



# **Water Resource Evaluation Quality Management Plan**

**City of Austin  
Watershed Protection & Development Review  
Environmental Resource Management Division**

August, 2004

## Table of Contents

1.0 Purpose.....	3
2.0 Mission & Performance Measures.....	4
3.0 Staff & Responsibilities.....	6
4.0 Monitoring Objectives.....	10
5.0 Operational QA/QC Requirements.....	11
6.0 QAPP Structure.....	12
7.0 Documentation and Records.....	13
8.0 References.....	14

## 1.0 Purpose

A quality management plan, as defined by EPA (2001), describes “the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and (the organization’s) processes for planning, implementing, documenting and assessing all activities conducted under the organization’s quality system.”

The benefits to implementing a quality management plan (EPA 2002) include:

- Scientific data integrity
- Reduced or justifiable resource expenditures
- Proper evaluation of internal and external activities
- Reliable and defensible decisions
- Increased efficiency

This quality management plan (QMP) is designed to document the sampling activities and objectives of the Water Resource Evaluation (WRE) Section of the City of Austin Environmental Resource Management Division, as well as to identify which specific staff members are responsible for maintaining the quality of these programs.

Prior to the implementation of this QMP, individual sampling programs had non-standardized activity descriptions with varying levels of detail known as “project sampling plans.” Aggregation of the different sampling plans to describe the activities of the WRE section as a whole could be a difficult and time-consuming process. The QMP, however, now defines the format and content of the documents describing these individual programs. To be consistent with EPA and Texas Commission on Environmental Quality (TCEQ) terminology, these individual project sampling plans will be known as Quality Assurance Project Plans (QAPP).

The structure of the QAPP for each project as defined in this QMP generally follow EPA (2001b) guidelines, such that the QAPP is “..written document that describes the quality assurance procedures, quality control specifications, and other technical activities that must be implemented to ensure that the results of the project or task to be performed will meet project specifications.” The QAPP details data collection, data usage and data processing. Thus, the QMP serves as the “umbrella document under which individual projects are conducted.” Additionally, changes to the QAPP for a specific project over time should be documented.

Specific data collection and analysis methodology is detailed in the WRE Standard Operating Procedures Manual (WRE 2004). The SOP manual in conjunction with the QMP and the individual QAPP should completely describe the management and implementation of the sampling activities of the WRE section.

### **The central tenets of the WRE QMP are:**

- All sampling programs will be documented in a consistent format (the QAPP)
- Changes to the sampling programs will be documented.
- All programs will be overseen by a committee consisting of (at a minimum) the Section Manager, the Team Leader, the Project Manager, a member of the WMA Team
- Sampling programs will be reviewed annually by the designated WMA team member to insure that QAPP specifications are being met.

## 2.0 Mission & Performance Measures

Crucial to the QMP is a statement of the organization mission. To this end, the mission, goals and performance measures directing the WRE Section are presented here.

### **Watershed Protection & Development Review Department:**

The purpose of the Watershed Protection Department is to reduce the impact of flooding, erosion and water pollution on our community in order to protect lives, property and the environment.

### **Environmental Resource Management Division (Water Quality Protection Program):**

The purpose of the Water Quality Protection program is to protect and improve water quality in Austin's creeks, lakes and aquifers for our community and aquatic life by preventing, detecting, evaluating and reducing water pollution.

### **Water Resource Evaluation Section (Pollution Detecting, Tracking and Forecasting Activity):**

The purpose of the Pollution Detection, Tracking and Forecasting activity is to provide technical information and recommendations to diagnose the current and future state of Austin's creeks, lakes and aquifers for citizens, City staff, regulatory agencies and policy makers so they are able to make informed decisions on water quality related issues.

The Pollution Detection, Tracking and Forecasting activity of the WRE section is a core activity, mandated by the City of Austin Municipal Stormwater Discharge Permit under the National Pollutant Discharge Elimination System (NPDES) administered by the EPA through the TCEQ. The NPDES program was authorized by the Clean Water Act of 1977, reauthorized in 1987.

The goal of the activity is to obtain information about the state of Austin's creeks, Town Lake and the Edwards Aquifer and use this information to focus the City's efforts toward protection and restoration of these water resources. The assessments performed under this activity are designed to:

- Diagnose the water quality conditions
- Identify pollution sources
- Recommend solutions to pollution problems
- Track effectiveness of water quality protection efforts.

Services provided by this activity include:

- Compliance with NPDES Reasonable and Prudent Measures monitoring requirements
- Provision of technical support to water quality education efforts
- Reporting of findings to the public including the annual State of the Environment Report
- Provision of technical support to endangered aquatic species monitoring efforts
- Assessment of specific water bodies as requested by CAF, Environmental Board and Council
- Collection and analysis of water quality data from Austin waterways
- Development and maintenance of water quality models of Austin waterways
- Inclusion of City data in TCEQ 303(d)/305(b) water quality assessments

The current performance measures used to gage the efficiency and output of the WRE section in meeting the objectives of this activity are:

- The percent of sampled creeks, lakes and aquifers for which detection, tracking and/or forecasting evaluations were reported
- The number of creeks, lakes and aquifers for which evaluations were reported
- The personnel cost per water body sampled and/or evaluated
- Total number of creeks, lakes and aquifers sampled
- Number of water quality studies completed annually
- Maintain current level of water, sediment, recreational quality, aquatic habitat and physical integrity in 50% of watersheds evaluated.

Table 2.1. WRE Section Performance Measure Completion from FY2001-FY2004. See <http://www.ci.austin.tx.us/budget/eperf/index.cfm> for most complete version.

<b>Performance Measure</b>	<b>FY 2001 Actual</b>	<b>FY 2002 Actual</b>	<b>FY 2003 Actual</b>	<b>FY 2003 Amended</b>	<b>FY 2004 Amended</b>
Percent of sampled creeks, lakes and aquifer for which detection, tracking and/or forecasting evaluations were reported.	29%	56.25%	48%	50%	50%
Number of creeks, lakes and aquifers for which evaluations reported	7	No Data	11	10	10
Personnel cost/water body sampled and/or evaluated	\$39,347	\$23,948	\$22,322	\$35,556	\$19,912
Total number of creeks, lakes, and aquifers sampled	24	No Data	23	20	20
Number of water quality studies completed (annually)	No Data	No Data	12	12	12
Maintain current level of water, sediment, recreational quality, aquatic habitat, and physical integrity in 50% of watersheds evaluated	No Data	100%	N/A	100%	100%

### 3.0 Staff & Responsibilities

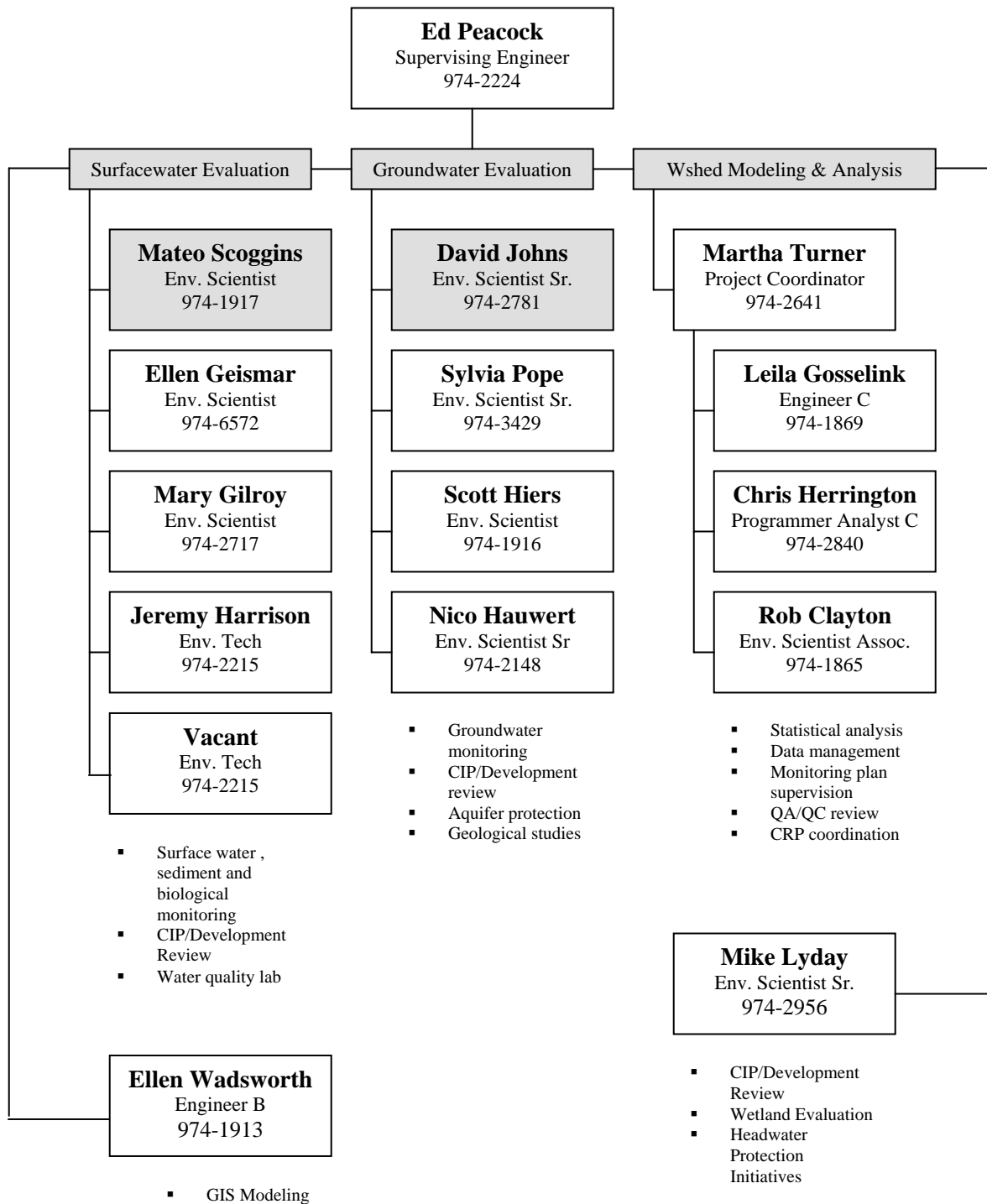
The sampling activities of WRE are completed and managed by three teams within the section: the Surface Water Evaluation Team, Groundwater Evaluation Team and the Watershed Modeling and Analysis Team (Figure 3.1).

The Surface Water Evaluation (SWE) program evaluates the quantity and quality of specific surface water resources in the Austin area. The SWE team identifies current characteristics of water resources, long-term trends based on historical data, projected impacts to water resources through the use of predictive modeling tools and strategies for maintaining the water quantity and quality of water resources.

The Groundwater Evaluation (GWE) program monitors groundwater for quality and quantity. The GWE team interprets groundwater data and projections by assessing the impact of urbanization on groundwater quality and quantity, monitoring chemical parameters which best characterize urban effects on groundwater and determining the effects of on-site or local wastewater disposal systems.

The Watershed Modeling and Analysis (WMA) Program provides quality assurance oversight of monitoring programs, assistance in the development of new water quality studies, data analysis/modeling and management of the central data repository for environmental quality data collected in the Austin area known as the Field Sampling Database.

Figure 3.1. Water Resource Evaluation Section Organizational Chart



All individual projects, including special short-term studies, are overseen by a committee consisting of, at a minimum:

- **the Section Manager** (Ed Peacock)
  - Responsible for integrating project objectives with section and division objectives, oversight of budget
- **the Team Leader** (Mateo Scoggins or David Johns)
  - Responsible for integrating project objectives with team objectives, oversight of resource scheduling and maintenance of project timelines
- **the Project Manager**
  - Responsible for data collection, entry to database, analysis and report generation
- **a member of the WMA Team**
  - Responsible for quality assurance oversight, technical assistance in sample planning and analysis and report generation, assistance with data management

The committee for each program is charged with (patterned after Box et al 1978):

1. Clearly defining the objectives of the study
2. Defining the criteria that will determine if objectives have been addressed
3. Iteratively adjusting the objectives or criteria as new information becomes available
4. Verifying that all members agree on the objectives and criteria
5. Maintaining lines of communication between committee members (and all interested parties)

So that data collection does not become an isolated and undirected activity, the designated WMA team member must review the data collected for a program once per year to ensure that QAPP specifications are being met. This review should verify that:

- Correct sites were sampled
- Correct parameters were analyzed
- Samples were collected at designated times
- Required QA/QC samples were collected
- Data has been entered into the FSDB and checked

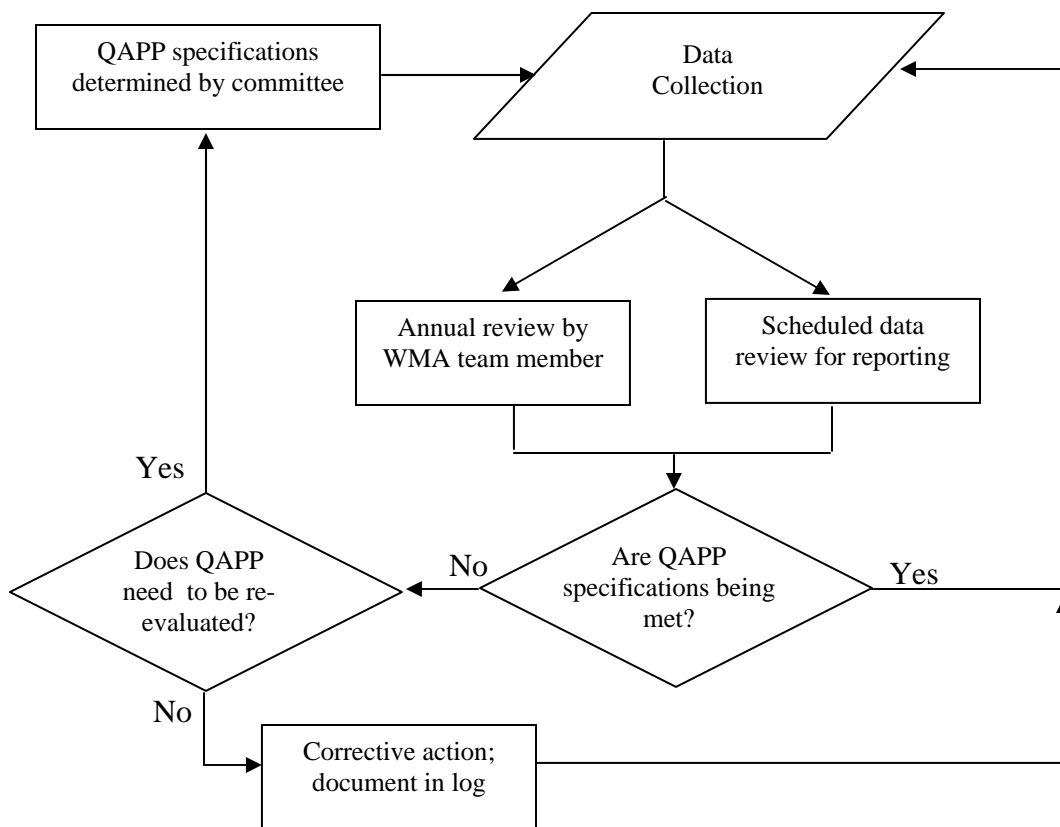
Deviations from QAPP specifications should be addressed by the committee if deviations suggest a review of the sampling objectives or criteria. If deviations are the result of an error, then a corrective action should be instituted and sampling should continue under the current QAPP (Figure 3.2). The outcome of either scenario should be documented in the log for that program.

The designated committee for routine, on-going intensive monitoring projects are detailed in Table 3.1. All short-term special study project should be managed by similar committee as well, detailed in the individual QAPP for that study.

Table 3.1. QAPP Committee Members for Current Intensive Study Projects. Note all committees include the Section Manager

Project	Team Leader	Project Manager	WMA Team Member
Barton Creek	Mateo Scoggins	Ellen Geismar	Leila Gosselink
Bull Creek	Mateo Scoggins	Ellen Geismar	Martha Turner
Walnut Creek	Mateo Scoggins	Mateo Scoggins	Martha Turner
Onion Creek	Mateo Scoggins	Mary Gilroy	Chris Herrington
Town Lake	Mateo Scoggins	Mary Gilroy	Chris Herrington
EII	Mateo Scoggins	Jeremy Harrison	Chris Herrington
Groundwater Monitoring	David Johns	Scott Hiers	Leila Gosselink

Figure 3.2. Data Generation and Review Process



## 4.0 Monitoring Objectives

Urbanization has detrimental impacts on environmental quality. As stated in the mission of the WRE section (see 2.0), the basic primary objectives of WRE sampling activities should be to:

- Identify and document impacts to environmental quality
- Recommend solutions to water quality problems and track the effectiveness of those solutions
- Predict future water quality conditions
- Maintain compliance with NPDES permit requirements

Additionally, the WRE section supports the activities of other City and non-City regulatory agencies by providing specific data as needed. All sampling activities should consider the monitoring needs of these entities, including the Texas Clean Rivers Program (<http://www.tnrcc.state.tx.us/water/quality/data/wmt/index.html>) administered by TCEQ, when those activities would provide a benefit to the citizens of Austin and are within the resource limitations of the WRE section.

To satisfy these objectives, WRE has two types of monitoring efforts. **Routine monitoring** is conducted in large watersheds (or at a city-wide spatial extent) over long periods of time to quantify deviations in baseline conditions, and includes programs such as the Town Lake Study, the Onion Creek Study and the Environmental Integrity Index. Additionally, **intensive monitoring** special studies are conducted over limited time periods to answer a specific questions.

Any long-term monitoring conducted by WRE should at a minimum provide sufficient data for (patterned after Dixit et al 1992):

- Continued reliable estimation of baseline variation
- Detection of long-term trends or deviations in the mean level of the baseline
- Detection of rare or unusual events
- Meaningful hypothesis testing

Any special study should be designed to address the issue in question in the time-frame specified, while complementing to the maximum extent existing routine monitoring or historical data. Special studies should be constructed within the framework of empirical science so that an initial hypothesis is constructed and tested by data collection or analysis of existing data.

Both routine and intensive study projects should have a documented QAPP as detailed in this QMP. One-time “emergency” response investigations or programs which do not require monitoring, analysis or the generation of a written report would not need a QAPP, although there are clear benefits to applying the QAPP planning process to ensure a well-designed scientifically supported program with clearly defined objectives.

## 5.0 Operational QA/QC Requirements

The QAPP for all programs will be used in combination with the WRE Standard Operating Procedures (SOP) Manual to define the monitoring efforts of the WRE Section. All procedures will be conducted according to the SOP manual. Changes to operational procedures should be reflected in the most current version of the SOP manual.

All new staff will be introduced to the QMP/QAPP structure, and trained to follow procedures as documented in the SOP manual.

The QAPP for each monitoring program will be reviewed annually by a member of the WMA team as discussed in section 3.0 to insure that QAPP-specifications are being met. Additional reviews of monitoring procedures for each program may be conducted to insure that monitoring efforts follow documented methods in the SOP manual.

## 6.0 QAPP Structure

A key element of the WRE QMP is the presentation of the standardized contents for the individual program QAPP, patterned after EPA requirements (EPA 2001b, EPA 2002b). Each QAPP must contain five critical elements, identified below with specific information needs for each element.

- **Project Management** – Who is responsible for this project?
  - i. Who is the project manager?
  - ii. Who is the WMA team representative?
  - iii. Are there additional interested parties?
  - iv. When will the annual WMA review be completed?
  
- **Data Objectives** – Why is the project being conducted?
  - i. What are the study objective(s)?
  - ii. Who will use the data?
  - iii. What decision(s) will be made from the information obtained?
  - iv. When will the decisions be made?
  - v. What has been done in the past?
  - vi. What could be done in the future?
  
- **Data generation** – How, where and when will the data be collected?
  - i. What sites will be sampled?
  - ii. What parameters will be collected?
  - iii. How often will sampling occur?
  - iv. When will sampling begin/end?
  - v. Under what conditions will samples be collected?
  - vi. What collection methods will be used?
  - vii. What analytical methods will be used?
  - viii. Where will the samples be analyzed?
  - ix. How much will samples cost?
  - x. What possible problems may arise in sample collection and what actions can be taken to mitigate their impact?
  
- **Validation** – How will QA/QC data be used to validate data quality?
  - i. What type of QA/QC samples will be collected?
  - ii. How often will QA/QC samples be generated?
  - iii. Where/How will QA/QC samples be generated?
  - iv. How will QA/QC sample results be used to validate data quality?
  - v. In case of QA/QC failure, what corrective action will be taken?
  
- **Assessment** – What criteria will be used to determine if the objectives have been met?
  - i. By what specific methods will the data be analyzed?
  - ii. What hypotheses will be tested?
  - iii. What additional parameters/indices will be calculated?
  - iv. When and/or how often will the data be analyzed?
  - v. How will it be determined that the study objectives have been met?

- **Reporting** – How often and with what detail will reporting be completed?
  - i. When will reports be generated?
  - ii. Who will review the reports prior to publication?
  - iii. To whom will reports be addressed?
  - iv. What level of detail will reports contain?

## 7.0 Documentation and Records

The QAPP for each monitoring program will be documented and made available to all staff via the network (G:\ drive). Changes to the QAPP for any program, as well as results of all auditing (including annual WMA team assessments) will be documented in a “log of changes” accompanying each QAPP.

Field data collection sheets and field notebooks will be stored indefinitely by the project manager. All field and lab data will be entered into the WRE Field Sampling Database (FSDB) and checked for accuracy according to the procedures outlined in the current version of WRE Standard Operating Procedures Manual.

## 8.0 References

- Box et al. 1978. *Statistics for experimenters*. Wiley, New York.
- Dixit et al. 1992. Diatoms: Powerful Indicators of Environmental Change. *Environmental Science and Technology* 26(1):23-33.
- EPA. 2000. *Guidance for the Data Quality Objectives Process (QA/G-4)*. EPA/600/R-96/055.
- EPA. 2001. *EPA Requirements for Quality Management Plans (QA/R-2)*. EPA/240/B-01/002.
- EPA. 2001b. *EPA Requirements for Quality Assurance Project Plans (QA/R-5)*. EPA/240/B-01/003.
- EPA. 2002. *Guidance for Developing Quality Systems for Environmental Programs (QA/G-1)*. EPA/240/R-02/008.
- EPA. 2002b. *Guidance for Quality Assurance Project Plans (QA/G-5)*. EPA/240/R-02/009.
- WRE. 2004. *Water Resource Evaluation Section Standard Operating Procedures Manual*. City of Austin Watershed Protection and Development Review Department, Environmental Resource Management Division.