Identifier: EP-DIV-SOP-10005
(formerly ENV-WQH-SOP-009.3) Revision: **0**

Effective Date: 09/13/2010 **Next Review Date:** 09/13/2012

Los Alamos NATIONAL LABORATORY EST.1943

Environmental Programs Directorate
Corrective Actions Projects

Standard Operating Procedure

for

OPERATION AND MAINTENANCE OF GAGE STATIONS FOR STORM WATER PROJECTS

APPROVAL SIGNATURES:

Subject Matter Expert:	**Organization**	**Signature**	**Date**
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Responsible Line Manager:	**Organization**	**Signature**	**Date**
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1.0 PURPOSE AND SCOPE

This procedure describes the installation, verification, activation, inspection, maintenance, seasonal deactivation, and permanent decommissioning of surface water gaging stations and the rain gage that is installed at some gage stations. Gage station equipment and electronic instruments include flumes, weirs, stilling wells, electronic data loggers, transducers for stage (water level) measurement, digital cell phones and telemetry, solar battery-charging equipment, and electronic rain gages. This procedure also describes how to obtain supplemental flow measurements in flowing streams. This procedure applies to the program and subcontractor personnel conducting operation and maintenance activities at stream gaging stations.

2.0 BACKGROUND AND PRECAUTIONS

2.1 Background

A stage (water height) sensor instrument is installed at weirs or another type of control structure to measure flow past the station. A Sutron datalogger continuously collects data on stage level. At some gage stations an ISCO sampler is installed to collect a sample of the runoff. At such stations, when a stage sensor detects a pre-programmed stage level of flow, the Sutron activates the ISCO sampler to start collecting water. At some stations, a rain gage is installed to measure precipitation. At some stations, a cell phone is installed which is activated by the datalogger to call three different programmed numbers, in sequence, with an alarm message.

2.2 Training prerequisites

Personnel performing this procedure will be familiar with the most current versions of the following procedures and operation manuals (copies kept at TA-64 building 64 “compound”):

- Manual for Sutron datalogger, 5600-0131-1
- Manual for Sutron Accububble bubbler system Model 5600-0131-1
- Manual for Trace C-12
- Manual for Tellular digital cell phone
- Manual for tipping bucket rain gage
- Manual for ISCO Sampler
- Manual for Probe Miltonics, PL-426
- Manual for Shaft Encoder, 8800-1082

2.3 Limitations

2.3.1 If the work will require any on-site excavation activities for a new installation, excavation permits must be obtained (in accordance with P-101-17, Excavation/Fill/Soil Disturbance). For existing sites, excavation may be performed under the following limits: hand dig only, existing soil must remain on the site, and excavation may not exceed 1.5 feet in depth.

2.3.2 Before going to the field, check and set a Field Team Member’s watch to the precise time by calling the Laboratory’s time system (667-TIME or 667-8463) or by logging on to the time page at **www.time.gov** or click on the time icon on the Laboratory’s internal home page. When at the site, station equipment clock times on both the datalogger and ISCO sampler need to be synchronized and verified. Station equipment clocks must be set to Mountain Standard Time at all times, with no daylight saving time adjustment.

2.3.3 Inspections may be discontinued during periods or conditions that may make Sites dangerous for worker safety or prevent personnel from safely accessing Sites (e.g. weather-related events such as flash floods, flooding, lightning, wildfires, hail, icy or slick roads, deep snow, and hazardous LANL operations).

3.0 EQUIPMENT AND TOOLS

Inspecting Samplers

- Copy of this procedure
- Copy of Integrated Work Document (IWD)
- Issued Work Order (see example in Attachment 1, Form 5213-1 Example of Gage Station Equipment Inspection)
- Dedicated and equipped field truck
- Field tool bag
- Synchronized time piece (to MST)
- Voltage meter
- Spare batteries
- Leather gloves
- Shovels
- Plastic wire “zip” ties
- Wooden stakes
- Backpacks (if needed)
- Ball-point pens (indelible dark ink)
- Felt tip markers (indelible dark ink)
- Leatherman type tool
- Radio
- Pager
- Cell phone (Government cell phone only in secure areas)
- Necessary access and station keys
- Laptop computer (for downloading data from Sutron datalogger)

4.0 STEP-BY-STEP PROCESS DESCRIPTION

4.1 Preparing for Fieldwork

Subcontractor Project Manager	1.	Receipt of Work Order indicates that sampler inspections have been approved by the LANL Field Team Lead and authorized by the STR. Schedule work in coordination with the operations assignee for the Plan of the Day. Schedule work to be completed by the target date appearing on the work order(s).
	2.	Review the work orders and e-mail confirmation of receipt to the Process Control Coordinator. An example Work Order form is provided in Attachment 5213-1, ISCO Sampler Inspection and Sample Retrieval Form.
	3.	Distribute work order(s) to Route Lead field personnel.

Subcontractor Project Manager (cont.)	4.	Inform (e.g., by e-mail) the Field Operations designee of the schedule for sampler inspection work and locations up to a week before (preferred) but no later than the day before (for minor changes) to be added to the appropriate plan of the day.
	5.	Conduct pre-job briefing with field personnel using the current Integrated Work Document. Obtain worker signatures on new or newly-revised IWDs. Two people are required for field work. Work should only be done during daylight hours. Extended work hours, if needed, must be approved by a supervisor.
	6.	For work at sites operated by Weapons Facility Operations or Nuclear Environmental Sites, notify the appropriate access control before traveling to those sites. The IWD Part II will address specific requirements and training for these sites.
Route Lead	7.	Obtain any necessary additional paperwork before conducting this work, including IWD's and excavation permits (if necessary).
	8.	Gather the required equipment (see section 3.0) for the work to be done.
	9.	Set watch(s) to the precise standard (MST, not daylight saving) time. This can be done by calling the Laboratory's time system (667-TIME or 667-8463) or by going to the time page at www.time.gov (or click on the clock icon on the lab's internal home page). This is so the ISCO clock can be set to the current local time.

4.2 Checking Gage Stations Upon Arrival

Field Team Member	1.	In the upper right corner of the work order (**Item 1** on work order; refer to example Work Order in Attachment 1), enter the date and time inspection is performed and the names and Z numbers of the field personnel performing the work. List the route lead first.
	2.	Scroll through the options on the datalogger (consult the manual for operating instructions) to check the following parameters and obtain information requested on work order (refer to example Work Order in Attachment 1): • Check that data recording is on (**Item 2** on work order) • Check datalogger time setting is within +/- 1 minute (**Item 3**) • Is alarm condition set to Normal? (**Item 4**) • Is bubbler/probe/recorder on? (**Item 5**) • Record inside gage measurement. (**Item 6**) • Record outside gage measurement. (**Item 7**)

Field Team Member (cont.)	3.	Check the following conditions at the station: • Is there a high water mark? (**Item 8**) • Is gage silted/isolated? (**Item 9**) • Record battery voltage. (**Item 10**) • If flow is present (**Item 11**) and if measurement of flow can be done safely, perform steps in section 4.8. • Is control (flume, channel, v-notch) clear? (**Item 12**). If no, describe any as-found condition.
	4.	If equipped with a phone system, check that the phone system is on and operating (consult operating manual). (**Item 13**)

4.3 Checking Rain Gage on Arrival

Field Team Member	1.	If a rain gage is installed at this site, complete the steps in this section.
	2.	Is rain gage on and operational? (**Item 14**)
	3.	Record rain amount and reset rain gage reading to zero. (**Item 15**)
	4.	Check the rain bucket for debris and indicate if debris was found (**Item 16**). If bucket was moved, ensure datalogger rain reading is still zero; reset if necessary.

4.4 Setting Trip Levels

Field Team Member	1.	To set trip levels, access the datalogger main menu and follow menu options to alarm options, set alarm high to specified trip level.
	2.	Follow menu options to basic program, list and set appropriate parameters to trip level.

4.5 Checking Gage Station Upon Departure

Field Team Member	1.	Before departing station, scroll through the options on the datalogger (consult the manual for operating instructions) to check the following parameters and obtain information requested on work order (refer to example work order in Attachment 1): • Check that data recording is on (**Item 17** on work order) • Is alarm condition set to Normal? (**Item 18**) • Is bubbler/probe/recorder on? (**Item 19**) • Record inside gage measurement. (**Item 20**) • Record outside gage measurement. (**Item 21**)

Field Team Member (cont.)	2.	Check that the model numbers and serial numbers of the installed equipment match the numbers on the top of the work order. Record any needed corrections.
	3.	If maintenance is required for any of the next 5 steps and can be completed during the inspection, describe the maintenance completed (**Item 30**).
	4.	Is gage silted or isolated? (**Item 22**)
	5.	Record battery voltage (**Item 23**). If voltage is below 12.0, replace battery if judgment indicates it should be higher after considering amount of past cloudy skies, time of day, and other factors that could explain a lower voltage.
	6.	Is control (flume, channel, v-notch) clear? (**Item 24**).
	7.	If phone is installed, is it on?
	8.	Were data retrieved (according to steps in Section 4.10) during the site visit? (**Item 26**). If yes, record data file name, size (Kb), and date.
	9.	If maintenance was performed, check “yes” in **Item 30** and describe.
	10.	If follow-up maintenance is required, check “yes” in **Item 31** and describe.
	11.	If water is flowing and a discharge measurement can be taken, check “yes” in **Item 32** and perform the measurement according to section 4.8.
Lead Inspector	12.	Have another field team member review the completed work order for accuracy, then certify that the information submitted is “true, accurate, and complete” by signing and dating “Lead Signature” line (**Item 34**).
	13.	Upon return to the office, return completed work order to a member of the Field Planning and Work Authorization Team.

4.6 Checking Rain Gage Upon Departure

Field Team Member	1.	If a rain gage is installed at this site, complete the steps in this section.
	2.	Before departure, is rain gage on and operational? (**Item 27**)
	3.	Is the tipping bucket free of debris? (**Item 28**). If bucket was moved, ensure datalogger rain reading is still zero; reset if necessary (**Item 29**).

4.7 Trouble-Shooting Gage Station Equipment

1. Consult appropriate equipment manual for trouble-shooting steps.

   Below are some of the more common problems:

   - If no power to any instrumentation, check electrical panel for blown fuses, replace as needed.
   - To correct inside gage height, ensure instrument is reading correctly by referencing reference point; use reference point to obtain proper gage height by measuring distance. The difference is the gage height. Follow Sutron menu to configure sensors and change levels accordingly.
   - Remove debris and sediment from stilling well, ensure float is not punctured and stilling well tape is correctly attached to wheel, and reset inside gage height if needed.
   - To clear bubbler line, run bubbler in order to purge debris; if debris is not dislodged, insert cleaning tool into intake of bubbler tubing and circle the tubing while running bubbler to dislodge debris.

4.8 Measuring Flow if Water is Flowing at Station

Field Team Member	1.	If water level is sufficiently deep, use a current flow meter to measure the stream flow. Refer to USGS Water Supply Paper 2175, Measurement and Computation of Stream Flow: Volume 1, Chapter 5 Measurement of Discharge by Conventional Current-Meter Methods, for additional guidance. Record all data on an original USGS Form 9-975 (example in Attachment 3).
	2.	If the flow is too shallow for use of the current meter, use a Parshall flume to measure the stream flow. Refer to USGS Water Supply Paper 2175, Chapter 8, Discharge Miscellaneous Methods, portable Parshall flume, page 265.
	3.	After flow stabilizes, take gage-height readings at 10-minute intervals for 30 minutes (total of 4 readings). Record all data on an original USGS Form 9-975 (example in Attachment 3). Calculate the mean value of the readings taken to determine the gage height.
	4.	Use Attachment 2 Table 2 to obtain the discharge flow rate.
	5.	After completion of the flow measurement, remove the flume and return channel to pre-measurement conditions.

4.9 Computation of Past Flows

Field Team Member	1.	If no flow is present and there has been a high stage indication, record the high water mark and later contact the Storm Water Lead to confirm if it is necessary to flag the high water levels in the stream channel.

Field Team Member (cont.)	2.	If deemed necessary by project leader, flag the high water levels in the stream channel. The location should be where the channel is narrowing slightly and has a straight reach. For slope area, the reach must be a minimum of 75 times the mean depth.
	3.	When convenient (e.g., after flows stop), take appropriate survey measurements to allow for a later calculation of flow and document using the slope-area calculation method.
	4.	Perform the calculation of peak discharge flow as detailed in Techniques of Water Resources Investigation of the United States Geological Survey, Measurement of Peak Discharge by the Slope-Area Method, Book 3, Chapter A2.

4.10 Retrieving Data in the Field Using a Laptop

Field Team Member	1.	Connect laptop computer to Sutron data logger using RS-232 data cable.
	2.	Open command prompt, program 8210.
	3.	Follow menu choices in order to download data.
	4.	Record file name and size information on work order form (**Item 27**).

4.11 Submitting Records Resulting from this Procedure

Field Planning and Work Authorization Data Manager	1.	When complete, submit the following completed records to the Storm Water Records point-of-contact at TA-59; Bldg. 53, utilizing the Storm Water Records Submittal Form: • Completed Gage Station Equipment Inspection Work Order (example in Attachment 1) • Completed USGS Form 9-275 (example in Attachment 3), if used to measure stream flow.

5.0 ATTACHMENTS

Attachment 1: Gage Station Equipment Inspection Work Order
Attachment 2: Parshall Flume Capacities and Discharge Tables
Attachment 3: USGS Form 9-275

6.0 REVISION HISTORY

Revision No. *[Enter current revision number, beginning with Rev.0]*	Effective Date *[DCC inserts effective date for revision]*	Description of Changes *[List specific changes made since the previous revision]*	Type of Change *[Technical (T) or Editorial (E)]*
0	10/01	New document (issued as ENV-WQH-SOP-009)	T
1	8/03	Annual review (issued as ENV-WQH-SOP-009)	T
2	5/05	Added safety precautions and excavation permit requirements (issued as ENV-WQH-SOP-009.3)	T
3	10/05	Removed steps for storm water sample collection and created new procedure, ENV-WQH-SOP-011, Collection of Storm Water Runoff Samples	T
0	9/13/2010	New document (issued as EP-DIV-SOP-10005, R0) Supersedes ENV-WQH-SOP-009.3; Reformatted and revised; updated organization;	T/E

Using a CRYPTO Card, click here for "Required Read" credit.

If you don't have a crypto card with A-level access, contact creichelt@lanl.gov for instructions on obtaining credit

ATTACHMENT 1	
EP-DIV-SOP-10005-1 **GAGE STATION EQUIPMENT INSPECTION WORK ORDER**	Records Use only Los Alamos NATIONAL LABORATORY EST.1943

Gage Station Equipment Inspection

Work Order ID: MSGP-5260 — Project ID: P-MSGP-253

3-PSP-5 : E121.9

Project: MSGP Wkly GS Inspect 6-14-10

Reason: Gage Inspection

Route: Target Date: 6/17/2010

1 Date: _____ Time: _____
Name/Z#: _____
Name/Z#: _____
Lead Signature: _____ 34
"I confirm the information as recorded is true, accurate and complete."

Equipment	MFG	Model	Serial No.	Specification	Configuration
Gage Station Phone	Tellular		699-3316		
Probe	Milltronics		V5300339	Trip level	0.12 ft
Sutron Datalogger	Sutron	8210	986896		

GAGE AND DATALOGGER ON ARRIVAL

2 AR-Is data recording on? ❒Yes ❒No
AR-Is data logger time +/- 1 min(MST)? If NO, record adjustment. ❒Yes ❒No
4 AR-Is alarm condition set to Normal? ❒Yes ❒No
5 AR-Is bubbler/probe/encoder on? ❒Yes ❒No
6 AR-Record inside gage measurement. ❒Yes ❒No
7 AR-Record outside gage measurement. ❒Yes ❒No
8 AR-Is there a high water mark? If Yes, record. ❒Yes ❒No
9 AR-is gage silted/isolated? ❒Yes ❒No
10 AR-Record battery voltage. ❒Yes ❒No
11 AR-Is water flowing? ❒Yes ❒No
12 AR-Is control clear? ❒Yes ❒No

13 AR-Is phone on? ❒Yes ❒No

GAGE AND DATALOGGER ON DEPARTURE

17 P-Is data recording on? ❒Yes ❒No
18 P-Is alarm condition set to Normal? ❒Yes ❒No
19 P-Is bubbler/probe/encoder on? ❒Yes ❒No
20 P-Record inside gage measurement. ❒Yes ❒No
21 P-Record outside gage measurement. ❒Yes ❒No
22 P-Is gage silted/isolated on departure? ❒Yes ❒No
23 P-Record battery voltage. ❒Yes ❒No
24 P-Is control clear upon departure? ❒Yes ❒No
26 Data File Name: _____
Start Date: _____ Size: _____ Kb

RAINGAGE ARRIVAL

14 AR-Is rain gage on? ❒Yes ❒No
15 AR-Record rain gage reading. ❒Yes ❒No
16 AR-Is tipping bucket free of debris? ❒Yes ❒No

RAINGAGE ON DEPARTURE

27 Is rain gage on upon departure? ❒Yes ❒No
28 Is tipping bucket free of debris upon departure? ❒Yes ❒No
29 Is rain gage set (or reset) to zero? ❒Yes ❒No

MAINTENANCE

30 If any maintenance completed, check YES: Describe. ❒Yes ❒No
31 If follow-on maintenance is required, check YES: Describe. ❒Yes ❒No
32 Was discharge measurement taken? If Yes, attach USGS 9-275. ❒Yes ❒No

Additional Notes:

LANL PERSONNEL USE ONLY (Initials and dates)		
Accepted	Tech QC	FTL

ATTACHMENT 2	
EP-DIV-SOP-10005-2 **Parshall Flume Capacities and Discharge Tables**	Records Use only Los Alamos NATIONAL LABORATORY EST.1943

RATING TABLE FOR 3" MODIFIED PARSHALL FLUME

Gage height (ft)	Discharge (ft^3/s)	Gage height (ft)	Discharge (ft^3/s)	Gage height (ft)	Discharge (ft^3/s)
0.01	0.0008	0.21	0.097	0.41	0.280
.02	.0024	.22	.104	.42	.290
.03	.0045	.23	.111	.43	.301
.04	.0070	.24	.119	.44	.312
.05	.010	.25	.127	.45	.323
.06	.013	.26	.135	.46	.334
.07	.017	.27	.144	.47	.345
.08	.021	.28	.153	.48	.357
.09	.025	.29	.162	.49	.368
.10	.030	.30	.170	.50	.380
.11	.035	.31	.179	.51	.392
.12	.040	.32	.188	.52	.404
.13	.045	.33	.198	.53	.417
.14	.051	.34	.208	.54	.430
.15	.057	.35	.218	.55	.443
.16	.063	.36	.228	.56	.456
.17	.069	.37	.238	.57	.470
.18	.076	.38	.248	.58	.483
.19	.083	.39	.259	.59	.497
.20	.090	.40	.269		

PARSHALL FLUME DISCHARGE TABLE

Gage Height (ft.)	Discharge (ft^3/s)			Gage Height (ft.)	Discharge (ft^3/s)		
	6″	**9″**	**12″**		**6″**	**9″**	**12″**
0.10	0.05	0.09	----	0.50	0.69	1.06	1.39
0.11	0.06	0.10	----	0.51	0.71	1.10	1.44
0.12	0.07	0.12	----	0.52	0.73	1.13	1.48
0.13	0.08	0.14	----	0.53	0.76	1.16	1.52
0.14	0.09	0.15	----	0.54	0.78	1.20	1.57
0.15	0.10	0.17	----	0.55	0.80	1.23	1.62
0.16	0.11	0.19	----	0.56	0.82	1.26	1.66
0.17	0.12	0.20	----	0.57	0.85	1.30	1.70
0.18	0.14	0.22	----	0.58	0.87	1.33	1.75
0.19	0.15	0.24	----	0.59	0.89	1.37	1.80
0.20	0.15	0.26	0.35	0.60	0.92	1.40	1.84
0.21	0.18	0.28	0.37	0.61	0.94	1.44	1.88
0.22	0.19	0.30	0.40	0.62	0.97	1.48	1.93
0.23	0.20	0.32	0.43	0.63	0.99	1.51	1.98
0.24	0.22	0.35	0.46	0.64	1.02	1.55	2.03
0.25	0.23	0.37	0.49	0.65	1.04	1.59	2.08
0.26	0.25	0.39	0.51	0.66	1.07	1.63	2.13
0.27	0.26	0.41	0.54	0.67	1.10	1.66	2.18
0.28	0.28	0.44	0.58	0.68	1.12	1.70	2.23
0.29	0.29	0.46	0.61	0.69	1.15	1.74	2.28
0.30	0.31	0.43	0.64	0.70	1.17	1.78	2.33
0.31	0.32	0.51	0.68	0.71	1.20	1.82	2.38
0.32	0.34	0.54	0.71	0.72	1.23	1.80	2.43
0.33	0.36	0.56	0.74	0.73	1.26	1.90	2.48
0.34	0.38	0.59	0.77	0.74	1.28	1.94	2.53
0.35	0.39	0.62	0.80	0.75	1.31	1.98	2.58
0.36	0.41	0.64	0.84	0.76	1.34	2.02	2.63
0.37	0.42	0.67	0.88	0.77	1.36	2.06	2.68
0.38	0.45	0.70	0.92	0.78	1.39	2.10	2.74
0.39	0.47	0.73	0.95	0.79	1.42	2.14	2.80
0.40	0.48	0.76	0.99	0.80	1.45	2.18	2.85
0.41	0.50	0.78	1.03	0.81	1.48	2.22	2.90
0.42	0.52	0.81	1.07	0.82	1.50	2.27	2.96
0.43	0.54	0.84	1.11	0.83	1.53	2.31	3.02
0.44	0.56	0.87	1.15	0.84	1.56	2.35	3.07
0.45	0.58	0.90	1.19	0.85	1.59	2.39	3.12
0.46	0.61	0.94	1.23	0.86	1.62	2.44	3.18
0.47	0.63	0.97	1.27	0.87	1.65	2.48	3.24
0.48	0.65	1.00	1.31	0.88	1.68	2.52	3.29
0.49	0.67	1.03	1.35	0.89	1.71	2.57	3.35

PARSHALL FLUME DISCHARGE TABLE (CONTINUED)

Gage Height (ft.)	Discharge (ft^3/s)			Gage Height (ft.)	Discharge (ft^3/s)		
	6″	**9″**	**12″**		**6″**	**9″**	**12″**
0.90	1.74	2.61	3.41	1.32	----	4.69	6.10
0.91	1.77	2.66	3.46	1.33	----	4.75	6.17
0.92	1.81	2.70	3.52	1.34	----	4.80	6.24
0.93	1.84	2.75	3.58	1.35	----	4.86	6.32
0.94	1.87	2.79	3.64	1.36	----	4.91	6.39
0.95	1.90	2.84	3.70	1.37	----	4.97	6.46
0.96	1.93	2.88	3.76	1.38	----	5.03	6.53
0.97	1.97	2.93	3.82	1.39	----	5.08	6.60
0.98	2.00	2.98	3.88	1.40	----	5.14	6.68
0.99	2.03	3.02	3.94	1.41	----	5.19	6.75
1.00	2.06	3.07	4.00	1.42	----	5.25	6.82
1.01	2.09	3.12	4.06	1.43	----	5.31	6.89
1.02	2.12	3.17	4.12	1.44	----	5.36	6.97
1.03	2.16	3.21	4.18	1.45	----	5.42	7.04
1.04	2.19	3.26	4.25	1.46	----	5.48	7.12
1.05	2.22	3.31	4.31	1.47	----	5.54	7.19
1.06	2.26	3.36	4.37	1.48	----	5.59	7.26
1.07	2.29	3.40	4.43	1.49	----	5.65	7.34
1.08	2.32	3.45	4.50	1.50	----	----	7.49
1.09	2.36	3.50	4.56	1.51	----	----	7.57
1.10	2.46	3.55	4.62	1.52	----	----	7.64
1.11	2.43	3.60	4.68	1.53	----	----	7.72
1.12	2.46	3.65	4.75	1.54	----	----	7.79
1.13	2.50	3.70	4.82	1.55	----	----	7.79
1.14	2.53	3.75	4.88	1.56	----	----	7.87
1.15	2.57	3.80	4.94	1.57	----	----	7.95
1.16	2.60	3.85	5.01	1.58	----	----	8.02
1.17	2.64	3.90	5.08	1.59	----	----	8.10
1.18	2.68	3.95	5.15	1.60	----	----	8.18
1.19	2.71	4.01	5.21	1.61	----	----	8.26
1.20	2.75	4.06	5.28	1.62	----	----	8.34
1.21	2.78	4.11	5.34	1.63	----	----	8.41
1.22	2.82	4.18	5.41	1.64	----	----	8.49
1.23	2.86	4.22	5.48	1.65	----	----	8.57
1.24	2.89	4.27	5.55	1.66	----	----	8.65
1.25	----	4.32	5.62	1.67	----	----	8.73
1.26	----	4.37	5.69	1.68	----	----	8.81
1.27	----	4.43	5.76	1.69	----	----	8.89
1.28	----	4.48	5.82	1.70	----	----	8.97
1.29	----	4.53	5.89				
1.30	----	4.59	5.96				
1.31	----	4.64	6.03				

ATTACHMENT 3	
EP-DIV-SOP-10005-3 **USGS Form 9-275**	Records Use only Los Alamos NATIONAL LABORATORY EST 1943

9-275-G
(Rev. 10-81)

U.S.G.S.
STANDARD
DISCHARE MEASUREMENT
NOTES

Meas. No.. . . . . .
Comp. by. . . . . .

Sta. No.. . . . . **DISCHARGE MEASUREMENT NOTES** Checked by . . . . .

. . . . . .

Date . . . . . , 20 . . . . . Party . . . . . .
Width . . . . . Area. . . . . Vel. . . . . G. H. . . . . Disch. . . . . .
Method . . . . . No. secs. . . . . G. H. change. . . . . in . . . . . hrs. Susp. . . . . .
Method coef. . . . . Hor. angle coef. . . . . Susp. coef. . . . . Meter No. . . . . .
Type of meter . . . . . Date rated . . . . . Tag checked . . . . . .
Meter . . . . . ft. above bottom of wt. Spin before meas. . . . . after . . . . . .
Meas. plots. . . . . % diff. from. . . . . rating. Levels obtained . . . . . .

GAGE READINGS						WATER QUALITY MEASUREMENTS
Time		Inside	ADR	Graphic	Outside	No . . . . Yes. . . . . Time . . . . .
						Samples Collected
						No . . . . . Yes. . . . . Time . . . . .
						Method Used
						EDI . . . . . EWI . . . . . Other. . . . .
						SEDIMENT SAMPLES
						No . . . . . Yes. . . . . Time . . . . .
						Method Used
						EDI . . . . . EWI . . . . . Other. . . . .
Weighted M.G.H.						BIOLOGICAL SAMPLES
G. H. correction						Yes. . . . . Time . . . . .
Correct M.G.H.						No . . . . . Type . . . . .

Check bar. chain found . . . . . changed to . . . . . at . . . . . .
Wading, cable, ice, boat, upstr., downstr., side bridge. . . . . feet, mile, above, below gage.
Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%); based on the following cond:
Flow. . . . . .
Cross section . . . . . .
Control . . . . . .
Gage operating . . . . . Weather . . . . . .
Intake/Orifice cleaned . . . . . Air . . . . . °C@ . . . . . Water . . . . . °C@ . . . . . .
Record removed . . . . . Extreme Indicator: Max. . . . . Min. . . . . .
Manometer N_2 Pressure Tank . . . . . Feed . . . . . Bbl rate . . . . . per min.
CSG checked . . . . . Stick reading . . . . . .
Observer . . . . . .
HWM . . . . . outside, in well
Remarks . . . . . .
. . . . . .
. . . . . .
G.H. of zero flow . . . . . ft. Sheet No. . . . . of . . . . . sheets

"Write in the Rain" ALL-WEATHER WRITING PAPER
G-163
RICKLY HYDROLOGICAL CO. COLUMBUS, OH
(614) 297-9877 • FAX (614) 297-9878

USGS Form 9-275 (continued)