Spreadsheet Number 0 - Notes and Instructions

NOTES - first, read all notes; then go to Instructions

(1) The model consists of one workbook containing five spreadsheets (numbers 1 through 5) in addition to this spreadsheet (number 0), and two break-even charts (Chart 1 and Chart 2). The spreadsheets either require user input/interface, make calculations or both. Upon receiving all required input the model automatically performs the necessary calculations and generates the break-even charts.

(2) To use the model, READ **ALL** NOTES AND INSTRUCTIONS FIRST, then follow the instructions in sequence and refer to comments on each spreadsheet during use. For first-time users, or if further explanation or background information is necessary, read the thesis model description of Section 2.2 and the example application of Section 3.2.

(3) Comments are named sequentially with two-character names - a numeral corresponding to the spreadsheet number and a letter assigned in order for the comments on each spreadsheet. Comments are indicated by a red tic mark in the upper right corner of the cell to which the comment applies; tic marks do not appear on printed sheets. Comments are provided to explain each spreadsheet at the title, each cell or set of cells requiring user input/interface and each spreadsheet-calculated variable or parameter. Cells requiring user interface are so indicated by comments which provide instructions. Spreadsheet number 4 is an exception; it contains only one comment at the title, and all instructions or explanations are contained in the spreadsheet cells. For spreadsheet number 1, comments are repeated on page 2.

(4) The model is color coded as follows. Light blue is used for spreadsheet titles. Lime green is used to indicate notes or instructions with associated headings in turquoise. Cells requiring numeric input are pale yellow with associated headings in cream. Cells requiring alpha input are light green with associated headings in darker green. Cells containing summary calculations (sub-totals, etc.) are brighter yellow. Cells containing calculated model variables or parameters are magenta. Cream is also used for other headings. Spreadsheet 5 is an exception: Lime green is used to show simulated flow delivered; pale yellow shows variables or parameters not plotted on the break-even charts, and brighter yellow shows dependent variables plotted on the break-even charts.

(5) Many variables and parameters have been assigned names, which allows the user to determine their definitions and model locations by clicking in the formula box followed by clicking on the name. Also, the user can trace the dependents and predecessors of a variable or parameter by using Excel's auditing function.

(6) Required system flow data are monthly volumes produced (plant inflow) and delivered (billed) from plant records. Required cost data are of three types: annual fixed costs for the existing (manual) monitoring mode from system accounting records; estimated fixed costs of the remote monitoring system including installation and all associated fees, from engineering or supplier estimates; annual variable costs for the manual monitoring mode from system accounting records for the same years as the fixed cost data. Reference thesis Subection 1.2.5, and sections 2.2 and 3.2 for more detailed information about model input.

(7) The model is set up for two years of historical data that represent the manual monitoring mode and one year of data that represents the remote monitoring mode. The remote mode is defined to exist in the "present" year and the manual mode is defined to exist in prior years "a" and "b." If insufficient data exists to provide all input for years a and b, the model can be run by adjusting existing data to satisfy the model. For example, if only one year of historical data exists, these data can be input for both years.

(8) Error messages will be present in certain cells where spreadsheet calculations are performed prior to providing all required input.

INSTRUCTIONS - read all first; then follow in sequence

(0) TO USE THE MODEL: FIRST, SAVE THE MODEL WITHOUT MODIFICATION OR INPUT BY SAVING THE EXCEL FILE IN AN APPROPRIATE LOCATION, AND MAKE A COPY OF THE MODEL BY SAVING THE EXCEL FILE WITH ANOTHER NAME IN AN APPROPRIATE LOCATION; THEN USE ONLY THE RENAMED COPY. Second, read all notes and instructions and read the thesis model description of Section 2.2 and/or the example application of Section 3.2, then refer to comments on each spreadsheet during use. Reference thesis Subection 1.2.5, and sections 2.2 and 3.2 for more detailed information about model input.

(1) **Open *Spreadsheet Number 1 - Flow Data*** . This spreadsheet sums two years of monthly flow data (produced and delivered) input by individual system and calculates system average annual quantities produced - QI, delivered - QD, and lost - QL. **One set of input required:**

(1.1) Input individual system names in column A. Input monthly volumes by individual system in columns B through AW: volume produced - Qi and volume delivered - Qd. Units are thousands of gallons (e.g., 100,000 gallons input as 100). Two years of data must be entered; if two years of data not available, user must adjust available data - e.g., to adjust one year of data repeat for second year.

(2) **Open *Spreadsheet Number 2 - Cost Data*** . This spreadsheet sums two years (manual mode) and present year (remote mode) fixed cost data input by cost category and calculates present worth values (CFWm and CFWp); it then calculates remote mode fixed cost as the sum of the annual present worth fixed costs (CFWr = CFWm + CFWp). It sums two years (manual mode) variable cost data input by cost category to calculate the annual manual mode variable cost present worth (CVWm). **Three sets of input/user interface required:**

(2.1) Input manual mode annual fixed cost category names in column A. Input annual fixed cost amounts by category for prior years - a and b in columns B and C. Units are dollars; do not use decimals. User must interface at cells B17 and C17 to provide parameter values for calculation of present worth sums for years a and b - CFWa and CFWb. User must specify annual interest rate(s) and numbers of years from present by revising default values. Go to cell formula and enter interest rate in first field (default is 5%) and enter number of years from present in second field (defaults are 2 and 1 for years a and b). DO NOT OMIT % SYMBOL. DO NOT REVISE OTHER FIELDS. USER ALERT: CFWa and CFWb SHOULD BE APPROXIMATELY EQUAL; IF NOT, INPUT SHOULD BE REVIEWED.

(2.2) Input remote mode fixed cost category names in column A. Input estimated total amounts (projected present year values) and useful lives by category in columns B and C. Units are dollars and years; do not use decimals.

(2.3) Input manual mode variable cost category names in column A. Input annual amounts by category for years prior to present - years a and b in columns B and C. Units are dollars; do not use decimals. User must interface at cells B45 and C45 for calculation of present worth sum of variable costs - CVWa and CVWb. User must specify annual interest rate(s) and number of years from present year by revising default values. Values specified should be the same as above. Go to cell formula and enter interest rate in first field (default is 3%) and enter number of years from present in second field (defaults are 2 and 1 for years a and b). DO NOT OMIT % SYMBOL. DO NOT REVISE OTHER FIELDS.

(3) **Open *Spreadsheet Number 3 - Manual Mode Variable Cost Parameter (Vm)*** . This spreadsheet calculates the manual mode variable cost parameter - Vm as the average of the year a and b annual unit variable costs. It obtains annual flow data (volume delivered - QDa and QDb) from spreadsheet number 1 and variable cost data (present worth variable cost - CVWa and CVWb) from spreadsheet number 2.
No input or user interface required.

(4) **Open *Spreadsheet Number 4 - Remote Mode Variable Cost Parameter (Vr)*** . This spreadsheet calculates the remote mode variable cost parameter - Vr as a function of the manual mode variable cost parameter - Vm and three remote mode variable cost adjustment factors that account for improved delivery efficiency (i.e., decreased loss - QL or equivalently, increased delivery QD) attributable to remote monitoring. **Three user inputs required:**

(4.1) FX = Remote Mode Extent Factor: This factor describes the extent of remote monitoring planned for the system as a fraction of the maximum potential loss reduction. Typically, a system will incorporate remote monitoring at one of two general extents: either all major system components such as tanks, pump stations, etc. or all major system components and strategic distribution conduit locations. For major system components a factor value range is 0.20 to 0.40, with 0.30 typical; for major components and conduits a factor value range is 0.45 to 0.85, with 0.65 typical. USER MUST ESTIMATE THESE VALUES BASED UPON SYSTEM AND MONITORING CONFIGURATION. Input must be in the form 0.XX - two digits to the right of a decimal.

(4.2) Tm = Manual Mode Frequency: User must input the average frequency of system component monitoring with manual monitoring. Units are number of monitoring events (per unit time), and must be the same units as Remote Mode Frequency, below. USER INPUTS NUMBER ONLY, such as 1 representing one monitoring event per day.

(4.3) Tr = Remote Mode Frequency: User must input the average frequency of system component monitoring with remote monitoring. Units are number of monitoring events (per unit time), and must be the same units as Manual Mode Frequency, above. USER INPUTS NUMBER ONLY. 12 should be the maximum value - used to represent real-time monitoring.

(5) **Open *Spreadsheet Number 5 - Cost Simulation*** . This spreadsheet calculates fixed costs, variable costs and total costs as functions of simulated system flow - Q (based upon the average system flow delivered - QD) for the manual and remote monitoring modes. Fixed costs and total costs are then plotted to create the break-even charts. **No user input required.**

(6) **Open *Break-Even Charts* .** The break-even charts show the simulated fixed and total costs as functions of system flow. Chart 1 ranges from zero to two times the simulated system capacity - 2Q, while Chart 2 ranges from zero to the simualted system capacity - Q to show the break-even point more clearly when it occurs within the single system flow range. The lower point at which the total costs intersect is the break-even point. Break-even chart titles may be changed by clicking on the title and typing; the divisions of the vertical axis (annual cost) of Chart 2 may be changed to match those of Chart 1 by right clicking on the axis, followed by going to "format axis," "scale," and setting "major unit" to match same on Chart 1.

(7) **END**

Exhibit 2.8. Spreadsheet number 0: notes and instructions.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	***Spreadsheet Number 1 - Flow Data*** ***User Input Required***																								
2		MONTHLY FLOW: YEAR a - Volume Produced (Qi) and Volume Delivered (Qd)																							
3		01/a		02/a		03/a		04/a		05/a		06/a		07/a		08/a		09/a		10/a		11/a		12/a	
4	INDIVIDUAL SYSTEM NAME	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd
5	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
6	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
7	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
8	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
9	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
10	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
11	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
12	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
13	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
14	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
15	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
16	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
17	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
18	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
19	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
20	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
21	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
22	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
23	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
24	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input
25	MONTHLY SUBTOTALS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	ANNUAL TOTALS																							0	0
27	ANNUAL TOTAL LOSSES																								0
28																									
29	FLOW SUMMARY TABLE																								
30	ANNUAL TOTALS	YR a	YR b	AVE.																					
31	PRODUCED (QI)	0	0	0																					
32	DELIVERED (QD)	0	0	0																					
33	LOSS (QL)	0	0	0																					
34																									

	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX
1																									
2	MONTHLY FLOW: YEAR b - Volume Produced (Qi) and Volume Delivered (Qd)																								
3	01/b		02/b		03/b		04/b		05/b		06/b		07/b		08/b		09/b		10/b		11/b		12/b		
4	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	Qi	Qd	
5	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
6	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
7	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
8	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
9	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
10	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
11	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
12	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
13	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
14	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
15	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
16	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
17	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
18	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
19	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
20	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
21	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
22	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
23	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
24	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	Input	
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26																							0	0	
27																								0	
28																									
29																									
30																									
31																									
32																									
33																									
34																									

Exhibit 2.9. Spreadsheet number 1: flow data.

	A	B	C	D	F
1	***Spreadsheet Number 2 - Cost Data***				
	User Input Required				
2		ANNUAL FIXED COSTS - MANUAL			
3	COST CATEGORY	YR a	YR b		
4	Input	Input	Input		
5	Input	Input	Input		
6	Input	Input	Input		
7	Input	Input	Input		
8	Input	Input	Input		
9	Input	Input	Input		
10	Input	Input	Input		
11	Input	Input	Input		
12	Input	Input	Input		
13	Input	Input	Input		
14	Input	Input	Input		
15	Input	Input	Input		
16	FIXED TOTALS - MANUAL	$0	$0		
17	FIXED PW TOTALS - MANUAL	$0	$0		
18	FIXED PW AVERAGE - MANUAL		$0		
19					
20		TOTAL FIXED COSTS - REMOTE			
21	COST CATEGORY	Cost	Life	Present	
22	Input	Input	Input	#VALUE!	
23	Input	Input	Input	#VALUE!	
24	Input	Input	Input	#VALUE!	
25	Input	Input	Input	#VALUE!	
26	Input	Input	Input	#VALUE!	
27	Input	Input	Input	#VALUE!	
28	FIXED PW TOTAL - PRESENT			#VALUE!	
29					
30	FIXED PW TOTAL - REMOTE			#VALUE!	
31					
32		ANNUAL VARIABLE COSTS - MANUAL			
33	COST CATEGORY	YR a	YR b		
34	Input	Input	Input		
35	Input	Input	Input		
36	Input	Input	Input		
37	Input	Input	Input		
38	Input	Input	Input		
39	Input	Input	Input		
40	Input	Input	Input		
41	Input	Input	Input		
42	Input	Input	Input		
43	Input	Input	Input		
44	VARIABLE TOTALS	$0	$0		
45	VARIABLE PW TOTALS	$0	$0		
46	VARIABLE PW AVERAGE		$0		
47					
48					

Exhibit 2.10. Spreadsheet number 2: cost data.

	A	B	C	E
1	***Spreadsheet Number 3 - Manual Mode Variable Cost Parameter (Vm)*** ***Spreadsheet Calculation***			
2		**ANNUAL VALUES**		
3		**YR a**	**YR b**	
4	**VOLUME DELIVERED**	**0**	**0**	
5	**VARIABLE COST**	**0**	**0**	
6	**ANNUAL UNIT VARIABLE COST**	**#DIV/0!**	**#DIV/0!**	
7				
8	**MANUAL MODE VARIABLE COST PARAMETER**	**#DIV/0!**		
9				
10				
11				
12				
13				
14				
15				
16				

Exhibit 2.11. Spreadsheet number 3: manual mode variable cost parameter.

	A	B	D	E
1				
2	***Spreadsheet Number 4 - Remote Mode Variable Cost Parameter (Vr)*** ***User Input Required*** ***Spreadsheet Calculations***			
3		**VARIABLE OR PARAMETER**		
4	**INSTRUCTIONS and CLARIFICATIONS**	**Symbol/Formula**	**Value**	
5	Spreadsheet Calculation - Remote Mode Loss Factor: This factor describes the maximum potential loss reduction attributible to remote monitoring. It is equal to the total loss in the manual mode - QL. This spreadsheet imports QL from spreadsheet number 1.	**FL = QL**	**0**	
6	USER INPUT REQUIRED - Remote Mode Extent Factor: This factor describes the the extent of remote monitoring planned for the water sytem as a fraction of the maximum potential loss reduction. Typically, a system will incorporate remote monitoring at one of two general extents: either all major system components such as tanks, pump stations, etc. or all major system components and strategic distribution conduit locations. For major system components a factor value range is 0.20 to 0.40, with 0.30 typical; for major components and conduits a factor value range is 0.45 to 0.85, with 0.65 typical. USER MUST ESTIMATE THESE VALUES BASED UPON SYSTEM AND MONITORING CONFIGURATION. Input must be in the form 0.XX - two digits to the right of a decimal.	**FX = USER INPUT**	**Input**	
7	USER INPUT REQUIRED - Manual Mode Frequency: User must input the average frequency of system component monitoring with manual monitoring. Units are number of monitoring events (per unit time) and must be the same units as Remote Mode Frequency, below. USER INPUTS NUMBER ONLY, such as 1 representing one monitoring event per day.	**Tm = USER INPUT**	**Input**	
8	USER INPUT REQUIRED - Remote Mode Frequency: User must input the average frequency of system component monitoring with remotel monitoring. Units are number of monitoring events (per unit time) and must be the same units as Manual Mode Frequency, above. USER INPUTS NUMBER ONLY, such as 12 representing twelve monitoring events per day; 12 events per day should be the maximum value, representing essentially real-time monitoring.	**Tr = USER INPUT**	**Input**	
9	Spreadsheet Calculation - Remote Mode Frequency Factor: This factor, calculated from the remote and manual monitoring frequencies above, describes system water loss reduction attributible to increased monitoring frequency.	**FT = 1 - (Tm/Tr)**	**#VALUE!**	
10	Spreadsheet Calculation - Remote Mode Annual Volume Delivered: This is the simulated volume of water delivered with remote monitoring - Qr, based upon the volume delivered with manual moinitoring - Qm (Qm = QD) and the adjustment factors, above.	**Qr = Qm + (FL*FX*FT)**	**#VALUE!**	
11	Spreadsheet Importation - Manual Mode Variable Cost Parameter: This spreadsheet imports Vm from spreadsheet number 3.	**Vm**	**#DIV/0!**	
12				
13	Spreadsheet Calculation - Remote Mode Variable Cost Parmeter: The remorte mode variable cost parmeter is calculated by adjusting the manual mode variable cost parameter by the ratio of the annual volumes delivered. This is the primary model parameter.	**Vr = Vm (Qm/Qr)**	**#DIV/0!**	
14				
15				
16				

Exhibit 2.12. Spreadsheet number 4: remote mode variable cost parameter.

Sprteadsheet Number 5 - Cost Simulation
Spreadsheet Calculations

			DEPENDENT VARIABLE OR PARAMETER							
Simulation Flow Delivered		Fixed Cost		Variable Cost Parameter		Variable Cost		Total Cost	
Fraction QD	Gallons/Year	Manual	Remote	Manual	Remote	Manual	Remote	Manual	Remote
0Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.1Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.2Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.3Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.4Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.5Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.6Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.7Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.8Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
.9Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.01Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.1Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.2Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.3Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.4Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.5Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.6Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.7Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.8Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
1.9Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!
2Q	0	$0	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#VALUE!

Exhibit 2.13. Spreadsheet number 5: cost simulation.