Appendixes

Appendix 1—Example for calculation of average pH

	Converting to appropriate $[H^+]$
Daily maximum pH = 8.0	pH 8.0 = 0.00000001 $[H^+]$
Daily minimum pH = 6.0	pH 6.0 = 0.00000100 $[H^+]$
Average pH (inaccurate) = 7.0	Average = 0.000000505 $[H^+]$
	Average (correct) = antilog = pH = 6.32

Appendix 2—Station description

Appendix 2A—*Contents of a station description*

Specific information about a field site (station) is summarized in a station description. The description should include:

1. Location of station
2. Station history
3. Drainage area (including basin characteristics)
4. Station description, equipment, and benchmarks
5. Discharge and monitor measurements methods and historical extremes
6. Cross-section measurements (discharge and water-quality)
7. Purpose and cooperation
8. Maps, photographs, and permits
9. Safety hazards, detailed road log, and access remarks

Appendix 2B—*Example of a station description for the Columbia River at Beaver Army Terminal near Quincy, Oregon*

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Original prepared 12-23-91 by K.K. Lee
revised 2-17-2000 by R.L.Kittelson

Description of Gaging Station

14-2469.00 Columbia River at Beaver Army Terminal nr Quincy, OR

LOCATION: Lat 46 °10'55", Long 123 °10'50", in NE1/4 sec 16, T.8 N., R.4 W., Columbia County, in an unused warehouse on 1600 ft long dock operated and maintained by Portland General Electric.

HISTORY: Stage data collected May 1968 to June 1970, Feb. 1991 to present. Stork Servex Surflow Mark 4 UVM (Ultrasonic Velocity Meter) installed June 1991. ORE Accusonic Model 7300 UVM installed Apr. 1997.

DRAINAGE AREA: 256,900 sq mi.

GAGE ON DOCK (LEFT BANK): Stage and velocity sensing equipment housed in room at warehouse. Data is recorded on a Campbell Scientific CR10X data logger. Data logger is connected to modem (phone number 503-728-2376). USGS computer downloads data from data logger on a daily schedule.

A. Stage: An 18 inch diameter corrugated pipe well is attached to a wood piling directly under the gage house floor. The top of the well is at approximately 20 ft gage datum. The bottom of the well

is capped and at elevation -1.0 ft gage datum. Several holes along the length of the well provide communication. An SDI-12 shaft encoder with float/tape system senses stage in the well and is recorded by the data logger. Range is -1.0 to +14 ft. Gage is referred to an electric tape gage (index elevation 22.672 ft gage datum, 23.192 ft sea level, from levels of 9-15-99) on the instrument shelf, RP1, or a staff gage (0 - 13.5 ft) at the downstream end of the dock.

B. Velocity (Stork Servex Surflow Mark 4 UVM): Four transducers with a frequency of 100 KHZ are located in a crossed path configuration.

Left bank transducers are located on the upstream and downstream ends of the dock. Cables run under the dock surface and are wired directly into the UVM console. A junction box is located above high water near each transducer. Transducers are attached to an aluminum carriage that can be raised and lowered from the water surface. The carriages roll inside an aluminum channel track, which are bolted to the wooden dock pilings. The top of the upstream aluminum channel is at approximately 12 ft gage datum, extends down to -25.5 ft gage datum, and the transducer is positioned at -21 ft gage datum. The top of the downstream aluminum channel is at approximately 10 ft gage datum, extends down to -27 ft gage datum, and the transducer is positioned at -25 ft gage datum.

Right bank transducers are mounted on a 3 pile steel dolphin near the right bank, across the river from the dock. Transducer cables run up the piling to a responder, which relays signals received from the left bank transducers. There is no hard wire link across the channel. Transducers are attached to an aluminum carriage and can be raised and lowered from the water surface. Right bank transducer carriages roll along the face of the 'H' piling. The top of the piling is at approximately 25 ft, and the bottom at -35 ft. Total length at piling is 90 ft. These transducers are positioned at approximately -25 ft gage datum.

Path length and angles (determined 2-4-97):
Line 1: Upstream Oregon side. Length = 1906.4 ft, angle = 56.6^{o}.
Line 2: Downstream Oregon side. Length = 1770.7 ft, angle = 69.9^{o}.
Combined length = 3677.1 ft, combined angle = at 63.3^{o}.

C. Velocity (ORE Accusonic Model 7300 UVM): Two transducers, with a frequency of 200 khz, located inside the piling area of the 1600 ft long dock, sense velocity in a 'short path'. Transducers are wired directly into the UVM console which is located in the gage house, cables are threaded through the underside of the dock. The UVM's SDI-12 output sends velocity data in feet per second to the CR10.

The upstream transducer is attached to shoreward side of dock piling, is located 160 ft downstream of gage house (cable length 190 ft), and is aimed in a shoreward/downstream direction. The downstream transducer is attached to upstream dock piling on downstream end of dock, is located 450 ft downstream and 250 ft streamward (cable length 735 ft), and is aimed in a streamward/upstream direction. The angle of the transducers in relation to the dock is 33^{o}, path length is 386 ft (determined 4-10-97). Transducers are attached to 2 inch aluminum pipe which can be raised/lowered by sliding through pipe brackets, both transducers are positioned at approximately -4.0 ft gage datum. The transducer pipe brackets are accessible from a wood boardwalk which is below the road surface of the dock.

GAGE ON PILING (RIGHT BANK): Water temperature/conductance sensor and 2 transducers (Stork UVM) attached to 3 pile steel dolphin near right bank across from dock. CR10X data logger, modem, cell phone (phone number 503-784-0136) and Stork Surflow UVM responder housed in a 1ft X 3ft X 4ft metal enclosure. Data logger records data from sensors. USGS computer downloads data from data logger on a daily schedule.

A HIF temperature/conductance probe is mounted on the upstream piling near the right bank side, in the main flow on the Washington side of the River.

BENCH MARKS: Levels last run 9-15-99.

BM 6 - could not be found at time of levels on 9-15-99, consider it destroyed.

RM 1 - could not be found at time of levels on 9-15-99, consider it destroyed.

TBM 2 - head of a 5/8" carriage bolt which attaches the guard curb to the dock roadway near the gage. The bolt is 3 ft streamward from the NW corner of the building which houses the gage, established 1966. Elevation 20.540 ft gage datum, 21.060 ft sea level. Used as the base RM for 9-15-99 levels.

RM 3 - NE corner (painted yellow) of square concrete pedestal of overhead light fixture 40 ft shoreward and 5 ft downstream from downstream corner of west end of dock, and 37 ft shoreward of RM 4, established 9-15-99. Elevation 20.690 ft gage datum, 21.210 ft sea level, from 9-15-99 levels.

RM 4 - NE corner (painted yellow) of square concrete pedestal of overhead light fixture, 3 ft shoreward and 5 ft downstream from downstream corner of west end of dock, established 9-15-99. Elevation 21.205 ft gage datum, 21.725 ft sea level, from 9-15-99 levels.

RP 1 - head of 1/2 inch lag bolt painted yellow in side of walkway 18 ft downstream and 4 ft shoreward of TBM 2, established 9-15-99. This RP can be used as a tape down to water surface. Elevation 19.423 ft gage datum, 19.943 sea level, from 9-15-99 levels.

Datum of gage is 0.52 ft above mean sea level.

DISCHARGE MEASUREMENTS: Made by Acoustic Doppler Current Profiler (ADCP) with boat at section 1000 - 1500 ft downstream from gage, and just below dock. Hazards occur from floating debris, particularly at high flow. During low flow, measurement times should be coordinated with the tide cycle for steady flow.

FLOODS: Maximum daily discharge 864,000 cfs Feb. 10, 1996; maximum gage height 13.33 ft Feb. 9, 1996.

POINT OF ZERO FLOW: Tide effect reverses flow during low-flow periods.

WINTER FLOW: No ice effect.

REGULATION: Flow regulated by many reservoirs in the basin.

ACCURACY: Measuring conditions are good except at extremely low velocities.

COOPERATION: U.S. Army Corps of Engineers, State of Oregon Department of Environmental Quality.

MAPS: Station can be located on Clatskanie, Oregon-Washington 15 minute 1952 USGS topographic sheet.

PHOTOGRAPHS: On file at Portland Field Office.

PERMITS: Permits from Corps of Engineers, Washington Department of Fisheries, Cowlitz County Washington, and Portland General Electric on file at Portland Field Office.

ROAD LOG:

Columbia River at Beaver Army Terminal nr Quincy, OR 14-2469.00

Interval	Total	Local
0.0	0.0	Oregon Hwy 30 at Longview Bridge
3.7	3.7	Alston Mayger Rd. Turn right.
0.2	3.9	Intersection. Turn right in front of grocery store.
6.7	10.6	Intersection Fish Station Rd. Continue on main road.
2.3	12.9	Unmarked intersection. Turn right.
1.2	14.1	Guard station. Check in. Go straight.
0.5	14.6	Boat launch.
0.3	14.9	Dock. Stilling well and AVM is in west end of large wood building. Go through second door from west side.

Alternate route which goes through Clatskanie, recommended when towing large boat. This route is narrow and winding.

0.0	0.0	Downtown Clatskanie at intersection of Hwy 30 and Nehalem St. Go north on Nehalem.
0.3	0.3	Intersection of 5th St. Turn left.
2.9	3.2	Intersection unmarked. Turn left.
0.3	3.5	Intersection Ritter Rd. Turn left.
0.8	4.3	Downtown Quincy. Go straight.
1.0	5.3	Quincy fire station. Go straight.
0.3	5.6	Intersection unmarked. Turn left. This is same point on above road log at mile 12.9.

rlk, 2-17-2000

Appendix 3—Station analysis

Appendix 3A—*Contents of a station analysis*

Specific information about a field site (station) is summarized annually in a station analysis. The analysis should include:

1. Sampling location—Station, name, number, year, and constituent measure
2. Sampling equipment or instrumentation—Type of monitoring sensor(s) and recorder, location of sensor(s) or intakes, any other special instrumentation or features, and dates sensor(s) were changed or replaced.
3. Published records—State the constituent parameter that is published, as well as any data that is collected and not published.
4. Channel characteristics—Brief description of the composition of the channel and any unique or unusual features of the installation.
5. Rating—Statement as to how the digital record is interpreted to provide the published constituent values for the primary and final records.
6. Record—Statement of the completeness of the record. Note all missing data and include the final rating of accuracy for the period of record (or specific service intervals) in chronological order.
7. Calibration—State how and when the instrument was calibrated or checked and note the procedures used in the calibration process. Include statement if corrections were needed for the data.
8. Computations—Statement of how corrections were applied to the data, a list of extreme correction values that were applied to the recorded values during the year, and causes of the need for correction.
9. Treatment of atypical data—Any treatment of unusual or atypical data should be documented.
10. Cross-section measurements—State how and when the cross section was measured, the number of verticals, and the amount of variation throughout the cross section. State if the location of the sensor(s) or water-supply intake is representative of the stream.
11. Remarks—Any additional information about the site, data collected, or general statements that do not fit in any other section.

Appendix 3B—*Example of a station analysis for temperature on the Columbia River at Beaver Army Terminal, near Quincy, Oregon*

1999 *14-2469.00*

STATION ANALYSIS

TEMPERATURE

Columbia River at Beaver Army Terminal, Near Quincy, Oregon

Equipment.-- Campbell CR10X datalogger and HIF temperature/conductance probe located on the UVM transducer piling near the RB, in a section of the river with good velocities. On March 3, 1996 a cell-phone system was installed that allows the site to be called daily between 1400 and 1430 to download data. Phone number is 503-784-0136.

Published records.--Daily maximum, minimum, and mean temperatures.

Primary Records.--Complete for the year.

Channel Characteristics.--The channel is approximately 1800 ft wide with depths up to 100 ft, with a bedrock bottom. Bradbury slough enters the river 0.3 miles upstream of the gage from the left bank. Under certain flow and tidal regimes, the x-section may not be well mixed on the right or left bank sections.

Rating.--Rating 1 was used for the entire year.

The measured temperature values ranged from 5.4 °C to 18.9 °C. The recorded temperature values ranged from 4.3 °C to 21.9 °C.

Calibration.-- The HIF temperature/conductance probe values were checked using Hydrolab field instrument. Calibration checks for the Hydrolab instruments were made using a certified NBS mercury thermometer.

Calibration checks were performed, Feb. 19, 1997, Mar. 19, 1998, and July 9, 1999 for the small projects Hydrolab W489763, which indicated that no correction was needed. No corrections were made to data collected with this instrument.

Two calibration checks were performed on the Hydrolab W499764 (Oct. 21, 1997; Dec. 2, 1998), which indicated that no correction was needed. No corrections were made to data collected with this instrument.

In the 2000 WY, all Hydrolabs will be checked/logged on a more routine basis.

For the HIF temperature/conductance probe, no calibration is possible.

Cross-sectional measurements.-- The depth and width integrated cross-sections on Aug. 24, 1998 varied by 0.3 ^{o}C. The depth and width integrated cross-sections on Sept. 14, 1999 varied by 0.2 ^{o}C. Width integrated cross-sections are made at the time of each NASQAN sampling. Cross-sectional data collected during sampling varied by less than 0.6 °C.

Computations.--Recorded CR10X values at the time of the cross-section are subtracted from the cross-section average, resulting in a computed correction to the recorded CR10X values (cross-section - CR10X = correction). This method takes into account the variation between the

CR10X recorded values compared to the cross-section average, and also the difference between the CR10X readings compared to the reference instrument (Hydrolab). Corrections varied from +0.2 °C to -0.2 °C, and were applied on a time-prorated basis between visits. Corrections were used as follows:

DATE/TIME	SHIFT	
1998 LAST ST:	08 24 1230	-.10
11 23 1210	0.10	
01 05 1130	0.10	
01 25 1140	0.00	
02 23 1120	-0.20	
03 08 1200	-0.20	
03 29 1140	0.10	
04 20 1050	0.10	
05 11 1120	-0.10	
05 25 1110	-0.10	
06 08 1120	0.10	
06 22 1100	0.10	
09 14 1120	0.20	
2000 FIRST ST:	10 19 1130	0.20

Treatment of Atypical Data.--None found.

Remarks.--This is a NASQAN II water quality collection site. Water temperature and specific conductance data are furnished monthly to the USGS in Reston for publication in the National Water Conditions report. No discharge was available at the time the record was computed.

Douglas O. Cushman, 12-17-1999
checked by
T.A. Herret 1/2/2000

doc, 12-17-99

Appendix 4—U.S. Geological Survey water-quality monitor field-inspection form

U.S. GEOLOGICAL SURVEY, WRD

WATER QUALITY FIELD INSPECTION FORM

Sta. Name: _____ Sta. No.: _____

Observations Made By: _____

Date: _____ Julian Day: _____ Watch Time: _____ EDL Time: _____

EDL Time Reset? No Yes → Watch Time: _____ EDL Time: _____

EDL Operational? No Yes Battery Voltage Found: _____ Volts

Program Altered? No Yes Battery Replaced? No Yes _____ Volts

Downloaded? No Yes File Name: _____

Remarks: _____

EDL SENSOR SECTION

Sensor Name	**Std. or Field Meas.**	**EDL Initial** @T°	**EDL Serviced** @T°	**EDL Adjusted** @T°	**Sensor Condition** (i.e., algae growth, silted)
Stage	OG:				
W. T°C					
SC					
SC					
SC					
SC					Cell:
pH					
pH					
pH					Slope:
pH					Offset:
DO					
DO					Press: mm/Hg
DO	ZERO				Salinity corr.:
Turbidity	ZERO				Slope:
Turbidity					Offset:

Sensor(s) removed from water _____HRMN Returned _____HRMN

Sensor(s) Maintenance Comments: _____

_____

_____

_____

Weather: Clear Partly Cloudy Light Medium Heavy Snow Rain Calm Light Breeze
Gusty Wind Very Cold Warm Hot Snow on Ground? No Yes _____in.

Reference Meter(s)	Make/Model	Serial No.	Corr. factor applied?
Temperature			None Yes No
Conductivity			None Yes No
pH			None Yes No
Dissolved Oxygen			None Yes No
			None Yes No
			None Yes No

Control: _____

Flow: _____

Cross Sectional Measurements: **Method:** EDI, EWI, other _____
Meas. Location: _____ ft upstream downstream of monitor
Stream Mixing: Excellent Good Fair Poor

Sta.	Ft from L. Bank or R. Bank	Time	Depth	T°C	pH	SC	DO		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
med.									
coef.									

Observations: _____

_____

_____

Appendix 5.—Effects of temperature on pH standards

(refer to manufacturer's specifications)

[°C, degrees Celsius; all pH values are in standard pH units]

Temp	Buffer and nominal pH value		
	4.01	7.00	10.00
0	4.00	7.14	10.30
5	4.00	7.10	10.23
10	4.00	7.07	10.17
15	4.00	7.04	10.11
20	4.00	7.02	10.05
25	4.01	7.00	10.00
30	4.01	6.99	9.96
35	4.02	6.98	9.92
40	4.03	6.98	9.88
45	4.05	6.98	9.85
50	4.06	6.98	9.82
55	4.07	6.98	9.79
60	4.09	6.99	9.76

Appendix 6—Troubleshooting problems with water-quality monitors

Symptom	Possible problem	Likely solution
	Water Temperature	
Thermistor does not read accurately	Dirty sensor	Clean sensor
Erratic monitor readings	Poor connections at monitor or sensor	Tighten connections
Monitor slow to stabilize	Dirty sensors	Clean sensor
Readings off scale	Failure in electronics	Replace sensor or monitor
	Specific electrical conductance	
Will not calibrate	Standards may be old or contaminated	Use fresh standards
	Electrodes dirty	Clean with soap solution
	Air trapped around sensor	Thrust sensors up and down to expel air
	Weak batteries	Replace batteries
Erratic monitor readings	Loose or defective connections	Tighten or replace
	Broken cables	Replace cables
Monitor requires frequent calibration		Replace monitor
	Dissolved oxygen	
Meter drift or excessive time for monitor to stabilize	Temperature compensator has not equilibrated with temperature of stream	Wait for temperature equilibration
	Fouled sensor	Clean or recondition
	Stirrer or pulse mechanism not working properly	Replace
Erratic monitor readings	Bad connection at monitor or sensor	Tighten connections
	Fouled sensor	Clean or recondition
Monitor slow to stabilize	Gold cathode tarnished	Buff with ink eraser or recondition sensor
	Fouled membrane	Recondition sensor and replace membrane
	Silver anode blackened	Replace sensor and soak fouled sensor in 3% ammonia for 24 hours
Monitor will not zero	Zero-DO solution contains oxygen	Add additional sodium sulfite to zero-DO solution
Monitor will not calibrate	Membrane damaged	Replace membrane
	Electrolyte diluted	Replace membrane and electrolyte

Appendix 6—Troubleshooting problems with water-quality monitors—Continued

Symptom	Possible problem	Likely solution
	pH	
Meter will not calibrate	Buffers may be contaminated	Replace buffers
	Faulty sensor	Replace
Slow response time	Dirty sensor bulb	Clean sensor
	Water is cold or low ionic strength	Patience
Erratic readings	Loose or defective connections	Tighten
	Defective sensor	Replace sensor
	Turbidity	
Unusually high or erratic readings	Entrained air bubbles on the optical sensor.	Follow manufacturer's directions
	Damaged sensor	Replace sensor
	Dirty sensor	Clean following manufacturer's directions
	Water in connections	Dry connector and reinstall

Appendix 7—Example of an ADAPS primary data table

1 UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION STATE 53 DIST 53
PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS
12471400 DATE PROCESSED: 08-24-2000 @ 11:23 BY kagreene
LIND COULEE WASTEWAY AT SR17 NR WARDEN, WA
(00010) WATER TEMPERATURE STORE STATISTIC(S) 00001, 00002, 00003
PROVISIONAL DATA FOR WATER YEAR ENDING SEPT. 30, 2000 TEST DIFF:****** PUNCH INTERVAL: 60 MIN

					VALUES AT INDICATED HOURS											
DATE	MAX	MIN	MEAN		1	2	3	4	5	6	7	8	9	10	11	12
10-01	14.3	12.4	13.5	AM	14.0	13.7	13.4	13.1	12.9	12.6	12.4	12.4	12.4	12.7	13.1	13.4
				PM	13.7	14.0	14.3	14.3	14.3	14.1	14.1	14.0	13.8	13.7	13.4	13.2
10-02	13.5	11.5	12.6	AM	13.1	12.7	12.6	12.3	12.1	11.8	11.7	11.5	11.7	11.8	12.1	12.6
				PM	12.9	13.2	13.4	13.5	13.4	13.4	13.2	13.1	12.9	12.7	12.4	12.3
10-03	13.2	10.9	12.2	AM	12.1	11.8	11.7	11.5	11.2	11.0	10.9	10.9	10.9	11.2	11.7	12.1
				PM	12.6	12.9	13.1	13.2	13.2	13.2	13.1	12.9	12.9	12.7	12.6	12.4
10-04	13.4	10.9	12.3	AM	12.1	12.0	11.8	11.5	11.3	11.2	11.0	10.9	11.0	11.3	11.8	12.1
				PM	12.6	12.9	13.2	13.4	13.4	13.2	13.2	13.1	13.1	12.9	12.9	12.7
10-05	14.0	12.0	13.0	AM	12.6	12.6	12.4	12.3	12.1	12.1	12.0	12.0	12.1	12.4	12.7	13.2
				PM	13.5	13.7	13.8	14.0	14.0	13.8	13.8	13.8	13.8	13.7	13.5	13.5
10-06	14.6	12.7	13.7	AM	13.4	13.4	13.2	13.1	12.9	12.7	12.7	12.7	12.7	13.1	13.4	13.8
				PM	14.1	14.3	14.6	14.6	14.6	14.4	14.4	14.3	14.1	14.0	13.8	13.7
10-07	14.0	12.7	13.5	AM	13.5	13.4	13.2	13.1	12.9	12.7	12.7	12.7	12.7	12.9	13.1	13.5
				PM	13.7	13.8	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.8	13.7	13.7
10-08	14.0	13.2	13.6	AM	13.7	13.7	13.5	13.5	13.4	13.4	13.2	13.2	13.4	13.4	13.7	13.8
				PM	14.0	14.0	14.0	14.0	13.8	13.8	13.7	13.7	13.5	13.5	13.4	13.2
10-09	13.5	12.1	12.8	AM	13.1	12.9	12.7	12.6	12.4	12.3	12.1	12.1	12.1	12.3	12.6	12.9
				PM	13.2	13.5	13.5	13.5	13.5	13.4	13.2	13.1	12.9	12.6	12.4	12.1
10-10	12.4	10.7	11.8	AM	12.0	11.8	11.7	11.3	11.2	10.9	10.7	10.7	10.7	10.9	11.3	11.7
				PM	12.0	12.3	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.3
10-11	12.4	11.7	12.1	AM	12.1	12.1	12.0	12.0	11.8	11.8	11.7	11.7	11.7	11.8	12.1	12.1
				PM	12.3	12.3	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.3	12.3	12.3
10-12	13.7	11.8	12.7	AM	12.1	12.1	12.0	12.0	12.0	11.8	11.8	11.8	11.8	12.1	12.4	12.9
				PM	13.2	13.5	13.7	13.7	13.7	13.7	13.5	13.5	13.4	13.4	13.2	13.1
10-13	14.4	12.3	13.3	AM	12.9	12.9	12.7	12.6	12.4	12.3	12.3	12.3	12.4	12.7	13.2	13.7
				PM	13.8	14.1	14.4	14.4	14.3	14.3	14.0	13.8	13.5	13.4	13.2	13.1
10-14	13.1	11.3	12.1	AM	12.9	12.6	12.4	12.1	12.0	11.7	11.5	11.3	11.5	11.5	11.8	12.1
				PM	12.4	12.6	12.7	12.7	12.6	12.4	12.3	12.0	11.8	11.7	11.5	11.3
10-15	11.3	9.8	10.6	AM	11.2	11.0	10.7	10.6	10.4	10.1	9.9	9.8	9.9	10.1	10.4	10.7
				PM	11.0	11.2	11.2	11.0	11.0	10.9	10.9	10.7	10.6	10.4	10.3	10.1
10-16	10.6	8.7	9.8	AM	9.9	9.8	9.6	9.3	9.2	9.0	8.7	8.7	8.7	9.0	9.3	9.6
				PM	10.1	10.3	10.6	10.6	10.6	10.6	10.4	10.3	10.3	10.1	10.1	9.9
10-17	10.9	9.0	10.0	AM	9.8	9.6	9.5	9.3	9.2	9.0	9.0	9.0	9.0	9.2	9.6	9.9
				PM	10.3	10.6	10.7	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.7	10.6

1 UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION STATE 53 DIST 53

PRIMARY COMPUTATIONS OF QUALITY OF WATER DIGITAL MONITOR RECORDS

12471400 DATE PROCESSED: 08-24-2000 @ 11:23 BY kagreene

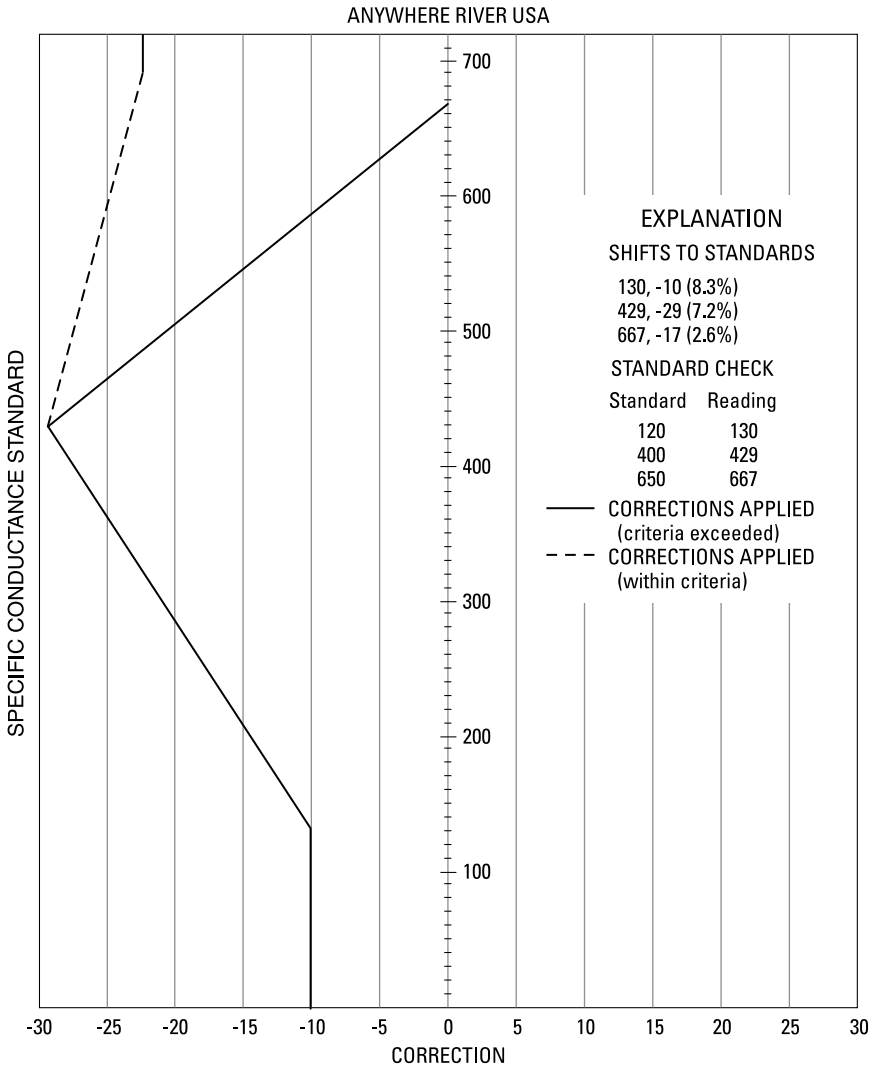
LIND COULEE WASTEWAY AT SR17 NR WARDEN, WA

(00010) WATER TEMPERATURE STORE STATISTIC(S) 00001, 00002, 00003

PROVISIONAL DATA FOR WATER YEAR ENDING SEPT. 30, 2000 TEST DIFF:****** PUNCH INTERVAL: 60 MIN

					VALUES AT INDICATED HOURS											
DATE	MAX	MIN	MEAN		1	2	3	4	5	6	7	8	9	10	11	12
10-18	11.3	9.5	10.5	AM	10.6	10.3	10.1	9.9	9.8	9.6	9.5	9.5	9.5	9.8	10.1	10.6
				PM	10.9	11.2	11.3	11.3	11.3	11.3	11.2	11.0	11.0	10.9	10.7	10.6
10-19	11.2	9.3	10.4	AM	10.6	10.3	10.1	9.9	9.6	9.5	9.3	9.3	9.3	9.6	9.9	10.4
				PM	10.7	10.9	11.2	11.2	11.2	11.0	11.0	10.9	10.7	10.7	10.6	10.6
10-20	11.2	9.3	10.4	AM	10.4	10.3	10.1	9.9	9.8	9.6	9.5	9.3	9.3	9.6	9.9	10.4
				PM	10.7	11.0	11.2	11.2	11.0	11.0	10.9	10.9	10.7	10.7	10.6	10.4
10-21	11.2	9.3	10.4	AM	10.4	10.3	10.1	9.9	9.6	9.6	9.3	9.3	9.3	9.6	9.9	10.3
				PM	10.6	10.9	11.2	11.2	11.2	11.0	11.0	10.9	10.9	10.7	10.6	10.4
10-22	11.3	9.5	10.5	AM	10.4	10.3	10.1	9.9	9.8	9.6	9.5	9.5	9.6	9.8	10.1	10.4
				PM	10.9	11.2	11.3	11.3	11.3	11.2	11.2	11.0	11.0	10.9	10.7	10.6
10-23	11.2	9.6	10.6	AM	10.4	10.4	10.3	10.1	9.9	9.8	9.6	9.6	9.6	9.9	10.3	10.6
				PM	10.9	11.0	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.0

Appendix 8—Variable shift corrections



Appendix 9—Example of a manuscript station description

NOOKSACK RIVER BASIN

12212100 FISHTRAP CREEK AT FLYNN ROAD, AT LYNDEN, WA

LOCATION—Lat 48°55'36", long 122°29'42", in NW 1/4 SE 1/4 sec.25, T.40 N., R.2 E., Whatcom County, Hydrologic Unit 17110004, on left bank, and at mile 1.7.

DRAINAGE AREA—38.1 mi2.

PERIOD OF RECORD—March 1996 to April 1998 (discontinued).

PERIOD OF DAILY RECORD—

SPECIFIC CONDUCTANCE: March to current year.
WATER TEMPERATURE: March to current year.
DISSOLVED OXYGEN: March to September 1996.

INSTRUMENTATION—Water-quality monitor since March 1996. Electronic data logger with 15-minute recording interval.

REMARKS—Specific conductance records rated excellent except the following periods: Dec. 13–Jan. 15, Aug. 5–31 rated good; Feb. 15–Mar. 10 rated fair; and Oct. 11–15 rated poor. Temperature records rated excellent.

EXTREMES FOR PERIOD OF RECORD—

SPECIFIC CONDUCTANCE: Maximum recorded, 337 microsiemens Nov. 19, 20, 1996, but may have been higher during period of missing record; minimum recorded, 108 microsiemens Jan. 30, 1997, but may have been lower during periods of missing record.
WATER TEMPERATURE: Maximum recorded, 20.5°C July 14, 26, 27, 29, 1996; minimum recorded, 0.0°C Dec. 26–31, 1996.
DISSOLVED OXYGEN: Maximum recorded, 12.1 mg/L Mar. 24, 1996, but may have been higher during periods of missing record; minimum recorded, 7.1 mg/L July 27, Aug. 26, 1996, but may have been lower during periods of missing record.

EXTREMES FOR CURRENT YEAR—

SPECIFIC CONDUCTANCE: Maximum recorded, 337 microsiemens Nov. 19, 20, but may have been higher during period of missing record; minimum recorded, 108 microsiemens. Jan. 30, but may have been lower during period of missing record.
WATER TEMPERATURE: Maximum recorded, 19.0°C Aug. 13, 14, but may have been higher during period of missing record; minimum recorded, 0.0°C Dec. 26–31.

Appendix 10—Example of an annual field measurement summary form

207-SC
Rev. 8–95

SPECIFIC CONDUCTANCE MEASUREMENT SUMMARY **WY** 1997

Station Name COLUMBIA RIVER at BEAVER ARMY TERMINAL nr QUINCY, OREGON **No.** _____

Date	Time	Stream reading		Cleaning and calibration check			Datum correction	Variable shift	Remarks
		Recording instrument	Portable field unit	74 STD/ RDNG	147 STD/ RDNG	220 STD/ RDNG	Shift to cross section	Shift to STDS	
Aug. 27	10:34	155.7 154/10:00 156/10:30	139					91, -17; 161, -14; 231, -11	Before cleaning (156) - after cleaning (137) = -19 = cleaning correction
	11:01	137 137/11:00 136/11:30	139	72	142	212		72, +2; 142, +5; 212, +8	
	12:30	136/12:00 136/12:30	(138*/ 11:26)				DC = -2		Cross section (136) - used RB surface reading of (138*) for reading at probe = -2 = DC
1997 Water Year									
Oct. 23	10:20	130 130/10:00 NA/10:30						76, -2; 146, +1; 215, +5	Before cleaning (130) - after cleaning (126) = -4 = cleaning correction
	10:55	126 126/11:00 125/11:30	131	72	141 + 143 = 142 = avg	211		72, +2; 142, +5; 211, +9	Two different standards were used and results were averaged
	12:10	125/12:00 126/12:30 126/13:00	(130.5*/ 11:22)				DC = 0		Cross section (130) - used RB surface reading of (130*) for reading at probe = 0 = DC

Copied by: _____ Checked by: _____ Date: 6/11/98

Form 2

Appendix 11—Example of a variable shift correction table

VARIABLE SHIFT VALUES

AGENCY CODE: USGS WATER YEAR: 1999
STATION ID: 12113390
STATION NAME: DUWAMISH R AT GOLF COURSE AT TUKWILA, WA
DATA DESCRIPTION: SPECIFIC CONDUCTANCE FROM EDL, IN US/CM @ 25C
1998 LAST SV: __ __ ____ _____ _____ _____ _____ _____ _____
2000 FIRST SV: 10 12 1413 49.0 .0 255.0 .0 498.0 .0

DATE/TIME MM DD/TTTT	INPUT	SHIFT	INPUT	SHIFT	INPUT	SHIFT
10 15 1300	52.00	-3.00	255.00	0.00	498.00	0.00
12 15 1135	52.00	-3.00	255.00	0.00	498.00	0.00
01 13 1116	51.00	-2.00	255.00	0.00	498.00	0.00
01 13 1127	52.00	-3.00	255.00	0.00	498.00	0.00
02 12 1116	49.00	0.00	255.00	0.00	498.00	0.00
03 15 1205	49.00	0.00	255.00	0.00	498.00	0.00
04 13 1114	53.00	-4.00	255.00	0.00	498.00	0.00
04 13 1122	55.00	-6.00	255.00	0.00	498.00	0.00
05 12 1305	44.00	5.00	255.00	0.00	498.00	0.00
05 12 1313	49.00	0.00	255.00	0.00	498.00	0.00

Appendix 12—Example of a datum shift correction table

DATUM CORRECTION VALUES

AGENCY CODE: USGS WATER YEAR: 1999
STATION ID: 12113390
STATION NAME: DUWAMISH R AT GOLF COURSE AT TUKWILA, WA
DATA DESCRIPTION: SPECIFIC CONDUCTANCE FROM EDL, IN US/CM @ 25C
1998 LAST DC: __ __ ____ _____ 2000 FIRST DC: 10 12 1345 -20.0

DATE/TIME MM DD/TTTT	VALUE	DATE/TIME MM DD/TTTT	VALUE	DATE/TIME MM DD/TTTT	VALUE	DATE/TIME MM DD/TTTT	VALUE
10 12 1300	.0						
12 15 1135	.0						
01 13 1105	-20.0						
01 13 1130	.0						
02 12 1112	-15.0						
02 12 1115	.0						
03 15 1200	-13.0						
03 15 1215	.0						
04 13 1135	.0						
05 12 1300	-12.0						
05 12 1315	.0						
09 08 1345	.0						

Appendix 13—Example of an ADAPS daily-values table

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS 10/31/2000

STATION NUMBER 12113390 DUWAMISH R AT GOLF COURSE AT TUKWILA, WA STREAM SOURCE AGENCY USGS
LATITUDE 472845 LONGITUDE 1221527 DRAINAGE AREA 461 DATUM STATE 53 COUNTY 033
FROM EDL
SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	236	180	196	259	141	158	78	63	73	49	41	43
2	289	181	199	244	140	152	78	74	76	44	37	40
3	---	162	---	278	141	160	78	75	76	42	38	39
4	325	156	182	280	135	173	75	70	72	49	40	44
5	316	157	184	135	112	124	76	70	74	57	49	53
6	---	184	---	248	126	147	76	73	75	63	56	59
7	---	189	---	237	142	166	77	74	76	71	58	64
8	---	192	---	301	145	173	77	74	75	70	66	68
9	241	171	187	---	143	---	84	77	80	74	69	72
10	230	165	178	---	136	---	90	81	87	75	72	74
11	286	170	200	---	131	---	89	79	85	76	73	74
12	325	184	212	201	125	142	82	75	78	74	63	67
13	189	147	165	143	82	108	75	60	65	64	55	61
14	157	142	149	94	59	79	64	60	62	71	62	64
15	227	149	160	59	56	57	69	59	62	73	65	70
16	223	151	165	58	55	57	64	60	62	84	73	80
17	227	151	172	66	57	62	71	64	68	94	84	90
18	175	147	161	73	64	68	67	61	64	97	94	95
19	177	147	158	77	71	74	72	62	68	103	97	99
20	175	139	158	78	76	77	73	66	69	105	103	104
21	158	126	135	78	76	77	76	66	70	112	105	108
22	156	134	140	76	63	68	93	68	82	113	110	111
23	189	149	167	63	60	61	94	81	86	110	109	110
24	228	150	167	60	58	59	100	79	88	111	110	110
25	228	148	167	59	56	58	91	74	81	113	111	112
26	193	149	162	63	58	61	80	74	76	119	113	115
27	285	150	177	61	59	60	79	64	72	124	119	121
28	163	130	144	60	56	57	64	55	60	126	120	124
29	227	147	167	59	57	58	55	45	47	120	114	117
30	266	145	165	64	58	60	48	44	47	115	114	115
31	328	143	171	---	---	---	45	43	44	118	115	117
MONTH	---	126	---	---	55	---	100	43	71	126	37	85

Appendix 13—Example of an ADAPS daily-values table (Continued)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS 10/31/2000

STATION NUMBER 12113390 DUWAMISH R AT GOLF COURSE AT TUKWILA, WA STREAM SOURCE AGENCY USGS
LATITUDE 472845 LONGITUDE 1221527 DRAINAGE AREA 461 DATUM STATE 53 COUNTY 033
FROM EDL
SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	118	117	118	77	73	75	125	107	116	115	90	101
2	118	116	117	85	75	80	137	114	125	97	88	92
3	116	112	113	85	83	84	132	110	119	93	79	85
4	112	104	107	84	82	82	123	110	116	80	74	76
5	104	103	104	88	82	85	123	111	116	85	75	79
6	109	104	107	99	87	94	133	111	120	96	80	86
7	111	109	111	104	99	101	135	115	125	96	85	91
8	112	111	111	108	103	106	132	115	122	88	75	80
9	113	112	113	109	105	107	129	113	119	87	74	78
10	117	113	115	118	107	113	131	112	121	93	81	87
11	118	116	117	124	117	121	131	111	120	90	81	85
12	121	112	118	128	121	125	133	111	119	99	77	85
13	122	112	116	124	112	115	130	106	112	99	74	80
14	118	108	113	113	105	108	130	104	112	95	73	81
15	131	109	120	112	105	107	133	105	113	102	76	83
16	132	116	123	112	91	102	132	92	106	103	77	86
17	123	112	117	106	94	101	116	81	92	102	78	91
18	120	111	116	110	97	104	103	80	87	90	81	84
19	113	100	105	129	100	115	87	65	75	90	71	78
20	113	104	109	131	112	121	82	63	72	79	63	69
21	116	106	112	123	102	113	80	71	75	77	63	69
22	118	105	113	112	93	101	83	71	75	75	61	66
23	110	102	104	102	64	75	90	75	81	73	60	63
24	103	76	83	76	64	70	93	81	85	74	61	64
25	96	81	90	77	69	73	95	82	88	75	62	65
26	101	95	98	77	69	74	90	70	77	72	62	65
27	101	77	85	84	69	77	75	69	71	73	60	63
28	80	74	77	89	76	85	74	68	71	69	58	61
29	---	---	---	93	83	88	86	68	76	74	58	62
30	---	---	---	107	93	99	110	80	96	74	61	64
31	---	---	---	114	99	107	---	---	---	76	61	65
MONTH	132	74	108	131	64	97	137	63	100	115	58	77

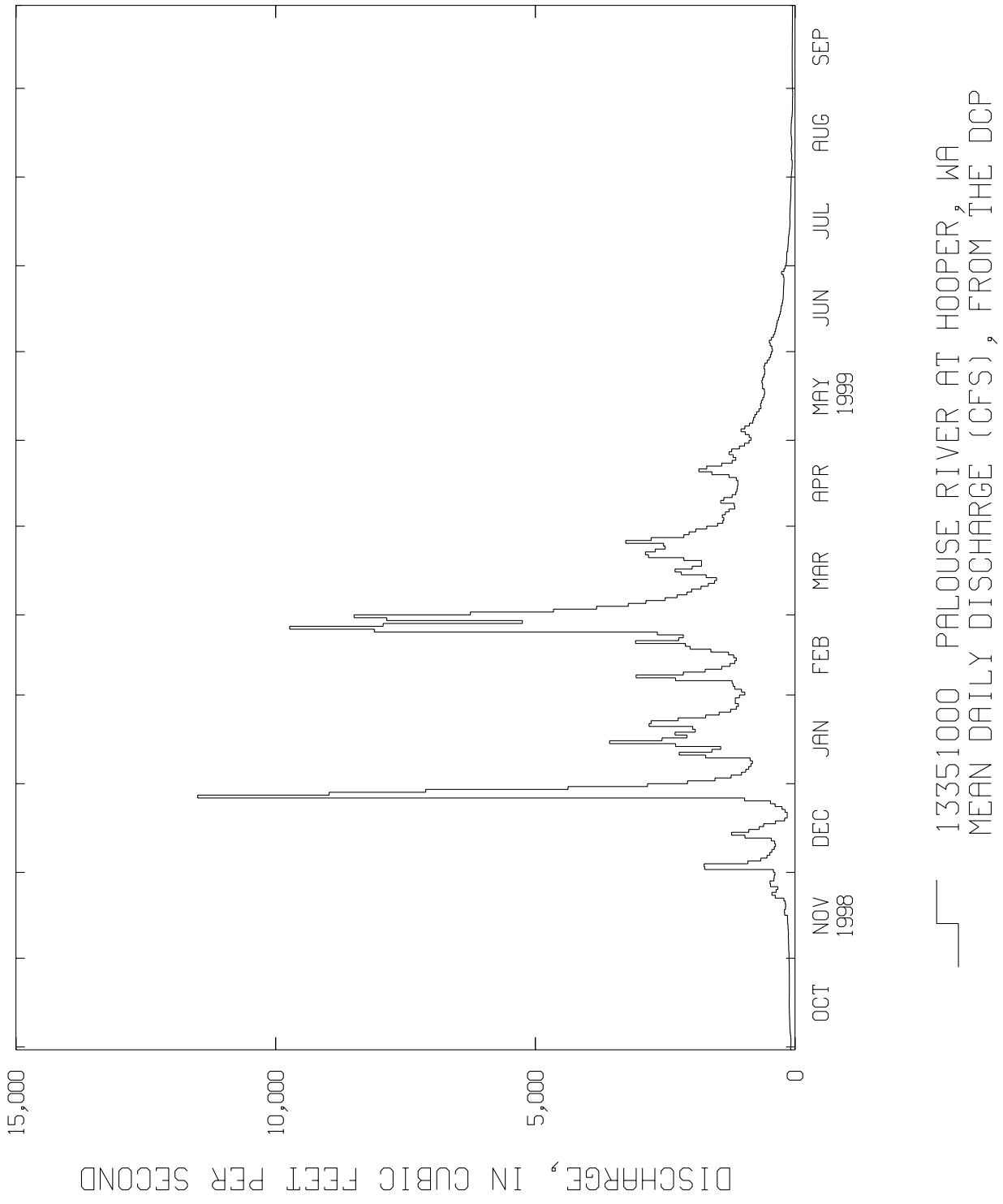
Appendix 13—Example of an ADAPS daily-values table (Continued)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS 10/31/2000

STATION NUMBER 12113390 DUWAMISH R AT GOLF COURSE AT TUKWILA, WA STREAM SOURCE AGENCY USGS
LATITUDE 472845 LONGITUDE 1221527 DRAINAGE AREA 461 DATUM STATE 53 COUNTY 033
FROM EDL
SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	76	62	66	135	86	104	230	156	174	254	151	174
2	75	61	64	139	101	112	239	150	168	264	154	178
3	82	62	68	124	94	102	263	149	203	264	161	180
4	103	67	83	106	79	89	263	151	172	272	163	193
5	101	80	87	98	77	82	193	144	170	276	162	187
6	99	77	82	98	76	81	193	133	155	268	160	189
7	102	75	80	111	77	86	167	127	142	248	160	180
8	95	60	70	113	80	87	159	119	132	386	159	199
9	79	60	64	146	80	104	190	125	149	306	161	193
10	92	61	73	151	107	123	192	130	145	260	161	189
11	103	71	79	147	105	113	233	140	171	256	160	190
12	100	67	75	156	105	111	248	151	175	240	161	182
13	89	66	70	143	102	111	241	151	168	222	160	176
14	91	66	71	147	99	111	232	149	174	171	157	162
15	94	66	71	148	95	105	199	145	164	167	157	162
16	93	55	64	144	95	114	202	148	175	170	154	160
17	81	55	59	112	81	91	215	148	168	178	146	163
18	88	58	65	113	83	92	220	144	161	171	144	159
19	116	61	82	129	91	101	250	150	170	162	143	152
20	116	86	91	146	93	105	244	151	169	157	133	146
21	114	82	94	147	97	107	263	156	193	159	131	145
22	114	87	98	138	91	102	253	160	181	131	105	122
23	123	91	103	145	91	105	273	162	195	108	103	105
24	112	72	85	153	97	110	260	162	182	363	99	133
25	81	66	72	150	96	110	251	162	178	163	107	123
26	93	67	77	169	96	124	268	160	184	191	106	129
27	99	76	82	219	122	160	235	158	176	175	110	118
28	103	77	85	238	168	188	250	158	177	172	110	125
29	103	77	83	249	165	192	258	161	183	207	112	135
30	117	79	92	244	167	193	266	159	186	163	116	134
31	---	---	---	254	159	184	230	153	170	---	---	---
MONTH	123	55	78	254	76	116	273	119	171	386	99	159

Appendix 14—Example of a discharge hydrograph



Appendix 15—Example of a review graph for an individual water-quality property