

## **Onion Creek Quality Assurance Project Plan**

### **Project #21**

#### **Introduction**

Onion Creek is 75 miles in length and has a drainage area of approximately 211 square miles. It is a unique watershed that crosses two ecoregions, the Edwards Plateau and the Blackland Prairies, and contributes a substantial amount of the total recharge to the Edwards Aquifer. The upper watershed, in the Edwards Plateau, is relatively pristine and dominated by large ranches, but these are in unincorporated areas and are increasingly being developed as subdivisions. As the creek flows into the Blackland Prairie ecoregion, toward the confluence with the Colorado River, the watershed becomes more agricultural and densely residential. These lower portions of watershed are currently coming under increasing development pressure associated in part with the newly opened Austin/Bergstrom airport.

The original monitoring program was in response to contact recreation concerns in McKinney Falls State Park. High levels of fecal coliform bacteria in Onion Creek (in part from the Williamson Creek Wastewater Treatment Plant immediately upstream) resulted in a swimming ban beginning in 1981. The monitoring program was designed to evaluate the re-opening of the park to swimming in 1993, several years after the plant had been decommissioned. Storm and baseflow sampling was conducted over a three-year period. Results indicated that swimmer safety is maintained during baseflow, but can be impacted by heavy rains. Additional investigations involved high nitrate springs, traced to sludge deposits from the old WWTP. Remediation efforts on the closed ponds were somewhat effective but groundwater monitoring is ongoing. In 1996, sampling regime shifted to quarterly (March, June, September, and December).

As part of the CoA Onion Creek Report (2003), the monitoring objectives and sampling activities were modified to those described in this document. Recommendations from the CoA Onion Creek Report (2003) suggested that baseline monitoring for large-scale temporal and spatial differences on mainstem Onion Creek should continue, though in a more limited manner with fewer sites and reduced frequency. In addition to this baseline monitoring, special targeted short-term studies to answer specific questions about Onion Creek and its tributaries were recommended. The first two special studies, implemented during 2003-2004, were:

- Chlorides and sulfates in Onion Creek tributaries
- Diel D.O. sampling on mainstem Onion Creek monitoring sites

#### **Project Management**

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1. Who is the project manager?  
Mary Gilroy
2. Who is the WMA team representative?  
Chris Herrington

3. What other WPDRD staff are on the committee for this project?  
Mateo Scoggins
4. When will the annual WMA review be completed?  
September
5. When will sampling begin/end?  
Sampling under this protocol will begin in February 2004 will be on-going

### **Data Objectives**

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6. What are the study objective(s)?
  - Maintain compliance with NPDES/TPDES permit requirements
  - Evaluate temporal changes at mainstem sites on Onion Creek
  - Evaluate spatial differences between current mainstem monitoring sites
  - Evaluate benthic macroinvertebrate data to determine that Onion Creek continues to support a “high” aquatic life use.
  - Contact recreation (based on indicator bacteria) safety will be assessed at McKinney Falls
7. In addition to the project committee, who else is interested in the data?  
Robbie Botto
8. What decision(s) will be made from the information obtained? When will the decisions be made?  
If Onion Creek benthic or DO data no longer support a “high” aquatic life use, a letter will be sent to TCEQ staff in support of listing some or all of Onion Creek as impaired for aquatic life.  
  
If there is an increase in the exceedances of contact recreation standards, Texas Parks & Wildlife staff will be notified.  
  
Decisions will be made during biannual data analysis.
9. What has been done in the past? List previous related reports or available data.  
2002 Onion Creek Report Update  
1993 Onion Creek Report
10. What could be done in the future? List and prioritize potential special studies.
  - **Source of elevated TDS (Mary?)**
  - **Source determination for high nitrates in Marble Creek (Chris)**  
Nitrate values at the mouth of Marble Creek are consistently elevated above values at the next site located only 1.5 miles upstream. What is the source of the nitrate input to Marble Creek between Thaxton Road and the mouth?
  - **Investigation of the Intermediate Disturbance Hypothesis (Mateo)**  
An ecological study employing multivariate analysis techniques, analysis of species composition at individual sites, and comparison of the benthic and diatom community structures will be used to determine if the IDH can explain observed variation in biological communities between sites.
  - **Eastern tributary study (Mateo)**

Are the eastern tributaries degraded or at a higher attainable aquatic life use for the Blackland Prairie Ecoregion? Need to acquire true BP ecoregion reference data and possibly utilize alternative sampling techniques in these muddy streams with no flow.

- **Index of Riparian Integrity for mainstem and tributary units (Mateo)**  
Aerial photography will be used to calculate the IRI for tributaries (as single units) and mainstem segments. Results will be compared to chemical and biological status of these analysis units
- **Use Attainability Analyses for tributaries (Chris?)**  
The feasibility of conducting a UAA for Onion Creek tributaries expected to degrade in the near future will be performed to establish a baseline aquatic life support use that can be used in future TCEQ 305(b) assessments.
- **Intensive habitat study (Cara/Mateo)**  
Habitat differences among sites, including canopy cover and substrate characterization, will be compared in an attempt to better document sources of variation in benthic and diatom communities.
- **Residential subdivision with effluent irrigation at Onion near Hwy 12 (Mary)**
- **Reference condition determination by ecoregion (Mateo)**  
Replicate benthic and diatom samples will be collected for each ecoregion in a short period of time to better establish a reference condition and to characterize the natural variability inherent in biological sampling.

### **Data generation**

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11. Describe the sampling. What sites will be sampled? In addition to the core parameter list in the SOP manual, what other parameters will be collected? When will sampling occur? Onion Creek will be divided into three analysis segments, each containing two sites (Table 1; Figure 1). The Upper Onion segment encapsulates non-point source inputs from development in Dripping Springs and portions of Hays County, and ranges from the western headwaters upstream of Dripping Springs to the eastern end of the recharge zone. The Middle Onion segment begins at the eastern end of the recharge zone and continues to McKinney Falls, ending just upstream of the confluence of Williamson Creek, and contains the mouths of all the urban tributaries except Williamson. The Lower Onion segment begins at the confluence of Williamson Creek and flows to the mouth of Onion. Discharge from the Bergstrom Airport, Williamson Creek, and agricultural land uses affect the Lower Onion segment.

Table 1. Sample site names.

Site #	Site Name	TCEQ Site #	Segment Name
1365	Onion Creek at Pfulman Ranch	12455	Upper Onion
612	Onion Creek Near Driftwood	12451	Upper Onion
241	Onion Above Footbridge	17275	Middle Onion
236	Onion Creek @ Twin Creeks Road (OC1)	12477	Middle Onion
255	Onion Creek @ McKinney Falls Below Lower Falls	12440	Lower Onion
1366	Onion Creek @ South Austin Regional WWTP	12434	Lower Onion

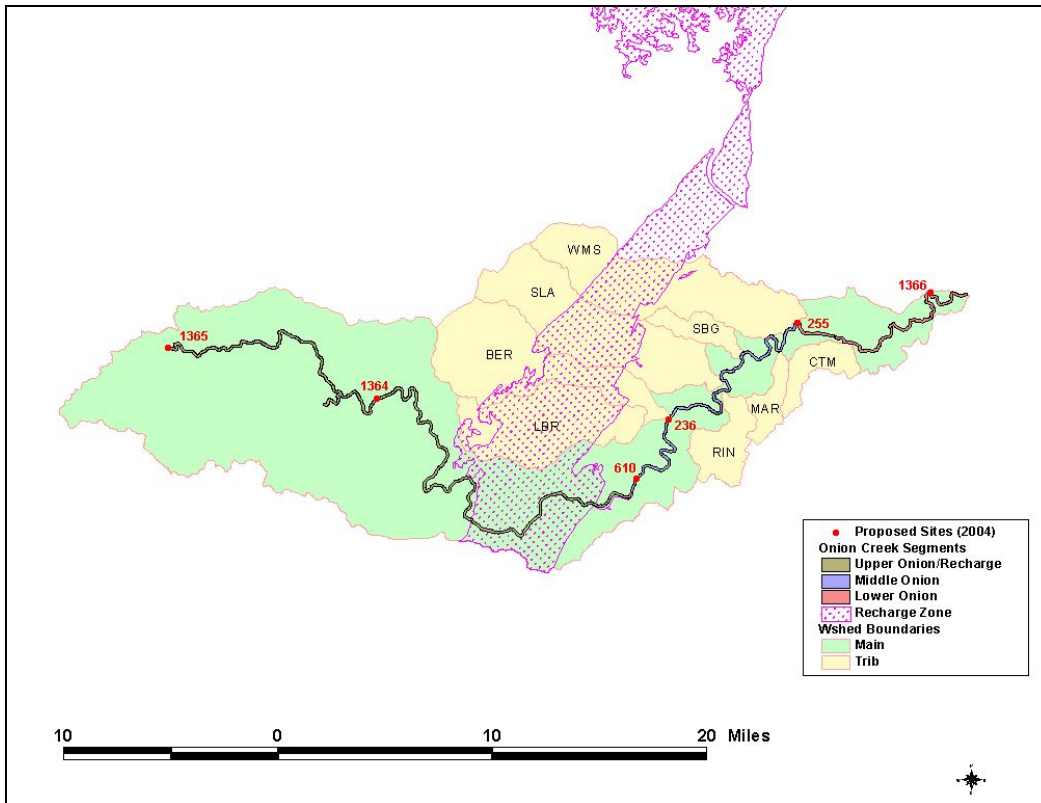


Figure 1. Sample site locations.

Bottle List (for each site).

# Bottles	Type	Volume	Preservative	Analyte
1	Bac-T	100mL	Ice	ECOLI
1	Plastic	1L	Ice	TSS
1	Plastic	250mL	H2SO4	NH3, NO3+NO2
1	Plastic	250mL	Ice	ORTHO-P

### Parameters

In addition to benthic macroinvertebrate and diatom sample collections, water quality parameters will be collected (Table 2). Parameter lists may vary for special studies outlined below.

Table 2. Water quality parameters to be collected

Parameter	Method or Equipment	Analysis Location	W/WW Lab Cost*
Dissolved Oxygen	Hydrolab or YSI	Field	N/A
pH	Hydrolab or YSI	Field	N/A
Temperature	Hydrolab or YSI	Field	N/A
Conductivity	Hydrolab or YSI	Field	N/A
Flow	Marsh-McBirney Meter	Field	N/A
Ammonia	EPA 350.1	Lab	\$10.00
Nitrate/Nitrite	EPA 353.2	Lab	\$12.00
Total Orthophosphorus	SM 4500-P F	Lab	\$12.00
TSS	SM 2540 D	Lab	\$8.00
E Coli	SM 9222 G	Lab	\$25.00

\*Effective 07/05/2007

### Frequency

Medium	Months of Sampling
Benthic Macro.	May-Jun, Jul-Aug
Diatom	May-Jun, Jul-Aug
Habitat	May-Jun, Jul-Aug
Water Quality	Jan-Feb, May-Jun, Jul-Aug
Diurnal Field	May-Jun, Jul-Aug

Water quality, benthic macroinvertebrate and diatom samples will be collected from all sites in May (during the “index period” from March 15 to October 15 as defined by TCEQ) and in July (after July 1 and before September 30 during the “critical period” as defined by TCEQ) pending adequate flow in accordance with TCEQ (2002) assessment procedures. If there is no flow at a site during a sampling event, that site will be sampled twice in the next year (with concurrent sampling events at least one month apart when possible pending flow conditions) during the same time period to maintain equal number of data points.

Habitat assessments will be conducted as follows:

- EPA HQI collected with both biological samples (index and critical periods).
- Intensive Habitat assessments will be conducted in conjunction with only one of the two biological sampling events (either index or critical period, not both).
- TCEQ Habitat protocol is currently not in use (as of Jan 2007); if implemented in the future, frequency will be determined at that time.

Additionally, water quality samples will be collected from all sites in the winter (January or February) pending the outcome of seasonal data analysis.

12. Describe special sample conditions. List only deviations from routine non-storm conditions as described in the SOP manual.

Water quality and diurnal field parameter samples will be collected under non-storm conditions as described in the WRE SOP Manual.

Biological and habitat samples will be collected by WRE SOP Manual Protocol.

13. Describe special collection methods. List only deviations from routine sample collection methods as listed in the SOP manual?

All water quality samples will be collected according to WRE Standard Operating Procedures.

Benthic macroinvertebrates are collected according to the SOP manual. Three surbers are collected at each site from the bottom, middle and top of the study riffle. Benthic macroinvertebrates from each surber are sorted discretely and entirely in the field and preserved for identification in the lab at a later date.

Diatoms are collected according to SOP. Three rocks are selected from the bottom middle and top of each riffle and place in a collection tray. A 7-cm diameter circle is drawn on the top of each rock and all material within this circle is removed using a wire brush. Material from all three rocks is composited together into one 250mL bottle and preserved for identification at a later date.

EPA's Habitat Assessment (Barbour et al. 1999), Pfankuch Channel Stability Evaluation (Pfankuch, 1975) and ERM's Intensive Habitat Assessment are all utilized to document general qualitative habitat condition at all sites and is important in interpretation of biological data. Protocols for each of these is described in WRE SOP Manual, Section 6.2 (EPA), Section 6.3 (Channel Stability) and Section 6.5 (Intensive Habitat).

14. List special laboratory analytical methods. Include details on CRP requirements, non-EPA approved methods and in-house analyses (Ohmicron).

See table 2 (item #12) for information on water quality sample analytical methods.

All water quality parameters will be collected and analyzed by methods that are suitable for submission of data to TCEQ for inclusion in 305(b) assessments.

15. Where will the samples be analyzed?

Water quality samples will be analyzed at the W/WW Walnut Creek Lab. Benthic samples will be identified in the WRE lab. Diatoms will be identified by Barbara Winsborough.

16. How much will samples cost?

Each water quality sample will cost \$67.00 yielding a total annual estimated lab cost of \$1,474.00.

Diatom samples cost \$60 per sample to be identified by Barbara Winsborough.

17. What possible problems may arise in sample collection and what actions can be taken to mitigate their impact?

If inadequate habitat for benthic samples is available, no sample will be collected and the committee will discuss changing the site prior to the next sampling event.

### **Validation**

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18. What type, how often and where will QA/QC samples will be collected?

One replicate water quality sample will be collected during each sampling event at the Pfluman Ranch site and labeled "982 Onion @ Brandt". One field blank will be generated at any site per calendar year and labeled "251 Onion @ County Line".

One duplicate diatom sample will be collected during each sampling event.

Detritus from 10% of samples (4 surbers per year, or 2 surbers per sampling event) will be preserved in alcohol and returned to WRE lab for review. Field verification of detritus from every benthic macroinvertebrate sample will be reviewed by alternate staff members.

19. How will QA/QC results be used to validate data quality?

<INSERT TEXT>

20. In case of QA/QC failure, what corrective action will be taken?

<INSERT TEXT>

## **Assessment**

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21. By what specific methods will the data be analyzed?

Water quality data will be compared to TCEQ standards and screening criteria as specified in the most current version of TCEQ guidance documents to determine water quality impairments and concerns on Onion Creek, including assessment of contact recreation use at McKinney Falls State Park using CoA and TPWD data.

Benthic data will be used to determine if Onion Creek supports a “high” aquatic life use (TCEQ qualitative aquatic life use score  $\geq 29$ ).

Regression analyses will be used to determine the existence of statistically significant changes in Onion Creek analytes over time at each site for each parameter.

ANOVA techniques will be used to compare current conditions to baseline conditions (earliest available data after 1995) and to determine statistically significant differences between sites and segments. *[A baseline condition will be established for water quality and biological samples by summarization of the earliest available data for each site or segment after 1995. The 1995 period is selected not only due to masterplan goal specifications, but also to avoid effects of the operation and remediation of the Williamson Creek WWTP.]*

Power analysis will be conducted to insure that current sampling rates are adequate.

22. What hypotheses will be tested?

Benthic data support a “high” aquatic life use.

Annual average concentrations of chloride, sulfate, TDS/conductivity are less than TCEQ standards.

Less than 25% of samples for DO, ammonia, nitrate+nitrite and orthophosphorus exceed TCEQ screening levels.

No change over time for any parameter at any site.

No difference between segments.

No difference between sites.

Current sampling rates yield adequate power.

23. When and/or how often will the data be analyzed?  
Data will be analyzed once every two years, with the next scheduled analysis in 2006.
24. How will it be determined that the study objectives have been met?  
<INSERT TEXT>

## **Reporting**

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25. When and what type of reports will be generated? Who will generate the report?  
A status report will be conducted as specified for each of the monitoring objectives above once every two years (next report by June 30, 2007). This report will also contain discussion of the status and outcome for any special studies conducted within that two year period, as well as specify the special studies to be conducted within the next two years.
26. Who will review the reports prior to publication?  
Mateo Scoggins, Ed Peacock

## **References**

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- Barbour, M.T., J. Gerritsen, B.D. Snyder and J.B. Stribling. 1999. Rapid Bioassessment Protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish, second edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C
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