

US EPA ARCHIVE DOCUMENT

Developing the Quality Assurance Project Plan (QAPP)

Michael Crow

Environmental Policy Consultant

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Overview

- Reasons for Emphasizing QA
- SIG QAPP Requirements and Process
- QAPP Support Available to SIG Winners
- Overview of the QAPP and Its Contents
- How to Describe and Address Key Quality Issues in the QAPP
- Discussion: Quality Issues in Your Project
- Guiding Principles for QAPP development

Why Emphasize QA?

Plan adequately to better ensure that:

- Analyses will support anticipated decision-making
- Experimental design and data collected will be sufficiently robust to support analyses
- Data will sufficiently represent actual conditions
- You will have confidence in your measures of project results/outcomes, avoiding nasty surprises

Remember: Garbage In, Garbage Out

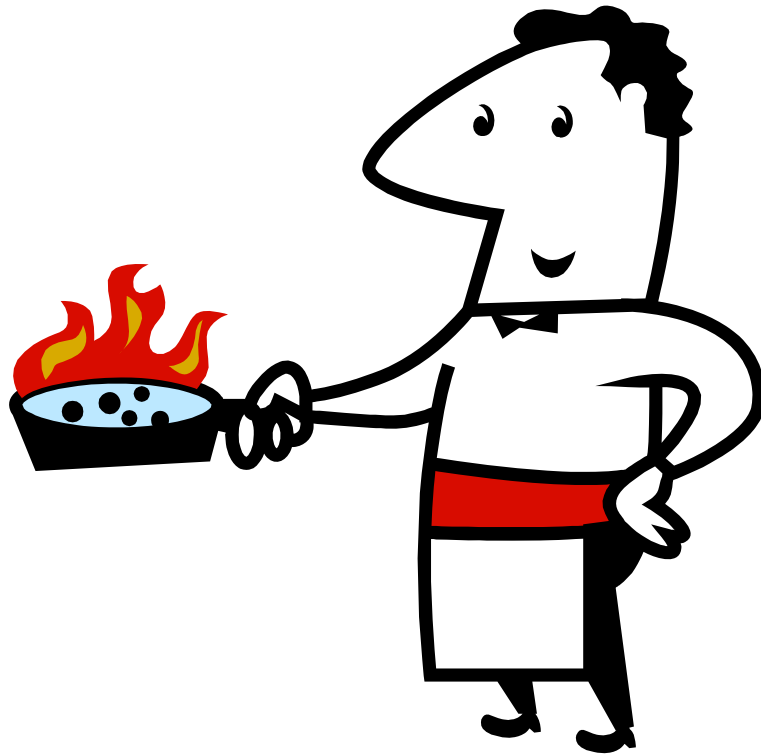
It's like cooking a new dish...

- Decide what to cook.
- Read cookbooks and get advice from friends.
- Decide on recipe.
- Gather the right ingredients in the proper amounts.
- Use clean cookware.
- Begin cooking, following the recipe, noting changes.
- Stir well and taste.
- Stir again and have someone else taste.
- Serve and enjoy!

Cooking, with QA



Cooking without QA



What Are SIG QA Requirements?

- **QA system** to support project data collection, modeling, analysis, etc. (consistent with ANSI standards)
- **You will need:**
 - **Quality Management Plan (QMP)**
 - **Quality Assurance Project Plan (QAPP)**

What is a QMP?

- Describes Agency/program management structure to ensure adequate data quality.
- Umbrella under which individual projects are conducted.
- Most likely already in place
 - Required for delegated programs (EO 5360.1)



What Is a QAPP?

- Document describing plan for collecting and using environmental information and data as part of *your* project.
- Intended to help ensure results will address your needs.
- Typically 10-20 pages long.

What Is the QAPP Process?

- **Draft, conditionally approved QAPP:**
 - Due 60 days after workplan approval/award
 - Some key project elements may remain unresolved until after award is received
- **Fully approved QAPP** necessary to begin collection of data
- Draft and amended QAPPs undergo **review by EPA:**
 - Region and Headquarters
 - QA and policy staff





QA Support for SIG States

- **Reference Documents.** Sample QAPPs and QAPP resources in binder.
- **Technical assistance.** EPA and contractor staff also available to help.
- **Collaborative QAPP review process.** EPA wants to reduce bureaucracy and see projects get implemented.
- **Templates.** QAPP templates designed specifically for ERP, Performance Track, and EMS-regulatory projects.

What Does a QAPP Contain?

- **High-level project information:** rationale, expected outcomes, decisions to be made based on data, and data quality objectives to support those decisions
- **Experimental design and data collection plan:** to meet needs for data quality and decision-making
- **Assessment and oversight plan:** to make sure the project is implemented as planned
- **Plan for assessing data quality:** to review and accept/reject data as needed

What Data Does QAPP Cover?

QAPP covers ALL data to be used by your project

- For “**primary**” data, you can affect the quality.
 - Any new data/information collected by your program. E.g.,
 - ERP data from random inspections or self-certification forms,
 - New ambient air quality monitoring data collected by your program
- For “**secondary**” data, you can only assess and cope with the quality
 - All existing data/information. E.g.,
 - Private-sector or other databases identifying regulated facilities,
 - Water quality data collected by your program for another purpose
 - New data/information collected by others

Rules of Thumb for Both Primary and Secondary Data

- *All* data should meet *your* quality objectives.
- Your use of each data source should be influenced by your understanding of its quality.
- You should always describe the quality of your data and how that quality impacts your analysis, regardless of the source.

- For secondary data: look for peer review, journal publication, and QAPPs
 - Can signal better quality
 - Can provide info on quality issues

How to Describe and Address Quality Issues in QAPP?

- Describe quality issues in terms of six “data quality indicators” (DQIs)
 - Precision, sensitivity/accuracy, bias, representativeness, completeness and comparability
- Address significant quality issues by setting “data quality objectives” (DQOs)
 - Identify the necessary level of confidence you need in your data (in terms of the DQIs) in order to apply the data in your analyses
 - Design DQOs to avoid major analytical and decision-making errors

What Do These DQIs Mean?

Next: Review of the Six DQIs...

- Definition
- Everyday example
- Examples potentially relevant to SIG projects, with sample DQO

- Goal: improved recognition of quality issues
 - Recognition more important than categorization
 - Don't get hung up on distinctions
 - Warning: I'll ask you later to ID a key data quality issue in your project

Precision: Definition

Measure of **agreement among repeated measurements** of the same property under identical or substantially similar conditions

Precision: Everyday Example

- **Measuring a child:**

Did he really get shorter?



Precision: SIG Example

- **Statistical sampling:**
 - Won't give perfectly precise results
 - 2 samples of the same population will likely have different results
- **Example DQO:**
 - "We have designed our sampling approach to ensure a maximum margin of error of +/- 5 percentage points, at a 90% confidence level – sufficient for our decision-making objectives."

Sensitivity: Definition

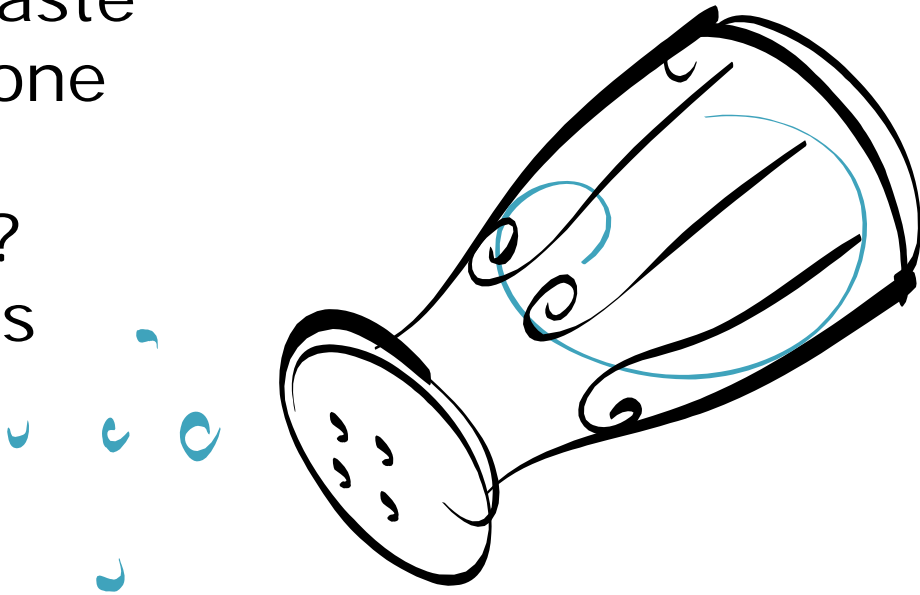


Measure of the **capability of a method or instrument to discriminate** between measurement responses representing different levels of the variable of interest.

This DQI can be thought of more broadly as "accuracy." In this sense, it reflects the ability of your measurement approach to detect actual conditions.

Sensitivity: Everyday Example

- **Cooking:** In your dish, can you taste the difference one grain of salt makes? 1 cup? How sensitive is your palate?



Sensitivity: SIG Example

- **Analyzing environmental samples:**
“Minimum detection limit” defines maximum sensitivity
- **Example DQO:**
 - “Our project will use the EPA-specified analytical approach for this water quality issue, which is capable of detecting contaminant levels below action limits. This will enable us to ensure we understand whether conditions exceed action limits.”

Bias: Definition

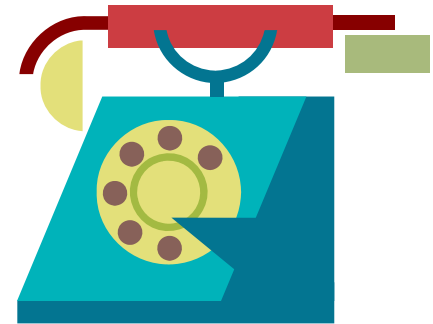
Systematic or persistent distortion
of a measurement process that
causes **errors in one direction.**

Bias: Everyday Example

**“Dewey
Defeats
Truman”**



- **Problem:** Tribune poll is biased in favor of phone owners



- Truman won handily among poor and rural voters without phones

Bias: SIG Example

- **Interested party:**
 - Facility-reported data, relative to inspector-collected data
 - How does the facility perspective/interest impact data quality?

- **Example DQO:**
 - “Facility reports on energy usage changes will be included in data set only if corroborated by energy bills.”

Representativeness: Definition

Degree to which a sample **accurately and precisely represents the larger context.**

Lack of representativeness can...

- Be a source of bias
- Create comparability problems

Representativeness: Everyday Example

Stirring a dish

- We stir well after adding ingredients to ensure our taste test is representative



Representativeness: SIG Examples

- **Sampling approaches**
 - Is your sample representative of all possibilities, or just a subset (like volunteers)?
 - Is it representative of seasonal or other differences that vary over time?
- **Example DQO:**
 - “Our random sample will be based upon a complete list of all facilities, not just volunteers.”
 - “We will structure our data collection to minimize the impact of seasonal highs and lows on our results.”



Completeness: Definition

Measure of the **amount of valid data needed** to be obtained from a measurement system.

- Incompleteness can be a source of bias

Completeness: Everyday Example



Cooking (again!):

- Are there any key ingredients you can't do without or substitute for?
- E.g., "I can do without the cumin, but not the tomatoes."

Completeness: SIG Example

- **Environmental Sampling:**
 - Were a sufficient number of samples collected, under the proper conditions?
- **Example DQO:**
 - “We will only use the results for decision-making purposes if 90% of the planned samples are collected properly, during specified weather conditions.”

Comparability: Definition

Measure of **confidence** that the underlying assumptions behind two data sets are similar enough **that the data sets can be compared** and/or combined to inform decisions.



- **Comparisons over time are most common**
- **Other DQIs play a role in comparability**

Comparability: Everyday Example

- **Home Electricity Usage:**
 - “That compact fluorescent bulb I screwed in sure makes a difference. I paid less for electricity in September than I did in August.”
 - Comparability issues:
 - Price changes in electricity
 - One less day in the month
 - Air-conditioning usage going down in September?
 - Etc.



Comparability: SIG Example

- **Changing energy prices over time impacts:**
 - Type and location of development?
 - Air quality, vis-à-vis changes in energy use?
 - Conservation and switches to alternative fuels?
- **Example DQOs:**
 - “We will track energy prices and qualitatively describe the estimated impact of price on energy usage and on project measures.”
 - “In expressing estimated emissions reductions due to control technologies, we will normalize the results based upon fuel usage.”

Rules of Thumb for DQOs

- **No surprises:** Make sure quality will be good enough for your needs.
- **Transparency:** Report all unresolved, important quality issues.
- **Achievability:** Too onerous, and data won't be collected or data will be rejected.

Discussion:

DQOs and Your Project

- What is a key data quality issue in your project?
- How perfect does your information need to be?
- What will your stakeholders expect?
- What kind of data quality objective might be appropriate?



Guiding Principles

Developing and Executing QAPPs Is a Balancing Act

- **Recognize there will be problems:** Every project will have quality issues, due to limited resources, other constraints
- **Prioritize:** Identify the biggest quality issues to resolve to ensure good decision-making, and direct resources/effort appropriately
- **Don't go overboard:** A QAPP's complexity and level of detail should be proportional to the complexity and significance of the intended use for the data.
- **Consider QA when developing your work plan:** Laundry list of measures needs QA approach governing **each** measure

Contact Information

Michael Crow

Environmental Policy Consultant

Takoma Park, Maryland

Phone: 240-398-3643

Cell: 301-580-3501

Fax: 240-804-8080

E-mail: Mike@CrowEnvironmental.com

Web: www.CrowEnvironmental.com