QUALITY ASSURANCE PROJECT PLAN
Addendum

FY-2003 Section 104(b)3 Supplemental Project 2 (CA# X7-976525-01)— Monitoring in Support of TMDL Development in the Upper Kiamichi and Upper Little River Watersheds

OKLAHOMA WATER RESOURCES BOARD
WATER QUALITY PROGRAMS DIVISION
3800 NORTH CLASSEN
OKLAHOMA CITY, OK 73118

February 1, 2008

ADDENDUM to the FY 2003 QAPP (new text are underlined in the following applicable text of the original QAPP)

A. PROJECT MANAGEMENT

A1. Title and Signature Page

FY-2003 Section 104(b)3 Supplemental Project 2 (CA# X7-976525-01)—Monitoring in Support of TMDL Development in the Upper Kiamichi and Upper Little River Watersheds

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Office of the Secretary of Environment

_____Date: _____
Timothy Herfel
EPA Region VI Project Officer

_____Date: _____
EPA Approving Official

A2. TABLE OF CONTENTS

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A6. PROJECT/TASK DESCRIPTION

The main objectives for the project are:

1. Review available historical data and determine analyze trends related to seasonality, rainfall, sediment, and flows. Outside of OWRB data, will also utilize USGS flow data from three stations—Kiamichi River near Big Cedar (07335700), Mountain Fork of the Little River near Smithville (07338750), and Glover River near Glover (07337900).

A7.6.4 Precision and Accuracy

Table 1. Summary table of field measured water quality variables and their associated range of values for precision and accuracy.

Parameter	Method	Meter / Lab	RANGE OF VALUES	PRECISION	CALIBRATED ACCURACY
Specific Conductance	2510-B	Multiparameter Instrument	0 to 150 mSiemens/cm	0.1% of reading	± 0.5% of reading
pH	4500 H-B	Multiparameter Instrument	0 su to 14 su	0.01 su	± 0.2 su
Temperature		Multiparameter Instrument	-5˚C to 45˚C	0.02˚C	± 0.2˚C
Total Hardness	8226	Hach Test Kit	10 – 4000	1-5 mg/L	HACH Digital Titration Test
Total Alkalinity	2320-B	Hach Test Kit	10 – 4000	1-5 mg/L	HACH Digital Titration Test
Continuous Nephelometric Turbidity	2130-B	Multiparameter Instrument	0 to 999 NTU	0. 1 NTU	± 1% of reading(0 –100 NTU) and ± 3% of reading (100 – 400 NTU)
Instantaneous Nephelometric Turbidity	2130-B	Hach 2100P	0 to 999 NTU	0.01 NTU	± 2% of reading
Instantaneous Discharge	Electromagnetic	Marsh McBirney	0.031-9.0 cfs	10-15%	
Instantaneous Discharge	Mechanical	Pygmy Meter—employed at both OWRB and USGS Gages	0.031-3.5 cfs	5-15%	
Instantaneous Discharge	Mechanical	Price Type AA—employed at both OWRB and USGS Gages	0.031-9.0 cfs	5-15%	
Continuous Inside Stage	Recording Gage	Gas Bubbler—employed at both OWRB and USGS Gages	0 to 34.60 feet at a calibrated pressure of 0 to 15 PSI	0.05%	± 0.007 foot
Instantaneous Outside Stage	Non-recording Gage	Wire Weight Gage—employed at both OWRB	0 to 100 feet	0.1%	± 0.01 foot

		and USGS Gages			
Rainfall	Recording Gage	Tipping Bucket — employed at both OWRB and USGS Gages	Rate = 0-25 inches per hour	0.01 inches/every 4 hours	0.01 inch

B. MEASUREMENT AND DATA ACQUISITION

B1. SAMPLING PROCESS DESIGN

In order to determine the support status of each site and the causes of impairment, parameters will be measured to determine chemical, physical, biological, and habitat properties of each site. Chemical and physical analysis will consist of measurements of instantaneous and continuous turbidity, pH, specific conductivity, water temperature, stage, and turbidity, and continuous rainfall as well as instantaneous alkalinity, total hardness, discharge and dissolved and total recoverable metals (lead and silver). Biological characteristics will be measured using fish and benthic macroinvertebrates. To measure habitat, an assessment will accompany each fish and macroinvertebrate collection. All measurements are considered critical for determining the support status of the streams and/or performing regression analyses. Continuous stage will be modeled using a stage/discharge rating. Stage and discharge records will be acquired from USGS gaging stations including Kiamichi River near Big Cedar (07335700), Mountain Fork of the Little River near Smithville (07338750), and Glover River near Glover (07337900). Stations utilize gas bubblers to obtain stage according and are maintained and rated according to USGS protocols.

B1.3. SAMPLING FREQUENCY

Activities to finish the project will be initiated as soon as the QAPP is approved. Parameters will be sampled at the frequencies listed in Table 5. If problems arise in the sampling program, the water body will be re-sampled at the earliest convenient date to accurately represent water quality conditions during the appropriate sampling event.

Table 2. Sampling frequency for All Water Quality Parameters

Parameter	Collection Frequency
Instantaneous turbidity, pH, specific conductivity, water temperature, outside stage, discharge and turbidity	During each collection calibration and in-field collection
Continuous turbidity, pH, specific conductivity, water temperature, inside stage, turbidity, and rainfall	Continuously logged every 15 minutes for the duration of the project at both USGS and OWRB stations
Metals	Quarterly and during base and

	high flow conditions
Benthic Macroinvertebrates	Two collections—summer and winter
Fish	One collection
Flow	With each assessment.
Habitat	During each field collection (will have forms tailored to the algal and macroinvertebrate collections)

B3. SAMPLE HANDLING AND CUSTODY REQUIREMENTS

B3.1 Field Measurements

Discharge measurement notes are completed for each measurement taken. These notes are transferred to an electronic format and saved to the OWRB network and compact disc. Hardcopies of the discharge measurement notes are maintained in the project notebook kept in the Division library. Discharge measurements collected via discharge computers are downloaded to the OWRB network and copied to compact disc. Hardcopies of these electronic notes are maintained in the project notebook kept in the Division library. Data from the USGS gages are downloaded from the individual station into a Microsoft Excel worksheet and are maintained on both the OWRB server and compact disc.

B4. ANALYTICAL METHODS REQUIREMENTS

B4.1FIELD METHODS REQUIREMENTS

Field analytical procedures are described in various OWRB SOP documents. The methods and meters required to perform field water quality and quantity analyses are listed in Tables 12. Reporting of failures in field analytical procedures and the implementation of corrective action for any failure in field analytic procedures is the responsibility of the Project Officer. Field methods are described in short below.

1. Multi-parameter instrument direct instantaneous measurements—Includes measurements for specific conductance (mSiemens/cm), water temperature (°C), turbidity (NTU), and pH (standard units). One reading is taken at the area of fastest and deepest at approximately the middle of the water column.

2. Multi-parameter instrument continuously recorded measurements—Includes measurements for specific conductance (mSiemens/cm), water temperature (°C), turbidity (NTU), and pH (standard units). Readings are taken every 15 minutes at the area installation.

3. Additional Nephelometric Turbidity (ntu) sample is taken from the water quality sample. Measurement is made using a Hach 2100P turbidometer.

4. Total Alkalinity sample is taken from the water quality sample. Measurement is made using a HACH® Total Alkalinity Kit.

5. Total Hardness sample is taken from the water quality sample. Measurement is made using a HACH® Total Hardness Kit.

6. Instantaneous Discharge is measured by taking a composite of readings using mechanical velocity (pygmy or Price AA) or electromagnetic meters. Floats may be used when point discharges are below the method detection limit of instruments. In addition, discharge may be taken from a nearby data collection platform or by measuring stage and comparing to a known rating. The USGS collects instantaneous discharge records according to USGS manuals for "Field Water-Quality Methods for Surface Water" which are published on their website (http://water.usgs.gov/pubs/).

7. Instantaneous Outside Stage is measured using a surveyed wire weight gage referenced to a datum. The USGS collects outside gage data records according to USGS manuals published on their website (http://water.usgs.gov/pubs/).

8. Continuous Inside Stage is measured using a gas bubbler recording every 15 minutes. The USGS collects outside gage data records according to USGS manuals published on their website (http://water.usgs.gov/pubs/).

Table 3. Parameters, Methods, Meters, and Method Detection Levels for Each Field Measured Parameter.

Parameter	Method	Meter/Kit	Method Detection Level
Specific Conductance	2510-B	Multiparameter Instrument	1.0 uS
pH	4500 H-B	Multiparameter Instrument	0.01 standard unit
Temperature		Multiparameter Instrument	-5.0˚C
Total Hardness	8226	Hach Test Kit	1 ppm
Total Alkalinity	2320-B	Hach Test Kit	1 ppm
Continuous Nephelometric Turbidity	2130-B	Multiparameter Instrument	0.1 NTU
Instantaneous Nephelometric Turbidity	2130-B	Hach 2100P	0.1 NTU
Instantaneous Discharge	Electromagnetic	Marsh McBirney	0.1 cfs
Instantaneous Discharge—employed at both OWRB and USGS Gages	Mechanical	Pygmy Meter	0.031 cfs
Instantaneous Discharge—employed at both OWRB and USGS	Mechanical	Price Type AA	0.031 cfs

Gages			
Continuous Inside Stage—employed at both OWRB and USGS Gages	Recording Gage	Gas Bubbler	0.007 foot
Instantaneous Outside—employed at both OWRB and USGS Gages Stage	Non-recording Gage	Wire Weight Gage	0.01 foot
Rainfall—employed at both OWRB and USGS Gages	Recording Gage	Tipping Bucket	0.01 inch

B5. QUALITY CONTROL REQUIREMENTS

Quality control of flow measurements will be achieved by conducting a replicate measurement at 10% of all sites. Side by side measurements will also be taken on a yearly basis. Mechanical meters will be calibrated (spin test), cleaned, and oiled at the beginning of each day and the end of each measurement. Electromagnetic meters will be calibrated (zero flow test) at the beginning of each day and cleaned at the end of each measurement. Quality control methods utilized by the USGS are described at their website http://water.usgs.gov/pubs/.

B6. INSTRUMENT/EQUIPMENT TESTING, INSPECTION & MAINTENANCE

The manufacturer provides procedures and a schedule for routine maintenance, inspection, and testing of each instrument. Other maintenance is required when calibration procedures, precision, and accuracy do not fall within acceptable limits. All maintenance, testing, and inspections are maintained in logbooks for each instrument. Maintenance of the thermometer probe, pH probe, specific conductance probe, and turbidity probes consists of cleaning, repair, and/or replacement of parts or reference solutions as required. Maintenance of dissolved oxygen, pH, thermometer, turbidity, and specific conductance probes will occur on at least a monthly basis or more often as conditions warrant. Such maintenance is recorded in a logbook kept with each field-monitoring instrument. Maintenance of the HACH® Turbidometer 2100P consists of cleaning, repair, or replacement of parts as recommended by the manufacturer. Velocity meter maintenance, testing, and inspection procedures are outlined in the Measurement of Discharge SOP and at the USGS website http://water.usgs.gov/pubs/. These procedures occur before each measurement and weekly when sampling trips are completed.

Repairs to agency equipment or instruments will be made by OWRB or USGS personnel when possible and by the manufacturer when necessary. All of the parts listed below are currently available on the OWRB or USGS premises or in vehicles for use when necessary. Spare parts are maintained and monitored by the Project Manager. Project manager ensures that depletion does not occur through semi-annual inventories. A list of critical spare parts would include the following:

- Various spare probes for multi-parameter instruments
- Spare cables for all instruments
- Spare batteries for all applications
- Spare lamps and vials for turbidometer
- Spare glassware and plastic ware for all kits
- Spare plastic ware for depth-integrated samplers
- Spare parts for mechanical velocity meters
- Spare cabling attachments for sounding winches

Quality control of field-measured parameters consists of testing instrument readings against a known standard. This comparison between the field instrument and a known value will occur prior to each field trip for the test instruments and in the field for the field minimonitors. If an instrument or piece of equipment cannot meet calibration specifications, then the instrument will be repaired in-house until it can meet specifications. If the instrument cannot be repaired in-house then it will be shipped back to the manufacturer for repair and an analogous instrument will be utilized for data collection. The OWRB will maintain one backup instrument.

B7. INSTRUMENT CALIBRATION AND FREQUENCY

The OWRB regularly calibrates all instruments. Instrument calibrations are maintained in logbooks for each instrument. Multi-parameter test instruments will be calibrated prior to every field-sampling event, and in-field monitors will be calibrated regularly. Specific calibration procedures are outlined in the Multi-Parameter Instrument SOP's. Turbidometer calibration procedures are outlined in the Turbidity Measurement SOP. Primary calibration for each turbidometer instrument will occur as recommended by the manufacturer. Secondary calibration of the HACH® instrument using secondary standards with known values will occur prior to sample analysis. Velocity meter calibration procedures are outlined in the Measurement of Discharge SOP and by the USGS according to methods described in the website http://water.usgs.gov/pubs/. Calibration occurs before each measurement and weekly when sampling trips are completed.