Stormwater Sample Management Plan

June 12, 1997

Version 1.0

Flood Control District of Maricopa County
2801 West Durango Street
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Purpose:

This stormwater sample management plan is written to show the methods and guidelines that the District will use in stormwater sampling. The sample plan consists of two parts: a sample plan, and the Field Sampling Protocol. The Field Sampling Protocol will remain a separate document designed for the field technicians' use. However, it will become part of the overall Sample Management Plan.

The Stormwater Sample Management Plan will include the following items:

- Sample Plan
- QA/QC Program
- Sampling Protocol/SOPs
- Analyses, detection limits
- Procedures
- QC sampling
- QA/QC Program
- Chain of custody
- Maintenance / calibration logs
- Description of sampling sites
- EPA sampling guidance for grab and composite samples
- Cleaning

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1.0 PURPOSE

The purpose of the Stormwater Sample Management Plan is to provide information about the District's stormwater sampling program and about the methods and procedures used for the collection of samples.

This management plan is divided into two parts. The first part is a general description of the sampling program, along with program description. The second part is the existing Field Sampling Protocol manual. The Field Sampling Protocol manual will be part of the Stormwater Sample Management Plan and will exist as a separate document for use by field technicians.

In 1999, the EPA will notify the District that we are required to obtain an NPDES stormwater permit to discharge. It is expected that the permit will be effective in 2002. The requirements for the permit have not yet been established, but may be similar to the requirements in the 1990 regulation. Upon issuance of the permit requirements, this Plan will be revised to reflect any new sampling activities. This document summarizes the current program in 1997.

NOTE: This document and the Field Sampling Protocol, overall known as the Stormwater Sample Management Plan, will be updated regularly. Either part of the document may be updated independently of the other and therefore the internal document dates and versions may vary.

2.0 LOCATIONS AND SITE DESCRIPTIONS

2.1 Site Location

Currently the District monitors eleven fixed land-based sites. (The Dreamy Draw site will be added later in 1997 and Phoenix SR-21 is being relocated.) Gila Drain is sampled to collect background data for a future water quality project at that location.

Phoenix SR-03

Located approximately 1/4 mile north of the Salt River on 35th Avenue. The contributing sub basin is approximately 1363 acres, and the outlet is a 75-inch concrete pipe.

Phoenix SR-21

This site has been discontinued and another site will be chosen.

Phoenix SR-45

Located on the south bank of the Salt River at 40th Street. The contributing sub basin is approximately 120 acres, and the outlet is a 54-inch concrete pipe.

Phoenix IB-08

Located on the north bank of Indian Bend Wash on the east side of 40th Street. The contributing sub basin is approximately 609 acres, and the outlet is a 66-inch concrete pipe.

Mesa 1

Located on Horne and Sixth Streets. The contributing sub basin is approximately 193 acres, and the outlet is a 36-inch concrete pipe. The drainage area is an older residential area with irrigated lots.

Mesa 2

Located on Broadway Road approximately 1/8 mile west of Lindsay Road. The contributing sub basin is approximately 145 acres, and the outlet is a 72-inch concrete pipe. The drainage area is mainly a mobile home park located north of Broadway Road and east of the Consolidated Canal.

Mesa 3

Located on Fighter Aces Drive, approximately 1/4 mile north of McKellips Road on Falcon Drive, which is located approximately ½ mile east of Greenfield Road. The contributing sub basin is approximately 171 acres, and the outlet is a 48-inch concrete pipe. The drainage area is developed and undeveloped parts of Falcon Field Airport.

Mesa 4

Located on Horne and Grandview Avenue just before discharge into a large retention basin. The contributing drainage area is approximately 66 acres, and the outlet is a 54-inch concrete pipe. The drainage area is a housing subdivision built after 1980.

Mesa 5

Located on Dobson Road approximately 1/4 mile south of Broadway Road. The contributing drainage area is approximately 63 acres, and the outlet is a 30-inch concrete pipe. The drainage area is mainly commercial business.

South Mountain

Located on Central Avenue in South Mountain Park past the park offices. The drainage area is approximately 1120 acres, and the outlet is a 72-inch corrugated metal pipe. The drainage area is undeveloped parkland.

Dreamy Draw

Located in Dreamy Draw Park in the outlet from the dam. The drainage area is 832 acres. The sampling point has not yet been chosen. The drainage area is mainly undeveloped mountain preserve.

Gila Drain

Located in the Gila Drain on 56th Street approximately 1/4 mile east of I-10. The drain is an irrigation tail water and Tempe stormwater drain.

2.2 Site Specific Information

Site	Drainage Area (acres)	Pipe Diameter (inch)	Pipe Slope (ft/ft)	Roughness Coefficient
Phoenix SR-03	1363	75	0.0009 [1]	0.013
Phoenix SR-21†	630	90	0.0024 [1]	0.013
Phoenix SR-45	120	54	0.0023 [1]	0.013
Phoenix IB-08	609	66	0.0032 [1]	0.013
Mesa 1	193	36	0.0029 [2]	0.013
Mesa 2	145	72	0.0011 [2]	0.013
Mesa 3	171	48	0.0014 [2]	0.013
Mesa 4	66	54	0.0040 [2]	0.013
Mesa 5	62	30	0.0014 [2]	0.013
South Mountain	1120	72	0.040	0.014
Dreamy Draw	832	N/A	N/A	N/A
Gila Drain	N/A	N/A	N/A	N/A

[1] City of Phoenix Stormdrain As-Builts
[2]City of Mesa
†Site is discontinued

2.3 Field Equipment

NPDES Water Quality Sites

The NPDES sites maintained by the District use Sigma automatic sampling equipment. Equipment in Mesa is the Sigma 800SL Sampler with integral

flowmeter. A dialout alarm and modem are exclusive from the sampler unit. Equipment in Phoenix is the Sigma 900 MAX Sampler with integral flowmeter, modem, and dialout alarm.

The five sites in Mesa have electric power supplied by Salt River Project and telephone service provided by US West. The four sites in Phoenix do not have commercial power, but are powered by battery charged by solar panel. The sites have telephone service provided by US West.

Non NPDES Water Quality Sites

Automatic sampling equipment used in non-NPDES compliance situations use the Isco 3230/4230 flowmeter and Isco 3700 sampler.

Currently, Isco samplers are in use at the Phoenix SR-45 and Phoenix IB-08 NPDES locations to capture grab samples to evaluate first flush pollution.

3.0 SAMPLING PROGRAM

3.1 Sampling

A sampling event occurs when rainfall and flow are detected at a sample site. The parameters for sampler initiation are presented in the following table.

SITE	RAINFALL (inch)	LEVEL (inch)
Mesa 1	0.05	0.5
Mesa 2	0.05	0.5
Mesa 3	0.05	0.5
Mesa 4	0.05	0.5
Mesa 5	0.05	0.5
Phx SR-03	0.05	0.5
Phx SR-21	0.05	0.5
Phx SR-45	0.05	0.5
Phx IB-08	0.05	0.5
Gila Drain	0.10	NA
South Mountain	NA	1.5
Dreamy Draw Dam	NA	1.5

Gila Drain is set to start on rain only because there is usually flow in the channel. South Mountain and Dreamy Draw Dam are set to start on level only because it is likely that there will be many rain events without flow, or a rain event may occur before flow begins.

Once the initiation parameters have been met, a series of actions occurs which notifies the sample technicians of the sampling event.

Grab samples, composite samples, and quality control samples are taken by the technicians and the automatic equipment.

3.1.1 Grab Samples

Grab sampling is a technique used to collect samples that are not amenable to collection with an automatic sampler. Pollutants such as oil and grease, volatile organic compounds, and fecal bacteria are best taken as grab samples. It is best to collect samples for these analyses directly from the discharge. In the Mesa samplers, most of the sample collection points are in manholes in busy streets, making it difficult if impossible to collect grab samples directly. The automatic equipment is used in these cases.

3.1.2 Composite Samples

A flow-weighted composite sample is also collected for each site. The flow-weighted sample is collected via the automatic sampling equipment. In the Sigma sampling equipment, the composite sample is collected in jars three through eight.

Four individual samples are collected in each jar, for a total of 24 aliquots collected. Each aliquot is collected based on a pre-set amount of flow passing across the flow sensor.

Each of the 24 aliquots in the six jars is placed in a large vessel for compositing. Once the individual aliquots are together, individual pre preserved bottles are filled. This procedure is most often done at the contract laboratory, but is sometimes done by the sampling technicians at the Instrumentation Lab.

3.1.3 Quality Control Samples

Quality control (QC) samples are taken to measure contamination of samples and equipment that may have been introduced by sampling techniques, and to check the accuracy of the contract laboratory. Three types of QC samples are taken: travel blanks, field duplicates, equipment blanks.

Travel blanks assess contamination during transport of the volatile organic samples to the laboratory. Field duplicates assess the accuracy of the laboratory analyses. Equipment blanks measure the effectiveness of cleaning of the sampling equipment.

3.2 Representative Storm

A representative storm has the following characteristics:

	Rainfall (inch)	Duration (hours)
SUMMER (June - Sept.)	0.2 - 0.8	2.2 - 6.5
WINTER (Oct. - May)	0.2 - 0.7	5.2 - 15.6

and no rainfall 72 hours prior to the representative event.

The District's policy has been to sample all storms that have a rainfall total of greater than 0.05 inches in 90 minutes. This plan works well because sometimes equipment fails and sampling opportunities are missed. The time limit on the rainfall will be decreased to 60 minutes.

3.3 Analyses of Samples

Since the sampling program began in 1993, the District has sampled for the same general set of constituents, with analyses being updated as necessary. Each sample is currently analyzed for approximately 160 analytes or compounds.

The following is a list of the analyses/methods:

BOD5, Fecal Coliform, Fecal Streptococci, Oil & Grease, EPA 624 (purgeables), COD, Chloride, TDS, TSS, Ammonia, Nitrates, Nitrites, Organic Nitrogen, Kjeldahl Nitrogen, Phosphorous total/dissolved/ortho, Total Organic Carbon, Alkalinity, Hardness, Sulfate, Metals total/dissolved (Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, Zn), EPA 608 (organochlorine pesticides), EPA 625 (Base/Neutral/Acid compounds).

3.4 Detection Limits

The detection limits for the analyses have been determined from the State Surface Water Quality Standards. Limits are based on the most stringent requirement for all applicable water uses. A copy precedes Section 5.0.

3.5 Surface Water Quality Standards

The reader is referred to Title 18, Chapter 11 of the Arizona Administrative Code, "Department of Environmental Quality, Water Quality Standards," for Arizona State Surface Water Quality Standards.

Surface water quality standards are developed by ADEQ. Standards differ and are based on the designated uses of a water course or water body.

4.0 QUALITY ASSURANCE / QUALITY CONTROL

The Quality Assurance / Quality Control (QAQC) program for the District's sampling is designed to ensure that the samples collected are of high quality and that the laboratory analyzing the samples is producing quality results. The program consists of sampling procedures, quality control samples, and maintenance of the sampling equipment.

4.1 Lab QA/QC Procedures

The contract laboratory has a full set of Quality Assurance procedures that cover all aspects of operations from building maintenance, sample log in, sample tracking, and sample analysis. A copy of the document is available at the District.

4.2 Sample QA/QC Procedures

The sample QAQC procedures consist of preparedness and sampling.

4.2.1 Preparedness

Sample equipment, bottles, and forms are all set up at each sampling site prior to a storm event. This helps to ensure that the proper laboratory bottles and sampler jars are at each site before a storm event occurs. By preparing for an event ahead of time, the possibility of filling incorrect bottles or mislabeled bottles can be avoided. All equipment is readied within five days after the previous storm event.

Readying a site includes:

- Placing clean sample jars in the sampling unit.
- Placing clean, labeled grab sample bottles at each site.
- Setting the sampler unit in a ready position for the next event.
- Cleaning the intake tubing.
- Checking for hardware problems.
- Correcting hardware problems that surfaced during a previous event.

4.2.2 Field QAQC Samples

Three types of QAQC samples are taken: Travel Blanks, Field Duplicates, and Equipment Blanks.

Travel Blanks are samples that accompany EPA 624, Volatile Organics samples. One set of travel blanks is placed in each cooler that contains VOC samples. The lab supplies the travel blanks and they are not opened during the sampling process. Travel blanks measure contamination that may occur during transportation to the lab.

Field Duplicates are samples taken when a normal sample is taken. The Field Duplicate and Normal sample results are compared to measure errors introduced by the laboratory. Because most of the sample volume collected by the automatic equipment is required for a full analysis, Field Duplicates will be split from one composite sample and analyzed for a reduced schedule of pollutants. The reduced schedule will include those pollutants most likely to be detected. Samples will be analyzed for total metals, Kjehldal Nitrogen, Nitrate, Nitrite, and Phosphorous.

Equipment Blanks are samples taken immediately after the equipment has been cleaned. The Equipment Blanks will be taken on the sample intake tubing and the glass sampler jars used in the automatic sampler equipment. Deionized water is used as the medium. Deionized water is poured into the glassware or pumped through the intake tubing directly into laboratory sample containers. Samples will be analyzed for total metals, Kjehldal Nitrogen, Nitrate, Nitrite, and Phosphorous.

4.3 Cleanliness

The cleanliness of the equipment is vital to ensuring that contamination is not introduced from a controllable factor. Both the intake tubing and the sample jars are cleaned to ensure no sample contamination.

Equipment cleaning consists of the following steps:

1. Disconnect intake tubing on sampling unit
2. Pump tap water through the tubing.
3. Pump Liquinox® mixed with tap water through the line.
4. Pump copious amounts of tap water through line.
5. Pump nitric acid through line.
6. Pump deionized water through line.
7. Pump methanol through line.
8. Rinse deionized water through line.

NOTE: See the Field Sampling Protocol for the necessary volumes.

Glassware cleaning consists of the following steps:

1. Wash the container with Liquinox® solution using a wire brush to clean sides.
2. Thoroughly rinse containers with tap water.
3. Rinse the container with nitric acid.
4. Rinse the container with deionized water.
5. Rinse with methanol.
6. Thorough final rinse with deionized water.

NOTE: See the Field Sampling Protocol for the necessary volumes.

4.4 Calibrations

Equipment calibrations will be conducted periodically to ensure that the automatic sampling equipment is operating properly. Calibrations of the flow measuring devices (pressure transducers) and sample intake volume are conducted at least twice per year.

For reference, a log of the calibration will be kept. The information to be kept in the log should include at least the following:

Date of the calibration
Time of calibration
Person(s) doing calibration
Depth of water to which PT probe is submerged
Volume of water pumped to calibrate sampler delivery volume

4.5 Chain of Custody

A Chain of Custody form is completed for each sample collection event. The contract laboratory provides the form. All individuals in whose physical possession the samples fall sign the form.

4.6 Field Records

A field notebook is kept to record all activities at each site. Information such as sampling events times and dates, calibration activities, and maintenance activities are recorded in the book.

4.7 Data Retrieval and Storage

There are two primary types of data collected in the stormwater monitoring program: Water Quality and Flow/Ambient Conditions.

4.7.1 Water Quality Data

The water quality data is a direct result of the samples collected during a storm from grab and composite samples. The samples are analyzed for the pollutants listed previously in section 3.3. Data is reported from the contract laboratory as hard copy and electronic file on disk.

All reports from the contract laboratory are reviewed when received. The review checks the data against that requested on the chain-of-custody and the data request form. The data is also checked to ensure that the results are acceptable and no unusual results have been reported.

The numerical data is currently entered into a Microsoft Excel spreadsheet. Electronic data is provided on disk in the Excel format. The hard copies of the laboratory reports are retained at the District offices. Attached to all reports is a Quality Control Report, which is kept separately at the District offices.

4.7.2 Flow/Ambient Data

Along with the water quality data, a number of parameters are collected and retained as part of the overall storm data. Data collected in this category includes:

Rainfall
Maximum 5-minute rainfall intensity
Runoff quantity sampled
Total storm runoff
Peak discharge

Days since last measurable rain
Storm Duration
Land use characteristics
Basin size

Flow data is downloaded by telephone line or direct connection with field equipment. Data is checked to ensure integrity.

4.8 Preventative Maintenance

Maintenance of the equipment will be on a scheduled, periodic basis. A regular six-month and annual maintenance will be done.

The six-month maintenance will consist of:

1. Calibrate the depth sensor.
2. Calibrate the pumped sample volume.
3. Check and clean raingages of debris.
4. Inspect sample intake line, connections, cables, pump tubing, batteries, solar panels, and battery charging system.

The annual maintenance will include the six month maintenance, and:

1. Replace sample intake tubing.
2. Replace sampler pump tubing.
3. Rinse new intake tubing with deionized water.

Since equipment failures tend to increase with time, more frequent maintenance may be required. Any repairs and replacements will be made as necessary. In addition, an Equipment Blank sample may indicate the need for tubing replacement before scheduled replacement.

4.9 Record Keeping

All records will be kept at the District offices, except for the field notebook kept at each site. Calibration and field records are kept in the Instrumentation Lab. Chains of custody, laboratory reports, and flow data are kept in the District Administration Building.

4.10 Equipment Replacement

As mentioned previously, equipment failures increase with age. It is the District's policy to replace equipment that is no longer functional. All equipment is first repaired for reuse. If a problem persists, the equipment will be replaced.

References

Environmental Sampling and Analysis for Technicians, Csuros, Maria, Lewis Publishers, 1994

NPDES Storm Water Sampling Guidance Document, U.S. Environmental Protection Agency, Document number EPA 833-B-92-001, July 1992.

City of Phoenix Part II NPDES Permit Application, Woodward Clyde Consultants, 1992.

Detection Limits
(based on water quality standards)

Method	Parameter	Detection Limit
200.7	ANTIMONY (AS Sb)	30
200.7	ARSENIC (AS As)	3.1
200.7	BERYLLIUM (AS Ba)	0.21
213.2	CADMIUM (AS Cd)	0.4
218.2	CHROMIUM (AS Cr)	1000
220.2	COPPER (AS Cu)	4
239.2	LEAD (as Pb)	1
245.1	MERCURY (as Hg)	0.01
249.2	NICKEL (as Ni)	49
200.7	SELENIUM (as Se)	2
200.7	SILVER (as Ag)	0.4
200.7	THALLIUM (as Tl)	44
289.2	ZINC (as Zn)	33
350.3	AMMONIA	9.3
300.0	CHLORINE (TOTAL RESIDUAL)	5
335.3	CYANIDE	9.7
353.2	NITRATE (as N)	NNS
353.2	NITRATE / NITRITE (total as N)	NNS
353.2	NITRITE (as N)	NNS
608	ALDRIN	0.0003
608	BHC - ALPHA	0.03
608	BHC - BETA	0.02
608	BHC - DELTA	130
608	BHC - GAMMA (LINDANE)	0.02
608	CHLORDANE	0.001
608	DDD	0.0009
608	DDE	0.0006
608	DDT	0.0005
608	DIELDRIN	0.0002
608	ENDOSULFAN SULFATE	0.06
608	ENDOSULFAN - ALPHA	0.06
608	ENDOSULFAN - BETA	0.06
608	ENDRIN	0.004
608	ENDRIN ALDEHYDE	0.08
608	HEPTACHLOR	0.0002
608	HEPTACHLOR EPOXIDE	0.0001
608	PCBs	0.00009
608	TOXAPHENE	0.005
624	ACROLEIN	30
624	ACRYLONITRILE	0.64
624	BENZENE	120
624	BROMOFORM	80
624	CARBON TETRACHLORIDE	5.5
624	CHLOROBENZENE	500
624	CHLORODIBROMOMETHANE	12
624	CHLOROETHANE	NNS
624	2 - CHLOROETHYL VINYL ETHER	9800
624	CHLOROFORM	590

Detection Limits are from the Standards, and are not lab detection limits.

Note: Some detection limits are below what the instrumentation is able to detect.

Detection Limits
(based on water quality standards)

Method	Parameter	Detection Limit
624	DICHLOROBROMOMETHANE	10
624	DICHLOROBROMOPROPANE	NNS
624	1,1 - DICHLOROETHANE	14000
624	1,2 - DICHLOROETHANE	120
624	1,1 - DICHLOROETHYLENE	4.5
624	1,2 - CIS - DICHLOROETHYLENE	NNS
624	1,2 - TRANS - DICHLOROETHYLENE	2800
624	1,2 - DICHLOROPROPANE	200
624	1,3 - DICHLOROPROPENE	60
624	ETHYLBENZENE	1400
624	ETHYLENE DIBROMIDE	NNS
624	METHYL BROMIDE	200
624	METHYL CHLORIDE	1800
624	METHYLENE CHLORIDE	480
624	STYRENE	NNS
624	1,1,2,2 - TETRACHLOROETHANE	11
624	TETRACHLOROETHYLENE	11
624	TOLUENE	180
624	1,2,4 - TRICHLOROBENZENE	300
624	1,1,1 - TRICHLOROETHANE	1600
624	1,1,2 - TRICHLOROETHANE	31
624	TRICHLOROETHYLENE	78
624	VINYL CHLORIDE	620
624	XYLENES (TOTAL)	NNS
625	ACENAPHTHENE	550
625	ACENAPHTHYLENE	0.002
625	ANTHRACENE	6300
625	BENZIDINE	0.0007
625	BENZO (A) ANTHRACENE	0.00008
625	BENZO (A) PYRENE	0.002
625	BENZO (GHI) PERYLENE	0.00001
625	BENZO (K) FLUORANTHENE	0.00001
625	3,4 - BENZOFLUORANTHENE	0.00004
625	BIS - (2-CHLOROETHOXY) METHANE	NNS
625	BIS - (2-CHLOROETHYL) ETHER	1.4
625	BIS - (2-CHLOROISOPROPYL) ETHER	5600
625	BIS - (2-ETHYLHEXYL) PHTHALATE	7.4
625	4 - BROMOPHENYL PHENYL ETHER	14
625	BUTYL BENZYL PHTHALATE	130
625	2 - CHLORONAPTHALENE	11000
625	2 - CHLOROPHENOL	150
625	3 - METHYL - 4 - CHLOROPHENOL	4.7
625	4 - CHLOROPHENYL PHENYL ETHER	NNS
625	CHRYSENE	0.0001
625	DIBENZO (AH) ANTHRACENE	0.00003
625	1,2 - DICHLOROBENZENE	470
625	1,3 - DICHLOROBENZENE	970
625	1,4 - DICHLOROBENZENE	780

Detection Limits are from the Standards, and are not lab detection limits.

Note: Some detection limits are below what the instrumentation is able to detect.

Detection Limits
(based on water quality standards)

Method	Parameter	Detection Limit
625	3,3 - DICHLOROBENZIDINE	0.09
625	2,4 - DICHLOROPHENOL	88
625	DIETHYL PHTHALATE	1600
625	DIMETHYL PHTHALATE	1000
625	2,4 - DIMETHYLPHENOL	310
625	2,4 - DINITROPHENOL	9.2
625	2 - METHYL - 4,6 - DINITROPHENOL	24
625	2,4 - DINITROTOLUENE	0.02
625	2,6 - DINITROTOLUENE	NNS
625	1,2 - DIPHENYLHYDRAZINE	0.25
625	DI - N - BUTYL PHTHALATE	35
625	DI - N - OCTYL PHTHALATE	NNS
625	FLUORANTHENE	130
625	FLUORENE	580
625	HEXACHLOROBENZENE	0.002
625	HEXACHLOROBUTADIENE	0.52
625	HEXACHLOROCYCLOPENTADIENE	0.3
625	HEXACHLOROETHANE	4.8
625	INDENO (1,2,3 - CD) PYRENE	0.000003
625	ISOPHORONE	520
625	NAPHTHALENE	560
625	NITROBENZENE	70
625	2 - NITROPHENOL	NNS
625	4 - NITROPHENOL	3000
625	N - NITROSODIMETHYLAMINE	2.1
625	N - NITROSODIPHENYLAMINE	12
625	N - NITROSODI - N - PROPYLAMINE	0.51
625	PENTACHLOROPHENOL	10
625	PHENANTHRENE	0.0005
625	PHENOL	1000
625	PYRENE	1100
625	2,4,6 - TRICHLOROPHENOL	4.9

Detection Limits are from the Standards, and are not lab detection limits.

Note: Some detection limits are below what the instrumentation is able to detect.

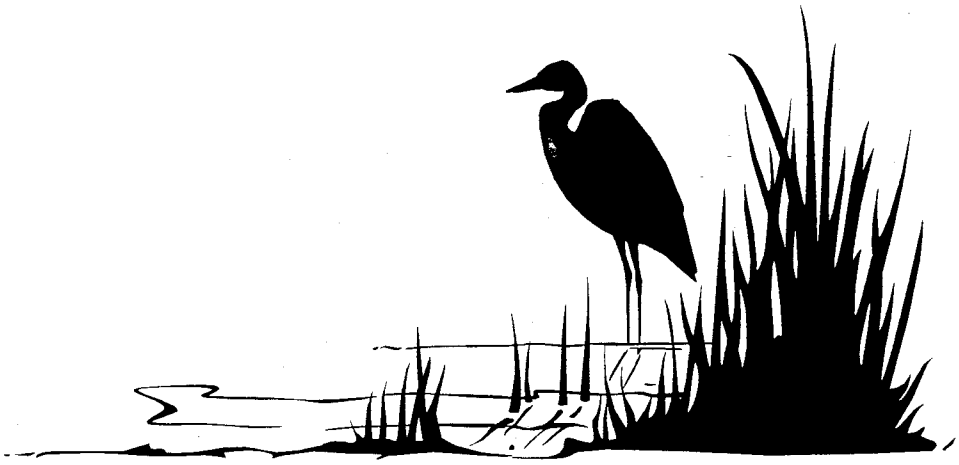
5.0 Field Sampling Protocol

The Field Sampling Protocol is a stand-alone document. However, it is incorporated into this document for completeness. A copy of the document follows this page.

Field Sampling Protocol

September 3, 1997

Version 4.1



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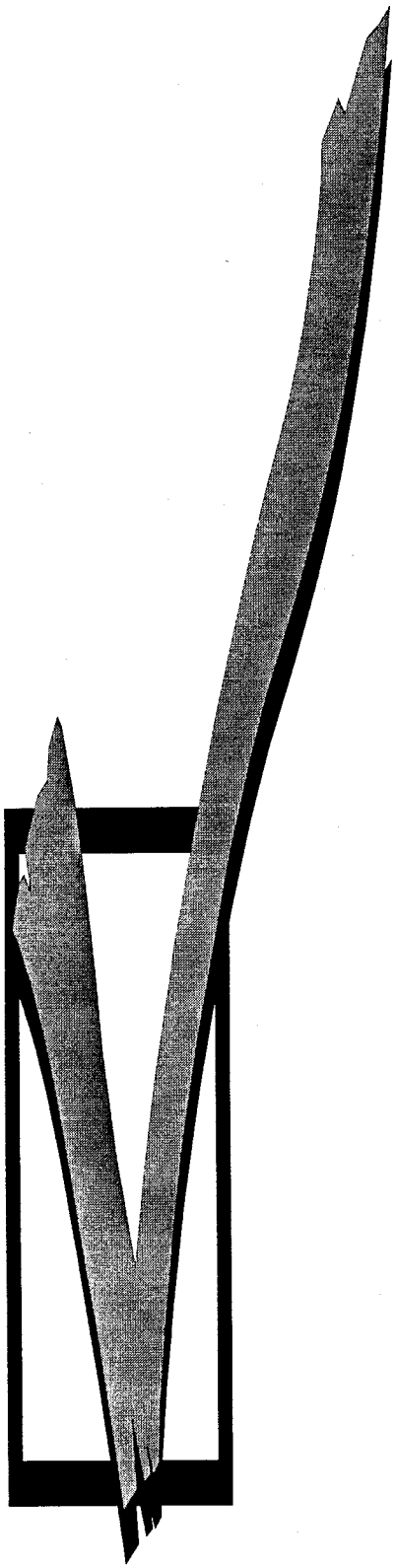
Sampling Checklist



- Refer to PROCEDURE SHEETS
- Check Voice Mail
- Check sampling status via computer
- Gather equipment - coolers, ice, pH/temperature probes, gloves, etc...
- Call lab to alert them about incoming samples
- Collect grab samples and return them to lab within 6 hours of collection. Collect grabs in laboratory bottles when possible
- Collect composite samples
- Hold one composite sample for a QC sample
- Prepare the QC sample, and turn in to the lab
- Turn composite samples in to the lab
- Clean station equipment
- Take an equipment blank QC sample at one site
- Download data

GRAB SAMPLE COLLECTION PROCEDURE

1. Ensure that the laboratory grab sample bottles are properly labeled prior to filling.

2. Remove the sample jars (1 & 2) from the sampler unit. It is best to do this without PAUSING the sampler program. (For South Mountain and Dreamy Draw Dam, use all 8 jars.)

3. Place ice around the remaining jars in the sampler unit.

4. If possible, collect grab samples from the discharge into the laboratory provided bottles.

   If this is not possible, transfer the grab sample from jars 1 and 2 into the laboratory provided bottles.

   Be careful not to overfill the bottles and spill out any preservative. If any bottles were overfilled, DO NOT submit those bottles, as the sample is no longer properly preserved. Use another bottle if it is available.

   South Mountain and Dreamy Draw Dam samples can be taken from the automatic sampler.

5. Place all labeled bottles into an ice chest surrounding the bottles with ice. Place the 6 travel blank bottles into the ice chest also.

6. Collect pH and temperature data and record them on the field data sheet.

7. Record the time, date, and sample number on the chain of custody form.

8. Before leaving, ensure that the sampler is running and not paused. If the sampler is paused, RESUME the sampling program. Do not use START SAMPLING to restart the sampler.

COMPOSITE SAMPLE COLLECTION PROCEDURE

1. Remove the composite sample jars from the sampler unit. Cap the jars and place them into a suitable carrying case or ice chest. Add ice to the case or chest.

   Do not reset the sampler program at this time. If this is done, all of the flow data will be erased. If the sampler is accidentally reset, DO NOT submit the samples to the lab. The water quality data is not useful without the flow data.

2. Fill out the Chain of Custody sheet indicating time, date, and sample number on the form.

3. If the contract lab is available, take the samples to the contract lab for compositing and preservation. Skip remaining steps.

4. If the contract lab is unavailable, take the samples to the Instrumentation Lab for compositing.

5. Take the composite jars for a single site and combine the contents into a single clean glass compositing jar.

6. Using a clean glass or stainless steel rod, gently stir the contents of the composite jar.

7. Using the Sample Bottle Priority sheet in the Appendix, fill the laboratory provided sample bottles using either a pipette or stopcock on the jar. The sample bottles should be filled to within one inch from the top. DO NOT overfill the bottle.

8. Fill out the Lab Analysis Sheet in the Appendix. Use a separate sheet for each site.

   The compositing jar must be cleaned after each use. Use the following procedure to clean the jars, stirring rod, and pipette or stopcock.

GLASSWARE CLEANING PROCEDURE

1. Pour out any remaining contents, and rinse thoroughly with tap water.
2. Wash the container with Liquinox® solution. Use a wire brush to scrub the inside of the container.
3. Thoroughly rinse the container with tap water.
4. Rinse the container with nitric acid.
5. Rinse with deionized water.
6. Rinse with methanol.
7. Thoroughly rinse with deionized water.
8. Rinse with acetone if the vessel is to be used again immediately. If not, allow to air dry.

Deionized water is available from the laboratory on request.

MSDS sheets must be available for nitric acid and methanol, both of which are harmful chemicals.

QUALITY CONTROL SAMPLING PROCEDURES

QC samples are only taken if more than 5 samplers collected samples.

TRAVEL BLANKS

1. These are provided by the lab. Submit one set of six bottles for each container of grab samples.

FIELD DUPLICATES

1. Using one set of jars from one site only, this sample will become the Field Duplicate. The site used for a Field Duplicate sample WILL NOT be submitted as a regular storm sample.

2. Composite as described in the COMPOSITE SAMPLING PROCEDURE.

3. Fill TWO sets of Field Duplicate bottles. (You will have two samples.)

4. Provide separate identification numbers for each set. Place samples in ice chest and fill with ice. Fill out Chain of Custody form. Submit samples to lab.

EQUIPMENT BLANKS

1. After sample event, clean the automatic samplers as usual. The equipment must be cleaned prior to the sampling.

2. At one site per event, disconnect the intake tubing in the pipe.

3. Using the manual sampling feature on the automatic sampler, pump deionized water through the intake tubing directly into laboratory provided bottles.

4. Give a sample identification number, fill out the chain of custody, place the samples on ice, and submit to the lab.

EQUIPMENT CLEANING PROCEDURE

1. Disconnect the intake tubing on the sampler unit.

2. Pump a gallon of tap water through the intake tubing. Pump this water into the stormdrain.

3. Pump a 1-liter mixture of tap water and Liquinox® through the intake tubing.

4. Pump a large amount of tap water through the intake tubing line to flush the soap out of the line.

5. Pump 1 half liter of nitric acid through the line.

6. Pump approximately 1 liter of deionized water through the line.

7. Pump approximately one half-liter methanol through the line.

8. Final rinse of approximately 2 liters deionized water through the line.

9. Reconnect the intake tubing line on the sampler unit.

10. Reset the sampler for the next storm event.

NOTE: Deionized water can be obtained from the lab on request.

DATA DOWNLOADING PROCEDURES

800 SERIES SIGMAS
(MESA, GILA DRAIN, SOUTH MOUNTAIN, DREAMY DRAW)

Remotely, the data can be downloaded by site from a computer through the program BITCOM. Once BITCOM is started, a screen should have the sites listed.

1. Select the site to interrogate.
2. Press the Escape key and press the Enter key.
3. Once connection has been made, wait for the timer to count 20 seconds. When 20 seconds have elapsed, press C (or shift C, the C must be in capital.)
4. The data should begin to scroll. Download time takes approximately 15 minutes. The download is done when the data stops scrolling.
5. Once complete quit BITCOM. The file the data is stored in is called bitcom.tra.
6. From the C: prompt, type rename bitcom.tra siteID.sam, where siteID is MESA1 etc.
7. Then at the C: prompt, type del bitcom.tra.
8. Restart BITCOM and repeat the steps until all sites have been interrogated.

At each site, the data can be downloaded onto a DTU. This procedure is necessary whenever a phone download fails, or no phone line exists. To use the DTU, connect the DTU and the sampler unit's RS-232 port. Follow the directions on the DTU unit for downloading.

900 SERIES SIGMA SAMPLERS (PHOENIX SITES)

Download of data from the 900 series samplers requires a program called INSIGHT be installed on a laptop or office computer. INSIGHT allows modem or RS-232 connection to the sampler.

If connecting by modem, click on the Modem button in the Insight program. If connecting directly, click on the 900 MAX button in the program. The appropriate site should be chosen for connection. Once connection has been made, the screens will ask for the operation (in this case "Retrieve Logged Data").

A central computer will be programmed to collect data on a schedule, and assuming it works, 900 series data collection should be automated.

Changes from the Third Edition

1. Samplers must be readied within 5 days of the previous storm event. Previously, samplers were required to be readied for another event within 72 hours of the previous event.

2. Inclusion of Sampling Checklist.

3. Changes have been made to the Quality Control Sampling section. The changes should make this activity easier to accomplish.

4. Procedure sheets have been added for Grab Sampling, Composite Sampling, Glassware Cleaning, and Equipment Cleaning.

1.0 Priorities

Safety of personnel is the highest priority. Care must be exercised when handling samples and sample containers, and when out on busy streets collecting samples and doing maintenance work. Sample integrity and quality is also high priority. Collection, preservation, and delivery of samples to the lab take priority over any other activity, such as cleaning stations.

Please note the following items:

- Always wear latex gloves when handling samples. (Use only latex gloves.) In addition to the threat of dermal exposure to hazardous compounds, contact between skin and samples can introduce contamination to the samples resulting in false results.

- Use caution when entering manholes to service the sampler intake tubing and depth sensors. Proper Standard Operating Procedures must be followed for Confined Space Entry.

- Always keep samples as cool as possible. The regulations require samples be kept at 4 degrees Celsius. Actually cooling the samples to that temperature may not be possible. However, keeping the samples iced and as cool as possible shows a good faith effort in following the regulations. Lower temperatures discourage bacterial growth and slows the breakdown process of nutrients and organics in the sample. Always use ice during all phases of sample collection and preservation.

- Collect samples as quickly as possible. Ideally, no sample should sit more than two hours once sampling has ended.

- Take composite samples to the lab for preservation ASAP or preserve samples at the office ASAP. Once samples are collected and cooled, samples should be transferred to the plastic and glass bottles/jars for delivery to the lab. Preservation of samples inhibits bacterial growth and breakdown of pollutants.

- Follow the Sample Bottle Fill priority sheet located in the Appendix. This will allow the most important parameters to be analyzed when an insufficient sample has been collected by the sampler.

2.0 Site Basics

The District has 12 stormwater monitoring sites that it currently maintains. There are five land based sites in Mesa, six in Phoenix, and one at the Gila Drain on the Gila River Indian Community.

The sites are identified as follows:

MESA-1	Horne and Sixth Street	644-1691
MESA-2	Broadway and Lindsay	644-1998
MESA-3	Falcon Field	830-6929
MESA-4	Horne and Grandview	644-1455
MESA-5	Dobson and Broadway	644-1599
PHX-1	Salt River and 35th Avenue (north bank)	278-9457
PHX-2	Salt River and 67th Avenue (north bank)	
PHX-3	Salt River and 40th Street (south bank)	470-0127
PHX-4	Indian Bend Wash and 40th Street	494-9926
Gila Drain	Maricopa Road and I-10	
South Mountain	Central Avenue in South Mountain Park	
Dreamy Draw	Outlet of Dreamy Draw Dam	

3.0 Equipment Setup

3.1 Site Specific Equipment

An assortment of equipment is employed in the notification and sampling efforts.

The five sites in Mesa have identical setups. The following equipment is used:

Sigma 800 SL Automatic Sampler with integral flowmeter
8 jar configuration, jar volume = 1900 mL (15.2L total)
Autodialer
Modem
Raingage

Each site in Mesa also contains a large grey tote with eight bottles in addition to the eight in the sampler unit.

Four sites in Phoenix (PHX 1-4) have identical setups. The following equipment is used:

Sigma 900 MAX Automatic sampler with integral flowmeter, modem, and dialout alarm.
8 jar configuration, jar volume = 1900 mL (15.2L total)
Raingage

The sites at Gila Drain, South Mountain, and Dreamy Draw Dam will have identical setups, except that Gila Drain will have a cellular phone, and South Mountain and Dreamy Draw will have no phone communications.

Sigma 800 SL Automatic Sampler with integral flowmeter
Raingage

3.2 Programming of Equipment

Specific programming for each site is included in the Appendix. Updates will be forwarded to you.

4.0 Safety

A number of safety issues need to be considered when sampling. There are concerns of traffic safety and sample/chemical handling safety. Furthermore, when performing routine maintenance involving manhole entry, additional precautions must be taken.

4.1 Traffic Safety

Most of the samplers are not located on busy streets. However, a few samplers are adjacent to busy streets. Care should be exercised so that traffic does not endanger work activities. When working in manholes in major streets, barricades should be set up to direct traffic away from work activities.

4.2 Sample / Chemical Safety

The stormwater samples contain contaminants of unknown composition. In most cases, the concentrations of contaminants in the stormwater are so low as to not be of concern. However, since the make up of the stormwater is unknown at the time of sampling, it is required that latex gloves be worn when handling stormwater. The gloves also prevent contamination from being transferred from hands to the samples. Furthermore, the latex gloves will protect skin from contact with the preservatives in some laboratory sample containers. The preservatives are either acids or bases. Both can burn skin.

If contact between skin and stormwater and/or preservatives occurs, wash the affected area with large amounts of water to dilute the contamination.

4.3 Maintenance Safety

Entering manholes may cause exposure to unknown vapors and gases in manholes. Proper Confined Space Entry procedures must be followed prior to entering manholes.

Confined Space Entry is not covered in this manual. A separate manual covers this subject.

5.0 Sampling Procedures

5.1 Sampler Storm Setup

Samplers must be readied for sampling within 5 days after the previous storm event. A number of bottles are necessary for the proper collection and preservation of the samples for analysis. Grab sample bottles will be kept at each site with lids tightly closed. Composite sample bottles will be kept at the District office. Clean sampler jars will be kept at the District office.

One set of grab sample bottles contain the following:

2	1-liter plastic, non preserved
2	125 mL plastic bacti bottles
2	1-liter amber glass, H_2SO_4 preserved
4	40 mL VOAs, HCl preserved
4	filled travel blank bottles, not to be opened

Site identification should be placed on the bottles prior to filling, and prior to the storm event. It is difficult to write on wet labels, whether it be from sample spillage or from rainwater. The travel blank bottles should have the site identification listed on them also.

In addition to the grab bottles, ten sets of laboratory composite bottles should be on hand at the District office. This allows us to composite and preserve the samples at the office should the contract laboratory not be available.

One set of composite sample bottles contains the following:

2	1 liter plastic, nonpreserved
1	1 liter plastic, H_2SO_4 preserved
1	1 liter plastic, NaOH preserved
1	1 liter plastic, HNO_3 preserved
2	1 liter amber glass, H_2SO_4 preserved
3	1 liter amber glass, nonpreserved

Always request a replacement set for any bottles used and submitted to the lab.

5.2 Sample Event

5.2.1 General

All samplers except Gila Drain, South Mountain, and Dreamy Draw Dam are set to activate when 0.05 inch of rain, and 0.5 inch of water level is reached at the gage. The table below gives the activation parameters for each site.

SITE	RAINFALL (inch)	LEVEL (inch)
Mesa 1	0.05	0.5
Mesa 2	0.05	0.5
Mesa 3	0.05	0.5
Mesa 4	0.05	0.5
Mesa 5	0.05	0.5
Phx 1	0.05	0.5
Phx 2	0.05	0.5
Phx 3	0.05	0.5
Phx 4	0.05	0.5
Gila Drain	0.10	NA
South Mountain	NA	1.5
Dreamy Draw Dam	NA	1.5

Gila Drain is set to activate on rain only because there is usually flow in the channel. South Mountain and Dreamy Draw Dam are set to activate on level only because it is likely that there will be many rain event without flow, or a rain event may occur before flow begins.

All sites except South Mountain and Dreamy Draw Dam will have dialout alarms which will call the voice mail number of 506-7300 and leave messages. The voice mail then pages the responders to notify them which gages have been activated.

Occasionally, a dialout alarm will fail. Some ALERT raingages have been set up to notify the voice mail that rainfall has occurred at the ALERT gages.

5.2.2 Grab Samples

All of the samplers are programmed to automatically collect a first flush grab sample as soon as the sampler has been activated.

Because Oil and Grease, Volatile Organic compounds, and bacteria are best not pumped through the sampler, it is required, when practical, to collect the samples manually from the discharge.

When the automatic sampler takes the first flush grab samples, it places them in the first two bottles.

The two bacterial samples have a short hold time of six hours. This means that from the time the sampler was activated, the sample must be collected, preserved, transported to the lab, and the analysis begun at the lab within six hours. If the sample is collected manually, the six hour period begins at that time.

Proper coordination with the lab must be done to ensure that this six hour window is met. If it is not possible to get to the lab with the sample taken by the automatic sampler within the six hours, another sample can be taken manually. (Use the manual sample feature on the sampler unit if it cannot be collected from the discharge.)

As mentioned previously, chilling the samples is extremely important. Ice is to be taken to all of the sites and placed around the jars in the sampler unit to keep the pumped samples as cool as possible. Samples remaining at ambient temperatures run the risk of having their chemical content altered from bacterial action and/or volatilization.

South Mountain and Dreamy Draw

For the South Mountain and Dreamy Draw samplers, a single sample will be distributed into all eight jars. The samples for these sites can be collected by the automatic sampler because no bacteria, volatile organic or oil & grease compounds will be analyzed.

Pour the contents of the eight jars into the laboratory provided sample bottles. Begin the filling from the first jar and progress to jar eight. Put the bottles in a cooler and surround by ice.

5.2.2 Composite Samples

Along with the grab samples, a flow-weighted composite sample is collected. This sample is based on a set quantity of water passing over the flow sensor between each aliquot collection. Each site has a different flow interval, based on site characteristics.

The composite will require from 2 to 16 hours to complete, depending upon the strength and intensity of the storm. In general, sampling is usually complete within a few hours. No sample should sit more than two hours once sampling is complete.

Sigma sampling equipment will indicate on the sampler unit's display if the program is complete. Occasionally, insufficient flow is produced from the storm to complete a sampling routine.

Composite samples will be collected in jars 3 through 8 in the Sigma samplers. The method for collecting, compositing, and preserving composite sample is given below.

Once the sampler is complete, or flow has stopped, remove jars 3 through 8 from the automatic sampler. Cap the jars and place them in a carrying case (Mesa) or an ice chest (Phoenix). Note the date, time, and sample number on a chain-of-custody form and in the Field Log Book.

If the contract lab is available, the samples will be transported to and composited by them. If the lab is not available, the samples will be first transported to the Instrumentation Lab for compositing and then to the contract lab for analysis.

To composite, take jars 3 through 8 for a single site and pour the contents into a large vessel. Using a clean glass rod, gently stir the contents. Fill the laboratory provided, preserved bottles. If only a small amount of sample is collected, fill the bottles according to the Sample Priority Sheet in the Appendix. After filling all bottles (or as many as possible), clean the vessel and repeat the procedure with the remaining sites. Once complete, transport the samples to the contract lab.

5.2.3 Quality Control Samples

To ensure that the data received from the lab is of highest quality, and to assess the cleanliness of the sample equipment, three types of QC samples will be submitted. Travel blanks, equipment blanks and field duplicates will be assessed. Travel blanks have been mentioned previously in the grab sample section.

For the NPDES stormwater monitoring project, one field duplicate and one equipment blank will be submitted per storm event when more than five samples are submitted. If the number of sites sampled is less than five, no duplicate or equipment blanks will be submitted. Travel blanks will be submitted each time the 40 mL VOA bottles are submitted.

Travel Blanks

The laboratory furnishes the travel blanks. These are used to assess whether contamination was introduced during transport of volatile organic samples to the lab.

There must be one set (4 bottles) of travel blanks per container that contain the 40 mL vials sampled.

Field Duplicates

Field blanks will assess the accuracy of the laboratory analyses. One site will be chosen to be the field blank sample for a given storm event, preferably the site most likely to display contamination; alternatively, the site providing the largest sample volume. Due to sample volume constraints, this site will not have the usual suite of NPDES analyses performed. It will have a lesser number of parameters analyzed as indicated below.

A sample will be collected in the usual manner, but will be brought to the District Instrumentation Lab instead of being taken to the lab for compositing. District personnel will composite the sample using the procedure given above. A special set of laboratory provided bottles will be used. The set will consist of two of each bottle type. Each 'pair' is filled in succession. The sample sets are given different sample identification numbers. The samples are submitted to the lab just as any other samples, with no mention made to the lab that this is a duplicate sample.

Duplicates will be analyzed for:

Total Metals
TKN, Nitrate, Nitrite, Phosphorous

These parameters were chosen because they are likely to be detected in most samples.

Equipment Blanks

The equipment blank will measure the effectiveness of the cleaning program of the sampling equipment.

One site will be chosen to serve as the equipment blank. The equipment is cleaned in the usual manner according to the instructions. After the cleaning, deionized water is pumped through the intake tubing directly into laboratory bottles for analysis.

Some sites, mainly in Mesa, will rarely be evaluated. A site with an easily accessible intake tubing should be used.

Equipment blanks will be analyzed for:

Total Metals as in the NPDES samples
TKN, Phosphorous, Nitrate, Nitrite

5.2.4 Multiple Sampler Sites

This section intentionally left blank.

5.3 Post Sample

5.3.1 Flow Data Collection

It is desirable to collect the flow data remotely from the office. However, this is not always possible due to modem problems or lack of a phone line.

As required, data will be collected in the field using a DTU. A different DTU is required for the Sigma 800 SL and the Sigma 900 MAX.

Mesa Sigmas and the sampler at Gila Drain can be collected by phone line using the Bitcom program. Phoenix samplers can be interrogated by phone line using a program called Insight. Data also can be collected directly from the equipment with a laptop computer and connect cable using the Insight program.

The samplers at South Mountain and Dreamy Draw must be collected by DTU. DTU data can be downloaded into the Insight program.

5.3.2 Post Event Cleaning

Cleaning of the sample equipment is very important in obtaining high quality samples. The sample jars should be cleaned according to the GLASSWARE CLEANING PROCEDURE, and the intake tubing line should be cleaned according to the EQUIPMENT CLEANING PROCEDURE. The contract lab will clean the sample jars when they are taken to the lab for compositing.

6.0 Periodic Maintenance

6.1 Six Month Maintenance

1. Calibrate the depth sensor
2. Calibrate the pumped sample volume
3. Check and clean rain gages of debris
4. Inspect sample intake line, connect cables, connections, pump tubing, batteries, solar panels, batteries, charging system

Make any repairs or replacements as necessary.

6.2 Annual Maintenance

1. Perform the Six Month Maintenance
2. Replace sample intake tubing
3. Replace sampler pump tubing
4. Rinse new intake tubing with deionized water

6.3 As Needed Maintenance

As equipment ages and fails, equipment should be replaced as quickly as possible. A small inventory of parts should be on-hand to replace failed parts. Replacement of stocked parts should be done within 2 weeks of problem report. Ordered parts should be replaced within a week of being received. As equipment is replaced, calibrations need to be performed.

6.4 Recordkeeping

A maintenance log needs to be kept. The log is part of a larger quality assurance and quality control program.

Maintenance records should include the date, time, personnel doing the service, and a description of the service done.

Calibration records should include the date, time, personnel doing the calibration, depth to which sensors are calibrated, and amount of pumped sample volume.

All records are kept at the District offices.

Appendix

Bolin Laboratories Inc.

CHAIN OF CUSTODY RECORD

☐ 17631 N. 25th Ave. Phoenix AZ 85023
(602) 942-8220 • Fax(602) 942-1050

☐ 440 N. Alvernon, Suite 103, Tucson AZ 85711
(520) 327-1234 • Fax(520) 327-0518

Page_____of_____

Laboratory Sample No.: SAMPLE

CLIENT INFORMATION

Client Name	Address	City	State	Zip	Phone	Fax
FLOOD CONTROL	2501 W DURANGO	PHOENIX	AZ	85009	506-8401	506-4161

Project Name	Project Number	Contact	P.O. No.	Fax Results ☐	QC Report ☒	Special Detection Limits ☐
NPDES		DAVE GARDNER				

SAMPLE TYPE CODES

DW=Drinking Water; WW=Waste Water; SW=Surface Water; GW=Ground Water; O=Other STORMWATER; S=Soil/Solid; T=Travel Blank; F=Food; G=Sludge

TURNAROUND TIME

☐ Standard 10 - 15 Day
☐ Standard UST 3 to 5 Day
☐ Other_____

★ Laboratory Authorization Required for Rush ★

REQUESTED ANALYSES

Client's Sample Identification	Date	Time	Sample Location	Composite	Grab	Sample Type	Compliance	No. of Containers	pH ✓ (Bolin Use Only)	See Attached 624														LAB NO.
MESA 1	8/8/88	1000	HORNE/6TH		X	O		6		✓														
MESA 1	8/8/88	1330	HORNE/6TH	X		O		6		✓														
MESA 2	8/8/88	1405	BROADWAY		X	O		12		✓														
MESA 2	8/8/88	1500	BROADWAY	X		O		6		✓														
TRAVEL BLANK						T		4			✓													

Comments / Special Instructions:_____

SAMPLE CONDITION UPON RECEIPT

No. of Containers		
Temperature Blank		
Custody Seals	Y	N
Seals Intact	Y	N
Preserved	Y	N

WHITE-LAB YELLOW-LAB PINK-CLIENT

	RELINQUISHED BY		SAMPLES RECEIVED BY	
①	Signature	Date	Signature	Date
	Printed Name	Time	Printed Name	Time
②	Signature	Date	Signature	Date
	Printed Name	Time	Printed Name	Time
③	Signature	Date	Signature	Date
	Printed Name	Time	Printed Name	Time

NPDES STORMWATER ANALYSIS FORM

SITE _____ DATE _____

GRAB SAMPLE

			Bottle(s) Required
X	BOD5	405.1	1- 1 liter plastic, unpreserved
X	Dissolved Oxygen	4500-O	1- 500 mL plastic, unpreserved
X	Fecal Coliform	9222C	1- bacterial bottle, tablet preserved
X	Fecal Streptococci	9230C	1- bacterial bottle, tablet preserved
X	Oil and Grease	413.1	1- 1 liter glass, HCl (acid) preserved
X	Purgeables	EPA 624	2- 40 mL glass vials, sodium thiosulfate preserved

COMPOSITE SAMPLE

Inorganic Chemistry - Non-Metals

X	pH	150.1	X	Nitrogen, NO2 + NO3	353.2
X	COD	410.1	X	Nitrogen, Organic	351.4
X	Chloride	300.0	X	Nitrogen, Kjeldahl	351.3
X	Cyanide	335.3	X	Phosphorous, Total	365.2
X	Total Dissolved Solids	160.1	X	Phosphorous, Dissolved	365.3
X	Total Suspended Solids	160.1	X	Phosphorous, Ortho	365.2
X	Nitrogen, Ammonia	350.3	X	Organic Carbon, Total	415.1
X	Nitrogen, Nitrate	353.2	X	Alkalinity, Total	310.1
X	Nitrogen, Nitrite	353.2	X	Hardness	130.2
			X	Sulfate, Dissovled	375.3
			X	Phenols	420.1

Inorganic Chemistry - Metals, Total and Dissolved

X	Antimony, Total	200.7	X	Lead, Total	239.2
X	Antimony, dissolved	200.7	X	Lead, dissolved	239.2
X	Arsenic, Total	200.7	X	Mercury, Total	245.1
X	Arsenic, dissolved	200.7	X	Mercury, dissolved	245.1
X	Beryllium, Total	200.7	X	Nickel, Total	249.2
X	Beryllium, dissolved	200.7	X	Nickel, dissolved	249.2
X	Cadmium, Total	213.2	X	Selenium, Total	200.7
X	Cadmium, dissolved	213.2	X	Selenium, dissolved	200.7
X	Chromium, Total	218.2	X	Silver, Total	200.7
X	Chromium VI, Total	SM3500	X	Silver, dissolved	200.7
X	Chromium, dissolved	218.2	X	Thallium, Total	200.7
X	Copper, Total	220.2	X	Thallium, dissolved	200.7
X	Copper, dissolved	220.2	X	Zinc, Total	289.2
			X	Zinc, dissolved	289.2

Organic Compounds

X	Organochlorine Pesticides	608			
X	Base/Neutral/Acid Extractable	625			

Analysis Priority and Bottle Fill Priority

Analytic Priority

1 Total/Dissolved Metals, Hardness
2 COD
3 TSS/TDS
4 Phosphorous - Total/Dissolved/Ortho
5 Nitrogen - Nitrate/Nitrite/Ammonia/TKN/Organic
6 pH
7 Alkalinity
8 608 - Organochlorine Pesticides
9 625 - Base/Neutral/Acid Extractables
10 Cyanide
11 Sulfates
12 Chloride
13 Total Organic Carbon
14 Phenols

Bottle Fill Priority

1 One Liter Plastic - Nitric Acid Preserved
2 One Liter Plastic - Non Preserved
1 One Liter Plastic - Sulfuric Acid Preserved
2 One Liter Amber Glass - Sulfuric Acid Preserved
3 One Liter Amber Glass - Non Preserved
1 One Liter Plastic - Sodium Hydroxide Preserved

Sample Bottle Request Form

Grab Sample Bottle Set

2	1-liter plastic	non-preserved
2	sterile bacti bottles	
2	1-liter glass amber	H_2SO_4 preserved
4	40 mL vial	HCl preserved
	Travel Blanks for EPA 624	

MESA 1		PHX 1	
MESA 2		PHX 2	
MESA 3		PHX 3	
MESA 4		PHX 4	
MESA 5		GILA DRAIN	

TOTAL GRAB SETS NEEDED	

Composite Sample Bottle Set

2	1-liter plastic	non preserved
1	1-liter plastic	H_2SO_4 preserved
1	1-liter plastic	NaOH preserved
1	1-liter plastic	HNO_3 preserved
2	1-liter amber glass	H_2SO_4 preserved
3	1-liter amber glass	non preserved

MESA 1		PHX 1	
MESA 2		PHX 2	
MESA 3		PHX 3	
MESA 4		PHX 4	
MESA 5		GILA DRAIN	

TOTAL COMPOSITE SETS NEEDED	

South Mountain/Dreamy Draw Bottle Set

6	1-liter plastic	non preserved
1	1-liter plastic	HNO_3 preserved
1	1-liter plastic	H_2SO_4 preserved
2	1-liter amber glass	H_2SO_4 preserved

South Mountain	
Dreamy Draw	

TOTAL SM/DD SETS NEEDED	

Additional Bottles Needed

Revised: August 27, 1997

Field Record Sheet

	Temperature	pH	Date	Time
Mesa 1 Sixth and Horne				
Mesa 2 Broadway and Lindsay				
Mesa 3 Falcon Field				
Mesa 4 Horne and Grandview				
Mesa 5 Dobson Road				
Phx 1 Salt River and 35th Avenue				
Phx 2 Salt River and I-10				
Phx 3 Salt River and 40th Street				
Phx 4 IBW and 40th Street				
Gila Drain				
South Mountain				
Dreamy Draw				

Date: 9/3/97

Calibration Sheet

	Initials	Date	Time	Depth of Sensor	Volume Pumped
Mesa 1 Sixth and Horne					
Mesa 2 Broadway and Lindsay					
Mesa 3 Falcon Field					
Mesa 4 Horne and Grandview					
Mesa 5 Dobson Road					
Phx 1 Salt River and 35th Avenue					
Phx 2 Salt River and I-10					
Phx 3 Salt River and 40th Street					
Phx 4 IBW and 40th Street					
Gila Drain					
South Mountain					
Dreamy Draw					

Date: 9/3/97

To begin programming the sampler, press the #2 key (change/halt)
Enter 8000 as the access code

Press the * key

1.	Advanced Program Features	yes
2.	Number of Sample Bottles	8
3.	Units for Bottle Volume	mL
4.	Bottle Volume	1900 mL
5.	Enter Units for Tubing Length	Feet
6.	Length of Intake Tubing	xx feet (Change each time tubing is replaced)
7.	Program Lock?	Yes
8.	Enable Internal Flowmeter?	Yes
9.	Flow Units	CFS
10.	Program Delay?	No
11.	Flow Mode?	Yes
12.	Variable Interval?	No
13.	Interval	5000 (Enter 50)
14.	Timed Override?	No
15.	Discrete Mode?	Yes
16.	Sample/Bottle?	Yes
17.	Number of Samples/Bottle?	4
18.	Change Volume?	No/Yes
19.	Sample Volume	450 mL
20.	Calibrate Volume?	No/Yes
21.	Intake Rinses?	Yes
22.	Rinse Cycles?	1
23.	Intake Faults?	Yes
24.	Intake Faults	2
25.	Enter ID	0102
26.	Set Up Flowmeter?	Yes
27.	Head vs Flow	Yes
28.	Enter Data Points	Head 01 = 0.29 Flow 01 = 5 Head 02 = 0.47 Flow 02 = 9 Head 03 = 0.51 Flow 03 = 10 Head 04 = 0.71 Flow 04 = 16 Head 05 = 0.79 Flow 05 = 19 Head 06 = 1.13 Flow 06 = 37 Head 07 = 1.23 Flow 07 = 45 Head 08 = 1.37 Flow 08 = 60

29.	Flow Recording Interval	1 min
30.	Calibrate Depth Sensor?	No/Yes (Yes during maintenance)
31.	Set Current Water Level	Enter current level if known

-Ready to Start-

Program for storm sampling

Press and hold the clear entry key

1.	Level control?	Yes
2.	Storm Mode?	Yes
3.	External Start?	No
4.	Start on	Rain
5.	Rain =	0.10 inch
6.	Rainfall Time limit	60 min
7.	First Flush Period	20
8.	Number of Bottles	2
9.	Set Timed Interval	Interval 01 = 0001 min Interval 02 = 0000 min (Use No/Pass key)
10.	Samples/Bottle=	002
11.	First Flush Vol=	950 mL
12.	Calibrate Vol?	No/Yes
13.	Sample Time limit?	480
14.	Special Output?	Yes
15.	Sample Output?	No
16.	Event Output?	Yes

-Ready to start-

Programming is complete. Press the START SAMPLING key to initiate the program/sampler.

To begin programming the sampler, press the #2 key (change/halt)
Enter 8000 as the access code

Press the * key

1.	Advanced Program Features	yes
2.	Number of Sample Bottles	8
3.	Units for Bottle Volume	mL
4.	Bottle Volume	1900 mL
5.	Enter Units for Tubing Length	Feet
6.	Length of Intake Tubing	12 feet (Change each time tubing is replaced)
7.	Program Lock?	Yes
8.	Enable Internal Flowmeter?	Yes
9.	Flow Units	CFS
10.	Program Delay?	No
11.	Timed Mode?	Yes
12.	Variable Interval?	No
13.	Interval	5 Min
14.	Discrete Mode?	Yes
15.	Bottles/Sample?	Yes
16.	Number of Bottles/Sample?	4
17.	Change Volume?	No/Yes
18.	Sample Volume	1875 mL
19.	Calibrate Volume?	No/Yes
20.	Intake Rinses?	Yes
21.	Rinse Cycles?	1
22.	Intake Faults?	Yes
23.	Intake Faults	2
24.	Enter ID	0101
25.	Set Up Flowmeter?	Yes
26.	Manning Formula	Yes
27.	Pipe ID	72.00 (Be sure to enter 7200)
28.	Roughness=	0.013
29.	Slope=	4.00/100
30.	Flow Recording Interval	1 min
31.	Calibrate Depth Sensor?	No/Yes (Yes during maintenance)
32.	Set Current Water Level	Enter current level if known

-Ready to Start-
proceed to page 2

Press and hold the clear entry key

1.	Level control?	Yes
2.	Storm Mode?	Yes
3.	External Start?	No
4.	Start on	Depth
5.	Level =	1.5 inch
6.	First Flush Period	0
7.	Sample Time limit?	480
8.	Special Output?	Yes
9.	Sample Output?	No
10.	Event Output?	Yes

-Ready to start-

Programming is complete. Press the START SAMPLING key to initiate the program/sampler.

To begin programming the sampler, press the #2 key (change/halt)
Enter 8000 as the access code

Press the * key

1.	Advanced Program Features	yes
2.	Number of Sample Bottles	8
3.	Units for Bottle Volume	mL
4.	Bottle Volume	1900 mL
5.	Enter Units for Tubing Length	Feet
6.	Length of Intake Tubing	xx feet (Change each time tubing is replaced)
7.	Program Lock?	Yes
8.	Enable Internal Flowmeter?	Yes
9.	Flow Units	CFS
10.	Program Delay?	No
11.	Timed Mode?	Yes
12.	Variable Interval?	No
13.	Interval	5 Min
14.	Discrete Mode?	Yes
15.	Bottles/Sample?	Yes
16.	Number of Bottles/Sample?	4
17.	Change Volume?	No/Yes
18.	Sample Volume	1875 mL
19.	Calibrate Volume?	No/Yes
20.	Intake Rinses?	Yes
21.	Rinse Cycles?	1
22.	Intake Faults?	Yes
23.	Intake Faults	2
24.	Enter ID	0103
25.	Set Up Flowmeter?	Yes
26.	Manning Formula	Yes
27.	Pipe ID	xx.xx (Be sure to enter xxxx)
28.	Roughness=	0.013
29.	Slope=	xxx/100
30.	Flow Recording Interval	1 min
31.	Calibrate Depth Sensor?	No/Yes (Yes during maintenance)
32.	Set Current Water Level	Enter current level if known

-Ready to Start- proceed to page 2

Press and hold the clear entry key

1.	Level control?	Yes
2.	Storm Mode?	Yes
3.	External Start?	No
4.	Start on	Depth
5.	Level =	1.5 inch
6.	First Flush Period	0
7.	Sample Time limit?	480
8.	Special Output?	Yes
9.	Sample Output?	No
10.	Event Output?	Yes

-Ready to start-

Programming is complete. Press the START SAMPLING key to initiate the program/sampler.

Mesa 1- Horne and Sixth Street
Sigma Stormwater Sampler Program

To begin programming the sampler, press the #2 key (change/halt)
Enter 8000 as the access code

Press the * key

1.	Advanced Program Features	yes
2.	Number of Sample Bottles	8
3.	Units for Bottle Volume	mL
4.	Bottle Volume	1900 mL
5.	Enter Units for Tubing Length	Feet
6.	Length of Intake Tubing	50 feet (Change each time tubing is replaced)
7.	Program Lock?	Yes
8.	Enable Internal Flowmeter?	Yes
9.	Flow Units	CFS
10.	Program Delay?	No
11.	Flow Mode?	Yes
12.	Variable Interval?	No
13.	Interval	1000 cu. Ft. (Enter 10, the 00 is provided)
14.	Timed Override?	No
15.	Discrete Mode?	Yes
16.	Samples/Bottles?	Yes
17.	Number of Samples/Bottles	4
18.	Change Volume?	No/Yes
19.	Sample Volume	450 mL
20.	Calibrate Volume?	No/Yes
21.	Intake Rinses?	Yes
22.	Rinse Cycles?	1
23.	Intake Faults?	Yes
24.	Intake Faults	2
25.	Enter ID	0001
26.	Set Up Flowmeter?	Yes
27.	Manning Formula	Yes
28.	Pipe ID	36.00 (Be sure to enter 3 6 0 0)
29.	Roughness=	0.013
30.	Slope=	0.29/100
31.	Flow Recording Interval	1 min
32.	Calibrate Depth Sensor?	No/Yes (Yes during maintenance)
33.	Set Current Water Level	Enter current level if known

-Ready to Start- proceed to page 2

Program for storm sampling

Press and hold the clear entry key

1.	Level control?	Yes
2.	Storm Mode?	Yes
3.	External Start?	No
4.	Start on	Depth and Rain (fourth choice)
5.	Rain =	0.05 inch
6.	Rainfall Time Limit=	60 min
7.	Level =	0.5 inch
8.	First Flush Period	20 min
9.	Number of Bottles	2
10.	Set Timed Interval	Interval 01=0001 min Interval 02=0000 min
11.	Samples/Bottle=	002
12.	First Flush Vol=	950 mL
13.	Calibrate Vol?	No/Yes
14.	Sample Time limit?	480
15.	Special Output?	Yes
16.	Sample Output?	No
17.	Event Output?	Yes

use the NO/PASS key if 0000 is entered, else enter 0000 and press the NO/PASS key. The Yes key will not work.

-Ready to start-

Programming is complete. Press the START SAMPLING key to initiate the program/sampler.

Mesa 2- Broadway and Lindsay
Sigma Stormwater Sampler Program

To begin programming the sampler, press the #2 key (change/halt)
Enter 8000 as the access code

Press the * key

1.	Advanced Program Features	yes
2.	Number of Sample Bottles	8
3.	Units for Bottle Volume	mL
4.	Bottle Volume	1900 mL
5.	Enter Units for Tubing Length	Feet
6.	Length of Intake Tubing	60 feet (Change each time tubing is replaced)
7.	Program Lock?	Yes
8.	Enable Internal Flowmeter?	Yes
9.	Flow Units	CFS
10.	Program Delay?	No
11.	Flow Mode?	Yes
12.	Variable Interval?	No
13.	Interval	2000 cu. Ft. (Enter 20, the 00 is provided)
14.	Timed Override?	No
15.	Discrete Mode?	Yes
16.	Samples/Bottles?	Yes
17.	Number of Samples/Bottles	4
18.	Change Volume?	No/Yes
19.	Sample Volume	450 mL
20.	Calibrate Volume?	No/Yes
21.	Intake Rinses?	Yes
22.	Rinse Cycles?	1
23.	Intake Faults?	Yes
24.	Intake Faults	2
25.	Enter ID	0002
26.	Set Up Flowmeter?	Yes
27.	Manning Formula	Yes
28.	Pipe ID	72.00 (Be sure to enter 7 2 0 0)
29.	Roughness=	0.013
30.	Slope=	0.11/100
31.	Flow Recording Interval	1 min
32.	Calibrate Depth Sensor?	No/Yes (Yes during maintenance)
33.	Set Current Water Level	Enter current level if known

-Ready to Start- proceed to page 2

Program for storm sampling

Press and hold the clear entry key

1.	Level control?	Yes
2.	Storm Mode?	Yes
3.	External Start?	No
4.	Start on	Depth and Rain (fourth choice)
5.	Rain =	0.05 inch
6.	Rainfall Time Limit=	60 min
7.	Level =	0.5 inch
8.	First Flush Period	20 min
9.	Number of Bottles	2
10.	Set Timed Interval	Interval 01=0001 min Interval 02=0000 min
11.	Samples/Bottle=	002
12.	First Flush Vol=	950 mL
13.	Calibrate Vol?	No/Yes
14.	Sample Time limit?	480
15.	Special Output?	Yes
16.	Sample Output?	No
17.	Event Output?	Yes

use the NO/PASS key if 0000 is entered, else enter 0000 and press the NO/PASS key. The Yes key will not work.

-Ready to start-

Programming is complete. Press the START SAMPLING key to initiate the program/sampler.

To begin programming the sampler, press the #2 key (change/halt)
Enter 8000 as the access code

Press the * key

1.	Advanced Program Features	yes
2.	Number of Sample Bottles	8
3.	Units for Bottle Volume	mL
4.	Bottle Volume	1900 mL
5.	Enter Units for Tubing Length	Feet
6.	Length of Intake Tubing	27 feet (Change each time tubing is replaced)
7.	Program Lock?	Yes
8.	Enable Internal Flowmeter?	Yes
9.	Flow Units	CFS
10.	Program Delay?	No
11.	Flow Mode?	Yes
12.	Variable Interval?	No
13.	Interval	4500 cu. Ft. (Enter 45, the 00 is provided)
14.	Timed Override?	No
15.	Discrete Mode?	Yes
16.	Samples/Bottles?	Yes
17.	Number of Samples/Bottles	4
18.	Change Volume?	No/Yes
19.	Sample Volume	450 mL
20.	Calibrate Volume?	No/Yes
21.	Intake Rinses?	Yes
22.	Rinse Cycles?	1
23.	Intake Faults?	Yes
24.	Intake Faults	2
25.	Enter ID	0003
26.	Set Up Flowmeter?	Yes
27.	Manning Formula	Yes
28.	Pipe ID	48.00 (Be sure to enter 4 8 0 0)
29.	Roughness=	0.013
30.	Slope=	0.14/100
31.	Flow Recording Interval	1 min
32.	Calibrate Depth Sensor?	No/Yes (Yes during maintenance)
33.	Set Current Water Level	Enter current level if known

-Ready to Start- **proceed to page 2**

Program for storm sampling

Press and hold the clear entry key

1.	Level control?	Yes
2.	Storm Mode?	Yes
3.	External Start?	No
4.	Start on	Depth and Rain (fourth choice)
5.	Rain =	0.05 inch
6.	Rainfall Time Limit=	60 min
7.	Level =	0.5 inch
8.	First Flush Period	20 min
9.	Number of Bottles	2
10.	Set Timed Interval	Interval 01=0001 min Interval 02=0000 min
11.	Samples/Bottle=	002
12.	First Flush Vol=	950 mL
13.	Calibrate Vol?	No/Yes
14.	Sample Time limit?	480
15.	Special Output?	Yes
16.	Sample Output?	No
17.	Event Output?	Yes

use the NO/PASS key if 0000 is entered, else enter 0000 and press the NO/PASS key. The Yes key will not work.

-Ready to start-

Programming is complete. Press the START SAMPLING key to initiate the program/sampler.

To begin programming the sampler, press the #2 key (change/halt)
Enter 8000 as the access code

Press the * key

1.	Advanced Program Features	yes
2.	Number of Sample Bottles	8
3.	Units for Bottle Volume	mL
4.	Bottle Volume	1900 mL
5.	Enter Units for Tubing Length	Feet
6.	Length of Intake Tubing	75 feet (Change each time tubing is replaced)
7.	Program Lock?	Yes
8.	Enable Internal Flowmeter?	Yes
9.	Flow Units	CFS
10.	Program Delay?	No
11.	Flow Mode?	Yes
12.	Variable Interval?	No
13.	Interval	1500 cu. Ft. (Enter 15, the 00 is provided)
14.	Timed Override?	No
15.	Discrete Mode?	Yes
16.	Samples/Bottles?	Yes
17.	Number of Samples/Bottles	4
18.	Change Volume?	No/Yes
19.	Sample Volume	450 mL
20.	Calibrate Volume?	No/Yes
21.	Intake Rinses?	Yes
22.	Rinse Cycles?	1
23.	Intake Faults?	Yes
24.	Intake Faults	2
25.	Enter ID	0004
26.	Set Up Flowmeter?	Yes
27.	Manning Formula	Yes
28.	Pipe ID	54.00 (Be sure to enter 5 4 0 0)
29.	Roughness=	0.013
30.	Slope=	0.40/100
31.	Flow Recording Interval	1 min
32.	Calibrate Depth Sensor?	No/Yes (Yes during maintenance)
33.	Set Current Water Level	Enter current level if known

-Ready to Start- proceed to page 2

Program for storm sampling

Press and hold the clear entry key

1.	Level control?	Yes
2.	Storm Mode?	Yes
3.	External Start?	No
4.	Start on	Depth and Rain (fourth choice)
5.	Rain =	0.05 inch
6.	Rainfall Time Limit=	60 min
7.	Level =	0.5 inch
8.	First Flush Period	20 min
9.	Number of Bottles	2
10.	Set Timed Interval	Interval 01=0001 min Interval 02=0000 min
11.	Samples/Bottle=	002
12.	First Flush Vol=	950 mL
13.	Calibrate Vol?	No/Yes
14.	Sample Time limit?	480
15.	Special Output?	Yes
16.	Sample Output?	No
17.	Event Output?	Yes

use the NO/PASS key if 0000 is entered, else enter 0000 and press the NO/PASS key. The Yes key will not work.

-Ready to start-

Programming is complete. Press the START SAMPLING key to initiate the program/sampler.

Mesa 5 - Dobson Road south of Broadway
Sigma Stormwater Sampler Program

To begin programming the sampler, press the #2 key (change/halt)
Enter 8000 as the access code

Press the * key

1.	Advanced Program Features	yes
2.	Number of Sample Bottles	8
3.	Units for Bottle Volume	mL
4.	Bottle Volume	1900 mL
5.	Enter Units for Tubing Length	Feet
6.	Length of Intake Tubing	80 feet (Change each time tubing is replaced)
7.	Program Lock?	Yes
8.	Enable Internal Flowmeter?	Yes
9.	Flow Units	CFS
10.	Program Delay?	No
11.	Flow Mode?	Yes
12.	Variable Interval?	No
13.	Interval	2000 cu. Ft. (Enter 20, the 00 is provided)
14.	Timed Override?	No
15.	Discrete Mode?	Yes
16.	Samples/Bottles?	Yes
17.	Number of Samples/Bottles	4
18.	Change Volume?	No/Yes
19.	Sample Volume	450 mL
20.	Calibrate Volume?	No/Yes
21.	Intake Rinses?	Yes
22.	Rinse Cycles?	1
23.	Intake Faults?	Yes
24.	Intake Faults	2
25.	Enter ID	0005
26.	Set Up Flowmeter?	Yes
27.	Manning Formula	Yes
28.	Pipe ID	30.00 (Be sure to enter 3 0 0 0)
29.	Roughness=	0.013
30.	Slope=	0.14/100
31.	Flow Recording Interval	1 min
32.	Calibrate Depth Sensor?	No/Yes (Yes during maintenance)
33.	Set Current Water Level	Enter current level if known

-Ready to Start- proceed to page 2

Program for storm sampling

Press and hold the clear entry key

1.	Level control?	Yes
2.	Storm Mode?	Yes
3.	External Start?	No
4.	Start on	Depth and Rain (fourth choice)
5.	Rain =	0.05 inch
6.	Rainfall Time Limit=	60 min
7.	Level =	0.5 inch
8.	First Flush Period	20 min
9.	Number of Bottles	2
10.	Set Timed Interval	Interval 01=0001 min Interval 02=0000 min
11.	Samples/Bottle=	002
12.	First Flush Vol=	950 mL
13.	Calibrate Vol?	No/Yes
14.	Sample Time limit?	480
15.	Special Output?	Yes
16.	Sample Output?	No
17.	Event Output?	Yes

use the NO/PASS key if 0000 is entered, else enter 0000 and press the NO/PASS key. The Yes key will not work.

-Ready to start-

Programming is complete. Press the START SAMPLING key to initiate the program/sampler.

Some Basic Program Notes:

To start sampling: press the **RUN/STOP** key and follow the directions.

To see the current status, Press the **STATUS** key from the **MAIN MENU**.

The **MAIN MENU** key can be pressed at any time to return to that point.

The **password** is **9000**.

To look at data, press **DISPLAY DATA** from the **MAIN MENU** and follow prompts.

1. Press the **MAIN MENU** key.
2. Press the **SETUP** key at the upper right side of the display.
3. Press the **MODIFY ALL ITEMS** key at the upper right side of the display.
4. **Number of bottles: 8**
   if **8** is displayed, press **ACCEPT**
   if **8** is not displayed, press **CHANGE CHOICE** until **8** appears, then press **ACCEPT.**
5. **Bottle Volume: 1900 mL**
   if **1900 mL** is displayed, press **ACCEPT**
   if **1900 mL** not displayed,
   Press **CHANGE UNITS** to change to **mL** AND
   Enter **1900** and press **ACCEPT.**
6. **Intake Tubing Length: 26 Ft.**
   PHX1 26 ft
   PHX2
   PHX3 19 ft
   PHX4 21 ft
   if the correct value is displayed, press **ACCEPT**
   if the correct value is not displayed, enter the correct value and press **ACCEPT.**
7. **Intake Tubing Type: 3/8" vinyl**
   if **3/8" vinyl** is displayed, press **ACCEPT**
   if **3/8" vinyl** is not displayed, press **CHANGE CHOICE** until it appears, then press the **ACCEPT** button.
8. **Program Lock: Enabled**
   if **enabled** is displayed, press **ACCEPT**
   if **disabled** is displayed, press **CHANGE CHOICE** until it appears, then press the **ACCEPT** button.

9. Program Delay: Disabled
if disabled is displayed, press ACCEPT
if enabled is displayed, press CHANGE CHOICE until it appears, then press the ACCEPT button.

10. Sample Collection: Flow Proportional
if flow proportional is displayed, press ACCEPT
if flow proportional is not displayed, press CHANGE CHOICE until it appears, then press the ACCEPT button.

11. Flow Meter: Integral
if integral is displayed, press ACCEPT
if integral is not displayed, press CHANGE CHOICE until it appears, then press the ACCEPT button.

12. Take Sample Every: (PHX 1: 3000 cf, PHX 3: 1000 cf, PHX 4: 3000 cf)
if xxxx cf appears in the display, press ACCEPT
if xxxx cf does not appear in the display,
press CHANGE UNITS to get CF, AND
enter xxxx and press ACCEPT.

13. Timed Override?: Disabled
if disabled appears in the display, press ACCEPT
if enabled appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.

14. Take First Sample: Immediately
if immediately appears in the display, press ACCEPT
if immediately does not appear in the display, press CHANGE CHOICE until it appears, then press ACCEPT.

15. Deliver Each Sample To All Bottles?: No
If no appears in the display, press ACCEPT
If yes appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.

16. Choose a Method of Distribution: Samples/Bottle
If Samples/Bottle appears in the display, press ACCEPT.
If Bottles/Sample appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.

17. Samples/Bottle: 4
If 4 appears in the display, press ACCEPT.
If 4 does not appear in the display, enter 4 and press ACCEPT.

18. Liquid Sensors: Enabled
If enabled appears in the display, press ACCEPT
If disabled appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.

19. Sample Volume: 450 mL
If 450 mL appears in the display, press ACCEPT
If 450 mL does not appear in the display, enter 450 and press ACCEPT.

20. Intake Rinses: 2
If 2 appears in the display, press ACCEPT
If 2 does not appear in the display, enter 2 and press ACCEPT.
21. Sample Retries: 2
If 2 appears in the display, press ACCEPT
If 2 does not appear in the display, enter 2 and press ACCEPT.
22. Site ID: ...011

PHX1	...011
PHX2	...022
PHX3	...033
PHX4	...044

If the correct ID appears in the display, press ACCEPT
If the correct ID does not appear in the display, enter 11 and press ACCEPT.
23. Do You Wish to Access Advanced Sampling Features?: Yes
Press the button for YES.
24. Use the DOWN arrow key to go to STORMWATER and press SELECT.
25. Storm Water:Enabled
If Enabled appears in the display, press ACCEPT
If Enabled does not appear in the display, press CHANGE CHOICE until it appears, then press ACCEPT.
26. Storm Water Start Condition: Rain and Level
If Rain and Level appears in the display, press ACCEPT
If Rain and Level does not appear in the display, press CHANGE CHOICE until it appears, then press ACCEPT.
27. Storm Water Rain Trigger: 0.05 inch
If 0.05 inch appears in the display, press ACCEPT
If 0.05 inch does not appear in the display, enter 0.05 and press ACCEPT.
28. Rainfall Time Interval: 1:00
If 1:00 (hr:min) appears in the display, press ACCEPT
If 1:00 (hr:min) does not appear in the display, enter 100 and press ACCEPT.
29. Storm Water Level Trigger: 0.5 inch
If 0.5 inch appears in the display, press ACCEPT
If 0.5 inch does not appear in the display, enter 0.5 and press ACCEPT.
30. First Flush Number of Bottles: 2
If 2 appears in the display, press ACCEPT
If 2 does not appear in the display, enter 2 and press ACCEPT.
31. Choose a Method of Distribution: Samples/Bottle
If Samples/Bottle appears in the display, press ACCEPT
If Bottles/Sample appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.
32. First Flush: Samples per Bottle: 2
If 2 appears in the display, press ACCEPT
If 2 does not appear in the display, enter 2 and press ACCEPT.

33. First Flush Interval 1: 0:05 (hr:min)
If 0:05 (hr:min) appears in the display, press ACCEPT & REPEAT
If 0:05 (hr:min) does not appear in the display, enter 005 and press ACCEPT & REPEAT.

34. First Flush Interval 2: 0:05 (hr:min)
If 0:05 (hr:min) appears in the display, press ACCEPT & REPEAT
If 0:05 (hr:min) does not appear in the display, enter 005 and press ACCEPT & REPEAT.

35. First Flush Interval 3: 0:05 (hr:min)
If 0:05 (hr:min) appears in the display, press ACCEPT & REPEAT
If 0:05 (hr:min) does not appear in the display, enter 005 and press ACCEPT & REPEAT.

36. First Flush Interval 4: 0:05 (hr:min)
If 0:05 (hr:min) appears in the display, press ACCEPT & REPEAT
If 0:05 (hr:min) does not appear in the display, enter 005 and press ACCEPT & REPEAT.

37. First Flush Sample Volume: 950 mL
If 950 mL appears in the display, press ACCEPT
If 950 mL does not appear in the display, enter 950 and press ACCEPT.

38. Program Time Limit: Enabled
If Enabled appears in the display, press ACCEPT
If Disabled appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.

39. Storm Water Program Time Limit: 8:00
If 8:00 (hr:min) appears in the display, press ACCEPT
If 8:00 (hr:min) does not appear in the display, enter 800 and press ACCEPT.

40. Press MAIN MENU button.

41. Press OPTIONS from the main menu.

42. Press ADVANCED OPTIONS.

43. Enter 9000 and press ACCEPT.

44. Select ALARMS and press SELECT.

45. Scroll to RAINFALL using the down arrow keys, and press SELECT.

46. Rainfall Alarm Condition: Enabled
If Enabled appears in the display, press ACCEPT
If Disabled appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.

47. Rainfall High Trigger Point: 0.05 inch
If 0.05 inch appears in the display, press ACCEPT
If 0.05 inch does not appear in the display, enter 0.05 and press ACCEPT.

48. Rainfall Time Interval: 1:00 (hr:min)
If 1:00 (hr:min) appears in the display, press ACCEPT
If 1:00 (hr:min) does not appear in the display, enter 100 and press ACCEPT.

49. Report Via Modem
Press SELECT
50. Press RETURN
51. Scroll to CALIBRATION if PT is to be calibrated.
52. Scroll to COMMUNICATION SETUP and press SELECT.
53. Scroll to MODEM SETUP and press SELECT.
54. **Modem Power: Enabled**
If **Enabled** appears in the display, press ACCEPT
If **Disabled** appears in the display, press CHANGE CHOICE until it appears and then press ACCEPT.
55. **Modem Baud Rate: 2400**
If 2400 appears in the display, press ACCEPT
If 2400 does not appear in the display, press CHANGE CHOICE until it appears and then press ACCEPT.
56. **Phone Number: 4151084**
If 4151084 appears in the display, press ACCEPT
If 4151084 does not appear in the display, enter 4151084 and press ACCEPT.
57. **Dial Method: Tone**
If **Tone** appears in the display, press ACCEPT
If **Pulse** appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.
58. Scroll to RS-232 setup and press SELECT.
59 **RS-232 Baud Rate: 9600**
If 9600 appears in the display, press SELECT
If 9600 does not appear in the display, enter 9600 and press ACCEPT.
60. Press RETURN
61. Scroll to DATA LOG and press SELECT.
62. Scroll to SELECT INPUTS and press SELECT.
63. Scroll to RAINFALL and press SELECT.
64. **Rainfall Input Data:Logged**
If **Logged** appears in the display, press SELECT
If **Logged** does not appear in the display, press CHANGE CHOICE until it appears, then press ACCEPT.
65. **Rainfall Logging Interval: 1 min**
If **1 min** appears in the display, press ACCEPT
If **1 min** does not appear in the display, enter 1 and press CHANGE CHOICE until minutes appears in the display, then press ACCEPT.
66. Scroll to LEVEL/FLOW and press SELECT.
67. **Level/Flow Input Data: Logged**
If **Logged** appears in the display, press SELECT
If **Logged** does not appear in the display, press CHANGE CHOICE until it appears, then press ACCEPT.

68. Level/Flow Logging Interval: 1 min
If 1 min appears in the display, press ACCEPT
If 1 min does not appear in the display, enter 1 and press CHANGE CHOICE until minutes appears in the display, then press ACCEPT.
69. Press RETURN.
70. Scroll to EXTENDED POWER MODE and press SELECT.
71. Extended Power Mode: Disabled
If Disabled appears in the display, press ACCEPT
If Enabled appears in the display, press CHANGE CHOICE until it appears, then press ACCEPT.
72. Press RETURN.
73. Scroll to SET MEMORY MODE and press SELECT.
74. Memory Mode: Wrap
If Wrap appears in the display, press ACCEPT
If Wrap does not appear in the display, press CHANGE CHOICE until it appears then press ACCEPT.
75. Press RETURN.
76. Scroll to FLOW METER SETUP and press SELECT.
77. Flow Units: cfs
If cfs appears in the display, press ACCEPT
If cfs does not appear in the display, press CHANGE CHOICE until it appears then press ACCEPT.
78. Level Units: in
If in appears in the display, press ACCEPT
If in does not appear in the display, press CHANGE CHOICE until it appears then press ACCEPT.
79. Primary Device: Manning Equation
If Manning Equation appears in the display, press ACCEPT
If Manning Equation does not appear in the display, press CHANGE CHOICE until it appears then press ACCEPT.
80. Shape: Circular Pipe
If Circular Pipe appears in the display, press ACCEPT
If Circular Pipe does not appear in the display, press CHANGE CHOICE until it appears then press ACCEPT.
81. Pipe Diameter:

PHX1	75 inch
PHX2	
PHX3	54 inch
PHX4	66 inch

If the value in the display is correct, press ACCEPT
If the value in the display is incorrect, enter the correct value (75, 54, 66, etc.), and press SELECT.

82. Pipe Slope:

PHX1	0.0009
PHX2	
PHX3	0.0023
PHX4	0.0032

If the value in the display is correct, press **ACCEPT**
If the value in the display is incorrect, enter the correct value (**0.0009, 0.0023, etc.**), and press **ACCEPT.**

83. **Pipe Roughness:** 0.013
If 0.013 appears in the display, press **SELECT**
If 0.013 does not appear in the display, enter 0.013 and press **ACCEPT.**

84. **Total Flow Units:** cf
If **cf** appears in the display, press **SELECT**
If **cf** does not appear in the display, press **CHANGE CHOICE** until it appears and press **ACCEPT.**

85. Press **RETURN.**

86. Scroll to **FLOW TOTALIZER**, and press **SELECT.**

87. Scroll to **MODIFY SETUP**, and press **SELECT.**

88. **Totalizer Scaling:** x 1
If **x 1** appears in the display, press **ACCEPT**
If **x 1** does not appear in the display, press **CHANGE CHOICE** until it appears, and then press **ACCEPT.**

89. **Total Flow Units:** cf
If **cf** appears in the display, press **ACCEPT**
If **cf** does not appear in the display, press **CHANGE CHOICE** until it appears, and then press **ACCEPT.**

90. Press **RETURN.**

91. Press **RETURN.**

92. Press **MAIN MENU.**

93. Ready to Start, press **RUN/STOP** to begin sampling.