Amendment # 1
to the Watershed Protection Plan Development for the Upper Cibolo Creek Quality Assurance Project Plan (QAPP) for Modeling

City of Boerne
402 E. Blanco
Boerne, Texas 78006

Funding Source:

Nonpoint Source Program CWA §319(h)
Prepared in cooperation with the Texas Commission on Environmental Quality
and the U.S. Environmental Protection Agency
Federal ID #99614613

Effective Date: Upon date of final signature

Questions concerning this quality assurance project plan should be directed to:

Ryan Bass, Watershed Planning Coordinator
City of Boerne
402 E. Blanco
Boerne, Texas 78006
(830) 249-9511
rbass@ci.beorne.tx.us

Justification: In order to meet data quality objectives of the project the following changes are proposed to the Quality Assurance Project Plan: add inputs to the model to ensure bacteria sources are adequately characterized and add references to the development of graphical representations of data and outputs of the model through charts and maps.

Some of the additional data sources listed were identified for informational purposes during the development of the draft Upper Cibolo Creek Watershed Characterization in March 2011. The remainder of the data sources, which include cliff swallow nest counts, axis deer, and urban waterfowl population estimates, were obtained prior to the approval of the Modeling QAPP Amendment #1. The only map generated with this data displays locations of on-site septic systems within the watershed. Septic systems were identified by overlaying Kendall County Parcels obtained from our City GIS database onto a combination of georeferenced aerial imagery purchased by the City of Boerne and Digital Ortho Quarter Quadrangles (DOQQ) obtained from Texas Natural Resource Information Systems. The additional data sources were provided to the subcontractor conducting the modeling in late February to early March 2012.

Summary of Changes: Changes are needed in Section B Measurement and Data Acquisition, Sub-Section B9 Non-Direct Measurements (Data Acquisition Requirements), Table B9.1 Data Sources for Model and WPP Development, to further describe data source locations for SWAT tool inputs.

Detail of Changes:

1. Add the following data source information to Table B9.1 to detail how data is derived for input into the SWAT tool:

    a. Urban Waterfowl Population
    b. Cliff Swallow Nest Count
    c. Axis Deer Population Estimate
    d. White-tail Deer Population
    e. Urban Pet Population
    f. City of Boerne Residential Units

2. Add information to Table B9.1 and D3 about graphical representations of data and outputs of the model to be produced through charts and maps.

Table B9.1 Data Sources for Model and WPP Development

Data Set	Description	Source & Transfer Method	Application
National Elevation Dataset	A 1/3 arc-second (~10-meter) resolution digital elevation model (DEM) will be used in determination of the contributing watersheds. Derivative data sets from the elevation grid include flow direction, flow accumulation, and slope grids, as well as watershed boundaries and outlets.	USGS Metadata link: http://seamless.usgs.gov/products/3arc.php Industry standard, public domain data source that can provide resolution necessary to conduct watershed modeling. Transfer by FTP as an ESRI grid from USGS server //seamless.usgs.gov/ to Parsons	Elevation used in subwatershed delineation in SWAT. Also used to extract basin topographic parameters in SWAT. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Streams - National Hydrography Dataset (NHD)	The National Hydrography Dataset (NHD) is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system.	USGS Metadata link: http://nhd.usgs.gov/ Industry standard, public domain data source that can provide resolution necessary to conduct GIS mapping, modeling, data analysis. Transfer as an ESRI geodatabase by FTP from USGS server //nhd.usgs.gov/ to Parsons	Stream network for SWAT. Aids in subwatershed delineation, outlet placement, and extraction of SWAT stream parameters (length, gradient). May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Soils - STATSGO soil map unit boundaries and soil properties	This data set is integrated into the SWAT model. It includes soil map unit boundaries, physical, hydrologic, and chemical properties, which directly impact watershed hydrology and constituent loads.	Natural Resources Conservation Service (NRCS) State Soil Geographic (STATSGO) database built in the ArcSWAT geodatabase NRCS metadata link: http://soildatamart.nrcs.usda.gov/ Integrated into SWAT model, downloaded as a ZIP-compressed file from http://swatmodel.tamu.edu/software/arcswat/ by Parsons	Assignment of soil properties to SWAT HRUs. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.

Data Set	Description	Source & Transfer Method	Application
Land use/ land cover - National Land Cover Dataset (NLCD)	This dataset, based on Landsat imagery from approximately 2006, converted to a 30-meter resolution grid, is currently the best available statewide land use coverage. The land use categories of the NLCD land use scheme will be re-classified in SWAT to provide simplified land use categories that are more meaningful in terms of estimating pollutant loading rates.	USGS National Land Cover Dataset 2006 Link: http://www.mrlc.gov/ Industry standard, public domain data source that can provide resolution necessary to conduct GIS mapping and modeling. Transfer as an ESRI GRID file by FTP from USGS server //seamless.usgs.gov/ to Parsons	Definition of SWAT HRUs. Assignment of land use characteristics to SWAT HRUs. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Meteorological data – National Climatic Data Center	Daily total precipitation, maximum and minimum daily temperature recorded at the National Weather Service (NWS) cooperative station at Boerne (in the watershed) for the period 1987 to 2011. The few small data gaps may be filled using data from nearby NWS stations in Comfort or Sisterdale.	National Climatic Data Center Link: http://www.ncdc.noaa.gov/ Public domain data source that provides more accurate local daily meteorological data than any other source available that is necessary for modeling. Transfer of comma-delimited text file by FTP from above link to Parsons	SWAT input. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
USGS stream gage data	Spatial data for USGS gage stations in the study area and historical flow records for each gage stations (daily stream flows).	USGS Link: http://waterdata.usgs.gov/nwis/dv/?referred_module=sw Best public domain data source available that can provide site specific data necessary to support modeling. USGS is only source of historical flow records in study area. Transfer of tab-delimited text file by http from above link to Parsons	SWAT hydrologic calibration. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Point source wastewater discharge (to Cibolo Creek)	Self-reported monthly data for the City of Boerne wastewater treatment plant discharge. Data to be obtained include flow rates, TSS, DO, NH3-N, CBOD, and FC concentrations.	City of Boerne. Transfer of Excel spreadsheet from City of Boerne to Parsons via email attachment	SWAT input. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.

Data Set	Description	Source & Transfer Method	Application
Ambient surface water quality data	Quality-assured water quality measurements and analyses from stream monitoring locations within the study area collected by the TCEQ, San Antonio River Authority, City of Boerne, and other entities for the calibration period.	Transfer by hypertext transfer protocol (HTTP) from TCEQ SWQMIS http://www8.tceq.state.tx.us/SwqmisWeb/public/index.faces Recent (2010-2011) data collected by the City of Boerne under the QAPP "Water Quality Monitoring for the Upper Cibolo Creek (Segment 1908) Watershed Protection Plan" will be transferred from the City of Boerne to Parsons in an Excel spreadsheet as an email attachment.	SWAT calibration. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Texas livestock census data	Total population estimates for various livestock species derived from 1997 to 2007 agricultural census for Kendall County. In addition to cattle, goats, swine, sheep, and poultry, population estimates for a number of other types of livestock are provided. This data was compiled by the Census of Agriculture every five years, providing the only source of consistent, comparable, and detailed agricultural data for every county in America (USDA 2007).	National Agricultural Statistics Service, USDA. Data link: http://quickstats.nass.usda.gov/ Only public domain data source available that provides data necessary for assessment. Transfer as comma-delimited text file by HTTP from above link to Parsons.	Estimation of average annual quantities of grazing and manure deposition to be input to SWAT. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Texas crop census data	Acreage estimates by crop type for various management practices (row crop, pasture/ forage crop, etc) at the county level, derived from 2007 census.	National Agricultural Statistics Service, USDA. Data link: http://quickstats.nass.usda.gov/ Transfer as comma-delimited text file by HTTP from above link to Parsons.	Estimation of parameters for SWAT management input files. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.

Data Set	Description	Source & Transfer Method	Application
Nutrient atmospheric loads	Measured ammonia and nitrate nitrogen air deposition fluxes will be input as direct sources to the watershed.	National Atmospheric Deposition Program Data Link: http://nadp.sws.uiuc.edu/data/ Transfer as comma-delimited text file by HTTP from above link to Parsons.	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Septic System Density	Number and locations of septic systems within the Upper Cibolo Creek watershed	Ryan Bass, City of Boerne. GIS Shapefile developed from maps of county parcels with improved structures and from list of sewer customers from City of Boerne.	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Septic System failure rate	Septic System failure rate	Reed, Stowe, and Yanke. 2001. Study to Determine the Magnitude of, and Reasons for, Chronically Malfunctioning On-Site Sewage Facility Systems in Texas, Prepared in Cooperation with the Texas On-Site Wastewater Treatment Council. Report obtained as PDF via email from Reed, Stowe, and Yanke.	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Livestock Manure Production and Characteristics	Estimates of the amount of manure produced by livestock and the nutrient, oxygen demand, and EC loads associated with it.	1992. U.S. Department of Agriculture. 1992. Agricultural Waste Management Field Handbook. 210-AWMFH. American Society of Agricultural Engineers (ASAE). 1998. *ASAE Standards, 45th edition: Standards, Engineering Practices, Data*. St. Joseph, MI. Metcalf & Eddy. 1991. W*astewater Engineering: Treatment, Disposal and Reuse.* Third edition. George Tchobanoglous and Franklin L. Burton, Eds.	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.

Data Set	Description	Source & Transfer Method	Application
Urban Waterfowl Population	Estimates of the number of waterfowl present at 3 locations within the watershed	University of Texas at San Antonio Independent Study Course. Avian Community Survey of the Upper Cibolo Creek Watershed. 2011. Chad Sundol, Janis Bush Ph.D.,	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Cliff Swallow Nest Count	Estimates of the number of cliff swallows nesting under Interstate Highway 10 bridges. All estimates are site specific and not used to determine populations within subwatersheds. Parsons Inc. used in house calculations to estimate the potential population at each bridge based on evidence of nest sites and known breeding and brood rearing habits.	Ryan Bass, City of Boerne. Visual count of nest sites under Interstate Highway 10 bridges on 2/24/12.	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Axis Deer Population Estimate	Estimates the number of Axis deer at the sub-watershed level	Rufus Stephens, Wildlife Biologist, Texas Parks and Wildlife Department – Population estimates are based on local knowledge and professional judgment of TPWD Wildlife biologist. The estimates are only for contributing sub-watersheds upstream of the impaired site at IH-10 .	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
White-tail Deer Population	Estimates of the population of white-tail deer within the watershed	Rufus Stephens, Wildlife Biologist, Texas Parks and Wildlife Department White-tailed deer density estimates for Resource Management Unit 7 which included Kendall County, Texas from 2005-2009.	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.

Data Set	Description	Source & Transfer Method	Application
Urban Pet Population	Estimates of the number of dogs within Boerne City Limits	Average number of dogs per household was obtained from the American Veterinary Medical Association (AMVA 2002)	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
City of Boerne Residential Units	Determination of the number of residential units within the City of Boerne	Ryan Bass, City of Boerne.11/2/2010. City residential trash collection customer billing data. City billing data accounts for multi-unit residential buildings.	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.
Water withdrawals	Monthly surface water use by the City of Boerne withdrawn from Boerne City Lake	City of Boerne records Transferred from the City of Boerne to Parsons in an Excel spreadsheet as an email attachment.	SWAT input parameter. May include tabular representation, graphical representation through charts or maps, and narrative representation. Summary and comparative statistics may be performed on data.

D3 Reconciliation with User Requirements

The Parsons QAO and the City of Boerne QAO will review and evaluate the draft modeling report and calculations for technical consistency with the requirements of this QAPP. The TCEQ, City of Boerne, and Parsons project managers will evaluate the draft final report for quality and consistency with the scope of work described in Section A6. Necessary revisions and refinements will be made to the draft modeling report based on comments. Any significant limitations on data used shall be communicated between the project personnel listed in this subsection and documented in the modeling report.

The SWAT model developed for this project will be used to evaluate flow and pollutant loading to Upper Cibolo Creek, as well as determining the effectiveness of best management practices (BMPs). The model will be developed to provide the City of Boerne and local stakeholder groups with information pertaining to watershed characteristics, ~~and to~~ the prediction of possible pollution problems, and the effectiveness of potential BMP solutions.

Output data generated by the models will be presented in the project deliverables as graphical comparisons of

observed and predicted water quality constituents and stream gage flow data. A comparison of predicted and measured averages will also be provided to show the models' prediction with respect to observed data at several locations in the watersheds.

Using the qualitative-quantitative approach discussed in A7 Quality Objectives and Criteria and Section C1 for model inputs and outputs, a determination will be made of the overall technical credibility of the methodology for addressing the pollutants of concern in Upper Cibolo Creek: dissolved oxygen, nutrients, and fecal bacteria. If model outputs show that they can meet the calibration and validation targets, then they will be considered to be technically defensible, and therefore useable, to provide water quality results for developing a WPP for Upper Cibolo Creek.

Model results may be subsequently analyzed using the SWAT platform, GIS, and summary and comparative statistics to provide narrative, tabular, and graphical representations (including charts or maps) of land uses, causes and sources of pollution, estimated pollutant loads, and determining the location and effectiveness of management measures at achieving load reductions. Results and analyses may be used by the City of Boerne and TCEQ for WPP development, stream standards modifications, permit decisions, and water quality assessments.

Distribution: QAPP Amendments will be distributed to all personnel on the original QAPP by the City of Boerne Project Manager. Records of distribution will be maintained by the City of Boerne.

Adherence Letters: The City of Boerne will secure written documentation from additional project participants (e.g., subcontractors, laboratories) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan amendment. The City of Boerne will maintain this documentation as part of the project's quality assurance records. This documentation will be available for review. Copies of this documentation will also be submitted as deliverables to the TCEQ NPS Project Manager within 30 days of final TCEQ approval of the QAPP Amendment.

Approval: The changes are effective upon final approval of the amendment. These changes will be incorporated into the full QAPP document when the QAPP is updated. The TCEQ, The City of Boerne and Parsons, Inc. acknowledge and accept these changes by signing this amendment.

Texas Commission on Environmental Quality

Field Operations Support Division

5/21/12

Kyle Girten, Lead NPS QA Specialist — Date
Quality Assurance Team

Water Quality Planning Division

5/21/12

Kerry Niemann, Team Leader — Date
Nonpoint Source Program

Anjushama Chalise — 5/21/2012

Anju Chalise, NPS QA Specialist — Date

Lauren Bilbe — 5/18/12

Lauren Bilbe, TCEQ NPS Project Manager — Date
Project Manager, Nonpoint Source Program

City of Boerne

5-17-12

Don Burger, P.E. City of Boerne — Date
Deputy Public Works Director

5/17/12

Ryan Bass, QA Officer — Date

Mel Vargas, Project Manager — Date 5/17/12

Monica Suarez, QA Officer — Date 5/17/12

May 17, 12 See attached email. JB TCEQ 5/18/12

Lauren Bilbe

From: Vargas, Mel [Mel.Vargas@parsons.com]
Sent: Friday, May 18, 2012 12:09 PM
To: Lauren Bilbe
Cc: Ryan Bass
Subject: RE: Cibolo Mod. QAPP Amendment

Yes Parsons agrees to the May 17, 2012 QAPP Amendment.

From: Lauren Bilbe [mailto:lauren.bilbe@tceq.texas.gov]
Sent: Friday, May 18, 2012 10:45 AM
To: Vargas, Mel
Cc: Ryan Bass
Subject: Cibolo Mod. QAPP Amendment

Greetings, Mel,

Can you please confirm that Parsons agreed to the May 17, 2012 version, though the footer says April 20, 2012?

Thank you,
Lauren

Lauren Bilbe
Project Manager
Nonpoint Source Team
Water Quality Planning Division
Texas Commission on Environmental Quality
(512) 239-1764