z, and Y' were fixed rather than random effects. This provides information about the mean value (and its standard error) for each year, whereas doing the analysis with Y, Z, and Y' as random effects was based simply on an assumption that Y, Z, and Y' for each year were random samples from a population with variances to be estimated. Both perspectives can be justified, and both sets of analyses provide useful information. When the year effects Y, Z, and Y' are fixed effects, no linear time-trend term is included in the models, so that all year-to-year variability is associated with the Y, Z, and Y' terms. Thus, a comparison of the mean time-slope estimates in the random-year effect model with the behavior of the year effect estimates in the fixed-year effect models provides valuable information on time trends.

Variability in Instantaneous Discharge

As defined earlier, *diffQ* is a measure of the difference in instantaneous discharge measured between the portable flowmeters and the TFMs. *DiffQ* was computed by subtracting the log of the TFM discharge from the log of the portable flowmeter discharge. The difference in log of discharges allows *diffQ* to be interpreted as a relative or fractional difference for small differences. Therefore, *diffQ* multiplied by 100 may be interpreted as a percent difference. The number of values of *diffQ* used in the statistical modeling was 1,266.

Boxplots showing the differences in discharge data (*diffQ*) for the entire study network and for the three portable flowmeter methods are shown in figure 5. Almost 90 percent of the differences in paired discharge measurements for the entire network of wells were less than 10 percent, almost 70 percent of the differences were less than 5 percent, and the median difference was –0.5 percent (fig. 5*A*). The overall mean of the 1,266 *diffQ* values was –0.0151. Results of fitting the statistical model in equation 4 are listed in tables 2 and 3. The estimated intercept of the statistical model for *diffQ* was –0.0193, with a standard error of 0.0050, indicating that, at time t=0 (the beginning of 1998) and under average PWL conditions ($w - \overline{\overline{w}} = 0$), the average *diffQ* was about –1.93 percent. On average, the portable flowmeter discharge measurement was about 2 percent less than the TFM discharge (table 2).

The distribution of the differences varied with the selected portable flowmeter method. The median *diffQ* values and interquartile ranges for method C and M were smaller than for method P (fig. 5*B*), with the median *diffQ* value for methods C and M being 0.5 percent and – 0.6 percent, respectively. The median *diffQ* value for method P was –4 percent, a value 6 to 8 times greater than for methods C and M. Additionally, the aggregated *diffQ* values computed using method C indicated no overall bias; whereas, the aggregated *diffQ* values computed using method M indicated a slight negative bias and the aggregated *diffQ* values computed using method P indicated a fairly strong negative bias (fig. 5*B*). A negative bias indicates that portable flowmeter method P tended to measure a smaller discharge than the TFM. The statistical model for *diffQ* indicated that the method effects accounted for about 7 percent of the total variance of *diffQ*. The estimated effect for method C relative to all three methods was about 1.7 percent; for method M, the estimated effect relative to all three methods was 0.2 percent; and for method P, the estimated effect relative to all three methods was about –1.9 percent (table 2). The positive sign on the effects for methods C and M indicated that these methods tended to have higher than average instantaneous discharge than was computed using data for all three methods; conversely, method P indicated a negative sign on the effects, indicating the method tended to have smaller discharge than the overall average.

Figures 5*C* and 6 show the temporal variability in *diffQ* during 1998–2002. The boxplots (fig. 5*C*) for *diffQ* show that portable flowmeter methods do not exhibit any observable persistent temporal trends. Figure 6 shows temporal variations in *diff*Q with respect to site (fig. 6*A*) and pumping water level (fig. 6*B*). Again, no persistent trends were observable. Estimates of the mean and variance of the random coefficients of the time-trend term and pumping water level term in the statistical model for *diffQ* are given in table 3. The time-trend term variable, A_Q , represents the rate of change (slope) of *diffQ* with respect to time *t*. The mean of A_Q for *diffQ* was estimated to be 0.0009 with a standard error of 0.0018, indicating the mean was not significantly different from zero (table 3). The variance of A_Q was estimated to be 0.0000313, giving a standard deviation (square root of the variance) of 0.0056. Thus, the time-trend coefficient may be considered a random variable with a mean slope of 0 percent per year and standard deviation of about 0.56 percent per year. For a normal distribution, the probability of drawing a value within one standard deviation of the mean is about 68 percent and is about 95 percent within two standard deviations of the mean. Thus, if *diffQ* (which may be interpreted as a percent) is plotted against time *t* and the slope is measured for all the sites, about 68 percent of the sites would have a change in *diffQ* between –0.56 and +0.56 percent per year, and about 95 percent of the sites would have a change in *diffQ* between –1.12 and +1.12 percent per year. If these estimates were extended, for example, to a 4-year period, about 68 percent of sites would have a change in *diffQ* between –2.24 percent and +2.24 percent (2.24 = 4 × 0.56), and about 95 percent of sites would have a change between –4.48 percent and +4.48 percent.

The statistical model developed for *diffQ* indicated that site-to-site variability accounted for the largest amount (about 46 percent) of the total variance of *diffQ,* and the time trend accounted for only about 6 percent of the total variance. Almost all of this time-trend variance resulted from site-to-site variability in the time slope, whereas the mean slope was near zero, indicating no tendency of *diffQ* from these sites to increase or decrease. The PWL term accounted for only a negligible amount of the variance of *diffQ*, indicating that changes in PWL had very little influence on differences in discharge. A detailed discussion of estimating the contributions of the different explanatory variables to the total variance (0.00323) for the *diffQ* model is provided in the "Supplemental Information" section in the back of the report.

Data analysis indicated that, overall, the quality of discharge measurements associated with TFMs did not degrade over time (during 1998–2002). However, problems did occur with some TFMs. During site visits, CDWR staff documented 27 performance problems associated with TFMs (fig. 7). In addition, near the beginning of the 5-year study, there were three failures of make M meters soon after the meters were initially installed. Total mechanical failures and recurring electronic failures generally resulted in dropping the well from the study. Equipment problems, including debris clogs and reasons unknown, occasionally resulted in loss of TFM data. Debris clogs in the meter components generally were observed early in the irrigation season during startup operations. In these cases, simply loosening, adjusting, and retightening the saddle mounting often solved this minor problem. During the installation period (1997–98), make S was in the research stage of development and did not include integrally sealed electronics. This prototype meter incurred a high frequency of electronic failures onsite when the wiring connection failed, often by cutting or breaking. Intermittent hardware and wiring problems with the prototype make S TFM commonly led to electronic malfunctions at the remotely located liquid crystal display (LCD) unit that stored total cumulative pumpage. Data were unrecoverable

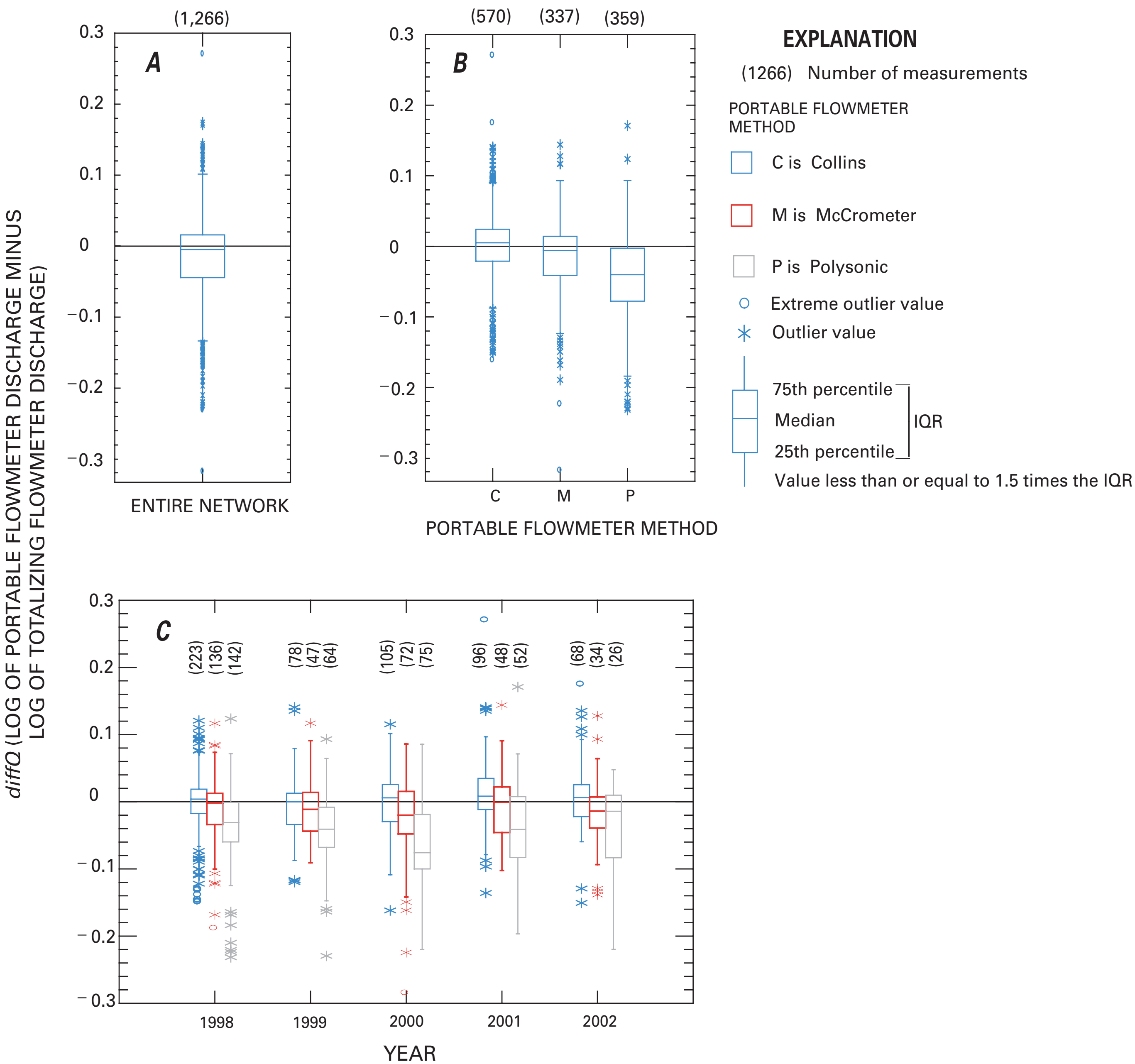


Figure 5. Boxplots showing *diffQ* (*A*) for the entire network, (*B*) by portable flowmeter method, and (*C*) by year, 1998–2002.

Table 2. Estimates of intercept and method fixed-effects parameters for the *diffQ* model.

[C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; S, mean is significantly different from zero at the 5-percent significance level; NS, mean is not significantly different from zero at the 5-percent significance level; the parameter estimates can be expressed as a percent difference by multiplying the respective value by 100]

Parameter	Estimate	Standard error	Significance at the 5-percent level
Intercept	– 0.0193	0.0050	S
Method of portable flowmeter (fixed)			
C	0.0173	0.0013	S
M	0.0019	0.0015	NS
P	–0.0192	0.0014	S

Table 3. Estimates of the mean and variance for random variables in the *diffQ* model of ground-water discharge differences.

[PWL, pumping water level; --, not applicable]

Random variables	Symbol	Mean	Standard error of the mean	Variance	Percentage of total variance explained by each variable
Time-trend coefficient	A_Q	0.0009	0.0018	0.0000313	5.5
PWL trend coefficient	U_Q	– 0.018	0.0170	0.00392	1.2
Site effect	S_Q	0	--	0.00147	45.5
Year effect	Y_Q	0	--	0.0000156	0.5
Site/year effect	$(SY)_Q$	0	--	0.000251	7.7
Date effect	D_Q	0	--	0.000190	5.9
Random error term	e_Q	0	--	0.000820	25.4

for these missing periods of TFM operation. Although the make S TFMs performed well during the initial year of the study (1998), a large percentage of these prototype meters failed over the course of the 5-year study.

Variability of Power Consumption and Flow

The use of PCCs to estimate ground-water pumpage from wells is most accurate when the relation of well discharge to power consumption remains stable. Over time, hydrologic and pump operating conditions may change, thus altering the relation between discharge and power consumption. Depth to ground water may increase during a drought or after an extended period of pumping, or the pump efficiency may decrease as the irrigation system ages. These well operations can result in variations in the PCC over time and can result in errors when using the PCC approach to estimate ground-water pumpage.

A comparison of the 1998–2002 PCC values was made using two different statistical models: *diffC* and *diffL*. Recall that *diffC* was defined simply as the log of PCC. *DiffL* was defined as the log of total power consumption for the season minus the log of TFM pumpage for the same season. *DiffP* was defined as the log of total pumpage using the PCC minus the log of total pumpage using TFM. Mathematically, *diffP* is equal to *diffL* minus *diffC*.

The difference between *diffC* and *diffL* was one of time scale: *diffC* was obtained using instantaneous values of power consumption and flow, whereas *diffL* was obtained using seasonally integrated values of power consumption and flow. Because of the similarity in *diffC* and *diffL*, a comparison of their statistical behavior is important, particularly in evaluating variability in *diffP*. It is also important to understand the compensating effects that occur in the differences between *diffC* and *diffL*, which provides an understanding of the sources of variability in *diffP*. Therefore, the following section summarizes the primary results from the statistical models for *diffC* and *diffL* followed by a subsequent section that provides a detailed discussion of the analysis of variance. Statistical modeling for *diffC* used 1,245 values, whereas the *diffL* analysis used 336 measurements (one *diffL* value per site per year).

Summary of Primary Results

Estimates for the method fixed effects for *diffC* (table 4) were very close to those for the *diffQ* model (table 2), except with opposite sign (because log portable flowmeter discharge was subtracted from the log of power demand to compute log PCC). However, significant differences were detected among the types of discharge distribution systems (table 4). PCCs for type S (sprinkler) discharge distribution systems were higher than PCCs for the other types; and type L (low pressure) PCCs were the lowest (fig. 8). The estimates for type fixed effects in the *diffL* model for L, O, and S distribution systems also were similar to the corresponding effects for the *diffC* model (table 4, fig. 8). A comparison of the statistical results, however, indicated a discrepancy between the CH and CL effects for the *diffC* and *diffL* models. These differences were not discernible in figure 8, probably as a result of the large site-to-site variability. The statistical models indicated the high and low TDH complex sites (CH and CL) had a fixed-effect difference of 0.149 using the *diffC* data but only 0.030 using the *diffL* data. The seasonal averaging of the values in *diffL* balanced the differences between high and low TDH in the complex system.

The results of statistical analysis indicated that distribution system type and site variables accounted for 94.8 percent of the

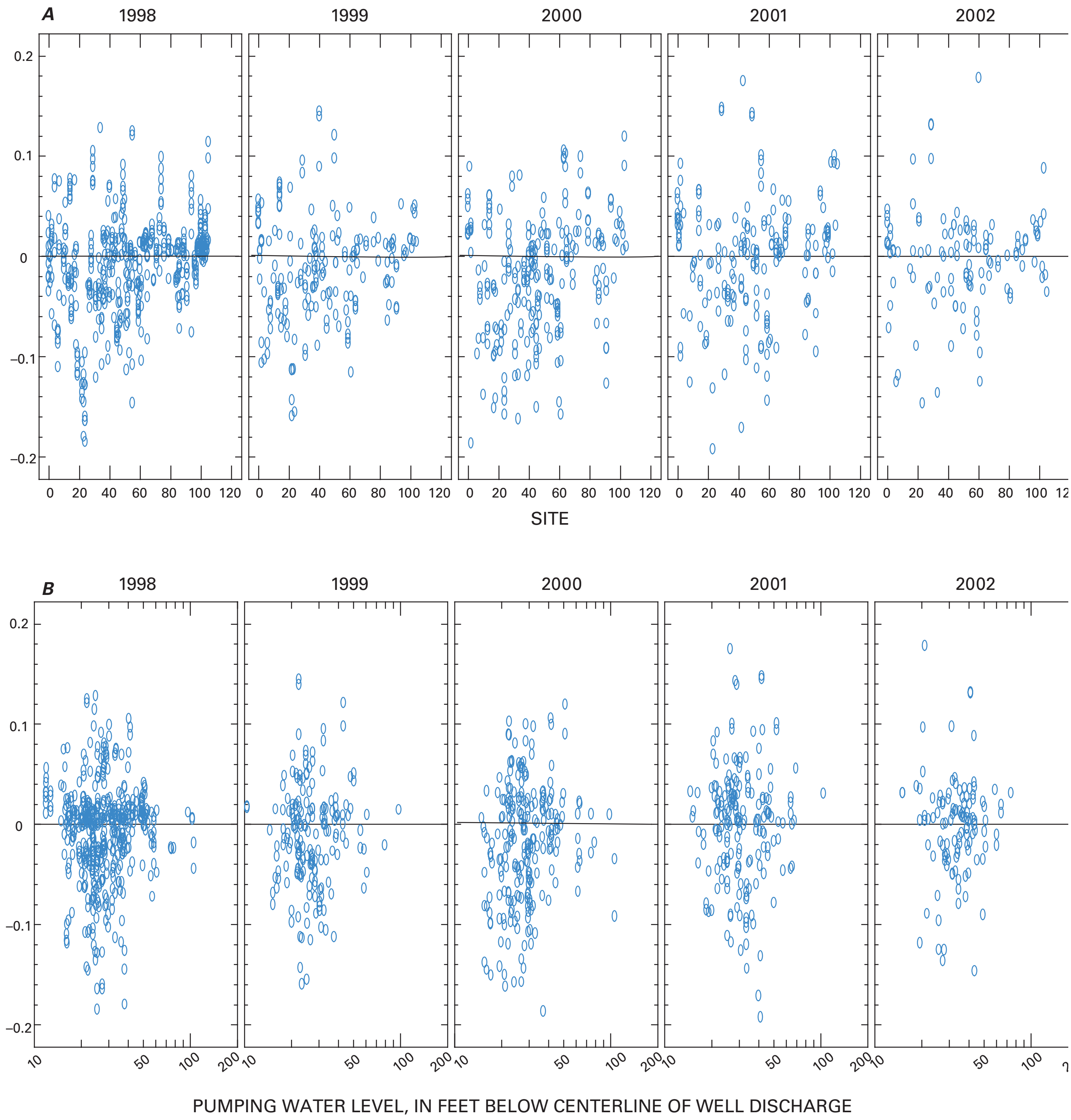
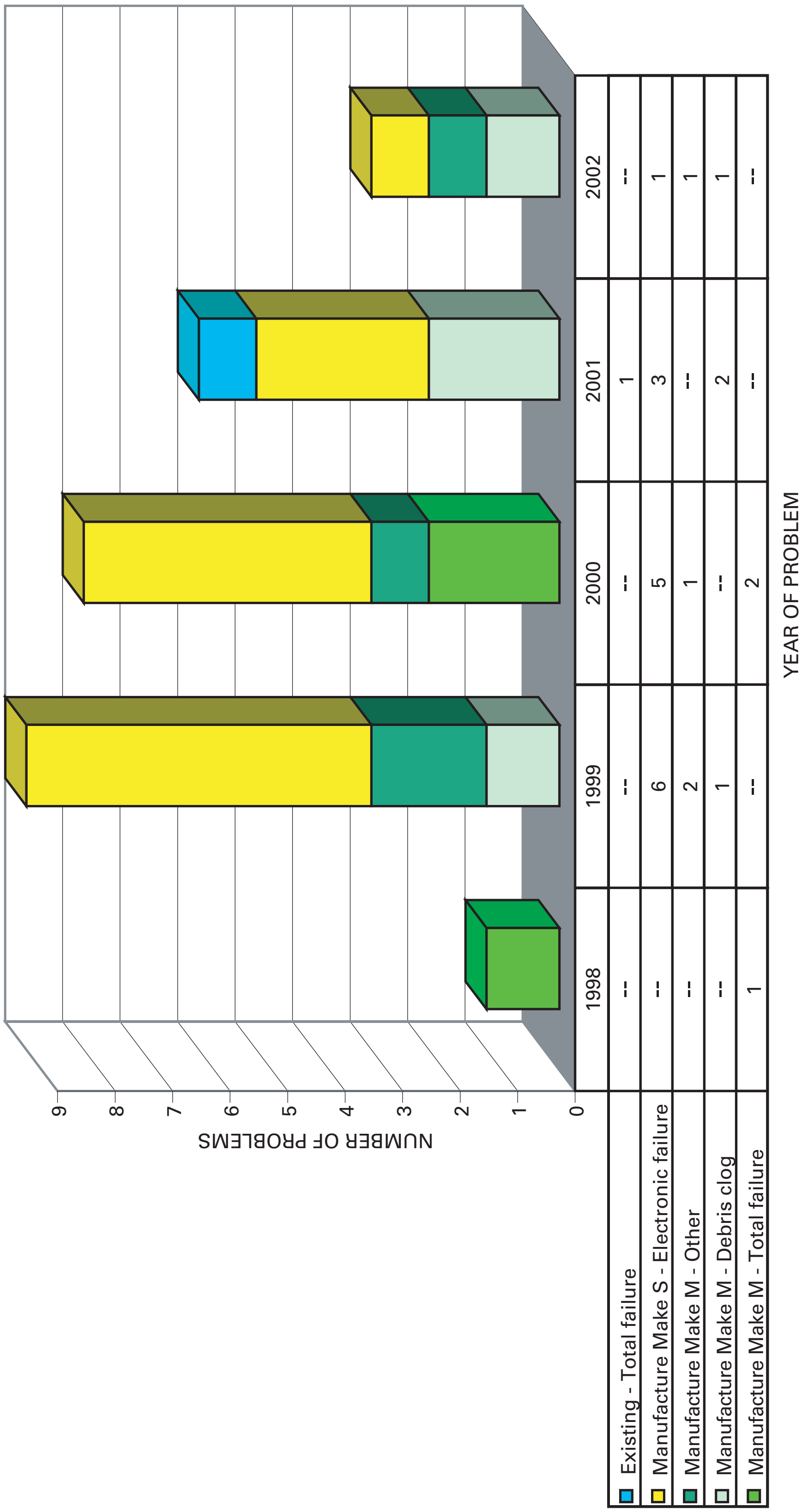


Figure 6. Variations in *diffQ* (*A*) by year at network sites, and (*B*) by year with respect to pumping water levels, 1998–2002.



	1998	1999	2000	2001	2002
Existing - Total failure	--	--	--	1	--
Manufacture Make S - Electronic failure	--	6	5	3	1
Manufacture Make M - Other	--	2	1	--	1
Manufacture Make M - Debris clog	--	1	--	2	1
Manufacture Make M - Total failure	1	--	2	--	--

Figure 7. Types of problems and failures for totalizing flowmeters, 1998–2002.

total variance in *diffC*, and the model with all explanatory variables accounted for 99.5 percent of the variance. The distribution system type and site variables accounted for 97.8 percent of the total variance in *diffL*, and the model with all explanatory variables accounted for 99.4 percent of the variance. Variables other than type and site only had a small influence on *diffC* and *diffL*. However, as described in the following section "Details of Analysis," the other variables were important because of their effect on *diffP*.

Estimates of mean and variance for the random coefficients of the quantitative variables in the *diffC* and *diffL* models (table 5) differed from those in the *diffQ* model (table 3). In the *diffC* model, the estimate for the mean of the time-trend coefficient, A_C, was 0.0149, which indicated a tendency of PCC values to increase by about 1.5 percent per year on the average. This indicates that the ratio of power consumption relative to amount of water pumped (as measured over a very short period of time) increased over the period of record; that is, depth to water increased and(or) pump efficiency decreased with time. About 90 percent of the sites showed a positive time-trend coefficient (fig. 9).

The mean of the coefficient U_C describing the change in *diffC* with respect to pumping water level was significantly positive (0.1310), indicating a tendency for PCCs to increase with PWL by about 1.3 percent for a 10-percent increase in PWL (table 5). Generally this may be interpreted as indicating a decrease in pump efficiency with increasing PWL. Figure 10 shows the overall relation between PCCs and pumping water levels (PWLs). Although there is a large amount of variance (scatter) in the relation, the PCC data indicated an overall tendency to increase as PWL increases.

In the *diffL* model, the estimated mean of the time trend, A_L, was 0.0166 (table 5), which indicated an upward trend with time equal to about 1.7 percent per year on average, similar to the time trend for *diffC* (table 5). The pumping water level (PWL) trend observed for *diffL* also was similar to that for *diffC*. The mean of the coefficient U_L describing the change in *diffL* with respect to pumping water level was significantly positive (0.0919, table 5), again, indicating a tendency for *diffL* to increase with PWL— about 0.92 percent for a 10-percent increase in PWL.

Details of Analysis

Results of the analysis of variance are listed in tables 4 and 5 for *diffC* and for *diffL* and were analogous to the results for the instantaneous discharge data (*diffQ*) presented in tables 2 and 3. Differences in estimates of the mean differences listed in table 4 that are more than 2 standard errors from zero are indicated as being statistically significant.

The total variance of *diffC* was 0.215, so the model accounted for about 100 × (0.215 – 0.00116)/0.215 = 99.5 percent of the total variance of *diffC*. The contribution of type was 0.108, which represented about 100 × 0.108/0.215 = 50.2 percent of the total variance. PCCs for type S (sprinkler) discharge distribution systems tended to be much larger than those for other types, and type L (low) and O (open) tended to be smaller. These tendencies were quantified by the type fixed-effect estimates provided in table 4. There was significant variability in

Table 4. Estimates of the intercept and method and type fixed effects parameters in the *diffC* and *diffL* models.

[C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; O, open; L, low-pressure; S, sprinkler; CH, complex high; CL, complex low; s, mean is significantly different from zero at the 5-percent significance level; ns, mean is not significantly different from zero at the 5-percent significance level; --, not applicable]

Parameter	Estimate (*diffC*)	Standard error (*diffC*)	Significance at the 5-percent level (*diffC*)	Estimate (*diffL*)	Standard error (*diffL*)	Significance at the 5-percent level (*diffL*)
Intercept	4.735	0.045	--	4.727	0.047	--
Method of portable flowmeter (fixed)						
C	–0.0171	0.0016	s	--	--	--
M	– 0.0025	0.0018	ns	--	--	--
P	0.0196	0.0017	s	--	--	--
Type of discharge distribution system (fixed)						
O	–0.289	0.058	s	–0.303	0.061	s
L	–0.425	0.091	s	–0.417	0.094	s
S	0.780	0.100	s	0.790	0.110	s
CH	0.040	0.054	ns	–0.020	0.057	ns
CL	– 0.109	0.054	s	–0.050	0.057	ns

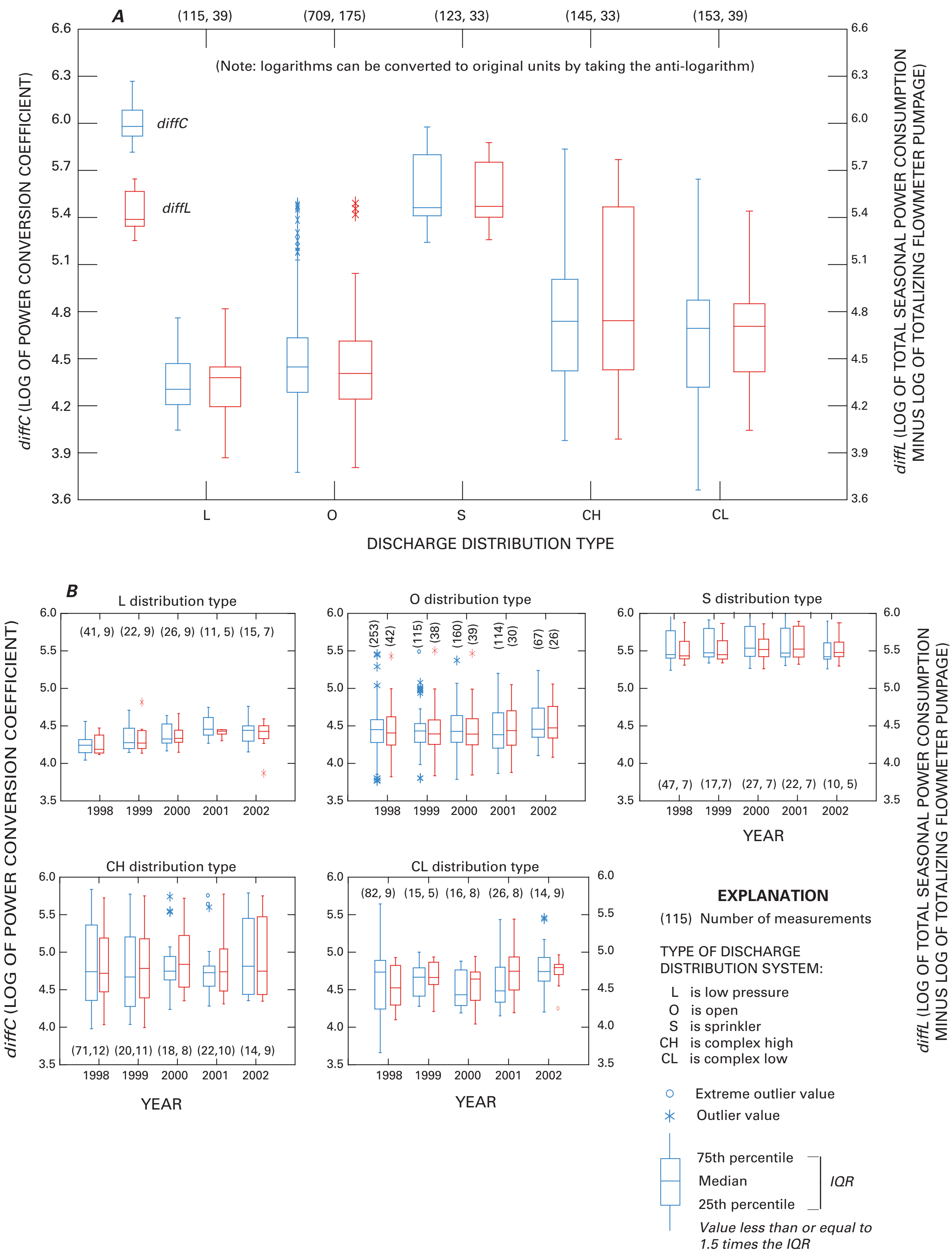


Figure 8. Variations in *diffC* and *diffL* (*A*) by various discharge distribution types, and (*B*) by year for each type of discharge distribution system, 1998–2002.

PCCs among different types of distribution systems that made this variable an important explanatory variable for *diffC*. In addition, the site term accounted for about 100 × 0.103/0.215 = 47.9 percent of the total variance (again disregarding the correlation among the three random terms S_C, A_C, and U_C), indicating that there was a large degree of site-to-site variability of PCCs, over and above that which could be accounted for by different discharge distribution-system types. Therefore, the statistical analysis indicated the type fixed effect and the site random effect were the most important terms in the model and accounted for almost all of the total variance of the (log transformed) PCCs. To confirm this and to get a more precise estimate of their combined effect, a second statistical analysis was performed with only two terms in the model—type and site. This analysis provided an error variance (measuring unexplained variation) of 0.00557, indicating that these two terms accounted for 100 × (0.215 – 0.00557)/0.215 = 94.8 percent of the total variance in *diffC*. The contribution of method to the total variance of *diffC* was calculated to be 0.000235. A break down of the effects of the mean (*E*) and variance (*V*) of the time trend and PWL random coefficients was given by $V_t = 0.00208$, $E_t = 0.000417$, $V_w = 0.00133$, $E_w = 0.000159$. (The reader is referred to the section titled "Estimates of Variance Components for Differences in Discharge" in the "Supplemental Information" section in the back of the report for a discussion of how these terms were computed.) The variance terms (*V*) were much larger than the mean terms (*E*), and, although the contribution of the time-trend slope variance (measured by 0.00208) was more important than the contribution from the PWL slope variance (measured by 0.00133), the two quantitative variables accounted for a relatively small percentage of the total variance of *diffC*. Although these quantitative explanatory variables (time and PWL) accounted for only a small percentage of the total variance of *diffC*, these variables had an important influence on pumpage differences (*diffP* equals *diffL* minus *diffC*) through their effects on *diffC* and *diffL*. Therefore, a detailed discussion of the effect of these variables on *diffC* follows. The mean of the random coefficients A_C (time coefficient) and U_C (PWL trend coefficient) were significantly different from zero (table 5). The estimated mean of A_C was 0.0149, which indicated that PCCs for all sites taken as a whole tended to increase by about 1.5 percent a year. The estimated mean of U_C was 0.1310, which indicated, for example, that a 10-percent increase in PWL resulted in about a 1.3-percent (using 0.10 × 0.1310 = 0.0131) increase in PCCs.

As stated earlier, statistical modeling for *diffL* used 336 measurements (one *diffL* value per site per year) and integrated values of power consumption and flow. Though similarly defined, the *diffL* analysis was independent of the *diffC* analysis. The total variance of the *diffL* model was 0.220, indicating the model accounted for about 100 × (0.220 – 0.00139)/0.220 = 99.4 percent of the total variance of *diffL*. The contribution of type to the variance was 0.111, or about 100 × 0.111/0.220 = 50.5 percent. The importance of this explanatory variable can, once again, be discerned from figure 8 and quantified in the fixed-effect estimates in table 4. The site random-effect term accounted for about 100 × 0.113/0.220 = 51.4 percent of the total variance. Thus, as was the case for *diffC*, the type fixed effect and the site random effect together accounted for almost all of the total variance (note, the total for these two terms was greater than 100 percent because of sampling errors in the estimates and because errors were introduced by not considering

Table 5. Estimates of mean and variance for random variables in the *diffC* and *diffL* models.

[PWL, pumping water level; --, not applicable]

Random variables	Symbol	Mean (*diffC*)	Standard error (*diffC*)	Variance (*diffC*)	Symbol	Mean (*diffL*)	Standard error (*diffL*)	Variance (*diffL*)
Time-trend coefficient	A_C	0.0149	0.0048	0.000375	A_L	0.0166	0.0053	0.000526
PWL trend coefficient	U_C	0.1310	0.0570	0.144	U_L	0.0919	0.0580	0.112
Site effect	S_C	0	--	0.103	S_L	0	--	0.113
Year effect	Y_C	0	--	0.000118	--	--	--	--
Site/year effect	$(SY)_C$	0	--	0.000770	--	--	--	--
Date effect	D_C	0	--	0.00182	--	--	--	--
Year pumpage is estimated effect	--	--	--	--	Z_L	0	--	0 .000153
Error term	e_C	0	--	0.00116	e_L	0	--	0.00139

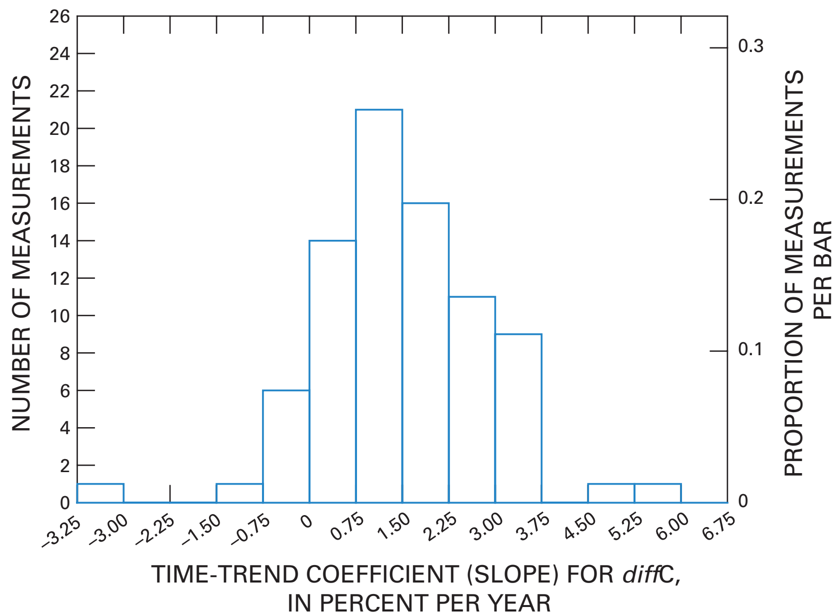


Figure 9. Distribution of time-trend coefficients (slope) for *diffC*, 1998–2002.

the correlation among the three random terms S_L, A_L, and U_L). Similar to the *diffC* analysis, a more precise estimate of the combined effect of these two terms on *diffL* was done using a second statistical analysis with only two terms in the model for *diffL*—type and site. The error variance for this model was 0.00480, indicating that type and site accounted for 100 × (0.220 – 0.00480)/0.220 = 97.8 percent of the variance of *diffL*.

A breakdown of the effects of the mean (*E*) and variance (*V*) of the time trend and PWL random coefficients in the *diffL* model was given by $V_t = 0.00280$, $E_t = 0.00054$, $V_w = 0.00111$, and $E_w = 0.00008$. Similar to the *diffC* results, estimates of the time trend and pumping water level (PWL) trend accounted for a small percentage of the total variance of *diffL*. The estimated mean values of A_L and U_L (table 5) had magnitudes and standard errors comparable to those of the *diffC* model. In several respects, the results for the *diffC* model and the *diffL* model were similar. Both models had a very high percentage (about 95 percent and 98 percent, respectively) of the total variance explained by two explanatory variables—type and site.

Other explanatory variables that explained only between 2 to 5 percent of the total variance in *diffC* and *diffL* were important in evaluating the differences in pumpage, *diffP*. This occurred because *diffP* was calculated as the difference between *diffL* and *diffC*. When *diffC* was subtracted from *diffL*, the type and site effects in the two models tended to cancel, so the importance of these two variables was greatly diminished in the *diffP* model. The other explanatory variables such as date, time, and PWL that were relatively unimportant in the *diffC* and *diffL* models became important in the *diffP* model. This explains the importance of keeping these other explanatory variables in the *diffC* and *diffL* models. The physical interpretation of what is happening is that PCC measurements made at a given site tended to be greatly influenced by the particular conditions unique to that site (such as discharge distribution-system type). However, in order to estimate pumpage by the PCC approach, these PCC values were applied to total seasonal kilowatthour measurements that were influenced by the same particular site conditions as the PCCs. Thus, the effects of the particular site conditions were canceled in estimating total pumpage. This will be observed in the next section when type and site are relatively much less important explanatory variables for *diffP*.

Variability in Ground-Water Pumpage

Using data collected at network wells during 1998–2002, the magnitude of discrepancy between ground-water pumpage as measured by TFMs and pumpage as computed by the PCC approach was evaluated. Statistical modeling was used to analyze variability in differences in ground-water pumpage (*diffP*) and evaluate temporal trends and effects of changes in pumping water levels.

As discussed in the “Statistical Models for Pumpage Differences” section, three estimation techniques were used to evaluate *diffP*. The results of the statistical modeling for *diffP* are discussed according to whether model fitting was done with the *diffP* values themselves or whether results from the *diffC* and *diffL* models were used, and whether *s* was equal to [*t*], where *s* stands for year in which pumpage was estimated, and [*t*] stands for year in which the PCC measurement was made. The three cases are listed again here for ease of reference:

1. Results obtained using *diffP* data under case (i) ($s \neq [t]$), fitting equation 7. For these results each PCC measurement was associated with one total power consumption

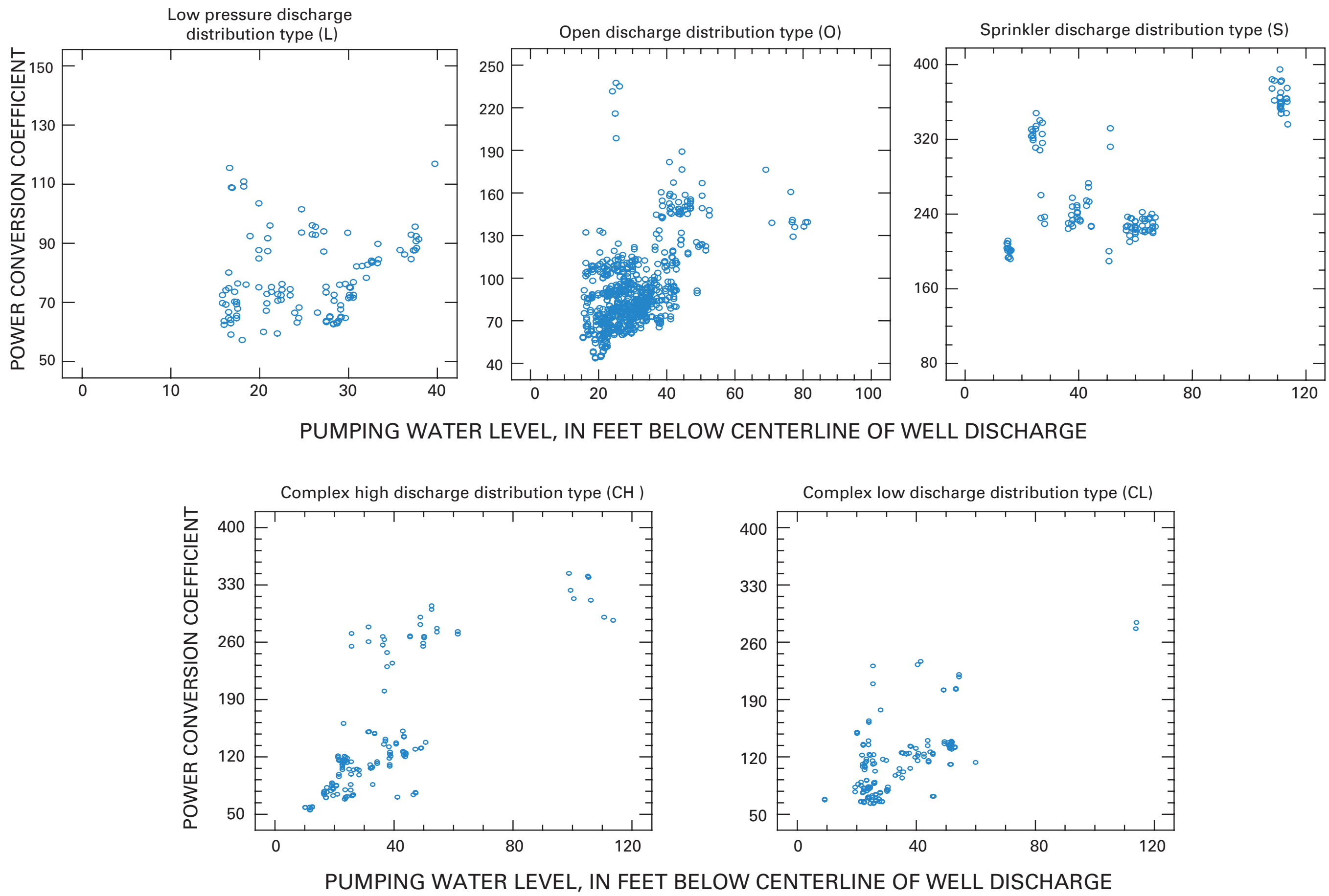


Figure 10. Relation between power conversion coefficients and pumping water levels for various discharge distribution systems, 1998–2002.

value in a randomly chosen year different from the year in which the PCC measurement was made.

2. Results obtained using *diffP* data under case (ii) ($s = [t]$), fitting equation 8.

3. Results obtained using the individually fitted *diffC* and *diffL* models (eqs. 5 and 6).

Figure 11 shows the distribution and variations in *diffP* for case (ii), when PCC measurements and power consumption for the same year were used to compute pumpage. The overall mean of the 1,245 *diffP* values was –1.8 percent. The median *diffP*, depending on the year, ranged from +0.1 to –2.9 percent; the median *diffP* for the entire network was –1.5 percent. About 60 percent of all *diffP* values were between –6 and +6 percent, and about 80 percent of *diffP* values were between –10 and +10 percent, regardless of the year. Most years showed a slight negative bias. A negative bias indicates that pumpage computed with the PCC approach tended to be smaller than pumpage using TFMs. Similar to *diffQ*, differences in pumpage that were computed using portable flowmeter method P showed an overall negative bias. There was no discernible bias in *diffP* when pumpage was computed using portable flowmeter method C.

Final results for the intercept and fixed effects estimates are listed in table 6 and are analogous to the results for the differences in instantaneous discharge data (*diffQ*) presented in table 2. The method effects were similar using all three estimation techniques, and these values were similar for *diffQ* and *diffC* models. The discharge distribution system type effects for L, O, and S types were not significantly different from zero. Evidently the large L, O, and S type effects detected in the *diffC* and *diffL* models tended to cancel when *diffP* was computed. For example, even though PCCs tended to be much larger for sprinkler (type S) distribution systems, the fact that these PCCs were applied to total electrical power-consumption values, which showed the same tendency in relation to total pumpage, made this type effect vanish. This was not the case for the CL and CH effects. The CL effect for the three estimation techniques ranged from 0.059 to 0.074, indicating that pumpage estimated by the PCC method was 6 to 7 percent greater than the pumpage measured by a TFM for complex sites using a low dynamic head PCC. The CH effect ranged from –0.060 to –0.066, indicating that pumpage estimated by the PCC method was 6 to 7 percent less than the pumpage measured by a TFM for complex sites for which the PCC was computed under high dynamic head conditions.

The best estimates (those with the lowest standard errors) of the mean of the time trend, A_p , were those using *diffP* data ($s \neq [t]$) or using the *diffC* and *diffL* data in table 7. These estimates (0.0158 and 0.0166, respectively) indicated that there was about a 1.6 or 1.7 percent increase in *diffP* for each year increase in the lag time u, and the standard errors of these numbers indicated a high degree of statistical significance. As an example of how these estimates are to be interpreted, if a PCC measurement was made in one year and this PCC value was used to estimate pumpage 2 years after the PCC measurement was made (that is, lag *u*=2 years), then *diffP* would on average tend to be about 3.2 percent more than if pumpage had been estimated in the same year the PCC measurement was made (lag *u*=0 years). The overall effect of the time trend and effects from the other variables on *diffP* are shown in figure 12. Recall that when lag year is zero, pumpage computed with the PCC approach tended to be smaller than pumpage using TFMs (figs. 11 and 12). Therefore, when *diffP* were computed using PCC measurements applied to the next year's power consumption, the median *diffP* was – 0.3 percent; and when PCC measurements were applied 2, 3, or 4 years into the future with respect to power consumption measurements, median *diffPs* were +1.8 percent for a 2-year forward lag, +4.9 percent for a 3-year forward lag, and +5.3 percent for a 4-year forward lag, indicating that pumpage computed with the PCC approach, as generally applied under the ground-water pumpage measurement rules by CDWR, tended to overestimate pumpage as compared to pumpage using TFMs when PCC measurement was applied to future years. Figure 12 shows the distribution and variability in *diffP* when a PCC measurement made in one year was applied to total power consumption for another year (lag *u* of –4 to +4 years). This figure shows a fairly linear change in the median *diffP* values for about ± 3 years. However, there was no discernible change between the third and fourth year lags. Overall, these results indicate that there was a time trend present in these data. This trend has important implications for estimation of pumpage by the PCC approach. Therefore, additional analysis was done to independently evaluate the time trend and evaluate the effect of water availability on the time trend. This independent analysis is presented in the next section.

The estimated mean of pumping water level effects, U_P, ranged from 0.0919 to 0.159, indicating that increasing the PWL conditions under which pumpage was measured relative to the PWL conditions under which the PCC was measured tended to cause an increase in *diffP*. The estimate of the mean of PWL, U_P, with the smallest standard error in table 7 was 0.0984; this value provided the best estimate of the magnitude of this effect. The standard error of the estimate 0.0984 was 0.052; so at the 5-percent level, this term was not significantly different from zero. However, the estimate of the mean of PWL, U_P, was significant at the 10-percent level. In addition, other estimates for PWL, U_P, were of comparable magnitude, indicating that the effect was real. If the mean slope was 0.0984 and if the pumping water level for the year in which pumpage was estimated was 10 percent higher than the pumping water level when the PCC measurement was made ($\overline{w} - w = 0.10$), then on average, *diffP* would be 0.00984 (0.0984 × 0.10) higher than if pumpage had been estimated under the same pumping water level conditions as the PCC value. An increase in *diffP* of 0.00984 translates into about a 1.0 percent increase in pumpage using the PCC approach relative to pumpage estimated using the TFM approach.

The total variance of *diffP* ($s \neq [t]$) was 0.0141, so the model accounted for about 100 × (0.0141 – 0.00107)/0.0141 = 92.4 percent of the total variance of *diffP*. The contribution of method to the variance was 0.000209, and the contribution of type to the variance was 0.00125. As previously stated, the method term was relatively unimportant, and the type term was much less important in explaining the variance of *diffP* than it was in explaining the variance of *diffC* and *diffL*. This is because *diffP* was calculated as the difference between *diffL* and *diffC*, so the type effect tended to cancel. This cancellation held for L, O, and S system types, but the difference between low total dynamic head and high total dynamic head PCC measurements in complex systems in fact was more evident in the *diffP* data than it was in the *diffC* or *diffL* data. The net effect was that type did not explain a high percentage of variance as it did for *diffC* and *diffL*, but type still accounted for a substantial percentage (100 × 0.00125/0.0141 = 8.9 percent) of the total variance. The same cancellation was detected in the random site effect term; the estimated site variance for *diffP* was 0.00216, which was much smaller than the site variance for either *diffC* or *diffL* and made the contribution of this variance to the total variance of *diffP* relatively smaller. A breakdown of the effects of the mean (*E*) and variance (*V*) of the time trend and PWL random coefficients in the *diffP* model was given by $V_u = 0.00215$, $E_u = 0.00119$, $V_w = 0.00309$, and $E_w = 0.00024$. The total contribution from the time trend was $V_u + E_u = 0.00334$ and the total contribution from PWL was $V_w + E_w = 0.00333$, which indicates the numbers are of comparable magnitude. Based on these computations and the results in tables 6 and 7, the type fixed effect, the time-trend term, the PWL term, the site term *S*, the site/year terms (*SY*) and (*SZ*), and the date term *D* all had variance contributions in the range of 0.001 to 0.003 compared to the total variance of 0.0141. Therefore, no single explanatory variable stood out as being more important than the rest. However, combined, the explanatory variables accounted for 92.4 percent of the total variance of *diffP*. This situation is in contrast to the *diffC* and *diffL* models, for which the two variables, type and site, dominated the other variables in explaining a large percentage of the total variance.

Year-to-Year Variability of Pumpage

Year-to-year variability in conditions affecting the relation between ground-water pumpage and electrical power consumption can have a large influence on differences between pumpage determined by the PCC approach and pumpage determined by a TFM. Results discussed in the previous section indicated that there was a time trend in *diffP* that resulted in about a 1.6 to 1.7 percent increase in *diffP* for each year increase in the lag time between PCC measurement and pumpage estimation. This section provides independent analyses of this finding. The independent analyses will involve (1) modeling year effects as fixed rather than random, (2) estimation of total time trends, and (3) modeling *diffP* with an additional explanatory variable reflecting water availability.

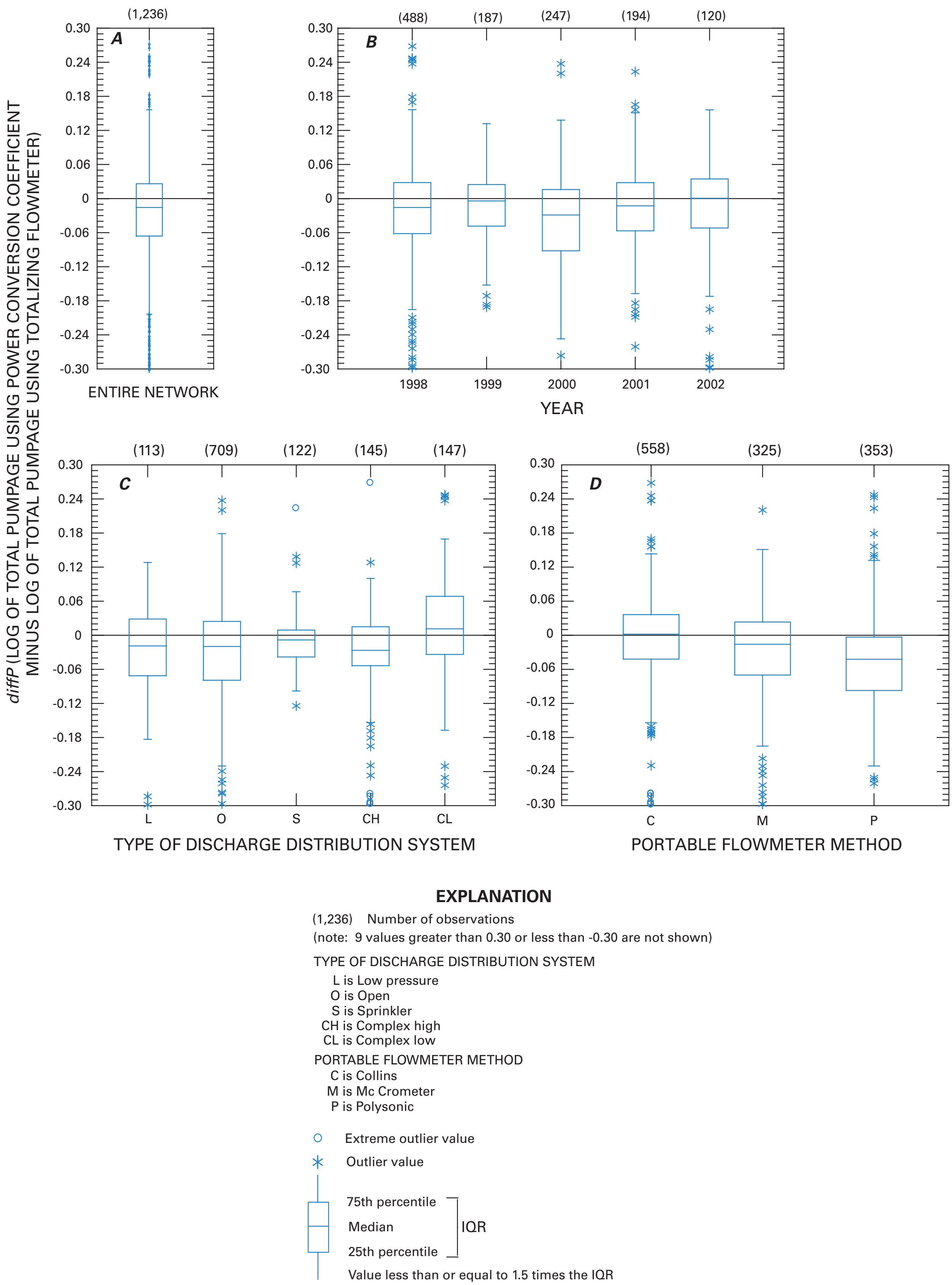


Figure 11. Variability of *diffP* when power conversion coefficient measurements and power consumption were made in the same year (*A*) for the entire network, (*B*) by year, (*C*) by type of discharge distribution system, and (*D*) by portable flowmeter method, 1998–2002.

Table 6. Estimates of parameters in the *diffP* model of differences in ground-water pumpage between the power conversion approach and totalizing flowmeters.

[C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; O, open; L, low pressure; S, sprinkler; CH, complex high; CL, complex low; *s*, year when pumpage is estimated (*s*=0 for 1998); [*t*], year when PCC measurement is made ([*t*]=0 for 1998; --, not applicable]

	diffP data, $s = [t]$		*diffP* data, $s \neq [t]$		*diffC*, *diffL* data	
	Estimate	Standard error	Estimate	Standard error	Estimate	Standard error
Intercept	–0.014	0.011	–0.006	0.010	–0.008	--
Method of portable flowmeter						
C	0.0170	0.0015	0.0153	0.0017	0.0171	0.0016
M	0.0023	0.0018	0.0040	0.0020	0.0025	0.0018
P	–0.0194	0.0017	–0.0192	0.0019	–0.0196	0.0017
Type of discharge distribution system						
L	–0.010	0.017	–0.012	0.016	0.008	--
O	–0.012	0.010	–0.009	0.010	–0.014	--
S	0.016	0.018	0.014	0.018	0.008	--
CH	–0.064	0.010	–0.066	0.010	–0.060	--
CL	0.069	0.010	0.074	0.010	0.059	--

Fixed-Year Effects

Results in the previous sections were obtained under an assumption that year effects, *Y* and *Z*, were random and that systematic changes over the period of record were modeled by a linear trend in time. In this section, the year effects, *Y* and *Z*, were made to be fixed effects, and the assumption of a linear trend was eliminated, thus allowing a more detailed evaluation of year-to-year changes.

Tables 8 and 9 provide estimates of the year effects when *Y* and *Z* are fixed effects. In the *diffQ* model, the only year effect that was significantly different from zero was 2001, and the magnitude of this effect was only 0.0085 (table 8). In the *diffC* and *diffL* models (table 8), there were similarities in the year effects for the 5 years under consideration for the two models, indicating similarities in the relation between flow and seasonal power consumption for short time scales (*diffC*) and yearly time scales (*diffL*). The largest positive year effect was for 2002, which was about 4 percent for both *diffC* and *diffL*. The largest negative year effect was for 1999, which was about –3 percent for *diffC* and about –2 percent for *diffL*. Similarly, in 1998, there was a negative year effect of about –2 percent. The year effects for *diffC* and *diffL* for 1998, 1999, and 2002 were significant when compared with their associated standard errors.

Generally, a monotonically increasing trend with time over the 5-year period existed for both models (although the 1999 effect for *diffC* was somewhat less than the 1998 effect) and the average increase per year was close to the mean slopes of 1.5 percent (0.0149) and 1.7 percent (0.0166) given in table 5 for *diffC* and *diffL*, respectively.

Estimates of Y_P (year effect for the year the PCC measurement was made) and Z_P (year effect for the year total power consumption was used to estimate pumpage) in the model for *diffP* data in table 9 were similar to each other in magnitude (with opposite sign), and the values obtained using *diffP* where $s \neq [t]$ were similar to those obtained using the *diffC* and *diffL* data. One interesting feature was that the effects Z_P were monotonically increasing from 1998 to 2002, whereas the effects Y_P exhibited an increase from 1998 to 1999 but then decreased monotonically from 1999 to 2002. The pattern for Y_P was the same as that for average PWLs, which is one indication that the factors causing temporal changes in Y_P may be related to factors causing temporal changes in PWLs.

Estimates of Y_P' (the year effect for data where the PCC measurement and pumpage estimate were made in the same year) provided in table 9 tended to be near zero; the only statistically significant value was 0.0143 for 1999, obtained in the analysis of the *diffP* data with *s*=[*t*]. (Notice in table 9 that results of the analysis of *diffP* with $s \neq [t]$ could be used to obtain estimates of Y_P' even though Y_P' did not appear explicitly in the fitted model; the standard errors, however, were considerably larger than those obtained using the *diffP* data with *s*=[*t*]). In this situation, the year effects associated with PCC measurement and pumpage estimate tended to cancel each other.

Table 7. Estimates of the mean and variance for random variables in ground-water pumpage using the *diffP* model.

[*s*, year when pumpage is estimated (*s*=0 for 1998); [*t*], year when PCC measurement is made ([*t*]=0 for 1998); A_p, time trend coefficient; U_p, pumping water level coefficient; S_p, site effect; Y_p, year effect for discharge or PCC measurement; $(SY)_p$, site/year effect; Z_p, year effect for a year total pumpage is estimated; $(SZ)_p$, site/year effect for a year in which total pumpage is estimated; Y'_p, year effect when PCC measurement and pumpage estimate are made in same year; $(SY')_p$, site/year effect when PCC measurement and pumpage estimate are made in same year; D_p, date effect; e_p, random error term; -- not applicable]

	diffP data, $s = [t]$		*diffP* data, $s \neq [t]$		*diffC*, *diffL* data	
	Estimate	Standard error	Estimate	Standard error	Estimate	Standard error
Mean						
A_P	0.001	0.057	0.0158	0.0037	0.0166	0.0053
U_P	0.159	0.083	0.0984	0.052	0.0919	0.058
Variance						
A_P	0.00315	--	0.000448	--	0.000526	--
U_P	0.287	--	0.126	--	0.112	--
S_P	0.00187	--	0.00216	--	--	--
Y_P	--	--	0.000162	--	0.000118	--
$(SY)_P$	--	--	0.000781	--	0.000770	--
Z_P	--	--	0.0000358	--	0.000153	--
$(SZ)_P$	--	--	0.00222	--	0.00139	--
Y'_P	0.0000349	--	--	--	--	--
$(SY')_P$	0.00136	--	--	--	--	--
D_P	0.00160	--	0.00159	--	0.00182	--
e_P	0.00115	--	0.00107	--	0.00116	--

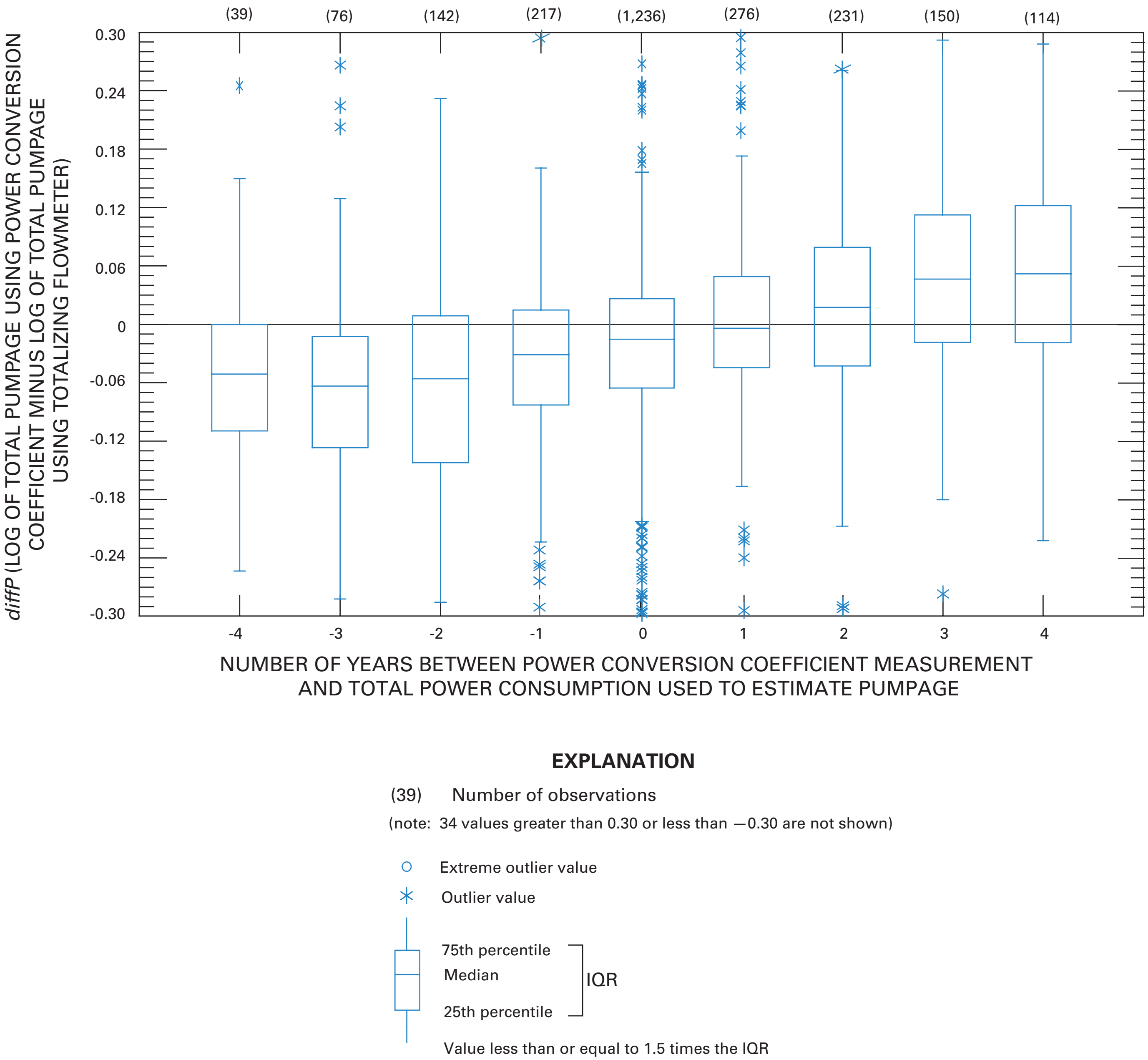


Figure 12. Variability of *diffP* for the number of years lagged between when the power conversion coefficient measurement was made and when total power consumption was used to estimate pumpage, 1998–2002.

To obtain the net year effects when PCC measurement and pumpage estimate are made in different years, the appropriate values of (for the year in which the PCC measurement was made) and Z_P (for the year in which pumpage was estimated) in table 9 must be summed. This calculation was done for all 25 possible combinations of pairs of years and plotted as a function of yearly lag $s-[t]$ in figure 13. The scatter plot has a strong linear pattern with a slope close to the 1.58 percent per year mean time-lag slope (A_P) given for *diffP* in table 7. Thus, the fixed effects analysis reflects the same upward trend as the random effects analysis. The pattern in figure 13 and the connection between the random and fixed effects analyses may be summarized by the relation $\hat{Y}_P + \hat{Z}_P \approx 0.0158u$, where the carets over the year effects on the left side of the relation indicate estimates from the fixed effects analysis and u on the right side of the relation is time lag in years.

Total Time Trend

It was mentioned in the “Methods of Statistical Analysis” section that it was necessary to consider the PWL and time-trend terms jointly in the models. That is, there may be some interaction between these terms that may have a bearing on interpreting the analyses. The results presented so far indicate that *diffC* and *diffL* tended on the average to exhibit an increase with both PWL and time. PWL tended on the average to increase with time; the increase of PWL over the period of record (1998 – 2002) was on the average 3.2 percent per year for all sites. Factors including availability of surface water for irrigation, regional ground-water conditions, and climate likely caused PWL to change over this 5-year period influencing the time trend in the models. In other words, the coefficients of the PWL term and time-trend term may be interrelated and may be, to some extent, reflecting the same underlying hydrologic conditions. On the other hand, it is possible that the time trend reflects additional factors that may be for the most part unrelated to PWL. For example, the time trend in *diffL* may be partly caused by a tendency for drift (associated with debris clogging) in the TFM at certain sites. Available data are insufficient to distinguish with certainty all the causative factors that might be affecting the observed time trend. Nevertheless, one useful analysis was to evaluate the time trend by fitting the models without the PWL term. This analysis provided an overall estimate of time trend without allowing any compensating adjustments for PWL. When this analysis was done using *diffC* data, the estimate of the mean value of the time coefficient A_C was 0.0214 (standard error 0.0055), indicating about a 2.1 percent per year increase in *diffC* as compared to the 1.5 percent per year increase in *diffC* when the PWL term was included in the model. This indicated that the presence of the PWL term accounted for some of the increase with time. Likewise, when this analysis was done for the *diffP* data ($s \neq [t]$), the estimate of the mean of A_P was 0.0217 (standard error 0.0041), indicating about a 2.2-percent increase per year, compared to 1.6 percent per year when PWL was included in the model. A fixed-year effects analysis similar to that discussed in the previous section produced the relation $\hat{Y}_P + \hat{Z}_P \approx 0.0217u$, which gives the approximate relation between fixed-year effects and trend in the random effects model when PWL was not included in the models.

Additional Explanatory Variables

It was discussed previously that the time-trend term in the models may be a surrogate for other explanatory variables for which data may not be available. It is reasonable to assume that there are underlying factors that cause any trend in time, but it is usually not known exactly what these factors may be or what variables would provide the most explanatory power in a statistical model. In this section, some additional data were used to evaluate the effect of incorporating another explanatory variable on the time trend. For many of the site-year combinations, an associated volume of ditch diversions for surface-water irrigation was known. There was one value for each combination of pumping season and ditch, and there may be more than one site associated with each ditch. The statistical model for *diffC* was fitted with this diversion (logarithmically transformed and corrected for the ditch average, exactly as the PWL was transformed and corrected in equation 5) as an additional explanatory variable. There were 1,081 *diffC* values for which data on the diversion variable were available. This analysis resulted in rendering the time-trend term insignificant and, thus, the time-trend term could be dropped from the model, leaving PWL and the diversion variable as the only quantitative explanatory variables. It is not known whether such a diversion variable is, in general, the best way to account for temporal variability of hydrologic conditions or whether other variables or combinations of variables would be more quantitative. This is left as a topic for further investigation. However, the fact that the time-trend term became insignificant in the presence of the diversion variable is additional evidence that the time trend in these data serves as a surrogate variable for other climate-related processes that caused the PWL changes through time.

Implications of Year-to-Year Variability for the PCC Approach to Pumpage Estimation

Results of the statistical analyses presented in this report reflect the changing hydrologic conditions in the Arkansas River alluvial aquifer for the period from 1998 through 2002.

Table 8. Estimates for year effect in the *diffQ*, *diffC*, and *diffL* models.

Year	*diffQ*		*diffC*		*diffL*	
	Estimate	Standard error	Estimate	Standard error	Estimate	Standard error
1998	–0.0020	0.0026	–0.0203	0.0058	–0.0234	0.0056
1999	–0.0027	0.0033	–0.0308	0.0071	–0.0175	0.0063
2000	–0.0057	0.0030	–0.0015	0.0065	–0.0094	0.0058
2001	0.0085	0.0032	0.0111	0.0070	0.0064	0.0063
2002	0.0018	0.0038	0.0416	0.0086	0.0438	0.0080

Table 9. Estimates for year effect in the *diffP* models.

[*s*, year when pumpage is estimated (*s*=0 for 1998); [*t*], year when PCC measurement is made ([*t*]=0 for 1998); Y_p, year PCC measurement is made; Z_p, year pumpage is estimated; Y'_p, year effect when PCC measurement and pumpage estimate are made in the same year; -- not applicable]

	diffP data, *s* = *[t]*		*diffP* data, *s* = *[t]*		*diffC, diffL* data	
	Estimate	Standard Error	Estimate	Standard error	Estimate	Standard error
Effect Y_p						
1998	--	--	0.0191	0.0060	0.0203	0.0058
1999	--	--	0.0318	0.0072	0.0308	0.0071
2000	--	--	-0.0003	0.0066	0.0015	0.0065
2001	--	--	–0.0061	0.0071	–0.0111	0.0070
2002	--	--	–0.0446	0.0085	–0.0416	0.0086
Effect Z_p						
1998	--	--	–0.0230	0.0074	–0.0234	0.0056
1999	--	--	–0.0206	0.0078	–0.0175	0.0063
2000	--	--	–0.0107	0.0072	–0.0094	0.0058
2001	--	--	0.0158	0.0079	0.0064	0.0063
2002	--	--	0.0386	0.0087	0.0438	0.0080
Effect Y'_p						
1998	0.0002	0.0051	–0.0039	0.0098	–0.0031	--
1999	0.0143	0.0061	0.0112	0.0103	0.0133	--
2000	–0.0095	0.0058	–0.0110	0.0098	–0.0079	--
2001	0.0003	0.0062	0.0097	0.0106	–0.0047	--
2002	–0.0053	0.0068	–0.0060	0.0111	0.0022	--

Streamflows and surface-water diversions for irrigation varied substantially during the study period and substantially decreased in 2001 and 2002. PWLs generally showed an upward trend, indicating that depth to ground water tended to increase. Statistical modeling of *diffC* (the log of PCC) and *diffL* showed similar upward trends with time and a positive dependence on PWL. The time trend for both variables was in the range of 1.5 to 1.7 percent per year for models including a PWL term, which statistically corrected for changes in PWL. However, given that PWLs also were increasing with time, the overall time trend of *diffC* and *diffL*, without correcting for PWL, was about 2.1 percent per year. The variables *diffC* and *diffL* both measure the relation of electrical power consumption to pumpage (that is, pump efficiency), but *diffC* and *diffL* corresponded to different times—*diffC* reflects the conditions under which the PCC was obtained and *diffL* reflects the conditions under which seasonal pumpage was estimated. When these two sets of conditions are different, then bias will be introduced in using the PCC method to estimate pumpage. In the relation $\hat{Y}_P + \hat{Z}_P \approx 0.0217u$, the term $\hat{Y}_P$ corresponds to the year effect for the year in which the PCC was measured, and $\hat{Z}_P$ corresponds to the year effect for the year in which pumpage was estimated, and these added together produced an overall average bias of about 2.2 percent per year of lag between the PCC measurement year and pumpage estimation year. The implication of such a trend, for example, is that for a 2-year lag, pumpage estimated by the PCC approach would be about 4.4 percent higher relative to TFM-estimated pumpage than if the lag was zero years, and for a 4-year lag pumpage estimated by the PCC approach would be about 8.8 percent higher relative to TFM-estimated pumpage. Again, recall that when lag is zero years, pumpage computed with the PCC approach tended to be smaller than pumpage using TFMs. Therefore, as shown in figure 12, the aggregate *diffP* for each forward-lag year was less than 2.2 percent per year of lag.

The model results with the surface-water diversion term indicates that much of the trend of 2.2 percent per lag year in *diffP* results from applying a PCC to estimate pumpage under hydrologic conditions different from those under which the PCC was measured. The analysis also indicates that the modeled time trend is a surrogate for changes in underlying hydrologic conditions. There is no evidence to conclude that the upward time trend determined in the data for this 5-year period would hold in the future, and it is feasible that future periods could exhibit downward trends or nonmonotonic variability. Although detailed long-term analyses have not been performed

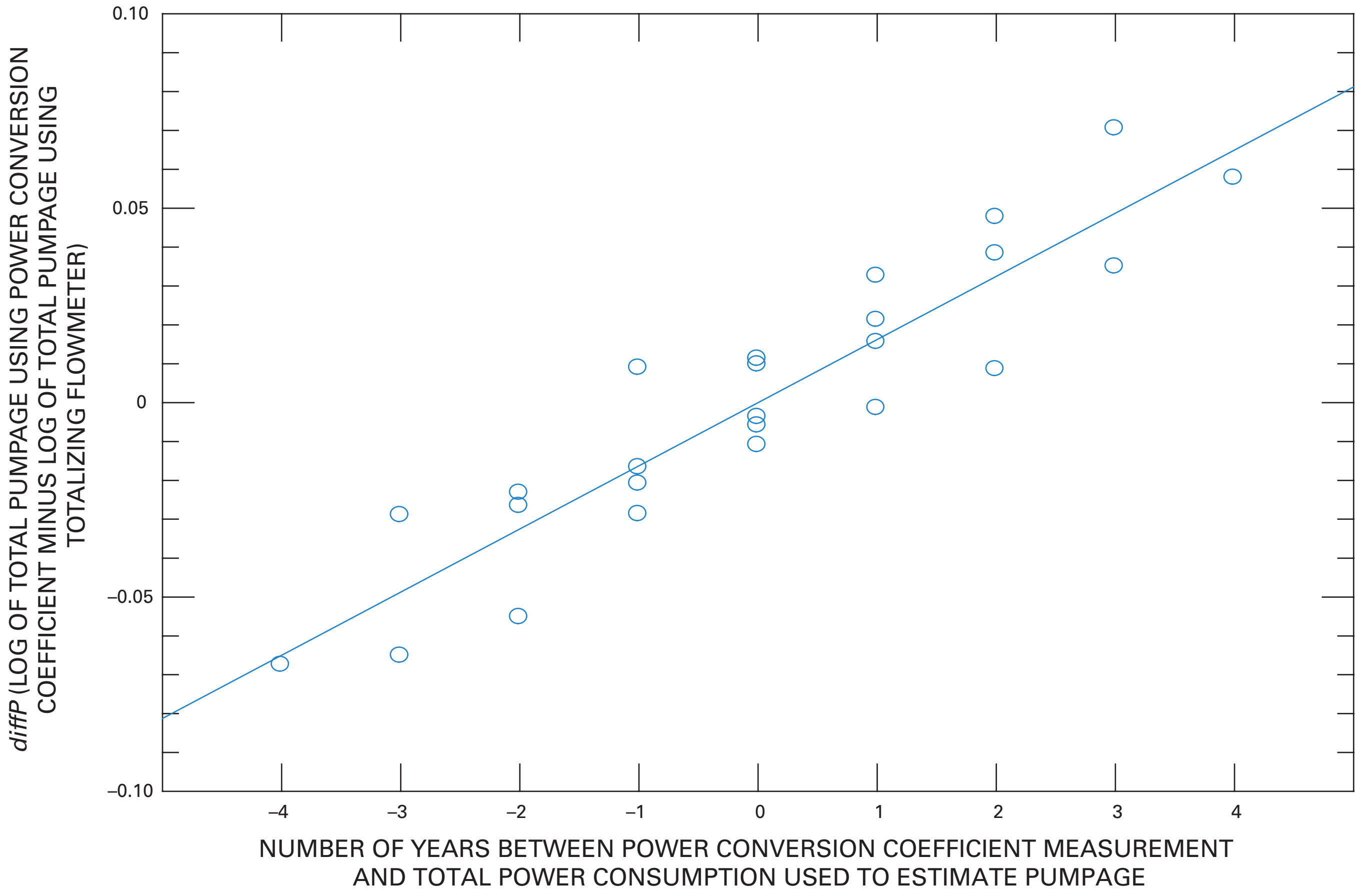


Figure 13. Average year effects on *diffP* for the number of years lagged between when the power conversion coefficient measurement was made and when total power consumption was used to estimate pumpage, 1998–2002.

for this report, other studies have shown (Steger, 2002) that static ground-water levels in the study area have exhibited small variations over multidecadal time scales with a high degree of temporal correlation, and monotonic trends that appear approximately linear over a 5-year period such as the one detected in this study are not uncommon in such slowly varying time series. Therefore, the approximately 2 percent per lag year trend determined in these data is expected to be a reasonable guideline for estimating potential errors in the PCC approach resulting from temporally varying hydrologic conditions between time of PCC measurement and pumpage estimation. Periodic PCC data are needed to determine actual future changes that may occur in *diffC*. A subset of wells in the network described in this report could be used to quantify future changes in *diffP* that may occur.

Estimation of Total Network Pumpage

The analysis presented earlier in the report, in the "Variability in Ground-Water Pumpage" section, provided estimates of *diffP*, the mean or average differences between the log-transformed PCC estimated total pumpage and TFM-measured total pumpage at a well. However, it also is important to quantify the differences in the total or aggregated pumpage for a network of wells.

Primary Results for Total Network Pumpage

Total network pumpage differences can be estimated by using techniques outlined in Dash and others (1999) and by following certain assumptions about average conditions and random sampling. The average pumpage per site per year for the network studied was 147 acre-ft, and the variance was 28,600 acre-ft squared (giving a standard deviation of 169 acre-ft). These values together with results from the analysis of the *diffP* data were used to estimate the mean and variance of differences between total network pumpage using the TFM method and the PCC method as a function of number of sites in the network and of lag between the time the PCC was measured and time total pumpage was estimated.

For small year effects, the average difference in TFM and PCC network pumpage, as a fraction of total network pumpage, is slightly greater than average individual well year effects in *diffP* independent of the number of wells in the network. The standard deviation of this difference, again relative to total network pumpage, also depends on individual well year effects and decreases as the number of wells in the network increases.

For 100 wells and a lag of 4 years between PCC measurement and pumpage estimation, the standard deviation is 2.3 percent of total network pumpage. Under assumptions of normality, there is a 95-percent probability that the total network pumpage for 100 wells estimated by the PCC approach would be between 5.2 and 14.4 percent greater than pumpage measured using a TFM. Figure 14 shows the estimated mean and expected range in differences in total pumpage for varying number of network wells and for varying lag years using the same assumptions as above. For 1,000 wells, the estimated difference in total network pumpage for a 4-year lag would be between about 8.4 and 11.3 percent greater than pumpage measured using a TFM; the estimated difference in total network pumpage for a 3-year lag would be between about 6.1 and 8.8 percent greater than pumpage measured using a TFM; and the estimated difference in total network pumpage for a 2-year lag would be between about 3.9 and 6.4 percent greater than pumpage measured using a TFM.

Details of Analysis and Results

The variable *diffP* is the difference between log annual pumpage using the PCC method and log annual pumpage using a TFM, for a single site. These results may be extended to estimate aggregated discrepancies between PCC pumpage and TFM pumpage for a number of sites by using the basic approach described in Dash and others (1999). Let D_n stand for the difference in aggregated total pumpage for *n* wells for a single year, or

$$D_n = \sum_{i=1}^{n}\tilde{V}_i - \sum_{i=1}^{n}V_i = \sum_{i=1}^{n}(\tilde{V}_i - V_i) = \sum_{i=1}^{n}V_i(e^{diffP_i} - 1) \tag{9}$$

where

$\tilde{V}_i$ is pumpage calculated by PCC, and

V_i is total pumpage measured by a TFM.

An estimate of the mean and variance of this difference can be obtained by using results of the *diffP* data analyses. As discussed in Dash and others (1999), the fact that D_n is a sum of independent (under current assumptions and others discussed below) random variables makes it reasonable to apply the central limit theory and conclude that D_n is approximately normally distributed. This assumption can be used, together with estimates of the mean and variance of D_n derived below, to make probability statements about the likely range of D_n—the difference in aggregated total pumpage for *n* wells for a single year.

The model for *diffP* ($s \neq [t]$) in equation 7 is used for all wells, with the same assumptions on site-to-site independence and normality of random terms stated before. In addition, certain other assumptions make the analysis easier, but similar derivations could be done for more general conditions. None of the wells is complex, so that the type effect of γ_P (insignificant in table 6) may be ignored. The intercept term, μ_P (also insignificant in table 6), is ignored. Portable flowmeter methods (C, M, and P) are assumed to be assigned randomly to wells with relative frequency of the different methods such that there is no net bias due to method.

It is assumed further that a PCC measurement is made for all *n* wells in the same year; the year effect (Y_P) is therefore the same for all *n* wells. Similarly, pumpage is estimated for the same year at all wells; the year effect for pumpage estimation (Z_P) is therefore the same for all *n* wells. These year effects are assumed to be fixed effects, and it is assumed that PWL is not included in modeling *diffP* so that the sum of the year effects may be approximated:

$$\hat{Y}_P + \hat{Z}_P \approx 0.0217u. \tag{10}$$

The *diffP* are taken to be independent of V_i and TFM pumpage (V_i) for *n* wells are sampled independently from a population with mean μ_V and variance σ_V^2. Using the sample mean and variance for all available sites and years (except those for which *diffL* outliers were identified) estimates for these quantities are $\hat{\mu}_V = 147$ acre-ft and $\hat{\sigma}_V^2 = 28600$ acre-ft squared. (Note: a caret is added over a parameter to denote sample estimate.)

Under these assumptions, normality of *diffP* may be used to show that the mean (that is, expectation E) of D_n is

$$\begin{aligned} ED_n &= E\sum_{i=1}^{n}V_i(e^{diffP_i} - 1) = n\mu_V E(e^{diffP} - 1) \\ &= n\mu_V(e^{E(diffP)+\frac{1}{2}Var(diffP)} - 1) \end{aligned} \tag{11}$$

and the variance is

$$\begin{aligned} Var(D_n) &= Var[\sum_{i=1}^{n}V_i(e^{diffP_i} - 1)] \\ &= nVar[V(e^{diffP} - 1)] \\ &= n[(\mu_V^2 + \sigma_V^2)e^{2E(diffP)+Var(diffP)}(e^{Var(diffP)} - 1) \\ &\quad + \sigma_V^2(e^{E(diffP)+\frac{1}{2}Var(diffP)} - 1)^2] \end{aligned} \tag{12}$$

These depend on the mean and variance of *diffP*, which are now obtained. Using equation 7 and the assumptions, the mean of *diffP* is

$$E(diffP) = Y_P + Z_P, \tag{13}$$

and the estimated mean of *diffP* is therefore

$$\hat{E}(diffP) = \hat{Y}_P + \hat{Z}_P. \tag{14}$$

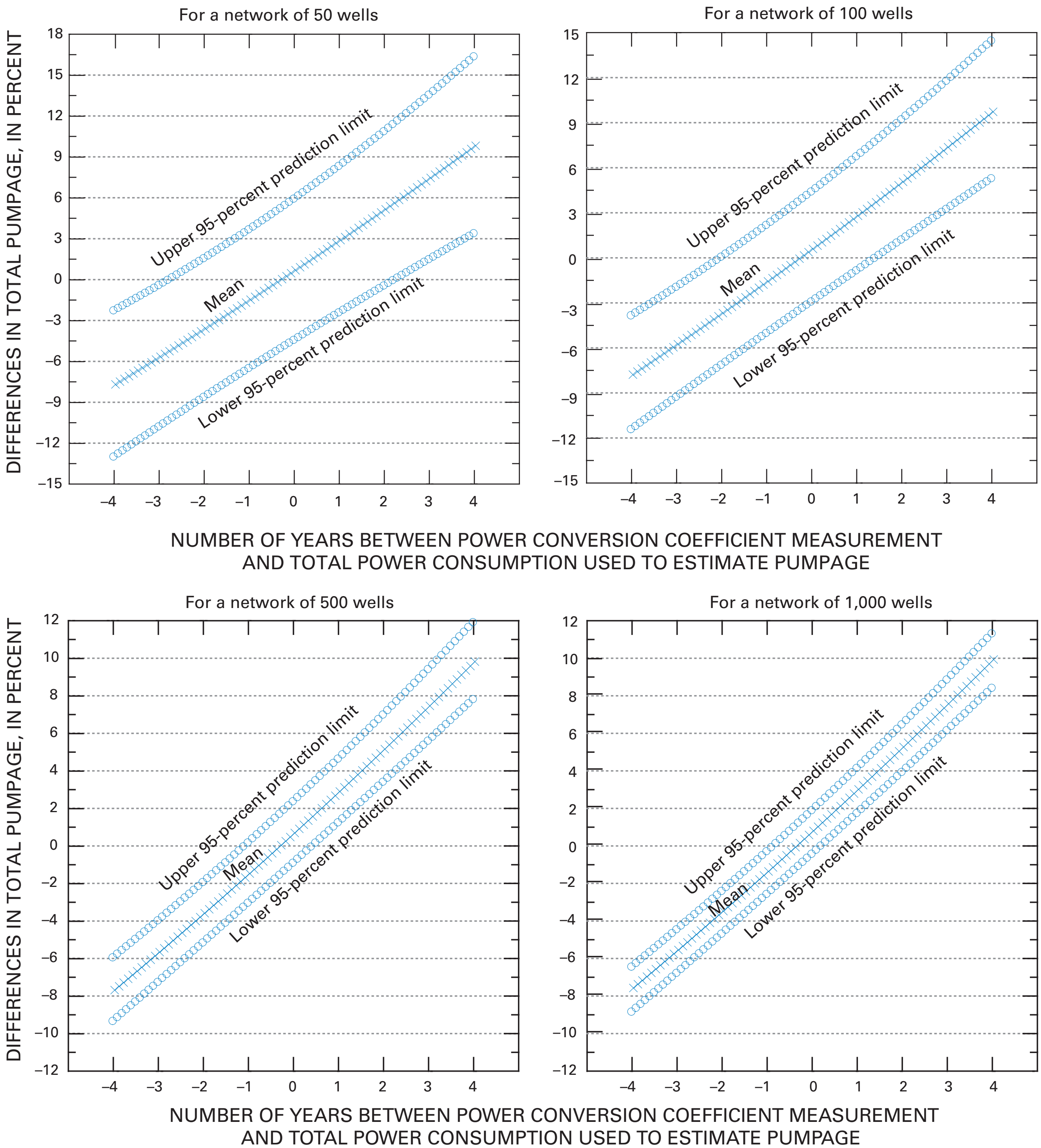


Figure 14. Estimation of differences in total pumpage for varying number of wells.

Equation 7 may be used to obtain $Var(diffP)$ in terms of the variance components and then estimates of the variance components from the data analysis substituted to obtain an estimate of $Var(diffP)$, but a more straightforward approach simply using the total variance of the *diffP* data given above is $\hat{V}ar(diffP) = 0.0141$.

Inserting these values into equations 10 and 11 yields final formulas for estimated mean and variance of D_n:

$$\hat{E}(D_n) = 147(e^{\hat{Y}_P + \hat{Z}_P + 0.0070} - 1)n \tag{15}$$

$$\hat{V}ar(D_n) = [713(e^{\hat{Y}_P + \hat{Z}_P + 0.0070})^2 + 28{,}600(e^{\hat{Y}_P + \hat{Z}_P + 0.0070} - 1)^2]n. \tag{16}$$

Also, the standard deviation is the square root of the variance, or

$$\hat{S}td(D_n) = \sqrt{[713(e^{\hat{Y}_P + \hat{Z}_P + 0.0070})^2 + 28{,}600(e^{\hat{Y}_P + \hat{Z}_P + 0.0070} - 1)^2]n.} \tag{17}$$

It is useful to look at these as a fraction of the mean network total TFM pumpage, or $E\sum_{i=1}^{n} V_i = n\mu_V$.

$$\frac{\hat{E}(D_n)}{n\hat{\mu}_V} = e^{\hat{Y}_P + \hat{Z}_P + 0.0070} - 1 \tag{18}$$

$$\frac{\hat{S}td(D_n)}{n\hat{\mu}_V} = \sqrt{0.033(e^{\hat{Y}_P + \hat{Z}_P + 0.0070})^2 + 1.32(e^{\hat{Y}_P + \hat{Z}_P + 0.0070} - 1)^2}\ \frac{1}{\sqrt{n}} \tag{19}$$

For small $\hat{Y}_P + \hat{Z}_P$, $e^{\hat{Y}_P + \hat{Z}_P + 0.0070} - 1 \approx \hat{Y}_P + \hat{Z}_P + 0.0070$.

Therefore, the mean of D_n, as a fraction of network total pumpage, is slightly greater than individual well year effects, independent of the number of wells in the network. Also, the presence of the term $1/\sqrt{n}$ in the standard deviation indicates that the standard deviation decreases as the number of wells in the network increases.

Figure 14 shows equations 18 and 19 in relation to lag *u* for several values of n, where equation 10 is used to evaluate the year effects. The mean exhibits a nearly linear dependence on lag year (*u*), but the standard deviation reflects little dependence on *u*. As an example of the calculation, letting *u*=4 lag years between PCC measurement and pumpage estimation gives $\hat{Y}_P + \hat{Z}_P = 0.0868$ and the mean from equation 18 is

$$\frac{\hat{E}(D_n)}{n\hat{\mu}_V} = 0.0983 \tag{20}$$

and the standard deviation from equation (19) is

$$\frac{\hat{S}td(D_n)}{n\hat{\mu}_V} = 0.229\frac{1}{\sqrt{n}}. \tag{21}$$

For *n*=100 wells, standard deviation is equal to 0.0229, or the standard deviation is about 2.3 percent of the total network pumpage. This is comparable in size to the estimate given in Dash and others (1999). Under normality of D_n, there is about a 95-percent probability that the fractional difference between total network pumpage obtained by the PCC method and that obtained using a TFM will be between 0.0983 – 2(0.0229) = 0.0525, or 5.25 percent, and 0.0983+2(0.0229) =0.1441, or 14.41 percent, for 100 wells with a lag of 4 years between time of PCC measurements and pumpage estimation year. The standard deviation is relatively small, and the major source of the difference is coming from the trend in the mean caused by the 4-year lag. For 1,000 wells, the estimated difference in total network pumpage for a 4-year lag would be between about 8.4 and 11.3 percent greater than pumpage measured using a TFM. The estimated difference in total network pumpage for a 3-year lag would be between about 6.1 and 8.8 percent greater than pumpage measured using a TFM. The estimated difference in total network pumpage for a 2-year lag would be between about 3.9 and 6.4 percent greater than pumpage measured using a TFM (fig. 14).

Summary and Conclusions

This report evaluates the variability in the differences between two approaches used to determine ground-water pumpage; the two approaches are power conversion coefficient (PCC) and totalizing flowmeter (TFM). The report compares measured pumpage using TFMs to computed pumpage using PCCs by developing statistical models of relations between explanatory variables, such as site, time, and pumping water level and the dependent variables based on discharge, PCC, and pumpage.

During the study period, 1998–2002, hydrologic conditions varied substantially as streamflow in the Arkansas River ranged from 928,500 acre-ft in 1999 to 205,780 acre-ft in 2002. Less streamflow affected the amount of surface-water diversions; cumulative diversions in 2001 and 2002 were substantially less than diversions in 1998, 1999, and 2000. In general, depth to ground water increased as annual surface-water diversions decreased; depth to ground water measured in 2001 and 2002 tended to be greater than during 1998–2000.

For the purposes of this report, four dependent variables—*diffQ, diffC, diffL,* and *diffP*—were developed. Variable *diffQ* was defined as the log portable flowmeter discharge minus the log TFM discharge; *diffC* was defined as the log of the power conversion coefficient (PCC); *diffL* was defined as the log of total seasonal power consumption minus log TFM pumpage for the same season; and *diffP* was defined as the log of total pumpage using PCC minus log of total pumpage using TFM. All four of these dependent variables represented differences in two logarithmically transformed variables.

Discharge measured with a TFM was compared with discharge measured by portable flowmeter using the dependent variable *diffQ*. Three types of portable flowmeter were used: a pitot tube/manometer device (method C), an ultrasonic flow meter (method P), and a propeller-type meter (method M). The overall mean of *diffQ* using all three portable flowmeter methods was –0.015, or about 1.5 percent less than TFM measurements, indicating that, on average, the portable flowmeter discharge measurement was about 2 percent less than the TFM discharge. However, the distribution of the differences varied with the selected portable flowmeter method. The median values and interquartile ranges for method C and M were smaller than for method P with the median *diffQ* value for methods C, M, and P being 0.5 percent, –0.6 percent, and –4 percent, respectively. Additionally, the aggregated *diffQ* values computed using method C indicated no overall bias; whereas, the aggregated *diffQ* values computed using method P indicated a fairly strong negative bias. A negative bias indicates that portable flowmeter method P tended to measure a smaller discharge than the TFM.

Graphs of *diffQ* categorized by portable flowmeter method exhibited no observable persistent temporal trends. Estimates of the mean and variance of the coefficients of the time-trend term and pumping water level term in the statistical model for *diffQ* indicated the time-trend coefficient had a mean slope of 0 percent per year and standard deviation of about 0.56 percent per year, indicating no tendency for *diffQ* at all sites taken together to increase or decrease. For a normal distribution, about 95 percent of the sites would have a change in *diffQ* between –1.12 and +1.12 percent per year. Extending these estimates to a 4-year period, about 95 percent of sites would have a change between –4.48 percent and +4.48 percent. The pumping water level (PWL) term accounted for only a negligible amount of the variance of *diffQ*, indicating that PWL had very little influence on differences in discharge. Overall, the quality of discharge measurements associated with TFMs did not degrade over time (1998–2002).

A comparison of the 1998–2002 PCC values was made using two different statistical models: *diffC* and *diffL*. The difference between *diffC* and *diffL* was one of time scale: *diffC* was obtained using instantaneous values of power consumption and flow, and *diffL* was obtained using seasonally integrated values of power consumption and flow. Significant differences were detected among the types of discharge distribution systems. PCCs for type S (sprinkler) discharge distribution systems tended to be larger than PCCs for the other types, and type L (low pressure) PCCs tended to be the smallest. The statistical models indicated that the difference between the high and low total dynamic head conditions for complex sites was substantially less using the *diffL* model (0.030) than the *diffC* model (0.149), indicating that the seasonal averaging of the values in *diffL* balanced out the differences between high and low total dynamic head in the complex system.

The statistical models for *diffC* and *diffL* indicated the discharge distribution system type and site variables accounted for 94.8 percent and 97.8 percent, respectively, of the total variance; with all explanatory variables, the models accounted for more than 99 percent of the total variance. In the *diffC* model, the estimate for the mean of the time-trend coefficient indicated a tendency of PCC values to increase by about 1.5 percent per year on the average. The mean of the change in *diffC* with respect to pumping water level indicated a tendency for PCCs to increase with pumping water level by about 1.3 percent for a 10-percent increase in pumping water level. In the *diffL* model, the estimated mean of the time trend indicated an increasing trend with time equal to about 1.7 percent per year on average, similar to the time trend for *diffC*. The rate of change of *diffL* was 0.92 percent for a 10-percent increase in pumping water level, also similar to that for *diffC*.

When differences in pumpage (*diffP*) were computed using PCC measurements and power consumption for the same year, the median *diffP* for the entire network was –1.5 percent; about 60 percent of all *diffP* values were between –6 and +6 percent, regardless of the year. Most years showed a slight negative bias, indicating that pumpage computed with the PCC approach tended to be smaller than pumpage using TFMs. Similar to *diffQ*, differences in pumpage that were computed using portable flowmeter method P showed an overall negative bias. There was no discernible bias in *diffP* when pumpage was computed using portable flowmeter method C. The discharge distribution system type effects for complex sites, CL and CH, indicated that (1) pumpage estimated by the PCC method was 6 to 7 percent greater than the pumpage measured by a TFM for complex sites using a low dynamic head PCC; and (2) pumpage estimated by the PCC method was 6 to 7 percent less than the pumpage measured by a TFM for complex sites for which the PCC was computed under high dynamic head conditions.

Statistical modeling was used to analyze variability in *diffP* that was associated with temporal trends and effects of changes in pumping water levels. The modeling was done first using *diffP* data for which PCC measurement and seasonal power consumption measurement were made during the same year (lag time 0) and then using *diffP* data for which these measurements were made in different years (lag time different from 0). The best statistical estimates of the mean of the time trend indicated that there was about a 1.6-percent increase in *diffP* for each year increase in the lag time. For example, if a PCC measurement was made in 1 year and this PCC value was used to estimate pumpage 2 years after the PCC measurement was made, then *diffP* would on the average tend to be 3.2 percent more than if pumpage had been estimated in the same year the PCC measurement was made. However, because at lag time 0 *diffP* indicated a negative bias, when *diffP* was computed using PCC measurements applied to the next year's power consumption, the median *diffP* was –0.3 percent; and when PCC measurements were applied 2, 3, or 4 years into the future with respect to power consumption measurements, median *diffPs* were +1.8 percent for a 2-year forward lag, +4.9 percent for a 3-year forward lag, and +5.3 percent for a 4-year forward lag, indicating that pumpage computed with the PCC approach, as generally applied under the ground-water pumpage measurement rules by CDWR, tended to overestimate pumpage as compared to pumpage using TFMs when PCC measurement was applied to future years. The analysis indicated a fairly linear change in the median *diffP* values for about ± 3 years. However, there was no discernible change between the third and fourth year lags. Overall, these results indicated that there was a time trend present in these data. This trend has important implications for estimation of pumpage by the PCC approach. Therefore, additional analysis was done to independently evaluate the time trend and evaluate the effect of water availability on the time trend.

The estimated mean of pumping water level effects indicated that increasing the depth to water under which pumpage was measured using the TFM relative to the pumping water level conditions under which the PCC was measured tended to cause an increase in *diffP*. For example, if the PCC was measured for a given depth to ground-water level and then this PCC was used to estimate pumpage in a different year when depth to ground water was 10 percent greater, then, on the average, *diffP* would be about 1.0 percent larger than if the depth to ground water had not changed.

An independent analysis of year-to-year variability was done, eliminating the assumption of a linear trend. The models indicated that the relation between flow and seasonal power consumption were similar for short time scales (*diffC*) and yearly time scales (*diffL*). The largest positive year effect was for 2002, which was about 4 percent for both *diffC* and *diffL*. The largest negative year effect was for 1999, which was about –3 percent for *diffC* and about –2 percent for *diffL*. Generally, a monotonically increasing trend with time over the 5-year period existed for both models, and the average increase per year was close to the mean slopes of 1.5 percent and 1.7 percent for *diffC* and *diffL*, respectively. The year effects obtained by analyzing the *diffP* data were similar to those indicated by the *diffC* and *diffL* data. Overall, there was about a 1.6 percent per year increase in *diffP* per year of lag between the time the PCC measurement was made and the year pumpage was estimated.

The time trend of about 1.6 percent per year in *diffP* was obtained using a statistical model that included a PWL term as one of the explanatory variables. That is, the magnitude of the time trend was based on statistically correcting for changing PWL. Because PWL also tended to increase with time over this period, an estimate of the overall time trend (uncorrected for PWL changes) was made by fitting a model without a PWL term, yielding a trend of about 2.2 percent per lag year for *diffP*. The implication of such a trend, for example, is that for a 2-year lag, pumpage estimated by the PCC approach would be about 4.4 percent higher relative to TFM-estimated pumpage than if the lag was zero years, and for a 4-year lag pumpage estimated by the PCC approach would be about 8.8 percent higher relative to TFM-estimated pumpage. However, when lag was zero years, pumpage computed with the PCC approach tended to be smaller than pumpage using TFMs. Therefore, the aggregate *diffP* for each forward-lag year was less than 2.2 percent per year of lag.

An analysis also was done in which a surface-water diversion term was included in the model, and in this analysis, the time-trend term was rendered insignificant. This result indicated that the time-trend term in the models served as a surrogate for other variables, some of which reflect underlying hydrologic conditions. A more precise explanation of the potential causes of the time trend was not obtained with the available data. However, the model results with the surface-water diversion term indicates that much of the trend of 2.2 percent per lag year in *diffP* results from applying a PCC to estimate pumpage under hydrologic conditions different from those under which the PCC was measured. There is no evidence to conclude that the upward time trend determined in the data for this 5-year period would hold in the future, and it is feasible that future periods could exhibit downward trends or nonmonotonic variability. Although detailed long-term analyses have not been performed for this report, other studies have shown that static ground-water levels in the study area have exhibited small variations over multidecadal time scales with a high degree of temporal correlation, and monotonic trends that appear approximately linear over a 5-year period such as the one detected in this study are not uncommon in such slowly varying time series. Therefore, the approximately 2 percent per lag year trend determined in these data is expected to be a reasonable guideline for estimating potential errors in the PCC approach resulting from temporally varying hydrologic conditions between time of PCC measurement and pumpage estimation. Periodic PCC data are needed to determine actual future changes that may occur in *diffC*. A subset of this network could be used to quantify future changes in *diffP* that may occur.

The differences between the PCC approach and the TFM approach in the total or aggregated pumpage for a network of wells was analyzed using certain assumptions about average conditions and random sampling. The average pumpage per site per year for the network studied was 147 acre-ft, and the variance was 28,600 acre-ft squared. These values together with results from the analysis of the *diffP* data were used to estimate the mean and variance of the difference between total network pumpage using the TFM method and the PCC method as a function of number of sites in the network and of lag between time of PCC measurement and pumpage estimation. For small year effects, the average difference in TFM and PCC network pumpage, as a fraction of total network pumpage, is slightly greater than average individual well year effects in *diffP* independent of the number of wells in the network. The standard deviation of this difference, again relative to total network pumpage, also depends on individual well year effects and decreases as the number of wells in the network increases.

For 100 wells and a lag of 4 years between PCC measurement and pumpage estimation, the standard deviation is 2.3 percent of total network pumpage. Under assumptions of normality, there is a 95-percent probability that the total network pumpage for 100 wells estimated by the PCC approach would be between 5.2 and 14.4 percent greater than pumpage measured using a TFM. For 1,000 wells, the estimated difference in total network pumpage for a 4-year lag would be between about 8.4 and 11.3 percent greater than pumpage measured using a TFM; the estimated difference in total network pumpage for a 3-year lag would be between about 6.1 and 8.8 percent greater than pumpage measured using a TFM; and the estimated difference in total network pumpage for a 2-year lag would be between about 3.9 and 6.4 percent greater than pumpage measured using a TFM.

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Supplemental Information

Supplemental Information

The section includes an explanation of evaluation of outliers, estimates of variance components for *diffQ*, and tables of supporting data used in the report.

Evaluation of Outliers

For discharge and pumpage data, outlier analysis was an essential step in the interpretation process. Graphical and statistical tools were used to characterize raw data and locate potential outliers. As a result, several of the data points were classified as outliers and were not used in the final fitting of the statistical models. These outliers may be considered as having been sampled from a different population that does not fit the same statistical models as the majority of the data and therefore need to be analyzed separately. Examination of these points was important in that outliers may reflect possible instrument malfunctions or errors in data collection, although typically it is not possible to pinpoint exactly why outliers are present or to predict beforehand when outliers might occur. It is expected that such outliers will inevitably be present in a certain small percentage of data collected in the past and in the future. It is important to factor the presence of such problems into any decision making based on the data.

The most straightforward way to quantify the presence of outliers is to assume that there are two populations – one associated with the majority of the data, and the other associated with the outliers. A small probability, say δ , is associated with the outliers, and the probability associated with the majority of the data are $1-\delta$. In other words, the data come from a mixture of two distributions, with δ determining the relative frequency of the two distributions (Barnett and Lewis, 1978).

The general procedure that was followed in evaluating outliers was first to identify individual data points as potential outliers based on known problems with the data collection, or based on examination of residuals after fitting the statistical models. Because outliers may have a large detrimental effect on parameter estimates (especially estimates of variances), the next step is to fit the models with the potential outliers excluded from the analysis, and then to examine the identified points with respect to the fitted model to evaluate if the identified outliers do indeed qualify as statistical outliers. Consider for example *diffQ*. Let d_Q stand for the difference between a value of *diffQ* that is suspected as an outlier and the predicted value based on the fitted model in equation 4. Then $z_Q = d_Q / s_Q$, where s_Q^2 is the estimate of the variance of e_Q obtained from the analysis, may be used to test the suspected outlier. This approach is described in more detail in Snedecor and Cochran (1967).

It is also useful to make a distinction between two types of outliers in these data. The first type is referred to as a “seasonal outlier” and may occur when persistent problems exist, at a given site during a given year, that result in large errors in all (or much of) the data for that site during a specific year (for example a malfunctioning electrical meter). The second type is referred to as an “instantaneous outlier” and may occur under circumstances unique to particular instantaneous measurements that result in a large error. *DiffL* may be only the first type, and *diffQ* and *diffC* may potentially be both types; *diffP* outliers will necessarily be caused by either *diffL* or *diffC* outliers.

There were no outliers in the *diffQ* data, and there were none in the *diffP* data other than those identified using *diffL* and *diffC*.

For the *diffL* data set, seasonal outliers were identified for seven site/year combinations (table 10). There were documented electrical power meter problems with site 9 (1998), and residuals examination was used to identify the other seasonal outliers. It is suspected, but not certain, that there are electrical power meter problems for site 15 (2002), site 49 (2001), site 82 (2001), and

Table 10. Outlier data that were removed in models *diffC* and *diffL*.

[z_L, outlier test statistic for *diffL* data; z_C, outlier test statistic for *diffC* data]

	z_L	z_C
Seasonal		
Site 9, 1998	–25.6	–16.2
Site 36, 2002	4.7	7.2
Site 15, 2002	–32.8	–1.2
Site 49, 2001	–31.0	–0.9
Site 82, 2001	–27.4	0.2
Site 100, 2000	–6.5	0.3
Site 22, 1998	13.8	–2.9
Instantaneous		
Site 64, April 17, 2001		17.3

site 100 (2000) and that there is a TFM problem for site 22 (1998). The extreme residuals associated with these points may easily be seen in plots obtained after fitting the model with all data included. Outliers also were identified by omitting data points one at a time, starting with the full set and refitting the model each time, with the point having the largest absolute residual being omitted at each step. In order to quantify the magnitude of the anomalous values, the *diffL* data were analyzed with these seven values omitted, and then statistics $z_L = d_L / s_L$ were computed, where d_L is observed minus model-predicted *diffL* and $s_L = 0.037$ (square root of the estimated variance of e_L, 0.00139, in table 5). Values of z_L are listed in table 10. There were 344 *diffL* data points altogether, and it may be shown that there was only a 1-percent probability that any of the 344 values sampled independently from a standard normal distribution was greater in absolute value than 4.18, so this may be used as a critical value with which to compare the magnitude of the z_L. The value 4.18 is a solution *x* of $0.01 = 1 - F^{344}(x)$, where *F* is the cumulative distribution of the absolute value of a standard normal random variable, and F^{344} is therefore the cumulative distribution of the maximum of 344 independent absolute normal random variables (see Snedecor and Cochran, 1967, section 6.13). Thus, it is indeed unlikely that these data points came from the same population as the majority of the data. Using seven outlying points from the total sample of 344 gives a probability δ associated with *diffL* seasonal outliers of 7/344=0.020, or 2.0 percent. This assumes that all site and year combinations are equally likely to be outlying data. One can see from these seven numbers that deviations of individual data points from behavior shown by the majority of the data can be quite large.

The seven site/year combinations identified as *diffL* seasonal outliers were flagged as potential seasonal outliers for the *diffC* data, corresponding to 29 *diffC* data points. It was reasoned that site/year problems in the *diffL* data might be expected to show up in *diffC* data. One additional instantaneous outlying point was identified by residuals examination of the *diffC* data for site 64, April 17, 2001. The *diffC* data were analyzed with these 30 values omitted and the results were then used to examine the omitted data points. The residuals for the first seven site/year combinations have the site/year effect ($(SY)_C$ in equation 5), date effect (D_C in equation 5), and random error (e_C in equation 5). The magnitude of a site/year effect was approximated by computing the average of the residuals for all *diffC* measurements made during that site/year. Letting this average be d_C, outlier test statistics $z_C = d_C / s_C$ may be obtained where s_C is the standard deviation associated with this average. Let n_C be the number of *diffC* residuals in this average for the given site/year and n_i be the number of measurements on date *i* for the given site/year $n_C = \Sigma n_i$. Because each residual has the three random components, the standard deviation s_C may be shown to be the square root of $0.000770 + 0.00182(\Sigma n_i^2 / n_C^2) + 0.00116 / n_C$, where the three variance component estimates are from table 5. For the instantaneous outlying point, d_C is the residual and s_C is the square root of the error variance 0.00116 in table 5. The values of z_C are listed in table 10. The critical value 4.18 may again be used for the seven seasonal outliers. The values for site 9 (1998) and site 36 (2002) are definitely rejected as outliers. Both z_L and z_C have the same sign, so this is consistent with an electrical power meter problem affecting both *diffL* and *diffC*. An estimate for the seasonal outlier probability for *diffC* data is 2/344=0.006, or less than 1 percent. The 1-percent critical value for the single instantaneous outlier is 4.47 (based on 1,275 values), so this data point is definitely rejected as an outlier. An estimate for the instantaneous outlier probability δ for *diffC* data is 1/1275=0.0008, or less than 0.1 percent.

Because some of the site/years identified as seasonal outliers using the *diffL* data turned out not to be outliers using the *diffC* data, one option would be to re-analyze the *diffC* data including these data values. This was done, with virtually no change in the *diffC* results shown in tables 4 and 5. However, the final analysis was done with data for the seven site/years in table 10 excluded so the related variables *diffL*, *diffC*, and *diffP* are analyzed with exactly the same set of data.

Estimates of Variance Components for Differences in Discharge

Estimates of the fixed effects for the *diffQ* model are given in table 2, and estimates of the mean and variance of the random terms (site, year, site/year interaction, date, and random error terms) for the *diffQ* model are listed in table 3. The relative importance of the different terms in the *diffQ* model can be obtained from the numbers in tables 2 and 3. The total variance of *diffQ* is 0.00323, so the model accounted for about 100 × (0.00323 – 0.000820)/0.00323 = 74.6 percent of the total variance of *diffQ*. The contribution of method differences to the variance of *diffQ* was estimated by the sample variance of the estimated method effects in table 2 with weighting based on the sample size in each of the three levels (Graybill, 1976, chapter 13); this variance is 0.000232, which is about 100 × 0.000232/0.00323 = 7.2 percent of the total variance. The most important term in the model is the site term, *S*, which has a variance that is 100 × 0.00147/0.00323 = 45.5 percent of the total variance. The magnitude of the influence of the quantitative explanatory variables, both of which have random slopes with an estimated mean and variance given by the data analysis, on *diffQ* can be estimated as follows. Note first that the magnitude of the variances of A_Q and U_Q in table 3 cannot be compared directly to total variance of *diffQ* because A_Q enters the model only through the product $A_Q t$ and U_Q enters only through the product $U_Q(w - \overline{\overline{w}})$. The other variances in table 3 on the other hand can be compared directly to total variance of *diffQ*. A technique to decompose the contribution of A_Q to the variance of *diffQ* into two parts, to be called E_t, which is due to the mean of A_Q, and V_t, which is due to the variance of A_Q, is described below. A similar decomposition is performed for U_Q, and the two components are called E_w and V_w. Note that to give a precise estimate of the combined contribution of the three random terms S_Q, A_Q, and U_Q to the total variance would require taking into consideration the correlation among them, and this is not done here; instead, only the individual influence of the terms is considered.

First-order analysis of the product $A_Q t$ can be used to show that the variance associated with this product can be approximated by the sum $V_t + E_t$ where $V_t = a_t \hat{V}ar(A_Q)$, $E_t = b_t(\hat{E}A_Q)^2$, a_t is the sample average of t^2 in the data set, b_t is the sample variance of *t* in the data set, $\hat{V}ar(A_Q)$ is the estimated variance of A_Q (0.0000313 in table 3), and $\hat{E}A_Q$ is the estimated mean of A_Q (0.0009 in table 3). The component V_t is a measure of the effect of the variance of the random slope, and the component E_t is a measure of the effect of the mean of the random slope. For this data set, $a_t = 5.61$ and $b_t = 1.90$, giving $V_t = 0.000176$ and $E_t = 0.000002$. The sum of the last two numbers can be compared to the total variance 0.00323, indicating that the time-trend term is accounting for only about 100x0.000178/0.00323= 5.5 percent of the total variance. The same technique is used to assess the influence of the PWL term. Using a subscript *w* rather than *t* for the PWL term, $a_w = 0.00914$, $b_w = 0.00914$, $V_w = 0.000036$, and $E_w = 0.000003$ indicating that PWL variability has a minor influence on *diffQ*.

The random error variance (0.000820 in table 3) measures the amount of variability among different portable flowmeter measurements applied on the same day at the same site. The error variance can be used to determine the range in expected differences between (logarithmically transformed) instantaneous discharges measured using two different portable flowmeters. The estimated variance of the difference will be 2×0.000820 (or 0.0016) because the variance of the difference between two independent random variables is the sum of their variances. This translates into a standard deviation of about 0.0405, or 4.05 percent.

Table 11. Data used in the *diffQ* model.

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
1	1998	35950	C	0.42192	-0.02363	0.01934
1	1998	35950	P	0.42192	-0.02363	-0.02507
1	1998	35989	C	0.52877	-0.01599	0.03602
1	1998	35989	M	0.52877	-0.01599	-0.01116
1	1998	35989	P	0.52877	-0.01599	-0.02387
1	1998	36026	C	0.63014	-0.06564	0.00586
1	1998	36026	M	0.63014	-0.06564	-0.00210
1	1998	36026	P	0.63014	-0.06564	-0.03875
1	1999	36343	C	1.49863	-0.09143	0.05279
1	1999	36343	P	1.49863	-0.09143	0.02802
1	1999	36369	C	1.56986	-0.18524	0.04145
1	1999	36369	P	1.56986	-0.18524	0.02955
1	1999	36397	C	1.64658	-0.22624	0.04442
1	1999	36397	P	1.64658	-0.22624	0.03929
1	2000	36650	C	2.33973	0.01132	0.04530
1	2000	36650	P	2.33973	0.01132	0.01753
1	2000	36727	C	2.55068	-0.02992	0.05820
1	2000	36727	P	2.55068	-0.02992	0.01899
1	2000	36752	C	2.61918	-0.06564	0.05282
1	2000	36752	P	2.61918	-0.06564	0.02291
1	2001	36990	C	3.27123	0.18406	0.03231
1	2001	36990	P	3.27123	0.18406	0.02690
1	2001	37084	C	3.52877	0.01468	0.05893
1	2001	37084	P	3.52877	0.01468	0.03846
1	2001	37111	C	3.60274	0.05255	0.05265
1	2001	37111	P	3.60274	0.05255	0.03376
1	2002	37351	C	4.26027	0.20369	0.02965
1	2002	37351	P	4.26027	0.20369	0.00822
1	2002	37449	C	4.52877	0.14653	0.03604
1	2002	37449	P	4.52877	0.14653	0.00993
1	2002	37476	C	4.60274	0.13172	0.04271
1	2002	37476	P	4.60274	0.13172	0.00870
2	1998	35936	C	0.38356	0.01061	-0.00468
2	1998	35936	P	0.38356	0.01061	-0.00485
2	1998	36048	C	0.69041	0.04031	0.00797
2	1998	36048	P	0.69041	0.04031	-0.01776
2	1998	36052	C	0.70137	0.03215	-0.00357
2	1998	36052	P	0.70137	0.03215	-0.03099
2	1999	36342	C	1.49589	-0.10843	0.00138
2	1999	36342	P	1.49589	-0.10843	-0.00642
2	1999	36348	C	1.51233	-0.02694	0.00130
2	1999	36348	P	1.51233	-0.02694	-0.02727
2	2000	36692	C	2.45479	-0.03567	0.02138
2	2000	36692	P	2.45479	-0.03567	0.08564
2	2001	37062	C	3.46849	-0.07139	0.00666
2	2001	37062	P	3.46849	-0.07139	0.03338
2	2001	37082	C	3.52329	0.00725	0.01402

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
2	2001	37082	P	3.52329	0.00725	0.01799
2	2001	37123	C	3.63562	0.05644	0.00562
2	2001	37123	P	3.63562	0.05644	0.02413
2	2002	37337	C	4.22192	0.09566	0.00714
2	2002	37337	P	4.22192	0.09566	-0.07583
3	1998	35975	C	0.49041	-0.02272	0.01036
3	1998	35975	P	0.49041	-0.02272	0.01550
3	1998	36000	C	0.55890	-0.02133	0.02743
3	1998	36000	P	0.55890	-0.02133	-0.06190
3	1998	36053	C	0.70411	-0.15208	0.02254
3	1998	36053	P	0.70411	-0.15208	-0.02506
3	1999	36348	C	1.51233	-0.06984	0.01097
3	1999	36348	P	1.51233	-0.06984	-0.11002
3	1999	36367	C	1.56438	-0.11776	0.01011
3	1999	36367	P	1.56438	-0.11776	0.04894
3	1999	36395	C	1.64110	-0.09952	0.01203
3	1999	36395	P	1.64110	-0.09952	-0.08985
3	2000	36699	C	2.47397	0.03552	0.02868
3	2000	36720	C	2.53151	0.04599	0.02449
3	2000	36720	P	2.53151	0.04599	-0.00084
3	2000	36739	C	2.58356	0.03552	0.02186
3	2000	36739	P	2.58356	0.03552	-0.19043
3	2001	36986	C	3.26027	0.12121	0.04552
3	2001	36986	P	3.26027	0.12121	0.07136
3	2001	37069	C	3.48767	0.03552	0.08820
3	2001	37069	P	3.48767	0.03552	-0.10389
3	2001	37104	C	3.58356	0.01424	0.02648
3	2001	37104	P	3.58356	0.01424	-0.09542
3	2002	37328	C	4.19726	0.08180	0.02323
3	2002	37448	C	4.52603	0.11150	-0.00101
3	2002	37448	P	4.52603	0.11150	-0.05358
3	2002	37449	C	4.52877	0.12121	0.01610
5	1998	35934	C	0.37808	0.09478	0.06468
5	1998	35934	P	0.37808	0.09478	-0.20988
5	1998	35975	C	0.49041	0.12019	-0.00082
5	1998	35975	P	0.49041	0.12019	-0.07302
5	1998	36061	C	0.72603	-0.25540	0.07309
5	1998	36061	P	0.72603	-0.25540	0.01361
5	1999	36333	C	1.47123	-0.05848	-0.04008
5	1999	36333	P	1.47123	-0.05848	-0.10694
5	2001	37057	C	3.45479	-0.26612	0.03848
5	2001	37057	P	3.45479	-0.26612	-0.06132
5	2002	37385	C	4.35342	0.16467	0.00186
5	2002	37424	C	4.46027	0.18936	-0.03032
5	2002	37461	C	4.56164	0.21346	0.00087
7	1998	35937	M	0.38630	0.04206	-0.09059
7	1998	35937	P	0.38630	0.04206	-0.07725
7	1998	35999	M	0.55616	0.03677	-0.07944
7	1998	35999	P	0.55616	0.03677	-0.11470

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
7	1998	36028	M	0.63562	-0.03954	-0.08709
7	1998	36028	P	0.63562	-0.03954	-0.07879
7	1999	36406	M	1.67123	-0.13419	-0.09071
7	1999	36406	P	1.67123	-0.13419	-0.10190
7	2000	36672	P	2.40000	-0.00066	-0.10101
7	2002	37573	M	4.86849	0.19045	-0.12928
8	1998	35905	P	0.29863	0.07138	0.00671
8	1998	35975	C	0.49041	-0.00070	0.00311
8	1998	35975	P	0.49041	-0.00070	-0.04310
8	1998	36031	C	0.64384	-0.08278	0.07070
8	1998	36031	P	0.64384	-0.08278	0.03285
8	1999	36299	C	1.37808	-0.05916	0.01080
8	1999	36299	P	1.37808	-0.05916	-0.05740
8	2000	36713	C	2.51233	-0.03969	-0.01823
8	2000	36713	P	2.51233	-0.03969	-0.08643
8	2002	37379	C	4.33699	0.14664	-0.00024
8	2002	37379	P	4.33699	0.14664	-0.12247
9	1998	35936	M	0.38356	0.01022	-0.05321
9	1998	35936	P	0.38356	0.01022	-0.05314
9	1998	35978	M	0.49863	0.00406	-0.05118
9	1998	35978	P	0.49863	0.00406	0.02191
9	1998	36027	M	0.63288	-0.05751	-0.06166
9	1998	36027	P	0.63288	-0.05751	-0.07166
9	1999	36340	M	1.49041	0.00612	-0.05117
9	1999	36340	P	1.49041	0.00612	-0.07660
9	1999	36370	M	1.57260	-0.00076	-0.04897
9	1999	36370	P	1.57260	-0.00076	-0.06578
9	2000	36630	M	2.28493	-0.10996	-0.04696
9	2000	36734	M	2.56986	-0.00421	-0.03486
9	2000	36790	M	2.72329	0.01972	-0.04127
9	2001	37063	M	3.47123	0.08510	-0.06398
9	2001	37063	P	3.47123	0.08510	-0.12974
11	1998	35947	M	0.41370	0.00193	-0.00101
11	1998	35947	P	0.41370	0.00193	0.00432
11	1998	35998	M	0.55342	0.05854	-0.00635
11	1998	35998	P	0.55342	0.05854	-0.01652
11	1998	36020	M	0.61370	-0.01905	-0.00946
11	1998	36020	P	0.61370	-0.01905	-0.04853
11	1999	36355	M	1.53151	-0.03748	-0.02636
11	2000	36698	M	2.47123	-0.07850	-0.14192
11	2000	36698	P	2.47123	-0.07850	-0.08579
11	2001	36993	M	3.27945	0.05581	-0.01380
11	2001	36993	P	3.27945	0.05581	-0.02475
12	1998	35935	M	0.38082	0.02188	0.02278
12	1998	35935	P	0.38082	0.02188	0.00170
12	1998	35982	M	0.50959	0.02847	0.02342
12	1998	35982	P	0.50959	0.02847	0.04949
12	1998	36014	M	0.59726	0.01809	0.01705
12	1998	36061	M	0.72603	-0.03952	-0.02740

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
12	1999	36362	M	1.55068	-0.05828	0.02120
12	1999	36362	P	1.55068	-0.05828	-0.01342
12	2000	36630	M	2.28493	-0.05982	0.02707
12	2000	36630	P	2.28493	-0.05982	-0.01414
12	2001	37025	M	3.36712	0.05167	-0.00941
12	2001	37082	M	3.52329	0.10526	-0.01083
14	1998	35944	C	0.40548	-0.02562	-0.01679
14	1998	35944	P	0.40548	-0.02562	-0.02571
14	1998	35975	C	0.49041	-0.01164	-0.03126
14	1998	35975	P	0.49041	-0.01164	-0.02614
14	1998	36055	C	0.70959	0.00387	-0.03381
14	1998	36055	P	0.70959	0.00387	-0.02916
14	1999	36348	C	1.51233	-0.05420	-0.03629
14	1999	36348	P	1.51233	-0.05420	-0.04256
14	1999	36406	C	1.67123	-0.03981	-0.03386
14	1999	36406	P	1.67123	-0.03981	-0.03902
14	1999	36447	C	1.78356	0.00215	-0.04080
14	1999	36447	P	1.78356	0.00215	-0.06135
14	2000	36648	C	2.33425	0.05029	-0.03414
14	2000	36648	P	2.33425	0.05029	-0.09193
14	2000	36733	C	2.56712	0.03583	-0.04242
14	2000	36733	P	2.56712	0.03583	-0.07787
14	2000	36768	C	2.66301	0.03913	-0.03164
14	2000	36768	P	2.66301	0.03913	-0.07458
15	1998	35948	M	0.41644	0.04543	0.07357
15	1998	35948	P	0.41644	0.04543	0.06806
15	1998	35968	C	0.47123	0.05384	0.06550
15	1998	35968	M	0.47123	0.05384	0.06146
15	1998	36006	C	0.57534	0.01803	0.05565
15	1998	36006	M	0.57534	0.01803	0.05250
15	1999	36335	C	1.47671	-0.09429	0.04673
15	1999	36335	M	1.47671	-0.09429	0.04558
15	1999	36335	P	1.47671	-0.09429	0.01732
15	1999	36384	C	1.61096	-0.00302	0.06769
15	1999	36384	M	1.61096	-0.00302	0.05827
15	1999	36432	C	1.74247	-0.10366	0.06928
15	1999	36432	M	1.74247	-0.10366	0.06446
15	1999	36432	P	1.74247	-0.10366	0.05580
15	2000	36636	C	2.30137	-0.02127	0.05612
15	2000	36636	M	2.30137	-0.02127	0.03784
15	2000	36636	P	2.30137	-0.02127	0.02731
15	2000	36706	C	2.49315	-0.06143	0.05683
15	2000	36706	M	2.49315	-0.06143	0.01907
15	2000	36749	C	2.61096	0.02495	0.04760
15	2000	36749	M	2.61096	0.02495	0.04361
15	2001	37007	C	3.31781	-0.02091	0.03560
15	2001	37007	M	3.31781	-0.02091	0.02126
15	2001	37069	C	3.48767	0.01803	0.06180
15	2001	37069	M	3.48767	0.01803	0.04119

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
15	2001	37118	C	3.62192	0.10128	0.05801
15	2001	37118	M	3.62192	0.10128	0.06214
15	2002	37375	C	4.32603	0.02495	0.09989
15	2002	37375	M	4.32603	0.02495	0.04088
15	2002	37420	C	4.44932	0.05886	0.13564
15	2002	37420	M	4.44932	0.05886	0.06414
15	2002	37503	C	4.67671	0.06881	0.10873
15	2002	37503	M	4.67671	0.06881	0.03707
16	1998	35936	C	0.38356	-0.02336	-0.06646
16	1998	35936	P	0.38356	-0.02336	-0.06412
16	1998	35942	C	0.40000	0.02879	-0.04770
16	1998	35942	P	0.40000	0.02879	-0.05972
16	1998	35982	C	0.50959	-0.10787	-0.01882
16	1998	35982	P	0.50959	-0.10787	-0.03097
16	1998	36017	C	0.60548	-0.06899	-0.02716
16	1998	36017	P	0.60548	-0.06899	-0.05688
16	1998	36056	C	0.71233	-0.03872	-0.02710
16	1998	36056	P	0.71233	-0.03872	-0.03136
16	1999	36321	C	1.43836	-0.02336	-0.06603
16	1999	36321	P	1.43836	-0.02336	-0.07536
16	1999	36357	C	1.53699	-0.12501	-0.02658
16	1999	36357	P	1.53699	-0.12501	-0.03803
16	2001	37097	C	3.56438	0.10878	-0.00300
16	2001	37097	P	3.56438	0.10878	-0.03428
16	2001	37158	C	3.73151	0.11850	-0.02897
16	2001	37158	P	3.73151	0.11850	-0.07444
16	2002	37390	C	4.36712	0.26246	-0.01683
18	1998	35947	P	0.41370	-0.06630	0.07161
18	1998	35986	C	0.52055	-0.06749	-0.00195
18	1998	35986	P	0.52055	-0.06749	-0.02040
18	1998	36020	C	0.61370	-0.11308	-0.01442
18	1998	36020	P	0.61370	-0.11308	-0.03467
18	1999	36314	C	1.41918	-0.08186	-0.03625
18	1999	36314	P	1.41918	-0.08186	-0.06793
18	2000	36665	C	2.38082	-0.02845	-0.03357
18	2000	36665	P	2.38082	-0.02845	-0.10261
18	2000	36713	C	2.51233	-0.02960	-0.03296
18	2000	36713	P	2.51233	-0.02960	-0.10371
18	2000	36791	C	2.72603	-0.02276	-0.03687
18	2000	36791	P	2.72603	-0.02276	-0.15524
18	2002	37375	C	4.32603	0.14909	0.09265
18	2002	37375	P	4.32603	0.14909	0.04772
18	2002	37522	C	4.72877	0.22729	0.00093
18	2002	37522	P	4.72877	0.22729	-0.02494
19	1998	35964	C	0.46027	-0.08529	0.00266
19	1998	35964	P	0.46027	-0.08529	-0.05366
19	1998	35999	C	0.55616	0.03457	0.00535
19	1998	36038	C	0.66301	-0.03516	-0.02069
19	1998	36038	P	0.66301	-0.03516	-0.09285

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
19	1999	36334	C	1.47397	-0.09232	-0.05101
19	1999	36334	P	1.47397	-0.09232	-0.05838
19	2000	36643	C	2.32055	0.07020	-0.03953
19	2000	36643	P	2.32055	0.07020	-0.09905
19	2000	36732	C	2.56438	0.07020	-0.07510
19	2000	36732	P	2.56438	0.07020	-0.14572
19	2001	36997	C	3.29041	0.05509	-0.05089
19	2001	36997	P	3.29041	0.05509	-0.09184
20	1998	35920	M	0.33973	-0.04169	-0.12228
20	1998	35920	P	0.33973	-0.04169	-0.10384
20	1998	36020	M	0.61370	-0.01976	-0.10014
20	1998	36053	M	0.70411	-0.04710	-0.12053
20	1998	36053	P	0.70411	-0.04710	-0.11368
20	1999	36426	M	1.72603	-0.10411	-0.07256
20	1999	36426	P	1.72603	-0.10411	-0.08408
20	2000	36756	M	2.63014	-0.00695	-0.07738
20	2000	36756	P	2.63014	-0.00695	-0.09279
20	2001	37027	M	3.37260	0.08794	-0.08959
20	2001	37027	P	3.37260	0.08794	-0.08317
20	2002	37511	M	4.69863	0.24359	-0.09342
22	1998	35998	C	0.55342	0.05886	0.04462
22	1998	35998	P	0.55342	0.05886	0.01311
22	1998	36018	C	0.60822	-0.00238	0.02450
22	1998	36018	P	0.60822	-0.00238	0.00936
22	1998	36041	C	0.67123	-0.03447	0.01637
22	1998	36041	P	0.67123	-0.03447	0.00219
22	1999	36361	C	1.54795	-0.03992	-0.02501
22	1999	36361	P	1.54795	-0.03992	-0.00935
22	1999	36406	C	1.67123	0.09770	0.01557
22	1999	36406	P	1.67123	0.09770	0.06448
22	2000	36664	P	2.37808	0.04891	0.04223
22	2000	36754	P	2.62466	0.10953	-0.09862
22	2001	37008	C	3.32055	-0.13141	0.02732
22	2001	37084	C	3.52877	-0.11951	-0.04304
22	2001	37159	C	3.73425	-0.11361	-0.01191
22	2002	37396	C	4.38356	0.04891	0.03078
22	2002	37524	C	4.73425	-0.00238	0.03414
23	1998	35941	C	0.39726	-0.05709	-0.14666
23	1998	35972	C	0.48219	0.07142	-0.13167
23	1998	36013	C	0.59452	0.07576	-0.13956
23	1998	36013	P	0.59452	0.07576	-0.22362
23	1998	36056	C	0.71233	-0.01053	-0.10980
23	1999	36426	C	1.72603	0.01907	-0.11742
23	1999	36426	P	1.72603	0.01907	-0.16364
23	1999	36447	C	1.78356	-0.00284	-0.11643
23	1999	36447	P	1.78356	-0.00284	-0.14737
23	2000	36651	C	2.34247	-0.02785	-0.07267
23	2000	36651	P	2.34247	-0.02785	-0.21993
23	2000	36713	C	2.51233	0.00649	-0.08123

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
23	2000	36746	C	2.60274	0.02032	-0.08961
23	2001	37008	C	3.32055	-0.06794	-0.01097
23	2002	37476	C	4.60274	-0.09093	-0.00068
24	1998	35913	C	0.32055	-0.02585	-0.13061
24	1998	35913	P	0.32055	-0.02585	-0.18387
24	1998	35991	C	0.53425	-0.02816	-0.14892
24	1998	35991	P	0.53425	-0.02816	-0.23153
24	1998	36040	C	0.66849	-0.07419	-0.12194
24	1998	36040	P	0.66849	-0.07419	-0.22058
24	1999	36369	C	1.56986	-0.03590	-0.11661
24	1999	36369	P	1.56986	-0.03590	-0.22949
24	2001	37082	C	3.52329	0.05327	-0.13584
24	2001	37082	P	3.52329	0.05327	-0.19656
24	2002	37449	C	4.52877	0.11082	-0.15058
24	2002	37449	P	4.52877	0.11082	-0.21985
25	1998	35927	C	0.35890	0.07035	-0.10018
25	1998	35978	C	0.49863	0.01317	-0.13193
25	1998	35978	M	0.49863	0.01317	-0.16817
25	1998	35978	P	0.49863	0.01317	-0.16398
25	1998	36017	C	0.60548	-0.06006	-0.13248
25	1998	36017	M	0.60548	-0.06006	-0.18928
25	1998	36017	P	0.60548	-0.06006	-0.16821
25	1999	36381	C	1.60274	-0.07009	-0.08733
25	1999	36381	P	1.60274	-0.07009	-0.15941
25	2000	36678	C	2.41644	0.04338	-0.02740
25	2000	36678	M	2.41644	0.04338	-0.22439
25	2000	36678	P	2.41644	0.04338	-0.12581
25	2000	36713	C	2.51233	0.02944	-0.00967
25	2000	36713	M	2.51233	0.02944	-0.28542
25	2000	36713	P	2.51233	0.02944	-0.14794
25	2000	36734	C	2.56986	-0.00265	-0.07796
25	2000	36734	M	2.56986	-0.00265	-0.16153
25	2000	36734	P	2.56986	-0.00265	-0.13875
27	1998	36055	P	0.70959	-0.15313	-0.03292
27	1999	36335	P	1.47671	-0.01271	-0.03045
27	2000	36650	P	2.33973	0.03482	-0.06278
27	2001	37005	P	3.31233	0.16053	-0.04069
27	2001	37104	P	3.58356	-0.02951	0.02565
28	1998	35963	C	0.45753	-0.06754	-0.03858
28	1998	35963	M	0.45753	-0.06754	-0.05562
28	1998	36003	C	0.56712	-0.05385	-0.03084
28	1998	36003	M	0.56712	-0.05385	-0.03398
28	1998	36038	C	0.66301	-0.04258	-0.04263
28	1998	36038	M	0.66301	-0.04258	-0.03314
28	2000	36658	C	2.36164	0.01913	-0.01633
28	2000	36658	M	2.36164	0.01913	0.00819
28	2000	36732	C	2.56438	0.00555	-0.01041
28	2000	36732	M	2.56438	0.00555	0.01782
28	2000	36763	C	2.64932	0.06162	-0.01872

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
28	2000	36763	M	2.64932	0.06162	0.02766
28	2001	37047	C	3.42740	-0.00475	-0.01682
28	2001	37047	M	3.42740	-0.00475	0.02812
28	2001	37089	C	3.54247	0.02375	-0.00708
28	2001	37089	M	3.54247	0.02375	0.00381
28	2001	37141	C	3.68493	0.02668	-0.05914
28	2002	37375	C	4.32603	0.04533	-0.03651
28	2002	37375	M	4.32603	0.04533	0.00187
29	1998	35912	M	0.31781	-0.16760	0.01659
29	1998	35912	P	0.31781	-0.16760	-0.00628
29	1998	35990	M	0.53151	-0.10960	0.00840
29	1998	35990	P	0.53151	-0.10960	-0.01645
29	1998	35990	P	0.53151	-0.10960	-0.01036
29	1998	36047	M	0.68767	0.14723	0.00185
29	1998	36047	P	0.68767	0.14723	-0.04117
29	1999	36356	M	1.53425	-0.01479	0.00830
29	1999	36356	P	1.53425	-0.01479	-0.02872
29	1999	36356	P	1.53425	0.00314	-0.02267
29	2000	36755	M	2.62740	0.01881	0.00204
29	2000	36755	P	2.62740	0.01881	-0.05648
29	2002	37326	M	4.19178	0.35833	-0.03470
30	1998	35913	C	0.32055	0.09673	0.10103
30	1998	35913	M	0.32055	0.09673	0.06720
30	1998	35971	C	0.47945	-0.09114	0.07128
30	1998	35971	M	0.47945	-0.09114	0.07045
30	1998	36041	C	0.67123	0.12030	0.09239
30	1998	36041	M	0.67123	0.12030	0.08484
30	1999	36425	C	1.72329	-0.13057	0.07907
30	1999	36425	M	1.72329	-0.13057	0.09113
30	2000	36699	C	2.47397	-0.15723	0.06510
30	2000	36699	M	2.47397	-0.15723	0.07562
30	2001	37112	C	3.60548	0.13200	0.14082
30	2001	37112	M	3.60548	0.13200	0.14407
30	2002	37379	C	4.33699	0.11322	0.12649
30	2002	37379	M	4.33699	0.11322	0.12782
30	2002	37531	M	4.75342	-0.16660	0.09322
32	1998	35893	M	0.26575	0.16886	-0.05367
32	1998	35893	P	0.26575	0.16886	-0.04475
32	1998	35977	M	0.49589	0.00925	-0.04714
32	1998	35977	P	0.49589	0.00925	-0.08463
32	1998	36026	M	0.63014	-0.02250	-0.03455
32	1998	36026	P	0.63014	-0.02250	-0.12493
32	1999	36333	M	1.47123	0.02283	-0.03556
32	1999	36333	P	1.47123	0.02283	-0.10332
32	1999	36370	M	1.57260	-0.10658	-0.03289
32	1999	36370	P	1.57260	-0.10658	-0.09684
32	1999	36399	M	1.65205	-0.11982	-0.01617
32	1999	36399	P	1.65205	-0.11982	-0.05229
32	2000	36690	M	2.44932	-0.01047	-0.04679

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
32	2000	36690	P	2.44932	-0.01047	-0.10115
32	2000	36720	M	2.53151	-0.11097	-0.02680
32	2000	36720	P	2.53151	-0.11097	-0.12346
32	2000	36747	M	2.60548	-0.06786	-0.02060
32	2000	36747	P	2.60548	-0.06786	-0.09282
32	2001	37064	M	3.47397	0.02090	-0.00032
32	2001	37064	P	3.47397	0.02090	-0.04175
32	2001	37111	M	3.60274	0.07355	-0.03344
32	2001	37111	P	3.60274	0.07355	-0.12214
32	2002	37455	M	4.54521	0.28564	-0.05116
34	1998	35902	M	0.29041	0.09768	-0.03627
34	1998	35902	P	0.29041	0.09768	-0.03167
34	1998	35989	C	0.52877	-0.02368	-0.04366
34	1998	35989	P	0.52877	-0.02368	-0.06741
34	1998	36026	C	0.63014	-0.06604	-0.00586
34	1998	36026	P	0.63014	-0.06604	-0.05310
34	1999	36368	C	1.56712	-0.14089	-0.01862
34	1999	36368	M	1.56712	-0.15130	-0.04650
34	1999	36368	P	1.56712	-0.14089	-0.06305
34	2000	36690	C	2.44932	-0.02368	-0.03718
34	2000	36690	M	2.44932	-0.02368	-0.01442
34	2000	36690	P	2.44932	-0.02368	-0.16606
34	2000	36752	C	2.61918	-0.08301	-0.05074
34	2000	36752	M	2.61918	-0.08301	-0.03879
34	2000	36752	P	2.61918	-0.08301	-0.12179
34	2001	36983	C	3.25205	0.10581	-0.04462
34	2001	36983	P	3.25205	0.10581	-0.03775
34	2001	37083	C	3.52603	0.00807	-0.04893
34	2001	37083	P	3.52603	0.00807	-0.06890
34	2001	37111	C	3.60274	0.04703	-0.04137
34	2002	37445	C	4.51781	0.23121	-0.02565
34	2002	37445	P	4.51781	0.23121	-0.14029
35	1998	35920	P	0.33973	0.04177	-0.04066
35	1998	35970	P	0.47671	0.00429	0.12374
35	1998	36048	P	0.69041	-0.03999	-0.01584
35	1999	36333	P	1.47123	0.00153	-0.00664
35	2000	36692	P	2.45479	-0.00759	0.07660
36	1998	35915	M	0.32603	-0.06501	-0.06567
36	1998	35915	P	0.32603	-0.06501	-0.11171
36	1998	35985	M	0.51781	-0.08436	-0.06679
36	1998	35985	P	0.51781	-0.08436	-0.03736
36	1998	36054	M	0.70685	0.06045	-0.07656
36	1999	36339	M	1.48767	-0.03890	-0.05403
36	1999	36339	P	1.48767	-0.03890	0.04197
36	2000	36733	M	2.56712	-0.02565	-0.07197
36	2000	36733	P	2.56712	-0.02565	-0.08066
36	2001	37110	M	3.60000	0.10568	-0.06878
36	2002	37410	M	4.42192	0.11182	-0.13844
36	2002	37410	P	4.42192	0.11182	-0.15518

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
36	2002	37455	M	4.54521	0.03806	-0.13344
37	1998	35915	M	0.32603	0.05905	0.02146
37	1998	35915	P	0.32603	0.05905	0.01650
37	1998	35977	C	0.49589	-0.01746	-0.04670
37	1998	35977	M	0.49589	-0.01746	-0.01843
37	1998	35977	P	0.49589	-0.01746	-0.04098
37	1998	36035	C	0.65479	-0.06359	-0.04567
37	1998	36035	M	0.65479	-0.06359	0.01238
37	1998	36035	P	0.65479	-0.06359	-0.02343
37	1999	36395	C	1.64110	-0.08090	-0.03507
37	1999	36395	M	1.64110	-0.08090	0.01872
37	1999	36395	P	1.64110	-0.08090	-0.03411
37	2001	37134	C	3.66575	0.04220	-0.00419
37	2001	37134	M	3.66575	0.04220	-0.02221
37	2001	37134	P	3.66575	0.04220	-0.04250
37	2002	37483	C	4.62192	0.24112	-0.00020
38	1998	35892	M	0.26301	-0.09670	-0.03394
38	1998	35892	P	0.26301	-0.09670	0.00941
38	1998	35977	M	0.49589	-0.00884	-0.02747
38	1998	35977	P	0.49589	-0.00884	0.01436
38	1998	36021	M	0.61644	0.01168	-0.05118
38	1998	36021	P	0.61644	0.01168	-0.00275
38	1999	36341	M	1.49315	-0.04791	-0.01415
38	1999	36341	P	1.49315	-0.04791	0.00296
38	1999	36370	M	1.57260	-0.03126	-0.03468
38	1999	36370	P	1.57260	-0.03126	0.00460
38	1999	36395	M	1.64110	-0.05294	-0.01775
38	1999	36395	P	1.64110	-0.05294	0.02156
38	2000	36641	M	2.31507	0.00338	-0.02929
38	2000	36641	P	2.31507	0.00338	-0.02152
38	2000	36719	M	2.52877	0.03155	-0.04983
38	2000	36719	P	2.52877	0.02737	-0.00964
38	2000	36742	M	2.59178	0.02225	-0.02782
38	2000	36742	P	2.59178	0.02225	-0.01475
38	2001	37012	M	3.33151	0.05827	-0.05383
38	2001	37012	P	3.33151	0.05827	-0.02697
38	2001	37104	M	3.58356	0.00100	-0.04523
38	2001	37104	P	3.58356	0.00100	-0.01048
38	2002	37350	M	4.25753	0.06120	-0.00446
38	2002	37350	P	4.25753	0.06120	0.03303
38	2002	37483	P	4.62192	0.10085	-0.04015
39	1998	36021	C	0.61644	-0.03945	0.01685
39	1998	36021	P	0.61644	-0.03945	-0.03986
39	1998	36028	C	0.63562	-0.04032	0.01679
39	1998	36028	P	0.63562	-0.04032	-0.01038
39	1999	36341	C	1.49315	-0.07095	0.00015
39	1999	36341	P	1.49315	-0.07095	-0.02487
39	1999	36367	C	1.56438	-0.03602	-0.00359
39	1999	36367	P	1.56438	-0.03602	-0.05482

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
39	1999	36433	C	1.74521	-0.04118	0.01253
39	1999	36433	P	1.74521	-0.04118	-0.03119
39	2001	37104	C	3.58356	0.08890	0.03412
39	2001	37153	C	3.71781	0.07363	0.01068
39	2002	37326	C	4.19178	0.10020	0.01772
40	1998	35919	M	0.33699	0.00004	0.02046
40	1998	35919	P	0.33699	0.00004	0.05083
40	1998	35944	M	0.40548	-0.04793	-0.00204
40	1998	35944	P	0.40548	-0.04793	0.00435
40	1998	36010	M	0.58630	0.00559	-0.10680
40	1998	36010	P	0.58630	0.00559	-0.09430
40	1999	36341	M	1.49315	-0.02753	-0.01413
40	1999	36341	P	1.49315	-0.02753	-0.09326
40	2000	36649	M	2.33699	-0.01083	-0.02945
40	2000	36719	M	2.52877	0.03132	-0.02798
40	2000	36719	P	2.52877	0.03132	-0.02430
40	2000	36740	M	2.58630	0.04393	-0.12357
40	2000	36740	P	2.58630	0.04393	-0.08944
41	1998	35915	M	0.32603	0.03835	-0.02046
41	1998	35915	P	0.32603	0.03835	-0.04518
41	1998	36011	C	0.58904	0.06942	0.06671
41	1998	36011	C	0.58904	0.06942	0.06433
41	1998	36011	M	0.58904	0.06942	-0.01316
41	1998	36011	P	0.58904	0.06942	-0.04022
41	1999	36336	C	1.47945	-0.32145	0.14067
41	1999	36336	C	1.47945	-0.32145	0.13537
41	1999	36336	M	1.47945	-0.32145	0.08540
41	2000	36656	C	2.35616	0.06055	0.01674
41	2000	36656	C	2.35616	0.06055	-0.00021
41	2000	36656	M	2.35616	0.06055	-0.03866
41	2000	36656	P	2.35616	0.06055	-0.11290
41	2000	36740	C	2.58630	0.09267	-0.00306
41	2000	36740	M	2.58630	0.09267	-0.05335
41	2000	36763	C	2.64932	0.04259	0.02597
41	2000	36763	M	2.64932	0.04259	-0.01946
43	1998	35958	C	0.44384	-0.02180	0.00432
43	1998	35958	M	0.44384	-0.02180	0.01941
43	1998	35958	P	0.44384	-0.02180	0.00485
43	1998	36003	C	0.56712	-0.03317	-0.01169
43	1998	36003	M	0.56712	-0.03317	0.01214
43	1998	36003	P	0.56712	-0.03317	-0.04257
43	1998	36053	C	0.70411	-0.08242	-0.01942
43	1998	36053	M	0.70411	-0.08242	0.01434
43	1999	36336	C	1.47945	0.02462	0.01461
43	1999	36336	P	1.47945	0.02462	-0.02328
43	1999	36399	C	1.65205	-0.02861	-0.00398
43	1999	36399	M	1.65205	-0.02861	0.00446
43	1999	36399	P	1.65205	-0.02861	-0.01614
43	2000	36657	C	2.35890	0.04175	0.00116

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
43	2000	36657	M	2.35890	0.04175	-0.02268
43	2000	36657	P	2.35890	0.04175	-0.00893
43	2000	36720	C	2.53151	0.00938	0.00534
43	2000	36720	M	2.53151	0.00938	-0.00955
43	2000	36720	P	2.53151	0.00938	-0.06288
43	2000	36747	C	2.60548	-0.09208	0.00575
43	2000	36747	M	2.60548	-0.09208	-0.01143
43	2000	36747	P	2.60548	-0.09208	-0.08034
43	2001	36984	C	3.25479	-0.09695	0.00040
43	2001	36984	M	3.25479	-0.09695	-0.03465
43	2001	36984	P	3.25479	-0.09695	-0.17494
43	2001	37103	C	3.58082	0.04387	0.00608
43	2001	37103	M	3.58082	0.04387	-0.02714
43	2001	37103	P	3.58082	0.04387	-0.03573
43	2002	37419	C	4.44658	0.11343	0.01829
43	2002	37419	M	4.44658	0.11343	-0.03915
43	2002	37419	P	4.44658	0.11343	-0.09401
43	2002	37526	C	4.73973	0.15409	-0.00080
43	2002	37526	M	4.73973	0.15409	-0.02675
44	1998	35906	C	0.30137	-0.01602	-0.00326
44	1998	35906	P	0.30137	-0.01602	-0.06558
44	1998	35957	C	0.44110	-0.00808	0.03414
44	1998	35957	P	0.44110	-0.00808	-0.00625
44	1998	36047	C	0.68767	-0.05253	-0.00578
44	1998	36047	P	0.68767	-0.05253	0.00119
44	1999	36389	C	1.62466	-0.07764	-0.02105
44	1999	36389	P	1.62466	-0.07764	-0.04380
44	2000	36691	C	2.45205	-0.05584	-0.00160
44	2000	36691	P	2.45205	-0.05584	-0.01399
44	2000	36719	C	2.52877	0.07530	0.00657
44	2000	36719	P	2.52877	0.07530	-0.05990
44	2000	36740	C	2.58630	0.04203	0.02218
44	2000	36740	P	2.58630	0.04203	-0.07663
44	2001	37012	C	3.33151	0.05695	0.26982
44	2001	37012	P	3.33151	0.05695	0.17096
44	2001	37110	P	3.60000	0.07166	0.01504
45	1998	35899	C	0.28219	-0.02076	0.03483
45	1998	35899	P	0.28219	-0.02076	-0.00107
45	1998	35942	C	0.40000	0.03578	0.05288
45	1998	35942	P	0.40000	0.03578	0.01015
45	1998	36054	P	0.70685	0.05475	0.01398
45	1999	36370	P	1.57260	-0.04056	-0.00992
45	2000	36692	P	2.45479	-0.02011	0.00222
45	2000	36720	P	2.53151	0.02397	-0.01293
45	2000	36755	P	2.62740	0.01076	-0.00688
45	2001	37012	P	3.33151	0.00505	0.00913
45	2001	37063	P	3.47123	-0.04056	0.02840
45	2001	37153	P	3.71781	-0.00777	0.00272
45	2002	37418	P	4.44384	-0.00777	0.02683

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
45	2002	37418	P	4.44384	-0.00777	0.02683
46	1998	35915	C	0.32603	0.07498	-0.08912
46	1998	35915	M	0.32603	0.07498	-0.08059
46	1998	36000	C	0.55890	-0.01209	-0.08410
46	1998	36000	M	0.55890	-0.01209	-0.07807
46	1998	36038	C	0.66301	-0.02902	-0.08574
46	1998	36038	M	0.66301	-0.02902	-0.07522
46	1999	36241	C	1.21918	0.06353	-0.06815
46	1999	36241	M	1.21918	0.06353	-0.07604
46	2000	36683	C	2.43014	-0.33775	-0.07138
46	2000	36683	M	2.43014	-0.33775	-0.10481
46	2000	36683	P	2.43014	-0.33775	-0.15444
46	2000	36734	C	2.56986	0.01245	-0.02493
46	2000	36734	M	2.56986	0.01245	-0.07245
46	2000	36734	P	2.56986	0.01245	-0.11145
46	2000	36777	C	2.68767	0.00851	-0.08623
46	2000	36777	M	2.68767	0.00851	-0.09815
46	2001	36991	C	3.27397	0.12771	-0.07862
46	2001	36991	M	3.27397	0.12771	-0.09796
46	2001	36991	P	3.27397	0.12771	-0.10768
46	2001	37048	C	3.43014	0.01376	-0.04654
46	2001	37048	M	3.43014	0.01376	-0.04619
46	2001	37048	P	3.43014	0.01376	-0.04874
46	2002	37335	C	4.21644	0.07035	-0.05393
46	2002	37335	M	4.21644	0.07035	-0.05434
47	1998	35951	M	0.42466	0.00930	-0.03063
47	1998	35951	P	0.42466	0.00930	-0.08235
47	1998	36000	M	0.55890	-0.01705	-0.04120
47	1998	36000	P	0.55890	-0.01705	-0.05070
47	1998	36031	M	0.64384	0.00021	0.01330
47	1998	36031	P	0.64384	0.00021	-0.00512
47	1999	36241	M	1.21918	0.06213	-0.04107
47	2000	36683	M	2.43014	-0.38623	-0.02361
47	2000	36683	P	2.43014	-0.38623	-0.04304
47	2000	36734	M	2.56986	0.01568	0.00796
47	2000	36734	P	2.56986	0.01568	-0.05416
47	2000	36777	M	2.68767	0.00439	-0.04894
47	2001	36991	M	3.27397	0.08195	0.02310
47	2001	36991	P	3.27397	0.08195	0.02561
47	2001	37057	M	3.45479	0.01456	0.04459
47	2001	37152	M	3.71507	0.01155	0.00839
47	2001	37152	P	3.71507	0.01155	-0.00233
47	2002	37335	M	4.21644	0.06926	-0.00377
47	2002	37477	M	4.60548	0.20942	0.00602
47	2002	37477	P	4.60548	0.20942	0.03939
48	1998	35928	M	0.36164	-0.01175	-0.06261
48	1998	35928	P	0.36164	-0.01175	-0.07114
48	1998	35965	M	0.46301	-0.03255	-0.05036
48	1998	35965	P	0.46301	-0.03255	-0.04928

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
48	1998	36054	M	0.70685	0.02858	-0.06864
48	1998	36054	P	0.70685	0.02858	-0.09780
48	1999	36383	M	1.60822	-0.02312	-0.04009
48	1999	36383	P	1.60822	-0.02312	-0.05179
48	2000	36663	M	2.37534	0.03631	-0.09621
48	2000	36663	P	2.37534	0.03631	-0.06265
48	2000	36741	M	2.58904	0.00505	-0.04404
49	1998	35912	P	0.31781	0.08436	-0.00274
49	1998	35975	C	0.49041	-0.03170	0.03773
49	1998	35975	P	0.49041	-0.03170	-0.06614
49	1998	36035	C	0.65479	-0.15398	0.01846
49	1998	36035	P	0.65479	-0.15398	0.02294
49	2000	36763	C	2.64932	0.03386	0.01970
49	2001	37152	C	3.71507	0.10021	0.02328
49	2002	37446	C	4.52055	0.15294	0.02165
50	1998	35899	C	0.28219	-0.14739	0.06539
50	1998	35899	M	0.28219	-0.14739	0.04361
50	1998	35961	C	0.45205	-0.05340	0.07697
50	1998	35961	M	0.45205	-0.05340	0.04822
50	1998	36012	C	0.59178	0.10548	0.08703
50	1998	36012	M	0.59178	0.10548	0.06125
50	1998	36059	C	0.72055	0.13760	0.04371
50	1998	36059	M	0.72055	0.13760	0.01505
50	1999	36357	C	1.53699	-0.11431	0.04603
50	1999	36357	M	1.53699	-0.11431	0.01578
50	2000	36662	C	2.37260	-0.09818	0.03877
50	2000	36662	M	2.37260	-0.09818	0.01693
50	2001	37023	C	3.36164	0.15949	0.13890
50	2001	37118	C	3.62192	0.18091	0.13540
51	1998	35906	M	0.30137	-0.03036	0.05245
51	1998	35906	P	0.30137	-0.03036	0.00094
51	1998	35972	M	0.48219	0.02994	0.00499
51	1998	35972	P	0.48219	0.02994	0.01259
51	1998	36020	M	0.61370	-0.07828	0.01316
51	1998	36020	P	0.61370	-0.07828	0.03242
51	1999	36241	M	1.21918	0.04632	0.11703
51	1999	36241	P	1.21918	0.04632	0.09336
51	2000	36678	M	2.41644	0.02002	0.05444
51	2000	36678	P	2.41644	0.02002	0.02657
51	2001	36991	M	3.27397	0.03703	0.02027
51	2001	36991	P	3.27397	0.03703	-0.01106
51	2001	37048	M	3.43014	0.05105	0.00272
51	2001	37048	P	3.43014	0.05105	-0.01329
51	2002	37421	M	4.45205	-0.07573	-0.05591
51	2002	37421	P	4.45205	-0.07573	-0.07671
52	1998	35965	C	0.46301	-0.03601	-0.07317
52	1998	35965	M	0.46301	-0.03601	-0.02072
52	1998	35965	P	0.46301	-0.03601	-0.11713
52	1998	35992	C	0.53699	0.05810	-0.06194

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
52	1998	35992	M	0.53699	0.05810	-0.02104
52	1998	36034	M	0.65205	0.00299	-0.00487
52	1998	36034	P	0.65205	0.00299	-0.03540
52	1999	36349	C	1.51507	-0.01993	-0.03939
52	1999	36349	M	1.51507	-0.01993	-0.01095
52	1999	36405	C	1.66849	0.01285	-0.06251
52	1999	36405	M	1.66849	0.01285	-0.01050
53	1998	35949	M	0.41918	0.08052	-0.01158
53	1998	35949	P	0.41918	0.08052	-0.06151
53	1998	35991	C	0.53425	0.10402	-0.02339
53	1998	35991	M	0.53425	0.10402	-0.04521
53	1998	35991	P	0.53425	0.10402	-0.07028
53	1998	36035	C	0.65479	0.07631	-0.04935
53	1998	36035	M	0.65479	0.07631	0.00407
53	1999	36319	C	1.43288	-0.16383	0.01136
53	1999	36319	M	1.43288	-0.16383	0.03628
53	2000	36649	C	2.33699	0.13097	0.01811
53	2000	36649	M	2.33699	0.13097	-0.01707
53	2000	36649	P	2.33699	0.13097	-0.07578
53	2000	36712	C	2.50959	-0.08654	0.00327
53	2000	36712	M	2.50959	-0.08654	-0.02363
53	2000	36733	C	2.56712	-0.17822	0.00599
53	2000	36733	M	2.56712	-0.17822	-0.00026
53	2000	36733	P	2.56712	-0.17822	-0.04587
53	2001	36982	C	3.24932	-0.23794	-0.01725
53	2001	36982	M	3.24932	-0.23794	-0.03848
53	2001	36982	P	3.24932	-0.23794	-0.11558
53	2001	37070	C	3.49041	-0.09484	0.00135
53	2001	37070	M	3.49041	-0.09484	-0.00127
53	2001	37070	P	3.49041	-0.09484	-0.05321
53	2001	37110	C	3.60000	0.18280	-0.00221
53	2001	37110	M	3.60000	0.18280	-0.00961
53	2001	37110	P	3.60000	0.18280	-0.06411
53	2002	37347	C	4.24932	0.19908	0.00739
53	2002	37347	M	4.24932	0.19908	-0.02525
53	2002	37445	C	4.51781	0.23447	0.03088
53	2002	37445	M	4.51781	0.23447	-0.02200
53	2002	37504	C	4.67945	-0.20020	0.02420
53	2002	37504	M	4.67945	-0.20020	-0.02114
54	1998	35963	C	0.45753	0.00088	-0.10034
54	1998	35963	M	0.45753	0.00088	-0.01317
54	1998	36053	C	0.70411	0.00381	-0.03356
54	1998	36056	C	0.71233	0.01173	-0.03116
54	1999	36362	C	1.55068	-0.01116	0.01897
54	1999	36362	M	1.55068	-0.01116	-0.07421
54	2000	36656	C	2.35616	0.00540	0.01798
54	2002	37349	C	4.25479	-0.00418	0.02242
55	1998	35956	C	0.43836	-0.01350	0.00054
55	1998	35956	M	0.43836	-0.01350	0.00639

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
55	1998	35998	C	0.55342	-0.02394	-0.00302
55	1998	35998	M	0.55342	-0.02394	0.00275
55	1998	36035	C	0.65479	-0.09230	0.00383
55	1998	36035	M	0.65479	-0.09230	0.00317
55	2000	36769	C	2.66575	-0.01625	-0.01933
55	2000	36769	M	2.66575	-0.01625	-0.02802
55	2000	36769	P	2.66575	-0.01625	-0.08576
55	2002	37371	C	4.31507	0.05069	-0.02874
55	2002	37371	M	4.31507	0.05069	-0.03320
55	2002	37469	C	4.58356	0.10343	0.00495
55	2002	37469	M	4.58356	0.10343	-0.01281
56	1998	35901	C	0.28767	-0.06984	0.12087
56	1998	35901	M	0.28767	-0.06984	0.11673
56	1998	35956	C	0.43836	-0.05610	-0.15010
56	1998	35956	M	0.43836	-0.05610	-0.03395
56	1998	35956	P	0.43836	-0.05610	-0.11193
56	1998	36046	C	0.68493	-0.12113	-0.00284
56	1998	36046	P	0.68493	-0.12113	-0.02347
56	2000	36762	C	2.64658	-0.08287	-0.04716
56	2000	36762	M	2.64658	-0.08287	-0.02730
56	2001	37036	C	3.39726	-0.12821	0.07869
56	2001	37036	M	3.39726	-0.12821	0.06537
56	2001	37071	C	3.49315	0.14469	0.09653
56	2001	37071	M	3.49315	0.14469	0.09086
56	2001	37124	C	3.63836	0.12321	-0.09654
56	2001	37124	M	3.63836	0.12321	-0.09411
56	2002	37343	C	4.23836	0.21829	-0.03432
56	2002	37343	M	4.23836	0.21829	-0.02392
58	1998	35954	C	0.43288	-0.05753	-0.01343
58	1998	35990	C	0.53151	-0.12302	-0.00066
58	1998	36020	C	0.61370	-0.17546	-0.00406
58	1999	36378	C	1.59452	-0.15002	-0.00013
58	1999	36378	M	1.59452	-0.17731	-0.00506
58	2000	36748	C	2.60822	-0.11216	0.00242
58	2001	36999	C	3.29589	0.15335	-0.01726
58	2001	37056	C	3.45205	0.06293	0.02612
58	2001	37103	C	3.58082	0.02072	0.03134
58	2002	37335	C	4.21644	0.16945	0.02658
58	2002	37414	C	4.43288	0.15765	0.02064
58	2002	37515	C	4.70959	0.23138	0.01091
59	1998	35964	M	0.46027	-0.08554	-0.03136
59	1998	35964	P	0.46027	-0.08554	-0.03826
59	1999	36390	M	1.62740	0.24237	-0.05802
59	1999	36390	P	1.62740	0.24237	-0.04414
59	2000	36650	P	2.33973	-0.31367	-0.05252
60	1998	35901	C	0.28767	0.01419	-0.05251
60	1998	35901	M	0.28767	0.01419	-0.03092
60	1998	35901	P	0.28767	0.01419	-0.06851
60	1998	35978	C	0.49863	0.02147	-0.05745

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
60	1998	35978	M	0.49863	0.02147	-0.02944
60	1998	35978	P	0.49863	0.02147	-0.04777
60	1998	36046	C	0.68493	-0.14613	-0.06123
60	1998	36046	M	0.68493	-0.14613	-0.03237
60	1998	36046	P	0.68493	-0.14613	-0.05983
60	1999	36362	C	1.55068	-0.03549	-0.08646
60	1999	36362	C	1.55068	-0.02815	-0.06970
60	1999	36362	M	1.55068	-0.03549	-0.08191
60	1999	36362	P	1.55068	-0.03549	-0.09072
60	2000	36691	C	2.45205	-0.05228	-0.05144
60	2000	36691	M	2.45205	-0.05228	-0.05661
60	2000	36691	P	2.45205	-0.05228	-0.06382
60	2000	36721	C	2.53425	-0.03645	-0.05263
60	2000	36721	M	2.53425	-0.03645	-0.05926
60	2000	36721	P	2.53425	-0.03645	-0.07942
60	2000	36761	C	2.64384	-0.03293	-0.08319
60	2000	36761	M	2.64384	-0.03293	-0.06030
60	2000	36761	P	2.64384	-0.03293	-0.11042
60	2001	37015	C	3.33973	0.09748	-0.04210
60	2001	37015	M	3.33973	0.09748	-0.06882
60	2001	37077	C	3.50959	0.05655	-0.07170
60	2001	37077	M	3.50959	0.05655	-0.10221
60	2001	37077	P	3.50959	0.05655	-0.12413
60	2001	37111	C	3.60274	0.06615	-0.06368
60	2001	37111	M	3.60274	0.06615	-0.07597
60	2001	37111	P	3.60274	0.06615	-0.14827
60	2002	37337	C	4.22192	0.08932	-0.05954
60	2002	37337	M	4.22192	0.08932	-0.06920
60	2002	37337	P	4.22192	0.08932	-0.08332
61	1998	35957	C	0.44110	-0.05184	0.00966
61	1998	35957	M	0.44110	-0.05184	-0.01729
61	1998	36004	C	0.56986	0.03154	-0.03413
61	1998	36004	M	0.56986	0.03154	-0.00760
61	1998	36042	C	0.67397	0.06352	0.00988
61	1998	36042	M	0.67397	0.06352	-0.04266
61	1999	36383	C	1.60822	-0.04642	0.04436
61	1999	36383	M	1.60822	-0.04642	-0.01810
61	2000	36691	C	2.45205	-0.16083	0.02901
61	2000	36691	M	2.45205	-0.16083	-0.14937
61	2001	37134	C	3.66575	0.06110	0.03198
61	2001	37134	M	3.66575	0.06110	-0.09020
61	2002	37349	C	4.25479	0.10293	0.17407
61	2002	37349	M	4.25479	0.10293	0.00417
62	1998	35928	P	0.36164	-0.32894	-0.03479
62	1998	35965	C	0.46301	-0.04666	-0.07988
62	1998	35965	P	0.46301	-0.03548	-0.02847
62	1998	36034	C	0.65205	-0.02606	-0.10807
62	1998	36034	P	0.65205	-0.02729	-0.05414
62	1999	36433	C	1.74521	0.08093	-0.11970

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
62	1999	36433	P	1.74521	0.08093	-0.04404
62	2000	36663	C	2.37534	0.03214	-0.10862
62	2000	36663	P	2.37534	0.03214	-0.07583
62	2000	36741	C	2.58904	-0.01512	-0.16174
62	2000	36741	P	2.58904	-0.01512	-0.08082
62	2001	37096	C	3.56164	0.17524	-0.08737
62	2002	37505	C	4.68219	0.04665	-0.12914
62	2002	37505	P	4.68219	0.04665	-0.10006
63	1998	35902	C	0.29041	-0.38021	0.00558
63	1998	35949	C	0.41918	-0.37651	0.01087
63	1998	36047	C	0.68767	-0.39181	0.00822
63	1999	36357	C	1.53699	-0.35660	-0.00509
63	2000	36684	C	2.43288	0.26052	-0.03174
63	2000	36728	C	2.55342	0.26830	-0.00312
63	2000	36761	C	2.64384	0.16040	0.01874
63	2001	36998	C	3.29315	0.29863	0.01997
63	2001	37034	C	3.39178	0.29591	0.00672
63	2001	37069	C	3.48767	0.28177	0.00779
63	2002	37356	C	4.27397	-0.06041	-0.02088
64	1998	35921	C	0.34247	-0.04651	0.00554
64	1998	35949	C	0.41918	-0.03789	0.01118
64	1998	36047	C	0.68767	-0.04026	0.01422
64	1998	36054	C	0.70685	-0.03080	0.00500
64	1999	36313	C	1.41644	-0.04056	-0.00402
64	1999	36369	C	1.56986	-0.04085	0.00065
64	2000	36684	C	2.43288	0.18998	0.10154
64	2000	36726	C	2.54795	0.20357	0.09498
64	2000	36781	C	2.69863	-0.06217	0.09307
64	2001	36998	C	3.29315	-0.04502	-0.06288
64	2001	37035	C	3.39452	0.00274	0.04174
64	2001	37069	C	3.48767	-0.02904	0.06276
64	2002	37355	C	4.27123	-0.02319	-0.03716
65	1998	35900	C	0.28493	-0.04504	0.01377
65	1998	35900	M	0.28493	-0.04504	0.01918
65	1998	35949	C	0.41918	0.25873	0.01797
65	1998	35949	M	0.41918	0.25873	0.01822
65	1998	36032	C	0.64658	-0.09808	0.00769
65	1998	36032	M	0.64658	-0.09808	0.01814
65	1998	36053	C	0.70411	-0.04152	0.00579
65	1998	36053	M	0.70411	-0.04152	0.01695
65	1999	36313	C	1.41644	-0.04108	-0.04875
65	1999	36313	M	1.41644	-0.04108	-0.04845
65	1999	36364	C	1.55616	0.00700	-0.05431
65	1999	36364	M	1.55616	0.00700	-0.05644
65	2000	36685	C	2.43562	-0.02797	0.09861
65	2000	36685	M	2.43562	-0.02797	0.08494
65	2000	36728	C	2.55342	-0.01204	0.04906
65	2000	36728	M	2.55342	-0.01204	0.05772
66	1998	35958	C	0.44384	-0.10064	-0.00321

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
66	1998	35958	M	0.44384	-0.10064	-0.08667
66	1998	36005	C	0.57260	-0.12413	-0.00266
66	1998	36005	M	0.57260	-0.12413	-0.04489
66	1998	36017	C	0.60548	-0.17524	-0.00506
66	1998	36017	M	0.60548	-0.17524	-0.02309
66	1999	36294	C	1.36438	-0.11383	0.00166
66	1999	36294	M	1.36438	-0.11383	-0.01111
66	1999	36362	C	1.55068	-0.05134	0.01162
66	1999	36362	M	1.55068	-0.05134	0.00320
66	2000	36665	C	2.38082	-0.03123	-0.00725
66	2000	36665	M	2.38082	-0.03123	-0.00479
66	2000	36718	C	2.52603	-0.01873	-0.00975
66	2000	36718	M	2.52603	-0.01873	0.00219
66	2000	36754	C	2.62466	0.02514	0.01019
66	2000	36754	M	2.62466	0.02514	0.02107
66	2001	37047	C	3.42740	-0.00435	0.01421
66	2001	37047	M	3.42740	-0.00435	0.00835
66	2001	37091	C	3.54795	0.03728	-0.00111
66	2001	37091	M	3.54795	0.03728	0.00219
66	2001	37141	C	3.68493	0.05634	-0.00969
66	2001	37141	M	3.68493	0.05634	-0.09522
66	2002	37455	C	4.54521	0.23679	0.00297
66	2002	37455	M	4.54521	0.23679	0.00708
66	2002	37488	C	4.63562	0.26394	0.01656
66	2002	37488	M	4.63562	0.26394	0.00279
68	1998	35949	C	0.41918	-0.00010	0.00937
68	1998	35991	C	0.53425	-0.02429	0.01136
68	1998	36019	C	0.61096	-0.07676	0.00850
68	1998	36061	C	0.72603	-0.05664	0.01110
68	1999	36327	C	1.45479	-0.00369	0.01269
68	2000	36700	C	2.47671	-0.03785	0.01328
68	2001	37026	C	3.36986	-0.00219	-0.00053
68	2001	37140	C	3.68219	-0.02276	0.00887
68	2001	37162	C	3.74247	-0.01880	-0.00414
68	2002	37370	C	4.31233	0.06971	-0.02372
68	2002	37491	C	4.64384	0.17337	-0.00874
69	1998	35942	C	0.40000	-0.06328	0.02751
69	1998	35942	P	0.40000	-0.06328	0.01798
69	1998	36026	C	0.63014	0.02129	0.02145
69	1998	36026	P	0.63014	0.02129	0.01866
69	1998	36040	C	0.66849	0.00795	0.01489
69	2000	36747	C	2.60548	-0.01108	-0.00474
69	2001	37083	C	3.52603	0.00151	0.00276
69	2002	37419	C	4.44658	0.04281	0.01322
69	2002	37419	P	4.44658	0.04281	-0.01143
70	1998	35930	C	0.36712	0.01237	-0.02876
70	1998	35983	C	0.51233	0.04637	-0.02799
70	1998	36033	C	0.64932	0.00592	-0.02728
70	1999	36320	C	1.43562	0.05971	-0.02491

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
70	2000	36634	C	2.29589	0.00216	-0.03257
70	2000	36705	C	2.49041	0.05294	-0.02224
70	2000	36755	C	2.62740	0.00346	0.00630
70	2001	37008	C	3.32055	-0.07758	0.05184
70	2001	37105	C	3.58630	-0.10280	-0.00061
70	2002	37449	C	4.52877	-0.00253	0.02732
72	1998	35948	C	0.41644	-0.11268	0.00325
72	1998	35948	M	0.41644	-0.11268	-0.01188
72	1998	35992	C	0.53699	0.00737	0.00175
72	1998	35992	M	0.53699	0.00737	-0.00584
72	1998	36041	C	0.67123	-0.07947	0.00894
72	1998	36041	M	0.67123	-0.07947	-0.00338
72	1999	36355	C	1.53151	-0.00170	0.01046
72	1999	36355	M	1.53151	-0.00170	0.00655
72	2000	36719	C	2.52877	-0.00218	0.02014
72	2000	36719	M	2.52877	-0.00218	0.00311
72	2001	37070	C	3.49041	0.03317	0.03397
72	2001	37070	M	3.49041	0.03317	0.02370
72	2001	37140	C	3.68219	0.06911	0.00780
72	2001	37140	M	3.68219	0.06911	0.01962
72	2001	37161	C	3.73973	0.08639	0.01567
72	2001	37161	M	3.73973	0.08639	0.01619
74	1998	35935	C	0.38082	-0.07054	0.02185
74	1998	35935	M	0.38082	-0.07054	-0.01883
74	1998	36004	C	0.56986	-0.04915	0.03385
74	1998	36004	M	0.56986	-0.04915	0.00176
74	1998	36048	C	0.69041	-0.08808	0.02588
74	1998	36048	M	0.69041	-0.08808	0.00226
74	2000	36686	C	2.43836	0.03801	0.03739
74	2000	36686	M	2.43836	0.03801	0.02044
74	2001	37007	C	3.31781	0.18793	0.05089
74	2001	37007	M	3.31781	0.18793	0.03238
74	2002	37454	C	4.54247	-0.01816	-0.00831
74	2002	37454	M	4.54247	-0.01816	-0.01517
75	1998	35914	C	0.32329	0.05430	0.09522
75	1998	35914	M	0.32329	0.05430	0.08332
75	1998	36004	C	0.56986	-0.02450	0.07215
75	1998	36004	M	0.56986	-0.02450	0.06303
75	1998	36041	C	0.67123	-0.03010	0.04982
75	1998	36041	M	0.67123	-0.03010	0.04753
75	2000	36720	C	2.53151	0.00031	0.09582
75	2000	36720	M	2.53151	0.00031	0.07894
77	1998	35997	C	0.55068	-0.06278	0.02071
77	1998	35997	M	0.55068	-0.06278	-0.00445
77	1998	36005	C	0.57260	-0.03646	0.02129
77	1998	36005	M	0.57260	-0.03646	0.00376
77	1998	36040	C	0.66849	0.06506	0.02446
77	1998	36040	M	0.66849	0.06506	0.00870
77	1999	36363	C	1.55342	0.03418	0.03438

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
77	1999	36363	M	1.55342	0.03418	0.01017
80	1998	35907	C	0.30411	-0.05807	-0.00006
80	1998	35907	M	0.30411	-0.05807	0.01171
80	1998	35907	P	0.30411	-0.05807	-0.02650
80	1998	35997	C	0.55068	-0.03700	0.00132
80	1998	35997	M	0.55068	-0.03700	0.00772
80	1998	36027	C	0.63288	-0.02817	0.00218
80	1998	36027	M	0.63288	-0.02817	0.01258
80	1999	36356	C	1.53425	-0.06901	-0.00854
80	1999	36356	M	1.53425	-0.06901	0.01432
80	2000	36636	C	2.30137	0.00173	0.03127
80	2000	36636	M	2.30137	0.00173	0.01887
80	2000	36705	C	2.49041	-0.02247	0.03196
80	2000	36705	M	2.49041	-0.02247	0.01079
80	2000	36749	C	2.61096	0.02117	0.05926
80	2000	36749	M	2.61096	0.02117	0.05770
80	2002	37489	C	4.63836	0.22085	-0.03680
80	2002	37489	M	4.63836	0.22085	-0.00340
82	1998	35969	C	0.47397	-0.16112	0.00142
82	1998	35993	C	0.53973	-0.14613	0.00225
82	1998	36055	C	0.70959	-0.08830	0.00180
82	2001	37145	C	3.69589	0.00218	-0.00279
82	2002	37419	C	4.44658	0.18374	-0.04076
82	2002	37504	C	4.67945	0.20964	-0.04591
85	1998	35928	C	0.36164	-0.03246	0.00165
85	1998	35928	P	0.36164	-0.03246	-0.02512
85	1998	35970	C	0.47671	-0.28981	0.00232
85	1998	35970	P	0.47671	-0.28981	-0.02990
85	1998	36024	C	0.62466	0.01009	0.00206
85	1998	36024	P	0.62466	0.01009	-0.02761
85	1999	36356	C	1.53425	-0.00230	0.00856
85	1999	36356	P	1.53425	-0.00230	-0.03075
85	2000	36685	C	2.43562	0.00720	0.00907
85	2000	36685	P	2.43562	0.00720	-0.02830
85	2001	37055	C	3.44932	0.30729	-0.02090
85	2001	37055	P	3.44932	0.30729	-0.08249
86	1998	35920	C	0.33973	-0.10908	0.00933
86	1998	35920	P	0.33973	-0.10908	-0.04529
86	1998	35976	C	0.49315	0.02433	0.00771
86	1998	35976	P	0.49315	0.02433	-0.02389
86	1998	36021	C	0.61644	0.05794	0.00322
86	1998	36021	P	0.61644	0.05794	-0.02264
86	1998	36062	C	0.72877	0.05794	-0.00098
86	1998	36062	P	0.72877	0.05794	-0.02675
86	1999	36333	C	1.47123	0.00315	-0.01015
86	1999	36333	P	1.47123	0.00315	-0.02750
86	1999	36370	C	1.57260	0.05744	-0.02931
86	1999	36370	P	1.57260	0.05744	-0.06798
86	2000	36686	C	2.43836	0.11225	-0.01886

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
86	2000	36686	P	2.43836	0.11225	-0.07148
86	2001	37055	C	3.44932	0.03645	-0.00316
86	2001	37055	P	3.44932	0.03645	-0.04997
86	2002	37378	C	4.33425	-0.24043	-0.00052
86	2002	37378	P	4.33425	-0.24043	-0.00357
87	1998	35920	C	0.33973	-0.07827	-0.01632
87	1998	35920	P	0.33973	-0.07827	-0.07645
87	1998	35964	C	0.46027	-0.09757	-0.01475
87	1998	35964	P	0.46027	-0.09757	-0.05567
87	1998	36026	C	0.63014	-0.05233	-0.01203
87	1998	36026	P	0.63014	-0.05233	-0.04351
87	1998	36062	C	0.72877	-0.01113	0.00947
87	1998	36062	P	0.72877	-0.01113	-0.05248
87	1999	36370	C	1.57260	-0.01065	0.00514
87	1999	36370	P	1.57260	-0.01065	-0.05255
87	2000	36657	C	2.35890	0.00266	0.00637
87	2000	36657	P	2.35890	0.00266	-0.04752
87	2000	36735	C	2.57260	0.02369	0.01864
87	2000	36735	P	2.57260	0.02369	-0.03339
87	2000	36782	C	2.70137	0.03090	0.01652
87	2000	36782	P	2.70137	0.03090	-0.04108
87	2001	37070	C	3.49041	0.04140	0.01734
87	2001	37070	P	3.49041	0.04140	-0.04858
87	2001	37113	C	3.60822	0.04563	0.02268
87	2001	37113	P	3.60822	0.04563	0.00643
87	2001	37140	C	3.68219	0.05911	-0.00367
87	2001	37140	P	3.68219	0.05911	-0.04621
87	2002	37379	C	4.33699	0.04654	0.01513
87	2002	37379	P	4.33699	0.04654	0.00751
89	1998	35920	C	0.33973	-0.00449	-0.04186
89	1998	35920	M	0.33973	-0.00449	0.00495
89	1998	35950	C	0.42192	0.05452	-0.04254
89	1998	35950	M	0.42192	0.05452	0.00226
89	1998	36048	C	0.69041	0.09166	-0.02069
89	1998	36048	M	0.69041	0.09166	0.00179
89	1999	36322	C	1.44110	0.03597	-0.03007
89	1999	36322	M	1.44110	0.03597	0.00896
89	1999	36370	C	1.57260	-0.09735	-0.00647
89	1999	36370	M	1.57260	-0.09735	0.00790
89	2000	36720	C	2.53151	-0.08030	0.01064
89	2000	36720	M	2.53151	-0.08030	0.01392
90	1998	35922	C	0.34521	-0.03911	0.00861
90	1998	35922	P	0.34521	-0.03911	-0.00362
90	1998	35977	C	0.49589	-0.03659	0.00395
90	1998	35977	P	0.49589	-0.03659	-0.00094
90	1998	36021	C	0.61644	-0.01203	0.01290
90	1998	36021	P	0.61644	-0.01203	0.01987
90	1999	36356	C	1.53425	-0.04012	0.01275
90	1999	36356	P	1.53425	-0.04012	0.00396

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
90	2000	36686	C	2.43836	0.04072	0.00612
90	2000	36686	P	2.43836	0.04072	-0.01640
90	2001	37055	C	3.44932	0.06098	0.02206
90	2002	37379	C	4.33699	0.05664	0.00228
90	2002	37379	P	4.33699	0.05664	-0.01384
92	1998	35920	C	0.33973	-0.02916	-0.02267
92	1998	35920	P	0.33973	-0.02916	-0.04851
92	1998	35964	C	0.46027	-0.00023	-0.00314
92	1998	35964	P	0.46027	-0.00023	-0.01585
92	1998	36053	C	0.70411	-0.00319	-0.01559
92	1998	36053	P	0.70411	-0.00319	-0.04435
92	1998	36060	C	0.72329	-0.00274	-0.02209
92	1998	36060	P	0.72329	-0.00274	-0.03410
92	1999	36333	C	1.47123	-0.00148	-0.01477
92	1999	36333	P	1.47123	-0.00148	-0.05497
92	1999	36370	C	1.57260	0.01658	-0.01259
92	1999	36370	P	1.57260	0.01658	-0.05641
92	2000	36643	C	2.32055	-0.02134	-0.03869
92	2000	36643	P	2.32055	-0.02134	-0.09599
92	2000	36719	C	2.52877	0.00121	-0.02957
92	2000	36719	P	2.52877	0.00121	-0.09522
92	2000	36782	C	2.70137	-0.00148	-0.07115
92	2000	36782	P	2.70137	-0.00148	-0.13090
92	2001	37012	C	3.33151	-0.00391	-0.02141
92	2001	37012	P	3.33151	-0.00391	-0.09966
92	2001	37126	C	3.64384	0.01869	-0.02143
92	2001	37126	P	3.64384	0.01869	-0.06103
92	2001	37168	C	3.75890	0.02063	0.00638
92	2002	37386	C	4.35616	0.01676	0.01124
92	2002	37386	P	4.35616	0.01676	0.01273
95	1998	35921	C	0.34247	0.03804	0.04850
95	1998	35990	C	0.53151	-0.15220	0.05882
95	1998	35992	C	0.53699	0.11713	0.07598
95	1998	35992	P	0.53699	0.11713	0.01771
95	1998	36035	C	0.65479	0.01869	0.06526
95	1998	36035	P	0.65479	0.01869	-0.07972
95	1998	36047	C	0.68767	0.03012	0.04220
95	1999	36319	C	1.43288	-0.19872	0.04765
95	2000	36635	C	2.29863	0.02633	0.04481
95	2000	36649	C	2.33699	0.05259	0.05294
95	2000	36719	C	2.52877	0.08896	0.05197
95	2001	36991	C	3.27397	-0.00457	0.06076
95	2001	37064	C	3.47397	-0.15220	0.05652
97	1998	35929	C	0.36438	0.01355	-0.01323
97	1998	35929	C	0.36438	0.04902	-0.02228
97	1998	35984	C	0.51507	-0.03129	-0.00751
97	1998	35984	C	0.51507	0.00462	-0.00358
97	1998	36029	C	0.63836	-0.05281	-0.01231
97	1998	36029	C	0.63836	-0.02711	-0.01093

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
97	1999	36369	C	1.56986	-0.05680	0.00230
97	1999	36369	C	1.56986	-0.03972	-0.00392
97	2000	36692	C	2.45479	0.01355	-0.02606
97	2001	37119	C	3.62466	0.01498	0.04387
97	2002	37448	C	4.52603	0.11201	0.03211
98	1998	35927	C	0.35890	-0.01967	-0.03232
98	1998	35927	C	0.35890	0.01866	-0.02813
98	1998	35984	C	0.51507	-0.04150	-0.01317
98	1998	36047	C	0.68767	-0.06597	-0.01816
98	1998	36047	C	0.68767	-0.03027	-0.01829
98	1998	36056	C	0.71233	-0.02251	-0.02242
98	1999	36320	C	1.43562	-0.01711	-0.00062
98	2000	36651	C	2.34247	-0.00538	0.01255
98	2001	37011	C	3.32877	0.03947	0.01511
98	2001	37083	C	3.52603	0.01320	0.00044
98	2002	37356	C	4.27397	0.13109	-0.01023
99	1998	35928	C	0.36164	-0.15822	0.00553
99	1998	35928	C	0.36164	-0.04642	0.00319
99	1998	35976	C	0.49315	-0.14916	0.00150
99	1998	35976	M	0.49315	-0.14916	0.00129
99	1998	35976	C	0.49315	-0.03581	0.00243
99	1998	35976	M	0.49315	-0.03581	0.00249
99	1998	36061	C	0.72603	-0.09323	0.00820
99	1998	36061	M	0.72603	-0.09323	0.00362
99	1998	36061	C	0.72603	-0.00223	0.00524
99	1998	36061	M	0.72603	-0.00223	0.00110
99	2000	36735	C	2.57260	0.00871	0.02780
99	2000	36735	M	2.57260	0.00871	0.01022
99	2001	37007	C	3.31781	0.21179	0.02194
99	2001	37007	M	3.31781	0.21179	0.00872
99	2002	37385	C	4.35342	0.16226	0.02045
99	2002	37385	M	4.35342	0.16226	0.02548
100	1998	35942	C	0.40000	-0.14704	0.00833
100	1998	35942	C	0.40000	-0.10075	0.00595
100	1998	35942	M	0.40000	-0.14704	0.00128
100	1998	35942	M	0.40000	-0.10075	-0.00037
100	1998	35970	C	0.47671	-0.10249	0.00307
100	1998	35970	M	0.47671	-0.10249	0.00011
100	1998	36033	C	0.64932	-0.01095	0.00939
100	1998	36033	C	0.64932	0.02957	0.01166
100	1998	36033	M	0.64932	-0.01095	0.00238
100	1998	36033	M	0.64932	0.02957	0.00253
100	2000	36643	C	2.32055	-0.07923	0.00323
100	2000	36643	M	2.32055	-0.07923	-0.00429
100	2000	36749	C	2.61096	-0.07329	0.00580
100	2000	36749	M	2.61096	-0.07329	-0.00629
100	2000	36782	C	2.70137	0.09532	0.02316
100	2000	36782	M	2.70137	0.09532	0.00601
100	2001	36998	C	3.29315	0.05817	0.01953

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
100	2001	36998	M	3.29315	0.05817	-0.00606
100	2001	37091	C	3.54795	0.10245	0.02010
100	2001	37091	M	3.54795	0.10245	0.01714
100	2001	37160	C	3.73699	0.13149	0.01499
100	2001	37160	M	3.73699	0.13149	0.02417
100	2002	37349	C	4.25479	0.09675	0.01870
100	2002	37349	M	4.25479	0.09675	0.01584
101	1998	35935	C	0.38082	0.02515	0.02832
101	1998	35935	M	0.38082	0.02515	0.01670
101	1998	35935	C	0.38082	0.02433	0.02355
101	1998	35935	M	0.38082	0.02433	0.00691
101	1998	35991	C	0.53425	0.03250	0.05229
101	1998	35991	M	0.53425	0.03250	0.04194
101	1998	35991	C	0.53425	0.03087	0.03691
101	1998	35991	M	0.53425	0.03087	0.02777
101	1998	36025	C	0.62740	0.09551	0.02848
101	1998	36025	M	0.62740	0.09551	0.01331
101	1998	36025	C	0.62740	0.09322	0.02434
101	1998	36025	M	0.62740	0.09322	0.00857
101	1999	36364	C	1.55616	-0.10686	0.01280
101	1999	36364	M	1.55616	-0.10686	0.01389
101	2000	36672	C	2.40000	-0.19472	0.04057
101	2000	36672	M	2.40000	-0.19472	0.02921
102	1998	35934	C	0.37808	-0.14907	0.00596
102	1998	35934	M	0.37808	-0.14907	-0.00742
102	1998	35934	C	0.37808	-0.07080	0.01115
102	1998	35934	M	0.37808	-0.07080	-0.00252
102	1998	35985	C	0.51781	0.03800	0.00311
102	1998	35985	C	0.51781	0.08683	0.00341
102	1998	36067	C	0.74247	0.03378	0.00196
102	1998	36067	C	0.74247	0.08107	0.00485
102	1999	36335	C	1.47671	-0.00448	0.00434
102	2000	36747	C	2.60548	0.06673	0.02597
102	2001	37105	C	3.58630	-0.09530	0.08997
102	2002	37420	C	4.44932	0.23311	0.03028
103	1998	35913	C	0.32055	0.01604	0.00541
103	1998	35913	P	0.32055	0.01604	-0.00950
103	1998	35913	C	0.32055	0.04786	0.00962
103	1998	35913	P	0.32055	0.04786	-0.00334
103	1998	35963	C	0.45753	-0.03188	0.00749
103	1998	35963	P	0.45753	-0.03188	0.01420
103	1998	35963	C	0.45753	0.02837	0.00555
103	1998	35963	P	0.45753	0.02837	0.01105
103	1998	36039	C	0.66575	-0.13043	0.00494
103	1998	36039	P	0.66575	-0.13043	0.00851
103	1998	36039	C	0.66575	-0.05099	0.00778
103	1998	36039	P	0.66575	-0.05099	0.00912
103	1999	36329	C	1.46027	-0.05825	0.04292
103	1999	36329	P	1.46027	-0.05825	0.01099

Table 11. Data used in the *diffQ* model.—Continued

[Date, number of days from January 1, 1900; C, Collins flowmeter; M, McCrometer flowmeter; P, Polysonic flowmeter; t, measurement time in fractional years (t=0 for Jan. 1, 1998); *w*, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffQ*, log portable flowmeter discharge minus log totalizing flowmeter discharge]

Site	Year	Date	Method	t	$w - \bar{\bar{w}}$	*diffQ*
103	2000	36693	C	2.45753	-0.03801	0.01779
103	2000	36693	P	2.45753	-0.03801	0.00269
103	2001	37062	C	3.46849	0.04804	-0.01949
103	2001	37062	P	3.46849	0.04804	-0.00194
103	2002	37413	C	4.43014	0.16925	-0.02553
103	2002	37413	P	4.43014	0.16925	-0.01449
104	1998	35922	C	0.34521	0.01289	0.03700
104	1998	35922	C	0.34521	0.02153	0.03401
104	1998	35922	M	0.34521	0.01289	-0.00576
104	1998	35922	M	0.34521	0.02153	-0.00615
104	1998	35964	C	0.46027	0.02306	0.02520
104	1998	35964	C	0.46027	0.02554	0.03187
104	1998	35964	M	0.46027	0.02306	0.00208
104	1998	35964	M	0.46027	0.02554	0.00122
104	1998	36021	C	0.61644	-0.02184	0.02159
104	1998	36021	C	0.61644	0.00222	0.02585
104	1998	36021	M	0.61644	-0.02184	0.00393
104	1998	36021	M	0.61644	0.00222	0.00669
104	1999	36334	C	1.47397	0.00883	0.04670
104	1999	36334	M	1.47397	0.00883	0.03870
104	2000	36649	C	2.33699	0.02478	0.11542
104	2000	36649	M	2.33699	0.02478	0.08602
104	2001	37013	C	3.33425	0.04478	0.09670
104	2001	37013	M	3.33425	0.04478	0.08976
104	2002	37379	C	4.33699	-0.14178	0.08415
104	2002	37379	M	4.33699	-0.14178	0.03749
105	1998	35927	C	0.35890	-0.08941	0.00760
105	1998	35927	C	0.35890	0.02271	0.00733
105	1998	35992	C	0.53699	-0.02501	0.00229
105	1998	35992	C	0.53699	0.04987	0.00827
105	1998	35992	C	0.53699	0.05310	0.01079
105	1998	36042	C	0.67397	-0.02709	0.00121
105	1998	36042	C	0.67397	0.05109	0.01464
105	1999	36335	C	1.47671	-0.08399	0.01023
105	2000	36649	C	2.33699	-0.07304	0.00588
105	2001	37064	C	3.47397	-0.01758	0.02653
105	2002	37492	C	4.64658	0.13933	-0.02307
106	1998	35955	C	0.43562	0.02125	0.04323
106	1998	36011	C	0.58904	0.00820	0.01157
106	1998	36055	C	0.70959	-0.03644	0.09346
106	1998	36055	C	0.70959	-0.02360	0.11021
106	2001	37162	C	3.74247	-0.14023	0.08767
106	2002	37372	C	4.31781	0.17082	-0.03938

Table 12. Data used in the *diffC* model.

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; w, log of pumping water level at time of measurement; $\overline{\overline{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \overline{\overline{w}}$	*diffC*
1	1998	35950	C	O	0.42192	-0.02363	4.29552
1	1998	35950	P	O	0.42192	-0.02363	4.34003
1	1998	35989	C	O	0.52877	-0.01599	4.33690
1	1998	35989	M	O	0.52877	-0.01599	4.38402
1	1998	35989	P	O	0.52877	-0.01599	4.39679
1	1998	36026	C	O	0.63014	-0.06564	4.36080
1	1998	36026	M	O	0.63014	-0.06564	4.36881
1	1998	36026	P	O	0.63014	-0.06564	4.40550
1	1999	36343	C	O	1.49863	-0.09143	4.30325
1	1999	36343	P	O	1.49863	-0.09143	4.33060
1	1999	36369	C	O	1.56986	-0.18524	4.27486
1	1999	36369	P	O	1.56986	-0.18524	4.28675
1	1999	36397	C	O	1.64658	-0.22624	4.37990
1	1999	36397	P	O	1.64658	-0.22624	4.38502
1	2000	36650	C	O	2.33973	0.01132	4.34847
1	2000	36650	P	O	2.33973	0.01132	4.37626
1	2000	36727	C	O	2.55068	-0.02992	4.29292
1	2000	36727	P	O	2.55068	-0.02992	4.33218
1	2000	36752	C	O	2.61918	-0.06564	4.29388
1	2000	36752	P	O	2.61918	-0.06564	4.32387
1	2001	36990	C	O	3.27123	0.18406	4.44817
1	2001	36990	P	O	3.27123	0.18406	4.45353
1	2001	37084	C	O	3.52877	0.01468	4.29620
1	2001	37084	P	O	3.52877	0.01468	4.31669
1	2001	37111	C	O	3.60274	0.05255	4.35234
1	2001	37111	P	O	3.60274	0.05255	4.37122
1	2002	37351	C	O	4.26027	0.20369	4.41316
1	2002	37351	P	O	4.26027	0.20369	4.43450
1	2002	37449	C	O	4.52877	0.14653	4.41546
1	2002	37449	P	O	4.52877	0.14653	4.44159
1	2002	37476	C	O	4.60274	0.13172	4.35221
1	2002	37476	P	O	4.60274	0.13172	4.38627
2	1998	35936	C	CL	0.38356	0.01061	4.34316
2	1998	35936	P	CL	0.38356	0.01061	4.34329
2	1998	36048	C	CL	0.69041	0.04031	4.37185
2	1998	36048	P	CL	0.69041	0.04031	4.39753
2	1998	36052	C	CL	0.70137	0.03215	4.38015
2	1998	36052	P	CL	0.70137	0.03215	4.40757
2	1999	36342	C	CH	1.49589	-0.10843	4.42041
2	1999	36342	P	CH	1.49589	-0.10843	4.42819
2	1999	36348	C	CL	1.51233	-0.02694	4.35799
2	1999	36348	P	CL	1.51233	-0.02694	4.38652
2	2000	36692	C	CL	2.45479	-0.03567	4.38875
2	2000	36692	P	CL	2.45479	-0.03567	4.32440
2	2001	37062	C	CH	3.46849	-0.07139	4.57523
2	2001	37062	P	CH	3.46849	-0.07139	4.54849
2	2001	37082	C	CL	3.52329	0.00725	4.49881

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
2	2001	37082	P	CL	3.52329	0.00725	4.49491
2	2001	37123	C	CL	3.63562	0.05644	4.40550
2	2001	37123	P	CL	3.63562	0.05644	4.38701
2	2002	37337	C	CH	4.22192	0.09566	4.35581
2	2002	37337	P	CH	4.22192	0.09566	4.43876
3	1998	35975	C	O	0.49041	-0.02272	4.28428
3	1998	35975	P	O	0.49041	-0.02272	4.27889
3	1998	36000	C	O	0.55890	-0.02133	4.27986
3	1998	36000	P	O	0.55890	-0.02133	4.36919
3	1998	36053	C	O	0.70411	-0.15208	4.38078
3	1998	36053	P	O	0.70411	-0.15208	4.42831
3	1999	36348	C	O	1.51233	-0.06984	4.23873
3	1999	36348	P	O	1.51233	-0.06984	4.35978
3	1999	36367	C	O	1.56438	-0.11776	4.20185
3	1999	36367	P	O	1.56438	-0.11776	4.16309
3	1999	36395	C	O	1.64110	-0.09952	4.23584
3	1999	36395	P	O	1.64110	-0.09952	4.33768
3	2000	36699	C	O	2.47397	0.03552	4.24835
3	2000	36720	C	O	2.53151	0.04599	4.21257
3	2000	36720	P	O	2.53151	0.04599	4.23772
3	2000	36739	C	O	2.58356	0.03552	4.21464
3	2000	36739	P	O	2.58356	0.03552	4.42700
3	2001	36986	C	O	3.26027	0.12121	4.28331
3	2001	36986	P	O	3.26027	0.12121	4.25745
3	2001	37069	C	O	3.48767	0.03552	4.17285
3	2001	37069	P	O	3.48767	0.03552	4.36501
3	2001	37104	C	O	3.58356	0.01424	4.26718
3	2001	37104	P	O	3.58356	0.01424	4.38913
3	2002	37328	C	O	4.19726	0.08180	4.29238
3	2002	37448	C	O	4.52603	0.11150	4.38652
3	2002	37448	P	O	4.52603	0.11150	4.45493
3	2002	37449	C	O	4.52877	0.12121	4.35914
5	1998	35934	C	CH	0.37808	0.09478	5.29235
5	1998	35934	P	CH	0.37808	0.09478	5.56693
5	1998	35975	C	CH	0.49041	0.12019	5.43228
5	1998	35975	P	CH	0.49041	0.12019	5.50448
5	1998	36038	C	CH	0.66301	0.08128	5.54181
5	1998	36038	P	CH	0.66301	0.08128	5.58109
5	1998	36061	C	CH	0.72603	-0.25540	5.53521
5	1998	36061	P	CH	0.72603	-0.25540	5.59467
5	1999	36333	C	CH	1.47123	-0.05848	5.55721
5	1999	36333	P	CH	1.47123	-0.05848	5.62402
5	2001	37057	C	CL	3.45479	-0.26612	5.33590
5	2001	37057	P	CL	3.45479	-0.26612	5.43569
5	2002	37385	C	CH	4.35342	0.16467	5.45091
5	2002	37424	C	CL	4.46027	0.18936	5.44246
5	2002	37461	C	CL	4.56164	0.21346	5.45993
7	1998	35937	M	CL	0.38630	0.04206	5.09068

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; w, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \bar{\bar{w}}$	*diffC*
7	1998	35937	P	CL	0.38630	0.04206	5.07730
7	1998	35999	M	CL	0.55616	0.03677	4.89185
7	1998	35999	P	CL	0.55616	0.03677	4.92711
7	1998	36028	M	CL	0.63562	-0.03954	4.89672
7	1998	36028	P	CL	0.63562	-0.03954	4.88839
7	1999	36406	M	CL	1.67123	-0.13419	4.99002
7	1999	36406	P	CL	1.67123	-0.13419	5.00126
7	2000	36672	P	CH	2.40000	-0.00066	5.07060
7	2002	37573	M	CL	4.86849	0.19045	5.16901
8	1998	35905	P	L	0.29863	0.07138	4.32823
8	1998	35975	C	L	0.49041	-0.00070	4.24935
8	1998	35975	P	L	0.49041	-0.00070	4.29552
8	1998	36031	C	L	0.64384	-0.08278	4.24219
8	1998	36031	P	L	0.64384	-0.08278	4.27999
8	1999	36299	C	L	1.37808	-0.05916	4.23498
8	1999	36299	P	L	1.37808	-0.05916	4.30312
8	2000	36713	C	L	2.51233	-0.03969	4.31227
8	2000	36713	P	L	2.51233	-0.03969	4.38040
8	2002	37379	C	L	4.33699	0.14664	4.31602
8	2002	37379	P	L	4.33699	0.14664	4.43817
9	1999	36340	M	O	1.49041	0.00612	4.18449
9	1999	36340	P	O	1.49041	0.00612	4.20990
9	1999	36370	M	O	1.57260	-0.00076	4.19253
9	1999	36370	P	O	1.57260	-0.00076	4.20931
9	2000	36630	M	O	2.28493	-0.10996	4.18205
9	2000	36734	M	O	2.56986	-0.00421	4.18159
9	2000	36790	M	O	2.72329	0.01972	4.19855
9	2001	37063	M	O	3.47123	0.08510	4.27486
9	2001	37063	P	O	3.47123	0.08510	4.34055
11	1998	35947	M	O	0.41370	0.00193	4.44230
11	1998	35947	P	O	0.41370	0.00193	4.43699
11	1998	35998	M	O	0.55342	0.05854	4.46866
11	1998	35998	P	O	0.55342	0.05854	4.47881
11	1998	36020	M	O	0.61370	-0.01905	4.40988
11	1998	36020	P	O	0.61370	-0.01905	4.44898
11	1999	36355	M	O	1.53151	-0.03748	4.37977
11	2000	36698	M	O	2.47123	-0.07850	4.51086
11	2000	36698	P	O	2.47123	-0.07850	4.45481
11	2001	36993	M	O	3.27945	0.05581	4.44746
11	2001	36993	P	O	3.27945	0.05581	4.45841
12	1998	35935	M	O	0.38082	0.02188	4.21715
12	1998	35935	P	O	0.38082	0.02188	4.23816
12	1998	35982	M	O	0.50959	0.02847	4.22946
12	1998	35982	P	O	0.50959	0.02847	4.20335
12	1998	36014	M	O	0.59726	0.01809	4.19855
12	1998	36061	M	O	0.72603	-0.03952	4.26000
12	1999	36362	M	O	1.55068	-0.05828	4.19540
12	1999	36362	P	O	1.55068	-0.05828	4.23004

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
12	2000	36630	M	O	2.28493	-0.05982	4.23859
12	2000	36630	P	O	2.28493	-0.05982	4.27986
12	2001	37025	M	O	3.36712	0.05167	4.23004
12	2001	37082	M	O	3.52329	0.10526	4.27875
14	1998	35944	C	L	0.40548	-0.02562	4.13308
14	1998	35944	P	L	0.40548	-0.02562	4.13724
14	1998	35975	C	L	0.49041	-0.01164	4.14313
14	1998	35975	P	L	0.49041	-0.01164	4.13804
14	1998	36055	C	L	0.70959	0.00387	4.17331
14	1998	36055	P	L	0.70959	0.00387	4.16868
14	1999	36348	C	L	1.51233	-0.05420	4.14504
14	1999	36348	P	L	1.51233	-0.05420	4.15135
14	1999	36406	C	L	1.67123	-0.03981	4.17022
14	1999	36406	P	L	1.67123	-0.03981	4.17531
14	1999	36447	C	L	1.78356	0.00215	4.21079
14	1999	36447	P	L	1.78356	0.00215	4.23135
14	2000	36648	C	L	2.33425	0.05029	4.28138
14	2000	36648	P	L	2.33425	0.05029	4.33912
14	2000	36733	C	L	2.56712	0.03583	4.28110
14	2000	36733	P	L	2.56712	0.03583	4.31655
14	2000	36768	C	L	2.66301	0.03913	4.27096
14	2000	36768	P	L	2.66301	0.03913	4.31388
15	1998	35948	M	O	0.41644	0.04543	4.55682
15	1998	35948	P	O	0.41644	0.04543	4.56226
15	1998	35968	C	O	0.47123	0.05384	4.52092
15	1998	35968	M	O	0.47123	0.05384	4.52504
15	1998	36006	C	O	0.57534	0.01803	4.52797
15	1998	36006	M	O	0.57534	0.01803	4.53120
15	1999	36335	C	O	1.47671	-0.09429	4.51009
15	1999	36335	M	O	1.47671	-0.09429	4.51119
15	1999	36335	P	O	1.47671	-0.09429	4.53946
15	1999	36384	C	O	1.61096	-0.00302	4.49312
15	1999	36384	M	O	1.61096	-0.00302	4.50247
15	1999	36432	C	O	1.74247	-0.10366	4.46338
15	1999	36432	M	O	1.74247	-0.10366	4.46820
15	1999	36432	P	O	1.74247	-0.10366	4.47688
15	2000	36636	C	O	2.30137	-0.02127	4.52027
15	2000	36636	M	O	2.30137	-0.02127	4.53860
15	2000	36636	P	O	2.30137	-0.02127	4.54913
15	2000	36706	C	O	2.49315	-0.06143	4.48323
15	2000	36706	M	O	2.49315	-0.06143	4.52103
15	2000	36749	C	O	2.61096	0.02495	4.57574
15	2000	36749	M	O	2.61096	0.02495	4.57975
15	2001	37007	C	O	3.31781	-0.02091	4.58016
15	2001	37007	M	O	3.31781	-0.02091	4.59451
15	2001	37069	C	O	3.48767	0.01803	4.61175
15	2001	37069	M	O	3.48767	0.01803	4.63240
15	2001	37118	C	O	3.62192	0.10128	4.62536

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \overline{\overline{w}}$	*diffC*
15	2001	37118	M	O	3.62192	0.10128	4.62124
16	1998	35936	C	CH	0.38356	-0.02336	4.27792
16	1998	35936	P	CH	0.38356	-0.02336	4.27555
16	1998	35942	C	CL	0.40000	0.02879	4.30596
16	1998	35942	P	CL	0.40000	0.02879	4.31789
16	1998	35982	C	CL	0.50959	-0.10787	4.21316
16	1998	35982	P	CL	0.50959	-0.10787	4.22523
16	1998	36017	C	CL	0.60548	-0.06899	4.23454
16	1998	36017	P	CL	0.60548	-0.06899	4.26437
16	1998	36056	C	CH	0.71233	-0.03872	4.25972
16	1998	36056	P	CH	0.71233	-0.03872	4.26395
16	1999	36321	C	CL	1.43836	-0.02336	4.27764
16	1999	36321	P	CL	1.43836	-0.02336	4.28703
16	1999	36357	C	CH	1.53699	-0.12501	4.22654
16	1999	36357	P	CH	1.53699	-0.12501	4.23801
16	2001	37097	C	CL	3.56438	0.10878	4.33402
16	2001	37097	P	CL	3.56438	0.10878	4.36526
16	2001	37158	C	CL	3.73151	0.11850	4.35837
16	2001	37158	P	CL	3.73151	0.11850	4.40379
16	2002	37390	C	CL	4.36712	0.26246	4.53131
18	1998	35947	P	L	0.41370	-0.06630	4.07550
18	1998	35986	C	L	0.52055	-0.06749	4.13884
18	1998	35986	P	L	0.52055	-0.06749	4.15732
18	1998	36020	C	L	0.61370	-0.11308	4.13035
18	1998	36020	P	L	0.61370	-0.11308	4.15072
18	1999	36314	C	L	1.41918	-0.08186	4.16604
18	1999	36314	P	L	1.41918	-0.08186	4.19765
18	2000	36665	C	L	2.38082	-0.02845	4.17884
18	2000	36665	P	L	2.38082	-0.02845	4.24792
18	2000	36713	C	L	2.51233	-0.02960	4.16589
18	2000	36713	P	L	2.51233	-0.02960	4.23671
18	2000	36791	C	L	2.72603	-0.02276	4.21464
18	2000	36791	P	L	2.72603	-0.02276	4.33310
18	2002	37375	C	L	4.32603	0.14909	4.24061
18	2002	37375	P	L	4.32603	0.14909	4.28552
18	2002	37522	C	L	4.72877	0.22729	4.30474
18	2002	37522	P	L	4.72877	0.22729	4.33060
19	1998	35964	C	CH	0.46027	-0.08529	4.28041
19	1998	35964	P	CH	0.46027	-0.08529	4.33677
19	1998	35999	C	CH	0.55616	0.03457	4.34329
19	1998	36038	C	CH	0.66301	-0.03516	4.32347
19	1998	36038	P	CH	0.66301	-0.03516	4.39568
19	1999	36334	C	CH	1.47397	-0.09232	4.30528
19	1999	36334	P	CH	1.47397	-0.09232	4.31268
19	2000	36643	C	CH	2.32055	0.07020	4.38751
19	2000	36643	P	CH	2.32055	0.07020	4.44699
19	2000	36732	C	CL	2.56438	0.07020	4.32810
19	2000	36732	P	CL	2.56438	0.07020	4.39876

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\bar{\bar{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \bar{\bar{W}}$	*diffC*
19	2001	36997	C	CH	3.29041	0.05509	4.42209
19	2001	36997	P	CH	3.29041	0.05509	4.46303
20	1998	35920	M	O	0.33973	-0.04169	4.27221
20	1998	35920	P	O	0.33973	-0.04169	4.25377
20	1998	36020	M	O	0.61370	-0.01976	4.12600
20	1998	36053	M	O	0.70411	-0.04710	4.18753
20	1998	36053	P	O	0.70411	-0.04710	4.18068
20	1999	36426	M	O	1.72603	-0.10411	4.04970
20	1999	36426	P	O	1.72603	-0.10411	4.06130
20	2000	36756	M	O	2.63014	-0.00695	4.08480
20	2000	36756	P	O	2.63014	-0.00695	4.10016
20	2001	37027	M	O	3.37260	0.08794	4.09551
20	2001	37027	P	O	3.37260	0.08794	4.08900
20	2002	37511	M	O	4.69863	0.24359	4.26732
22	1999	36361	C	L	1.54795	-0.03992	4.70664
22	1999	36361	P	L	1.54795	-0.03992	4.69098
22	1999	36406	C	L	1.67123	0.09770	4.51612
22	1999	36406	P	L	1.67123	0.09770	4.46717
22	2000	36664	P	L	2.37808	0.04891	4.63754
22	2000	36754	P	L	2.62466	0.10953	4.56205
22	2001	37008	C	L	3.32055	-0.13141	4.74710
22	2001	37084	C	L	3.52877	-0.11951	4.68822
22	2001	37159	C	L	3.73425	-0.11361	4.68721
22	2002	37396	C	L	4.38356	0.04891	4.47152
22	2002	37524	C	L	4.73425	-0.00238	4.52418
23	1998	35941	C	O	0.39726	-0.05709	4.48515
23	1998	35972	C	O	0.48219	0.07142	4.51064
23	1998	36013	C	O	0.59452	0.07576	4.47881
23	1998	36013	P	O	0.59452	0.07576	4.55230
23	1998	36056	C	O	0.71233	-0.01053	4.47927
23	1999	36426	C	O	1.72603	0.01907	4.49669
23	1999	36426	P	O	1.72603	0.01907	4.54361
23	1999	36447	C	O	1.78356	-0.00284	4.49312
23	1999	36447	P	O	1.78356	-0.00284	4.52407
23	2000	36651	C	O	2.34247	-0.02785	4.48119
23	2000	36651	P	O	2.34247	-0.02785	4.62850
23	2000	36713	C	O	2.51233	0.00649	4.51896
23	2000	36746	C	O	2.60274	0.02032	4.50014
23	2001	37008	C	O	3.32055	-0.06794	4.67330
23	2002	37476	C	O	4.60274	-0.09093	4.60247
24	1998	35913	C	O	0.32055	-0.02585	4.95997
24	1998	35913	P	O	0.32055	-0.02585	5.01330
24	1998	35991	C	O	0.53425	-0.02816	4.95484
24	1998	35991	P	O	0.53425	-0.02816	5.03747
24	1998	36040	C	O	0.66849	-0.07419	4.87252
24	1998	36040	P	O	0.66849	-0.07419	4.97120
24	1999	36369	C	O	1.56986	-0.03590	4.96284
24	1999	36369	P	O	1.56986	-0.03590	5.07517

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; w, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \bar{\bar{w}}$	*diffC*
24	2001	37082	C	O	3.52329	0.05327	5.05625
24	2001	37082	P	O	3.52329	0.05327	5.11704
24	2002	37449	C	O	4.52877	0.11082	5.17083
24	2002	37449	P	O	4.52877	0.11082	5.24005
25	1998	35927	C	O	0.35890	0.07035	4.47666
25	1998	35978	C	O	0.49863	0.01317	4.47938
25	1998	35978	M	O	0.49863	0.01317	4.51568
25	1998	35978	P	O	0.49863	0.01317	4.51152
25	1998	36017	C	O	0.60548	-0.06006	4.44077
25	1998	36017	M	O	0.60548	-0.06006	4.49758
25	1998	36017	P	O	0.60548	-0.06006	4.47643
25	1999	36381	C	O	1.60274	-0.07009	4.41824
25	1999	36381	P	O	1.60274	-0.07009	4.49032
25	2000	36678	C	O	2.41644	0.04338	4.35183
25	2000	36678	M	O	2.41644	0.04338	4.54881
25	2000	36678	P	O	2.41644	0.04338	4.45027
25	2000	36713	C	O	2.51233	0.02944	4.42700
25	2000	36713	M	O	2.51233	0.02944	4.70275
25	2000	36713	P	O	2.51233	0.02944	4.56529
25	2000	36734	C	O	2.56986	-0.00265	4.51360
25	2000	36734	M	O	2.56986	-0.00265	4.59714
25	2000	36734	P	O	2.56986	-0.00265	4.57440
27	1998	36055	P	L	0.70959	-0.15313	4.19449
27	1999	36335	P	L	1.47671	-0.01271	4.26788
27	2000	36650	P	L	2.33973	0.03482	4.35786
27	2001	37005	P	L	3.31233	0.16053	4.45411
27	2001	37104	P	L	3.58356	-0.02951	4.26591
28	1998	35963	C	CH	0.45753	-0.06754	4.76814
28	1998	35963	M	CH	0.45753	-0.06754	4.78516
28	1998	36003	C	CH	0.56712	-0.05385	4.73708
28	1998	36003	M	CH	0.56712	-0.05385	4.74023
28	1998	36038	C	CH	0.66301	-0.04258	4.74528
28	1998	36038	M	CH	0.66301	-0.04258	4.73576
28	2000	36658	C	CL	2.36164	0.01913	4.75083
28	2000	36658	M	CL	2.36164	0.01913	4.72633
28	2000	36732	C	CH	2.56438	0.00555	4.73602
28	2000	36732	M	CH	2.56438	0.00555	4.70782
28	2000	36763	C	CH	2.64932	0.06162	4.76192
28	2000	36763	M	CH	2.64932	0.06162	4.71555
28	2001	37047	C	CH	3.42740	-0.00475	4.73778
28	2001	37047	M	CH	3.42740	-0.00475	4.69281
28	2001	37089	C	CH	3.54247	0.02375	4.73171
28	2001	37089	M	CH	3.54247	0.02375	4.72082
28	2001	37141	C	CH	3.68493	0.02668	4.78156
28	2002	37375	C	CH	4.32603	0.04533	4.77221
28	2002	37375	M	CH	4.32603	0.04533	4.73383
29	1998	35912	M	O	0.31781	-0.16760	4.18525
29	1998	35912	P	O	0.31781	-0.16760	4.20812

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
29	1998	35990	M	O	0.53151	-0.10960	4.12520
29	1998	35990	P	O	0.53151	-0.10960	4.15009
29	1998	35990	P	O	0.53151	-0.10960	4.13308
29	1998	36047	M	O	0.68767	0.14723	4.29292
29	1998	36047	P	O	0.68767	0.14723	4.33598
29	1999	36356	M	O	1.53425	-0.01479	4.30082
29	1999	36356	P	O	1.53425	-0.01479	4.33781
29	1999	36356	P	O	1.53425	0.00314	4.29932
29	2000	36755	M	O	2.62740	0.01881	4.30312
29	2000	36755	P	O	2.62740	0.01881	4.36157
29	2002	37326	M	O	4.19178	0.35833	4.48345
30	1998	35913	C	O	0.32055	0.09673	4.48807
30	1998	35913	M	O	0.32055	0.09673	4.52179
30	1998	35971	C	O	0.47945	-0.09114	4.53120
30	1998	35971	M	O	0.47945	-0.09114	4.53206
30	1998	36041	C	O	0.67123	0.12030	4.50147
30	1998	36041	M	O	0.67123	0.12030	4.50899
30	1999	36425	C	O	1.72329	-0.13057	4.50976
30	1999	36425	M	O	1.72329	-0.13057	4.49770
30	2000	36699	C	O	2.47397	-0.15723	4.53131
30	2000	36699	M	O	2.47397	-0.15723	4.52081
30	2001	37112	C	O	3.60548	0.13200	4.51295
30	2001	37112	M	O	3.60548	0.13200	4.50965
30	2002	37379	C	O	4.33699	0.11322	4.53625
30	2002	37379	M	O	4.33699	0.11322	4.53496
30	2002	37531	M	O	4.75342	-0.16660	4.59219
32	1998	35893	M	O	0.26575	0.16886	4.71716
32	1998	35893	P	O	0.26575	0.16886	4.70818
32	1998	35977	M	O	0.49589	0.00925	4.65110
32	1998	35977	P	O	0.49589	0.00925	4.68859
32	1998	36026	M	O	0.63014	-0.02250	4.68684
32	1998	36026	P	O	0.63014	-0.02250	4.77719
32	1999	36333	M	O	1.47123	0.02283	4.65710
32	1999	36333	P	O	1.47123	0.02283	4.72482
32	1999	36370	M	O	1.57260	-0.10658	4.61779
32	1999	36370	P	O	1.57260	-0.10658	4.68176
32	1999	36399	M	O	1.65205	-0.11982	4.62104
32	1999	36399	P	O	1.65205	-0.11982	4.65719
32	2000	36690	M	O	2.44932	-0.01047	4.66674
32	2000	36690	P	O	2.44932	-0.01047	4.72108
32	2000	36720	M	O	2.53151	-0.11097	4.62566
32	2000	36720	P	O	2.53151	-0.11097	4.72233
32	2000	36747	M	O	2.60548	-0.06786	4.63259
32	2000	36747	P	O	2.60548	-0.06786	4.70483
32	2001	37064	M	O	3.47397	0.02090	4.64526
32	2001	37064	P	O	3.47397	0.02090	4.68675
32	2001	37111	M	O	3.60274	0.07355	4.66400
32	2001	37111	P	O	3.60274	0.07355	4.75273

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\bar{\bar{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \bar{\bar{W}}$	*diffC*
32	2002	37455	M	O	4.54521	0.28564	4.71805
34	1998	35902	M	O	0.29041	0.09768	4.14298
34	1998	35902	P	O	0.29041	0.09768	4.13852
34	1998	35989	C	O	0.52877	-0.02368	4.05508
34	1998	35989	P	O	0.52877	-0.02368	4.07889
34	1998	36026	C	O	0.63014	-0.06604	4.02642
34	1998	36026	P	O	0.63014	-0.06604	4.07363
34	1999	36368	C	O	1.56712	-0.14089	3.98453
34	1999	36368	M	O	1.56712	-0.15130	4.02482
34	1999	36368	P	O	1.56712	-0.14089	4.02909
34	2000	36690	C	O	2.44932	-0.02368	4.10890
34	2000	36690	M	O	2.44932	-0.02368	4.08614
34	2000	36690	P	O	2.44932	-0.02368	4.23772
34	2000	36752	C	O	2.61918	-0.08301	4.08312
34	2000	36752	M	O	2.61918	-0.08301	4.07108
34	2000	36752	P	O	2.61918	-0.08301	4.15418
34	2001	36983	C	O	3.25205	0.10581	4.16620
34	2001	36983	P	O	3.25205	0.10581	4.15935
34	2001	37083	C	O	3.52603	0.00807	4.09867
34	2001	37083	P	O	3.52603	0.00807	4.11855
34	2001	37111	C	O	3.60274	0.04703	4.11071
34	2002	37445	C	O	4.51781	0.23121	4.28207
34	2002	37445	P	O	4.51781	0.23121	4.39679
35	1998	35920	P	O	0.33973	0.04177	5.45797
35	1998	35970	P	O	0.47671	0.00429	5.28877
35	1998	36048	P	O	0.69041	-0.03999	5.44294
35	1999	36333	P	O	1.47123	0.00153	5.46802
35	2000	36692	P	O	2.45479	-0.00759	5.37268
36	1998	35915	M	O	0.32603	-0.06501	4.62094
36	1998	35915	P	O	0.32603	-0.06501	4.66692
36	1998	35985	M	O	0.51781	-0.08436	4.62918
36	1998	35985	P	O	0.51781	-0.08436	4.59976
36	1998	36054	M	O	0.70685	0.06045	4.66542
36	1999	36339	M	O	1.48767	-0.03890	4.62134
36	1999	36339	P	O	1.48767	-0.03890	4.52537
36	2000	36733	M	O	2.56712	-0.02565	4.65224
36	2000	36733	P	O	2.56712	-0.02565	4.66098
36	2001	37110	M	O	3.60000	0.10568	4.64813
37	1998	35915	M	O	0.32603	0.05905	4.18556
37	1998	35915	P	O	0.32603	0.05905	4.19056
37	1998	35977	C	O	0.49589	-0.01746	4.17669
37	1998	35977	M	O	0.49589	-0.01746	4.14836
37	1998	35977	P	O	0.49589	-0.01746	4.17084
37	1998	36035	C	O	0.65479	-0.06359	4.26409
37	1998	36035	M	O	0.65479	-0.06359	4.20604
37	1998	36035	P	O	0.65479	-0.06359	4.24176
37	1999	36395	C	O	1.64110	-0.08090	4.11660
37	1999	36395	M	O	1.64110	-0.08090	4.06285

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \overline{\overline{w}}$	*diffC*
37	1999	36395	P	O	1.64110	-0.08090	4.11562
37	2001	37134	C	O	3.66575	0.04220	4.13068
37	2001	37134	M	O	3.66575	0.04220	4.14867
37	2001	37134	P	O	3.66575	0.04220	4.16899
37	2002	37483	C	O	4.62192	0.24112	4.24792
38	1998	35892	M	O	0.26301	-0.09670	4.89133
38	1998	35892	P	O	0.26301	-0.09670	4.84796
38	1998	35977	M	O	0.49589	-0.00884	4.57430
38	1998	35977	P	O	0.49589	-0.00884	4.53249
38	1998	36021	M	O	0.61644	0.01168	4.54404
38	1998	36021	P	O	0.61644	0.01168	4.49558
38	1999	36341	M	O	1.49315	-0.04791	4.52233
38	1999	36341	P	O	1.49315	-0.04791	4.50524
38	1999	36370	M	O	1.57260	-0.03126	4.57492
38	1999	36370	P	O	1.57260	-0.03126	4.53539
38	1999	36395	M	O	1.64110	-0.05294	4.71295
38	1999	36395	P	O	1.64110	-0.05294	4.67367
38	2000	36641	M	O	2.31507	0.00338	4.77845
38	2000	36641	P	O	2.31507	0.00338	4.77068
38	2000	36719	M	O	2.52877	0.03155	4.70121
38	2000	36719	P	O	2.52877	0.02737	4.66108
38	2000	36742	M	O	2.59178	0.02225	4.71680
38	2000	36742	P	O	2.59178	0.02225	4.70375
38	2001	37012	M	O	3.33151	0.05827	4.83953
38	2001	37012	P	O	3.33151	0.05827	4.81267
38	2001	37104	M	O	3.58356	0.00100	4.73646
38	2001	37104	P	O	3.58356	0.00100	4.70175
38	2002	37350	M	O	4.25753	0.06120	4.87893
38	2002	37350	P	O	4.25753	0.06120	4.84143
38	2002	37483	P	O	4.62192	0.10085	5.03533
39	1998	36021	C	CH	0.61644	-0.03945	4.63279
39	1998	36021	P	CH	0.61644	-0.03945	4.68951
39	1998	36028	C	CH	0.63562	-0.04032	4.65615
39	1998	36028	P	CH	0.63562	-0.04032	4.68333
39	1999	36341	C	CL	1.49315	-0.07095	4.66843
39	1999	36341	P	CL	1.49315	-0.07095	4.69346
39	1999	36367	C	CL	1.56438	-0.03602	4.65947
39	1999	36367	P	CL	1.56438	-0.03602	4.71070
39	1999	36433	C	CL	1.74521	-0.04118	4.63084
39	1999	36433	P	CL	1.74521	-0.04118	4.67460
39	2001	37104	C	CL	3.58356	0.08890	4.70366
39	2001	37153	C	CL	3.71781	0.07363	4.69602
39	2002	37326	C	CL	4.19178	0.10020	4.61453
39	2002	37526	C	CL	4.73973	0.19312	4.74988
40	1998	35919	M	O	0.33699	0.00004	4.58129
40	1998	35919	P	O	0.33699	0.00004	4.55093
40	1998	35944	M	O	0.40548	-0.04793	4.52537
40	1998	35944	P	O	0.40548	-0.04793	4.51896

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
40	1998	36010	M	O	0.58630	0.00559	4.79876
40	1998	36010	P	O	0.58630	0.00559	4.78632
40	1999	36341	M	O	1.49315	-0.02753	4.49111
40	1999	36341	P	O	1.49315	-0.02753	4.57027
40	2000	36649	M	O	2.33699	-0.01083	4.66174
40	2000	36719	M	O	2.52877	0.03132	4.53935
40	2000	36719	P	O	2.52877	0.03132	4.53571
40	2000	36740	M	O	2.58630	0.04393	4.72446
40	2000	36740	P	O	2.58630	0.04393	4.69034
41	1998	35915	M	O	0.32603	0.03835	4.33336
41	1998	35915	P	O	0.32603	0.03835	4.35812
41	1998	36011	C	O	0.58904	0.06942	4.28634
41	1998	36011	C	O	0.58904	0.06942	4.26872
41	1998	36011	M	O	0.58904	0.06942	4.36628
41	1998	36011	P	O	0.58904	0.06942	4.39334
41	1999	36336	C	O	1.47945	-0.32145	4.29633
41	1999	36336	C	O	1.47945	-0.32145	4.28524
41	1999	36336	M	O	1.47945	-0.32145	4.35170
41	2000	36656	C	O	2.35616	0.06055	4.31589
41	2000	36656	C	O	2.35616	0.06055	4.30474
41	2000	36656	M	O	2.35616	0.06055	4.37134
41	2000	36656	P	O	2.35616	0.06055	4.44559
41	2000	36740	C	O	2.58630	0.09267	4.34653
41	2000	36740	M	O	2.58630	0.09267	4.39679
41	2000	36763	C	O	2.64932	0.04259	4.31655
41	2000	36763	M	O	2.64932	0.04259	4.36195
41	2001	37070	C	O	3.49041	0.04861	4.31842
41	2001	37070	M	O	3.49041	0.04861	4.37563
43	1998	35958	C	O	0.44384	-0.02180	4.98839
43	1998	35958	M	O	0.44384	-0.02180	4.97328
43	1998	35958	P	O	0.44384	-0.02180	4.98784
43	1998	36003	C	O	0.56712	-0.03317	5.00005
43	1998	36003	M	O	0.56712	-0.03317	4.97625
43	1998	36003	P	O	0.56712	-0.03317	5.03096
43	1998	36053	C	O	0.70411	-0.08242	5.00990
43	1998	36053	M	O	0.70411	-0.08242	4.97611
43	1999	36336	C	O	1.47945	0.02462	4.97508
43	1999	36336	P	O	1.47945	0.02462	5.01297
43	1999	36399	C	O	1.65205	-0.02861	4.98463
43	1999	36399	M	O	1.65205	-0.02861	4.97618
43	1999	36399	P	O	1.65205	-0.02861	4.99681
43	2000	36657	C	O	2.35890	0.04175	5.00133
43	2000	36657	M	O	2.35890	0.04175	5.02513
43	2000	36657	P	O	2.35890	0.04175	5.01144
43	2000	36720	C	O	2.53151	0.00938	4.99566
43	2000	36720	M	O	2.53151	0.00938	5.01057
43	2000	36720	P	O	2.53151	0.00938	5.06386
43	2000	36747	C	O	2.60548	-0.09208	4.98189

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \bar{\bar{w}}$	*diffC*
43	2000	36747	M	O	2.60548	-0.09208	4.99910
43	2000	36747	P	O	2.60548	-0.09208	5.06796
43	2001	36984	C	O	3.25479	-0.09695	5.02474
43	2001	36984	M	O	3.25479	-0.09695	5.05981
43	2001	36984	P	O	3.25479	-0.09695	5.20010
43	2001	37103	C	O	3.58082	0.04387	5.00173
43	2001	37103	M	O	3.58082	0.04387	5.03494
43	2001	37103	P	O	3.58082	0.04387	5.04355
43	2002	37419	C	O	4.44658	0.11343	5.00267
43	2002	37419	M	O	4.44658	0.11343	5.06006
43	2002	37419	P	O	4.44658	0.11343	5.11494
43	2002	37526	C	O	4.73973	0.15409	4.96766
43	2002	37526	M	O	4.73973	0.15409	4.99362
44	1998	35906	C	S	0.30137	-0.01602	5.73773
44	1998	35906	P	S	0.30137	-0.01602	5.80006
44	1998	35957	C	S	0.44110	-0.00808	5.81006
44	1998	35957	P	S	0.44110	-0.00808	5.85045
44	1998	36047	C	S	0.68767	-0.05253	5.77007
44	1998	36047	P	S	0.68767	-0.05253	5.76309
44	1999	36389	C	S	1.62466	-0.07764	5.77641
44	1999	36389	P	S	1.62466	-0.07764	5.79915
44	2000	36691	C	S	2.45205	-0.05584	5.78000
44	2000	36691	P	S	2.45205	-0.05584	5.79240
44	2000	36719	C	S	2.52877	0.07530	5.75397
44	2000	36719	P	S	2.52877	0.07530	5.82044
44	2000	36740	C	S	2.58630	0.04203	5.72896
44	2000	36740	P	S	2.58630	0.04203	5.82777
44	2001	37012	C	S	3.33151	0.05695	5.46018
44	2001	37012	P	S	3.33151	0.05695	5.55906
44	2001	37110	P	S	3.60000	0.07166	5.78383
45	1998	35899	C	S	0.28219	-0.02076	5.29907
45	1998	35899	P	S	0.28219	-0.02076	5.33499
45	1998	35942	C	S	0.40000	0.03578	5.25301
45	1998	35942	P	S	0.40000	0.03578	5.29576
45	1998	36054	P	S	0.70685	0.05475	5.30121
45	1999	36370	P	S	1.57260	-0.04056	5.33836
45	2000	36692	P	S	2.45479	-0.02011	5.35034
45	2000	36720	P	S	2.53151	0.02397	5.30529
45	2000	36755	P	S	2.62740	0.01076	5.26502
45	2001	37012	P	S	3.33151	0.00505	5.30465
45	2001	37063	P	S	3.47123	-0.04056	5.31281
45	2001	37153	P	S	3.71781	-0.00777	5.31197
45	2002	37418	P	S	4.44384	-0.00777	5.26093
45	2002	37418	P	S	4.44384	-0.00777	5.26093
46	1998	35892	C	O	0.26301	0.06632	4.32863
46	1998	35892	M	O	0.26301	0.06632	4.31442
46	1998	35892	P	O	0.26301	0.06632	4.37311
46	1998	35915	C	O	0.32603	0.07498	4.31402

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
46	1998	35915	M	O	0.32603	0.07498	4.30555
46	1998	36000	C	O	0.55890	-0.01209	4.24406
46	1998	36000	M	O	0.55890	-0.01209	4.23801
46	1998	36038	C	O	0.66301	-0.02902	4.27569
46	1998	36038	M	O	0.66301	-0.02902	4.26521
46	1999	36241	C	O	1.21918	0.06353	4.32267
46	1999	36241	M	O	1.21918	0.06353	4.33047
46	2000	36683	C	O	2.43014	-0.33775	4.26956
46	2000	36683	M	O	2.43014	-0.33775	4.30298
46	2000	36683	P	O	2.43014	-0.33775	4.35260
46	2000	36734	C	O	2.56986	0.01245	4.21346
46	2000	36734	M	O	2.56986	0.01245	4.26099
46	2000	36734	P	O	2.56986	0.01245	4.30000
46	2000	36777	C	O	2.68767	0.00851	4.25689
46	2000	36777	M	O	2.68767	0.00851	4.26872
46	2001	36991	C	O	3.27397	0.12771	4.25320
46	2001	36991	M	O	3.27397	0.12771	4.27249
46	2001	36991	P	O	3.27397	0.12771	4.28221
46	2001	37048	C	O	3.43014	0.01376	4.27151
46	2001	37048	M	O	3.43014	0.01376	4.27123
46	2001	37048	P	O	3.43014	0.01376	4.27375
46	2002	37335	C	O	4.21644	0.07035	4.29060
46	2002	37335	M	O	4.21644	0.07035	4.29101
47	1998	35951	M	O	0.42466	0.00930	4.55860
47	1998	35951	P	O	0.42466	0.00930	4.61026
47	1998	36000	M	O	0.55890	-0.01705	4.53528
47	1998	36000	P	O	0.55890	-0.01705	4.54478
47	1998	36031	M	O	0.64384	0.00021	4.49914
47	1998	36031	P	O	0.64384	0.00021	4.51754
47	1999	36241	M	O	1.21918	0.06213	4.36386
47	2000	36683	M	O	2.43014	-0.38623	4.32453
47	2000	36683	P	O	2.43014	-0.38623	4.34407
47	2000	36734	M	O	2.56986	0.01568	4.27165
47	2000	36734	P	O	2.56986	0.01568	4.33376
47	2000	36777	M	O	2.68767	0.00439	4.26014
47	2001	36991	M	O	3.27397	0.08195	4.22567
47	2001	36991	P	O	3.27397	0.08195	4.22318
47	2001	37057	M	O	3.45479	0.01456	4.28372
47	2001	37152	M	O	3.71507	0.01155	4.31375
47	2001	37152	P	O	3.71507	0.01155	4.32440
47	2002	37335	M	O	4.21644	0.06926	4.24692
47	2002	37477	M	O	4.60548	0.20942	4.34238
47	2002	37477	P	O	4.60548	0.20942	4.37223
48	1998	35928	M	O	0.36164	-0.01175	4.34536
48	1998	35928	P	O	0.36164	-0.01175	4.35388
48	1998	35965	M	O	0.46301	-0.03255	4.35914
48	1998	35965	P	O	0.46301	-0.03255	4.35812
48	1998	36054	M	O	0.70685	0.02858	4.37437

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; w, log of pumping water level at time of measurement; $\overline{\overline{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \overline{\overline{w}}$	*diffC*
48	1998	36054	P	O	0.70685	0.02858	4.40354
48	1999	36383	M	O	1.60822	-0.02312	4.29701
48	1999	36383	P	O	1.60822	-0.02312	4.30878
48	2000	36663	M	O	2.37534	0.03631	4.40477
48	2000	36663	P	O	2.37534	0.03631	4.37122
48	2000	36741	M	O	2.58904	0.00505	4.36932
49	1998	35912	P	CL	0.31781	0.08436	4.31268
49	1998	35975	C	CH	0.49041	-0.03170	4.26577
49	1998	35975	P	CH	0.49041	-0.03170	4.36957
49	1998	36035	C	CH	0.65479	-0.15398	4.23106
49	1998	36035	P	CH	0.65479	-0.15398	4.22654
49	2000	36763	C	CH	2.64932	0.03386	4.28785
49	2002	37446	C	CH	4.52055	0.15294	4.36068
50	1998	35899	C	L	0.28219	-0.14739	4.29497
50	1998	35899	M	L	0.28219	-0.14739	4.31682
50	1998	35961	C	L	0.45205	-0.05340	4.27875
50	1998	35961	M	L	0.45205	-0.05340	4.30744
50	1998	36012	C	L	0.59178	0.10548	4.29251
50	1998	36012	M	L	0.59178	0.10548	4.31829
50	1998	36059	C	L	0.72055	0.13760	4.25277
50	1998	36059	M	L	0.72055	0.13760	4.28138
50	1999	36357	C	L	1.53699	-0.11431	4.25362
50	1999	36357	M	L	1.53699	-0.11431	4.28386
50	2000	36662	C	L	2.37260	-0.09818	4.25774
50	2000	36662	M	L	2.37260	-0.09818	4.27958
50	2001	37023	C	L	3.36164	0.15949	4.32744
50	2001	37118	C	L	3.62192	0.18091	4.33086
51	1998	35906	M	CL	0.30137	-0.03036	4.73532
51	1998	35906	P	CL	0.30137	-0.03036	4.78682
51	1998	35972	M	CH	0.48219	0.02994	4.83007
51	1998	35972	P	CH	0.48219	0.02994	4.82246
51	1998	36020	M	CH	0.61370	-0.07828	4.69181
51	1998	36020	P	CH	0.61370	-0.07828	4.67255
51	1999	36241	M	CH	1.21918	0.04632	4.77567
51	1999	36241	P	CH	1.21918	0.04632	4.79934
51	2000	36678	M	CL	2.41644	0.02002	4.77567
51	2000	36678	P	CL	2.41644	0.02002	4.80353
51	2001	36991	M	CH	3.27397	0.03703	4.79049
51	2001	36991	P	CH	3.27397	0.03703	4.82181
51	2001	37048	M	CH	3.43014	0.05105	4.80000
51	2001	37048	P	CH	3.43014	0.05105	4.81600
51	2002	37421	M	CH	4.45205	-0.07573	4.80164
51	2002	37421	P	CH	4.45205	-0.07573	4.82246
52	1998	35965	C	O	0.46301	-0.03601	4.54860
52	1998	35965	M	O	0.46301	-0.03601	4.49614
52	1998	35965	P	O	0.46301	-0.03601	4.59249
52	1998	35992	C	O	0.53699	0.05810	4.55303
52	1998	35992	M	O	0.53699	0.05810	4.51207

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \overline{\overline{w}}$	*diffC*
52	1998	36034	M	O	0.65205	0.00299	4.49714
52	1998	36034	P	O	0.65205	0.00299	4.52775
52	1999	36349	C	O	1.51507	-0.01993	4.49245
52	1999	36349	M	O	1.51507	-0.01993	4.49077
52	1999	36405	C	O	1.66849	0.01285	4.53978
52	1999	36405	M	O	1.66849	0.01285	4.48774
53	1998	35949	M	O	0.41918	0.08052	4.53828
53	1998	35949	P	O	0.41918	0.08052	4.58823
53	1998	35991	C	O	0.53425	0.10402	4.56299
53	1998	35991	M	O	0.53425	0.10402	4.58476
53	1998	35991	P	O	0.53425	0.10402	4.60986
53	1998	36035	C	O	0.65479	0.07631	4.56830
53	1998	36035	M	O	0.65479	0.07631	4.51492
53	1999	36319	C	O	1.43288	-0.16383	4.53828
53	1999	36319	M	O	1.43288	-0.16383	4.51338
53	2000	36649	C	O	2.33699	0.13097	4.60217
53	2000	36649	M	O	2.33699	0.13097	4.63735
53	2000	36649	P	O	2.33699	0.13097	4.69611
53	2000	36712	C	O	2.50959	-0.08654	4.64804
53	2000	36712	M	O	2.50959	-0.08654	4.67498
53	2000	36733	C	O	2.56712	-0.17822	4.63938
53	2000	36733	M	O	2.56712	-0.17822	4.64564
53	2000	36733	P	O	2.56712	-0.17822	4.69107
53	2001	36982	C	O	3.24932	-0.23794	4.72064
53	2001	36982	M	O	3.24932	-0.23794	4.74188
53	2001	36982	P	O	3.24932	-0.23794	4.81899
53	2001	37070	C	O	3.49041	-0.09484	4.68684
53	2001	37070	M	O	3.49041	-0.09484	4.68951
53	2001	37070	P	O	3.49041	-0.09484	4.74136
53	2001	37110	C	O	3.60000	0.18280	4.70529
53	2001	37110	M	O	3.60000	0.18280	4.71268
53	2001	37110	P	O	3.60000	0.18280	4.76720
53	2002	37347	C	O	4.24932	0.19908	4.65215
53	2002	37347	M	O	4.24932	0.19908	4.68481
53	2002	37445	C	O	4.51781	0.23447	4.68647
53	2002	37445	M	O	4.51781	0.23447	4.73935
53	2002	37504	C	O	4.67945	-0.20020	4.68868
53	2002	37504	M	O	4.67945	-0.20020	4.73409
54	1998	35963	C	L	0.45753	0.00088	4.55787
54	1998	35963	M	L	0.45753	0.00088	4.47072
54	1998	36053	C	L	0.70411	0.00381	4.50502
54	1998	36056	C	L	0.71233	0.01173	4.51251
54	1999	36362	C	L	1.55068	-0.01116	4.43580
54	1999	36362	M	L	1.55068	-0.01116	4.52904
54	2000	36656	C	L	2.35616	0.00540	4.47927
54	2000	36718	C	L	2.52603	0.00381	4.52407
54	2002	37349	C	L	4.25479	-0.00418	4.47027
55	1998	35956	C	O	0.43836	-0.01350	4.39679

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; w, log of pumping water level at time of measurement; $\overline{\overline{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \overline{\overline{w}}$	*diffC*
55	1998	35956	M	O	0.43836	-0.01350	4.39099
55	1998	35998	C	O	0.55342	-0.02394	4.36729
55	1998	35998	M	O	0.55342	-0.02394	4.36144
55	1998	36035	C	O	0.65479	-0.09230	4.32002
55	1998	36035	M	O	0.65479	-0.09230	4.32068
55	2000	36769	C	O	2.66575	-0.01625	4.42137
55	2000	36769	M	O	2.66575	-0.01625	4.43010
55	2000	36769	P	O	2.66575	-0.01625	4.48785
55	2002	37371	C	O	4.31507	0.05069	4.44206
55	2002	37371	M	O	4.31507	0.05069	4.44653
55	2002	37469	C	O	4.58356	0.10343	4.78382
55	2002	37469	M	O	4.58356	0.10343	4.80156
56	1998	35901	C	O	0.28767	-0.06984	4.01332
56	1998	35901	M	O	0.28767	-0.06984	4.01746
56	1998	35956	C	O	0.43836	-0.05610	4.09418
56	1998	35956	M	O	0.43836	-0.05610	3.97800
56	1998	35956	P	O	0.43836	-0.05610	4.05595
56	1998	36046	C	O	0.68493	-0.12113	3.93359
56	1998	36046	P	O	0.68493	-0.12113	3.95412
56	2000	36762	C	O	2.64658	-0.08287	3.93574
56	2000	36762	M	O	2.64658	-0.08287	3.91582
56	2001	37036	C	O	3.39726	-0.12821	4.03601
56	2001	37036	M	O	3.39726	-0.12821	4.04935
56	2001	37071	C	O	3.49315	0.14469	4.09966
56	2001	37071	M	O	3.49315	0.14469	4.10528
56	2001	37124	C	O	3.63836	0.12321	4.08816
56	2001	37124	M	O	3.63836	0.12321	4.08581
56	2002	37343	C	O	4.23836	0.21829	4.11464
56	2002	37343	M	O	4.23836	0.21829	4.10413
58	1998	35954	C	O	0.43288	-0.05753	4.14409
58	1998	35990	C	O	0.53151	-0.12302	4.14456
58	1998	36020	C	O	0.61370	-0.17546	4.10099
58	1999	36378	C	O	1.59452	-0.15002	4.20110
58	1999	36378	M	O	1.59452	-0.17731	4.22464
58	2000	36748	C	O	2.60822	-0.11216	4.15466
58	2001	36999	C	O	3.29589	0.15335	4.37727
58	2001	37056	C	O	3.45205	0.06293	4.26816
58	2001	37103	C	O	3.58082	0.02072	4.20155
58	2002	37335	C	O	4.21644	0.16945	4.35466
58	2002	37414	C	O	4.43288	0.15765	4.30744
58	2002	37515	C	O	4.70959	0.23138	4.36042
59	1998	35964	M	O	0.46027	-0.08554	4.48582
59	1998	35964	P	O	0.46027	-0.08554	4.47050
59	1999	36390	M	O	1.62740	0.24237	4.41207
59	1999	36390	P	O	1.62740	0.24237	4.39827
59	2000	36650	P	O	2.33973	-0.31367	4.31522
60	1998	35901	C	O	0.28767	0.01419	4.45004
60	1998	35901	M	O	0.28767	0.01419	4.42843

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \overline{\overline{w}}$	*diffC*
60	1998	35901	P	O	0.28767	0.01419	4.46602
60	1998	35978	C	O	0.49863	0.02147	4.45876
60	1998	35978	M	O	0.49863	0.02147	4.43070
60	1998	35978	P	O	0.49863	0.02147	4.44910
60	1998	36046	C	O	0.68493	-0.14613	4.37827
60	1998	36046	M	O	0.68493	-0.14613	4.34937
60	1998	36046	P	O	0.68493	-0.14613	4.37689
60	1999	36362	C	O	1.55068	-0.03549	4.43521
60	1999	36362	C	O	1.55068	-0.02815	4.37563
60	1999	36362	M	O	1.55068	-0.03549	4.43070
60	1999	36362	P	O	1.55068	-0.03549	4.43947
60	2000	36691	C	O	2.45205	-0.05228	4.40843
60	2000	36691	M	O	2.45205	-0.05228	4.41365
60	2000	36691	P	O	2.45205	-0.05228	4.42089
60	2000	36721	C	O	2.53425	-0.03645	4.40036
60	2000	36721	M	O	2.53425	-0.03645	4.40696
60	2000	36721	P	O	2.53425	-0.03645	4.42712
60	2000	36761	C	O	2.64384	-0.03293	4.44053
60	2000	36761	M	O	2.64384	-0.03293	4.41763
60	2000	36761	P	O	2.64384	-0.03293	4.46775
60	2001	37015	C	O	3.33973	0.09748	4.39642
60	2001	37015	M	O	3.33973	0.09748	4.42317
60	2001	37077	C	O	3.50959	0.05655	4.44112
60	2001	37077	M	O	3.50959	0.05655	4.47164
60	2001	37077	P	O	3.50959	0.05655	4.49357
60	2001	37111	C	O	3.60274	0.06615	4.43959
60	2001	37111	M	O	3.60274	0.06615	4.45190
60	2001	37111	P	O	3.60274	0.06615	4.52418
60	2002	37337	C	O	4.22192	0.08932	4.48051
60	2002	37337	M	O	4.22192	0.08932	4.49010
60	2002	37337	P	O	4.22192	0.08932	4.50424
61	1998	35957	C	O	0.44110	-0.05184	4.65928
61	1998	35957	M	O	0.44110	-0.05184	4.68620
61	1998	36004	C	O	0.56986	0.03154	4.68610
61	1998	36004	M	O	0.56986	0.03154	4.65956
61	1998	36042	C	O	0.67397	0.06352	4.64343
61	1998	36042	M	O	0.67397	0.06352	4.69602
61	1999	36383	C	O	1.60822	-0.04642	4.58149
61	1999	36383	M	O	1.60822	-0.04642	4.64391
61	2000	36691	C	O	2.45205	-0.16083	4.70221
61	2000	36691	M	O	2.45205	-0.16083	4.88060
61	2001	37134	C	O	3.66575	0.06110	4.76729
61	2001	37134	M	O	3.66575	0.06110	4.88945
61	2002	37349	C	O	4.25479	0.10293	4.70998
61	2002	37349	M	O	4.25479	0.10293	4.87984
62	1998	35928	P	L	0.36164	-0.32894	4.04445
62	1998	35965	C	L	0.46301	-0.04666	4.19389
62	1998	35965	P	L	0.46301	-0.03548	4.14250

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
62	1998	36034	C	L	0.65205	-0.02606	4.22039
62	1998	36034	P	L	0.65205	-0.02729	4.16651
62	1999	36433	C	L	1.74521	0.08093	4.54116
62	1999	36433	P	L	1.74521	0.08093	4.46545
62	2000	36663	C	L	2.37534	0.03214	4.56299
62	2000	36663	P	L	2.37534	0.03214	4.53023
62	2000	36741	C	L	2.58904	-0.01512	4.61789
62	2000	36741	P	L	2.58904	-0.01512	4.53700
62	2001	37096	C	L	3.56164	0.17524	4.53625
62	2002	37505	C	L	4.68219	0.04665	4.55745
62	2002	37505	P	L	4.68219	0.04665	4.52840
63	1998	35902	C	CL	0.29041	-0.38021	4.22523
63	1998	35949	C	CL	0.41918	-0.37651	4.24176
63	1998	36047	C	CH	0.68767	-0.39181	4.20170
63	1999	36357	C	CH	1.53699	-0.35660	4.24907
63	2000	36684	C	CL	2.43288	0.26052	4.25220
63	2000	36728	C	CL	2.55342	0.26830	4.25106
63	2000	36761	C	CH	2.64384	0.16040	4.23743
63	2001	36998	C	CH	3.29315	0.29863	4.30757
63	2001	37034	C	CH	3.39178	0.29591	4.31642
63	2001	37069	C	CH	3.48767	0.28177	4.28041
63	2002	37356	C	CH	4.27397	-0.06041	4.43876
64	1998	35921	C	O	0.34247	-0.04651	4.35812
64	1998	35949	C	O	0.41918	-0.03789	4.41920
64	1998	36047	C	O	0.68767	-0.04026	4.39148
64	1998	36054	C	O	0.70685	-0.03080	4.40305
64	1999	36313	C	O	1.41644	-0.04056	4.42497
64	1999	36369	C	O	1.56986	-0.04085	4.43592
64	2000	36684	C	O	2.43288	0.18998	4.37739
64	2000	36726	C	O	2.54795	0.20357	4.37450
64	2000	36781	C	O	2.69863	-0.06217	4.43308
64	2001	37035	C	O	3.39452	0.00274	4.41340
64	2001	37069	C	O	3.48767	-0.02904	4.40672
64	2002	37355	C	O	4.27123	-0.02319	4.66155
65	1998	35900	C	O	0.28493	-0.04504	4.49714
65	1998	35900	M	O	0.28493	-0.04504	4.49167
65	1998	35949	C	O	0.41918	0.25873	4.51820
65	1998	35949	M	O	0.41918	0.25873	4.51798
65	1998	36032	C	O	0.64658	-0.09808	4.49032
65	1998	36032	M	O	0.64658	-0.09808	4.47995
65	1998	36053	C	O	0.70411	-0.04152	4.47141
65	1998	36053	M	O	0.70411	-0.04152	4.46014
65	1999	36313	C	O	1.41644	-0.04108	4.43153
65	1999	36313	M	O	1.41644	-0.04108	4.43129
65	1999	36364	C	O	1.55616	0.00700	4.47790
65	1999	36364	M	O	1.55616	0.00700	4.48006
65	2000	36685	C	O	2.43562	-0.02797	4.49256
65	2000	36685	M	O	2.43562	-0.02797	4.50623

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
65	2000	36728	C	O	2.55342	-0.01204	4.47438
65	2000	36728	M	O	2.55342	-0.01204	4.46568
66	1998	35958	C	O	0.44384	-0.10064	4.16806
66	1998	35958	M	O	0.44384	-0.10064	4.25149
66	1998	36005	C	O	0.57260	-0.12413	4.16418
66	1998	36005	M	O	0.57260	-0.12413	4.20633
66	1998	36017	C	O	0.60548	-0.17524	4.08648
66	1998	36017	M	O	0.60548	-0.17524	4.10446
66	1999	36294	C	O	1.36438	-0.11383	4.12180
66	1999	36294	M	O	1.36438	-0.11383	4.13453
66	1999	36362	C	O	1.55068	-0.05134	4.12050
66	1999	36362	M	O	1.55068	-0.05134	4.12891
66	2000	36665	C	O	2.38082	-0.03123	4.15151
66	2000	36665	M	O	2.38082	-0.03123	4.14899
66	2000	36718	C	O	2.52603	-0.01873	4.14520
66	2000	36718	M	O	2.52603	-0.01873	4.13324
66	2000	36754	C	O	2.62466	0.02514	4.16868
66	2000	36754	M	O	2.62466	0.02514	4.15779
66	2001	37047	C	O	3.42740	-0.00435	4.15638
66	2001	37047	M	O	3.42740	-0.00435	4.16216
66	2001	37091	C	O	3.54795	0.03728	4.14361
66	2001	37091	M	O	3.54795	0.03728	4.14027
66	2001	37141	C	O	3.68493	0.05634	4.18753
66	2001	37141	M	O	3.68493	0.05634	4.27305
66	2002	37455	C	O	4.54521	0.23679	4.25035
66	2002	37455	M	O	4.54521	0.23679	4.24621
66	2002	37488	C	O	4.63562	0.26394	4.27082
66	2002	37488	M	O	4.63562	0.26394	4.28455
68	1998	35949	C	L	0.41918	-0.00010	4.43474
68	1998	35991	C	L	0.53425	-0.02429	4.42951
68	1998	36019	C	L	0.61096	-0.07676	4.40623
68	1998	36061	C	L	0.72603	-0.05664	4.40794
68	1999	36327	C	L	1.45479	-0.00369	4.41992
68	2000	36700	C	L	2.47671	-0.03785	4.41280
68	2001	37026	C	L	3.36986	-0.00219	4.49502
68	2001	37140	C	L	3.68219	-0.02276	4.42185
68	2001	37162	C	L	3.74247	-0.01880	4.42628
68	2002	37370	C	L	4.31233	0.06971	4.47187
68	2002	37491	C	L	4.64384	0.17337	4.75935
69	1998	35942	C	O	0.40000	-0.06328	4.75703
69	1998	35942	P	O	0.40000	-0.06328	4.76661
69	1998	36026	C	O	0.63014	0.02129	4.81324
69	1998	36026	P	O	0.63014	0.02129	4.81608
69	1998	36040	C	O	0.66849	0.00795	4.81080
69	2000	36747	C	O	2.60548	-0.01108	4.82711
69	2001	37083	C	O	3.52603	0.00151	4.80065
69	2002	37419	C	O	4.44658	0.04281	4.77921
69	2002	37419	P	O	4.44658	0.04281	4.80386

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
70	1998	35930	C	O	0.36712	0.01237	4.90941
70	1998	35983	C	O	0.51233	0.04637	4.91192
70	1998	36033	C	O	0.64932	0.00592	4.85764
70	1999	36320	C	O	1.43562	0.05971	4.93469
70	2000	36634	C	O	2.29589	0.00216	4.93419
70	2000	36705	C	O	2.49041	0.05294	4.93368
70	2000	36755	C	O	2.62740	0.00346	4.94528
70	2001	37008	C	O	3.32055	-0.07758	4.93087
70	2001	37105	C	O	3.58630	-0.10280	5.16997
70	2002	37449	C	O	4.52877	-0.00253	5.07636
72	1998	35948	C	O	0.41644	-0.11268	3.85333
72	1998	35948	M	O	0.41644	-0.11268	3.86849
72	1998	35992	C	O	0.53699	0.00737	3.79863
72	1998	35992	M	O	0.53699	0.00737	3.80622
72	1998	36041	C	O	0.67123	-0.07947	3.76352
72	1998	36041	M	O	0.67123	-0.07947	3.77574
72	1999	36355	C	O	1.53151	-0.00170	3.80087
72	1999	36355	M	O	1.53151	-0.00170	3.80466
72	2000	36719	C	O	2.52877	-0.00218	3.78555
72	2000	36719	M	O	2.52877	-0.00218	3.80243
72	2001	37070	C	O	3.49041	0.03317	3.86556
72	2001	37070	M	O	3.49041	0.03317	3.87577
72	2001	37140	C	O	3.68219	0.06911	3.94526
72	2001	37140	M	O	3.68219	0.06911	3.93339
72	2001	37161	C	O	3.73973	0.08639	3.93789
72	2001	37161	M	O	3.73973	0.08639	3.93730
74	1998	35935	C	O	0.38082	-0.07054	4.49547
74	1998	35935	M	O	0.38082	-0.07054	4.53614
74	1998	36004	C	O	0.56986	-0.04915	4.43129
74	1998	36004	M	O	0.56986	-0.04915	4.46338
74	1998	36048	C	O	0.69041	-0.08808	4.42185
74	1998	36048	M	O	0.69041	-0.08808	4.44547
74	2000	36686	C	O	2.43836	0.03801	4.44136
74	2000	36686	M	O	2.43836	0.03801	4.45829
74	2001	37007	C	O	3.31781	0.18793	4.48852
74	2001	37007	M	O	3.31781	0.18793	4.50701
74	2002	37454	C	O	4.54247	-0.01816	4.42903
74	2002	37454	M	O	4.54247	-0.01816	4.43592
75	1998	35914	C	O	0.32329	0.05430	4.71411
75	1998	35914	M	O	0.32329	0.05430	4.72597
75	1998	36004	C	O	0.56986	-0.02450	4.66476
75	1998	36004	M	O	0.56986	-0.02450	4.67386
75	1998	36041	C	O	0.67123	-0.03010	4.66363
75	1998	36041	M	O	0.67123	-0.03010	4.66589
75	2000	36720	C	O	2.53151	0.00031	4.68878
75	2000	36720	M	O	2.53151	0.00031	4.70565
77	1998	35997	C	O	0.55068	-0.06278	4.61453
77	1998	35997	M	O	0.55068	-0.06278	4.63967

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; w, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \bar{\bar{w}}$	*diffC*
77	1998	36005	C	O	0.57260	-0.03646	4.62781
77	1998	36005	M	O	0.57260	-0.03646	4.64535
77	1998	36040	C	O	0.66849	0.06506	4.66419
77	1998	36040	M	O	0.66849	0.06506	4.68000
77	1999	36363	C	O	1.55342	0.03418	4.65738
77	1999	36363	M	O	1.55342	0.03418	4.68167
80	1998	35907	C	O	0.30411	-0.05807	4.25604
80	1998	35907	M	O	0.30411	-0.05807	4.24420
80	1998	35907	P	O	0.30411	-0.05807	4.28248
80	1998	35997	C	O	0.55068	-0.03700	4.20886
80	1998	35997	M	O	0.55068	-0.03700	4.20245
80	1998	36027	C	O	0.63288	-0.02817	4.21818
80	1998	36027	M	O	0.63288	-0.02817	4.20782
80	1999	36356	C	O	1.53425	-0.06901	4.20738
80	1999	36356	M	O	1.53425	-0.06901	4.18449
80	2000	36636	C	O	2.30137	0.00173	4.27040
80	2000	36636	M	O	2.30137	0.00173	4.28276
80	2000	36705	C	O	2.49041	-0.02247	4.16620
80	2000	36705	M	O	2.49041	-0.02247	4.18738
80	2000	36749	C	O	2.61096	0.02117	4.19525
80	2000	36749	M	O	2.61096	0.02117	4.19675
80	2002	37489	C	O	4.63836	0.22085	4.30892
80	2002	37489	M	O	4.63836	0.22085	4.27555
82	1998	35969	C	L	0.47397	-0.16112	4.09134
82	1998	35993	C	L	0.53973	-0.14613	4.20395
82	1998	36055	C	L	0.70959	-0.08830	4.08210
82	2002	37419	C	L	4.44658	0.18374	4.15261
82	2002	37504	C	L	4.67945	0.20964	4.16713
85	1998	35928	C	S	0.36164	-0.03246	5.40959
85	1998	35928	P	S	0.36164	-0.03246	5.43638
85	1998	35970	C	S	0.47671	-0.28981	5.43285
85	1998	35970	P	S	0.47671	-0.28981	5.46506
85	1998	36024	C	S	0.62466	0.01009	5.42107
85	1998	36024	P	S	0.62466	0.01009	5.45074
85	1999	36356	C	S	1.53425	-0.00230	5.43403
85	1999	36356	P	S	1.53425	-0.00230	5.47332
85	2000	36685	C	S	2.43562	0.00720	5.51072
85	2000	36685	P	S	2.43562	0.00720	5.54806
85	2001	37055	C	S	3.44932	0.30729	5.74079
85	2001	37055	P	S	3.44932	0.30729	5.80236
86	1998	35920	C	S	0.33973	-0.10908	5.24127
86	1998	35920	P	S	0.33973	-0.10908	5.29586
86	1998	35976	C	S	0.49315	0.02433	5.34506
86	1998	35976	P	S	0.49315	0.02433	5.37667
86	1998	36021	C	S	0.61644	0.05794	5.35969
86	1998	36021	P	S	0.61644	0.05794	5.38555
86	1998	36062	C	S	0.72877	0.05794	5.39345
86	1998	36062	P	S	0.72877	0.05794	5.41921

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
86	1999	36333	C	S	1.47123	0.00315	5.40205
86	1999	36333	P	S	1.47123	0.00315	5.41938
86	1999	36370	C	S	1.57260	0.05744	5.40524
86	1999	36370	P	S	1.57260	0.05744	5.44393
86	2000	36686	C	S	2.43836	0.11225	5.39345
86	2000	36686	P	S	2.43836	0.11225	5.44605
86	2001	37055	C	S	3.44932	0.03645	5.41093
86	2001	37055	P	S	3.44932	0.03645	5.45775
86	2002	37378	C	S	4.33425	-0.24043	5.41974
86	2002	37378	P	S	4.33425	-0.24043	5.42279
87	1998	35920	C	S	0.33973	-0.07827	5.41930
87	1998	35920	P	S	0.33973	-0.07827	5.45865
87	1998	35964	C	S	0.46027	-0.09757	5.42433
87	1998	35964	P	S	0.46027	-0.09757	5.46527
87	1998	36026	C	S	0.63014	-0.05233	5.41388
87	1998	36026	P	S	0.63014	-0.05233	5.44536
87	1998	36062	C	S	0.72877	-0.01113	5.42407
87	1998	36062	P	S	0.72877	-0.01113	5.48600
87	1999	36370	C	S	1.57260	-0.01065	5.39848
87	1999	36370	P	S	1.57260	-0.01065	5.45618
87	2000	36657	C	S	2.35890	0.00266	5.40191
87	2000	36657	P	S	2.35890	0.00266	5.45579
87	2000	36735	C	S	2.57260	0.02369	5.40304
87	2000	36735	P	S	2.57260	0.02369	5.45506
87	2000	36782	C	S	2.70137	0.03090	5.40466
87	2000	36782	P	S	2.70137	0.03090	5.46226
87	2001	37070	C	S	3.49041	0.04140	5.41245
87	2001	37070	P	S	3.49041	0.04140	5.47834
87	2001	37113	C	S	3.60822	0.04563	5.42036
87	2001	37113	P	S	3.60822	0.04563	5.43660
87	2001	37140	C	S	3.68219	0.05911	5.41978
87	2001	37140	P	S	3.68219	0.05911	5.46231
87	2002	37379	C	S	4.33699	0.04654	5.38893
87	2002	37379	P	S	4.33699	0.04654	5.39658
89	1998	35920	C	O	0.33973	-0.00449	4.38863
89	1998	35920	M	O	0.33973	-0.00449	4.34186
89	1998	35950	C	O	0.42192	0.05452	4.40085
89	1998	35950	M	O	0.42192	0.05452	4.35607
89	1998	36048	C	O	0.69041	0.09166	4.35876
89	1998	36048	M	O	0.69041	0.09166	4.33624
89	1999	36322	C	O	1.44110	0.03597	4.36767
89	1999	36322	M	O	1.44110	0.03597	4.32863
89	1999	36370	C	O	1.57260	-0.09735	4.33139
89	1999	36370	M	O	1.57260	-0.09735	4.31695
89	2000	36720	C	O	2.53151	-0.08030	4.34484
89	2000	36720	M	O	2.53151	-0.08030	4.34160
90	1998	35922	C	S	0.34521	-0.03911	5.45352
90	1998	35922	P	S	0.34521	-0.03911	5.46574

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \overline{\overline{w}}$	*diffC*
90	1998	35977	C	S	0.49589	-0.03659	5.48197
90	1998	35977	P	S	0.49589	-0.03659	5.48687
90	1998	36021	C	S	0.61644	-0.01203	5.45155
90	1998	36021	P	S	0.61644	-0.01203	5.44458
90	1999	36356	C	S	1.53425	-0.04012	5.50744
90	1999	36356	P	S	1.53425	-0.04012	5.51625
90	2000	36686	C	S	2.43836	0.04072	5.51428
90	2000	36686	P	S	2.43836	0.04072	5.53682
90	2001	37055	C	S	3.44932	0.06098	5.53165
90	2002	37379	C	S	4.33699	0.05664	5.59091
90	2002	37379	P	S	4.33699	0.05664	5.60701
92	1998	35920	C	S	0.33973	-0.02916	5.92332
92	1998	35920	P	S	0.33973	-0.02916	5.94916
92	1998	35964	C	S	0.46027	-0.00023	5.84872
92	1998	35964	P	S	0.46027	-0.00023	5.86141
92	1998	36053	C	S	0.70411	-0.00319	5.86856
92	1998	36053	P	S	0.70411	-0.00319	5.89735
92	1998	36060	C	S	0.72329	-0.00274	5.86593
92	1998	36060	P	S	0.72329	-0.00274	5.87796
92	1999	36333	C	S	1.47123	-0.00148	5.87175
92	1999	36333	P	S	1.47123	-0.00148	5.91193
92	1999	36370	C	S	1.57260	0.01658	5.85019
92	1999	36370	P	S	1.57260	0.01658	5.89402
92	2000	36643	C	S	2.32055	-0.02134	5.88855
92	2000	36643	P	S	2.32055	-0.02134	5.94587
92	2000	36719	C	S	2.52877	0.00121	5.88020
92	2000	36719	P	S	2.52877	0.00121	5.94584
92	2000	36782	C	S	2.70137	-0.00148	5.88263
92	2000	36782	P	S	2.70137	-0.00148	5.94235
92	2001	37012	C	S	3.33151	-0.00391	5.89842
92	2001	37012	P	S	3.33151	-0.00391	5.97668
92	2001	37126	C	S	3.64384	0.01869	5.88524
92	2001	37126	P	S	3.64384	0.01869	5.92484
92	2001	37168	C	S	3.75890	0.02063	5.81506
92	2002	37386	C	S	4.35616	0.01676	5.89465
92	2002	37386	P	S	4.35616	0.01676	5.89316
95	1998	35921	C	CL	0.34247	0.03804	4.47164
95	1998	35990	C	CL	0.53151	-0.15220	4.42401
95	1998	35992	C	CH	0.53699	0.11713	4.56934
95	1998	35992	P	CH	0.53699	0.11713	4.62762
95	1998	36035	C	CH	0.65479	0.01869	4.57780
95	1998	36035	P	CH	0.65479	0.01869	4.72278
95	1998	36047	C	CL	0.68767	0.03012	4.45423
95	1999	36319	C	CL	1.43288	-0.19872	4.44441
95	2000	36635	C	CL	2.29863	0.02633	4.46625
95	2000	36649	C	CH	2.33699	0.05259	4.63103
95	2000	36719	C	CH	2.52877	0.08896	4.64044
95	2001	36991	C	CH	3.27397	-0.00457	4.63861

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
95	2001	37064	C	CL	3.47397	-0.15220	4.47347
97	1998	35929	C	CH	0.36438	0.01355	4.72384
97	1998	35929	C	CL	0.36438	0.04902	4.60697
97	1998	35984	C	CH	0.51507	-0.03129	4.66466
97	1998	35984	C	CL	0.51507	0.00462	4.58129
97	1998	36029	C	CH	0.63836	-0.05281	4.64928
97	1998	36029	C	CL	0.63836	-0.02711	4.56132
97	1999	36369	C	CH	1.56986	-0.05680	4.68951
97	1999	36369	C	CH	1.56986	-0.03972	4.65167
97	2000	36692	C	CL	2.45479	0.01355	4.64660
97	2001	37119	C	CH	3.62466	0.01498	4.70329
97	2002	37448	C	CL	4.52603	0.11201	4.64785
98	1998	35927	C	CH	0.35890	-0.01967	4.87428
98	1998	35927	C	CL	0.35890	0.01866	4.85857
98	1998	35984	C	CL	0.51507	-0.04150	4.81259
98	1998	36047	C	CH	0.68767	-0.06597	4.89575
98	1998	36047	C	CL	0.68767	-0.03027	4.87939
98	1998	36056	C	CL	0.71233	-0.02251	4.87604
98	1999	36320	C	CH	1.43562	-0.01711	4.75841
98	2000	36651	C	CH	2.34247	-0.00538	4.78206
98	2001	37011	C	CL	3.32877	0.03947	4.81056
98	2001	37083	C	CL	3.52603	0.01320	4.76958
98	2002	37356	C	CL	4.27397	0.13109	4.82575
99	1998	35928	C	CH	0.36164	-0.15822	5.00267
99	1998	35928	C	CL	0.36164	-0.04642	4.81681
99	1998	35976	C	CH	0.49315	-0.14916	5.00542
99	1998	35976	M	CH	0.49315	-0.14916	5.00562
99	1998	35976	C	CL	0.49315	-0.03581	4.81389
99	1998	35976	M	CL	0.49315	-0.03581	4.81381
99	1998	36061	C	CH	0.72603	-0.09323	4.98798
99	1998	36061	M	CH	0.72603	-0.09323	4.99254
99	1998	36061	C	CL	0.72603	-0.00223	4.80337
99	1998	36061	M	CL	0.72603	-0.00223	4.80754
99	2000	36735	C	CH	2.57260	0.00871	4.92500
99	2000	36735	M	CH	2.57260	0.00871	4.94257
99	2001	37007	C	CL	3.31781	0.21179	4.79991
99	2001	37007	M	CL	3.31781	0.21179	4.81308
99	2002	37385	C	CH	4.35342	0.16226	4.96606
99	2002	37385	M	CH	4.35342	0.16226	4.96102
100	1998	35942	C	CL	0.40000	-0.14704	4.15277
100	1998	35942	C	CL	0.40000	-0.10075	4.15214
100	1998	35942	M	CL	0.40000	-0.14704	4.16107
100	1998	35942	M	CL	0.40000	-0.10075	4.15841
100	1998	35970	C	CL	0.47671	-0.10249	4.13629
100	1998	35970	M	CL	0.47671	-0.10249	4.13932
100	1998	36033	C	CL	0.64932	-0.01095	4.11855
100	1998	36033	C	CL	0.64932	0.02957	4.11790
100	1998	36033	M	CL	0.64932	-0.01095	4.12568

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\overline{\overline{W}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$W - \overline{\overline{W}}$	*diffC*
100	1998	36033	M	CL	0.64932	0.02957	4.12713
100	2001	36998	C	CL	3.29315	0.05817	4.16231
100	2001	36998	M	CL	3.29315	0.05817	4.18783
100	2001	37091	C	CL	3.54795	0.10245	4.15904
100	2001	37091	M	CL	3.54795	0.10245	4.16200
100	2001	37160	C	CL	3.73699	0.13149	4.16154
100	2001	37160	M	CL	3.73699	0.13149	4.15230
100	2002	37349	C	CL	4.25479	0.09675	4.20320
100	2002	37349	M	CL	4.25479	0.09675	4.20604
101	1998	35935	C	CH	0.38082	0.02515	4.03300
101	1998	35935	M	CH	0.38082	0.02515	4.04463
101	1998	35935	C	CL	0.38082	0.02433	3.69362
101	1998	35935	M	CL	0.38082	0.02433	3.71040
101	1998	35991	C	CH	0.53425	0.03250	3.97819
101	1998	35991	M	CH	0.53425	0.03250	3.98861
101	1998	35991	C	CL	0.53425	0.03087	3.66254
101	1998	35991	M	CL	0.53425	0.03087	3.67148
101	1998	36025	C	CH	0.62740	0.09551	4.04006
101	1998	36025	M	CH	0.62740	0.09551	4.05508
101	1998	36025	C	CL	0.62740	0.09322	3.69387
101	1998	36025	M	CL	0.62740	0.09322	3.70966
101	1999	36364	C	CH	1.55616	-0.10686	4.03777
101	1999	36364	M	CH	1.55616	-0.10686	4.03672
101	2000	36672	C	CL	2.40000	-0.19472	4.18950
101	2000	36672	M	CL	2.40000	-0.19472	4.20095
102	1998	35934	C	CH	0.37808	-0.14907	4.89732
102	1998	35934	M	CH	0.37808	-0.14907	4.91067
102	1998	35934	C	CL	0.37808	-0.07080	4.72073
102	1998	35934	M	CL	0.37808	-0.07080	4.73435
102	1998	35985	C	CH	0.51781	0.03800	4.86268
102	1998	35985	C	CL	0.51781	0.08683	4.69510
102	1998	36067	C	CH	0.74247	0.03378	4.86020
102	1998	36067	C	CL	0.74247	0.08107	4.69291
102	1999	36335	C	CH	1.47671	-0.00448	4.85094
102	2000	36747	C	CH	2.60548	0.06673	4.91317
102	2001	37105	C	CH	3.58630	-0.09530	5.01103
102	2002	37420	C	CL	4.44932	0.23311	4.71626
103	1998	35913	C	CH	0.32055	0.01604	5.69864
103	1998	35913	P	CH	0.32055	0.01604	5.71353
103	1998	35913	C	CL	0.32055	0.04786	5.37560
103	1998	35913	P	CL	0.32055	0.04786	5.38857
103	1998	35963	C	CH	0.45753	-0.03188	5.58203
103	1998	35963	P	CH	0.45753	-0.03188	5.57534
103	1998	35963	C	CL	0.45753	0.02837	5.30767
103	1998	35963	P	CL	0.45753	0.02837	5.30221
103	1998	36039	C	CH	0.66575	-0.13043	5.58282
103	1998	36039	P	CH	0.66575	-0.13043	5.57924
103	1998	36039	C	CL	0.66575	-0.05099	5.29942

Table 12. Data used in the *diffC* model.—Continued

[C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; W, log of pumping water level at time of measurement; $\bar{\bar{w}}$, average log PWL for a given site; *diffC*, log of power conversion coefficient]

Site	Year	Date	Method	Type	t	$w - \bar{\bar{w}}$	*diffC*
103	1998	36039	P	CL	0.66575	-0.05099	5.29807
103	1999	36329	C	CH	1.46027	-0.05825	5.63472
103	1999	36329	P	CH	1.46027	-0.05825	5.66663
103	2000	36693	C	CH	2.45753	-0.03801	5.53505
103	2000	36693	P	CH	2.45753	-0.03801	5.55013
103	2001	37062	C	CH	3.46849	0.04804	5.61877
103	2001	37062	P	CH	3.46849	0.04804	5.60123
103	2002	37413	C	CH	4.43014	0.16925	5.60370
103	2002	37413	P	CH	4.43014	0.16925	5.59266
104	1998	35922	C	CL	0.34521	0.01289	4.85593
104	1998	35922	C	CL	0.34521	0.02153	4.86730
104	1998	35922	M	CL	0.34521	0.01289	4.89866
104	1998	35922	M	CL	0.34521	0.02153	4.90742
104	1998	35964	C	CL	0.46027	0.02306	4.90030
104	1998	35964	C	CL	0.46027	0.02554	4.88590
104	1998	35964	M	CL	0.46027	0.02306	4.92341
104	1998	35964	M	CL	0.46027	0.02554	4.91654
104	1998	36021	C	CL	0.61644	-0.02184	4.90298
104	1998	36021	C	CL	0.61644	0.00222	4.89268
104	1998	36021	M	CL	0.61644	-0.02184	4.92064
104	1998	36021	M	CL	0.61644	0.00222	4.91185
104	1999	36334	C	CL	1.47397	0.00883	4.87482
104	1999	36334	M	CL	1.47397	0.00883	4.88280
104	2000	36649	C	CL	2.33699	0.02478	4.85101
104	2000	36649	M	CL	2.33699	0.02478	4.88045
104	2001	37013	C	CL	3.33425	0.04478	4.86607
104	2001	37013	M	CL	3.33425	0.04478	4.87298
104	2002	37379	C	CL	4.33699	-0.14178	4.88356
104	2002	37379	M	CL	4.33699	-0.14178	4.93022
105	1998	35927	C	CH	0.35890	-0.08941	5.83592
105	1998	35927	C	CH	0.35890	0.02271	5.66632
105	1998	35992	C	CH	0.53699	-0.02501	5.82219
105	1998	35992	C	CH	0.53699	0.04987	5.65323
105	1998	35992	C	CL	0.53699	0.05310	5.64368
105	1998	36042	C	CH	0.67397	-0.02709	5.82641
105	1998	36042	C	CL	0.67397	0.05109	5.61644
105	1999	36335	C	CH	1.47671	-0.08399	5.77427
105	2000	36649	C	CH	2.33699	-0.07304	5.74169
105	2001	37064	C	CH	3.47397	-0.01758	5.73560
105	2002	37492	C	CH	4.64658	0.13933	5.79140
106	1998	35955	C	CL	0.43562	0.02125	4.79645
106	1998	36011	C	CL	0.58904	0.00820	4.73427
106	1998	36055	C	CL	0.70959	-0.03644	4.79975
106	1998	36055	C	CL	0.70959	-0.02360	4.78891
106	2001	37162	C	CL	3.74247	-0.14023	4.79240
106	2002	37372	C	CL	4.31781	0.17082	4.73699

Table 13. Data used in the *diffL* model.

[O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; *s*, is time when power consumption at the well was used to estimate pumpage (in years, *s*=0 for 1998); $\overline{w}$, average log PWL for a given site in a given year; $\overline{\overline{w}}$ is average log of pumping water level for a given site]

Site	Year	Type	s	$\overline{w} - \overline{\overline{w}}$	*diffL*
1	1998	O	0	-0.03652	4.35337
1	1999	O	1	-0.16764	4.40675
1	2000	O	2	-0.02808	4.37760
1	2001	O	3	0.08376	4.40732
1	2002	O	4	0.16065	4.44670
2	1998	CL	0	0.02769	4.37287
2	1999	CH	1	-0.06768	4.48512
2	2000	CL	2	-0.03567	4.46249
2	2001	CH	3	-0.00256	4.47577
2	2002	CH	4	0.09566	4.43039
3	1998	O	0	-0.06538	4.30802
3	1999	O	1	-0.09570	4.25977
3	2000	O	2	0.03971	4.24189
3	2001	O	3	0.05699	4.29083
3	2002	O	4	0.10651	4.40192
5	1998	CH	0	0.01021	5.56054
5	1999	CH	1	-0.05848	5.51983
5	2001	CL	3	-0.26612	5.44265
5	2002	CH	4	0.18916	5.46911
7	1998	CL	0	0.01310	4.82667
7	1999	CL	1	-0.13419	4.86791
7	2000	CH	2	-0.00066	4.88988
7	2002	CL	4	0.19045	4.93866
8	1998	L	0	-0.01912	4.28572
8	1999	L	1	-0.05916	4.23084
8	2000	L	2	-0.03969	4.28313
8	2002	L	4	0.14664	4.39942
9	1999	O	1	0.00268	4.05772
9	2000	O	2	-0.03148	4.04311
9	2001	O	3	0.08510	4.07977
11	1998	O	0	0.01381	4.36818
11	1999	O	1	-0.03748	4.36827
11	2000	O	2	-0.07850	4.34822
11	2001	O	3	0.05581	4.43966
12	1998	O	0	0.01321	4.21720
12	1999	O	1	-0.05828	4.19971
12	2000	O	2	-0.05982	4.22474
12	2001	O	3	0.07847	4.22760
14	1998	L	0	-0.01113	4.11853
14	1999	L	1	-0.03062	4.13586
14	2000	L	2	0.04175	4.17905
15	1998	O	0	0.03910	4.57411
15	1999	O	1	-0.07499	4.56517
15	2000	O	2	-0.01954	4.59487
15	2001	O	3	0.03280	4.74560
16	1998	CH	0	-0.04203	4.21422
16	1999	CL	1	-0.07418	4.21149
16	2001	CL	3	0.11364	4.34919

Table 13. Data used in the *diffL* model.—Continued

[O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; *s*, is time when power consumption at the well was used to estimate pumpage (in years, *s*=0 for 1998); $\overline{w}$, average log PWL for a given site in a given year; $\overline{\overline{w}}$ is average log of pumping water level for a given site]

Site	Year	Type	s	$\overline{w} - \overline{\overline{w}}$	*diffL*
16	2002	CL	4	0.26246	4.55214
18	1998	L	0	-0.08549	4.13964
18	1999	L	1	-0.08186	4.13690
18	2000	L	2	-0.02694	4.14998
18	2002	L	4	0.18819	4.26619
19	1998	CH	0	-0.04126	4.27180
19	1999	CH	1	-0.09232	4.28652
19	2000	CH	2	0.07020	4.36300
19	2001	CH	3	0.05509	4.30633
20	1998	O	0	-0.03947	4.03298
20	1999	O	1	-0.10411	3.96069
20	2000	O	2	-0.00695	3.98000
20	2001	O	3	0.08794	3.97650
20	2002	O	4	0.24359	4.15830
22	1999	L	1	0.02889	4.81925
22	2000	L	2	0.07922	4.66617
22	2001	L	3	-0.12151	4.67903
22	2002	L	4	0.02326	4.53562
23	1998	O	0	0.03106	4.34270
23	1999	O	1	0.00811	4.35290
23	2000	O	2	-0.00722	4.40810
23	2001	O	3	-0.06794	4.57296
23	2002	O	4	-0.09093	4.74578
24	1998	O	0	-0.04273	4.78315
24	1999	O	1	-0.03590	4.88842
24	2001	O	3	0.05327	4.90857
24	2002	O	4	0.11082	5.04503
25	1998	O	0	-0.01005	4.32828
25	1999	O	1	-0.07009	4.35053
25	2000	O	2	0.02339	4.42622
27	1998	L	0	-0.15313	4.18959
27	1999	L	1	-0.01271	4.20032
27	2000	L	2	0.03482	4.29432
27	2001	L	3	0.06551	4.30247
28	1998	CH	0	-0.05465	4.71999
28	2000	CL	2	0.02876	4.73093
28	2001	CH	3	0.01294	4.72920
28	2002	CH	4	0.04533	4.74396
29	1998	O	0	-0.05279	4.22971
29	1999	O	1	-0.00881	4.27112
29	2000	O	2	0.01881	4.25621
29	2002	O	4	0.35833	4.38926
30	1998	O	0	0.04196	4.58768
30	1999	O	1	-0.13057	4.56735
30	2000	O	2	-0.15723	4.57188
30	2001	O	3	0.13200	4.58362
30	2002	O	4	0.01995	4.63538
32	1998	O	0	0.05187	4.60768
32	1999	O	1	-0.06786	4.62187

Table 13. Data used in the *diffL* model.—Continued

[O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; *s*, is time when power consumption at the well was used to estimate pumpage (in years, *s*=0 for 1998); $\overline{w}$, average log PWL for a given site in a given year; $\overline{\overline{w}}$ is average log of pumping water level for a given site]

Site	Year	Type	s	$\overline{w} - \overline{\overline{w}}$	*diffL*
32	2000	O	2	-0.06310	4.61006
32	2001	O	3	0.04723	4.60986
32	2002	O	4	0.28564	4.67226
34	1998	O	0	0.00265	4.04397
34	1999	O	1	-0.14436	4.08005
34	2000	O	2	-0.05334	4.03010
34	2001	O	3	0.05496	4.03265
34	2002	O	4	0.23121	4.22470
35	1998	O	0	0.00202	5.42066
35	1999	O	1	0.00153	5.49202
35	2000	O	2	-0.00759	5.45742
36	1998	O	0	-0.04766	4.58330
36	1999	O	1	-0.03890	4.60517
36	2000	O	2	-0.02565	4.57262
36	2001	O	3	0.10568	4.61816
37	1998	O	0	-0.01563	4.17575
37	1999	O	1	-0.08090	4.13517
37	2001	O	3	0.04220	4.12734
37	2002	O	4	0.24112	4.24832
38	1998	O	0	-0.03129	4.67441
38	1999	O	1	-0.04404	4.59694
38	2000	O	2	0.01836	4.70381
38	2001	O	3	0.02963	4.69749
38	2002	O	4	0.07442	4.87583
39	1998	CH	0	-0.03989	4.66174
39	1999	CL	1	-0.04938	4.66527
39	2001	CL	3	0.08126	4.70747
39	2002	CL	4	0.14666	4.74839
40	1998	O	0	-0.01410	4.61600
40	1999	O	1	-0.02753	4.55862
40	2000	O	2	0.02793	4.66412
41	1998	O	0	0.05906	4.30354
41	1999	O	1	-0.32145	4.35085
41	2000	O	2	0.06409	4.33670
41	2001	O	3	0.04861	4.36320
43	1998	O	0	-0.04122	4.98466
43	1999	O	1	-0.00732	4.98103
43	2000	O	2	-0.01365	4.97827
43	2001	O	3	-0.02654	4.99655
43	2002	O	4	0.12969	4.96925
44	1998	S	0	-0.02554	5.76196
44	1999	S	1	-0.07764	5.74473
44	2000	S	2	0.02049	5.75457
44	2001	S	3	0.06185	5.78252
45	1998	S	0	0.01696	5.30766
45	1999	S	1	-0.04056	5.33901
45	2000	S	2	0.00488	5.26024
45	2001	S	3	-0.01443	5.31961
45	2002	S	4	-0.00777	5.29679

Table 13. Data used in the *diffL* model.—Continued

[O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; *s*, is time when power consumption at the well was used to estimate pumpage (in years, *s*=0 for 1998); $\overline{w}$, average log PWL for a given site in a given year; $\overline{\overline{w}}$ is average log of pumping water level for a given site]

Site	Year	Type	s	$\overline{w}$ - $\overline{\overline{w}}$	*diffL*
46	1998	O	0	0.02963	4.18864
46	1999	O	1	0.06353	4.22416
46	2000	O	2	-0.11986	4.19086
46	2001	O	3	0.07073	4.24569
46	2002	O	4	0.07035	4.32570
47	1998	O	0	-0.00251	4.49222
47	1999	O	1	0.06213	4.45571
47	2000	O	2	-0.14734	4.32087
47	2001	O	3	0.04031	4.33716
47	2002	O	4	0.16270	4.36067
48	1998	O	0	-0.00524	4.26310
48	1999	O	1	-0.02312	4.32487
48	2000	O	2	0.02589	4.29031
49	1998	CL	0	-0.05740	4.29623
49	2000	CH	2	0.03386	4.34530
49	2002	CH	4	0.15294	4.34135
50	1998	L	0	0.01057	4.38025
50	1999	L	1	-0.11431	4.27372
50	2000	L	2	-0.09818	4.33623
50	2001	L	3	0.17020	4.39261
51	1998	CL	0	-0.02623	4.77263
51	1999	CH	1	0.04632	4.82794
51	2000	CL	2	0.02002	4.74222
51	2001	CH	3	0.04404	4.77867
51	2002	CH	4	-0.07573	4.72823
52	1998	O	0	0.00202	4.48159
52	1999	O	1	-0.00354	4.50789
53	1998	O	0	0.08939	4.50908
53	1999	O	1	-0.16383	4.51881
53	2000	O	2	-0.03935	4.55175
53	2001	O	3	-0.04999	4.68884
53	2002	O	4	0.07778	4.66411
54	1998	L	0	0.00433	4.47196
54	1999	L	1	-0.01116	4.45788
54	2000	L	2	0.00460	4.47064
54	2002	L	4	-0.00418	4.47439
55	1998	O	0	-0.04325	4.37322
55	2000	O	2	-0.01625	4.38309
55	2002	O	4	0.07706	4.50494
56	1998	O	0	-0.07860	3.97001
56	2000	O	2	-0.08287	3.92072
56	2001	O	3	0.04657	4.04459
56	2002	O	4	0.21829	4.06530
58	1998	O	0	-0.11867	4.14652
58	1999	O	1	-0.16366	4.22673
58	2000	O	2	-0.11216	4.21261
58	2001	O	3	0.07900	4.24605
58	2002	O	4	0.18616	4.36401
59	1998	O	0	-0.08554	4.44924

Table 13. Data used in the *diffL* model.—Continued

[O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; *s*, is time when power consumption at the well was used to estimate pumpage (in years, *s*=0 for 1998); $\overline{w}$, average log PWL for a given site in a given year; $\overline{\overline{w}}$ is average log of pumping water level for a given site]

Site	Year	Type	s	$\overline{w} - \overline{\overline{w}}$	*diffL*
59	1999	O	1	0.24237	4.39073
59	2000	O	2	-0.31367	4.29581
60	1998	O	0	-0.03682	4.32211
60	1999	O	1	-0.03365	4.30126
60	2000	O	2	-0.04055	4.29208
60	2001	O	3	0.07038	4.34002
60	2002	O	4	0.08932	4.41170
61	1998	O	0	0.01441	4.73484
61	1999	O	1	-0.04642	4.70667
61	2000	O	2	-0.16083	4.74416
61	2001	O	3	0.06110	4.83546
61	2002	O	4	0.10293	4.82919
62	1998	L	0	-0.09289	4.12126
62	1999	L	1	0.08093	4.43526
62	2000	L	2	0.00851	4.44434
62	2001	L	3	0.17524	4.43111
62	2002	L	4	0.04665	4.42754
63	1998	CL	0	-0.38284	4.24809
63	1999	CH	1	-0.35660	4.24976
63	2000	CL	2	0.22974	4.25535
63	2001	CH	3	0.29210	4.33234
63	2002	CH	4	-0.06041	4.38526
64	1998	O	0	-0.03887	4.41008
64	1999	O	1	-0.04071	4.43794
64	2000	O	2	0.11046	4.48320
64	2001	O	3	-0.02377	4.51556
64	2002	O	4	-0.02319	4.56067
65	1998	O	0	0.01852	4.49593
65	1999	O	1	-0.01704	4.43458
65	2000	O	2	-0.02001	4.50921
66	1998	O	0	-0.13334	4.17299
66	1999	O	1	-0.08258	4.12926
66	2000	O	2	-0.00827	4.15095
66	2001	O	3	0.02976	4.17164
66	2002	O	4	0.25036	4.25111
68	1998	L	0	-0.03945	4.43744
68	1999	L	1	-0.00369	4.44022
68	2000	L	2	-0.03785	4.43682
68	2001	L	3	-0.01458	4.45292
68	2002	L	4	0.12154	4.59470
69	1998	O	0	-0.01521	4.83315
69	2000	O	2	-0.01108	4.83350
69	2001	O	3	0.00151	4.80453
69	2002	O	4	0.04281	4.79066
70	1998	O	0	0.02155	4.85042
70	1999	O	1	0.05971	4.85510
70	2000	O	2	0.01952	4.90613
70	2001	O	3	-0.09019	5.03861
70	2002	O	4	-0.00253	4.91663

Table 13. Data used in the *diffL* model.—Continued

[O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; *s*, is time when power consumption at the well was used to estimate pumpage (in years, *s*=0 for 1998); $\overline{w}$, average log PWL for a given site in a given year; $\overline{\overline{w}}$ is average log of pumping water level for a given site]

Site	Year	Type	s	$\overline{w} - \overline{\overline{w}}$	*diffL*
72	1998	O	0	-0.06159	3.80652
72	1999	O	1	-0.00170	3.81931
72	2000	O	2	-0.00218	3.82930
72	2001	O	3	0.06289	3.86247
74	1998	O	0	-0.06926	4.46541
74	2000	O	2	0.03801	4.50484
74	2001	O	3	0.18793	4.50789
74	2002	O	4	-0.01816	4.47514
75	1998	O	0	-0.00010	4.76369
75	2000	O	2	0.00031	4.92606
77	1998	O	0	-0.01139	4.68017
77	1999	O	1	0.03418	4.67134
80	1998	O	0	-0.04351	4.22263
80	1999	O	1	-0.06901	4.24005
80	2000	O	2	0.00014	4.22661
80	2002	O	4	0.22085	4.23781
82	1998	L	0	-0.13185	4.14375
82	2002	L	4	0.19669	3.86889
85	1998	S	0	-0.10406	5.42883
85	1999	S	1	-0.00230	5.44504
85	2000	S	2	0.00720	5.53837
85	2001	S	3	0.30729	5.87910
86	1998	S	0	0.00778	5.36851
86	1999	S	1	0.03029	5.38144
86	2000	S	2	0.11225	5.42202
86	2001	S	3	0.03645	5.40306
86	2002	S	4	-0.24043	5.47253
87	1998	S	0	-0.05983	5.41429
87	1999	S	1	-0.01065	5.39492
87	2000	S	2	0.01908	5.41361
87	2001	S	3	0.04872	5.42158
87	2002	S	4	0.04654	5.41786
89	1998	O	0	0.04723	4.33543
89	1999	O	1	-0.03069	4.33780
89	2000	O	2	-0.08030	4.34575
90	1998	S	0	-0.02924	5.47597
90	1999	S	1	-0.04012	5.51115
90	2000	S	2	0.04072	5.51195
90	2001	S	3	0.06098	5.51862
90	2002	S	4	0.05664	5.60768
92	1998	S	0	-0.00883	5.86743
92	1999	S	1	0.00755	5.85292
92	2000	S	2	-0.00721	5.84781
92	2001	S	3	0.01004	5.85243
92	2002	S	4	0.01676	5.86206
95	1998	CL	0	0.02680	4.52741
95	1999	CL	1	-0.19872	4.56977
95	2000	CL	2	0.05596	4.59436
95	2001	CH	3	-0.07838	4.62980

Table 13. Data used in the *diffL* model.—Continued

[O, open; CL, complex low; CH, complex high; L, low-pressure; S, sprinkler; *s*, is time when power consumption at the well was used to estimate pumpage (in years, *s*=0 for 1998); $\overline{w}$, average log PWL for a given site in a given year; $\overline{\overline{w}}$ is average log of pumping water level for a given site]

Site	Year	Type	s	$\overline{w} - \overline{\overline{w}}$	*diffL*
97	1998	CH	0	-0.00734	4.67159
97	1999	CH	1	-0.04826	4.65388
97	2000	CL	2	0.01355	4.69504
97	2001	CH	3	0.01498	4.74240
97	2002	CL	4	0.11201	4.80406
98	1998	CH	0	-0.02688	4.82442
98	1999	CH	1	-0.01711	4.77860
98	2000	CH	2	-0.00538	4.78745
98	2001	CL	3	0.02633	4.79147
98	2002	CL	4	0.13109	4.79738
99	1998	CH	0	-0.07655	4.70833
99	2000	CH	2	0.00871	4.69571
99	2001	CL	3	0.21179	4.64593
99	2002	CH	4	0.16226	4.93744
100	1998	CL	0	-0.06633	4.10179
100	2001	CL	3	0.09737	4.19458
100	2002	CL	4	0.09675	4.23120
101	1998	CH	0	0.05026	4.02671
101	1999	CH	1	-0.10686	3.98883
101	2000	CL	2	-0.19472	4.04425
102	1998	CH	0	-0.02501	4.81222
102	1999	CH	1	-0.00448	4.80453
102	2000	CH	2	0.06673	4.87831
102	2001	CH	3	-0.09530	5.03907
102	2002	CL	4	0.23311	4.83991
103	1998	CH	0	-0.02017	5.54507
103	1999	CH	1	-0.05825	5.57320
103	2000	CH	2	-0.03801	5.55009
103	2001	CH	3	0.04804	5.59023
103	2002	CH	4	0.16925	5.61110
104	1998	CL	0	0.01057	4.93108
104	1999	CL	1	0.00883	4.93744
104	2000	CL	2	0.02478	4.94723
104	2001	CL	3	0.04478	4.96598
104	2002	CL	4	-0.14178	4.96728
105	1998	CH	0	0.00504	5.72359
105	1999	CH	1	-0.08399	5.74714
105	2000	CH	2	-0.07304	5.71809
105	2001	CH	3	-0.01758	5.77068
105	2002	CH	4	0.13933	5.74954
106	1998	CL	0	-0.00765	4.86335
106	2001	CL	3	-0.14023	4.91179
106	2002	CL	4	0.17082	4.70504

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
1	1998	35950	C	O	-0.42188	-0.01289	0.05785
1	1998	35950	P	O	-0.42188	-0.01289	0.01333
1	1998	35989	C	O	-0.52881	-0.02053	0.01647
1	1998	35989	M	O	-0.52881	-0.02053	-0.03066
1	1998	35989	P	O	-0.52881	-0.02053	-0.04343
1	1998	36026	C	O	-0.63013	0.02912	-0.00744
1	1998	36026	M	O	-0.63013	0.02912	-0.01545
1	1998	36026	P	O	-0.63013	0.02912	-0.05213
1	1999	36343	C	O	-0.49866	-0.07621	0.10350
1	1999	36343	P	O	-0.49866	-0.07621	0.07615
1	1999	36369	C	O	-0.56982	0.01761	0.13189
1	1999	36369	P	O	-0.56982	0.01761	0.12000
1	1999	36397	C	O	-0.64661	0.05860	0.02685
1	1999	36397	P	O	-0.64661	0.05860	0.02173
1	2000	36650	C	O	-0.33972	-0.03940	0.02913
1	2000	36650	P	O	-0.33972	-0.03940	0.00134
1	2000	36727	C	O	-0.55066	0.00184	0.08468
1	2000	36727	P	O	-0.55066	0.00184	0.04542
1	2000	36752	C	O	-0.61914	0.03756	0.08372
1	2000	36752	P	O	-0.61914	0.03756	0.05373
1	2001	36990	C	O	-0.27124	-0.10029	-0.04085
1	2001	36990	P	O	-0.27124	-0.10029	-0.04621
1	2001	37084	C	O	-0.52881	0.06908	0.11112
1	2001	37084	P	O	-0.52881	0.06908	0.09063
1	2001	37111	C	O	-0.60278	0.03121	0.05498
1	2001	37111	P	O	-0.60278	0.03121	0.03610
1	2002	37351	C	O	-0.26025	-0.04304	0.03354
1	2002	37351	P	O	-0.26025	-0.04304	0.01220
1	2002	37449	C	O	-0.52881	0.01411	0.03124
1	2002	37449	P	O	-0.52881	0.01411	0.00511
1	2002	37476	C	O	-0.60278	0.02893	0.09449
1	2002	37476	P	O	-0.60278	0.02893	0.06043
2	1998	35936	C	CL	-0.38354	0.01708	0.02972
2	1998	35936	P	CL	-0.38354	0.01708	0.02959
2	1998	36048	C	CL	-0.69043	-0.01262	0.00102
2	1998	36048	P	CL	-0.69043	-0.01262	-0.02466
2	1998	36052	C	CL	-0.70142	-0.00446	-0.00728
2	1998	36052	P	CL	-0.70142	-0.00446	-0.03470
2	1999	36342	C	CH	-0.49585	0.04075	0.06471
2	1999	36342	P	CH	-0.49585	0.04075	0.05692
2	1999	36348	C	CL	-0.51233	-0.04075	0.12713
2	1999	36348	P	CL	-0.51233	-0.04075	0.09860
2	2000	36692	C	CL	-0.45483	0.00000	0.07374
2	2000	36692	P	CL	-0.45483	0.00000	0.13809
2	2001	37062	C	CH	-0.46851	0.06883	-0.09946
2	2001	37062	P	CH	-0.46851	0.06883	-0.07273

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
2	2001	37082	C	CL	-0.52332	-0.00982	-0.02304
2	2001	37082	P	CL	-0.52332	-0.00982	-0.01914
2	2001	37123	C	CL	-0.63562	-0.05901	0.07027
2	2001	37123	P	CL	-0.63562	-0.05901	0.08875
2	2002	37337	C	CH	-0.22192	0.00000	0.07458
2	2002	37337	P	CH	-0.22192	0.00000	-0.00837
3	1998	35975	C	O	-0.49036	-0.04265	0.02375
3	1998	35975	P	O	-0.49036	-0.04265	0.02914
3	1998	36000	C	O	-0.55896	-0.04405	0.02817
3	1998	36000	P	O	-0.55896	-0.04405	-0.06117
3	1998	36053	C	O	-0.70410	0.08670	-0.07275
3	1998	36053	P	O	-0.70410	0.08670	-0.12029
3	1999	36348	C	O	-0.51233	-0.02586	0.02104
3	1999	36348	P	O	-0.51233	-0.02586	-0.10001
3	1999	36367	C	O	-0.56433	0.02205	0.05792
3	1999	36367	P	O	-0.56433	0.02205	0.09668
3	1999	36395	C	O	-0.64111	0.00381	0.02393
3	1999	36395	P	O	-0.64111	0.00381	-0.07791
3	2000	36699	C	O	-0.47400	0.00419	-0.00646
3	2000	36720	C	O	-0.53149	-0.00628	0.02932
3	2000	36720	P	O	-0.53149	-0.00628	0.00417
3	2000	36739	C	O	-0.58362	0.00419	0.02725
3	2000	36739	P	O	-0.58362	0.00419	-0.18511
3	2001	36986	C	O	-0.26025	-0.06422	0.00752
3	2001	36986	P	O	-0.26025	-0.06422	0.03337
3	2001	37069	C	O	-0.48767	0.02147	0.11798
3	2001	37069	P	O	-0.48767	0.02147	-0.07418
3	2001	37104	C	O	-0.58362	0.04275	0.02365
3	2001	37104	P	O	-0.58362	0.04275	-0.09830
3	2002	37328	C	O	-0.19727	0.02471	0.10954
3	2002	37448	C	O	-0.52600	-0.00500	0.01540
3	2002	37448	P	O	-0.52600	-0.00500	-0.05301
3	2002	37449	C	O	-0.52881	-0.01471	0.04278
5	1998	35934	C	CH	-0.37805	-0.08457	0.26819
5	1998	35934	P	CH	-0.37805	-0.08457	-0.00639
5	1998	35975	C	CH	-0.49036	-0.10998	0.12826
5	1998	35975	P	CH	-0.49036	-0.10998	0.05606
5	1998	36038	C	CH	-0.66296	-0.07107	0.01873
5	1998	36038	P	CH	-0.66296	-0.07107	-0.02055
5	1998	36061	C	CH	-0.72607	0.26562	0.02534
5	1998	36061	P	CH	-0.72607	0.26562	-0.03413
5	1999	36333	C	CH	-0.47119	0.00000	-0.03739
5	1999	36333	P	CH	-0.47119	0.00000	-0.10419
5	2001	37057	C	CL	-0.45483	0.00000	0.10675
5	2001	37057	P	CL	-0.45483	0.00000	0.00696
5	2002	37385	C	CH	-0.35339	0.02449	0.01820
5	2002	37424	C	CL	-0.46033	-0.00020	0.02664

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
5	2002	37461	C	CL	-0.56165	-0.02430	0.00918
7	1998	35937	M	CL	-0.38635	-0.02896	-0.26401
7	1998	35937	P	CL	-0.38635	-0.02896	-0.25063
7	1998	35999	M	CL	-0.55615	-0.02367	-0.06518
7	1998	35999	P	CL	-0.55615	-0.02367	-0.10044
7	1998	36028	M	CL	-0.63562	0.05264	-0.07005
7	1998	36028	P	CL	-0.63562	0.05264	-0.06172
7	1999	36406	M	CL	-0.67126	0.00000	-0.12211
7	1999	36406	P	CL	-0.67126	0.00000	-0.13334
7	2000	36672	P	CH	-0.40002	0.00000	-0.18072
7	2002	37573	M	CL	-0.86853	0.00000	-0.23034
8	1998	35905	P	L	-0.29858	-0.09049	-0.04251
8	1998	35975	C	L	-0.49036	-0.01841	0.03636
8	1998	35975	P	L	-0.49036	-0.01841	-0.00980
8	1998	36031	C	L	-0.64380	0.06366	0.04353
8	1998	36031	P	L	-0.64380	0.06366	0.00572
8	1999	36299	C	L	-0.37805	0.00000	-0.00413
8	1999	36299	P	L	-0.37805	0.00000	-0.07227
8	2000	36713	C	L	-0.51233	0.00000	-0.02914
8	2000	36713	P	L	-0.51233	0.00000	-0.09727
8	2002	37379	C	L	-0.33704	0.00000	0.08340
8	2002	37379	P	L	-0.33704	0.00000	-0.03876
9	1999	36340	M	O	-0.49036	-0.00344	-0.12677
9	1999	36340	P	O	-0.49036	-0.00344	-0.15218
9	1999	36370	M	O	-0.57263	0.00344	-0.13481
9	1999	36370	P	O	-0.57263	0.00344	-0.15159
9	2000	36630	M	O	-0.28491	0.07847	-0.13894
9	2000	36734	M	O	-0.56982	-0.02727	-0.13848
9	2000	36790	M	O	-0.72327	-0.05120	-0.15544
9	2001	37063	M	O	-0.47119	0.00000	-0.19509
9	2001	37063	P	O	-0.47119	0.00000	-0.26078
11	1998	35947	M	O	-0.41370	0.01188	-0.07412
11	1998	35947	P	O	-0.41370	0.01188	-0.06881
11	1998	35998	M	O	-0.55347	-0.04474	-0.10048
11	1998	35998	P	O	-0.55347	-0.04474	-0.11063
11	1998	36020	M	O	-0.61365	0.03286	-0.04171
11	1998	36020	P	O	-0.61365	0.03286	-0.08081
11	1999	36355	M	O	-0.53149	0.00000	-0.01151
11	2000	36698	M	O	-0.47119	0.00000	-0.16264
11	2000	36698	P	O	-0.47119	0.00000	-0.10659
11	2001	36993	M	O	-0.27942	0.00000	-0.00781
11	2001	36993	P	O	-0.27942	0.00000	-0.01875
12	1998	35935	M	O	-0.38086	-0.00867	0.00005
12	1998	35935	P	O	-0.38086	-0.00867	-0.02095
12	1998	35982	M	O	-0.50964	-0.01526	-0.01226
12	1998	35982	P	O	-0.50964	-0.01526	0.01385
12	1998	36014	M	O	-0.59729	-0.00488	0.01865

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
12	1998	36061	M	O	-0.72607	0.05273	-0.04280
12	1999	36362	M	O	-0.55066	0.00000	0.00431
12	1999	36362	P	O	-0.55066	0.00000	-0.03034
12	2000	36630	M	O	-0.28491	0.00000	-0.01385
12	2000	36630	P	O	-0.28491	0.00000	-0.05512
12	2001	37025	M	O	-0.36707	0.02679	-0.00244
12	2001	37082	M	O	-0.52332	-0.02679	-0.05115
14	1998	35944	C	L	-0.40552	0.01449	-0.01455
14	1998	35944	P	L	-0.40552	0.01449	-0.01872
14	1998	35975	C	L	-0.49036	0.00051	-0.02461
14	1998	35975	P	L	-0.49036	0.00051	-0.01951
14	1998	36055	C	L	-0.70959	-0.01500	-0.05478
14	1998	36055	P	L	-0.70959	-0.01500	-0.05015
14	1999	36348	C	L	-0.51233	0.02358	-0.00917
14	1999	36348	P	L	-0.51233	0.02358	-0.01549
14	1999	36406	C	L	-0.67126	0.00919	-0.03436
14	1999	36406	P	L	-0.67126	0.00919	-0.03945
14	1999	36447	C	L	-0.78357	-0.03277	-0.07493
14	1999	36447	P	L	-0.78357	-0.03277	-0.09549
14	2000	36648	C	L	-0.33423	-0.00854	-0.10232
14	2000	36648	P	L	-0.33423	-0.00854	-0.16006
14	2000	36733	C	L	-0.56714	0.00592	-0.10205
14	2000	36733	P	L	-0.56714	0.00592	-0.13750
14	2000	36768	C	L	-0.66296	0.00262	-0.09190
14	2000	36768	P	L	-0.66296	0.00262	-0.13483
15	1998	35948	M	O	-0.41638	-0.00633	0.01729
15	1998	35948	P	O	-0.41638	-0.00633	0.01185
15	1998	35968	C	O	-0.47119	-0.01474	0.05319
15	1998	35968	M	O	-0.47119	-0.01474	0.04907
15	1998	36006	C	O	-0.57532	0.02107	0.04615
15	1998	36006	M	O	-0.57532	0.02107	0.04291
15	1999	36335	C	O	-0.47668	0.01931	0.05508
15	1999	36335	M	O	-0.47668	0.01931	0.05399
15	1999	36335	P	O	-0.47668	0.01931	0.02572
15	1999	36384	C	O	-0.61096	-0.07197	0.07205
15	1999	36384	M	O	-0.61096	-0.07197	0.06270
15	1999	36432	C	O	-0.74243	0.02867	0.10180
15	1999	36432	M	O	-0.74243	0.02867	0.09697
15	1999	36432	P	O	-0.74243	0.02867	0.08829
15	2000	36636	C	O	-0.30139	0.00173	0.07461
15	2000	36636	M	O	-0.30139	0.00173	0.05627
15	2000	36636	P	O	-0.30139	0.00173	0.04574
15	2000	36706	C	O	-0.49316	0.04189	0.11164
15	2000	36706	M	O	-0.49316	0.04189	0.07384
15	2000	36749	C	O	-0.61096	-0.04449	0.01913
15	2000	36749	M	O	-0.61096	-0.04449	0.01512
15	2001	37007	C	O	-0.31775	0.05371	0.16544

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
15	2001	37007	M	O	-0.31775	0.05371	0.15109
15	2001	37069	C	O	-0.48767	0.01477	0.13385
15	2001	37069	M	O	-0.48767	0.01477	0.11320
15	2001	37118	C	O	-0.62195	-0.06848	0.12024
15	2001	37118	M	O	-0.62195	-0.06848	0.12436
16	1998	35936	C	CH	-0.38354	-0.01867	-0.06370
16	1998	35936	P	CH	-0.38354	-0.01867	-0.06134
16	1998	35942	C	CL	-0.40002	-0.07082	-0.09174
16	1998	35942	P	CL	-0.40002	-0.07082	-0.10367
16	1998	35982	C	CL	-0.50964	0.06584	0.00105
16	1998	35982	P	CL	-0.50964	0.06584	-0.01101
16	1998	36017	C	CL	-0.60547	0.02696	-0.02032
16	1998	36017	P	CL	-0.60547	0.02696	-0.05015
16	1998	36056	C	CH	-0.71228	-0.00331	-0.04550
16	1998	36056	P	CH	-0.71228	-0.00331	-0.04973
16	1999	36321	C	CL	-0.43835	-0.05082	-0.06615
16	1999	36321	P	CL	-0.43835	-0.05082	-0.07554
16	1999	36357	C	CH	-0.53699	0.05082	-0.01505
16	1999	36357	P	CH	-0.53699	0.05082	-0.02652
16	2001	37097	C	CL	-0.56433	0.00486	0.01517
16	2001	37097	P	CL	-0.56433	0.00486	-0.01607
16	2001	37158	C	CL	-0.73157	-0.00486	-0.00918
16	2001	37158	P	CL	-0.73157	-0.00486	-0.05460
16	2002	37390	C	CL	-0.36707	0.00000	0.02084
18	1998	35947	P	L	-0.41370	-0.01918	0.06414
18	1998	35986	C	L	-0.52051	-0.01800	0.00080
18	1998	35986	P	L	-0.52051	-0.01800	-0.01768
18	1998	36020	C	L	-0.61365	0.02759	0.00929
18	1998	36020	P	L	-0.61365	0.02759	-0.01108
18	1999	36314	C	L	-0.41919	0.00000	-0.02914
18	1999	36314	P	L	-0.41919	0.00000	-0.06075
18	2000	36665	C	L	-0.38086	0.00152	-0.02886
18	2000	36665	P	L	-0.38086	0.00152	-0.09794
18	2000	36713	C	L	-0.51233	0.00266	-0.01591
18	2000	36713	P	L	-0.51233	0.00266	-0.08673
18	2000	36791	C	L	-0.72607	-0.00418	-0.06466
18	2000	36791	P	L	-0.72607	-0.00418	-0.18312
18	2002	37375	C	L	-0.32605	0.03910	0.02558
18	2002	37375	P	L	-0.32605	0.03910	-0.01933
18	2002	37522	C	L	-0.72876	-0.03910	-0.03855
18	2002	37522	P	L	-0.72876	-0.03910	-0.06442
19	1998	35964	C	CH	-0.46033	0.04402	-0.00861
19	1998	35964	P	CH	-0.46033	0.04402	-0.06497
19	1998	35999	C	CH	-0.55615	-0.07584	-0.07149
19	1998	36038	C	CH	-0.66296	-0.00610	-0.05167
19	1998	36038	P	CH	-0.66296	-0.00610	-0.12388
19	1999	36334	C	CH	-0.47400	0.00000	-0.01876

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
19	1999	36334	P	CH	-0.47400	0.00000	-0.02616
19	2000	36643	C	CH	-0.32056	0.00000	-0.02451
19	2000	36643	P	CH	-0.32056	0.00000	-0.08400
19	2000	36732	C	CL	-0.56433	0.00000	0.03490
19	2000	36732	P	CL	-0.56433	0.00000	-0.03576
19	2001	36997	C	CH	-0.29041	0.00000	-0.11576
19	2001	36997	P	CH	-0.29041	0.00000	-0.15670
20	1998	35920	M	O	-0.33972	0.00222	-0.23924
20	1998	35920	P	O	-0.33972	0.00222	-0.22079
20	1998	36020	M	O	-0.61365	-0.01970	-0.09303
20	1998	36053	M	O	-0.70410	0.00763	-0.15456
20	1998	36053	P	O	-0.70410	0.00763	-0.14770
20	1999	36426	M	O	-0.72607	0.00000	-0.08901
20	1999	36426	P	O	-0.72607	0.00000	-0.10062
20	2000	36756	M	O	-0.63013	0.00000	-0.10480
20	2000	36756	P	O	-0.63013	0.00000	-0.12016
20	2001	37027	M	O	-0.37256	0.00000	-0.11901
20	2001	37027	P	O	-0.37256	0.00000	-0.11249
20	2002	37511	M	O	-0.69861	0.00000	-0.10902
22	1999	36361	C	L	-0.54797	0.06881	0.11260
22	1999	36361	P	L	-0.54797	0.06881	0.12827
22	1999	36406	C	L	-0.67126	-0.06881	0.30313
22	1999	36406	P	L	-0.67126	-0.06881	0.35208
22	2000	36664	P	L	-0.37805	0.03031	0.02863
22	2000	36754	P	L	-0.62463	-0.03031	0.10412
22	2001	37008	C	L	-0.32056	0.00990	-0.06808
22	2001	37084	C	L	-0.52881	-0.00200	-0.00920
22	2001	37159	C	L	-0.73425	-0.00790	-0.00819
22	2002	37396	C	L	-0.38354	-0.02565	0.06410
22	2002	37524	C	L	-0.73425	0.02565	0.01144
23	1998	35941	C	O	-0.39722	0.08816	-0.14244
23	1998	35972	C	O	-0.48218	-0.04036	-0.16794
23	1998	36013	C	O	-0.59448	-0.04470	-0.13611
23	1998	36013	P	O	-0.59448	-0.04470	-0.20959
23	1998	36056	C	O	-0.71228	0.04160	-0.13656
23	1999	36426	C	O	-0.72607	-0.01095	-0.14380
23	1999	36426	P	O	-0.72607	-0.01095	-0.19072
23	1999	36447	C	O	-0.78357	0.01095	-0.14023
23	1999	36447	P	O	-0.78357	0.01095	-0.17117
23	2000	36651	C	O	-0.34241	0.02063	-0.07309
23	2000	36651	P	O	-0.34241	0.02063	-0.22039
23	2000	36713	C	O	-0.51233	-0.01371	-0.11086
23	2000	36746	C	O	-0.60278	-0.02754	-0.09204
23	2001	37008	C	O	-0.32056	0.00000	-0.10034
23	2002	37476	C	O	-0.60278	0.00000	0.14331
24	1998	35913	C	O	-0.32056	-0.01688	-0.17682
24	1998	35913	P	O	-0.32056	-0.01688	-0.23014

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
24	1998	35991	C	O	-0.53430	-0.01457	-0.17169
24	1998	35991	P	O	-0.53430	-0.01457	-0.25432
24	1998	36040	C	O	-0.66846	0.03146	-0.08937
24	1998	36040	P	O	-0.66846	0.03146	-0.18805
24	1999	36369	C	O	-0.56982	0.00000	-0.07443
24	1999	36369	P	O	-0.56982	0.00000	-0.18676
24	2001	37082	C	O	-0.52332	0.00000	-0.14768
24	2001	37082	P	O	-0.52332	0.00000	-0.20847
24	2002	37449	C	O	-0.52881	0.00000	-0.12579
24	2002	37449	P	O	-0.52881	0.00000	-0.19502
25	1998	35927	C	O	-0.35889	-0.08039	-0.14838
25	1998	35978	C	O	-0.49866	-0.02322	-0.15110
25	1998	35978	M	O	-0.49866	-0.02322	-0.18741
25	1998	35978	P	O	-0.49866	-0.02322	-0.18324
25	1998	36017	C	O	-0.60547	0.05001	-0.11249
25	1998	36017	M	O	-0.60547	0.05001	-0.16931
25	1998	36017	P	O	-0.60547	0.05001	-0.14815
25	1999	36381	C	O	-0.60278	0.00000	-0.06771
25	1999	36381	P	O	-0.60278	0.00000	-0.13979
25	2000	36678	C	O	-0.41638	-0.01999	0.07440
25	2000	36678	M	O	-0.41638	-0.01999	-0.12259
25	2000	36678	P	O	-0.41638	-0.01999	-0.02405
25	2000	36713	C	O	-0.51233	-0.00605	-0.00078
25	2000	36713	M	O	-0.51233	-0.00605	-0.27653
25	2000	36713	P	O	-0.51233	-0.00605	-0.13906
25	2000	36734	C	O	-0.56982	0.02604	-0.08738
25	2000	36734	M	O	-0.56982	0.02604	-0.17092
25	2000	36734	P	O	-0.56982	0.02604	-0.14818
27	1998	36055	P	L	-0.70959	0.00000	-0.00490
27	1999	36335	P	L	-0.47668	0.00000	-0.06756
27	2000	36650	P	L	-0.33972	0.00000	-0.06354
27	2001	37005	P	L	-0.31238	-0.09502	-0.15165
27	2001	37104	P	L	-0.58362	0.09502	0.03655
28	1998	35963	C	CH	-0.45752	0.01288	-0.04815
28	1998	35963	M	CH	-0.45752	0.01288	-0.06516
28	1998	36003	C	CH	-0.56714	-0.00081	-0.01708
28	1998	36003	M	CH	-0.56714	-0.00081	-0.02023
28	1998	36038	C	CH	-0.66296	-0.01208	-0.02529
28	1998	36038	M	CH	-0.66296	-0.01208	-0.01577
28	2000	36658	C	CL	-0.36169	0.00964	-0.01990
28	2000	36658	M	CL	-0.36169	0.00964	0.00460
28	2000	36732	C	CH	-0.56433	0.02321	-0.00509
28	2000	36732	M	CH	-0.56433	0.02321	0.02311
28	2000	36763	C	CH	-0.64929	-0.03285	-0.03099
28	2000	36763	M	CH	-0.64929	-0.03285	0.01538
28	2001	37047	C	CH	-0.42737	0.01769	-0.00858
28	2001	37047	M	CH	-0.42737	0.01769	0.03639

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
28	2001	37089	C	CH	-0.54248	-0.01082	-0.00252
28	2001	37089	M	CH	-0.54248	-0.01082	0.00838
28	2001	37141	C	CH	-0.68494	-0.01375	-0.05236
28	2002	37375	C	CH	-0.32605	0.00000	-0.02825
28	2002	37375	M	CH	-0.32605	0.00000	0.01013
29	1998	35912	M	O	-0.31775	0.11481	0.04446
29	1998	35912	P	O	-0.31775	0.11481	0.02159
29	1998	35990	M	O	-0.53149	0.05681	0.10451
29	1998	35990	P	O	-0.53149	0.05681	0.07962
29	1998	35990	P	O	-0.53149	0.05681	0.09663
29	1998	36047	M	O	-0.68762	-0.20002	-0.06321
29	1998	36047	P	O	-0.68762	-0.20002	-0.10627
29	1999	36356	M	O	-0.53430	0.00598	-0.02969
29	1999	36356	P	O	-0.53430	0.00598	-0.06669
29	1999	36356	P	O	-0.53430	-0.01195	-0.02820
29	2000	36755	M	O	-0.62744	0.00000	-0.04691
29	2000	36755	P	O	-0.62744	0.00000	-0.10536
29	2002	37326	M	O	-0.19177	0.00000	-0.09419
30	1998	35913	C	O	-0.32056	-0.05477	0.09960
30	1998	35913	M	O	-0.32056	-0.05477	0.06589
30	1998	35971	C	O	-0.47949	0.13311	0.05648
30	1998	35971	M	O	-0.47949	0.13311	0.05562
30	1998	36041	C	O	-0.67126	-0.07834	0.08620
30	1998	36041	M	O	-0.67126	-0.07834	0.07869
30	1999	36425	C	O	-0.72327	0.00000	0.05759
30	1999	36425	M	O	-0.72327	0.00000	0.06965
30	2000	36699	C	O	-0.47400	0.00000	0.04058
30	2000	36699	M	O	-0.47400	0.00000	0.05107
30	2001	37112	C	O	-0.60547	0.00000	0.07067
30	2001	37112	M	O	-0.60547	0.00000	0.07397
30	2002	37379	C	O	-0.33704	-0.09327	0.09914
30	2002	37379	M	O	-0.33704	-0.09327	0.10042
30	2002	37531	M	O	-0.75342	0.18654	0.04320
32	1998	35893	M	O	-0.26575	-0.11699	-0.10948
32	1998	35893	P	O	-0.26575	-0.11699	-0.10050
32	1998	35977	M	O	-0.49585	0.04262	-0.04342
32	1998	35977	P	O	-0.49585	0.04262	-0.08091
32	1998	36026	M	O	-0.63013	0.07437	-0.07916
32	1998	36026	P	O	-0.63013	0.07437	-0.16951
32	1999	36333	M	O	-0.47119	-0.09069	-0.03523
32	1999	36333	P	O	-0.47119	-0.09069	-0.10295
32	1999	36370	M	O	-0.57263	0.03872	0.00408
32	1999	36370	P	O	-0.57263	0.03872	-0.05989
32	1999	36399	M	O	-0.65210	0.05197	0.00082
32	1999	36399	P	O	-0.65210	0.05197	-0.03533
32	2000	36690	M	O	-0.44934	-0.05263	-0.05668
32	2000	36690	P	O	-0.44934	-0.05263	-0.11102

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
32	2000	36720	M	O	-0.53149	0.04787	-0.01560
32	2000	36720	P	O	-0.53149	0.04787	-0.11227
32	2000	36747	M	O	-0.60547	0.00476	-0.02253
32	2000	36747	P	O	-0.60547	0.00476	-0.09477
32	2001	37064	M	O	-0.47400	0.02632	-0.03540
32	2001	37064	P	O	-0.47400	0.02632	-0.07689
32	2001	37111	M	O	-0.60278	-0.02632	-0.05415
32	2001	37111	P	O	-0.60278	-0.02632	-0.14287
32	2002	37455	M	O	-0.54517	0.00000	-0.04580
34	1998	35902	M	O	-0.29041	-0.09503	-0.09901
34	1998	35902	P	O	-0.29041	-0.09503	-0.09455
34	1998	35989	C	O	-0.52881	0.02633	-0.01112
34	1998	35989	P	O	-0.52881	0.02633	-0.03492
34	1998	36026	C	O	-0.63013	0.06869	0.01755
34	1998	36026	P	O	-0.63013	0.06869	-0.02966
34	1999	36368	C	O	-0.56714	-0.00347	0.09552
34	1999	36368	M	O	-0.56714	0.00694	0.05523
34	1999	36368	P	O	-0.56714	-0.00347	0.05095
34	2000	36690	C	O	-0.44934	-0.02966	-0.07880
34	2000	36690	M	O	-0.44934	-0.02966	-0.05604
34	2000	36690	P	O	-0.44934	-0.02966	-0.20762
34	2000	36752	C	O	-0.61914	0.02966	-0.05301
34	2000	36752	M	O	-0.61914	0.02966	-0.04097
34	2000	36752	P	O	-0.61914	0.02966	-0.12408
34	2001	36983	C	O	-0.25208	-0.05085	-0.13355
34	2001	36983	P	O	-0.25208	-0.05085	-0.12670
34	2001	37083	C	O	-0.52600	0.04689	-0.06602
34	2001	37083	P	O	-0.52600	0.04689	-0.08590
34	2001	37111	C	O	-0.60278	0.00793	-0.07806
34	2002	37445	C	O	-0.51782	0.00000	-0.05737
34	2002	37445	P	O	-0.51782	0.00000	-0.17210
35	1998	35920	P	O	-0.33972	-0.03974	-0.03731
35	1998	35970	P	O	-0.47668	-0.00226	0.13188
35	1998	36048	P	O	-0.69043	0.04201	-0.02228
35	1999	36333	P	O	-0.47119	0.00000	0.02400
35	2000	36692	P	O	-0.45483	0.00000	0.08473
36	1998	35915	M	O	-0.32605	0.01735	-0.03764
36	1998	35915	P	O	-0.32605	0.01735	-0.08362
36	1998	35985	M	O	-0.51782	0.03670	-0.04588
36	1998	35985	P	O	-0.51782	0.03670	-0.01645
36	1998	36054	M	O	-0.70691	-0.10810	-0.08212
36	1999	36339	M	O	-0.48767	0.00000	-0.01617
36	1999	36339	P	O	-0.48767	0.00000	0.07980
36	2000	36733	M	O	-0.56714	0.00000	-0.07963
36	2000	36733	P	O	-0.56714	0.00000	-0.08837
36	2001	37110	M	O	-0.59998	0.00000	-0.02998
37	1998	35915	M	O	-0.32605	-0.07468	-0.00980

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
37	1998	35915	P	O	-0.32605	-0.07468	-0.01481
37	1998	35977	C	O	-0.49585	0.00183	-0.00094
37	1998	35977	M	O	-0.49585	0.00183	0.02739
37	1998	35977	P	O	-0.49585	0.00183	0.00491
37	1998	36035	C	O	-0.65479	0.04796	-0.08834
37	1998	36035	M	O	-0.65479	0.04796	-0.03028
37	1998	36035	P	O	-0.65479	0.04796	-0.06601
37	1999	36395	C	O	-0.64111	0.00000	0.01857
37	1999	36395	M	O	-0.64111	0.00000	0.07231
37	1999	36395	P	O	-0.64111	0.00000	0.01955
37	2001	37134	C	O	-0.66577	0.00000	-0.00334
37	2001	37134	M	O	-0.66577	0.00000	-0.02134
37	2001	37134	P	O	-0.66577	0.00000	-0.04165
37	2002	37483	C	O	-0.62195	0.00000	0.00039
38	1998	35892	M	O	-0.26306	0.06542	-0.21692
38	1998	35892	P	O	-0.26306	0.06542	-0.17355
38	1998	35977	M	O	-0.49585	-0.02245	0.10011
38	1998	35977	P	O	-0.49585	-0.02245	0.14191
38	1998	36021	M	O	-0.61646	-0.04297	0.13037
38	1998	36021	P	O	-0.61646	-0.04297	0.17883
38	1999	36341	M	O	-0.49316	0.00388	0.07460
38	1999	36341	P	O	-0.49316	0.00388	0.09170
38	1999	36370	M	O	-0.57263	-0.01278	0.02202
38	1999	36370	P	O	-0.57263	-0.01278	0.06155
38	1999	36395	M	O	-0.64111	0.00890	-0.11601
38	1999	36395	P	O	-0.64111	0.00890	-0.07673
38	2000	36641	M	O	-0.31506	0.01498	-0.07464
38	2000	36641	P	O	-0.31506	0.01498	-0.06687
38	2000	36719	M	O	-0.52881	-0.01319	0.00260
38	2000	36719	P	O	-0.52881	-0.00901	0.04273
38	2000	36742	M	O	-0.59180	-0.00388	-0.01299
38	2000	36742	P	O	-0.59180	-0.00388	0.00006
38	2001	37012	M	O	-0.33154	-0.02864	-0.14204
38	2001	37012	P	O	-0.33154	-0.02864	-0.11518
38	2001	37104	M	O	-0.58362	0.02864	-0.03897
38	2001	37104	P	O	-0.58362	0.02864	-0.00426
38	2002	37350	M	O	-0.25757	0.01322	-0.00310
38	2002	37350	P	O	-0.25757	0.01322	0.03440
38	2002	37483	P	O	-0.62195	-0.02643	-0.15950
39	1998	36021	C	CH	-0.61646	-0.00043	0.02896
39	1998	36021	P	CH	-0.61646	-0.00043	-0.02777
39	1998	36028	C	CH	-0.63562	0.00043	0.00559
39	1998	36028	P	CH	-0.63562	0.00043	-0.02159
39	1999	36341	C	CL	-0.49316	0.02157	-0.00315
39	1999	36341	P	CL	-0.49316	0.02157	-0.02818
39	1999	36367	C	CL	-0.56433	-0.01337	0.00581
39	1999	36367	P	CL	-0.56433	-0.01337	-0.04543

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
39	1999	36433	C	CL	-0.74524	-0.00820	0.03444
39	1999	36433	P	CL	-0.74524	-0.00820	-0.00933
39	2001	37104	C	CL	-0.58362	-0.00763	0.00381
39	2001	37153	C	CL	-0.71777	0.00763	0.01146
39	2002	37326	C	CL	-0.19177	0.04646	0.13386
39	2002	37526	C	CL	-0.73975	-0.04646	-0.00149
40	1998	35919	M	O	-0.33704	-0.01414	0.03471
40	1998	35919	P	O	-0.33704	-0.01414	0.06507
40	1998	35944	M	O	-0.40552	0.03383	0.09063
40	1998	35944	P	O	-0.40552	0.03383	0.09704
40	1998	36010	M	O	-0.58630	-0.01969	-0.18277
40	1998	36010	P	O	-0.58630	-0.01969	-0.17033
40	1999	36341	M	O	-0.49316	0.00000	0.06751
40	1999	36341	P	O	-0.49316	0.00000	-0.01165
40	2000	36649	M	O	-0.33704	0.03876	0.00238
40	2000	36719	M	O	-0.52881	-0.00338	0.12477
40	2000	36719	P	O	-0.52881	-0.00338	0.12841
40	2000	36740	M	O	-0.58630	-0.01600	-0.06034
40	2000	36740	P	O	-0.58630	-0.01600	-0.02622
41	1998	35915	M	O	-0.32605	0.02071	-0.02982
41	1998	35915	P	O	-0.32605	0.02071	-0.05458
41	1998	36011	C	O	-0.58899	-0.01036	0.01720
41	1998	36011	C	O	-0.58899	-0.01036	0.03482
41	1998	36011	M	O	-0.58899	-0.01036	-0.06274
41	1998	36011	P	O	-0.58899	-0.01036	-0.08980
41	1999	36336	C	O	-0.47949	0.00000	0.05452
41	1999	36336	C	O	-0.47949	0.00000	0.06561
41	1999	36336	M	O	-0.47949	0.00000	-0.00085
41	2000	36656	C	O	-0.35620	0.00354	0.02081
41	2000	36656	C	O	-0.35620	0.00354	0.03195
41	2000	36656	M	O	-0.35620	0.00354	-0.03465
41	2000	36656	P	O	-0.35620	0.00354	-0.10889
41	2000	36740	C	O	-0.58630	-0.02858	-0.00983
41	2000	36740	M	O	-0.58630	-0.02858	-0.06010
41	2000	36763	C	O	-0.64929	0.02150	0.02014
41	2000	36763	M	O	-0.64929	0.02150	-0.02526
41	2001	37070	C	O	-0.49036	0.00000	0.04478
41	2001	37070	M	O	-0.49036	0.00000	-0.01243
43	1998	35958	C	O	-0.44385	-0.01942	-0.00373
43	1998	35958	M	O	-0.44385	-0.01942	0.01138
43	1998	35958	P	O	-0.44385	-0.01942	-0.00318
43	1998	36003	C	O	-0.56714	-0.00805	-0.01539
43	1998	36003	M	O	-0.56714	-0.00805	0.00841
43	1998	36003	P	O	-0.56714	-0.00805	-0.04630
43	1998	36053	C	O	-0.70410	0.04120	-0.02524
43	1998	36053	M	O	-0.70410	0.04120	0.00855
43	1999	36336	C	O	-0.47949	-0.03194	0.00595

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
43	1999	36336	P	O	-0.47949	-0.03194	-0.03194
43	1999	36399	C	O	-0.65210	0.02129	-0.00361
43	1999	36399	M	O	-0.65210	0.02129	0.00484
43	1999	36399	P	O	-0.65210	0.02129	-0.01578
43	2000	36657	C	O	-0.35889	-0.05540	-0.02305
43	2000	36657	M	O	-0.35889	-0.05540	-0.04686
43	2000	36657	P	O	-0.35889	-0.05540	-0.03316
43	2000	36720	C	O	-0.53149	-0.02303	-0.01739
43	2000	36720	M	O	-0.53149	-0.02303	-0.03230
43	2000	36720	P	O	-0.53149	-0.02303	-0.08559
43	2000	36747	C	O	-0.60547	0.07843	-0.00362
43	2000	36747	M	O	-0.60547	0.07843	-0.02083
43	2000	36747	P	O	-0.60547	0.07843	-0.08969
43	2001	36984	C	O	-0.25476	0.07041	-0.02819
43	2001	36984	M	O	-0.25476	0.07041	-0.06326
43	2001	36984	P	O	-0.25476	0.07041	-0.20355
43	2001	37103	C	O	-0.58081	-0.07041	-0.00518
43	2001	37103	M	O	-0.58081	-0.07041	-0.03839
43	2001	37103	P	O	-0.58081	-0.07041	-0.04701
43	2002	37419	C	O	-0.44653	0.01627	-0.03342
43	2002	37419	M	O	-0.44653	0.01627	-0.09081
43	2002	37419	P	O	-0.44653	0.01627	-0.14568
43	2002	37526	C	O	-0.73975	-0.02440	0.00159
43	2002	37526	M	O	-0.73975	-0.02440	-0.02437
44	1998	35906	C	S	-0.30139	-0.00953	0.02423
44	1998	35906	P	S	-0.30139	-0.00953	-0.03810
44	1998	35957	C	S	-0.44104	-0.01746	-0.04810
44	1998	35957	P	S	-0.44104	-0.01746	-0.08848
44	1998	36047	C	S	-0.68762	0.02699	-0.00811
44	1998	36047	P	S	-0.68762	0.02699	-0.00113
44	1999	36389	C	S	-0.62463	0.00000	-0.03169
44	1999	36389	P	S	-0.62463	0.00000	-0.05443
44	2000	36691	C	S	-0.45203	0.07634	-0.02543
44	2000	36691	P	S	-0.45203	0.07634	-0.03783
44	2000	36719	C	S	-0.52881	-0.05481	0.00060
44	2000	36719	P	S	-0.52881	-0.05481	-0.06587
44	2000	36740	C	S	-0.58630	-0.02153	0.02561
44	2000	36740	P	S	-0.58630	-0.02153	-0.07320
44	2001	37012	C	S	-0.33154	0.00490	0.32234
44	2001	37012	P	S	-0.33154	0.00490	0.22346
44	2001	37110	P	S	-0.59998	-0.00980	-0.00130
45	1998	35899	C	S	-0.28223	0.03772	0.00859
45	1998	35899	P	S	-0.28223	0.03772	-0.02733
45	1998	35942	C	S	-0.40002	-0.01882	0.05465
45	1998	35942	P	S	-0.40002	-0.01882	0.01189
45	1998	36054	P	S	-0.70691	-0.03779	0.00644
45	1999	36370	P	S	-0.57263	0.00000	0.00066

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
45	2000	36692	P	S	-0.45483	0.02498	-0.09011
45	2000	36720	P	S	-0.53149	-0.01910	-0.04506
45	2000	36755	P	S	-0.62744	-0.00589	-0.00478
45	2001	37012	P	S	-0.33154	-0.01948	0.01496
45	2001	37063	P	S	-0.47119	0.02613	0.00680
45	2001	37153	P	S	-0.71777	-0.00666	0.00764
45	2002	37418	P	S	-0.44385	0.00000	0.03586
45	2002	37418	P	S	-0.44385	0.00000	0.03586
46	1998	35892	C	O	-0.26306	-0.03669	-0.13999
46	1998	35892	M	O	-0.26306	-0.03669	-0.12578
46	1998	35892	P	O	-0.26306	-0.03669	-0.18447
46	1998	35915	C	O	-0.32605	-0.04534	-0.12538
46	1998	35915	M	O	-0.32605	-0.04534	-0.11691
46	1998	36000	C	O	-0.55896	0.04173	-0.05542
46	1998	36000	M	O	-0.55896	0.04173	-0.04937
46	1998	36038	C	O	-0.66296	0.05865	-0.08706
46	1998	36038	M	O	-0.66296	0.05865	-0.07657
46	1999	36241	C	O	-0.21924	0.00000	-0.09851
46	1999	36241	M	O	-0.21924	0.00000	-0.10631
46	2000	36683	C	O	-0.43018	0.21789	-0.07870
46	2000	36683	M	O	-0.43018	0.21789	-0.11213
46	2000	36683	P	O	-0.43018	0.21789	-0.16174
46	2000	36734	C	O	-0.56982	-0.13231	-0.02260
46	2000	36734	M	O	-0.56982	-0.13231	-0.07013
46	2000	36734	P	O	-0.56982	-0.13231	-0.10914
46	2000	36777	C	O	-0.68762	-0.12837	-0.06603
46	2000	36777	M	O	-0.68762	-0.12837	-0.07786
46	2001	36991	C	O	-0.27393	-0.05698	-0.00751
46	2001	36991	M	O	-0.27393	-0.05698	-0.02680
46	2001	36991	P	O	-0.27393	-0.05698	-0.03652
46	2001	37048	C	O	-0.43018	0.05698	-0.02583
46	2001	37048	M	O	-0.43018	0.05698	-0.02555
46	2001	37048	P	O	-0.43018	0.05698	-0.02806
46	2002	37335	C	O	-0.21643	0.00000	0.03511
46	2002	37335	M	O	-0.21643	0.00000	0.03470
47	1998	35951	M	O	-0.42468	-0.01181	-0.06639
47	1998	35951	P	O	-0.42468	-0.01181	-0.11804
47	1998	36000	M	O	-0.55896	0.01453	-0.04307
47	1998	36000	P	O	-0.55896	0.01453	-0.05257
47	1998	36031	M	O	-0.64380	-0.00272	-0.00693
47	1998	36031	P	O	-0.64380	-0.00272	-0.02532
47	1999	36241	M	O	-0.21924	0.00000	0.09185
47	2000	36683	M	O	-0.43018	0.23889	-0.00366
47	2000	36683	P	O	-0.43018	0.23889	-0.02320
47	2000	36734	M	O	-0.56982	-0.16302	0.04921
47	2000	36734	P	O	-0.56982	-0.16302	-0.01289
47	2000	36777	M	O	-0.68762	-0.15173	0.06073

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
47	2001	36991	M	O	-0.27393	-0.04164	0.11150
47	2001	36991	P	O	-0.27393	-0.04164	0.11398
47	2001	37057	M	O	-0.45483	0.02576	0.05344
47	2001	37152	M	O	-0.71509	0.02876	0.02341
47	2001	37152	P	O	-0.71509	0.02876	0.01276
47	2002	37335	M	O	-0.21643	0.09344	0.11375
47	2002	37477	M	O	-0.60547	-0.04672	0.01829
47	2002	37477	P	O	-0.60547	-0.04672	-0.01156
48	1998	35928	M	O	-0.36169	0.00651	-0.08227
48	1998	35928	P	O	-0.36169	0.00651	-0.09079
48	1998	35965	M	O	-0.46301	0.02731	-0.09605
48	1998	35965	P	O	-0.46301	0.02731	-0.09502
48	1998	36054	M	O	-0.70691	-0.03382	-0.11128
48	1998	36054	P	O	-0.70691	-0.03382	-0.14045
48	1999	36383	M	O	-0.60828	0.00000	0.02785
48	1999	36383	P	O	-0.60828	0.00000	0.01608
48	2000	36663	M	O	-0.37537	-0.01042	-0.11446
48	2000	36663	P	O	-0.37537	-0.01042	-0.08091
48	2000	36741	M	O	-0.58899	0.02083	-0.07902
49	1998	35912	P	CL	-0.31775	-0.14176	-0.01645
49	1998	35975	C	CH	-0.49036	-0.02570	0.03045
49	1998	35975	P	CH	-0.49036	-0.02570	-0.07335
49	1998	36035	C	CH	-0.65479	0.09658	0.06517
49	1998	36035	P	CH	-0.65479	0.09658	0.06969
49	2000	36763	C	CH	-0.64929	0.00000	0.05745
49	2002	37446	C	CH	-0.52051	0.00000	-0.01932
50	1998	35899	C	L	-0.28223	0.15796	0.08529
50	1998	35899	M	L	-0.28223	0.15796	0.06343
50	1998	35961	C	L	-0.45203	0.06397	0.10151
50	1998	35961	M	L	-0.45203	0.06397	0.07282
50	1998	36012	C	L	-0.59180	-0.09491	0.08774
50	1998	36012	M	L	-0.59180	-0.09491	0.06197
50	1998	36059	C	L	-0.72058	-0.12703	0.12748
50	1998	36059	M	L	-0.72058	-0.12703	0.09888
50	1999	36357	C	L	-0.53699	0.00000	0.02010
50	1999	36357	M	L	-0.53699	0.00000	-0.01014
50	2000	36662	C	L	-0.37256	0.00000	0.07850
50	2000	36662	M	L	-0.37256	0.00000	0.05666
50	2001	37023	C	L	-0.36169	0.01071	0.06517
50	2001	37118	C	L	-0.62195	-0.01071	0.06174
51	1998	35906	M	CL	-0.30139	0.00412	0.03731
51	1998	35906	P	CL	-0.30139	0.00412	-0.01419
51	1998	35972	M	CH	-0.48218	-0.05617	-0.05744
51	1998	35972	P	CH	-0.48218	-0.05617	-0.04982
51	1998	36020	M	CH	-0.61365	0.05205	0.08083
51	1998	36020	P	CH	-0.61365	0.05205	0.10009
51	1999	36241	M	CH	-0.21924	0.00000	0.05227

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
51	1999	36241	P	CH	-0.21924	0.00000	0.02860
51	2000	36678	M	CL	-0.41638	0.00000	-0.03345
51	2000	36678	P	CL	-0.41638	0.00000	-0.06131
51	2001	36991	M	CH	-0.27393	0.00701	-0.01181
51	2001	36991	P	CH	-0.27393	0.00701	-0.04314
51	2001	37048	M	CH	-0.43018	-0.00701	-0.02132
51	2001	37048	P	CH	-0.43018	-0.00701	-0.03733
51	2002	37421	M	CH	-0.45203	0.00000	-0.07342
51	2002	37421	P	CH	-0.45203	0.00000	-0.09423
52	1998	35965	C	O	-0.46301	0.03803	-0.06701
52	1998	35965	M	O	-0.46301	0.03803	-0.01454
52	1998	35965	P	O	-0.46301	0.03803	-0.11090
52	1998	35992	C	O	-0.53699	-0.05608	-0.07144
52	1998	35992	M	O	-0.53699	-0.05608	-0.03048
52	1998	36034	M	O	-0.65210	-0.00097	-0.01555
52	1998	36034	P	O	-0.65210	-0.00097	-0.04616
52	1999	36349	C	O	-0.51501	0.01640	0.01544
52	1999	36349	M	O	-0.51501	0.01640	0.01712
52	1999	36405	C	O	-0.66846	-0.01639	-0.03189
52	1999	36405	M	O	-0.66846	-0.01639	0.02015
53	1998	35949	M	O	-0.41919	0.00887	-0.02921
53	1998	35949	P	O	-0.41919	0.00887	-0.07915
53	1998	35991	C	O	-0.53430	-0.01463	-0.05392
53	1998	35991	M	O	-0.53430	-0.01463	-0.07569
53	1998	35991	P	O	-0.53430	-0.01463	-0.10078
53	1998	36035	C	O	-0.65479	0.01307	-0.05922
53	1998	36035	M	O	-0.65479	0.01307	-0.00584
53	1999	36319	C	O	-0.43286	0.00000	-0.01947
53	1999	36319	M	O	-0.43286	0.00000	0.00543
53	2000	36649	C	O	-0.33704	-0.17032	-0.05041
53	2000	36649	M	O	-0.33704	-0.17032	-0.08559
53	2000	36649	P	O	-0.33704	-0.17032	-0.14435
53	2000	36712	C	O	-0.50964	0.04719	-0.09628
53	2000	36712	M	O	-0.50964	0.04719	-0.12322
53	2000	36733	C	O	-0.56714	0.13887	-0.08762
53	2000	36733	M	O	-0.56714	0.13887	-0.09388
53	2000	36733	P	O	-0.56714	0.13887	-0.13932
53	2001	36982	C	O	-0.24927	0.18794	-0.03180
53	2001	36982	M	O	-0.24927	0.18794	-0.05304
53	2001	36982	P	O	-0.24927	0.18794	-0.13015
53	2001	37070	C	O	-0.49036	0.04484	0.00200
53	2001	37070	M	O	-0.49036	0.04484	-0.00067
53	2001	37070	P	O	-0.49036	0.04484	-0.05252
53	2001	37110	C	O	-0.59998	-0.23279	-0.01645
53	2001	37110	M	O	-0.59998	-0.23279	-0.02384
53	2001	37110	P	O	-0.59998	-0.23279	-0.07836
53	2002	37347	C	O	-0.24927	-0.12129	0.01196

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
53	2002	37347	M	O	-0.24927	-0.12129	-0.02071
53	2002	37445	C	O	-0.51782	-0.15668	-0.02237
53	2002	37445	M	O	-0.51782	-0.15668	-0.07524
53	2002	37504	C	O	-0.67944	0.27798	-0.02458
53	2002	37504	M	O	-0.67944	0.27798	-0.06998
54	1998	35963	C	L	-0.45752	0.00344	-0.08591
54	1998	35963	M	L	-0.45752	0.00344	0.00124
54	1998	36053	C	L	-0.70410	0.00052	-0.03306
54	1998	36056	C	L	-0.71228	-0.00741	-0.04055
54	1999	36362	C	L	-0.55066	0.00000	0.02208
54	1999	36362	M	L	-0.55066	0.00000	-0.07116
54	2000	36656	C	L	-0.35620	-0.00080	-0.00863
54	2000	36718	C	L	-0.52600	0.00080	-0.05343
54	2002	37349	C	L	-0.25476	0.00000	0.00413
55	1998	35956	C	O	-0.43835	-0.02975	-0.02357
55	1998	35956	M	O	-0.43835	-0.02975	-0.01776
55	1998	35998	C	O	-0.55347	-0.01930	0.00593
55	1998	35998	M	O	-0.55347	-0.01930	0.01178
55	1998	36035	C	O	-0.65479	0.04905	0.05321
55	1998	36035	M	O	-0.65479	0.04905	0.05254
55	2000	36769	C	O	-0.66577	0.00000	-0.03827
55	2000	36769	M	O	-0.66577	0.00000	-0.04701
55	2000	36769	P	O	-0.66577	0.00000	-0.10476
55	2002	37371	C	O	-0.31506	0.02637	0.06288
55	2002	37371	M	O	-0.31506	0.02637	0.05842
55	2002	37469	C	O	-0.58362	-0.02637	-0.27888
55	2002	37469	M	O	-0.58362	-0.02637	-0.29662
56	1998	35901	C	O	-0.28772	-0.00876	-0.04331
56	1998	35901	M	O	-0.28772	-0.00876	-0.04745
56	1998	35956	C	O	-0.43835	-0.02251	-0.12417
56	1998	35956	M	O	-0.43835	-0.02251	-0.00799
56	1998	35956	P	O	-0.43835	-0.02251	-0.08594
56	1998	36046	C	O	-0.68494	0.04253	0.03642
56	1998	36046	P	O	-0.68494	0.04253	0.01589
56	2000	36762	C	O	-0.64661	0.00000	-0.01502
56	2000	36762	M	O	-0.64661	0.00000	0.00490
56	2001	37036	C	O	-0.39722	0.17477	0.00858
56	2001	37036	M	O	-0.39722	0.17477	-0.00475
56	2001	37071	C	O	-0.49316	-0.09813	-0.05507
56	2001	37071	M	O	-0.49316	-0.09813	-0.06069
56	2001	37124	C	O	-0.63831	-0.07665	-0.04357
56	2001	37124	M	O	-0.63831	-0.07665	-0.04122
56	2002	37343	C	O	-0.23840	0.00000	-0.04934
56	2002	37343	M	O	-0.23840	0.00000	-0.03883
58	1998	35954	C	O	-0.43286	-0.06114	0.00243
58	1998	35990	C	O	-0.53149	0.00435	0.00195
58	1998	36020	C	O	-0.61365	0.05679	0.04553

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
58	1999	36378	C	O	-0.59448	-0.01364	0.02563
58	1999	36378	M	O	-0.59448	0.01364	0.00209
58	2000	36748	C	O	-0.60828	0.00000	0.05795
58	2001	36999	C	O	-0.29590	-0.07435	-0.13122
58	2001	37056	C	O	-0.45203	0.01607	-0.02211
58	2001	37103	C	O	-0.58081	0.05828	0.04449
58	2002	37335	C	O	-0.21643	0.01671	0.00935
58	2002	37414	C	O	-0.43286	0.02851	0.05657
58	2002	37515	C	O	-0.70959	-0.04522	0.00359
59	1998	35964	M	O	-0.46033	0.00000	-0.03659
59	1998	35964	P	O	-0.46033	0.00000	-0.02126
59	1999	36390	M	O	-0.62744	0.00000	-0.02134
59	1999	36390	P	O	-0.62744	0.00000	-0.00754
59	2000	36650	P	O	-0.33972	0.00000	-0.01941
60	1998	35901	C	O	-0.28772	-0.05101	-0.12792
60	1998	35901	M	O	-0.28772	-0.05101	-0.10632
60	1998	35901	P	O	-0.28772	-0.05101	-0.14391
60	1998	35978	C	O	-0.49866	-0.05830	-0.13664
60	1998	35978	M	O	-0.49866	-0.05830	-0.10858
60	1998	35978	P	O	-0.49866	-0.05830	-0.12699
60	1998	36046	C	O	-0.68494	0.10931	-0.05615
60	1998	36046	M	O	-0.68494	0.10931	-0.02726
60	1998	36046	P	O	-0.68494	0.10931	-0.05477
60	1999	36362	C	O	-0.55066	0.00184	-0.13396
60	1999	36362	C	O	-0.55066	-0.00551	-0.07437
60	1999	36362	M	O	-0.55066	0.00184	-0.12944
60	1999	36362	P	O	-0.55066	0.00184	-0.13821
60	2000	36691	C	O	-0.45203	0.01173	-0.11634
60	2000	36691	M	O	-0.45203	0.01173	-0.12156
60	2000	36691	P	O	-0.45203	0.01173	-0.12880
60	2000	36721	C	O	-0.53430	-0.00410	-0.10828
60	2000	36721	M	O	-0.53430	-0.00410	-0.11488
60	2000	36721	P	O	-0.53430	-0.00410	-0.13504
60	2000	36761	C	O	-0.64380	-0.00763	-0.14845
60	2000	36761	M	O	-0.64380	-0.00763	-0.12555
60	2000	36761	P	O	-0.64380	-0.00763	-0.17566
60	2001	37015	C	O	-0.33972	-0.02710	-0.05641
60	2001	37015	M	O	-0.33972	-0.02710	-0.08315
60	2001	37077	C	O	-0.50964	0.01383	-0.10110
60	2001	37077	M	O	-0.50964	0.01383	-0.13162
60	2001	37077	P	O	-0.50964	0.01383	-0.15355
60	2001	37111	C	O	-0.60278	0.00424	-0.09957
60	2001	37111	M	O	-0.60278	0.00424	-0.11189
60	2001	37111	P	O	-0.60278	0.00424	-0.18416
60	2002	37337	C	O	-0.22192	0.00000	-0.06881
60	2002	37337	M	O	-0.22192	0.00000	-0.07839
60	2002	37337	P	O	-0.22192	0.00000	-0.09254

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
61	1998	35957	C	O	-0.44104	0.06625	0.07556
61	1998	35957	M	O	-0.44104	0.06625	0.04864
61	1998	36004	C	O	-0.56982	-0.01713	0.04873
61	1998	36004	M	O	-0.56982	-0.01713	0.07527
61	1998	36042	C	O	-0.67395	-0.04912	0.09141
61	1998	36042	M	O	-0.67395	-0.04912	0.03882
61	1999	36383	C	O	-0.60828	0.00000	0.12518
61	1999	36383	M	O	-0.60828	0.00000	0.06276
61	2000	36691	C	O	-0.45203	0.00000	0.04196
61	2000	36691	M	O	-0.45203	0.00000	-0.13644
61	2001	37134	C	O	-0.66577	0.00000	0.06817
61	2001	37134	M	O	-0.66577	0.00000	-0.05398
61	2002	37349	C	O	-0.25476	0.00000	0.11921
61	2002	37349	M	O	-0.25476	0.00000	-0.05065
62	1998	35928	P	L	-0.36169	0.23606	0.07680
62	1998	35965	C	L	-0.46301	-0.04623	-0.07263
62	1998	35965	P	L	-0.46301	-0.05740	-0.02124
62	1998	36034	C	L	-0.65210	-0.06682	-0.09913
62	1998	36034	P	L	-0.65210	-0.06560	-0.04525
62	1999	36433	C	L	-0.74524	0.00000	-0.10591
62	1999	36433	P	L	-0.74524	0.00000	-0.03019
62	2000	36663	C	L	-0.37537	-0.02363	-0.11865
62	2000	36663	P	L	-0.37537	-0.02363	-0.08589
62	2000	36741	C	L	-0.58899	0.02363	-0.17355
62	2000	36741	P	L	-0.58899	0.02363	-0.09266
62	2001	37096	C	L	-0.56165	0.00000	-0.10514
62	2002	37505	C	L	-0.68225	0.00000	-0.12991
62	2002	37505	P	L	-0.68225	0.00000	-0.10086
63	1998	35902	C	CL	-0.29041	-0.00263	0.02286
63	1998	35949	C	CL	-0.41919	-0.00633	0.00633
63	1998	36047	C	CH	-0.68762	0.00897	0.04638
63	1999	36357	C	CH	-0.53699	0.00000	0.00070
63	2000	36684	C	CL	-0.43286	-0.03078	0.00315
63	2000	36728	C	CL	-0.55347	-0.03856	0.00429
63	2000	36761	C	CH	-0.64380	0.06934	0.01792
63	2001	36998	C	CH	-0.29309	-0.00652	0.02476
63	2001	37034	C	CH	-0.39172	-0.00380	0.01592
63	2001	37069	C	CH	-0.48767	0.01033	0.05193
63	2002	37356	C	CH	-0.27393	0.00000	-0.05350
64	1998	35921	C	O	-0.34241	0.00765	0.05196
64	1998	35949	C	O	-0.41919	-0.00098	-0.00912
64	1998	36047	C	O	-0.68762	0.00139	0.01860
64	1998	36054	C	O	-0.70691	-0.00806	0.00703
64	1999	36313	C	O	-0.41638	-0.00015	0.01297
64	1999	36369	C	O	-0.56982	0.00015	0.00201
64	2000	36684	C	O	-0.43286	-0.07952	0.10581
64	2000	36726	C	O	-0.54797	-0.09311	0.10871

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
64	2000	36781	C	O	-0.69861	0.17263	0.05013
64	2001	37035	C	O	-0.39453	-0.02652	0.10215
64	2001	37069	C	O	-0.48767	0.00527	0.10884
64	2002	37355	C	O	-0.27124	0.00000	-0.10088
65	1998	35900	C	O	-0.28491	0.06357	-0.00121
65	1998	35900	M	O	-0.28491	0.06357	0.00426
65	1998	35949	C	O	-0.41919	-0.24021	-0.02227
65	1998	35949	M	O	-0.41919	-0.24021	-0.02205
65	1998	36032	C	O	-0.64661	0.11660	0.00561
65	1998	36032	M	O	-0.64661	0.11660	0.01598
65	1998	36053	C	O	-0.70410	0.06004	0.02452
65	1998	36053	M	O	-0.70410	0.06004	0.03578
65	1999	36313	C	O	-0.41638	0.02404	0.00305
65	1999	36313	M	O	-0.41638	0.02404	0.00329
65	1999	36364	C	O	-0.55615	-0.02404	-0.04332
65	1999	36364	M	O	-0.55615	-0.02404	-0.04548
65	2000	36685	C	O	-0.43567	0.00797	0.01664
65	2000	36685	M	O	-0.43567	0.00797	0.00297
65	2000	36728	C	O	-0.55347	-0.00797	0.03483
65	2000	36728	M	O	-0.55347	-0.00797	0.04353
66	1998	35958	C	O	-0.44385	-0.03269	0.00493
66	1998	35958	M	O	-0.44385	-0.03269	-0.07850
66	1998	36005	C	O	-0.57263	-0.00921	0.00880
66	1998	36005	M	O	-0.57263	-0.00921	-0.03335
66	1998	36017	C	O	-0.60547	0.04190	0.08651
66	1998	36017	M	O	-0.60547	0.04190	0.06853
66	1999	36294	C	O	-0.36438	0.03125	0.00746
66	1999	36294	M	O	-0.36438	0.03125	-0.00527
66	1999	36362	C	O	-0.55066	-0.03125	0.00876
66	1999	36362	M	O	-0.55066	-0.03125	0.00035
66	2000	36665	C	O	-0.38086	0.02295	-0.00056
66	2000	36665	M	O	-0.38086	0.02295	0.00196
66	2000	36718	C	O	-0.52600	0.01046	0.00576
66	2000	36718	M	O	-0.52600	0.01046	0.01771
66	2000	36754	C	O	-0.62463	-0.03341	-0.01773
66	2000	36754	M	O	-0.62463	-0.03341	-0.00684
66	2001	37047	C	O	-0.42737	0.03410	0.01526
66	2001	37047	M	O	-0.42737	0.03410	0.00949
66	2001	37091	C	O	-0.54797	-0.00752	0.02803
66	2001	37091	M	O	-0.54797	-0.00752	0.03137
66	2001	37141	C	O	-0.68494	-0.02658	-0.01589
66	2001	37141	M	O	-0.68494	-0.02658	-0.10140
66	2002	37455	C	O	-0.54517	0.01357	0.00076
66	2002	37455	M	O	-0.54517	0.01357	0.00490
66	2002	37488	C	O	-0.63562	-0.01357	-0.01971
66	2002	37488	M	O	-0.63562	-0.01357	-0.03345
68	1998	35949	C	L	-0.41919	-0.03935	0.00270

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
68	1998	35991	C	L	-0.53430	-0.01516	0.00793
68	1998	36019	C	L	-0.61096	0.03731	0.03120
68	1998	36061	C	L	-0.72607	0.01719	0.02950
68	1999	36327	C	L	-0.45483	0.00000	0.02030
68	2000	36700	C	L	-0.47668	0.00000	0.02402
68	2001	37026	C	L	-0.36987	-0.01239	-0.04210
68	2001	37140	C	L	-0.68225	0.00818	0.03108
68	2001	37162	C	L	-0.74243	0.00421	0.02664
68	2002	37370	C	L	-0.31238	0.05183	0.12284
68	2002	37491	C	L	-0.64380	-0.05183	-0.16465
69	1998	35942	C	O	-0.40002	0.04807	0.07612
69	1998	35942	P	O	-0.40002	0.04807	0.06654
69	1998	36026	C	O	-0.63013	-0.03650	0.01991
69	1998	36026	P	O	-0.63013	-0.03650	0.01707
69	1998	36040	C	O	-0.66846	-0.02316	0.02235
69	2000	36747	C	O	-0.60547	0.00000	0.00638
69	2001	37083	C	O	-0.52600	0.00000	0.00388
69	2002	37419	C	O	-0.44653	0.00000	0.01145
69	2002	37419	P	O	-0.44653	0.00000	-0.01320
70	1998	35930	C	O	-0.36707	0.00918	-0.05899
70	1998	35983	C	O	-0.51233	-0.02482	-0.06150
70	1998	36033	C	O	-0.64929	0.01563	-0.00722
70	1999	36320	C	O	-0.43567	0.00000	-0.07959
70	2000	36634	C	O	-0.29590	0.01736	-0.02805
70	2000	36705	C	O	-0.49036	-0.03342	-0.02755
70	2000	36755	C	O	-0.62744	0.01606	-0.03915
70	2001	37008	C	O	-0.32056	-0.01261	0.10774
70	2001	37105	C	O	-0.58630	0.01261	-0.13136
70	2002	37449	C	O	-0.52881	0.00000	-0.15973
72	1998	35948	C	O	-0.41638	0.05108	-0.04681
72	1998	35948	M	O	-0.41638	0.05108	-0.06197
72	1998	35992	C	O	-0.53699	-0.06896	0.00789
72	1998	35992	M	O	-0.53699	-0.06896	0.00030
72	1998	36041	C	O	-0.67126	0.01788	0.04300
72	1998	36041	M	O	-0.67126	0.01788	0.03078
72	1999	36355	C	O	-0.53149	0.00000	0.01844
72	1999	36355	M	O	-0.53149	0.00000	0.01465
72	2000	36719	C	O	-0.52881	0.00000	0.04375
72	2000	36719	M	O	-0.52881	0.00000	0.02687
72	2001	37070	C	O	-0.49036	0.02972	-0.00309
72	2001	37070	M	O	-0.49036	0.02972	-0.01331
72	2001	37140	C	O	-0.68225	-0.00622	-0.08280
72	2001	37140	M	O	-0.68225	-0.00622	-0.07093
72	2001	37161	C	O	-0.73975	-0.02350	-0.07542
72	2001	37161	M	O	-0.73975	-0.02350	-0.07483
74	1998	35935	C	O	-0.38086	0.00128	-0.03006
74	1998	35935	M	O	-0.38086	0.00128	-0.07073

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
74	1998	36004	C	O	-0.56982	-0.02010	0.03412
74	1998	36004	M	O	-0.56982	-0.02010	0.00203
74	1998	36048	C	O	-0.69043	0.01883	0.04356
74	1998	36048	M	O	-0.69043	0.01883	0.01994
74	2000	36686	C	O	-0.43835	0.00000	0.06349
74	2000	36686	M	O	-0.43835	0.00000	0.04655
74	2001	37007	C	O	-0.31775	0.00000	0.01936
74	2001	37007	M	O	-0.31775	0.00000	0.00088
74	2002	37454	C	O	-0.54248	0.00000	0.04611
74	2002	37454	M	O	-0.54248	0.00000	0.03921
75	1998	35914	C	O	-0.32324	-0.05440	0.04958
75	1998	35914	M	O	-0.32324	-0.05440	0.03772
75	1998	36004	C	O	-0.56982	0.02440	0.09893
75	1998	36004	M	O	-0.56982	0.02440	0.08984
75	1998	36041	C	O	-0.67126	0.03000	0.10006
75	1998	36041	M	O	-0.67126	0.03000	0.09780
75	2000	36720	C	O	-0.53149	0.00000	0.23728
75	2000	36720	M	O	-0.53149	0.00000	0.22041
77	1998	35997	C	O	-0.55066	0.05138	0.06565
77	1998	35997	M	O	-0.55066	0.05138	0.04050
77	1998	36005	C	O	-0.57263	0.02507	0.05236
77	1998	36005	M	O	-0.57263	0.02507	0.03482
77	1998	36040	C	O	-0.66846	-0.07645	0.01598
77	1998	36040	M	O	-0.66846	-0.07645	0.00017
77	1999	36363	C	O	-0.55347	0.00000	0.01396
77	1999	36363	M	O	-0.55347	0.00000	-0.01032
80	1998	35907	C	O	-0.30408	0.01457	-0.03341
80	1998	35907	M	O	-0.30408	0.01457	-0.02157
80	1998	35907	P	O	-0.30408	0.01457	-0.05986
80	1998	35997	C	O	-0.55066	-0.00651	0.01376
80	1998	35997	M	O	-0.55066	-0.00651	0.02018
80	1998	36027	C	O	-0.63293	-0.01534	0.00444
80	1998	36027	M	O	-0.63293	-0.01534	0.01480
80	1999	36356	C	O	-0.53430	0.00000	0.03267
80	1999	36356	M	O	-0.53430	0.00000	0.05556
80	2000	36636	C	O	-0.30139	-0.00158	-0.04379
80	2000	36636	M	O	-0.30139	-0.00158	-0.05615
80	2000	36705	C	O	-0.49036	0.02261	0.06041
80	2000	36705	M	O	-0.49036	0.02261	0.03923
80	2000	36749	C	O	-0.61096	-0.02103	0.03136
80	2000	36749	M	O	-0.61096	-0.02103	0.02986
80	2002	37489	C	O	-0.63831	0.00000	-0.07111
80	2002	37489	M	O	-0.63831	0.00000	-0.03775
82	1998	35969	C	L	-0.47400	0.02927	0.05241
82	1998	35993	C	L	-0.53967	0.01428	-0.06019
82	1998	36055	C	L	-0.70959	-0.04355	0.06165
82	2002	37419	C	L	-0.44653	0.01295	-0.28372

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
82	2002	37504	C	L	-0.67944	-0.01295	-0.29824
85	1998	35928	C	S	-0.36169	-0.07160	0.01924
85	1998	35928	P	S	-0.36169	-0.07160	-0.00755
85	1998	35970	C	S	-0.47668	0.18575	-0.00401
85	1998	35970	P	S	-0.47668	0.18575	-0.03623
85	1998	36024	C	S	-0.62463	-0.11415	0.00777
85	1998	36024	P	S	-0.62463	-0.11415	-0.02190
85	1999	36356	C	S	-0.53430	0.00000	0.01101
85	1999	36356	P	S	-0.53430	0.00000	-0.02829
85	2000	36685	C	S	-0.43567	0.00000	0.02764
85	2000	36685	P	S	-0.43567	0.00000	-0.00970
85	2001	37055	C	S	-0.44934	0.00000	0.13831
85	2001	37055	P	S	-0.44934	0.00000	0.07674
86	1998	35920	C	S	-0.33972	0.11686	0.12724
86	1998	35920	P	S	-0.33972	0.11686	0.07265
86	1998	35976	C	S	-0.49316	-0.01654	0.02345
86	1998	35976	P	S	-0.49316	-0.01654	-0.00815
86	1998	36021	C	S	-0.61646	-0.05016	0.00882
86	1998	36021	P	S	-0.61646	-0.05016	-0.01704
86	1998	36062	C	S	-0.72876	-0.05016	-0.02493
86	1998	36062	P	S	-0.72876	-0.05016	-0.05069
86	1999	36333	C	S	-0.47119	0.02715	-0.02060
86	1999	36333	P	S	-0.47119	0.02715	-0.03794
86	1999	36370	C	S	-0.57263	-0.02715	-0.02380
86	1999	36370	P	S	-0.57263	-0.02715	-0.06249
86	2000	36686	C	S	-0.43835	0.00000	0.02857
86	2000	36686	P	S	-0.43835	0.00000	-0.02403
86	2001	37055	C	S	-0.44934	0.00000	-0.00787
86	2001	37055	P	S	-0.44934	0.00000	-0.05470
86	2002	37378	C	S	-0.33423	0.00000	0.05279
86	2002	37378	P	S	-0.33423	0.00000	0.04974
87	1998	35920	C	S	-0.33972	0.01845	-0.00500
87	1998	35920	P	S	-0.33972	0.01845	-0.04436
87	1998	35964	C	S	-0.46033	0.03775	-0.01004
87	1998	35964	P	S	-0.46033	0.03775	-0.05098
87	1998	36026	C	S	-0.63013	-0.00749	0.00042
87	1998	36026	P	S	-0.63013	-0.00749	-0.03106
87	1998	36062	C	S	-0.72876	-0.04870	-0.00978
87	1998	36062	P	S	-0.72876	-0.04870	-0.07171
87	1999	36370	C	S	-0.57263	0.00000	-0.00356
87	1999	36370	P	S	-0.57263	0.00000	-0.06126
87	2000	36657	C	S	-0.35889	0.01642	0.01170
87	2000	36657	P	S	-0.35889	0.01642	-0.04218
87	2000	36735	C	S	-0.57263	-0.00460	0.01058
87	2000	36735	P	S	-0.57263	-0.00460	-0.04145
87	2000	36782	C	S	-0.70142	-0.01182	0.00896
87	2000	36782	P	S	-0.70142	-0.01182	-0.04865

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
87	2001	37070	C	S	-0.49036	0.00731	0.00913
87	2001	37070	P	S	-0.49036	0.00731	-0.05677
87	2001	37113	C	S	-0.60828	0.00308	0.00122
87	2001	37113	P	S	-0.60828	0.00308	-0.01502
87	2001	37140	C	S	-0.68225	-0.01039	0.00179
87	2001	37140	P	S	-0.68225	-0.01039	-0.04073
87	2002	37379	C	S	-0.33704	0.00000	0.02893
87	2002	37379	P	S	-0.33704	0.00000	0.02128
89	1998	35920	C	O	-0.33972	0.05172	-0.05320
89	1998	35920	M	O	-0.33972	0.05172	-0.00642
89	1998	35950	C	O	-0.42188	-0.00729	-0.06542
89	1998	35950	M	O	-0.42188	-0.00729	-0.02064
89	1998	36048	C	O	-0.69043	-0.04443	-0.02333
89	1998	36048	M	O	-0.69043	-0.04443	-0.00081
89	1999	36322	C	O	-0.44104	-0.06666	-0.02988
89	1999	36322	M	O	-0.44104	-0.06666	0.00917
89	1999	36370	C	O	-0.57263	0.06666	0.00641
89	1999	36370	M	O	-0.57263	0.06666	0.02084
89	2000	36720	C	O	-0.53149	0.00000	0.00091
89	2000	36720	M	O	-0.53149	0.00000	0.00416
90	1998	35922	C	S	-0.34521	0.00987	0.02245
90	1998	35922	P	S	-0.34521	0.00987	0.01024
90	1998	35977	C	S	-0.49585	0.00735	-0.00600
90	1998	35977	P	S	-0.49585	0.00735	-0.01090
90	1998	36021	C	S	-0.61646	-0.01721	0.02442
90	1998	36021	P	S	-0.61646	-0.01721	0.03139
90	1999	36356	C	S	-0.53430	0.00000	0.00370
90	1999	36356	P	S	-0.53430	0.00000	-0.00510
90	2000	36686	C	S	-0.43835	0.00000	-0.00233
90	2000	36686	P	S	-0.43835	0.00000	-0.02487
90	2001	37055	C	S	-0.44934	0.00000	-0.01303
90	2002	37379	C	S	-0.33704	0.00000	0.01676
90	2002	37379	P	S	-0.33704	0.00000	0.00066
92	1998	35920	C	S	-0.33972	0.02033	-0.05589
92	1998	35920	P	S	-0.33972	0.02033	-0.08173
92	1998	35964	C	S	-0.46033	-0.00860	0.01871
92	1998	35964	P	S	-0.46033	-0.00860	0.00602
92	1998	36053	C	S	-0.70410	-0.00564	-0.00113
92	1998	36053	P	S	-0.70410	-0.00564	-0.02991
92	1998	36060	C	S	-0.72327	-0.00609	0.00150
92	1998	36060	P	S	-0.72327	-0.00609	-0.01053
92	1999	36333	C	S	-0.47119	0.00903	-0.01883
92	1999	36333	P	S	-0.47119	0.00903	-0.05901
92	1999	36370	C	S	-0.57263	-0.00903	0.00273
92	1999	36370	P	S	-0.57263	-0.00903	-0.04109
92	2000	36643	C	S	-0.32056	0.01414	-0.04073
92	2000	36643	P	S	-0.32056	0.01414	-0.09805

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
92	2000	36719	C	S	-0.52881	-0.00841	-0.03239
92	2000	36719	P	S	-0.52881	-0.00841	-0.09803
92	2000	36782	C	S	-0.70142	-0.00572	-0.03481
92	2000	36782	P	S	-0.70142	-0.00572	-0.09454
92	2001	37012	C	S	-0.33154	0.01395	-0.04598
92	2001	37012	P	S	-0.33154	0.01395	-0.12425
92	2001	37126	C	S	-0.64380	-0.00866	-0.03281
92	2001	37126	P	S	-0.64380	-0.00866	-0.07241
92	2001	37168	C	S	-0.75891	-0.01059	0.03738
92	2002	37386	C	S	-0.35620	0.00000	-0.03259
92	2002	37386	P	S	-0.35620	0.00000	-0.03110
95	1998	35921	C	CL	-0.34241	-0.01124	0.05577
95	1998	35990	C	CL	-0.53149	0.17900	0.10340
95	1998	35992	C	CH	-0.53699	-0.09033	-0.04192
95	1998	35992	P	CH	-0.53699	-0.09033	-0.10021
95	1998	36035	C	CH	-0.65479	0.00811	-0.05039
95	1998	36035	P	CH	-0.65479	0.00811	-0.19536
95	1998	36047	C	CL	-0.68762	-0.00332	0.07318
95	1999	36319	C	CL	-0.43286	0.00000	0.12535
95	2000	36635	C	CL	-0.29858	0.02963	0.12811
95	2000	36649	C	CH	-0.33704	0.00337	-0.03667
95	2000	36719	C	CH	-0.52881	-0.03300	-0.04608
95	2001	36991	C	CH	-0.27393	-0.07382	-0.00880
95	2001	37064	C	CL	-0.47400	0.07382	0.15634
97	1998	35929	C	CH	-0.36438	-0.02088	-0.05226
97	1998	35929	C	CL	-0.36438	-0.05636	0.06462
97	1998	35984	C	CH	-0.51501	0.02396	0.00692
97	1998	35984	C	CL	-0.51501	-0.01196	0.09030
97	1998	36029	C	CH	-0.63831	0.04547	0.02230
97	1998	36029	C	CL	-0.63831	0.01977	0.11026
97	1999	36369	C	CH	-0.56982	0.00854	-0.03563
97	1999	36369	C	CH	-0.56982	-0.00854	0.00221
97	2000	36692	C	CL	-0.45483	0.00000	0.04844
97	2001	37119	C	CH	-0.62463	0.00000	0.03911
97	2002	37448	C	CL	-0.52600	0.00000	0.15621
98	1998	35927	C	CH	-0.35889	-0.00720	-0.04986
98	1998	35927	C	CL	-0.35889	-0.04553	-0.03415
98	1998	35984	C	CL	-0.51501	0.01463	0.01183
98	1998	36047	C	CH	-0.68762	0.03910	-0.07133
98	1998	36047	C	CL	-0.68762	0.00339	-0.05497
98	1998	36056	C	CL	-0.71228	-0.00437	-0.05162
98	1999	36320	C	CH	-0.43567	0.00000	0.02019
98	2000	36651	C	CH	-0.34241	0.00000	0.00539
98	2001	37011	C	CL	-0.32874	-0.01313	-0.01908
98	2001	37083	C	CL	-0.52600	0.01313	0.02189
98	2002	37356	C	CL	-0.27393	0.00000	-0.02837
99	1998	35928	C	CH	-0.36169	0.08167	-0.29434

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W} - W$	diffP
99	1998	35928	C	CL	-0.36169	-0.03013	-0.10848
99	1998	35976	C	CH	-0.49316	0.07261	-0.29709
99	1998	35976	M	CH	-0.49316	0.07261	-0.29729
99	1998	35976	C	CL	-0.49316	-0.04074	-0.10556
99	1998	35976	M	CL	-0.49316	-0.04074	-0.10548
99	1998	36061	C	CH	-0.72607	0.01668	-0.27965
99	1998	36061	M	CH	-0.72607	0.01668	-0.28421
99	1998	36061	C	CL	-0.72607	-0.07432	-0.09503
99	1998	36061	M	CL	-0.72607	-0.07432	-0.09921
99	2000	36735	C	CH	-0.57263	0.00000	-0.22929
99	2000	36735	M	CH	-0.57263	0.00000	-0.24686
99	2001	37007	C	CL	-0.31775	0.00000	-0.15399
99	2001	37007	M	CL	-0.31775	0.00000	-0.16715
99	2002	37385	C	CH	-0.35339	0.00000	-0.02862
99	2002	37385	M	CH	-0.35339	0.00000	-0.02358
100	1998	35942	C	CL	-0.40002	0.08071	-0.05098
100	1998	35942	C	CL	-0.40002	0.03442	-0.05035
100	1998	35942	M	CL	-0.40002	0.08071	-0.05928
100	1998	35942	M	CL	-0.40002	0.03442	-0.05662
100	1998	35970	C	CL	-0.47668	0.03616	-0.03449
100	1998	35970	M	CL	-0.47668	0.03616	-0.03753
100	1998	36033	C	CL	-0.64929	-0.05538	-0.01676
100	1998	36033	C	CL	-0.64929	-0.09590	-0.01611
100	1998	36033	M	CL	-0.64929	-0.05538	-0.02389
100	1998	36033	M	CL	-0.64929	-0.09590	-0.02534
100	2001	36998	C	CL	-0.29309	0.03920	0.03226
100	2001	36998	M	CL	-0.29309	0.03920	0.00674
100	2001	37091	C	CL	-0.54797	-0.00508	0.03554
100	2001	37091	M	CL	-0.54797	-0.00508	0.03258
100	2001	37160	C	CL	-0.73694	-0.03412	0.03304
100	2001	37160	M	CL	-0.73694	-0.03412	0.04228
100	2002	37349	C	CL	-0.25476	0.00000	0.02800
100	2002	37349	M	CL	-0.25476	0.00000	0.02517
101	1998	35935	C	CH	-0.38086	0.02511	-0.00629
101	1998	35935	M	CH	-0.38086	0.02511	-0.01792
101	1998	35935	C	CL	-0.38086	0.02593	0.33309
101	1998	35935	M	CL	-0.38086	0.02593	0.31631
101	1998	35991	C	CH	-0.53430	0.01777	0.04852
101	1998	35991	M	CH	-0.53430	0.01777	0.03810
101	1998	35991	C	CL	-0.53430	0.01939	0.36417
101	1998	35991	M	CL	-0.53430	0.01939	0.35523
101	1998	36025	C	CH	-0.62744	-0.04525	-0.01336
101	1998	36025	M	CH	-0.62744	-0.04525	-0.02837
101	1998	36025	C	CL	-0.62744	-0.04295	0.33284
101	1998	36025	M	CL	-0.62744	-0.04295	0.31705
101	1999	36364	C	CH	-0.55615	0.00000	-0.04895
101	1999	36364	M	CH	-0.55615	0.00000	-0.04789

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{w}$, average log pumping water level for a given site in a given year; w, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{w} - w$	diffP
101	2000	36672	C	CL	-0.40002	0.00000	-0.14525
101	2000	36672	M	CL	-0.40002	0.00000	-0.15671
102	1998	35934	C	CH	-0.37805	0.12406	-0.08510
102	1998	35934	M	CH	-0.37805	0.12406	-0.09845
102	1998	35934	C	CL	-0.37805	0.04579	0.09149
102	1998	35934	M	CL	-0.37805	0.04579	0.07787
102	1998	35985	C	CH	-0.51782	-0.06301	-0.05045
102	1998	35985	C	CL	-0.51782	-0.11184	0.11712
102	1998	36067	C	CH	-0.74243	-0.05878	-0.04798
102	1998	36067	C	CL	-0.74243	-0.10608	0.11932
102	1999	36335	C	CH	-0.47668	0.00000	-0.04641
102	2000	36747	C	CH	-0.60547	0.00000	-0.03486
102	2001	37105	C	CH	-0.58630	0.00000	0.02804
102	2002	37420	C	CL	-0.44934	0.00000	0.12364
103	1998	35913	C	CH	-0.32056	-0.03622	-0.15357
103	1998	35913	P	CH	-0.32056	-0.03622	-0.16847
103	1998	35913	C	CL	-0.32056	-0.06803	0.16947
103	1998	35913	P	CL	-0.32056	-0.06803	0.15650
103	1998	35963	C	CH	-0.45752	0.01171	-0.03696
103	1998	35963	P	CH	-0.45752	0.01171	-0.03027
103	1998	35963	C	CL	-0.45752	-0.04854	0.23740
103	1998	35963	P	CL	-0.45752	-0.04854	0.24286
103	1998	36039	C	CH	-0.66577	0.11026	-0.03775
103	1998	36039	P	CH	-0.66577	0.11026	-0.03417
103	1998	36039	C	CL	-0.66577	0.03082	0.24565
103	1998	36039	P	CL	-0.66577	0.03082	0.24700
103	1999	36329	C	CH	-0.46033	0.00000	-0.06152
103	1999	36329	P	CH	-0.46033	0.00000	-0.09344
103	2000	36693	C	CH	-0.45752	0.00000	0.01504
103	2000	36693	P	CH	-0.45752	0.00000	-0.00004
103	2001	37062	C	CH	-0.46851	0.00000	-0.02854
103	2001	37062	P	CH	-0.46851	0.00000	-0.01100
103	2002	37413	C	CH	-0.43018	0.00000	0.00739
103	2002	37413	P	CH	-0.43018	0.00000	0.01843
104	1998	35922	C	CL	-0.34521	-0.00232	0.07515
104	1998	35922	C	CL	-0.34521	-0.01096	0.06378
104	1998	35922	M	CL	-0.34521	-0.00232	0.03242
104	1998	35922	M	CL	-0.34521	-0.01096	0.02366
104	1998	35964	C	CL	-0.46033	-0.01249	0.03078
104	1998	35964	C	CL	-0.46033	-0.01497	0.04518
104	1998	35964	M	CL	-0.46033	-0.01249	0.00768
104	1998	35964	M	CL	-0.46033	-0.01497	0.01454
104	1998	36021	C	CL	-0.61646	0.03241	0.02811
104	1998	36021	C	CL	-0.61646	0.00834	0.03840
104	1998	36021	M	CL	-0.61646	0.03241	0.01044
104	1998	36021	M	CL	-0.61646	0.00834	0.01924
104	1999	36334	C	CL	-0.47400	0.00000	0.06262

Table 14. Data used in the *diffP* model where PCC measurements and power consumption were made in the same year.—Continued

[PCC, power conversion coefficient; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year	Date	Method	Type	u	$\overline{W}$ - W	diffP
104	1999	36334	M	CL	-0.47400	0.00000	0.05463
104	2000	36649	C	CL	-0.33704	0.00000	0.09621
104	2000	36649	M	CL	-0.33704	0.00000	0.06678
104	2001	37013	C	CL	-0.33423	0.00000	0.09991
104	2001	37013	M	CL	-0.33423	0.00000	0.09300
104	2002	37379	C	CL	-0.33704	0.00000	0.08372
104	2002	37379	M	CL	-0.33704	0.00000	0.03706
105	1998	35927	C	CH	-0.35889	0.09445	-0.11233
105	1998	35927	C	CH	-0.35889	-0.01767	0.05727
105	1998	35992	C	CH	-0.53699	0.03005	-0.09859
105	1998	35992	C	CH	-0.53699	-0.04483	0.07037
105	1998	35992	C	CL	-0.53699	-0.04806	0.07992
105	1998	36042	C	CH	-0.67395	0.03213	-0.10282
105	1998	36042	C	CL	-0.67395	-0.04605	0.10715
105	1999	36335	C	CH	-0.47668	0.00000	-0.02714
105	2000	36649	C	CH	-0.33704	0.00000	-0.02359
105	2001	37064	C	CH	-0.47400	0.00000	0.03508
105	2002	37492	C	CH	-0.64661	0.00000	-0.04185
106	1998	35955	C	CL	-0.43567	-0.02890	0.06690
106	1998	36011	C	CL	-0.58899	-0.01585	0.12908
106	1998	36055	C	CL	-0.70959	0.02880	0.06360
106	1998	36055	C	CL	-0.70959	0.01595	0.07444
106	2001	37162	C	CL	-0.74243	0.00000	0.11939
106	2002	37372	C	CL	-0.31775	0.00000	-0.03194

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
1	1998	2002	35950	C	O	3.57812	0.18427	0.15119
1	1998	2000	35950	P	O	1.57812	-0.00445	0.03757
1	1998	2002	35989	C	O	3.47119	0.17663	0.10980
1	1998	1999	35989	M	O	0.47119	-0.15165	0.02273
1	1998	2002	35989	P	O	3.47119	0.17663	0.04991
1	1998	2001	36026	C	O	2.36987	0.14940	0.04652
1	1998	2000	36026	M	O	1.36987	0.03756	0.00878
1	1998	1999	36026	P	O	0.36987	-0.10199	0.00125
1	1999	2002	36343	C	O	2.50134	0.25207	0.14345

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
1	1999	2001	36343	P	O	1.50134	0.17519	0.07672
1	1999	1998	36369	C	O	-1.56982	0.14873	0.07851
1	1999	2001	36369	P	O	1.43018	0.26900	0.12056
1	1999	2001	36397	C	O	1.35339	0.31000	0.02742
1	1999	2002	36397	P	O	2.35339	0.38688	0.06168
1	2000	2002	36650	C	O	1.66028	0.14933	0.09823
1	2000	2001	36650	P	O	0.66028	0.07244	0.03106
1	2000	1999	36727	C	O	-1.55066	-0.13771	0.11383
1	2000	2001	36727	P	O	0.44934	0.11368	0.07514
1	2000	1998	36752	C	O	-2.61914	0.02912	0.05949
1	2000	1999	36752	P	O	-1.61914	-0.10199	0.08288
1	2001	1998	36990	C	O	-3.27124	-0.22057	-0.09480
1	2001	2000	36990	P	O	-1.27124	-0.21214	-0.07594
1	2001	2002	37084	C	O	0.47119	0.14597	0.15051
1	2001	2002	37084	P	O	0.47119	0.14597	0.13001
1	2001	2002	37111	C	O	0.39722	0.10810	0.09436
1	2001	1998	37111	P	O	-3.60278	-0.08906	-0.01785
1	2002	1999	37351	C	O	-3.26025	-0.37133	-0.00641
1	2002	1998	37351	P	O	-4.26025	-0.24021	-0.08113
1	2002	2001	37449	C	O	-1.52881	-0.06277	-0.00814
1	2002	2001	37449	P	O	-1.52881	-0.06277	-0.03427
1	2002	2000	37476	C	O	-2.60278	-0.15980	0.02539
1	2002	1998	37476	P	O	-4.60278	-0.16824	-0.03290
2	1998	2001	35936	C	CL	2.61646	-0.01317	0.13261
2	1998	2001	35936	P	CL	2.61646	-0.01317	0.13248
2	1998	2000	36048	C	CL	1.30957	-0.07599	0.09064
2	1998	1999	36048	P	CL	0.30957	-0.10800	0.08759
2	1998	1999	36052	C	CL	0.29858	-0.09984	0.10497
2	1998	2000	36052	P	CL	1.29858	-0.06782	0.05492
2	1999	2001	36342	C	CH	1.50415	0.10587	0.05536
2	1999	2001	36342	P	CH	1.50415	0.10587	0.04757
2	1999	1998	36348	C	CL	-1.51233	0.05463	0.01488
2	1999	2002	36348	P	CL	2.48767	0.12260	0.04388
2	2000	1998	36692	C	CL	-2.45483	0.06336	-0.01588
2	2000	1999	36692	P	CL	-1.45483	-0.03201	0.16072
2	2001	2002	37062	C	CH	0.53149	0.16705	-0.14483
2	2001	1998	37062	P	CH	-3.46851	0.09908	-0.17562
2	2001	2002	37082	C	CL	0.47668	0.08841	-0.06842
2	2001	2000	37082	P	CL	-1.52332	-0.04293	-0.03242
2	2001	2000	37123	C	CL	-1.63562	-0.09212	0.05699
2	2001	2002	37123	P	CL	0.36438	0.03922	0.04338
2	2002	1999	37337	C	CH	-3.22192	-0.16335	0.12931
2	2002	2000	37337	P	CH	-2.22192	-0.13134	0.02373
3	1998	2000	35975	C	O	1.50964	0.06243	-0.04239
3	1998	2002	35975	P	O	3.50964	0.12923	0.12303
3	1998	2002	36000	C	O	3.44104	0.12784	0.12206

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
3	1998	2000	36000	P	O	1.44104	0.06104	-0.12730
3	1998	2002	36053	C	O	3.29590	0.25859	0.02114
3	1998	2000	36053	P	O	1.29590	0.19179	-0.18642
3	1999	2001	36348	C	O	1.48767	0.12683	0.05209
3	1999	2002	36348	P	O	2.48767	0.17635	0.04214
3	1999	1998	36367	C	O	-1.56433	0.05238	0.10617
3	1999	2001	36367	P	O	1.43567	0.17475	0.12774
3	1999	2001	36395	C	O	1.35889	0.15651	0.05498
3	1999	1998	36395	P	O	-1.64111	0.03414	-0.02966
3	2000	2002	36699	C	O	1.52600	0.07099	0.15357
3	2000	1998	36720	C	O	-2.53149	-0.11137	0.09545
3	2000	2002	36720	P	O	1.46851	0.06052	0.16420
3	2000	2002	36739	C	O	1.41638	0.07099	0.18728
3	2000	1998	36739	P	O	-2.58362	-0.10090	-0.11898
3	2001	1998	36986	C	O	-3.26025	-0.18659	0.02471
3	2001	2000	36986	P	O	-1.26025	-0.08151	-0.01556
3	2001	2002	37069	C	O	0.51233	0.07099	0.22907
3	2001	2000	37069	P	O	-1.48767	0.00419	-0.12312
3	2001	2000	37104	C	O	-1.58362	0.02547	-0.02529
3	2001	1999	37104	P	O	-2.58362	-0.10995	-0.12936
3	2002	2001	37328	C	O	-1.19727	-0.02481	-0.00155
3	2002	1999	37448	C	O	-3.52600	-0.20721	-0.12675
3	2002	1999	37448	P	O	-3.52600	-0.20721	-0.19516
3	2002	2000	37449	C	O	-2.52881	-0.08151	-0.11725
5	1998	2001	35934	C	CH	2.62195	-0.36090	0.15030
5	1998	2002	35934	P	CH	3.62195	0.09438	-0.09783
5	1998	2001	35975	C	CH	2.50964	-0.38631	0.01037
5	1998	2002	35975	P	CH	3.50964	0.06897	-0.03537
5	1998	2002	36038	C	CH	3.33704	0.10788	-0.07271
5	1998	1999	36038	P	CH	0.33704	-0.13976	-0.06126
5	1998	1999	36061	C	CH	0.27393	0.19693	-0.01538
5	1998	2002	36061	P	CH	3.27393	0.44457	-0.12557
5	1999	2002	36333	C	CH	2.52881	0.24764	-0.08811
5	1999	1998	36333	P	CH	-1.47119	0.06869	-0.06348
5	2001	1998	37057	C	CL	-3.45483	0.27633	0.22464
5	2001	1999	37057	P	CL	-2.45483	0.20764	0.08414
5	2002	2001	37385	C	CH	-1.35339	-0.43078	-0.00826
5	2002	1998	37424	C	CL	-4.46033	-0.17915	0.11808
5	2002	1999	37461	C	CL	-3.56165	-0.27193	0.05990
7	1998	1999	35937	M	CL	0.61365	-0.17625	-0.22276
7	1998	2000	35937	P	CL	1.61365	-0.04272	-0.18742
7	1998	1999	35999	M	CL	0.44385	-0.17096	-0.02394
7	1998	2000	35999	P	CL	1.44385	-0.03743	-0.03723
7	1998	2000	36028	M	CL	1.36438	0.03888	-0.00684
7	1998	2000	36028	P	CL	1.36438	0.03888	0.00149
7	1999	1998	36406	M	CL	-1.67126	0.14729	-0.16335

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
7	1999	2002	36406	P	CL	2.32874	0.32464	-0.06260
7	2000	2002	36672	P	CH	1.59998	0.19111	-0.13194
7	2002	2000	37573	M	CL	-2.86853	-0.19111	-0.27913
8	1998	2002	35905	P	L	3.70142	0.07526	0.07119
8	1998	2002	35975	C	L	3.50964	0.14734	0.15006
8	1998	2002	35975	P	L	3.50964	0.14734	0.10390
8	1998	2002	36031	C	L	3.35620	0.22941	0.15723
8	1998	1999	36031	P	L	0.35620	0.02362	-0.04915
8	1999	2002	36299	C	L	2.62195	0.20579	0.16444
8	1999	2000	36299	P	L	0.62195	0.01947	-0.01999
8	2000	1998	36713	C	L	-2.51233	0.02058	-0.02656
8	2000	2002	36713	P	L	1.48767	0.18633	0.01902
8	2002	1998	37379	C	L	-4.33704	-0.16575	-0.03030
8	2002	1999	37379	P	L	-3.33704	-0.20579	-0.20733
9	1999	2001	36340	M	O	1.50964	0.07899	-0.10472
9	1999	2000	36340	P	O	0.50964	-0.03760	-0.16679
9	1999	2001	36370	M	O	1.42737	0.08586	-0.11276
9	1999	2001	36370	P	O	1.42737	0.08586	-0.12953
9	2000	2001	36630	M	O	0.71509	0.19506	-0.10228
9	2000	1999	36734	M	O	-1.56982	0.00689	-0.12387
9	2000	2001	36790	M	O	0.27673	0.06538	-0.11878
9	2001	1999	37063	M	O	-2.47119	-0.08242	-0.21714
9	2001	1999	37063	P	O	-2.47119	-0.08242	-0.28283
11	1998	2000	35947	M	O	1.58630	-0.08043	-0.09408
11	1998	2000	35947	P	O	1.58630	-0.08043	-0.08877
11	1998	1999	35998	M	O	0.44653	-0.09602	-0.10040
11	1998	1999	35998	P	O	0.44653	-0.09602	-0.11055
11	1998	1999	36020	M	O	0.38635	-0.01843	-0.04162
11	1998	2001	36020	P	O	2.38635	0.07486	-0.00933
11	1999	2000	36355	M	O	0.46851	-0.04102	-0.03156
11	2000	1999	36698	M	O	-1.47119	0.04102	-0.14259
11	2000	2001	36698	P	O	0.52881	0.13431	-0.01516
11	2001	1998	36993	M	O	-3.27942	-0.04201	-0.07929
11	2001	1998	36993	P	O	-3.27942	-0.04201	-0.09023
12	1998	2001	35935	M	O	2.61914	0.05659	0.01045
12	1998	2001	35935	P	O	2.61914	0.05659	-0.01056
12	1998	2000	35982	M	O	1.49036	-0.08829	-0.00472
12	1998	2001	35982	P	O	2.49036	0.05000	0.02425
12	1998	2000	36014	M	O	1.40271	-0.07791	0.02618
12	1998	2000	36061	M	O	1.27393	-0.02031	-0.03526
12	1999	2000	36362	M	O	0.44934	-0.00154	0.02934
12	1999	1998	36362	P	O	-1.55066	0.07150	-0.01284
12	2000	2001	36630	M	O	0.71509	0.13829	-0.01099
12	2000	2001	36630	P	O	0.71509	0.13829	-0.05226
12	2001	2000	37025	M	O	-1.36707	-0.11150	-0.00530
12	2001	2000	37082	M	O	-1.52332	-0.16508	-0.05401

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
14	1998	2000	35944	C	L	1.59448	0.06738	0.04597
14	1998	2000	35944	P	L	1.59448	0.06738	0.04181
14	1998	2000	35975	C	L	1.50964	0.05339	0.03592
14	1998	2000	35975	P	L	1.50964	0.05339	0.04101
14	1998	2000	36055	C	L	1.29041	0.03789	0.00574
14	1998	1999	36055	P	L	0.29041	-0.03448	-0.03281
14	1999	2000	36348	C	L	0.48767	0.09595	0.03402
14	1999	1998	36348	P	L	-1.51233	0.04307	-0.03283
14	1999	2000	36406	C	L	0.32874	0.08156	0.00883
14	1999	1998	36406	P	L	-1.67126	0.02868	-0.05678
14	1999	2000	36447	C	L	0.21643	0.03960	-0.03174
14	1999	2000	36447	P	L	0.21643	0.03960	-0.05229
14	2000	1999	36648	C	L	-1.33423	-0.08091	-0.14551
14	2000	1998	36648	P	L	-2.33423	-0.06142	-0.22059
14	2000	1999	36733	C	L	-1.56714	-0.06645	-0.14524
14	2000	1999	36733	P	L	-1.56714	-0.06645	-0.18069
14	2000	1999	36768	C	L	-1.66296	-0.06975	-0.13509
14	2000	1999	36768	P	L	-1.66296	-0.06975	-0.17802
15	1998	2001	35948	M	O	2.58362	-0.01263	0.18878
15	1998	2001	35948	P	O	2.58362	-0.01263	0.18334
15	1998	2001	35968	C	O	2.52881	-0.02104	0.22468
15	1998	2001	35968	M	O	2.52881	-0.02104	0.22056
15	1998	2001	36006	C	O	2.42468	0.01477	0.21764
15	1998	1999	36006	M	O	0.42468	-0.09302	0.03397
15	1999	1998	36335	C	O	-1.47668	0.13340	0.06402
15	1999	2001	36335	M	O	1.52332	0.12710	0.23441
15	1999	2000	36335	P	O	0.52332	0.07476	0.05541
15	1999	1998	36384	C	O	-1.61096	0.04212	0.08099
15	1999	2000	36384	M	O	0.38904	-0.01652	0.09240
15	1999	2000	36432	C	O	0.25757	0.08413	0.13150
15	1999	1998	36432	M	O	-1.74243	0.14277	0.10591
15	1999	1998	36432	P	O	-1.74243	0.14277	0.09723
15	2000	2001	36636	C	O	0.69861	0.05407	0.22534
15	2000	1999	36636	M	O	-1.30139	-0.05372	0.02657
15	2000	1999	36636	P	O	-1.30139	-0.05372	0.01605
15	2000	1998	36706	C	O	-2.49316	0.10053	0.09088
15	2000	2001	36706	M	O	0.50684	0.09423	0.22457
15	2000	2001	36749	C	O	0.38904	0.00785	0.16986
15	2000	2001	36749	M	O	0.38904	0.00785	0.16585
15	2001	2000	37007	C	O	-1.31775	0.00137	0.01471
15	2001	2000	37007	M	O	-1.31775	0.00137	0.00036
15	2001	2000	37069	C	O	-1.48767	-0.03757	-0.01688
15	2001	1999	37069	M	O	-2.48767	-0.09302	-0.06722
15	2001	2000	37118	C	O	-1.62195	-0.12081	-0.03049
15	2001	1999	37118	M	O	-2.62195	-0.17627	-0.05607
16	1998	2001	35936	C	CH	2.61646	0.13700	0.07128

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
16	1998	1999	35936	P	CH	0.61646	-0.05082	-0.06407
16	1998	2001	35942	C	CL	2.59998	0.08485	0.04324
16	1998	2002	35942	P	CL	3.59998	0.23367	0.23426
16	1998	1999	35982	C	CL	0.49036	0.03369	-0.00168
16	1998	2002	35982	P	CL	3.49036	0.37034	0.32692
16	1998	1999	36017	C	CL	0.39453	-0.00519	-0.02305
16	1998	1999	36017	P	CL	0.39453	-0.00519	-0.05288
16	1998	2001	36056	C	CH	2.28772	0.15236	0.08947
16	1998	2002	36056	P	CH	3.28772	0.30118	0.28820
16	1999	2002	36321	C	CL	2.56165	0.28582	0.27451
16	1999	2002	36321	P	CL	2.56165	0.28582	0.26511
16	1999	1998	36357	C	CH	-1.53699	0.08298	-0.01232
16	1999	2001	36357	P	CH	1.46301	0.23865	0.11118
16	2001	1998	37097	C	CL	-3.56433	-0.15081	-0.11980
16	2001	1999	37097	P	CL	-2.56433	-0.18296	-0.15377
16	2001	1998	37158	C	CL	-3.73157	-0.16053	-0.14416
16	2001	1998	37158	P	CL	-3.73157	-0.16053	-0.18957
16	2002	2001	37390	C	CL	-1.36707	-0.14882	-0.18212
18	1998	2002	35947	P	L	3.58630	0.25450	0.19068
18	1998	1999	35986	C	L	0.47949	-0.01436	-0.00194
18	1998	1999	35986	P	L	0.47949	-0.01436	-0.02042
18	1998	2000	36020	C	L	1.38635	0.08614	0.01963
18	1998	2000	36020	P	L	1.38635	0.08614	-0.00074
18	1999	2000	36314	C	L	0.58081	0.05492	-0.01606
18	1999	2000	36314	P	L	0.58081	0.05492	-0.04767
18	2000	1999	36665	C	L	-1.38086	-0.05340	-0.04193
18	2000	2002	36665	P	L	1.61914	0.21665	0.01826
18	2000	1999	36713	C	L	-1.51233	-0.05226	-0.02899
18	2000	2002	36713	P	L	1.48767	0.21779	0.02947
18	2000	1998	36791	C	L	-2.72607	-0.06273	-0.07500
18	2000	1998	36791	P	L	-2.72607	-0.06273	-0.19346
18	2002	1998	37375	C	L	-4.32605	-0.23458	-0.10097
18	2002	1998	37375	P	L	-4.32605	-0.23458	-0.14587
18	2002	2000	37522	C	L	-2.72876	-0.25423	-0.15476
18	2002	2000	37522	P	L	-2.72876	-0.25423	-0.18062
19	1998	2000	35964	C	CH	1.53967	0.15548	0.08259
19	1998	2001	35964	P	CH	2.53967	0.14037	-0.03044
19	1998	1999	35999	C	CH	0.44385	-0.12689	-0.05677
19	1998	1999	36038	C	CH	0.33704	-0.05716	-0.03695
19	1998	2001	36038	P	CH	2.33704	0.09025	-0.08935
19	1999	2001	36334	C	CH	1.52600	0.14741	0.00105
19	1999	1998	36334	P	CH	-1.47400	0.05106	-0.04088
19	2000	1999	36643	C	CH	-1.32056	-0.16252	-0.10099
19	2000	1999	36643	P	CH	-1.32056	-0.16252	-0.16048
19	2000	1998	36732	C	CL	-2.56433	-0.11146	-0.05630
19	2000	1998	36732	P	CL	-2.56433	-0.11146	-0.12696

Table 15. Data used in the *diffP* model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
19	2001	2000	36997	C	CH	-1.29041	0.01511	-0.05909
19	2001	1999	36997	P	CH	-2.29041	-0.14741	-0.17651
20	1998	2000	35920	M	O	1.66028	0.03474	-0.29222
20	1998	2001	35920	P	O	2.66028	0.12963	-0.27726
20	1998	1999	36020	M	O	0.38635	-0.08435	-0.16532
20	1998	2000	36053	M	O	1.29590	0.04015	-0.20754
20	1998	1999	36053	P	O	0.29590	-0.05702	-0.21999
20	1999	1998	36426	M	O	-1.72607	0.06465	-0.01672
20	1999	1998	36426	P	O	-1.72607	0.06465	-0.02833
20	2000	1998	36756	M	O	-2.63013	-0.03252	-0.05182
20	2000	1999	36756	P	O	-1.63013	-0.09716	-0.13947
20	2001	1998	37027	M	O	-3.37256	-0.12741	-0.06254
20	2001	1999	37027	P	O	-2.37256	-0.19205	-0.12831
20	2002	2001	37511	M	O	-1.69861	-0.15565	-0.29081
22	1999	2000	36361	C	L	0.45203	0.11914	-0.04047
22	1999	2000	36361	P	L	0.45203	0.11914	-0.02481
22	1999	2001	36406	C	L	1.32874	-0.21921	0.16290
22	1999	2000	36406	P	L	0.32874	-0.01848	0.19900
22	2000	2001	36664	P	L	0.62195	-0.17042	0.04148
22	2000	2002	36754	P	L	1.37537	-0.08627	-0.02643
22	2001	2002	37008	C	L	0.67944	0.15468	-0.21148
22	2001	2000	37084	C	L	-1.52881	0.19873	-0.02205
22	2001	2002	37159	C	L	0.26575	0.13687	-0.15159
22	2002	1999	37396	C	L	-3.38354	-0.02002	0.34772
22	2002	2000	37524	C	L	-2.73425	0.08161	0.14199
23	1998	2001	35941	C	O	2.60278	-0.01085	0.08781
23	1998	2000	35972	C	O	1.51782	-0.07865	-0.10254
23	1998	2001	36013	C	O	2.40552	-0.14371	0.09415
23	1998	2001	36013	P	O	2.40552	-0.14371	0.02066
23	1998	2001	36056	C	O	2.28772	-0.05741	0.09369
23	1999	2002	36426	C	O	2.27393	-0.11000	0.24908
23	1999	1998	36426	P	O	-1.72607	0.01200	-0.20091
23	1999	2001	36447	C	O	1.21643	-0.06511	0.07984
23	1999	1998	36447	P	O	-1.78357	0.03390	-0.18136
23	2000	1999	36651	C	O	-1.34241	0.03596	-0.12830
23	2000	1998	36651	P	O	-2.34241	0.05891	-0.28579
23	2000	2002	36713	C	O	1.48767	-0.09742	0.22682
23	2000	2001	36746	C	O	0.39722	-0.08826	0.07282
23	2001	2002	37008	C	O	0.67944	-0.02299	0.07248
23	2002	1999	37476	C	O	-3.60278	0.09905	-0.24957
24	1998	2001	35913	C	O	2.67944	0.07911	-0.05140
24	1998	2002	35913	P	O	3.67944	0.13667	0.03173
24	1998	2002	35991	C	O	3.46570	0.13898	0.09019
24	1998	2002	35991	P	O	3.46570	0.13898	0.00756
24	1998	2001	36040	C	O	2.33154	0.12746	0.03605
24	1998	2002	36040	P	O	3.33154	0.18501	0.07383

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
24	1999	2002	36369	C	O	2.43018	0.14672	0.08219
24	1999	2002	36369	P	O	2.43018	0.14672	-0.03014
24	2001	1999	37082	C	O	-2.52332	-0.08917	-0.16783
24	2001	1999	37082	P	O	-2.52332	-0.08917	-0.22862
24	2002	1999	37449	C	O	-3.52881	-0.14672	-0.28241
24	2002	1999	37449	P	O	-3.52881	-0.14672	-0.35163
25	1998	2000	35927	C	O	1.64111	-0.04696	-0.05043
25	1998	2000	35978	C	O	1.50134	0.01022	-0.05316
25	1998	2000	35978	M	O	1.50134	0.01022	-0.08946
25	1998	2000	35978	P	O	1.50134	0.01022	-0.08530
25	1998	2000	36017	C	O	1.39453	0.08345	-0.01455
25	1998	1999	36017	M	O	0.39453	-0.01003	-0.14706
25	1998	2000	36017	P	O	1.39453	0.08345	-0.05021
25	1999	2000	36381	C	O	0.39722	0.09348	0.00798
25	1999	2000	36381	P	O	0.39722	0.09348	-0.06410
25	2000	1998	36678	C	O	-2.41638	-0.05343	-0.02355
25	2000	1999	36678	M	O	-1.41638	-0.11347	-0.19828
25	2000	1998	36678	P	O	-2.41638	-0.05343	-0.12199
25	2000	1999	36713	C	O	-1.51233	-0.09953	-0.07647
25	2000	1999	36713	M	O	-1.51233	-0.09953	-0.35222
25	2000	1998	36713	P	O	-2.51233	-0.03949	-0.23701
25	2000	1998	36734	C	O	-2.56982	-0.00740	-0.18533
25	2000	1999	36734	M	O	-1.56982	-0.06744	-0.24661
25	2000	1999	36734	P	O	-1.56982	-0.06744	-0.22387
27	1998	2000	36055	P	L	1.29041	0.18794	0.09983
27	1999	1998	36335	P	L	-1.47668	-0.14042	-0.07829
27	2000	1998	36650	P	L	-2.33972	-0.18794	-0.16827
27	2001	1999	37005	P	L	-2.31238	-0.17324	-0.25380
27	2001	2000	37104	P	L	-1.58362	0.06433	0.02841
28	1998	2001	35963	C	CH	2.54248	0.08048	-0.03894
28	1998	2001	35963	M	CH	2.54248	0.08048	-0.05596
28	1998	2002	36003	C	CH	3.43286	0.09918	0.00688
28	1998	2001	36003	M	CH	2.43286	0.06678	-0.01103
28	1998	2000	36038	C	CH	1.33704	0.07134	-0.01435
28	1998	2001	36038	M	CH	2.33704	0.05551	-0.00656
28	2000	2001	36658	C	CL	0.63831	-0.00619	-0.02163
28	2000	2002	36658	M	CL	1.63831	0.02620	0.01763
28	2000	2002	36732	C	CH	1.43567	0.03978	0.00794
28	2000	1998	36732	M	CH	-2.56433	-0.06020	0.01217
28	2000	2001	36763	C	CH	0.35071	-0.04868	-0.03272
28	2000	1998	36763	M	CH	-2.64929	-0.11627	0.00444
28	2001	2002	37047	C	CH	0.57263	0.05008	0.00618
28	2001	2002	37047	M	CH	0.57263	0.05008	0.05114
28	2001	2002	37089	C	CH	0.45752	0.02158	0.01224
28	2001	2000	37089	M	CH	-1.54248	0.00501	0.01011
28	2001	2000	37141	C	CH	-1.68494	0.00208	-0.05063

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
28	2002	2001	37375	C	CH	-1.32605	-0.03239	-0.04301
28	2002	1998	37375	M	CH	-4.32605	-0.09998	-0.01384
29	1998	2002	35912	M	O	3.68225	0.52593	0.20401
29	1998	2000	35912	P	O	1.68225	0.18641	0.04809
29	1998	2000	35990	M	O	1.46851	0.12841	0.13101
29	1998	2002	35990	P	O	3.46851	0.46793	0.23917
29	1998	2000	35990	P	O	1.46851	0.12841	0.12312
29	1998	2000	36047	M	O	1.31238	-0.12842	-0.03672
29	1998	2002	36047	P	O	3.31238	0.21111	0.05328
29	1999	2000	36356	M	O	0.46570	0.03360	-0.04461
29	1999	2000	36356	P	O	0.46570	0.03360	-0.08161
29	1999	2002	36356	P	O	2.46570	0.35519	0.08994
29	2000	2002	36755	M	O	1.37256	0.33952	0.08614
29	2000	1998	36755	P	O	-2.62744	-0.07160	-0.13186
29	2002	1998	37326	M	O	-4.19177	-0.41112	-0.25374
30	1998	2002	35913	C	O	3.67944	-0.07679	0.14731
30	1998	2002	35913	M	O	3.67944	-0.07679	0.11360
30	1998	2002	35971	C	O	3.52051	0.11109	0.10418
30	1998	2002	35971	M	O	3.52051	0.11109	0.10332
30	1998	2000	36041	C	O	1.32874	-0.27754	0.07041
30	1998	2000	36041	M	O	1.32874	-0.27754	0.06289
30	1999	1998	36425	C	O	-1.72327	0.17254	0.07792
30	1999	2002	36425	M	O	2.27673	0.15052	0.13769
30	2000	2002	36699	C	O	1.52600	0.17718	0.10408
30	2000	1998	36699	M	O	-2.47400	0.19920	0.06687
30	2001	2000	37112	C	O	-1.60547	-0.28923	0.05894
30	2001	2002	37112	M	O	0.39453	-0.11205	0.12573
30	2002	2000	37379	C	O	-2.33704	-0.27045	0.03564
30	2002	1999	37379	M	O	-3.33704	-0.24379	0.03239
30	2002	1998	37531	M	O	-4.75342	0.20856	-0.00451
32	1998	2002	35893	M	O	3.73425	0.11678	-0.04490
32	1998	2000	35893	P	O	1.73425	-0.23196	-0.09812
32	1998	2002	35977	M	O	3.50415	0.27639	0.02116
32	1998	2001	35977	P	O	2.50415	0.03797	-0.07873
32	1998	2002	36026	M	O	3.36987	0.30814	-0.01459
32	1998	2002	36026	P	O	3.36987	0.30814	-0.10493
32	1999	2000	36333	M	O	0.52881	-0.08594	-0.04704
32	1999	2002	36333	P	O	2.52881	0.26281	-0.05256
32	1999	2001	36370	M	O	1.42737	0.15380	-0.00793
32	1999	2001	36370	P	O	1.42737	0.15380	-0.07190
32	1999	2001	36399	M	O	1.34790	0.16705	-0.01118
32	1999	2001	36399	P	O	1.34790	0.16705	-0.04733
32	2000	1999	36690	M	O	-1.44934	-0.05739	-0.04487
32	2000	1998	36690	P	O	-2.44934	0.06234	-0.11341
32	2000	2002	36720	M	O	1.46851	0.39662	0.04660
32	2000	1998	36720	P	O	-2.53149	0.16285	-0.11465

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
32	2000	2002	36747	M	O	1.39453	0.35351	0.03967
32	2000	2002	36747	P	O	1.39453	0.35351	-0.03258
32	2001	2002	37064	M	O	0.52600	0.26474	0.02700
32	2001	1998	37064	P	O	-3.47400	0.03097	-0.07907
32	2001	2000	37111	M	O	-1.60278	-0.13665	-0.05394
32	2001	1999	37111	P	O	-2.60278	-0.14140	-0.13086
32	2002	2001	37455	M	O	-1.54517	-0.23842	-0.10819
34	1998	1999	35902	M	O	0.70959	-0.24204	-0.06293
34	1998	2001	35902	P	O	2.70959	-0.04272	-0.10587
34	1998	2002	35989	C	O	3.47119	0.25489	0.16961
34	1998	2000	35989	P	O	1.47119	-0.02966	-0.04879
34	1998	2001	36026	C	O	2.36987	0.12100	0.00623
34	1998	1999	36026	P	O	0.36987	-0.07832	0.00642
34	1999	2000	36368	C	O	0.43286	0.08754	0.04557
34	1999	2000	36368	M	O	0.43286	0.09796	0.00529
34	1999	1998	36368	P	O	-1.56714	0.14354	0.01487
34	2000	1999	36690	C	O	-1.44934	-0.12068	-0.02886
34	2000	1999	36690	M	O	-1.44934	-0.12068	-0.00610
34	2000	1999	36690	P	O	-1.44934	-0.12068	-0.15768
34	2000	1998	36752	C	O	-2.61914	0.08566	-0.03915
34	2000	1998	36752	M	O	-2.61914	0.08566	-0.02711
34	2000	2002	36752	P	O	1.38086	0.31422	0.07051
34	2001	2002	36983	C	O	0.74792	0.12540	0.05850
34	2001	1999	36983	P	O	-2.25208	-0.25017	-0.07930
34	2001	1998	37083	C	O	-3.52600	-0.00541	-0.05470
34	2001	2002	37083	P	O	0.47400	0.22314	0.10615
34	2001	1999	37111	C	O	-2.60278	-0.19139	-0.03066
34	2002	2001	37445	C	O	-1.51782	-0.17625	-0.24942
34	2002	1998	37445	P	O	-4.51782	-0.22856	-0.35282
35	1998	1999	35920	P	O	0.66028	-0.04024	0.03405
35	1998	2000	35970	P	O	1.52332	-0.01188	0.16864
35	1998	1999	36048	P	O	0.30957	0.04151	0.04908
35	1999	1998	36333	P	O	-1.47119	0.00049	-0.04736
35	2000	1998	36692	P	O	-2.45483	0.00962	0.04797
36	1998	2000	35915	M	O	1.67395	0.03936	-0.04833
36	1998	2001	35915	P	O	2.67395	0.17070	-0.04877
36	1998	2000	35985	M	O	1.48218	0.05871	-0.05656
36	1998	2000	35985	P	O	1.48218	0.05871	-0.02714
36	1998	1999	36054	M	O	0.29309	-0.09934	-0.06025
36	1999	1998	36339	M	O	-1.48767	-0.00876	-0.03804
36	1999	2000	36339	P	O	0.51233	0.01325	0.04725
36	2000	1999	36733	M	O	-1.56714	-0.01325	-0.04707
36	2000	1998	36733	P	O	-2.56714	-0.02201	-0.07768
36	2001	1999	37110	M	O	-2.59998	-0.14458	-0.04296
37	1998	2001	35915	M	O	2.67395	-0.01685	-0.05822
37	1998	1999	35915	P	O	0.67395	-0.13995	-0.05540

Table 15. Data used in the *diffP* model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
37	1998	2001	35977	C	O	2.50415	0.05966	-0.04936
37	1998	2001	35977	M	O	2.50415	0.05966	-0.02102
37	1998	2002	35977	P	O	3.50415	0.25857	0.07747
37	1998	2002	36035	C	O	3.34521	0.30470	-0.01577
37	1998	2002	36035	M	O	3.34521	0.30470	0.04228
37	1998	1999	36035	P	O	0.34521	-0.01732	-0.10659
37	1999	2002	36395	C	O	2.35889	0.32202	0.13172
37	1999	1998	36395	M	O	-1.64111	0.06527	0.11290
37	1999	2002	36395	P	O	2.35889	0.32202	0.13270
37	2001	1999	37134	C	O	-2.66577	-0.12311	0.00449
37	2001	2002	37134	M	O	0.33423	0.19891	0.09964
37	2001	2002	37134	P	O	0.33423	0.19891	0.07933
37	2002	1999	37483	C	O	-3.62195	-0.32202	-0.11276
38	1998	1999	35892	M	O	0.73694	0.05267	-0.29439
38	1998	2000	35892	P	O	1.73694	0.11507	-0.14415
38	1998	2000	35977	M	O	1.50415	0.02720	0.12951
38	1998	2001	35977	P	O	2.50415	0.03847	0.16500
38	1998	2001	36021	M	O	2.38354	0.01796	0.15345
38	1998	2002	36021	P	O	3.38354	0.06274	0.38025
38	1999	2002	36341	M	O	2.50684	0.12233	0.35350
38	1999	2002	36341	P	O	2.50684	0.12233	0.37059
38	1999	2002	36370	M	O	2.42737	0.10568	0.30091
38	1999	2001	36370	P	O	1.42737	0.06090	0.16210
38	1999	2000	36395	M	O	0.35889	0.07130	-0.00914
38	1999	2000	36395	P	O	0.35889	0.07130	0.03014
38	2000	1999	36641	M	O	-1.31506	-0.04742	-0.18151
38	2000	2002	36641	P	O	1.68494	0.07104	0.10514
38	2000	2002	36719	M	O	1.47119	0.04287	0.17462
38	2000	2001	36719	P	O	0.47119	0.00226	0.03642
38	2000	2002	36742	M	O	1.40820	0.05217	0.15903
38	2000	2002	36742	P	O	1.40820	0.05217	0.17208
38	2001	1998	37012	M	O	-3.33154	-0.08956	-0.16512
38	2001	1998	37012	P	O	-3.33154	-0.08956	-0.13827
38	2001	2000	37104	M	O	-1.58362	0.01737	-0.03265
38	2001	2000	37104	P	O	-1.58362	0.01737	0.00206
38	2002	1999	37350	M	O	-3.25757	-0.10524	-0.28199
38	2002	1999	37350	P	O	-3.25757	-0.10524	-0.24449
38	2002	2000	37483	P	O	-2.62195	-0.08249	-0.33152
39	1998	1999	36021	C	CH	0.38354	-0.00993	0.03249
39	1998	2001	36021	P	CH	2.38354	0.12072	0.01796
39	1998	2001	36028	C	CH	2.36438	0.12158	0.05132
39	1998	1999	36028	P	CH	0.36438	-0.00907	-0.01806
39	1999	2002	36341	C	CL	2.50684	0.21761	0.07996
39	1999	2002	36341	P	CL	2.50684	0.21761	0.05494
39	1999	1998	36367	C	CL	-1.56433	-0.00387	0.00227
39	1999	2002	36367	P	CL	2.43567	0.18267	0.03769

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
39	1999	2001	36433	C	CL	1.25476	0.12244	0.07663
39	1999	1998	36433	P	CL	-1.74524	0.00129	-0.01286
39	2001	1998	37104	C	CL	-3.58362	-0.12878	-0.04192
39	2001	1998	37153	C	CL	-3.71777	-0.11351	-0.03428
39	2002	1999	37326	C	CL	-3.19177	-0.14958	0.05075
39	2002	1999	37526	C	CL	-3.73975	-0.24250	-0.08460
40	1998	1999	35919	M	O	0.66296	-0.02756	-0.02267
40	1998	2000	35919	P	O	1.66296	0.02790	0.11319
40	1998	2000	35944	M	O	1.59448	0.07587	0.13875
40	1998	1999	35944	P	O	0.59448	0.02041	0.03966
40	1998	1999	36010	M	O	0.41370	-0.03312	-0.24015
40	1998	2000	36010	P	O	1.41370	0.02234	-0.12220
40	1999	2000	36341	M	O	0.50684	0.05546	0.17302
40	1999	1998	36341	P	O	-1.49316	0.01342	0.04573
40	2000	1998	36649	M	O	-2.33704	-0.00327	-0.04574
40	2000	1999	36719	M	O	-1.52881	-0.05884	0.01927
40	2000	1999	36719	P	O	-1.52881	-0.05884	0.02290
40	2000	1998	36740	M	O	-2.58630	-0.05804	-0.10847
40	2000	1999	36740	P	O	-1.58630	-0.07146	-0.13172
41	1998	2000	35915	M	O	1.67395	0.02574	0.00333
41	1998	1999	35915	P	O	0.67395	-0.35980	-0.00727
41	1998	2000	36011	C	O	1.41101	-0.00532	0.05035
41	1998	1999	36011	C	O	0.41101	-0.39087	0.08213
41	1998	2000	36011	M	O	1.41101	-0.00532	-0.02958
41	1998	2001	36011	P	O	2.41101	-0.02080	-0.03014
41	1999	1998	36336	C	O	-1.47949	0.38051	0.00721
41	1999	2001	36336	C	O	1.52051	0.37006	0.07796
41	1999	2001	36336	M	O	1.52051	0.37006	0.01150
41	2000	1999	36656	C	O	-1.35620	-0.38200	0.03496
41	2000	1999	36656	C	O	-1.35620	-0.38200	0.04611
41	2000	2001	36656	M	O	0.64380	-0.01194	-0.00814
41	2000	1999	36656	P	O	-1.35620	-0.38200	-0.09474
41	2000	2001	36740	C	O	0.41370	-0.04406	0.01667
41	2000	1998	36740	M	O	-2.58630	-0.03361	-0.09325
41	2000	2001	36763	C	O	0.35071	0.00602	0.04665
41	2000	1998	36763	M	O	-2.64929	0.01647	-0.05841
41	2001	1999	37070	C	O	-2.49036	-0.37006	0.03243
41	2001	1998	37070	M	O	-3.49036	0.01045	-0.07209
43	1998	1999	35958	C	O	0.55615	0.01448	-0.00736
43	1998	1999	35958	M	O	0.55615	0.01448	0.00775
43	1998	2002	35958	P	O	3.55615	0.15149	-0.01859
43	1998	1999	36003	C	O	0.43286	0.02586	-0.01902
43	1998	2002	36003	M	O	3.43286	0.16287	-0.00700
43	1998	1999	36003	P	O	0.43286	0.02586	-0.04993
43	1998	1999	36053	C	O	0.29590	0.07510	-0.02888
43	1998	2002	36053	M	O	3.29590	0.21212	-0.00686

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
43	1999	2002	36336	C	O	2.52051	0.10507	-0.00583
43	1999	2000	36336	P	O	0.52051	-0.03827	-0.03469
43	1999	1998	36399	C	O	-1.65210	-0.01261	0.00003
43	1999	2001	36399	M	O	1.34790	0.00207	0.02037
43	1999	2002	36399	P	O	2.34790	0.15830	-0.02756
43	2000	2002	36657	C	O	1.64111	0.08794	-0.03207
43	2000	2002	36657	M	O	1.64111	0.08794	-0.05588
43	2000	2001	36657	P	O	0.64111	-0.06829	-0.01489
43	2000	2001	36720	C	O	0.46851	-0.03592	0.00089
43	2000	2001	36720	M	O	0.46851	-0.03592	-0.01402
43	2000	1999	36720	P	O	-1.53149	-0.01670	-0.08283
43	2000	1998	36747	C	O	-2.60547	0.05086	0.00277
43	2000	1999	36747	M	O	-1.60547	0.08477	-0.01808
43	2000	1999	36747	P	O	-1.60547	0.08477	-0.08693
43	2001	2002	36984	C	O	0.74524	0.22664	-0.05548
43	2001	1998	36984	M	O	-3.25476	0.05573	-0.07515
43	2001	1999	36984	P	O	-2.25476	0.08963	-0.21907
43	2001	1999	37103	C	O	-2.58081	-0.05119	-0.02070
43	2001	1998	37103	M	O	-3.58081	-0.08509	-0.05028
43	2001	1998	37103	P	O	-3.58081	-0.08509	-0.05889
43	2002	2000	37419	C	O	-2.44653	-0.12708	-0.02440
43	2002	2001	37419	M	O	-1.44653	-0.13997	-0.06351
43	2002	1999	37419	P	O	-3.44653	-0.12075	-0.13391
43	2002	2000	37526	C	O	-2.73975	-0.16774	0.01061
43	2002	1999	37526	M	O	-3.73975	-0.16141	-0.01260
44	1998	2001	35906	C	S	2.69861	0.07787	0.04479
44	1998	1999	35906	P	S	0.69861	-0.06162	-0.05534
44	1998	1999	35957	C	S	0.55896	-0.06956	-0.06534
44	1998	1999	35957	P	S	0.55896	-0.06956	-0.10572
44	1998	1999	36047	C	S	0.31238	-0.02511	-0.02534
44	1998	2000	36047	P	S	1.31238	0.07303	-0.00852
44	1999	1998	36389	C	S	-1.62463	0.05209	-0.01445
44	1999	2000	36389	P	S	0.37537	0.09813	-0.04458
44	2000	2001	36691	C	S	0.54797	0.11770	0.00252
44	2000	2001	36691	P	S	0.54797	0.11770	-0.00988
44	2000	1998	36719	C	S	-2.52881	-0.10084	0.00799
44	2000	1998	36719	P	S	-2.52881	-0.10084	-0.05848
44	2000	1999	36740	C	S	-1.58630	-0.11966	0.01576
44	2000	1999	36740	P	S	-1.58630	-0.11966	-0.08304
44	2001	2000	37012	C	S	-1.33154	-0.03646	0.29439
44	2001	1998	37012	P	S	-3.33154	-0.08250	0.20290
44	2001	1998	37110	P	S	-3.59998	-0.09720	-0.02186
45	1998	2002	35899	C	S	3.71777	0.01299	-0.00228
45	1998	2002	35899	P	S	3.71777	0.01299	-0.03820
45	1998	1999	35942	C	S	0.59998	-0.07634	0.08601
45	1998	2001	35942	P	S	2.59998	-0.05021	0.02385

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
45	1998	1999	36054	P	S	0.29309	-0.09531	0.03780
45	1999	2000	36370	P	S	0.42737	0.04544	-0.07812
45	2000	1999	36692	P	S	-1.45483	-0.02046	-0.01133
45	2000	1999	36720	P	S	-1.53149	-0.06454	0.03372
45	2000	1999	36755	P	S	-1.62744	-0.05133	0.07400
45	2001	2002	37012	P	S	0.66846	-0.01282	-0.00786
45	2001	2002	37063	P	S	0.52881	0.03279	-0.01602
45	2001	1998	37153	P	S	-3.71777	0.02473	-0.00432
45	2002	2001	37418	P	S	-1.44385	-0.00666	0.05868
45	2002	2001	37418	P	S	-1.44385	-0.00666	0.05868
46	1998	2000	35892	C	O	1.73694	-0.18618	-0.13777
46	1998	1999	35892	M	O	0.73694	-0.00280	-0.09026
46	1998	1999	35892	P	O	0.73694	-0.00280	-0.14895
46	1998	2002	35915	C	O	3.67395	-0.00463	0.01169
46	1998	2000	35915	M	O	1.67395	-0.19484	-0.11469
46	1998	2001	36000	C	O	2.44104	0.08283	0.00163
46	1998	2001	36000	M	O	2.44104	0.08283	0.00768
46	1998	2001	36038	C	O	2.33704	0.09975	-0.03000
46	1998	2000	36038	M	O	1.33704	-0.09084	-0.07435
46	1999	2000	36241	C	O	0.78076	-0.18339	-0.13182
46	1999	2000	36241	M	O	0.78076	-0.18339	-0.13961
46	2000	1999	36683	C	O	-1.43018	0.40127	-0.04540
46	2000	2002	36683	M	O	1.56982	0.40810	0.02272
46	2000	1998	36683	P	O	-2.43018	0.36738	-0.16396
46	2000	2002	36734	C	O	1.43018	0.05790	0.11224
46	2000	1999	36734	M	O	-1.56982	0.05108	-0.03683
46	2000	1999	36734	P	O	-1.56982	0.05108	-0.07584
46	2000	1999	36777	C	O	-1.68762	0.05502	-0.03273
46	2000	2001	36777	M	O	0.31238	0.06223	-0.02303
46	2001	1998	36991	C	O	-3.27393	-0.09808	-0.06456
46	2001	1999	36991	M	O	-2.27393	-0.06419	-0.04833
46	2001	1999	36991	P	O	-2.27393	-0.06419	-0.05805
46	2001	2000	37048	C	O	-1.43018	-0.13362	-0.08066
46	2001	1999	37048	M	O	-2.43018	0.04977	-0.04707
46	2001	2002	37048	P	O	0.56982	0.05659	0.05196
46	2002	2001	37335	C	O	-1.21643	0.00039	-0.04491
46	2002	2001	37335	M	O	-1.21643	0.00039	-0.04532
47	1998	1999	35951	M	O	0.57532	0.05284	-0.10289
47	1998	2000	35951	P	O	1.57532	-0.15664	-0.28939
47	1998	1999	36000	M	O	0.44104	0.07918	-0.07957
47	1998	2002	36000	P	O	3.44104	0.17974	-0.18411
47	1998	2001	36031	M	O	2.35620	0.04010	-0.16198
47	1998	2001	36031	P	O	2.35620	0.04010	-0.18038
47	1999	2000	36241	M	O	0.78076	-0.20948	-0.04300
47	2000	1999	36683	M	O	-1.43018	0.44837	0.13118
47	2000	2002	36683	P	O	1.56982	0.54893	0.01660

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
47	2000	1998	36734	M	O	-2.56982	-0.01819	0.22056
47	2000	1998	36734	P	O	-2.56982	-0.01819	0.15846
47	2000	1998	36777	M	O	-2.68762	-0.00690	0.23207
47	2001	1998	36991	M	O	-3.27393	-0.08446	0.26655
47	2001	2000	36991	P	O	-1.27393	-0.22929	0.09769
47	2001	2000	37057	M	O	-1.45483	-0.16190	0.03714
47	2001	1999	37152	M	O	-2.71509	0.05058	0.14197
47	2001	1999	37152	P	O	-2.71509	0.05058	0.13132
47	2002	1998	37335	M	O	-4.21643	-0.07177	0.24529
47	2002	1998	37477	M	O	-4.60547	-0.21193	0.14984
47	2002	2000	37477	P	O	-2.60547	-0.35676	-0.05136
48	1998	1999	35928	M	O	0.63831	-0.01136	-0.02049
48	1998	1999	35928	P	O	0.63831	-0.01136	-0.02902
48	1998	2000	35965	M	O	1.53699	0.05844	-0.06884
48	1998	1999	35965	P	O	0.53699	0.00943	-0.03325
48	1998	2000	36054	M	O	1.29309	-0.00270	-0.08407
48	1998	1999	36054	P	O	0.29309	-0.05170	-0.07868
48	1999	2000	36383	M	O	0.39172	0.04901	-0.00671
48	1999	2000	36383	P	O	0.39172	0.04901	-0.01848
48	2000	1999	36663	M	O	-1.37537	-0.05942	-0.07990
48	2000	1999	36663	P	O	-1.37537	-0.05942	-0.04635
48	2000	1998	36741	M	O	-2.58899	-0.01029	-0.10623
49	1998	2000	35912	P	CL	1.68225	-0.05050	0.03263
49	1998	2000	35975	C	CH	1.50964	0.06557	0.07953
49	1998	2002	35975	P	CH	3.50964	0.18464	-0.02822
49	1998	2000	36035	C	CH	1.34521	0.18784	0.11425
49	1998	2002	36035	P	CH	3.34521	0.30692	0.11481
49	2000	1998	36763	C	CH	-2.64929	-0.09126	0.00837
49	2002	1998	37446	C	CH	-4.52051	-0.21034	-0.06445
50	1998	2001	35899	C	L	2.71777	0.31759	0.09764
50	1998	2000	35899	M	L	1.71777	0.04921	0.01941
50	1998	2001	35961	C	L	2.54797	0.22360	0.11386
50	1998	2001	35961	M	L	2.54797	0.22360	0.08517
50	1998	2001	36012	C	L	2.40820	0.06472	0.10010
50	1998	2000	36012	M	L	1.40820	-0.20366	0.01795
50	1998	2000	36059	C	L	1.27942	-0.23578	0.08346
50	1998	1999	36059	M	L	0.27942	-0.25192	-0.00765
50	1999	2000	36357	C	L	0.46301	0.01614	0.08261
50	1999	2001	36357	M	L	1.46301	0.28451	0.10875
50	2000	1998	36662	C	L	-2.37256	0.10875	0.12252
50	2000	1998	36662	M	L	-2.37256	0.10875	0.10068
50	2001	1998	37023	C	L	-3.36169	-0.14892	0.05282
50	2001	1998	37118	C	L	-3.62195	-0.17033	0.04939
51	1998	2001	35906	M	CL	2.69861	0.07440	0.04335
51	1998	2000	35906	P	CL	1.69861	0.05038	-0.04461
51	1998	2001	35972	M	CH	2.51782	0.01410	-0.05140

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
51	1998	2002	35972	P	CH	3.51782	-0.10567	-0.09423
51	1998	2001	36020	M	CH	2.38635	0.12232	0.08687
51	1998	1999	36020	P	CH	0.38635	0.12461	0.15539
51	1999	2000	36241	M	CH	0.78076	-0.02630	-0.03345
51	1999	2002	36241	P	CH	2.78076	-0.12205	-0.07111
51	2000	2001	36678	M	CL	0.58362	0.02402	0.00300
51	2000	2002	36678	P	CL	1.58362	-0.09575	-0.07530
51	2001	1999	36991	M	CH	-2.27393	0.00930	0.03746
51	2001	2000	36991	P	CH	-1.27393	-0.01700	-0.07960
51	2001	2000	37048	M	CH	-1.43018	-0.03103	-0.05778
51	2001	1998	37048	P	CH	-3.43018	-0.07729	-0.04336
51	2002	1998	37421	M	CH	-4.45203	0.04949	-0.02901
51	2002	2000	37421	P	CH	-2.45203	0.09575	-0.08024
52	1998	1999	35965	C	O	0.53699	0.03247	-0.04071
52	1998	1999	35965	M	O	0.53699	0.03247	0.01175
52	1998	1999	35965	P	O	0.53699	0.03247	-0.08460
52	1998	1999	35992	C	O	0.46301	-0.06164	-0.04515
52	1998	1999	35992	M	O	0.46301	-0.06164	-0.00418
52	1998	1999	36034	M	O	0.34790	-0.00653	0.01075
52	1998	1999	36034	P	O	0.34790	-0.00653	-0.01986
52	1999	1998	36349	C	O	-1.51501	0.02196	-0.01086
52	1999	1998	36349	M	O	-1.51501	0.02196	-0.00918
52	1999	1998	36405	C	O	-1.66846	-0.01083	-0.05819
52	1999	1998	36405	M	O	-1.66846	-0.01083	-0.00615
53	1998	2000	35949	M	O	1.58081	-0.11987	0.01347
53	1998	2001	35949	P	O	2.58081	-0.13051	0.10061
53	1998	1999	35991	C	O	0.46570	-0.26784	-0.04418
53	1998	2001	35991	M	O	2.46570	-0.15401	0.10408
53	1998	2000	35991	P	O	1.46570	-0.14337	-0.05810
53	1998	2000	36035	C	O	1.34521	-0.11566	-0.01654
53	1998	2000	36035	M	O	1.34521	-0.11566	0.03684
53	1999	2001	36319	C	O	1.56714	0.11384	0.15056
53	1999	2001	36319	M	O	1.56714	0.11384	0.17546
53	2000	2001	36649	C	O	0.66296	-0.18096	0.08667
53	2000	2002	36649	M	O	1.66296	-0.05319	0.02676
53	2000	2002	36649	P	O	1.66296	-0.05319	-0.03200
53	2000	1998	36712	C	O	-2.50964	0.17592	-0.13896
53	2000	1998	36712	M	O	-2.50964	0.17592	-0.16590
53	2000	2002	36733	C	O	1.43286	0.25600	0.02473
53	2000	2002	36733	M	O	1.43286	0.25600	0.01847
53	2000	1999	36733	P	O	-1.56714	0.01439	-0.17226
53	2001	1998	36982	C	O	-3.24927	0.32732	-0.21156
53	2001	1999	36982	M	O	-2.24927	0.07411	-0.22307
53	2001	2002	36982	P	O	0.75073	0.31572	-0.15488
53	2001	1999	37070	C	O	-2.49036	-0.06899	-0.16803
53	2001	2000	37070	M	O	-1.49036	0.05548	-0.13776

Table 15. Data used in the *diffP* model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
53	2001	2002	37070	P	O	0.50964	0.17262	-0.07725
53	2001	2002	37110	C	O	0.40002	-0.10501	-0.04118
53	2001	1999	37110	M	O	-2.59998	-0.34662	-0.19387
53	2001	2000	37110	P	O	-1.59998	-0.22215	-0.21545
53	2002	1998	37347	C	O	-4.24927	-0.10969	-0.14307
53	2002	2000	37347	M	O	-2.24927	-0.23843	-0.13306
53	2002	1998	37445	C	O	-4.51782	-0.14508	-0.17740
53	2002	1999	37445	M	O	-3.51782	-0.39830	-0.22054
53	2002	1998	37504	C	O	-4.67944	0.28958	-0.17961
53	2002	2000	37504	M	O	-2.67944	0.16084	-0.18234
54	1998	2002	35963	C	L	3.54248	-0.00507	-0.08348
54	1998	1999	35963	M	L	0.54248	-0.01204	-0.01284
54	1998	1999	36053	C	L	0.29590	-0.01497	-0.04713
54	1998	2000	36056	C	L	1.28772	-0.00713	-0.03811
54	1999	2000	36362	C	L	0.44934	0.01576	0.03859
54	1999	2002	36362	M	L	2.44934	0.00698	-0.05465
54	2000	1998	36656	C	L	-2.35620	-0.00107	-0.00731
54	2000	2002	36718	C	L	1.47400	-0.00799	-0.04968
54	2002	1999	37349	C	L	-3.25476	-0.00698	-0.01238
55	1998	2000	35956	C	O	1.56165	-0.00275	-0.01370
55	1998	2002	35956	M	O	3.56165	0.09056	0.11396
55	1998	2002	35998	C	O	3.44653	0.10101	0.13765
55	1998	2002	35998	M	O	3.44653	0.10101	0.14350
55	1998	2000	36035	C	O	1.34521	0.07604	0.06308
55	1998	2002	36035	M	O	3.34521	0.16936	0.18426
55	2000	2002	36769	C	O	1.33423	0.09332	0.08358
55	2000	1998	36769	M	O	-2.66577	-0.02699	-0.05688
55	2000	1998	36769	P	O	-2.66577	-0.02699	-0.11463
55	2002	2000	37371	C	O	-2.31506	-0.06695	-0.05897
55	2002	1998	37371	M	O	-4.31506	-0.09394	-0.07330
55	2002	2000	37469	C	O	-2.58362	-0.11969	-0.40072
55	2002	1998	37469	M	O	-4.58362	-0.14668	-0.42834
56	1998	2002	35901	C	O	3.71228	0.28813	0.05198
56	1998	2000	35901	M	O	1.71228	-0.01303	-0.09674
56	1998	2000	35956	C	O	1.56165	-0.02678	-0.17346
56	1998	2000	35956	M	O	1.56165	-0.02678	-0.05728
56	1998	2001	35956	P	O	2.56165	0.10266	-0.01136
56	1998	2001	36046	C	O	2.31506	0.16770	0.11100
56	1998	2000	36046	P	O	1.31506	0.03826	-0.03340
56	2000	2002	36762	C	O	1.35339	0.30116	0.12956
56	2000	2001	36762	M	O	0.35339	0.12944	0.12878
56	2001	2002	37036	C	O	0.60278	0.34650	0.02929
56	2001	2000	37036	M	O	-1.39722	0.04534	-0.12863
56	2001	2000	37071	C	O	-1.49316	-0.22757	-0.17894
56	2001	1998	37071	M	O	-3.49316	-0.22330	-0.13527
56	2001	1998	37124	C	O	-3.63831	-0.20182	-0.11815

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
56	2001	2002	37124	M	O	0.36169	0.09508	-0.02051
56	2002	2000	37343	C	O	-2.23840	-0.30116	-0.19392
56	2002	2001	37343	M	O	-1.23840	-0.17172	-0.05954
58	1998	1999	35954	C	O	0.56714	-0.10614	0.08265
58	1998	1999	35990	C	O	0.46851	-0.04064	0.08217
58	1998	1999	36020	C	O	0.38635	0.01180	0.12574
58	1999	2000	36378	C	O	0.40552	0.03786	0.01150
58	1999	2001	36378	M	O	1.40552	0.25631	0.02140
58	2000	2002	36748	C	O	1.39172	0.29832	0.20935
58	2001	1999	36999	C	O	-2.29590	-0.31702	-0.15053
58	2001	2002	37056	C	O	0.54797	0.12323	0.09585
58	2001	2002	37103	C	O	0.41919	0.16544	0.16245
58	2002	1998	37335	C	O	-4.21643	-0.28812	-0.20814
58	2002	1999	37414	C	O	-3.43286	-0.32131	-0.08070
58	2002	1999	37515	C	O	-3.70959	-0.39504	-0.13369
59	1998	2000	35964	M	O	1.53967	-0.22813	-0.19001
59	1998	2000	35964	P	O	1.53967	-0.22813	-0.17468
59	1999	1998	36390	M	O	-1.62744	-0.32791	0.03716
59	1999	2000	36390	P	O	0.37256	-0.55604	-0.10246
59	2000	1998	36650	P	O	-2.33972	0.22813	0.13402
60	1998	2002	35901	C	O	3.71228	0.07513	-0.03833
60	1998	1999	35901	M	O	0.71228	-0.04784	-0.12718
60	1998	2002	35901	P	O	3.71228	0.07513	-0.05432
60	1998	2002	35978	C	O	3.50134	0.06784	-0.04705
60	1998	2002	35978	M	O	3.50134	0.06784	-0.01900
60	1998	2000	35978	P	O	1.50134	-0.06203	-0.15702
60	1998	2002	36046	C	O	3.31506	0.23545	0.03343
60	1998	2000	36046	M	O	1.31506	0.10558	-0.05729
60	1998	2002	36046	P	O	3.31506	0.23545	0.03481
60	1999	2000	36362	C	O	0.44934	-0.00507	-0.14313
60	1999	1998	36362	C	O	-1.55066	-0.00867	-0.05352
60	1999	2000	36362	M	O	0.44934	-0.00507	-0.13862
60	1999	2002	36362	P	O	2.44934	0.12480	-0.02777
60	2000	1999	36691	C	O	-1.45203	0.01863	-0.10717
60	2000	2001	36691	M	O	0.54797	0.12267	-0.07363
60	2000	2001	36691	P	O	0.54797	0.12267	-0.08087
60	2000	1998	36721	C	O	-2.53430	-0.00037	-0.07824
60	2000	2001	36721	M	O	0.46570	0.10683	-0.06695
60	2000	1999	36721	P	O	-1.53430	0.00280	-0.12586
60	2000	1999	36761	C	O	-1.64380	-0.00072	-0.13928
60	2000	1999	36761	M	O	-1.64380	-0.00072	-0.11638
60	2000	1998	36761	P	O	-2.64380	-0.00389	-0.14563
60	2001	2000	37015	C	O	-1.33972	-0.13804	-0.10434
60	2001	2002	37015	M	O	0.66028	-0.00817	-0.01147
60	2001	2000	37077	C	O	-1.50964	-0.09711	-0.14904
60	2001	1999	37077	M	O	-2.50964	-0.09021	-0.17038

Table 15. Data used in the *diffP* model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
60	2001	1999	37077	P	O	-2.50964	-0.09021	-0.19231
60	2001	2002	37111	C	O	0.39722	0.02317	-0.02789
60	2001	1999	37111	M	O	-2.60278	-0.09980	-0.15065
60	2001	2000	37111	P	O	-1.60278	-0.10670	-0.23210
60	2002	2001	37337	C	O	-1.22192	-0.01893	-0.14050
60	2002	1998	37337	M	O	-4.22192	-0.12614	-0.16798
60	2002	2000	37337	P	O	-2.22192	-0.12987	-0.21216
61	1998	2002	35957	C	O	3.55896	0.15477	0.16991
61	1998	1999	35957	M	O	0.55896	0.00542	0.02048
61	1998	2002	36004	C	O	3.43018	0.07139	0.14308
61	1998	2002	36004	M	O	3.43018	0.07139	0.16962
61	1998	2001	36042	C	O	2.32605	-0.00242	0.19203
61	1998	2001	36042	M	O	2.32605	-0.00242	0.13945
61	1999	2000	36383	C	O	0.39172	-0.11441	0.16267
61	1999	2001	36383	M	O	1.39172	0.10752	0.19155
61	2000	1998	36691	C	O	-2.45203	0.17524	0.03263
61	2000	1999	36691	M	O	-1.45203	0.11441	-0.17393
61	2001	1999	37134	C	O	-2.66577	-0.10752	-0.06062
61	2001	2000	37134	M	O	-1.66577	-0.22193	-0.14528
61	2002	2000	37349	C	O	-2.25476	-0.26376	0.03418
61	2002	2001	37349	M	O	-1.25476	-0.04183	-0.04438
62	1998	2000	35928	P	L	1.63831	0.33745	0.39989
62	1998	1999	35965	C	L	0.53699	0.12758	0.24137
62	1998	2000	35965	P	L	1.53699	0.04399	0.30184
62	1998	2000	36034	C	L	1.34790	0.03457	0.22395
62	1998	2001	36034	P	L	2.34790	0.20252	0.26460
62	1999	1998	36433	C	L	-1.74524	-0.17381	-0.41991
62	1999	2002	36433	P	L	2.25476	-0.03428	-0.03791
62	2000	1998	36663	C	L	-2.37537	-0.12502	-0.44174
62	2000	2002	36663	P	L	1.62463	0.01451	-0.10269
62	2000	2002	36741	C	L	1.41101	0.06176	-0.19035
62	2000	1999	36741	P	L	-1.58899	0.09604	-0.10174
62	2001	1998	37096	C	L	-3.56165	-0.26812	-0.41499
62	2002	2001	37505	C	L	-1.68225	0.12859	-0.12634
62	2002	1998	37505	P	L	-4.68225	-0.13953	-0.40714
63	1998	2002	35902	C	CL	3.70959	0.31980	0.16004
63	1998	2001	35949	C	CL	2.58081	0.66861	0.09058
63	1998	2001	36047	C	CH	2.31238	0.68391	0.13063
63	1999	2000	36357	C	CH	0.46301	0.58634	0.00629
63	2000	1999	36684	C	CL	-1.43286	-0.61712	-0.00244
63	2000	2001	36728	C	CL	0.44653	0.02380	0.08127
63	2000	2001	36761	C	CH	0.35620	0.13170	0.09490
63	2001	1999	36998	C	CH	-2.29309	-0.65523	-0.05781
63	2001	2002	37034	C	CH	0.60828	-0.35632	0.06884
63	2001	1999	37069	C	CH	-2.48767	-0.63838	-0.03064
63	2002	2000	37356	C	CH	-2.27393	0.29015	-0.18341

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
64	1998	2000	35921	C	O	1.65759	0.15698	0.12509
64	1998	2000	35949	C	O	1.58081	0.14835	0.06400
64	1998	2002	36047	C	O	3.31238	0.01707	0.16919
64	1998	2002	36054	C	O	3.29309	0.00762	0.15762
64	1999	1998	36313	C	O	-1.41638	0.00169	-0.01489
64	1999	2002	36369	C	O	2.43018	0.01767	0.12475
64	2000	1999	36684	C	O	-1.43286	-0.23069	0.06054
64	2000	2002	36726	C	O	1.45203	-0.22676	0.18617
64	2000	2001	36781	C	O	0.30139	0.03840	0.08248
64	2001	2002	37035	C	O	0.60547	-0.02593	0.14727
64	2001	2000	37069	C	O	-1.48767	0.13950	0.07649
64	2002	1998	37355	C	O	-4.27124	-0.01568	-0.25147
65	1998	1999	35900	C	O	0.71509	0.02800	-0.06256
65	1998	2000	35900	M	O	1.71509	0.02504	0.01754
65	1998	2000	35949	C	O	1.58081	-0.27874	-0.00899
65	1998	1999	35949	M	O	0.58081	-0.27577	-0.08340
65	1998	1999	36032	C	O	0.35339	0.08104	-0.05574
65	1998	2000	36032	M	O	1.35339	0.07808	0.02926
65	1998	2000	36053	C	O	1.29590	0.02151	0.03780
65	1998	2000	36053	M	O	1.29590	0.02151	0.04906
65	1999	1998	36313	C	O	-1.41638	0.05960	0.06440
65	1999	2000	36313	M	O	0.58362	0.02107	0.07791
65	1999	1998	36364	C	O	-1.55615	0.01152	0.01802
65	1999	2000	36364	M	O	0.44385	-0.02701	0.02915
65	2000	1998	36685	C	O	-2.43567	0.04649	0.00337
65	2000	1999	36685	M	O	-1.43567	0.01093	-0.07165
65	2000	1999	36728	C	O	-1.55347	-0.00500	-0.03980
65	2000	1999	36728	M	O	-1.55347	-0.00500	-0.03110
66	1998	2002	35958	C	O	3.55615	0.35101	0.08305
66	1998	1999	35958	M	O	0.55615	0.01806	-0.12223
66	1998	2002	36005	C	O	3.42737	0.37449	0.08692
66	1998	2002	36005	M	O	3.42737	0.37449	0.04477
66	1998	2001	36017	C	O	2.39453	0.20500	0.08516
66	1998	2001	36017	M	O	2.39453	0.20500	0.06718
66	1999	2002	36294	C	O	2.63562	0.36420	0.12931
66	1999	2002	36294	M	O	2.63562	0.36420	0.11658
66	1999	2000	36362	C	O	0.44934	0.04306	0.03045
66	1999	2000	36362	M	O	0.44934	0.04306	0.02204
66	2000	1998	36665	C	O	-2.38086	-0.10211	0.02147
66	2000	2002	36665	M	O	1.61914	0.28159	0.10212
66	2000	2001	36718	C	O	0.47400	0.04849	0.02645
66	2000	2002	36718	M	O	1.47400	0.26909	0.11786
66	2000	1998	36754	C	O	-2.62463	-0.15847	0.00431
66	2000	1999	36754	M	O	-1.62463	-0.10772	-0.02853
66	2001	2000	37047	C	O	-1.42737	-0.00393	-0.00543
66	2001	2000	37047	M	O	-1.42737	-0.00393	-0.01121

Table 15. Data used in the *diffP* model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
66	2001	1998	37091	C	O	-3.54797	-0.17062	0.02938
66	2001	2000	37091	M	O	-1.54797	-0.04555	0.01068
66	2001	1998	37141	C	O	-3.68494	-0.18968	-0.01454
66	2001	1998	37141	M	O	-3.68494	-0.18968	-0.10006
66	2002	1998	37455	C	O	-4.54517	-0.37013	-0.07736
66	2002	2001	37455	M	O	-1.54517	-0.20703	-0.07456
66	2002	2000	37488	C	O	-2.63562	-0.27221	-0.11986
66	2002	1999	37488	M	O	-3.63562	-0.34652	-0.15529
68	1998	2001	35949	C	L	2.58081	-0.01448	0.01819
68	1998	2001	35991	C	L	2.46570	0.00971	0.02342
68	1998	1999	36019	C	L	0.38904	0.07307	0.03399
68	1998	2000	36061	C	L	1.27393	0.01879	0.02888
68	1999	1998	36327	C	L	-1.45483	-0.03576	0.01751
68	2000	2001	36700	C	L	0.52332	0.02327	0.04013
68	2001	1999	37026	C	L	-2.36987	-0.00150	-0.05480
68	2001	2002	37140	C	L	0.31775	0.14430	0.17286
68	2001	1998	37162	C	L	-3.74243	-0.02065	0.01115
68	2002	2001	37370	C	L	-1.31238	-0.08429	-0.01894
68	2002	1998	37491	C	L	-4.64380	-0.21282	-0.32191
69	1998	2001	35942	C	O	2.59998	0.06479	0.04750
69	1998	2001	35942	P	O	2.59998	0.06479	0.03793
69	1998	2002	36026	C	O	3.36987	0.02152	-0.02258
69	1998	2000	36026	P	O	1.36987	-0.03236	0.01742
69	1998	2001	36040	C	O	2.33154	-0.00643	-0.00627
69	2000	1998	36747	C	O	-2.60547	-0.00413	0.00604
69	2001	1998	37083	C	O	-3.52600	-0.01672	0.03250
69	2002	2001	37419	C	O	-1.44653	-0.04130	0.02533
69	2002	2000	37419	P	O	-2.44653	-0.05388	0.02964
70	1998	2002	35930	C	O	3.63293	-0.01490	0.00722
70	1998	2000	35983	C	O	1.48767	-0.02685	-0.00579
70	1998	2001	36033	C	O	2.35071	-0.09611	0.18097
70	1999	2000	36320	C	O	0.56433	-0.04019	-0.02856
70	2000	2001	36634	C	O	0.70410	-0.09235	0.10443
70	2000	2001	36705	C	O	0.50964	-0.14313	0.10493
70	2000	1999	36755	C	O	-1.62744	0.05625	-0.09018
70	2001	1998	37008	C	O	-3.32056	0.09913	-0.08045
70	2001	2000	37105	C	O	-1.58630	0.12232	-0.26384
70	2002	2001	37449	C	O	-1.52881	-0.08766	-0.03775
72	1998	2000	35948	C	O	1.58362	0.11049	-0.02403
72	1998	2000	35948	M	O	1.58362	0.11049	-0.03919
72	1998	2000	35992	C	O	1.46301	-0.00955	0.03067
72	1998	2001	35992	M	O	2.46301	0.05552	0.05625
72	1998	1999	36041	C	O	0.32874	0.07777	0.05578
72	1998	1999	36041	M	O	0.32874	0.07777	0.04356
72	1999	2000	36355	C	O	0.46851	-0.00048	0.02843
72	1999	1998	36355	M	O	-1.53149	-0.05989	0.00186

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
72	2000	1999	36719	C	O	-1.52881	0.00048	0.03375
72	2000	1998	36719	M	O	-2.52881	-0.05941	0.00409
72	2001	1999	37070	C	O	-2.49036	-0.03488	-0.04625
72	2001	1999	37070	M	O	-2.49036	-0.03488	-0.05647
72	2001	2000	37140	C	O	-1.68225	-0.07129	-0.11596
72	2001	1998	37140	M	O	-3.68225	-0.13070	-0.12687
72	2001	2000	37161	C	O	-1.73975	-0.08857	-0.10858
72	2001	2000	37161	M	O	-1.73975	-0.08857	-0.10800
74	1998	2001	35935	C	O	2.61914	0.25846	0.01242
74	1998	2002	35935	M	O	3.61914	0.05237	-0.06101
74	1998	2000	36004	C	O	1.43018	0.08716	0.07355
74	1998	2002	36004	M	O	3.43018	0.03099	0.01176
74	1998	2000	36048	C	O	1.30957	0.12609	0.08300
74	1998	2001	36048	M	O	2.30957	0.27601	0.06242
74	2000	2001	36686	C	O	0.56165	0.14992	0.06653
74	2000	2002	36686	M	O	1.56165	-0.05617	0.01684
74	2001	2000	37007	C	O	-1.31775	-0.14992	0.01632
74	2001	1998	37007	M	O	-3.31775	-0.25719	-0.04160
74	2002	2001	37454	C	O	-1.54248	0.20609	0.07886
74	2002	1998	37454	M	O	-4.54248	-0.05110	0.02949
75	1998	2000	35914	C	O	1.67676	-0.05400	0.21194
75	1998	2000	35914	M	O	1.67676	-0.05400	0.20009
75	1998	2000	36004	C	O	1.43018	0.02481	0.26130
75	1998	2000	36004	M	O	1.43018	0.02481	0.25220
75	1998	2000	36041	C	O	1.32874	0.03041	0.26243
75	1998	2000	36041	M	O	1.32874	0.03041	0.26017
75	2000	1998	36720	C	O	-2.53149	-0.00041	0.07492
75	2000	1998	36720	M	O	-2.53149	-0.00041	0.05804
77	1998	1999	35997	C	O	0.44934	0.09696	0.05682
77	1998	1999	35997	M	O	0.44934	0.09696	0.03168
77	1998	1999	36005	C	O	0.42737	0.07064	0.04353
77	1998	1999	36005	M	O	0.42737	0.07064	0.02599
77	1998	1999	36040	C	O	0.33154	-0.03087	0.00715
77	1998	1999	36040	M	O	0.33154	-0.03087	-0.00866
77	1999	1998	36363	C	O	-1.55347	-0.04558	0.02279
77	1999	1998	36363	M	O	-1.55347	-0.04558	-0.00149
80	1998	2002	35907	C	O	3.69592	0.27892	-0.01823
80	1998	1999	35907	M	O	0.69592	-0.01093	-0.00415
80	1998	1999	35907	P	O	0.69592	-0.01093	-0.04243
80	1998	1999	35997	C	O	0.44934	-0.03201	0.03119
80	1998	2002	35997	M	O	3.44934	0.25785	0.03536
80	1998	2002	36027	C	O	3.36707	0.24902	0.01962
80	1998	2000	36027	M	O	1.36707	0.02831	0.01879
80	1999	2000	36356	C	O	0.46570	0.06915	0.01923
80	1999	1998	36356	M	O	-1.53430	0.02550	0.03814
80	2000	2002	36636	C	O	1.69861	0.21912	-0.03259

Table 15. Data used in the *diffP* model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W , log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
80	2000	1999	36636	M	O	-1.30139	-0.07073	-0.04271
80	2000	2002	36705	C	O	1.50964	0.24331	0.07161
80	2000	2002	36705	M	O	1.50964	0.24331	0.05043
80	2000	2002	36749	C	O	1.38904	0.19968	0.04256
80	2000	1998	36749	M	O	-2.61096	-0.06468	0.02588
80	2002	1999	37489	C	O	-3.63831	-0.28986	-0.06887
80	2002	1999	37489	M	O	-3.63831	-0.28986	-0.03550
82	1998	2002	35969	C	L	3.52600	0.35781	-0.22245
82	1998	2002	35993	C	L	3.46033	0.34281	-0.33505
82	1998	2002	36055	C	L	3.29041	0.28499	-0.21321
82	2002	1998	37419	C	L	-4.44653	-0.31559	-0.00886
82	2002	1998	37504	C	L	-4.67944	-0.34149	-0.02338
85	1998	2000	35928	C	S	1.63831	0.03966	0.12878
85	1998	2001	35928	P	S	2.63831	0.33975	0.44272
85	1998	1999	35970	C	S	0.52332	0.28751	0.01219
85	1998	2000	35970	P	S	1.52332	0.29701	0.07331
85	1998	1999	36024	C	S	0.37537	-0.01239	0.02397
85	1998	2000	36024	P	S	1.37537	-0.00289	0.08763
85	1999	1998	36356	C	S	-1.53430	-0.10176	-0.00519
85	1999	2000	36356	P	S	0.46570	0.00950	0.06505
85	2000	2001	36685	C	S	0.56433	0.30009	0.36838
85	2000	2001	36685	P	S	0.56433	0.30009	0.33104
85	2001	1998	37055	C	S	-3.44934	-0.41135	-0.31196
85	2001	2000	37055	P	S	-1.44934	-0.30009	-0.26399
86	1998	2001	35920	C	S	2.66028	0.14553	0.16179
86	1998	2001	35920	P	S	2.66028	0.14553	0.10719
86	1998	2001	35976	C	S	2.50684	0.01212	0.05800
86	1998	2001	35976	P	S	2.50684	0.01212	0.02639
86	1998	1999	36021	C	S	0.38354	-0.02765	0.02175
86	1998	1999	36021	P	S	0.38354	-0.02765	-0.00410
86	1998	2002	36062	C	S	3.27124	-0.29837	0.07908
86	1998	2002	36062	P	S	3.27124	-0.29837	0.05332
86	1999	2000	36333	C	S	0.52881	0.10911	0.01997
86	1999	2001	36333	P	S	1.52881	0.03330	-0.01633
86	1999	1998	36370	C	S	-1.57263	-0.04966	-0.03673
86	1999	2000	36370	P	S	0.42737	0.05481	-0.02191
86	2000	2002	36686	C	S	1.56165	-0.35268	0.07908
86	2000	2001	36686	P	S	0.56165	-0.07580	-0.04299
86	2001	2000	37055	C	S	-1.44934	0.07580	0.01109
86	2001	2002	37055	P	S	0.55066	-0.27688	0.01478
86	2002	1998	37378	C	S	-4.33423	0.24821	-0.05123
86	2002	2000	37378	P	S	-2.33423	0.35268	-0.00077
87	1998	1999	35920	C	S	0.66028	0.06763	-0.02438
87	1998	2002	35920	P	S	3.66028	0.12481	-0.04079
87	1998	2000	35964	C	S	1.53967	0.11665	-0.01072
87	1998	2002	35964	P	S	3.53967	0.14411	-0.04741

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}-W$	*diffP*
87	1998	2002	36026	C	S	3.36987	0.09887	0.00399
87	1998	2001	36026	P	S	2.36987	0.10105	-0.02378
87	1998	2000	36062	C	S	1.27124	0.03021	-0.01045
87	1998	2001	36062	P	S	2.27124	0.05984	-0.06442
87	1999	2002	36370	C	S	2.42737	0.05719	0.01938
87	1999	2001	36370	P	S	1.42737	0.05936	-0.03460
87	2000	1998	36657	C	S	-2.35889	-0.06249	0.01238
87	2000	2001	36657	P	S	0.64111	0.04606	-0.03421
87	2000	2002	36735	C	S	1.42737	0.02285	0.01482
87	2000	2002	36735	P	S	1.42737	0.02285	-0.03720
87	2000	2001	36782	C	S	0.29858	0.01781	0.01692
87	2000	1999	36782	P	S	-1.70142	-0.04155	-0.06734
87	2001	2000	37070	C	S	-1.49036	-0.02232	0.00117
87	2001	1999	37070	P	S	-2.49036	-0.05205	-0.08343
87	2001	1998	37113	C	S	-3.60828	-0.10546	-0.00606
87	2001	2002	37113	P	S	0.39172	0.00090	-0.01874
87	2001	2000	37140	C	S	-1.68225	-0.04003	-0.00617
87	2001	1999	37140	P	S	-2.68225	-0.06976	-0.06739
87	2002	2001	37379	C	S	-1.33704	0.00218	0.03264
87	2002	1998	37379	P	S	-4.33704	-0.10636	0.01772
89	1998	2000	35920	C	O	1.66028	-0.07581	-0.04288
89	1998	2000	35920	M	O	1.66028	-0.07581	0.00390
89	1998	2000	35950	C	O	1.57812	-0.13482	-0.05510
89	1998	1999	35950	M	O	0.57812	-0.08521	-0.01827
89	1998	1999	36048	C	O	0.30957	-0.12235	-0.02096
89	1998	2000	36048	M	O	1.30957	-0.17196	0.00951
89	1999	1998	36322	C	O	-1.44104	0.01126	-0.03224
89	1999	1998	36322	M	O	-1.44104	0.01126	0.00680
89	1999	1998	36370	C	O	-1.57263	0.14458	0.00404
89	1999	1998	36370	M	O	-1.57263	0.14458	0.01848
89	2000	1998	36720	C	O	-2.53149	0.12753	-0.00941
89	2000	1999	36720	M	O	-1.53149	0.04961	-0.00380
90	1998	1999	35922	C	S	0.65479	-0.00101	0.05762
90	1998	2000	35922	P	S	1.65479	0.07983	0.04621
90	1998	1999	35977	C	S	0.50415	-0.00352	0.02918
90	1998	2002	35977	P	S	3.50415	0.09323	0.12081
90	1998	2002	36021	C	S	3.38354	0.06867	0.15612
90	1998	2001	36021	P	S	2.38354	0.07300	0.07404
90	1999	1998	36356	C	S	-1.53430	0.01087	-0.03147
90	1999	2000	36356	P	S	0.46570	0.08084	-0.00430
90	2000	1999	36686	C	S	-1.43835	-0.08084	-0.00313
90	2000	2001	36686	P	S	0.56165	0.02025	-0.01821
90	2001	1998	37055	C	S	-3.44934	-0.09022	-0.05568
90	2002	1998	37379	C	S	-4.33704	-0.08588	-0.11494
90	2002	1999	37379	P	S	-3.33704	-0.09675	-0.09587
92	1998	2000	35920	C	S	1.66028	0.02195	-0.07551

Table 15. Data used in the *diffP* model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
92	1998	2000	35920	P	S	1.66028	0.02195	-0.10135
92	1998	2000	35964	C	S	1.53967	-0.00698	-0.00091
92	1998	2000	35964	P	S	1.53967	-0.00698	-0.01360
92	1998	2001	36053	C	S	2.29590	0.01323	-0.01613
92	1998	2000	36053	P	S	1.29590	-0.00402	-0.04953
92	1998	2000	36060	C	S	1.27673	-0.00447	-0.01812
92	1998	1999	36060	P	S	0.27673	0.01029	-0.02504
92	1999	2001	36333	C	S	1.52881	0.01152	-0.01932
92	1999	2001	36333	P	S	1.52881	0.01152	-0.05950
92	1999	2002	36370	C	S	2.42737	0.00018	0.01188
92	1999	2000	36370	P	S	0.42737	-0.02379	-0.04621
92	2000	1999	36643	C	S	-1.32056	0.02889	-0.03562
92	2000	2002	36643	P	S	1.67944	0.03810	-0.08380
92	2000	2002	36719	C	S	1.47119	0.01555	-0.01813
92	2000	1999	36719	P	S	-1.52881	0.00634	-0.09292
92	2000	2002	36782	C	S	1.29858	0.01824	-0.02056
92	2000	2001	36782	P	S	0.29858	0.01152	-0.08992
92	2001	2000	37012	C	S	-1.33154	-0.00330	-0.05060
92	2001	2000	37012	P	S	-1.33154	-0.00330	-0.12887
92	2001	1998	37126	C	S	-3.64380	-0.02752	-0.01781
92	2001	2002	37126	P	S	0.35620	-0.00194	-0.06278
92	2001	2000	37168	C	S	-1.75891	-0.02783	0.03276
92	2002	2000	37386	C	S	-2.35620	-0.02396	-0.04684
92	2002	2001	37386	P	S	-1.35620	-0.00672	-0.04073
95	1998	2001	35921	C	CL	2.65759	-0.11643	0.15816
95	1998	1999	35990	C	CL	0.46851	-0.04652	0.14576
95	1998	1999	35992	C	CH	0.46301	-0.31585	0.00043
95	1998	2001	35992	P	CH	2.46301	-0.19551	0.00219
95	1998	2000	36035	C	CH	1.34521	0.03727	0.01656
95	1998	2001	36035	P	CH	2.34521	-0.09707	-0.09297
95	1998	2001	36047	C	CL	2.31238	-0.10850	0.17557
95	1999	2000	36319	C	CL	0.56714	0.25468	0.14995
95	2000	1999	36635	C	CL	-1.29858	-0.22505	0.10352
95	2000	2001	36649	C	CH	0.66296	-0.13098	-0.00123
95	2000	1999	36719	C	CH	-1.52881	-0.28768	-0.07067
95	2001	2000	36991	C	CH	-1.27393	0.06053	-0.04424
95	2001	2000	37064	C	CL	-1.47400	0.20816	0.12089
97	1998	2002	35929	C	CH	3.63562	0.09846	0.08022
97	1998	2002	35929	C	CL	3.63562	0.06298	0.19709
97	1998	2000	35984	C	CH	1.48499	0.04484	0.03037
97	1998	2002	35984	C	CL	3.48499	0.10738	0.22277
97	1998	2000	36029	C	CH	1.36169	0.06636	0.04575
97	1998	2000	36029	C	CL	1.36169	0.04065	0.13371
97	1999	1998	36369	C	CH	-1.56982	0.04946	-0.01793
97	1999	2001	36369	C	CH	1.43018	0.05470	0.09073
97	2000	1998	36692	C	CL	-2.45483	-0.02088	0.02498

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
97	2001	1999	37119	C	CH	-2.62463	-0.06324	-0.04941
97	2002	1998	37448	C	CL	-4.52600	-0.11934	0.02374
98	1998	1999	35927	C	CH	0.64111	0.00257	-0.09568
98	1998	2002	35927	C	CL	3.64111	0.11244	-0.06119
98	1998	1999	35984	C	CL	0.48499	0.02440	-0.03399
98	1998	1999	36047	C	CH	0.31238	0.04887	-0.11715
98	1998	2000	36047	C	CL	1.31238	0.02489	-0.09194
98	1998	2000	36056	C	CL	1.28772	0.01712	-0.08859
98	1999	1998	36320	C	CH	-1.43567	-0.00977	0.06601
98	2000	1999	36651	C	CH	-1.34241	-0.01173	-0.00346
98	2001	1999	37011	C	CL	-2.32874	-0.05657	-0.03196
98	2001	1999	37083	C	CL	-2.52600	-0.03031	0.00902
98	2002	1998	37356	C	CL	-4.27393	-0.15797	-0.00133
99	1998	2001	35928	C	CH	2.63831	0.37002	-0.35674
99	1998	2002	35928	C	CL	3.63831	0.20867	0.12063
99	1998	2001	35976	C	CH	2.50684	0.36096	-0.35949
99	1998	2002	35976	M	CH	3.50684	0.31142	-0.06818
99	1998	2001	35976	C	CL	2.50684	0.24761	-0.16796
99	1998	2001	35976	M	CL	2.50684	0.24761	-0.16788
99	1998	2000	36061	C	CH	1.27393	0.10194	-0.29227
99	1998	2002	36061	M	CH	3.27393	0.25549	-0.05510
99	1998	2001	36061	C	CL	2.27393	0.21403	-0.15744
99	1998	2002	36061	M	CL	3.27393	0.16449	0.12990
99	2000	2002	36735	C	CH	1.42737	0.15354	0.01243
99	2000	1998	36735	M	CH	-2.57263	-0.08526	-0.23424
99	2001	2002	37007	C	CL	0.68225	-0.04954	0.13753
99	2001	1998	37007	M	CL	-3.31775	-0.28835	-0.10475
99	2002	2000	37385	C	CH	-2.35339	-0.15354	-0.27034
99	2002	2001	37385	M	CH	-1.35339	0.04954	-0.31510
100	1998	2002	35942	C	CL	3.59998	0.24379	0.07843
100	1998	2002	35942	C	CL	3.59998	0.19750	0.07906
100	1998	2002	35942	M	CL	3.59998	0.24379	0.07013
100	1998	2001	35942	M	CL	2.59998	0.19812	0.03616
100	1998	2001	35970	C	CL	2.52332	0.19986	0.05829
100	1998	2001	35970	M	CL	2.52332	0.19986	0.05526
100	1998	2002	36033	C	CL	3.35071	0.10770	0.11265
100	1998	2001	36033	C	CL	2.35071	0.06780	0.07668
100	1998	2001	36033	M	CL	2.35071	0.10832	0.06890
100	1998	2001	36033	M	CL	2.35071	0.06780	0.06744
100	2001	2002	36998	C	CL	0.70691	0.03858	0.06889
100	2001	2002	36998	M	CL	0.70691	0.03858	0.04337
100	2001	1998	37091	C	CL	-3.54797	-0.16878	-0.05725
100	2001	1998	37091	M	CL	-3.54797	-0.16878	-0.06021
100	2001	2002	37160	C	CL	0.26306	-0.03473	0.06967
100	2001	1998	37160	M	CL	-3.73694	-0.19782	-0.05051
100	2002	1998	37349	C	CL	-4.25476	-0.16309	-0.10141

Table 15. Data used in the *diffP* model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W}$ - W	*diffP*
100	2002	1998	37349	M	CL	-4.25476	-0.16309	-0.10424
101	1998	1999	35935	C	CH	0.61914	-0.13201	-0.04417
101	1998	1999	35935	M	CH	0.61914	-0.13201	-0.05580
101	1998	2000	35935	C	CL	1.61914	-0.21905	0.35063
101	1998	2000	35935	M	CL	1.61914	-0.21905	0.33385
101	1998	2000	35991	C	CH	1.46570	-0.22722	0.06606
101	1998	1999	35991	M	CH	0.46570	-0.13936	0.00021
101	1998	2000	35991	C	CL	1.46570	-0.22559	0.38171
101	1998	2000	35991	M	CL	1.46570	-0.22559	0.37277
101	1998	1999	36025	C	CH	0.37256	-0.20237	-0.05124
101	1998	1999	36025	M	CH	0.37256	-0.20237	-0.06626
101	1998	1999	36025	C	CL	0.37256	-0.20008	0.29496
101	1998	1999	36025	M	CL	0.37256	-0.20008	0.27917
101	1999	2000	36364	C	CH	0.44385	-0.08786	0.00647
101	1999	1998	36364	M	CH	-1.55615	0.15712	-0.01001
101	2000	1998	36672	C	CL	-2.40002	0.24498	-0.16279
101	2000	1998	36672	M	CL	-2.40002	0.24498	-0.17425
102	1998	2001	35934	C	CH	2.62195	0.05377	0.14176
102	1998	2000	35934	M	CH	1.62195	0.21580	-0.03236
102	1998	2001	35934	C	CL	2.62195	-0.02450	0.31835
102	1998	2000	35934	M	CL	1.62195	0.13753	0.14396
102	1998	2002	35985	C	CH	3.48218	0.19510	-0.02277
102	1998	2002	35985	C	CL	3.48218	0.14627	0.14481
102	1998	2001	36067	C	CH	2.25757	-0.12907	0.17887
102	1998	2002	36067	C	CL	3.25757	0.15203	0.14700
102	1999	2000	36335	C	CH	0.52332	0.07121	0.02737
102	2000	2002	36747	C	CH	1.39453	0.16638	-0.07326
102	2001	2000	37105	C	CH	-1.58630	0.16203	-0.13273
102	2002	1998	37420	C	CL	-4.44934	-0.25811	0.09596
103	1998	2001	35913	C	CH	2.67944	0.03200	-0.10841
103	1998	2002	35913	P	CH	3.67944	0.15321	-0.10244
103	1998	2001	35913	C	CL	2.67944	0.00018	0.21463
103	1998	2002	35913	P	CL	3.67944	0.12140	0.22253
103	1998	2001	35963	C	CH	2.54248	0.07992	0.00820
103	1998	2002	35963	P	CH	3.54248	0.20114	0.03576
103	1998	1999	35963	C	CL	0.54248	-0.08662	0.26552
103	1998	2002	35963	P	CL	3.54248	0.14088	0.30889
103	1998	2000	36039	C	CH	1.33423	0.09242	-0.03273
103	1998	1999	36039	P	CH	0.33423	0.07218	-0.00604
103	1998	2002	36039	C	CL	3.33423	0.22025	0.31168
103	1998	2001	36039	P	CL	2.33423	0.09903	0.29216
103	1999	2002	36329	C	CH	2.53967	0.22751	-0.02362
103	1999	2002	36329	P	CH	2.53967	0.22751	-0.05554
103	2000	2001	36693	C	CH	0.54248	0.08605	0.05518
103	2000	2001	36693	P	CH	0.54248	0.08605	0.04010
103	2001	2000	37062	C	CH	-1.46851	-0.08605	-0.06868

Table 15. Data used in the *diff*P model where PCC measurements and pumpage estimates were made in different years.—Continued

[Year-PCC, year that PCC was measured; PCC, power conversion coefficient; Year-pump, year that power consumption was used to estimate pumpage; Date, number of days from January 1, 1900; C, Collins flowmeter; P, Polysonic flowmeter; M, McCrometer flowmeter; O, open; CL, complex low; CH, complex high; L, low pressure; S, sprinkler; *u*, the *diffP* lag time; $\overline{W}$, average log pumping water level for a given site in a given year; W, log of pumping water level at time of measurement; *diffP*, log total pumpage using PCC minus log total pumpage using totalizing flowmeter]

Site	Year-*pcc*	Year-pump	Date	Method	Type	u	$\overline{W} - W$	*diffP*
103	2001	1999	37062	P	CH	-2.46851	-0.10629	-0.02803
103	2002	1998	37413	C	CH	-4.43018	-0.18943	-0.05863
103	2002	2000	37413	P	CH	-2.43018	-0.20727	-0.04257
104	1998	1999	35922	C	CL	0.65479	-0.00406	0.08151
104	1998	1999	35922	C	CL	0.65479	-0.01270	0.07013
104	1998	2002	35922	M	CL	3.65479	-0.15467	0.06861
104	1998	2001	35922	M	CL	2.65479	0.02325	0.05856
104	1998	2002	35964	C	CL	3.53967	-0.16484	0.06698
104	1998	1999	35964	C	CL	0.53967	-0.01671	0.05153
104	1998	2001	35964	M	CL	2.53967	0.02172	0.04257
104	1998	2002	35964	M	CL	3.53967	-0.16731	0.05073
104	1998	2001	36021	C	CL	2.38354	0.06662	0.06300
104	1998	2001	36021	C	CL	2.38354	0.04255	0.07330
104	1998	2002	36021	M	CL	3.38354	-0.11993	0.04664
104	1998	1999	36021	M	CL	0.38354	0.00661	0.02559
104	1999	2001	36334	C	CL	1.52600	0.03595	0.09117
104	1999	1998	36334	M	CL	-1.47400	0.00174	0.04828
104	2000	1999	36649	C	CL	-1.33704	-0.01594	0.08642
104	2000	2001	36649	M	CL	0.66296	0.02000	0.08553
104	2001	2000	37013	C	CL	-1.33423	-0.02000	0.08116
104	2001	1999	37013	M	CL	-2.33423	-0.03595	0.06445
104	2002	2000	37379	C	CL	-2.33704	0.16655	0.06367
104	2002	1998	37379	M	CL	-4.33704	0.15234	0.00086
105	1998	2001	35927	C	CH	2.64111	0.07183	-0.06524
105	1998	2002	35927	C	CH	3.64111	0.11662	0.08322
105	1998	1999	35992	C	CH	0.46301	-0.05898	-0.07505
105	1998	1999	35992	C	CH	0.46301	-0.13386	0.09391
105	1998	1999	35992	C	CL	0.46301	-0.13709	0.10346
105	1998	2000	36042	C	CH	1.32605	-0.04595	-0.10832
105	1998	1999	36042	C	CL	0.32605	-0.13508	0.13069
105	1999	1998	36335	C	CH	-1.47668	0.08903	-0.05068
105	2000	1999	36649	C	CH	-1.33704	-0.01095	0.00545
105	2001	1999	37064	C	CH	-2.47400	-0.06641	0.01153
105	2002	2001	37492	C	CH	-1.64661	-0.15692	-0.02071
106	1998	2001	35955	C	CL	2.56433	-0.16149	0.11534
106	1998	2001	36011	C	CL	2.41101	-0.14844	0.17752
106	1998	2002	36055	C	CL	3.29041	0.20726	-0.09471
106	1998	2002	36055	C	CL	3.29041	0.19441	-0.08386
106	2001	1998	37162	C	CL	-3.74243	0.13259	0.07095
106	2002	1998	37372	C	CL	-4.31775	-0.17846	0.12636