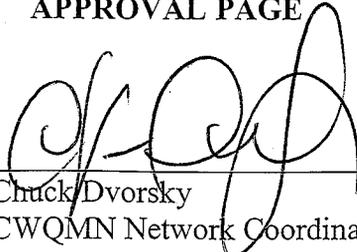


TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
LAKE PALESTINE
CONTINUOUS WATER QUALITY MONITORING
PROJECT PLAN

A1 APPROVAL PAGE



Chuck Dvorsky
CWQMN Network Coordinator, TCEQ

2/11/08
Date



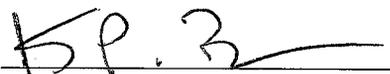
Patrick Roques
Section Manager, TCEQ Water Quality
Monitoring & Assessment Program

2/19/08
Date



Brenda Archer
Team Leader, TCEQ Surface Water
Quality Monitoring Program

2/11/08
Date



Pat Bohannon
Lake Palestine CWQMN Project Lead

2/11/08
Date



Edward Ragsdale
CWQMN Quality Control Officer

2/11/08
Date



David Manis
Section Manager, TCEQ Data Management
& Quality Assurance Section

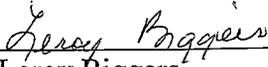
2/13/08
Date



Sharon Coleman
CWQMN Quality Assurance Officer

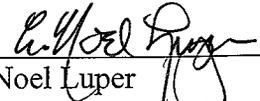
2/14/2008
Date

A1 APPROVAL PAGE



Leroy Biggers
Regional Director, TCEQ Region 5, Tyler

2-11-08
Date



Noel Luper
Water Section Manager, TCEQ Region 5

02/11/08
Date



Mike Prater
Site Operator, TCEQ Region 5

02/11/08
Date

The Lake Palestine Continuous Water Quality Monitoring Network (CWQMN) Project Plan documents project specific details for this particular project. Please see the CWQMN QAPP for additional project requirements.

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LIST OF ACRONYMS

°C	Degrees Celsius
CAMS	Continuous Ambient Monitoring Station
CO	TCEQ Central Office
CoT PWS	City of Tyler Public Water Supply
CVS	Calibration Verification Sample
CWA	Clean Water Act
CWQMN	Continuous Water Quality Monitoring Network
DO	Dissolved Oxygen
DM&QA	Data Management and Quality Assurance
DQO	Data Quality Objective
LEADS/RHONE	Leading Environmental Analysis and Display System
µS/cm	micro Siemens per centimeter
mg/L	Milligram per Liter
MOPs	Monitoring Operation Division
NA	Not Applicable
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPE	Relative Percent Error
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
WQM&A	Water Quality Monitoring & Assessment Section

A3 DISTRIBUTION LIST

ANGELINA-NECHES RIVER AUTHORITY (ANRA)

P.O. Box 387
210 East Lufkin Avenue
Lufkin, Texas 75901
(936) 362-7795
Mr. Matthew Romig, Clean Rivers Manager, ANRA

UPPER NECHES RIVER AUTHORITY (UNRA)

P.O. Box 1965
Palestine, Texas 75802
(903) 876-2237
Mr. Monty Shank, General Manager, UNRA

CITY OF TYLER WATER UTILITIES

511 W. Locust St.
Tyler, TX 75702
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Mr. Jim Anderson

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, REGION 5, TYLER

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Mr. Leroy Biggers, Regional Director
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Mr. Mike Prater, Surface Water Quality Monitoring
Mr. Arthur Crowe, Surface Water Quality Monitoring

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY CENTRAL OFFICE

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Mr. Pat Bohannon, Surface Water Quality Monitoring Team, Water Quality Monitoring & Assessment Section
Mr. Scott Mgebhoff, Section Manager, Ambient Monitoring Section, Monitoring Operations Division
Mr. Charles Dvorsky, Network Coordinator, Ambient Monitoring Section, Monitoring Operations Division
Mr. Larry Lehmann, System Planning and Implementation Team, Ambient Monitoring Section, Monitoring Operations Division
Mr. Lynn Robbins, Systems Planning and Implementation Team Work Leader, Ambient Monitoring Section, Monitoring Operations Division
Mr. Lloyd Lawrence, Ambient Monitoring Communications Coordinator, Ambient Monitoring Section, Monitoring Operations Division
Mr. David Manis, Section Manager, Data Management & Quality Assurance Section, Monitoring Operations Division
Ms. Nancy Ragland, Data Management & Quality Assurance Section, Monitoring Operations Division
Ms. Anne Panko, Data Management & Quality Assurance Section, Monitoring Operations Division
Mr. Paul Owen, Quality Assurance Team, Data Management & Quality Assurance Section, Monitoring Operations Division
Ms. Laurie Curra, Watershed Management Team Leader, Water Quality Monitoring & Assessment Section
Ms. Sharon Coleman, CWQMN Quality Assurance Officer, Compliance Support Division
Ms. Gail Rothe, Categorical 106 Grant Project Manager

A4 PROJECT/TASK ORGANIZATION

This section is intended to identify individuals and organizations that will be responsible for developing and/or supporting new CWQMN projects. For a list of additional project/task and responsibilities please refer to section A4 of the CWQMN QAPP.

A4.1 TCEQ CWQMN Coordinator (Charles Dvorsky)

- Provides overall support for coordination, development, and installation of new Continuous Ambient Monitoring Station (CAMS)
- Responsible for ensuring external data customers have access to TCEQ data behind firewall

A4.2 TCEQ Project Lead (Pat Bohannon)

- Responsible for writing Project Plan
- Responsible for site selection
- Responsible for overall coordination of project
- Responsible for monitoring equipment purchases
- Participate in station deployment
- Provide training to site operator
- Provide operation and maintenance supplies to site operator when requested
- Provide assistance to site operator, QC officer, and data validator to resolve data quality problems as needed

A4.3 TCEQ Region 5 SWQM (Mike Prater)

- Lead for site operation
- Responsible for water quality monitoring equipment quality control activities
- Participate in site deployment
- Communicate equipment needs for operation and maintenance of site to project lead
- Data customer
- Provides feedback to TCEQ for specific data needs

A4.4 TCEQ Ambient Monitoring (Lloyd Lawrence)

- Responsible for site communication setup
- Provide support during site deployment

A4.5 TCEQ Systems Planning and Implementation Team (Larry Lehmann)

- Provides overall support and logistics for deployment of monitoring stations
- Provides training to operate and maintain station infrastructure

A4.6 TCEQ Data Validation (Quality Assurance Team)

- Processes Site Initiation and Update Forms and assigns Station IDs in the Surface Water Quality Monitoring Information System (SWQMIS)
- Provides data validation for site
- Train operators on data validation software and procedures when applicable including Manual Validation
- Provide training for Site Operator on the data display system
- Contacts Site Operator and Project Lead to when potential data issues arise

A4.7 TCEQ CWQMN Quality Control Officer (Edward Ragsdale)

- Provides QC oversight of project
- Reviews and comments on proposed project plan

A5 PROBLEM DEFINITION/BACKGROUND

The upper portions of Lake Palestine have been listed for high pH in previous and current water quality assessments in addition to having concerns for depressed dissolved oxygen in the headwaters and upper reaches of the reservoir. The middle portion of the lake, including the Flat Creek arm (including Flat Bay) and near the City of Tyler Public Water System (CoT PWS) intake structure has been identified as impaired for high pH.

Lake Palestine, located approximately ten (10) miles southwest of Tyler, is one of two reservoirs supplying drinking water for the City of Tyler and several smaller municipalities. Raw water is pumped from one of three pumps located at various depths, to the Lake Palestine Water Treatment Plant where it is treated, filtered, and disinfected before distribution. Historically, the City of Tyler has received complaints about the taste and odor of the public drinking water. Seasonal taste and odor problems are typically caused by the production of geosmin, an organic compound with an earthy or musty smell, from cyanobacteria (blue-green algae) and actinomycete bacterial blooms. These blooms are generally precipitated by increased nutrient concentrations, decreased water movement, and internal nutrient recycling due to temperature and DO stratification. The anoxic water layer contains decomposing bacteria and hydrogen sulfide which may also contribute to taste and odor problems. To avoid these taste and odor problems, CoT PWS staff must monitor geosmin levels and pump water from the oxygenated mixed surface layer during certain times of the year.

Water temperature, pH, specific conductivity, and DO will be measured at various depths, creating a profile. These profile data will be useful in determining the mixed surface layer which CoT PWS staff may consider when choosing the appropriate pump to avoid anoxic water. Continuously-collected profile data are currently unable to be ingested into SWQMIS. Eventually, pH data collected from the mixed surface layer may be used to address the pH impairments in the mid-lake area.

A6 PROJECT/TASK DESCRIPTION

TCEQ will establish a CWQMN station (CAMS 0766, Station ID ?) on Lake Palestine, mid-lake between the City of Tyler PWS water intake facility and SH 155 bridge (Figures 1 and 2). This site is representative of the area near the raw water intake structure and the Flat Creek arm. Water quality monitoring equipment will include a YSI Model 6600EDS V2 multiprobe sonde mounted on a YSI Model 6951 Floating Vertical Profiler.

Deployment is expected to be completed in Winter 2008 with *in-situ* water quality sampling beginning immediately upon installation and continuing for a period of at least (but not limited to) two years. All water quality data will be transmitted and stored in the LEADS database. Currently, profile data can neither be uploaded to the SWQMIS database nor displayed publicly via the TCEQ website.

Figure 1: Aerial view of Lake Palestine



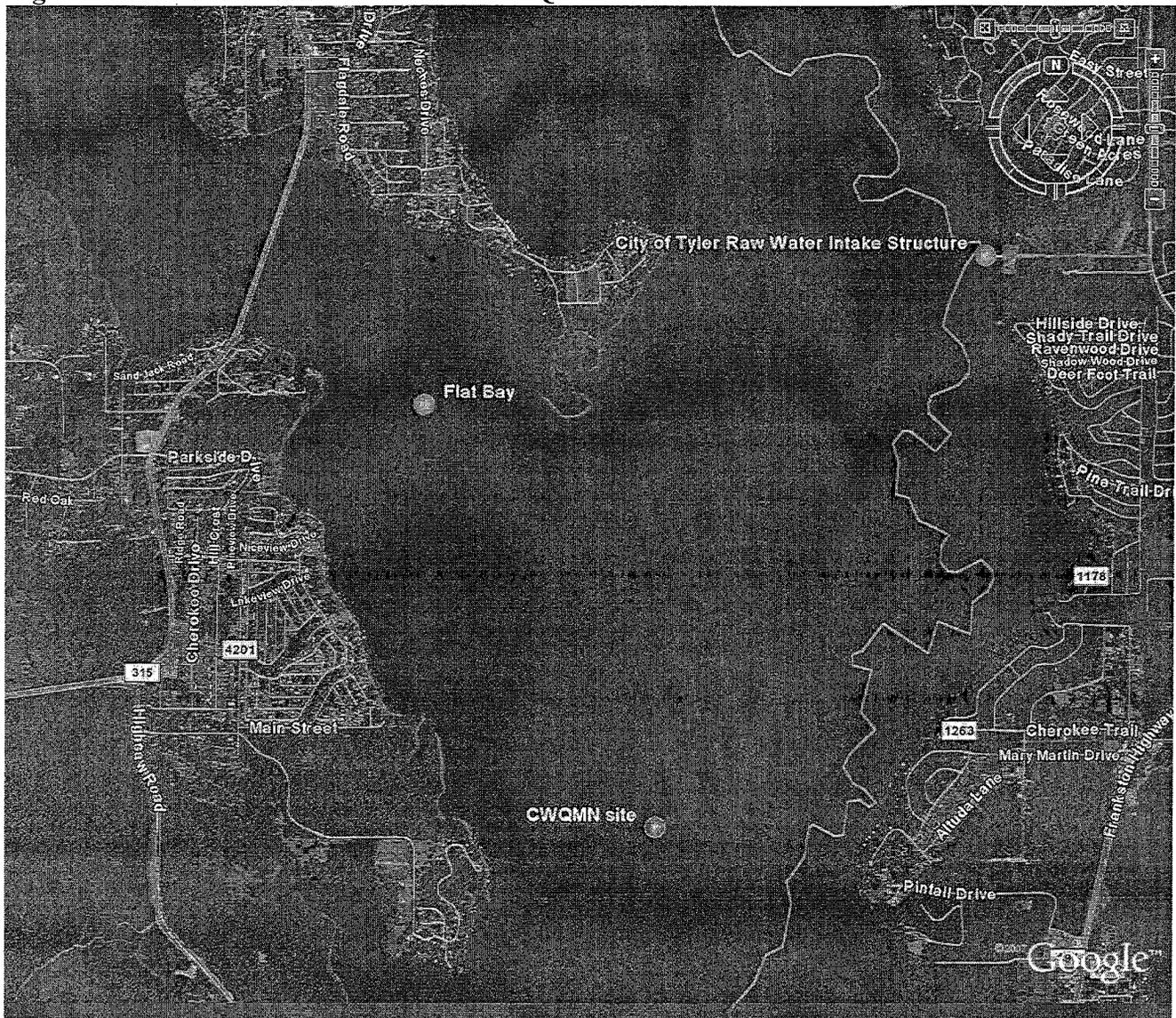
A7 QUALITY OBJECTIVES AND CRITERIA

Methods used for the YSI multiprobe are based on *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, 1998, unless otherwise noted.

The measurement performance specifications to support the project objectives are specified in Table A7.1.

Data Quality Objectives and criteria have not been developed for data collected with meteorological equipment. These ancillary data (air temperature, relative humidity, and wind speed and direction) are neither quality assured nor displayed on TCEQ public website but are available on request. The primary usefulness of the data is assessing suitable weather conditions for site visits.

Figure 2: Aerial view of Lake Palestine CWQMN site



Ambient Water Reporting Limits (AWRLs)
NA.

Precision
NA.

Bias
As described in Section A7.4 of the CWQMN QAPP for DO, specific conductivity, and pH.

Representativeness

As described in Section A7.2 of the CWQMN QAPP.

Table A7.1 – YSI Sonde (Multi-Probe) Data Quality Objectives

Parameter	LEADS Parameter Code	Units	Method	Calibration Verification Sample (CVS)
pH	10400	pH/ units	Glass electrode, Standard Method 4500-H+B	± 0.5 pH unit **
Dissolved Oxygen*	10300 10301	mg/L %saturation	Optical Luminescence (Hach LDO Method 10360)*	% Saturation ≤6.0% ** ± 0.5 mg/L
Specific Conductance	10095	µS/cm	Conductivity cell, Standard Method 2510B	≤ 5.0% RPE **
TDS	10294	mg/L	Calculated by LEADS, Specific Conductance multiplied by 0.65	≤ 5.0% RPE (Specific Conductance CVS)
Water Temperature	10010	°C	Standard Method 2550 B	± 0.5°C**
Sample Depth	10078	m	Pressure transducer	NA

* *Luminescent Measurement of Dissolved Oxygen in Water and Wastewater*, Revision 1.1, Hach Co., January 2006.

** CVS criteria for use in the 305(b) and 303(d) Lists per SWQM DQO's.

Comparability

As described in Section A7.3 of the CWQMN QAPP.

Completeness

A general requirement of 75 percent data completeness goal has been set for the CWQM network. Periods of flood or other conditions that necessitate the shutdown of any or all instrumentation during these times are not considered in the calculation for data completeness. See Section A7.5 CWQMN QAPP.

A8 SPECIAL TRAINING/CERTIFICATION

TCEQ Region 5 staff will be the lead for site operation and maintenance for the CWQMN station on Lake Palestine. Regional staff will receive Manuals for setup and calibration of the YSI 6600EDS V2 multi-probe and the maintenance and troubleshooting of the YSI Vertical Profiler prior to deployment. A follow-up training will be conducted by SWQM CO staff upon instrument installation at the site. Region 5 staff will be invited to attend a LEADS data management training.

A9 DOCUMENTS AND RECORDS

As described in sections A9 of the CWQMN QAPP.

B1 SAMPLING PROCESS DESIGN

Site Selection Criteria

The mid-lake site was chosen based on the following criteria:

- Location allows CoT PWS staff to consider data collected, specifically the determination of the depth of DO stratification, as part of their management decision to employ pumps at various depths within the oxygenated layer.
- Location is mid-lake, downstream, but representative, of both Flat Creek arm/Flat Bay, an area impaired for high pH, and the City of Tyler raw water intake structure.
- A new TCEQ station will be created for the site. Data collected from profiler sampling may be considered for inclusion in future 305(b) CWA Assessments to address pH and DO impairments. These data are currently not uploaded from LEADS to SWQMIS.

Monitoring Station Design

Monitoring and Support Equipment

The CAMS site will include the following monitoring and support equipment;

- (2) YSI 6600EDS V2 multiprobes (guards, cables, carrying case)
- (1) Campbell CR10X datalogger
- (1) Model 6951 YSI floating profiling system (winch, solar panel, depth sounder, meteorological equipment, mooring system)
- (1) wireless modem
- (1) dedicated laptop computer for communicating with the datalogger
- Accompanying software and manuals

Monitoring Equipment Configurations and Measurement Frequencies

Water column profile data will be collected once per hour, beginning at 0.5 m and 1.0 m increments to 0.5 m from the bottom. Reservoir pool level will be monitored periodically to determine whether a new profile program is necessary. The multiprobe will remain at each depth for approximately 2 minutes to allow adequate time for the multiprobe to equilibrate with the ambient water prior to taking measurements. The multiprobe will measure depth, DO, pH, specific conductance, and temperature during each profile.

B2 SAMPLING METHODS

In-situ water quality data collected and logged hourly by the data logger. Profiler data are transmitted via wireless modem to the MeteoStar/LEADS system in Austin, Texas where the data are ingested, archived, and posted to the internal TCEQ RHONE webserver.

Sampling/Measurement System Corrective Action

As described in sections B2.2 of the CWQMN QAPP.

B3 SAMPLE HANDLING AND CUSTODY

As described in Section B3 of the CWQMN QAPP.

B4 ANALYTICAL METHODS

Analytical methods are listed in Section A.7.1

B5 QUALITY CONTROL

Quality control procedures are described in Section B5 of the CWQMN QAPP.

YSI Model 6600EDS V2 Multiprobe

Please see Table A7.1 for sonde multiprobe QC criteria.

Specific conductivity, pH, temperature and depth sensors

For QC procedures please see SOP AMPM – 11: Analysis of Dissolved Oxygen (DO), Specific Conductance (SC), pH, Temperature, and Sample Depth in Ambient Surface Water Using Yellow Springs Instrument (YSI) 600 XLM and 6600 Extended Deployment System (EDS) Sonde, TCEQ June 2006.

Optical DO sensors

A specific SOP for the calibration of Optical DO is currently in development.

QC procedures should be performed with a minimum frequency of once per month, or greater to achieve the goal of 75 percent capture of valid station data.

Corrective Action Related to Quality Control

As described in Section B5 of the CWQMN QAPP.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

As described in Section B6 of the CWQMN QAPP.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Specific conductivity, pH, temperature and depth sensors

For QC procedures please see SOP AMPM – 11: Analysis of Dissolved Oxygen (DO), Specific Conductance (SC), pH, Temperature, and Sample Depth in Ambient Surface Water Using Yellow Springs Instrument (YSI) 600 XLM and 6600 Extended Deployment System (EDS) Sonde, TCEQ June 2006.

Optical DO sensors

A specific SOP for the calibration of Optical DO sensors using the Luminescence Hach Method 10360 is currently being developed by TCEQ. Site Operator should follow QC procedures described in the *6-Series Multiparameter Water Quality Sondes User Manual*, Version D, Yellow Springs Instruments, October 2006. Sensors are calibrated using a one-point calibration in water-saturated air.

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

MOPs ambient monitoring section keeps an inventory of common spare parts. Parts may be mailed via United Parcel Service and will usually arrive the next day (if mailed before noon on the mailing day). The Project lead will be responsible for the coordination of parts replacement. Calibration standards are available to the site operator through TCEQ general supply.

B9 NON-DIRECT MEASUREMENTS

There are no non-direct measurements used in this project.

B10 DATA MANAGEMENT

As described in Section B10 of the CWQMN QAPP.

Data validation will be performed by TCEQ DM&QA staff as noted in Section A4.6

Project water temperature, pH, DO, specific conductance, and depth will be stored in the TCEQ LEADS database. Continuously-collected profile data are currently unable to be ingested into the SWQMIS database. However, that capability is scheduled to be addressed.

Steve Matlock and Mark Wells at CoT PWS and/or designee will have access to view CAMS 0766 data behind the TCEQ firewall. They may consider the recorded water quality data in their decisions regarding raw water intake.

C1 ASSESSMENTS AND RESPONSE ACTIONS

As described in CWQMN QAPP.

Corrective Action

As described in Section C1 of the CWQMN QAPP.

C2 REPORTS TO MANAGEMENT

As described in Section C2 of the CWQMN QAPP.

Reports to TCEQ Project Management

As described in Section C2 of the CWQMN QAPP.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

As described in Section D1 of the CWQMN QAPP

Data validation will be conducted by DM&QA staff at TCEQ Central Office in Austin, TX.

Sonde data validation is described in Section D1 of the CWQMN QAPP. Please see SOP DQRP-015, *Validation of Continuous Water Quality Monitoring Data Collected by Multi-parameter Sonde* (Appendix B).

D2 VERIFICATION AND VALIDATION METHODS

As described in Section D2 of the CWQMN QAPP.

D3 RECONCILIATION WITH USER REQUIREMENTS

As described in Section D3 of the CWQMN QAPP.

D4 LITERATURE CITED

Quality Assurance Project Plan for Continuous Water Quality Monitoring Network Program. Monitoring Operations Division, TCEQ. December 2006.

http://www.tceq.state.tx.us/assets/public/compliance/monops/water/wqm/tx_realtime_swf.html

SOP AMPM – 11: *Analysis of Dissolved Oxygen (DO), Specific Conductance (SC), pH, Temperature, and Sample Depth in Ambient Surface Water Using Yellow Springs Instrument (YSI) 600 XLM and 6600 Extended Deployment System (EDS) Sonde.* Monitoring Operations Division, TCEQ. June 2006.

http://www.tceq.state.tx.us/assets/public/compliance/monops/water/wqm/tx_realtime_swf.html

YSI. *6-Series Multiparameter Water Quality Sondes User Manual*, Version D, Yellow Springs Instruments, October 2006.