QUALITY ASSURANCE PROJECT PLAN

for the

Nitrogen Loading Assessments
Wekiva Study Area

Prepared for:

Florida Department of Health
Division of Environmental Health
Bureau of Onsite Sewage Programs
4052 Bald Cypress Way, Bin #A08
Tallahassee, Florida 32399-1713

Prepared by:

Ellis & Associates, Inc.
7064 Davis Creek Road
Jacksonville, Florida 32256

January 2007

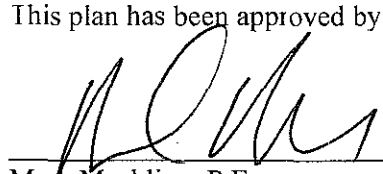
1.0 TITLE AND APPROVAL SHEET

1.1 Preface

This Quality Assurance Project Plan is submitted in fulfillment of the requirements of the Florida Department of Health agreement with Ellis & Associates, Inc. for investigations at individual onsite wastewater treatment systems to further identify and quantify the fate of nitrogen loading in the Wekiva Study Area

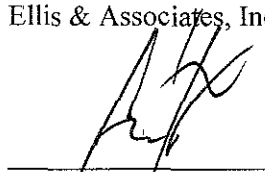
1.2 Quality Assurance Project Plan Approval Sheet

This plan has been approved by the following individuals



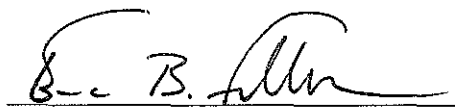
1/29/07

Mark Mechling, P E. Date
Principal Engineer / Project Manager
Ellis & Associates, Inc.



1/29/07

Gabriel S Pastrana, P.E. Date
Lead Engineer
Ellis & Associates, Inc.



1/29/07

Eric B Fuller, Date
Project QA/QC Officer
Ellis & Associates, Inc.

2/1/07

Eberhard Roeder, Ph.D , P E Date
Florida Department of Health

2.0 TABLE OF CONTENTS

2.1 List of Terms and Abbreviations

a. Bureau - Bureau of Onsite Sewage Programs

b CBOD5- The carbonaceous biochemical oxygen demand over a 5-day period (mg/L)

c. Department - Florida Department of Health, Bureau of Onsite Sewage Programs

d DMS – Department of Management Services

e. E&A – Ellis & Associates, Inc

f FDEP – Florida Department of Environmental Protection

g. Fecal Coliform – fecal bacteria that form blue colonies after incubation on M-FC medium (SM 9222D) Fecal coliform include E. coli

h. Field parameters - parameters measured by one or more instruments at the time and general location of taking a sample: nitrate and ammonia at the option of provider, chloride, turbidity, dissolved oxygen, pH, electric conductivity, temperature, oxygen reduction potential, redox indicator such as ferric/ferrous iron; Substitutions and changes permissible contingent on approval by the department.

i OSTDS – Onsite Sewage Treatment and Disposal System, synonymous with OWTS

j OWTS – Onsite Wastewater Treatment System, synonymous with OSTDS

k. Provider – entity or entities performing work outlined in this attachment for the Department of Management Services (DMS)

l. RRAC – Research Review and Advisory Committee for the Bureau

m TN - Total Nitrogen concentration in a water sample (mg/L)

n. TP - Total Phosphorus concentration in a water sample (mg/L)

o TSS - Total Suspended Solids concentration in a water sample (mg/L)

p WAVA – Wekiva Aquifer Vulnerability Assessment, see Florida Geological Survey Report of Investigation 104; available at www.dep.state.fl.us/water/wastewater/dom/docs/RI_104a_FGS_Report.pdf

q Wekiva Study Area - Area delineated by the Wekiva Parkway and Protection Act of 2004 (http://www.dca.state.fl.us/fdcp/DCP/wekiva/wekivaact/study%20area%20map.pdf)

3.0 DISTRIBUTION LIST

Eberhard Roeder, Ph D., P E.
Florida Department of Health

Mark Mechling, P.E.
Ellis & Associates, Inc.

Gabriel S. Pastrana, P.E.
Ellis & Associates, Inc.

Eric B. Fuller, CFEA, REPA
Ellis & Associates, Inc.

4.0 QA PROJECT PLAN GOALS

The goals of the QA project plan are to ensure that:

- the measurements to be undertaken will adequately support the project objectives regarding data collection,
- data collected are of the highest quality that can be reasonably expected,
- the quality of the data is known,
- the data and its quality are adequately documented, and
- the data are adequately preserved and rendered in available form

5.0 DEFINITION OF PROBLEM AND BACKGROUND

5.1 Overview

Governor Jeb Bush signed The Wekiva Parkway and Protection Act into law on Tuesday, June 29, 2004, at Wekiva Springs State Park, in Apopka. The law authorizes building the Wekiva Parkway and provides protection to the Wekiva River system. The Act requires a comprehensive approach to protecting the Wekiva River system involving local governments, state agencies, and the St Johns River Management District. The Act requires the Department of Health to address nitrogen reduction through appropriate onsite disposal standards.

The Department has been tasked with the commissioning of an Onsite Nitrogen Fate and Transport Study to systematically evaluate the fate and transport of nitrogen from OWTS in shallow groundwater. Nitrogen loading is important to the mission of the Bureau of Onsite Sewage Programs, "Protecting the public health and environment through a comprehensive onsite sewage program"

E&A will conduct multiple field investigations at individual OWTS to further identify and quantify the fate of nitrogen loaded by OWTS in the Wekiva Study Area.

5.2 Objectives

The primary objectives of the study are to gather data from a series of groundwater probe locations in order to provide the following:

a. Tabulation of results and graphical representation of parameter concentrations across the cross section, and as applicable along a long section, of the plume;

b. A mass balance of a conservative tracer and nitrogen, in which loading of tracer and nitrogen inputs from the OWTS to the water table and from upstream are balanced by first or zeroth order denitrification and transport through the cross section established during field work (e.g., Anderson, 1998). Results will be compared to values given in reviews such as by McCray et al. (2005)

5.3 Project Organization

5.3.1 Project Management and Responsibilities.

Project organization is described as follows.

Mark Mechling, P.E., will serve as Principal Engineer and Project Manager for the project. He will consult on all technical matters and will provide senior oversight to the project. He will be responsible for execution of task orders, including technical, cost, and schedule control.

Gabriel Pastrana, P.E., will serve as Lead Engineer for the project. He will be in charge of all field activities, including oversight of drilling and field and laboratory analyses. He will also serve as directing author of the project report.

Eric Fuller, CFEA, REPA will serve as Quality Assurance Officer for the project. As such he will:

- Ensure that technically defensible and consistent field and laboratory methods are followed and documented;
- Document that procedures used to collect, preserve, and handle samples are appropriate and consistent;
- Ensure that sample collection and chemical analysis is performed according to written protocols so that data accuracy, precision, and representativeness may be assessed;

- Ensure that calculations and resultant interpretations have been checked and are accurate;
- Ensure validity of procedures and systems used to achieve project goals;
- Perform corrective actions when appropriate, and provide documentation of all corrective actions; and
- Ensure that project documentation is verified and complete.

5.4 Project Schedule

Task 1. Development of QAPP – early January 2007

Task 2. Site Selection – January 2007

Task 3 Overall OWTS characterization, and

Task 4 Instantaneous delineation of OWTS-effluent plume

Site 1 – January/ February 2007

Sites 2 and 3 – February / March 2007

The provider shall present an update on the status of the project at a RRAC-meeting in February 2007.

Task 5 Data interpretation and mass balance modeling

Task 6 Report

The provider shall submit twenty copies of a draft report for the first site investigated and an electronic copy to the department by March 23, 2007 The provider will give a presentation on this draft report to the RRAC early in April 2007 The department shall be responsible for soliciting review of the draft report by interested parties

In developing the final report, the provider shall consider the comments of the department and other reviewers that may have commented. The department will provide these comments for the first site investigated by April 13, 2007

The second draft report (for the first and subsequent sites investigated) will be provided to RRAC by May 2, 2006 The department shall be responsible for soliciting review of the draft report by interested parties. The department will provide these comments by May16, 2007

The provider shall submit twenty copies of the final report for the first site and subsequent sites and also supply the department with at least one electronic copy of the final report and of tabulated analytical results in a format compatible with department software May 30, 2007. The provider will give a presentation on this final report to the RRAC early in June 2007

6.0 PROJECT TASK DESCRIPTION

Principle tasks are as follows: 1) field measurements, 2) laboratory sample analysis, 3) data base entry, 4) QA/QC, 5) data reduction/analysis in support of project objectives and testing of stated project hypotheses, and reporting.

6.1 Field Measurements

6.1.1 Overall OWTS characterization

a) For each OWTS, provider will develop a site map, such as used for DOH site evaluations, for which survey by tape measure and leveling relative to a reference elevation benchmark will be sufficient. Latitude and longitude will be determined for reference locations to allow mapping. The provider will record water use, interview the system users about use patterns, and will note recent weather and flooding patterns. .

b) For each residence site the provider will perform an existing system evaluation according to the procedure outlined in 64E-6 F A.C Pump-out of the septic tank shall occur after field work for Task 4 has been completed The subcontractor will perform an initial assessment of water tightness of the tank by determining change in water level at the tank inlet during at least one hour when water is not is use at the residence.

c) As part of the existing system evaluation the provider will auger to characterize the soil material underneath the drainfield This characterization shall be done according to USDA classification, and texture shall be confirmed by sieve analysis of two samples from the vadose zone at an elevation below the infiltrative surface

d) The provider shall sample septic tank effluent as a grab sample at an accessible location nearest to the drainfield (e.g. outlet filter, pump tank or pump vault) on three separate days and analyze samples for cBOD5, TSS, TN and TP. Field parameters of sewage will be measured at the same location on the same occasion
Method FS2430 1.3.4 () will be utilized to collect samples

6.1.2 Instantaneous delineation of OWTS-effluent plume

Electrical conductivity will be the guiding parameter to delineate the boundary between effluent-influenced and other ground water, supplemented by chloride and other parameters that show a difference between background and plume.

A typical probing scheme will look as follows:

Background: Provider will probe at approximately three locations at some distance from the drainfield to a depth of at least 20 feet under the water table or refusal to determine background concentrations Hydraulic conductivity estimates based on subsurface properties combined with the gradient estimates can be used to assess the direction, velocity, depth, width of the plume

Impact under and near Drainfield: The Provider will probe at approximately four locations close to the drainfield or between drainfield trenches from the capillary fringe until the plume boundary has been crossed by five feet or probe refusal is reached to determine the depth of the plume, mounding, and concentrations at the water table.

Flux away from Drainfield: The provider will probe approximately eight locations to obtain at least one cross section of the plume and assess attenuation downgradient from the source If near-drainfield probing, above, indicates that the plume is moving predominantly vertical, these probes will serve to further delineate the horizontal and vertical extent of the plume

a) Groundwater will be sampled with slotted-pipe probes using direct push technology The sampling methododolgy will be as follows: 1) a sleeve-covered slotted sampling device will be pushed into the groundwater nearest the ground surface (i.e. if groundwater is a four feet below land surface, the sampling device will be pushed to a depth of four to six feet below land surface), 2) The sleeve will be retracted, exposing the slotted sampling device, 3) Purging of the water column, and stabilization and groundwater sampling will be in accordance with FS 2200 using a peristaltic pump and tubing

Field parameters readings and water samples will be taken in regular intervals (2 foot) from the capillary fringe until the plume boundary has been crossed by five feet or probe refusal is reached.

The following conditions will be monitored and recorded, as applicable. The last four (4) items only need to be recorded once:

- Purging rate.
- Drawdown in the well, if any
- Pump or tubing intake placement
- Length and location of the screened interval.
- A description of the process and the data used to design the well.
- The equipment and procedure used to install the well
- The well development procedure.
- Pertinent lithologic or hydrogeologic information.

b) Groundwater will be sampled for the following laboratory analyses: All samples will be analyzed for TN. Half of the water samples, usually including the topmost sample of every probing, will be analyzed for cBOD5. 10% of samples, usually including the topmost sample of a probing, will be analyzed for TSS, TP, and fecal coliforms.

QA/QC samples to the extent of approximately 10% of the number of laboratory analyzed samples shall be included FQ1230 prescribes that 5% of samples shall be blanks, for this project equipment blanks (FQ1211/FQ1212) shall be used. FQ 1200 excludes BOD from the need to collect blanks The other 5% of QA/QC samples shall be field duplicates (FQ1220)

c). Field parameters Parameters measured by one or more instruments at the time and general location of taking a sample: nitrate (LaMotte SMART 2 Colorimeter, using cadmium or zinc reduction), chloride (LaMotte SMART 2 Colorimeter, using argentometric reagent), turbidity (FT1600), dissolved oxygen(FT1500), pH (FT1100), electric conductivity (FT1200), temperature (FT1400), oxygen reduction potential (FT2100), and redox indicator such as ferric/ferrous iron (LaMotte SMART 2 Colorimeter, using bipyridyl or 1, 10 phenanthriline reagent) Calibration of field instruments will be documented on form FD9000-8 or equivalent.

All field measurements will be recorded on form FD-9000-24 (revised) A copy of this form is included as *Attachment 1*

Substitutions and changes permissible contingent on approval by the department All field sampling shall be in accordance with FDEP Standard Operating Procedures for Field Activities (DEP-SOP-001/01) dated February 1, 2004, revised May 2, 2005 The complete DEP-SOP-001/01 is available at http://www.dep.state.fl.us/labs/qa/sops.htm

6.2 Laboratory Elemental Analyses

Water samples will be analyzed for TN (Methods 350.1, 351.2, 353.1, 353.3, 354.1), for cBOD5 (Method 5210B), for TSS (Method 160.2), TP (Method 365.4), and fecal coliform (SM 9222D). Analyses will be performed in NELAP-certified labs within the applicable holding times. QA/QC samples to the extent of approximately 10% of the number of laboratory analyzed samples shall be included.

If results for the first site establish that field methods, such as nitrate probes or colorimetric kits, result in an average relative absolute deviation from the laboratory analysis of less than 25% for lab results under 2 mg/L and less than 10% for samples above 2 mg/L and a 90%-tile relative absolute deviation less than three times these values, laboratory analyses for the respective parameters can be halved

Approximately four samples at each site, which may include a septic tank effluent sample, will be analyzed for nitrogen isotopes (Extraction of Nitrate from Groundwater Via Ion Exchange method) to characterize the isotope ratios for evidence of denitrification upstream, directly underneath the drainfield, and some distance in the plume downstream

6.3 Data Base Entry

All field measurement documentation will be approved and signed off by field personnel conducting the measurements. All field forms will be reviewed and signed off by Lead Engineer prior to database entry. Entry of field and laboratory data into databases will be by administrative personnel. Administrative personnel will sign off on data entry after proofing input data.

6.4 QA/QC

All field data will be reviewed by field personnel conducting the measurements after database entry, followed by review by QA/QC officer. QA/QC officer will review all laboratory data after data base entry.

6.5 Data reduction/Analyses and Reporting

The Principal and Lead Engineer will confer and review all field data prior to data reduction/report writing. The Lead Engineer will assume responsibility for tasking data reduction and report writing to appropriate staff members. Draft versions of data reduction and reports will be reviewed and edited first by the Lead Engineer and then the Principal Engineer. When a Draft version approved by both the Lead Engineer and Principal Engineer has been completed, it will be submitted to the Department for review and comment

Final reporting will consider and include comments as appropriate from the Department and stakeholders provided though the Department.

Attachment 1 – Form FD 9000-24 Revised

GROUNDWATER SAMPLING LOG

SITE NAME:	SITE LOCATION:	
WELL NO:	SAMPLE ID:	DATE:

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH: feet to feet	STATIC DEPTH TO WATER (feet):	PURGE PUMP TYPE OR BAILER:

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (gallons):

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP (°C)	COND. (µmhos/cm or µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)

Notes:	Nitrate (as NO3) (ppm)	ORP (mV)	Chloride (ppm)	Total Iron (ppm)	Ferrous Iron (ppm)	Ferric Iron (ppm) calcuated	

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0 04; **1 25"** = 0 06; **2"** = 0.16; **3"** = 0 37; **4"** = 0.65; **5"** = 1 02; **6"** = 1.47; **12"** = 5 88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.0006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
PUMP OR TUBING DEPTH IN WELL (feet):	SAMPLE PUMP FLOW RATE (mL per minute):	TUBING MATERIAL CODE:	
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N FILTER SIZE: ____ µm Filtration Equipment Type:	DUPLICATE: Y N	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION				
SAMPLE ID CODE	# OF CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

NOTES: 1. **The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0 2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0 2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)