Assessing Attainment of Dissolved Oxygen Criteria for East Texas Streams

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Applying the Regression Equation for DO/stream flow/bedslope:

- Table 5 that relates DO/stream flow/bedslope in Section 307.7 of the 2000 Water Quality Standards
- Applicable to classified and unclassified streams in defined areas of East and South Texas that have been assigned limited to exceptional aquatic life uses (with 24-hour average DO criteria from 3.0 to 6.0 mg/L.)
- Table doesn't affect streams with an assigned 24-hour (either presumed or designated) average DO criterion of $\leq$ 3.0 mg/L

Steps for Assessing DO Data

- SAS will screen all raw data against 7Q2 for that station and will automatically eliminate all samples below 7Q2 from the data set

- Data set then run through SAS assessment without regression equation applied

- If there is a concern or impairment of the presumed criteria of the grab minimum, 24-hr average/minimum and there <u>is flow data</u>, then those data will be re-run by hand using the E. Texas regression equation

- If there is a concern or impairment of the presumed criteria and there are <u>no flow data</u>, then the approach used in previous assessments would require identification of a concern or impairment as the assessment outcome
  - Other options would be to call the data set "not assessed" or "concern" due to no flow data

Using Flow Severity

- For perennial streams where the initial assessment shows a concern or impairment of the presumed DO criteria, and there are only flow severity data, then those DO values with flow severity values of "1" will be deleted from the data set and the assessment re-run.

- The assessment of the resulting data set will be conducted using the presumed criteria.

Steps for De-Listing DO Impairments

- If the listing was for grab DO, then 24-hr data are required to de-list

- The 24-hr average and minimum is then assessed using the same procedures as "Steps for Assessing…"

- If there are no flow data and data show FS of presumed criteria, then water body may be de-listed without the use of the regression equation

- If there are no flow data and the data show either a concern or NS of the presumed criteria, then the water body will not be de-listed

Possible Strategies for Listings Where Flow is Not Available

- Perform detailed analysis of watershed, hydrology, etc. to see if flow measurements are practical/possible

- With available slope, use "0" flow in equation to see if the regression equation would even make a difference in the appropriate criteria

- Where resources have not been available to conduct flow measurements where flows can be collected, possible contracts could be developed to collect flow

- Use water effects ratios being developed by USGS to see if flow estimate could be derived

Regression Equation to Define Applicable DO Criteria for each DO Measurement by Calculation

- **DOr** = $7.088 + 0.551\ln(Q + 0.01) + 0.686\ln(Bd) - k - j$
- **DOt** = DOr truncated to a whole number by dropping the decimal fraction
  - **DOr** = DO criterion from regression (mg/L; 24-hour average)
  - **Q** = Flow (ft^3/s)
  - **Bd** = Bedslope (m/km)
  - **k** = 1.61 (constant for 50th percentile of tree canopy cover)
  - **j** = 0.5 (to set the DO criterion an increment below the predicted ambient DO)
  - **DOc** = The designated or presumed DO criterion (mg/L, 24-hour average)
  - **DOt** = The applicable DO criterion, as adjusted by flow and bedslope, and equivalent to the DO table in the WQ Standards

Example

Date	Flow	Slope	DOc Mean	DOc Min	Site Specific DO	DOt Mean	DOt Min
10/6/1999	2.0	0.18	5.0	3.0	4.18632051	4.0	3.0
5/24/2006	6.5	0.18	5.0	3.0	4.833858319	4.0	3.0
1/3/2006	1.0	0.22	5.0	3.0	3.944791008	3.0	2.0
7/10/2006	0.1	0.22	5.0	3.0	2.723099898	2.0	1.0
7/15/2008	5.1	0.74	5.0	3.0	5.670232778	5.0	3.0
2/8/2009	0.3	0.74	5.0	3.0	4.126120084	4.0	3.0

Determining Applicable Criterion

- If DOt is equal to or higher than DOc, then DOc is the applicable DO criterion.

- If DOt is less than DOc, then DOt is the applicable DO criterion.

Site-specific Uses and Criteria

- Site-specific multiple regression equation developed for 5 segments in Basin 4
- Still under review by EPA

Segment No.	Segment Name
0401	Harrison Bayou
0406	Black Bayou
0407	James' Bayou
0409	Little Cypress Bayou
0410	Black Cypress Bayou
0410	Black Cypress Creek

Derivation of Site-specific Uses and Criteria

- The site-specific multiple regression equation is derived from a study on the Black Cypress Creek by Art Crowe and Charlie Bayer of TCEQ

- The equation was modified for use in other streams within the Cypress Creek Basin