



Stakeholder Water Quality Questions from 7/18/2013 Meeting

Part 1: Sampling Requirements and History

The Texas Commission on Environmental Quality (TCEQ) publishes a specific guidance document to govern how a stream's water quality is to be assessed and reported. The most recent version is the *2012 Guidance for Assessing and Reporting Surface Water Quality in Texas* ("2012 Guidance"). Many of the answers to the questions in this section may be found in greater detail in that document, which may be accessed at:

http://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012_guidance.pdf

The 2012 Guidance describes the objective for assessing water quality:

- A primary objective of water quality assessment is to draw conclusions about a water body based on a group of measurements for a particular water quality parameter of interest."

Note: In this water quality discussion, a "parameter" is a measurable characteristic of the water.

1. How often is sampling performed?

Routine State sampling by TCEQ is generally conducted approximately every three months, but may differ for different sites. In addition, special studies are sometimes conducted for more intensive monitoring and evaluation. Before being considered for analysis, all sampling data collected, whether as part of TCEQ's routine monitoring program or as a special study, must meet minimum quality assurance and quality control requirements established by TCEQ.

In 2006-07, USGS conducted one such special study that included Double Bayou. It was focused more on habitat and biology, but also included dissolved oxygen and other water quality data collection and analysis. HARC conducted a special water quality characterization study of Double Bayou in 2009-2011. The development of Watershed Protection Plans also generally includes much more intensive water quality data collection and analysis.

2. Is the data collected at one time period deleted after a 7 year time period?

No. The data are saved permanently.

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Double Bayou Watershed Partnership is a project of the following entities:



3. When did E. & W. Fork sampling start?

What kind of sampling from each fork is available?

There are a total of 386 different water quality parameters in the TCEQ Surface Water Quality Monitoring (SWQM) database (the database that contains all of the information from the routine and specialized sampling discussed above) that are identified as being collected in the Double Bayou watershed, starting around 1984.

Below is a list of those parameters that are included in TCEQ's routine quarterly sampling:

Temperature	Nitrate + Nitrite
pH	Sulfate
Dissolved Oxygen	Fluoride
Specific Conductance	Chlorophyll a
Salinity (if tidal)	Ammonia
Flow (if non-tidal)	Total Phosphorus
Secchi	TOC (Total Organic Carbon)
Total Alkalinity	TKN (Total Kjeldahl Nitrogen)
Chloride	E.Coli (non-tidal)
TSS (Total Suspended Solids)	Enterococci (tidal)
VSS (Volatile Suspended Solids)	

The rest of the list of 386 parameters includes metals, toxics, potentially harmful synthetic chemicals, and other biological parameters, and many of these have only one or two samples in the database, with another group having only about ten samples.

4. Begin in year 1948 to date, what change or none in the quality of water in West Fork and East Fork Double Bayou?

As noted above, water quality sampling data for Double Bayou does not go back that far. Also, because water quality data are so variable, trend analysis has not yet been done for Double Bayou. During the WPP process, we will be analyzing changes in parameters over time and place, and discussing the results with the stakeholders.

5. How many samples must be below the acceptable level to cause the stream to be unacceptable? 1%/10%/20%

How many samples below the standard for the water body to be listed?

For most parameters (except bacteria), the goal is generally no more than 10% exceedances.

The number of samples below a criterion before a stream segment is listed as impaired depends on the parameter. And it depends on the total number of samples. There needs to be a sample size large enough – over a seven-year period of record – to support a listing. The minimum number of samples has been determined to be at least 10 for everything but bacteria, and needs to be at least 20 samples for bacteria. (That 7-year period of record may be extended in some cases to evaluate more samples.)

Additionally, samples have to be representative. For example, sampling events need to be on a routine frequency and vary over the seasons, and samples may not be counted if the stream flow is below a defined minimum level. Sampling plans must also take into consideration how the values may change over depth – with a depth of about one foot below the water surface being generally the most appropriate place for sampling water quality for standards.

If the sample set is smaller than the minimum, then a statistical analysis (the Binomial Method) may be used – to reduce the chance of error in the potential listing. This analysis is summarized in what's called the binomial table. In that table, the number of exceedances is evaluated for how well the stream can support its designated use – that is: fully supporting, not supporting, concern, or no concern.

In general, a stream may be listed as impaired if it has more than 10% exceedances for a particular parameter.

6. Past exceedances – DO too low anywhere from 6-18% of the time, although the long-term averages meet standards. If the long-term averages meet standards why is it a concern? (From handout 4/11/11 – Double Bayou Watershed Protection Overview)

If the long term average meets the standards, why are we concerned?

D.O. is not an average-based standard, because low D.O. at any time can harm aquatic life, even when the average D.O. is fine. TCEQ looks at average D.O. data for trends. For impairment, it looks at the number of times the D.O. is below the standard.

Also, TCEQ uses the past seven years to assess a water body for its health and to determine whether it should be considered impaired, because TCEQ thinks that time window reflects the current conditions of a water body better than its long-term history.

7. Dissolved oxygen appears to be worse (more samples below the grab sample line) than the west. Why isn't the East Fork listed as excessive?

For the dissolved oxygen **grab** data, the East Fork does have more exceedances (8.3%) compared to the West Fork (6.3%), but both are below 10%, so neither is listed based on this parameter. The West Fork is listed because 6 out of 14 **24-hour** dissolved oxygen samples were below the standard. The East Fork does not yet have enough 24-hour dissolved oxygen samples to assess, so it is not listed. These results are based on the data analyzed by the TCEQ for its 2012 integrated report and 2012 listing,

8. Why is the chlorophyll and nutrients in water on the West and the East Fork are very high?

Why are the chlorophyll-a levels so high in both forks?

The chlorophyll-a levels are elevated in 31% of the samples from the West Fork and in 11% of the samples from the East Fork, from the data analyzed by TCEQ for its 2012

integrated report and 2012 listing. The nutrient screening levels were exceeded 8 times in the West Fork and only once in the East Fork (and only by 0.02 mg/L). Chlorophyll-a is a measure of algae production, which is greatly influenced by nutrient loads, and both of these can affect oxygen levels. The relationship between nutrients, chlorophyll-a, and dissolved oxygen should be further evaluated during the WPP process.

9. *If a drought happens, it is going to have low oxygen, so is that an accurate measurement?*

It is my understanding that to obtain a more accurate DO sample it must be sampled in a moving stream and not obtained in a dead (still) water area. How do you catch an accurate sample in a still water bayou? I may be old school...

Is there a problem with the data set if samples were taken during the drought?

What consideration is given to: 3 year drought caused low flow?

In science, the accuracy of a measurement is not a function of whether the water is moving or a drought is occurring, but rather whether the measurement was done properly. Today's sampling instruments can take accurate measurements whether or not the water is moving.

For routine monitoring, samples are taken regardless of tides or weather conditions, but these conditions are noted. If the conditions are abnormal or not representative, then the data may not be used in evaluating a stream for listing. That only representative samples may be used for listing is part of why so many samples are required.

However, in order to fully represent a stream's health and evaluate sources of pollution, all flow regimes need to be represented (high, normal, low). So, the drought samples that were taken as part of the characterization study will provide for representing the low flow of the regime. The low flow situation will ideally be balanced by sampling during higher flow conditions. As the WPP samples are collected, the team will be watching especially for opportunities to collect samples during the high parts of the flow regime.

(Dissolved oxygen can indeed be low during low flows, and this can be the result of several factors, such as higher temperatures and less mixing. But the D.O. can also be high, and again, the low flow situation will ideally be balanced by sampling during higher flow conditions.)

10. *Do you also monitor stream flows? (In or out)*

TCEQ does not routinely measure flow in tidal streams, though it may note the tidal status when a sample is taken. In a flowing, non-tidal stream, the flow "severity" is noted as one of seven different levels.

As part of the WPP process, a flow meter on the West Fork was installed in order to capture continuous flow measurements to help with modeling the stream for the effects of pollutant loading and best management practices. Single quantitative flow measurements are also measured when a water quality sample is taken during the WPP process.

11. Explain Double Bayou “Tidal Stream” and any differences for obtaining accurate samples versus running streams.

Is when or how sampling is done changed because of tides?

If the water level is affected by tides, TCEQ categorizes the stream as tidal, and then classifies and assesses it as a tidal stream.

Only two changes are made for TCEQ routine sampling in tidal streams: (1) Enterococcus is measured for bacteria (instead of *E. coli*), and (2) flow measurements are not attempted.

For the WPP study, to better understand how the pollutants, especially bacteria, may best be reduced by management practices, HARC/USGS are sampling for three types of bacteria indicators – Enterococcus, *E. coli*, and fecal coliform – regardless of tidal/non-tidal. This will allow the results to be compared over historical trends. Flow measurements are also being taken at all sampling points to enable analysis that will help target numerical reductions in loads to meet criteria.

12. Who decides a “waters” designated usage?

As part of its standards-setting process, TCEQ establishes the designated uses for streams, with public input, and then EPA has to approve the designated uses.

13. Are the DO criteria appropriate for the waterbodies?

The D.O. criteria are based on the Aquatic Life Use designation for the stream. The fish and other animals that live in the water need oxygen to live, but they get it from the water rather than from the air. Dissolved oxygen of at least 2.0 milligrams per liter (mg/L) is needed for most aquatic life to live. To thrive, including being able to reproduce, an average D.O. of 4.0 mg/L is needed for most species.

The specific D.O. criteria are different depending on the water body classification. Examples of different types of water bodies with varying D.O. criteria include: freshwater perennial streams, reservoirs, tidal streams, estuaries, and wetlands. Amongst the different types of water bodies, there can also be different D.O. criteria depending on the designated Aquatic Life Use for the water body segment (Exceptional, High, Intermediate or Limited).

Double Bayou’s criteria are 4.0 milligram per liter (mg/L) 24-hour average D.O. and 3.0 mg/L minimum D.O.

14. *There was comment on errors (labeling of a sample) in sampling. Why should we trust these data?*

The Quality Assurance Project Plan (QAPP) process helps ensure that the measurements themselves are accurate, with several steps in the sampling and analysis process. Under the QAPP, both the sampling and lab analysis processes must follow a rigorous protocol with very stringent guidelines. Then, the data analysis has a rigorous protocol for assessment.

As noted in the July 18 presentation, TCEQ did make an error in the 2012 Integrated Report for the West Fork calculations. It was the review for this project that helped ensure that the labeling error was caught. This type of error is rare; TCEQ performs these assessments for hundreds of streams throughout the state and sometimes mistakes happen. TCEQ has assured us they will correct the mistake in the next assessment and that it did not change the status of impairment for either fork.