

Rachel Ickert

From: Rachel Ickert
Sent: Monday, March 16, 2009 12:59 PM
To: 'Angela Masloff'
Cc: Tom Gooch; 'jparks@ntmwd.com'; Amy Kaarlela; 'Melisa Fuller'; 'ntd08492@freese.com'
Subject: Re: Request for TWDB approval of modified WAMs and use of safe yield in Region C

Attachments: Let_Changes to WAM_03-05-09.pdf; Attachment B.pdf



Let_Changes to WAM_03-05-09.pdf



Attachment B.pdf (69 KB)

Angela,

Per your request, we have prepared the following explanation on the use of safe yield for TRWD and operational yield for Lake Athens:

The TRWD operates its raw water system in accordance with its Management Plan, which is based on the safe yield of the system. The safe yield represents the amount of water that could have been supplied from a reservoir during the worst historical drought leaving a reserve supply at the end of the critical period. This is discussed in the Region C plan on Page 3.19 and Appendix I (p. I-5).

Lake Athens is located in the East Texas Region (Region I) and provides water to the City of Athens, which is located in both Regions C and I. The lake also provides water to Texas Freshwater Fisheries Center. The firm yield of this reservoir is reported in the Region I plan at 6,145 acre-feet per year. However, the intake structure for the fish hatchery does not allow the water level to drop below 431 feet msl and maintain inflow to the hatchery. Considering this constraint, the operational yield of Lake Athens is estimated at 2,900 acre-feet per year. This is discussed in Chapter 3 of the East Texas Regional Water Plan, pp 21-22.

Attachments include:

- 1) The original letter requesting revisions to water availability models for planning purposes dated March 5, 2009, and
- 2) Attachment B: the above-referenced pages of the 2006 Region C Water Plan and East Texas Regional Water Plan.

Please let us know if you have any questions or need any additional information.

Thank you,

Rachel A. Ickert, P.E.
Freese and Nichols, Inc.
p (817) 735-7286

-----Original Message-----

From: Angela Masloff [mailto:Angela.Masloff@twdb.state.tx.us]
Sent: Thursday, March 12, 2009 3:42 PM
To: Tom Gooch; Jim Parks
Cc: Amy Kaarlela; Rachel Ickert; Melisa Fuller
Subject: Request for TWDB approval of modified WAMs and use of safe yield in Region C

Hi all. We received your letter and are preparing a response. Thanks for sending this in.

There is a little more info on the safe yield part of the request that we will need. If we can get this through email, that will be fine and I will put your response with your original letter when our response letter is routing here.

We will also need to know the details on the use of safe yield for TRWD and the details on the use of operational yield for Lake Athens. If you could provide definitions for safe and operational yields in these situations and any other information that is pertinent, we can process both requests at the same time (use of modified WAMs and use of safe and operational yields).

Thanks!
-Angela

Angela Masloff
Project Manager, Regions A, B, and C
Water Resources Planning Division
Texas Water Development Board
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REGION C WATER PLANNING GROUP

Senate Bill One Third Round of Regional Water Planning - Texas Water Development Board

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Jack Stevens
Danny Vance
Mary E. Vogelson
Dr. Tom Woodward

March 5, 2009

Mr. Kevin Ward
Texas Water Development Board
1700 North Congress
Austin, Texas 78711-3231

RE: Request for Modifications to Water Availability Models
for Planning Purposes

Dear Mr. Ward:

Region C is located primarily within the Trinity and Red River Basins. Small areas of the region are located in the Sabine, Sulphur and Brazos River Basins. Reservoirs in each of these river basins and the Neches River Basin supply water to Region C. There are also some potential supplies for Region C in the Cypress River Basin. As part of the 2006 planning efforts, the Water Availability Models (WAM) for each of these basins were updated to reflect the current (2000) and future (2060) area-capacity conditions of the reservoirs in the respective basins. In addition, the Trinity, Sabine, and Neches River Basins were updated to account for current operating conditions, including:

- Subordination agreements,
- System operations, where appropriate, and
- Other corrections noted during review of the models.

The Region C Water Planning Group respectfully requests to use a similar approach to water availability to that used for the 2006 Region C Water Plan. Specific changes that were made to the WAM models for the 2006 planning efforts are noted in Appendix I of the 2006 Region C Water Plan and are attached herein (Attachment A).

For the 2011 Region C Water Plan, we request to use the Neches and Sabine River WAM models as modified by the Region I Planning Group with the approval of the Texas Water Development Board. For supplies in the Brazos River Basin, we request to use the Brazos G WAM as modified by the Brazos G Planning Group with the approval of the Texas Water Development Board. For the Sulphur River Basin, we propose to take the same approach as we did for the 2006 planning efforts and use the *Operations Plan for Lake Chapman* (Brandes, June 2003). The Sulphur River Basin WAM was used in the Brandes Study.

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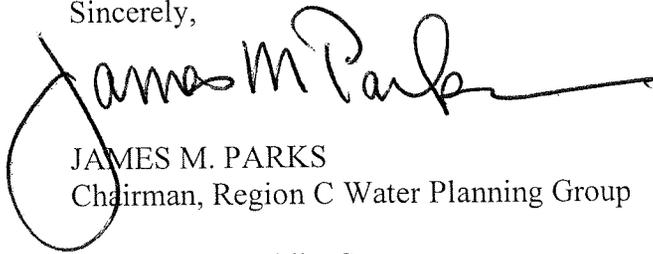
For the Trinity and Red River Basins, the region intends to use the updated TCEQ WAM models, Run 3, with the following modifications:

- Current (2000) and future (2060) area-capacity conditions using information from the most recent volumetric surveys,
- System operations, where appropriate,
- New water rights issued after the latest WAM update, and
- Other changes as needed as we move forward. (We will seek permission for specific changes if we determine that they are needed.)

As intended by Senate Bill 1, the assessment of surface water availability in Region C will be conducted to accurately reflect water supplies that are available for use. This assessment will include updates to the area-capacity relationships for reservoirs with new volumetric surveys, new water rights permits, and current operating policies and/or contractual agreements. As required by the planning guidelines, we will provide information on firm yields for all water supply sources (including those which are to be operated in safe yield mode.) We request to use safe yield for the Tarrant Regional Water District system and operational yield for Lake Athens for planning purposes. We may find that other changes are needed as we move forward. As noted above, we will seek permission for specific changes if we determine that they are necessary.

Please call me if you have any questions regarding our request.

Sincerely,



JAMES M. PARKS
Chairman, Region C Water Planning Group

cc: Russell Laughlin, Secretary
Angela Masloff, TWDB Project Manager
Tom Gooch, Freese and Nichols, Inc.

Attachment A

**Pages I-1 through I-3 from Appendix I
2006 Region C Water Plan**

**APPENDIX I
WATER SUPPLY AVAILABLE TO REGION C**

Table I-1 shows the overall water supply available to Region C. The rest of the appendix explains the sources of the data in the table. The table represents the water supply that might be available to the region, whether it is currently connected to a water user group or not. The table is based on:

- Existing water rights
- Available supply for reservoirs
- Reliable supplies from run-of-the-river diversions
- Available supply from groundwater
- Estimated reliable local supplies for mining and livestock
- Existing and permitted reuse supplies

Limits to water supply due to current water transmission facilities and wells are not considered in the development of Table I-1. They are considered in Appendix J, Current Supplies by Water User Groups.

**Table I-1
Overall Water Supply Availability in Region C
(acre-feet per year)**

SUMMARY	2000	2010	2020	2030	2040	2050	2060
Reservoirs in Region C	1,173,789	1,165,080	1,155,771	1,146,113	1,135,964	1,125,705	1,111,096
Local Irrigation	20,205	20,205	20,205	20,205	20,205	20,205	20,205
Other Local Supply	23,701	23,701	23,701	23,701	23,701	23,701	23,701
Surface Water Imports	567,772	564,302	560,292	555,492	550,689	545,898	541,117
Groundwater	106,460	106,460	106,460	106,460	106,460	106,460	106,460
Reuse	77,363	99,979	105,810	104,800	104,175	103,697	103,429
REGION C TOTAL	1,969,290	1,979,727	1,972,240	1,956,770	1,941,194	1,925,666	1,906,007

Water Supply Systems and Reservoirs

Table I-2 presents the water availability for water supply systems and reservoirs in Region C that are used in the 2006 regional water plan. In accordance with the Texas Water Development

Board's (TWDB) established procedures, these surface water supplies are determined using the TCEQ-approved Water Availability Models (WAM). WAMs have been completed for each of the major river basins in Texas. The WAM models were developed for the purpose of reviewing and granting new surface water rights permits. The assumptions in the WAM models are based on the legal interpretation of water rights, and in some cases do not accurately reflect current operations. Availabilities for each water right are analyzed in priority date order, with water rights with the earliest permit date diverting first. WAM Run 3, which is the version required for planning, assumes full permitted diversions by all water rights and no return flows unless return flows are specifically included in the water right. Run 3 also does not include agreements or operations that are not reflected in the water rights permits and does not account for reductions in reservoir storage capacities due to sediment accumulation. For planning purposes, adjustments were made to the WAMs to better reflect current and future surface water conditions in the region. Generally, changes to the WAMs included:

- Assessment of reservoir sedimentation rates and calculation of area-capacity conditions for current (2000) and future (2060) conditions.
- Inclusion of subordination agreements
- Inclusion of system operations where appropriate
- Other corrections

Specific adjustments to the WAMs to more accurately reflect the water rights and agreements for water supply sources in Region C are:

Trinity River Basin WAM

- Modeling of Lake Jacksboro and Lost Creek as a system.
- Modeling of Tarrant Regional Water District's West Fork reservoirs (Bridgeport, Eagle Mountain, and Worth) as a system.
- Subordination special condition in Lake Ray Hubbard water right. (Lake Ray Hubbard is not allowed to make priority calls on flows originating upstream of Lake Lavon unless Lake Lavon is spilling. This change was accepted by TCEQ and incorporated into the TCEQ-approved model.)
- Correction of flow distribution errors at the control point between Lake Lavon and Lake Ray Hubbard. (This change is being submitted to the TCEQ.)
- An upstream diversion of Lake Livingston water from the Trinity River to Fairfield Lake.
- Inclusion of a minimum elevation for Lake Fairfield (305.0 ft. msl).

- Modeling of Dallas' water rights in the Elm Fork of the Trinity River as a system with Lake Lewisville and Ray Roberts.

Sabine River Basin WAM

- Adjusted the sedimentation rate for Lake Fork to equal the rate determined for Lake Tawakoni. (Based on soil types and watershed characteristics of the two lakes, sedimentation for Lake Fork should be less than Lake Tawakoni. This rate will be re-assessed after a new volumetric survey is completed for Lake Fork.)

Other adjustments to the WAMs in the Sabine and Neches River Basins had no impacts to the currently available water supplies in Region C. The Red River WAM was not used to assess surface water supplies from this basin. Previous yield studies were used to establish supplies for surface water reservoirs. The reliable supply from run-of-the-river diversions was assumed equal to the permitted diversion for water rights located on the main stem of the river and 75 percent of the permitted diversion for water rights located on tributaries. Supplies from Lake Chapman were determined from the *Operations Plan for Lake Chapman* (Brandes, June 2003). The Sulphur River Basin WAM was used in the Brandes study. Region C has very few water supplies in the Brazos River Basin. Thus, the water availability information as determined by the Brazos G Regional Water Planning Group was adopted.

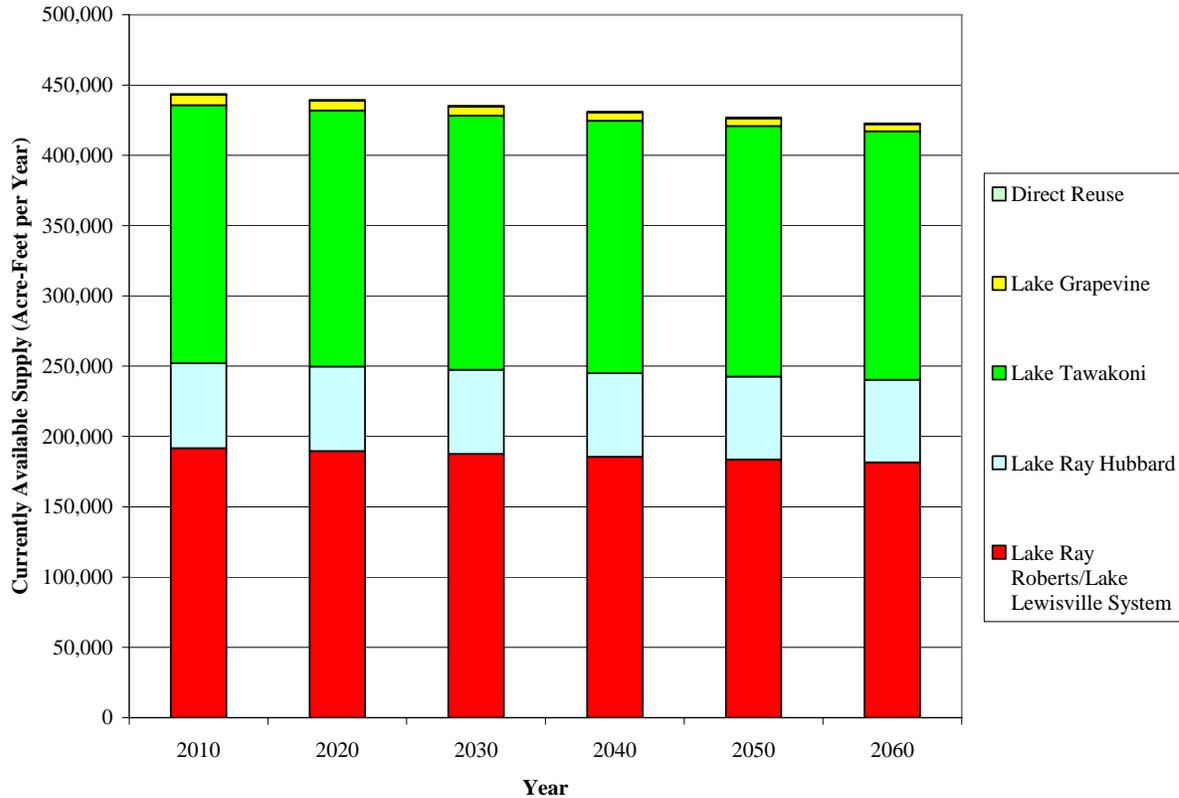
Table I-2
Currently Available Surface Water Supplies from Reservoirs in Region C
(Not Considering Transmission Constraints)
(Acre-Feet per Year)

	Basin	2000	2010	2020	2030	2040	2050	2060
WATER SUPPLY SYSTEMS								
Lost Creek/ Jacksboro System	Trinity	1,440	1,440	1,440	1,440	1,440	1,440	1,440
West Fork (includes Bridgeport Local)	Trinity	110,000	108,500	107,000	105,500	104,000	102,500	101,000
Elm Fork/ Lewisville/ Ray Roberts	Trinity	193,753	191,729	189,705	187,681	185,657	183,633	181,609
Grapevine - Dallas	Trinity	7,700	7,250	6,800	6,350	5,900	5,450	5,000
Subtotal		312,893	308,919	304,945	300,971	296,997	293,023	289,049

Attachment B

**Excerpts from 2006 Region C Water Plan and 2006
East Texas Regional Water Plan**

Figure 3.3
Currently Available Water Supplies for Dallas Water Utilities



Tarrant Regional Water District

Figure 3.4 shows the currently available water supply for Tarrant Regional Water District (TRWD). TRWD’s water supply system includes Cedar Creek Reservoir, Richland-Chambers Reservoir, Benbrook Lake, Lake Bridgeport, Eagle Mountain Lake and Lake Worth (owned by Fort Worth). Lakes Bridgeport, Eagle Mountain, and Worth are operated as the West Fork system. TRWD operates its system on a safe yield basis, and the currently available water supply as of 2060 is 394,049 acre-feet per year on a safe yield basis. TRWD has recently received water rights allowing it to divert return flows of treated wastewater from the Trinity River into Cedar Creek Reservoir and Richland-Chambers Reservoir. When this project is implemented, it will increase the safe yield of the two lakes to the permitted diversion amount and will also provide substantial supplemental yield for TRWD.

Table I-2, Continued

RESERVOIRS IN REGION C (Continued)								
	Basin	2000	2010	2020	2030	2040	2050	2060
Mineral Wells	Brazos	2,520	2,508	2,495	2,483	2,470	2,458	2,445
Teague City Lake	Brazos	189	189	189	189	189	189	189
Lake Lavon	Trinity	104,000	104,000	104,000	104,000	104,000	104,000	104,000
Muenster		0	0	0	0	0	0	0
	Subtotal	874,396	869,995	864,993	859,642	853,800	847,849	837,547
	TOTAL	1,187,289	1,178,914	1,169,938	1,160,613	1,150,797	1,140,872	1,126,596

WATER SUPPLY SYSTEMS

The water supply systems listed are operated as physical systems – the water they provide cannot easily be separated by individual source. The supply available is based on the calculation of the Water Availability Models (WAMs), as described above. More detailed discussions on water supply available for each system are given below.

Lost Creek/Jacksboro System (Jacksboro). Lake Jacksboro is a 2,129 acre-foot reservoir located just outside of the City of Jacksboro in the Trinity River Basin in Jack County, and Lost Creek Reservoir is an 11,961 acre-foot reservoir located 1.5 miles downstream of the Lake Jacksboro dam. The City of Jacksboro holds a water right for the combined use of both reservoirs for municipal water supply and the right to divert 1,440 acre-feet per year. The water right authorizes the reservoirs to be operated as a system, so the WAM was modified to include system operation. According to the WAM, the available supply from this system as of 2060 is 1,440 acre-feet per year.

West Fork including Bridgeport Local System (Tarrant Regional Water District). Tarrant Regional Water District’s West Fork Reservoir system is comprised of Lake Bridgeport, Lake Worth, and Eagle Mountain Lake. The WAM was modified to include the system operation of these three reservoirs. The resulting combined system yield was 108,500 acre-feet per year in 2010 and 101,000 acre-feet per year in 2060.

Under current conditions, this system provides somewhat less supply than shown. With existing facilities, it is not possible to divert water from Lake Worth when the lake is drawn down more than four feet, which makes some of the water stored in Lake Worth unavailable. In addition, the Tarrant Regional Water District operates its water supplies on a safe yield basis, which provides a smaller supply than the firm yield numbers shown. (In safe yield operation, the

user takes less than the firm yield in order to leave a reserve supply in the reservoir in case a drought worse than any historical drought occurs.)

Elm Fork/Lake Lewisville/Ray Roberts System (Dallas). This system, owned by Dallas, is comprised of Lake Lewisville, Lake Ray Roberts, and run-of-the-river rights from Elm Fork. The WAM was modified to include the system operation of these supplies. The resulting combined system yield was 191,729 acre-feet per year in 2010 and 181,609 acre-feet per year in 2060.

Lake Grapevine (Dallas). Dallas includes its portion of supply from Lake Grapevine in its system operation with Elm Fork/Lewisville/Ray Roberts. The WAM was modified to include this system operation. The resulting yield for Dallas' portion of Lake Grapevine was 7,250 acre-feet per year in 2010 and 5,000 acre-feet per year in 2060.

RESERVOIRS IN REGION C

All major reservoirs in Region C as well as some smaller reservoirs used for municipal supply are listed in Table I-2. The supply available is based on the calculation of the Water Availability Models (WAMs), which limits the supply to the lesser of the firm yield or the permit amount.

Cedar Creek. Cedar Creek Reservoir is located on Cedar Creek in the Trinity River Basin in Henderson and Kaufman Counties. The reservoir has conservation storage of 678,900 acre-feet. Tarrant Regional Water District holds a water right for diversion of 175,000 acre-feet per year. According to the WAM, the available supply from Cedar Creek as of 2060 is 175,000 acre-feet per year.

Richland-Chambers. Richland-Chambers Reservoir is located on Richland Creek in the Trinity River Basin in Freestone and Navarro Counties. The reservoir has conservation storage of 1,135,000 acre-feet. Tarrant Regional Water District and City of Corsicana hold water rights in the reservoir (210,000 acre-feet per year for TRWD and 13,650 acre-feet per year for Corsicana). According to the WAM, the available supply from Richland-Chambers as of 2060 is 217,650 acre-feet per year.

Moss. Moss Lake is located on Fish Creek in the Red River Basin in Cooke County. The reservoir has conservation storage of 23,210 acre-feet. The City of Gainesville holds a water

3.4 Water Availability by Wholesale Water Provider

There are 17 designated wholesale water providers in the East Texas Regional Water Planning Area. A wholesale water provider is a provider that has wholesale water contracts for 1,000 acre-feet per year or is expected to contract for 1,000 acre-feet per year or more over the planning period. Similar to the available supply to water user groups, the water availability for each wholesale water provider is limited by the ability to deliver the raw water. These limitations include firm yield of reservoirs, well field capacity, aquifer characteristics, water quality, water rights, permits, contracts, regulatory restrictions and infrastructure. A summary of supplies to each wholesale water provider is included in Chapter 4A, Appendix B. A brief description of the supply sources is presented below. As previously discussed, the analyses of the available supplies by source were determined using the assumptions outlined in Sections 3.2.1 and 3.2.2. The results of these analyses are for planning purposes and do not affect the right of a water holder to divert and use the full amount of water authorized by its permit.

Angelina & Neches River Authority (ANRA): ANRA has a state permit to construct Lake Columbia on Mud Creek in the Neches River Basin and divert 85,507 acre-feet per year. ANRA estimates that development of the lake could be complete by the year 2010. No currently available supply is shown since the reservoir is not constructed. The estimated firm yield using the modified Neches WAM Run 3 is 75,700 acre-feet per year.

Angelina – Neches Water Control Improvement District #1 (A-N WCID #1) The A-N WCID #1 owns and operates Lake Striker in Rusk and Cherokee Counties. Currently the only demand on A-N WCID#1 is for steam electric power in Cherokee County. The paper mill that formerly received water from this provider has closed.

Athens Municipal Water Authority. Athens MWA provides water to the city of Athens, which is located in both Region C and Region I, and the Texas Freshwater Fisheries Center at Lake Athens. Athens MWA has 8,500 acre-feet per year of water rights in Lake Athens. The firm yield of the lake using the modified Neches WAM Run 3 was estimated at 6,145 acre-feet per

year. However, the intake structure for the fish hatchery does not allow the water level to drop below 431 feet msl and maintain inflow to hatchery. Using this operational constraint, the yield of Lake Athens is 2,900 acre-feet per year. The Athens MWA also has a wastewater reuse permit for 2,677 acre-feet per year, but the infrastructure is not in place to utilize this source.

City of Beaumont: The City of Beaumont obtains water from the Neches River and groundwater wells from the Gulf Coast Aquifer in Hardin County. The supplies are based on firm yield of the city's run-of-the-river water rights and current well capacity.

The City provides treated water to most of the County-Other demands in Jefferson County, including Jefferson County Water Improvement District No. 1 and Northwest Forest MUD and the prison complexes. The City also serves several industrial customers, which is estimated at 0.5% of the total manufacturing demands in Jefferson County.

City of Carthage The city of Carthage provides wholesale water to County-Other customers in Panola County and manufacturing customers. The city currently obtains its water from groundwater from the Carrizo-Wilcox Aquifer and surface water from Panola County FWSD (Lake Murvaul). Considering its current water system capacities, the city of Carthage has sufficient supplies to meet its projected demands.

City of Center: The City of Center currently obtains water from Lake Center and Lake Pinkston for use within the City and for distribution to its municipal and industrial customers. The City owns and operates Lake Center, with a firm yield of 754 acre-feet of municipal water. Water from Lake Pinkston is pumped from the Neches River Basin to the City, located in the Sabine River Basin. The City holds rights to 3,800 acre-feet of water in Lake Pinkston. The current firm yield of the lake using the modified Neches WAM Run 3 is 2,045 acre-feet per year, which decreases to 1,960 acre-feet per year by 2060. The City's municipal customers include Sand Hills WSC and Shelbyville WSC. The primary customer for manufacturing water is Tyson Foods, Inc. The City of Center holds a water right from Lake Pinkston that is intended to be the entire yield of the lake. The WRAP computer model recognizes Lake Pinkston's priority date, as junior to Sam Rayburn's. As a result the model simulates releases of water from Lake Pinkston during the drought of record in an attempt to keep Rayburn full when calculating the yields of these reservoirs. Calculating the yield of Lake Pinkston in this fashion drastically decreases the