Quality Assurance (QA)
What, When, How, Resources

GCSA Employee Training

Nienhuis Park Community Center

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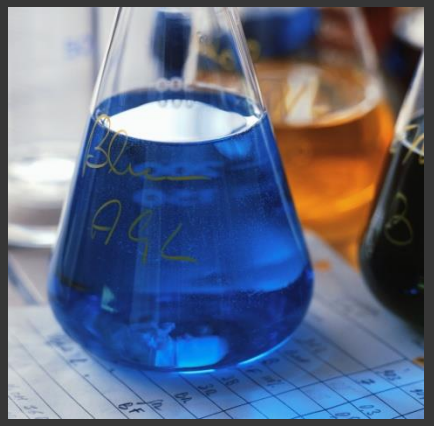
Richard Smith, Stormwater Consultant

Quality Assurance Concepts and Uses

- "QA" is essential to the usefulness of data.
- *"Monitoring" data (e.g. field and lab data).*
- *Observation data (e.g. visual inspections).*
- *Records of meetings, emails, letters, etc.*
- *Data analysis (e.g. statistics, graphs, tables).*
- *Reports and data transfers (e.g. spreadsheets, letters).*
- *Management structure and lines of authority.*
- *Storage, calibration and use of equipment and supplies.*

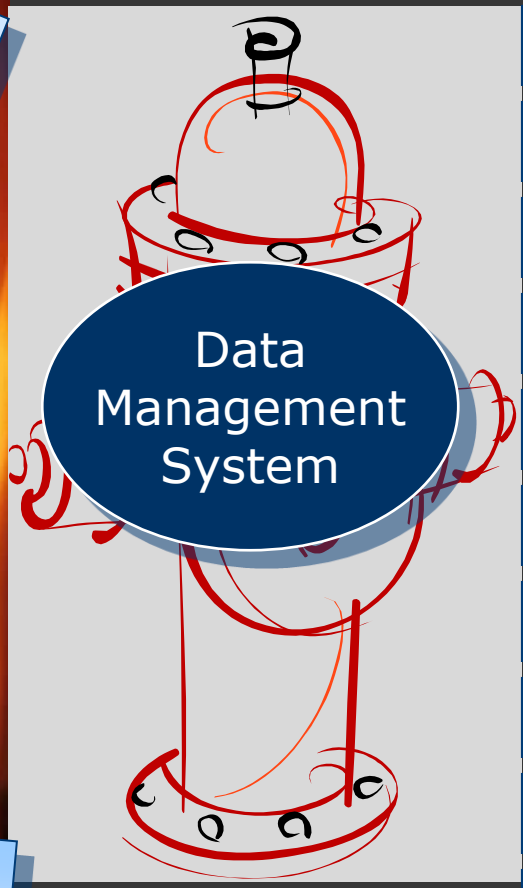


QA = CYA

Stormwater Program Data Streaming

DATA IN-FLOWS

- Lab & Field Data
- Who, what, where, when, why, how
- Visual Observations
- Measurable Goals
- Photographs
- BMP Quantities
- Inspection Interviews
- Map Data
- Data from Agencies
- Training Records
- Complaint Tracking
- Budget items



DATA OUT-FLOWS

- Information to Media
- Data for Court
- Enforcement Data
- Reports to Councils
- Management Reports
- Reports to City Staff
- Reports to Citizens
- Data to Agencies
- ODEQ Annual Report
- Program Audits

To What Activities Should QA Apply ?

- Technically, all activities pertaining to any type of data collection, analysis, manipulation and reporting....

- Determine your highest priorities first. For example:
  - *Visual inspections / DWFS monitoring of MS4*
  - *Source tracking inspections*
  - *Construction site inspections*

- If private consultants and/or labs are used, be sure that they employ appropriate and adequate QA to their activities.

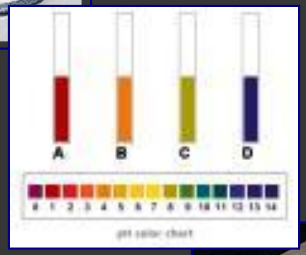
- Make this part of your contract specifications, especially if their work is needed for enforcement or court evidence.

Even Simple Test Kits Need Attention

- Expired chemicals – don't use expired chemicals; keep records of re-fresh purchases.
- Some kits require "calibration" – use fresh standards, keep a log of calibration activities, follow all directions.
- Some kits can measure "check samples" (known analytes) – perform checks frequently and keep records of all tests.
- SOPs help ensure continuous proper use, and aid in training new employees. The backbone of good QA.
- Maintenance – verify equipment function, replace defective parts before re-use of the kit. Keep detailed maintenance records. Follow all directions.

Types of Field Instruments

Comparator Test Kits



Test Strips

Titrations

Colorimeters

Multi-Test Kits

These types of kits rely upon chemical reactions to indicate the presence and/or concentration of one specific parameter.

An SOP should be written for each devise and procedure.

No endorsement of products is intended.

Types of Field Instruments

Test Pens

Single Parameter Meters

Multi-Parameter Meters

Field Fluorometer

Turbidimeter

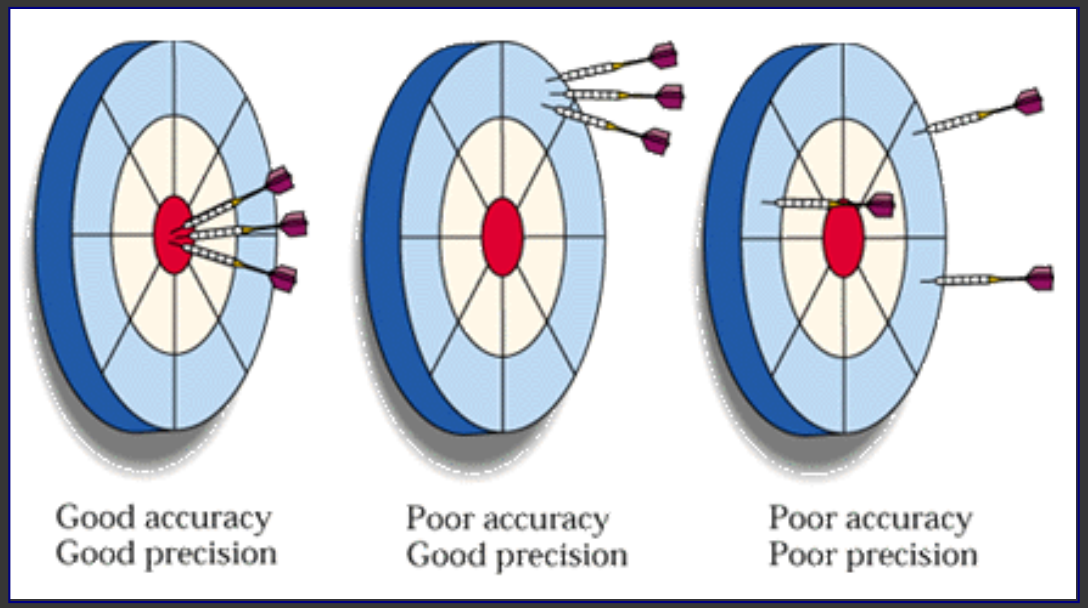
Flow Meter

These types of kits measure directly the concentration of one or more parameters.

An SOP should be written for each device and procedure.

No endorsement of products is intended.

QA Concepts



Precision is a measure of how close multiple readings are of the same sample.

Accuracy is a measure of how close a reading is to the known value.

Both are important concepts in assessing quality of data.

Both are normally reported with laboratory data.

More QA Concepts

Representativeness	Does the sample represent what you intend?
Completeness	Do you have enough samples and measurements?
Comparability	Are sampling methods and data useable to others and to you using future tests?
Chain of Custody	Legal documentation of "ownership" of samples during all phases of transport.
Sample Labels	Adequate information on each sample bottle to show ownership, collection information and intended analyses.

Types of QA Documentation to Consider

QAPP – QA Project Plan - *how you conduct data gathering, analysis and reporting for your Phase II program.*

DQOs – Data Quality Objectives – *deciding in the beginning what types of data you will be collecting and, most important, how all data will be used.*

QMP – Quality Management Plan – *down the road, you may consider this – describes your overall system for data management and communication.*

SOPs – Standard Operating Procedures – *detailed instructions for how you perform specific data collection activities, including use, storage and care of measurement equipment.*

What Is Absolutely Required ?

- OKR04 Part V lists a number of requirements for "Monitoring, Record Keeping and Reporting"
  - *"Samples and measurements...shall be representative..."*
  - *"If lab analysis is conducted it must [use] 40 CFR Part 136" [methods]*
  - *"Monitoring records must include...[names, dates, times, place, methods, etc.]"*
  - *"Retain records of all monitoring information" (e.g. copies of reports, instrument charts, etc.)*
  - *OKR04 does not require formal QA Documents (e.g., QAPPs)*

Site Conditions on Field Forms

Having this may give critical information as data is being used.

Subwatershed:	**Outfall ID:**
Date:	**Time (24 Hour):**
Investigators:	**Photograph Numbers:**
Latitude:	**Longitude:**
Land Use in Drainage Area (Check all that apply): ☐ **Industrial** ☐ **Open Space** ☐ **Urban Residential** ☐ **Institutional** ☐ **Suburban Residential** **Other: _____** ☐ **Commercial** **Known Industries:**	
Origin of Outfall if Known:	
Receiving Stream:	
Access Instructions:	
Comments:	

Weather Conditions on Field Forms

More valuable information needed for data interpretation.

TIME	CLOUD COVER	AIR TEMP (F)	WIND Sp & Dir	OTHER CONDITIONS
07:00				
09:00				
12:00				
15:00				

Consider also recording weather for previous 48 hours.

Labels for Sample Containers

City Name

Sample date and time

Site name and code number

Preservative

Names of field crew members

Parameter(s) for analysis

City of Compote

November 11, 2016

EXAMPLE

Perilous Creek - PC-031

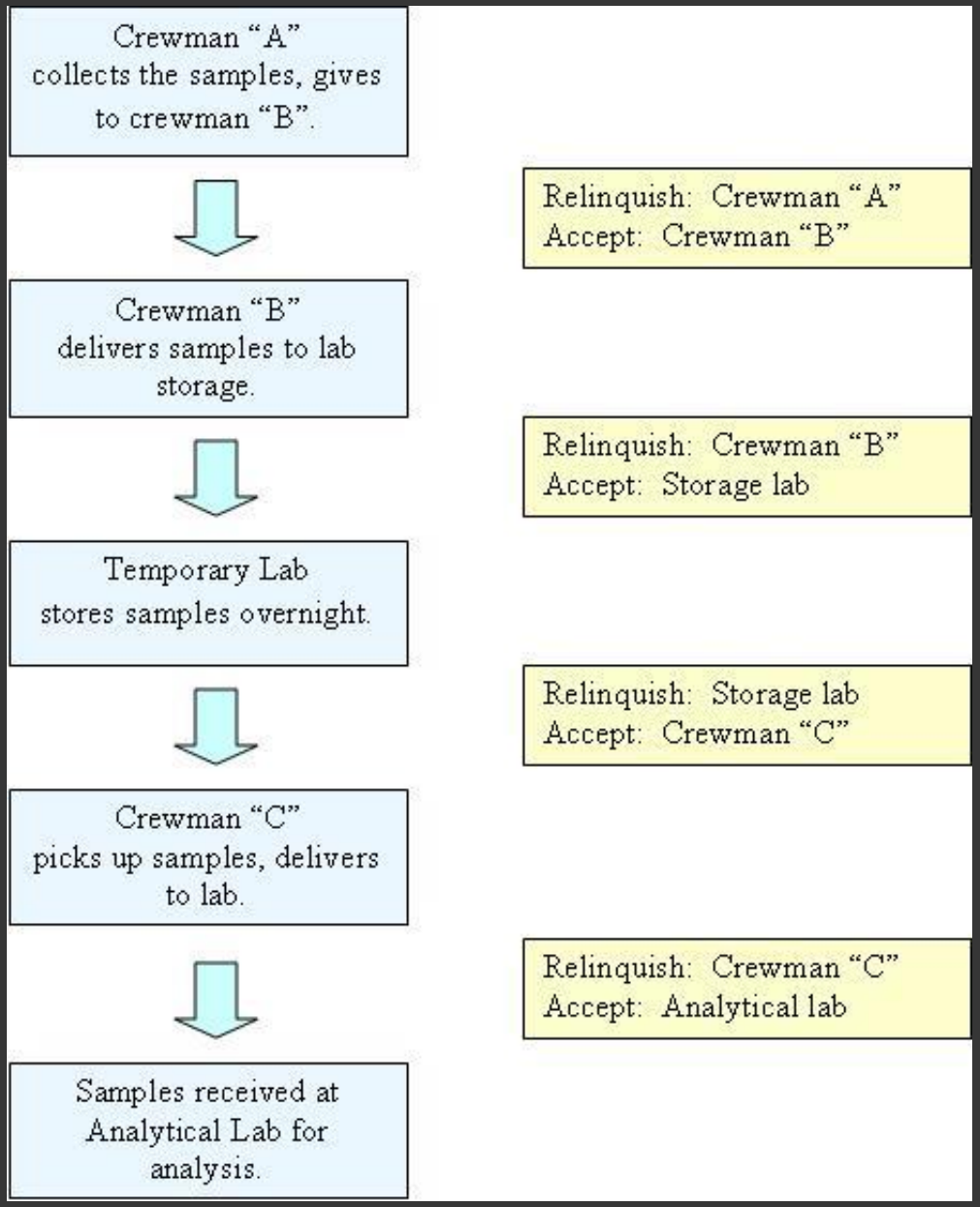
HNO_3 at 4 ^oC

Mary Smith / Bob Jones

Metals (lead, copper, zinc, cadmium)

Use waterproof labels and ink !

How Chain of Custody Works



An example of multiple transfers of possession of a set of samples, from initial site collection to final receipt at the analytical lab.

Chain of Custody forms are legal documents, they are admissible as evidence in court.

Problems with C.O.C. can destroy the value of the lab data.

Chain of Custody Form

Collector:				Date Sampled:
Address:			FAX:	
Project:				Project #:
Analyses Requested: (Arranged by present contract).				
LAB SAMPLE NUMBER	CITY SAMPLE NUMBER	CONTAINER P / G	PRESERVATIVE	FIELD INFORMATION
1				
2				
3				
4				
5				
6				
7				
8				
Relinquished By:	Date / Time:		Accepted By:	Date / Time:
Relinquished By:	Date / Time:		Accepted By:	Date / Time:
Relinquished By:	Date / Time:		Accepted By:	Date / Time:
Relinquished By:	Date / Time:		Accepted By:	Date / Time:

Common Units of Measure

mg/L milligrams per liter (approximately parts per million)

ug/L micrograms per liter (approximately parts per billion)

lbs/d pounds per day (a measure of pollutant loadings).

cfs cubic feet per second (a measure of "discharge")

fps feet per second (a measure of velocity of flowing water)

NTU Nephelometric Turbidity Unit (turbidity unit)

uS/cm microsiemens per centimeter (conductivity unit)

^{o}C centigrade or Celsius (temperature scale used most)

Sampling Considerations

Don’t just walk out the door – prepare !

- TYPE: Grab vs. Composite
- DEVICE: Direct fill, sampler, compositor
- CONTAINERS: Plastic, glass, specialized (e.g. Teflon lid)
- LABELS:
- PRESERVATIVES:
- HOLDING TIMES:
- CHAIN OF CUSTODY: Forms
- FIELD NOTES & MEASUREMENTS: More forms
- INSTRUMENTS: Calibrated, properly working

Spikes, Blanks & Dupes (Replicates)

Tests for Precision and Accuracy – both Lab and Field uses

QA TEST	FIELD KIT MEASUREMENT	FIELD VISUAL OBSERVATION	LAB SAMPLE COLLECTION	LAB INTERNAL
DUPE *	X	Some	X	X
BLANK *	Some		X	X
SPIKE	-	-	om	X
CHECK	Some	-	-	X
TEMP BLANK	-	-	X	-

10%

* There are different kinds of dupes & blanks; document the type you use for each.

Types of Field Blanks

- EQUIPMENT: DI water is passed through one, several or all samplers, collection bottles, compositors, etc. in the field to test for equipment contamination.
- TRIP: Transport DI water in container from lab to field and back to lab to test for contamination of containers during transport.
- FULL FIELD: Pass DI water through all sampling phases to test for overall contamination during all phases of sampling. This does not identify which sampling phase is the problem.
- SIMPLE FIELD: Fill collection bottle in field with DI water to test for bottle filling process and bottle contamination.
- INTERMEDIATE BLANK: DI water is passed through some field equipment but not all.

Types of Field Dupes

- FULL SAMPLING DUPE: A second sample is collected with the same procedures as close in time as possible to the first.

- COMPOSITOR DUPE: The sample and duplicate are poured into separate sample containers from the same bucket or compositor.

- SPLIT SAMPLE: The sample goes to your regular lab, and the "replicates" go to other labs. This compares lab analytical results of the same collected water sample. Split sampling is not done unless it is necessary to verify adequacy of the lab analysis itself.

Emergency Contact Information

Carry these in the field – along with First Aid kits and supplies.

Include list of Emergency Treatment Facilities and a map.

Name	Department	Office Phone #	Cell Phone #
	Public Works		
	Police Department		
	Fire Department		
	Supervisor		
	Ambulance Service		
	Emergency Response		

Not necessarily QA, but essential to field work nonetheless.

Include maps and addresses of emergency facilities.

Employee Training in QA

General Permits require "qualified personnel" and training.

Construction inspections

Dry Weather Field Screens

Source tracking inspections

Appropriate field equipment

Safety of field kit use

Proper use of field kits

Identifying illicit discharges

Rules for property access

Water quality impacts

Developing & using forms

Field safety & dangers

Confined space entry

Dealing with chemical exposure

How to conduct interviews

City documents & credentials

Processing lab samples

Chemical spill procedures

Management requirements

How to Start a Formal QA Program

- Managers and staff must learn the importance of good QA'd data, and how it will help them defend their programs.
- Don't try to do it all at once – expect changes as you go.
- Decide what level of QA you need to apply to each type of data and activity.
- Start with SOPs and a basic QAPP.
- Seek guidance from experienced resources.
- Be comfortable with what you create – stick to basics.
- QA is dynamic - amend as your Phase II program grows.

A Good Beginning QA Program

- Start applying QA to "hard data" first – Field measurements and observations, field test kits and lab data.

- DQOs – Decide upon the level of data quality you want for the main types of data you will be collecting. *Use of the data*.

- SOPs – identify all routinely repeatable actions, and write detailed step by step instructions; list supplies needed.

- QAPP – prepare an umbrella QA plan for all activities requiring formal QA attention.

- Lab and Service Contracts – include the technical requirements that you need, and specify these in your QAPP.

EPA's QA Resources

- **EPA guidance documents:**
  - http://www.epa.gov/region6/qa/qatools.htm
  - *DQO Guidance = QA/G-4*
  - *QAPP Guidance = QA/R-5*
  - *QMP Guidance = QA/R-2*
  - *SOP Guidance = QA/G-6*

- These are not approvable by EPA unless they pertain to projects funded by EPA water quality grants.
- EPA periodically offers QA training courses.
- Contact your Permitting Authority and substates for QA advice.

Thank you.

Any Questions ?

Vernon Seaman
Manager, Envir. And Energy Planning
INCOG
Two West 2nd Street, Ste 800
Tulsa, OK 74103
(918) 579-9451
vseaman@incog.org

INCOG | Environmental and Energy Planning

Green Country Stormwater Alliance
Give Clean Water a Helping Hand