Identifier: EP-DIV-SOP-10008 (**Formerly ENV-WQH-SOP-009.3**)	Revision: **0,** IPC-1
Effective Date: 9/27/2010	Next Review Date: 9/13/2012

Los Alamos NATIONAL LABORATORY EST.1943

Environmental Protection Directorate Corrective Actions Projects

Standard Operating Procedure

for **INSTALLING, SETTING UP, AND OPERATING ISCO SAMPLERS**

APPROVAL SIGNATURES:

Subject Matter Expert:	**Organization**	**Signature**	**Date**
Sam Loftin	ENV-RCRA	Signature on File	9/27/2010
Responsible Line Manager:	**Organization**	**Signature**	**Date**
Steve Veenis	PMFS-DO	Signature on File	9/27/2010

1.0 PURPOSE AND SCOPE

This procedure describes the installation, setup, programming, and operation of Teledyne ISCO model 3700 full-size portable automated samplers used to collect storm water runoff samples. This procedure applies to the project and contractor personnel conducting operation and maintenance activities at stream gaging stations and single stage stations. The attachments to this procedure do not include configuration and programming parameters for the Environmental Surveillance (ES) Program or LA/Pueblo Watershed Stabilization (LPWS) Project stations.

2.0 BACKGROUND AND PRECAUTIONS

2.1 Background

ISCO samplers are used in a variety of applications across the Laboratory. ISCO samplers coupled with model 1640 sampler actuators are used at Individual Permit Site Management Areas (SMAs), in the Regional PCB Background Study, and potentially will be used in Consent Order-driven stormwater monitoring and some Multisector General Permit (MSGP) Program stations. ISCO samplers coupled with Sutron dataloggers and stage sensors are used at some gage stations to monitor stormwater for the MSGP Program, the Environmental Surveillance (ES) Program, and LA/Pueblo Watershed Stabilization (LPWS) Project.

3.0 TRAINING PREREQUISITES

Personnel performing this procedure will be familiar with the most current versions of the following procedures and operation manuals:

- EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples
- Manual for Sutron datalogger, 5600-0131-1, operation overview
- Manual for ISCO Sampler, operation overview

3.1 If the work will require any on-site excavation activities, obtain an Excavation Permit in accordance with P-101-17, Excavation/Fill/Soil Disturbance.

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 adjustments made.

4.0 EQUIPMENT AND TOOLS

Ensure the following equipment is available in the field vehicle:

- Copy of this procedure
- Copy of Integrated Work Document (IWD)
- Excavation permits, if required (see section 5.1)
- Charged spare battery
- Battery voltage tester
- Appropriate tools in tool box
- Voltage meter
- Leather gloves
- Shovels
- Spare tubing: tygon and Teflon®
- Plastic wire "zip" ties

- Wooden stakes
- Backpacks (if needed)
- Leatherman type tool
- Radio
- Pager
- Cell phone (Government cell phone only in secure areas)
- Necessary access and station keys

5.0 STEP-BY-STEP PROCESS DESCRIPTION

5.1 Preparing for fieldwork

Subcontractor or Project Manager	1.	Receipt of a work order indicates that sampler installations, activations, or shut-downs have been approved by the LANL Field Team Lead. 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-1, ISCO Sampler Installation Form.
	3.	Distribute work order(s) to Route Lead field personnel.
	4.	Inform (e.g., by e-mail) the Field Operations designee of the schedule for sampler inspection work and locations up to a week (preferred) before 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 4.0) for the work to be done.
	9.	Set watch(s) to the precise mountain standard (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.

5.2 Installing ISCO Samplers

Field Team Member	1.	Enter the date and time installation is performed and the names and Z numbers of the field personnel performing the work in the upper right corner of the work order (**Item 1** on work order; refer to example work order in Attachment 1). List the route lead first.
	2.	Deploy the ISCO sampler and charged battery on level ground above the flood plain, within 26 vertical feet of the channel (the maximum lift of the ISCO 3700 pump). Often (at locations with public access) large tool/storage boxes (Greenlee boxes) are used for equipment protection in the field. The sampler should be as level as possible to allow effective sample collection.
	3.	Record on the work order (**Item 2**) the serial number of the sampler installed (**Item 5**).
	4.	Install the separate protective battery box for the charged battery (follow manufacturer's instructions).
	5.	Record whether a Greenlee box is installed (**Item 4**).
	6.	Determine the bottle configuration needs from the work order and install the correct distributor arm (has either "12" or "24" embossed on bottom at outlet), bottles, and retaining devices in the sampler base. Check that the end of the pump tubing does not extend below the bottom face of the distributor arm (where it could snag the bottle tops and jam as the arm advances through the bottle sequence). (**Item 6**).
	7.	Remove and place the clean bottle caps in a new Ziploc plastic bag.
	8.	Attach a length of 3/8-inch diameter Teflon suction line to the sampler intake line and anchor as needed for the site-specific location. Measure and remember (for later programming steps) the tubing length used. Route the sample tubing downslope from the sampler to the stream intake so that there is a continuous slope with no dips that could retain water between sample intervals.
	9.	For samplers not located at a gaging station, • Anchor a stake to the channel bottom in the main flow of the stream, not in an eddy or edge of the flow. • Attach the stream intake end and the 1640 liquid level detector (actuator) to the stake. • Attach the actuator at least ½ inch above the intake tube to ensure there is enough water to submerge the intake. • Connect the sampler actuator to the sampler using the cable provided by the manufacturer. • Record the height of the actuator above the channel bottom.

Field Team Member (cont.)		Professional judgment determines the actuator height above the channel bottom. For example, wide, low-flowing channels may require locating the intake <1 inch above the bottom, while a narrow, high-flowing channel may allow placement of the intake higher in the water column.
	10.	For samplers located at a gaging station, set the Sutron data logger to trigger the ISCO sampler at the stage level specified in the work order.
	11.	Connect the sampler to the power source (12v deep cycle battery or other power source).
	12.	Turn on the sampler and configure and program the sampler to the required settings (see work order) according to sections 5.3 and 5.4 below.
5.3	**Configuring ISCO Samplers**	
Route Lead	1.	When a new ISCO sampler is being installed, configure the sampler in accordance with the steps contained in this section. For the configuration indicated on the Work Order, use the appropriate configuration settings given in Attachment-2.
	2.	Turn on the sampler by pressing the “On” button.
	3.	Press the “Enter/Program” button.
	4.	Select “Configuration”.
	5.	Set the configuration parameters in accordance with the guidance on Attachment-2, ISCO 3700 Configure Sequence. After each selection is made, press the “Enter” button to allow the next configuration parameter to be displayed on the screen.
	6.	Double check that the programming is correct for the location (refer to required configuration on work order) and that proper programming was set (**Item 7**).
	7.	After the programming is complete, select “Run diagnostics” and press “Enter” to run the system diagnostic test (**Item 8**). These include the following: • RAM and ROM test • LCD test • Pump test (“OFF/On” number should be between 50 and 200 for a successful test) • Distributor test -- select “YES” to run test. Test will move the distributor to Position 24 and then return it to Position 1.
	8.	Following the diagnostic tests, “Reinitialize Controller” will be displayed. Select “No” and press “Enter” (If “Yes” is selected, the sampler will reset a number of configuration and program settings to the factory default values).

Route Lead (cont.)	9.	To leave the configuration sequence, use the “Exit configuration” and press “Yes” or press the “Enter/Program” key.
5.4 Programming ISCO samplers		
Route Lead	1.	Follow the steps in this process to program a new ISCO or to confirm the program settings are correct for a specific location or project. Follow the project-specific program settings as indicated on the Work Order and given in Attachment-3.
	2.	Turn on the sampler by pressing the “On” button
	3.	Press the “Enter/Program” button.
	4.	Select “Program”.
	5.	Set the program parameters as specified on Attachment-3 - ISCO 3700 Program Sequence. After each selection is made, press the “Enter” button to allow the next configuration parameter to be displayed on the screen.
	6.	If actuator is installed, set switch on actuator to “toggle.”
	7.	Check that the configuration and programming that were set are correct for the number and types of bottles specified on the work order and installed in the sampler (**Item 7**).
	8.	Complete all items on the work order. Record any additional information to explain problems encountered, special conditions, etc., as needed (**Item 13**).
	9.	Optional but recommended for new samplers: Run a test of the sampler pump to confirm it delivers the correct volume to fill but not overflow a bottle. Use a bucket with distilled water at the intake and run a test to fill one bottle (see ISCO operation manual). Change the sample volume parameter in the program to adjust the volume delivered.
	10.	Check battery voltage (**Item 9**) and electrical connections (**Item 10**) after all installation steps completed.
	11.	Ensure sampler is on upon departure (**Item 11**) and displays “Bottle 1 of x after 1” or “Sampler Inhibited” (**Item 12**).
Route Lead	12.	Review the work order(s) for accuracy and certify that the information submitted is “true, accurate, and complete” by signing and dating “Lead Signature” line on work order (**Item 14**).
	13.	Return completed work order to a member of the Field Planning and Work Authorization Team.

5.5 Activating Samplers

Route Lead	1.	Follow the steps in this section when a Work Order is received to activate a sampler (generally at the beginning of a field season or after a certain time period after a sample was collected).
	2.	If not already installed, install and hook up the charged battery. If a battery is already in place, use the voltage tester to check for minimum voltage of 11.7 volts. If the voltage is lower, replace the battery with a charged battery.
	3.	Turn on sampler power. “Program halted” will be displayed; press enter/program button to enter program/configure sequence.
	4.	Check the configuration and programming parameters to ensure they are still correct for the specific installation – follow section 4.3 for the steps and see Attachment-3, see Attachments 2 and 3 for the correct parameters.
	5.	Check integrity and condition of sampling tubes, water sensor, wiring, etc., to ensure sampler will properly collect a sample.
	6.	To test the integrity of the tubing, press “Pump forward” to turn on pump and test for suction at the tubing intake. Press “Stop” to turn off pump. If No suction is felt at the intake, check the integrity of the tubing and replace as necessary.
	7.	Remove cover, remove caps from bottles, and place caps in a bag in the center of the sampler. If bottles are dirty or previously used, replace with new.
	8.	Reinstall cover.
	9.	To activate the sampler, press “Start sampling” and “Enter” twice.
	10.	For samplers at a gaging station and thus connected to a Sutron datalogger, ensure the sampler indicates “Bottle 1 after 1”. For samplers not located at a gaging station, ensure the sampler indicates “Sampler inhibited”.
Route Lead	11.	Review the work order(s) for accuracy and certify that the information submitted is “true, accurate, and complete” by signing and dating “Lead Signature” line on work order.
	12.	Return completed work order to a member of the Field Planning and Work Authorization Team.

5.6 Standing Down or Winterizing Samplers

Route Lead	1.	Follow the steps in this section when a Work Order is received to turn off ("stand down") a sampler (generally at the end of a field season or to disable a sampler for a certain time period after a sample was collected).
	2.	Turn off power.
	3.	Remove cover and place caps on bottles to keep them clean.
	4.	If sampler will be left in place for the winter, remove the battery and return to storage compound.
	5.	Close sampler.
Route Lead	6.	Review the work order(s) for accuracy and certify that the information submitted is "true, accurate, and complete" by signing and dating "Lead Signature" line on work order.
	7.	Return completed work order to a member of the Field Planning and Work Authorization Team.

5.7 Sampler Reset and Re-Initialization After Sample Collection

Route Lead	1.	Follow SOP-5213 for collecting samples from an ISCO and installing new bottles so it is ready to collect new samples.
	2.	After collecting samples and resetting the sampler, follow instructions on sample collection work order regarding whether the sampler should be disabled: in many cases, sampler should be disabled immediately after collecting a sample so a subsequent sample is not collected before the allowed time period (no sooner than 15 days for some programs). If sampler is to be deactivated, ensure sampler is turned off upon departure. If sampler is to be left activated, press "Start sampling" and "Enter" twice: • For samplers at a gaging station and thus connected to a Sutron datalogger, ensure the sampler indicates "Bottle 1 after 1". • For samplers not located at a gaging station, ensure the sampler indicates "Sampler inhibited".

5.8 Removing a Sampler

Route Lead	1.	Follow the steps in this process when a Work Order is received to un-install or remove a sampler.
	2.	Disconnect all equipment and remove from site. Return equipment to TA-64 compound.

Route Lead (cont.)	3.	Dispose of all equipment components that contacted samples (tubing, bottles, etc.) as waste according to applicable waste management procedure.

5.9 Submitting records resulting from this procedure

Field Planning and Work Authorization Data Manager	1.	When complete, submit the following to the Storm Water Records point of contact at TA-59, Bldg 53, utilizing the Storm Water Records Submittal form. • Completed Work Order

6.0 ATTACHMENTS

Attachment -1: ISCO Sampler Installation Form

Attachment -2: ISCO 3700 Configure Sequence

Attachment -3: ISCO 3700 Program Sequence

7.0 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)	
1	8/03	Annual review (issued as ENV-WQH-SOP-009)	
2	5/05	Added safety precautions and excavation permit requirements (issued as ENV-WQH-SOP-009.3)	
3	10/05	Removed steps for storm water sample collection and created new procedure, ENV-WQH-SOP-011, Collection of Storm Water Runoff Samples	
0	9/13/10	New document (issued as EP-DIV-SOP-10008, R0) Supersedes ENV-WQH-SOP-009.3; Reformatted and revised; updated organization	T/E
IPC-1	9/27/10	Added new column in Attachment 3 to reflect "Time Sampling with Multiplex and Toggle/Reset".	T

ATTACHMENT 1	
EP-DIV-SOP-10008-1 **ISCO Sampler Installation Form**	Records Use only Los Alamos NATIONAL LABORATORY EST. 1943

ISCO Sampler Installation Form (6/2010)

Work Order ID: SMPLR-1353 **Project ID: P-SMPLR-40**

DP-SMA-0.6 : SS081902 1 Date:_____ Time:_____

Project: 2009 Sampler Installation Name/∠#:_____

Target Date: 6/30/2009 Name/Z#:_____

Map ID: 09-0013-137-D003-DP0.6-R3 Lead Signature:_____ 14

"I confirm the information as recorded is true, accurate and complete."

Equipment	MFG	Model	Serial No.	Specification	Configuration
ISCO Sampler	ISCO	3700	207H00759	Bottle Set Configuration	24 1L Poly

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Sampler Installation		Note: If "No" provide correct information or explanation.
Is sampler installed according to steps in procedure?	❒Yes ❒No	3
Is Greenlee box used?	❒Yes ❒No	4
Record sampler serial number in equipment section above.	❒Yes ❒No	5
Is sampler physically configured for the types and number of bottles specified above?	❒Yes ❒No	6
Is sampler programming and configuration correctly set per procedure attachments for the number and types of bottles specified above?	❒Yes ❒No	7
Diagnostics test OK?	❒Yes ❒No	8
Record battery voltage. Is voltage acceptable?	❒Yes ❒No	9
Are electrical connections secure?	❒Yes ❒No	10
Is sampler ON upon departure?	❒Yes ❒No	11
Does ISCO display either "Bottle 1 of X after 1" or "Sampler Inhibited"?	❒Yes ❒No	12

Additional Notes:

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Continuation Form: ❒Yes ❒No

ATTACHMENT 2

EP-DIV-SOP-10008-2

ISCO 3700 Configure Sequence

Records Use only

Parameter	Delayed sampling with multiplex	Time sampling with multiplex	Flow sampling with multiplex
Time/ Date	[Set to MST]	[Set to MST]	[Set to MST]
Portable/ Refrig	Portable	Portable	Portable
Bottles	12 or 24	12 or 24	12 or 24
Bottle volume	950 ml	1000 ml	1000 ml
Suction line diameter	3/8 inch	3/8 inch	3/8 inch
Suction line type	Teflon	Teflon	Teflon
Suction line length	X feet	X feet	X feet
Liquid detector	Enable	Enable	Enable
Rinse cycles	0	1	1
Enter Head Manually	No	Yes	Yes
Retry	1	1	1
Program mode	Extended	Basic	Basic
Load program	None	N/A	N/A
Save program as	None	N/A	N/A
Take sample at start time	No	N/A	N/A
Take sample at time switch	No	N/A	N/A
Enter intervals in minutes	1 minute	N/A	N/A
Calibrate sampler	Disable	Enable	Enable
Sampling stop/resume	Disable	N/A	N/A
Start time delay	0 minutes	0 minutes	0 minutes
Master slave	No	No	No
Sample upon Disable	No	No	No
Sample upon enable	No	Yes	Yes
Reset sample interval	Yes	Yes	No
Inhibit countdown	Yes	Yes	No
Event marker	Pulse	Pulse	Pulse
At the beginning of:	Purge	Purge	Purge
Purge counts presample counts	150	100	100
Post sample counts	394	1000	1000
Pump counts	[500,000]	[500,000]	[500,000]
Reset pump counter	No	No	No
Pump counts to warning	500,000	500,000	500,000
Program lock	Disable	Disable	Disable
Sampler ID number is:	[leave blank]	[leave blank]	[leave blank]
Run diagnostics	Yes	Yes	Yes
Test distributor	Yes	Yes	Yes
Re-initialize	No	No	No

ATTACHMENT 3 IPC-1

EP-DIV-SOP-10008-3 IPC-1

ISCO 3700 Program Sequence

Records Use only

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Parameter	**Delayed sampling, with multiplex**
[Switch on liquid actuator]	Set to "Latch"
Paced sampling	Storm
Time Mode 1st Bottle Group	5-minute delay
Timed Sample Event	1
Bottle per sample event	11 or 23
Sample volume	950 ml
Bottles available	1
2nd bottle group	Time
2nd group samples	1-minute delay
Sample interval	1 minute
Bottles per sampling event	1
Sample per bottle	1
Sample volume	950 ml
Enter start time	No

[Programming complete]

Parameter	**Time sampling with multiplex and Latch**	**Time sampling with multiplex and Toggle/Reset**	**Flow sampling with multiplex**
[Switch on liquid actuator]	Set to "Latch"	Set to "Toggle/Reset"	NA
Paced Sampling	Time	Time	Flow
Sample Every	0 Hours, 1 min	0 Hours, 1 min	1 pulse
Multiplex Samples?	Yes	Yes	Yes
Bottles/sample or Samples/Bottle	Bottles/Sample	Bottles/Sample	Bottles/Sample
Bottles Per Sample Event	12 or 24	1	12 or 24
Sample Volumes of ___ ml	1000 ml	1000 ml	1000 ml
Suction Head	XX Ft	XX Ft	XX Ft
Calibrate Sample Volume	No	Yes/No: If Yes press "Manual Sample" when ready	No
Enter start time	No	No	No

[Programming complete]

IPC-1