

Surface Water Hydrologic Variance Request Checklist

Texas Water Development Board (TWDB) rules¹ require that regional water planning groups (RWPG) use the most current Water Availability Models (WAM) from the Texas Commission on Environmental Quality (TCEQ) and assume full utilization of existing water rights and no return flows for surface water supply analysis. Additionally, evaluation of existing stored surface water available during Drought of Record conditions must be based on Firm Yield using anticipated sedimentation rates. However, the TWDB rules also allow, and **we encourage**, RWPGs to use more representative, water availability modeling assumptions; better site-specific information; or justified operational procedures other than Firm Yield with written approval (via a Hydrologic Variance) from the Executive Administrator in order to better represent and therefore prepare for expected drought conditions.

RWPGs must use this checklist, which is intended to save time and reduce effort, to request a Hydrologic Variance for estimating the availability of surface water sources. For Questions 4 – 10, please indicate whether the requested variance is for determining Existing Supply, Strategy Supply, or both. Please complete a separate checklist for each river basin in which variances are being requested.

Water Planning Region: N

1. Which major river basin does the request apply to? Please specify if the request only applies part of the basin or only to certain reservoirs.

Nueces Basin. Specifically, the water supply available to the City of Corpus Christi from the Choke Canyon Reservoir and Lake Corpus Christi.

2. Please give a brief, bulleted, description of the requested hydrologic variances including how the alternative availability assumptions vary from rule requirements, how the modifications will affect the associated annual availability volume(s) in the regional water plan, and why the variance is necessary or provides a better basis for planning. You must provide more-detailed descriptions in the subsequent checklist questions. Attach any available documentation supporting the request.

The Coastal Bend Regional Water Planning Group is requesting two variances:

- Use of the Corpus Christi Water Supply Model to evaluate water availability for the Corpus Christi Regional Supply System. All other run-of-river rights will be evaluated using the Nueces WAM Run #3 to estimate availability.
- Use of Safe Yield with 75,000 ac-ft reserve and City's reservoir operations policy to evaluate surface water supplies for the Corpus Christi Regional Supply System. All other rights will be evaluated using firm yield.

Background and supporting information related to this request is provided in Attachment 1 supplement.

¹ 31 Texas Administrative Code (TAC) §§ 357.10(14) and 357.32(c)

3. Was this request submitted in a previous planning cycle? If yes, please indicate which cycle and note how it is different, if at all, from the previous request?

Yes

The previous Region N Plans (2006, 2011, 2016, and 2021 Plans) have received hydrologic variances to use the Corpus Christi Water Supply Model (formerly NUBAY model) and use of safe yield to evaluate water availability for the Corpus Christi Regional Supply System.

4. Are you requesting to extend the period of record beyond the current applicable WAM hydrologic period? If yes, please describe the proposed methodology. Indicate whether you believe there is a new drought of record in the basin.

Yes

Existing Supply

A new drought of record for the Corpus Christi Regional Water Supply System from 2007 to 2013 was identified in the 2021 Plan. The single lowest inflow year to the Lake Corpus Christi/ Choke Canyon Reservoir system occurred in 2011. The minimum 2 year (twenty-four month) inflow to the LCC/CCR system during this most recent decade occurred from October 2010 to September 2012 at an inflow of 124,000 acft, which is 32% less than the minimum 2 year inflow to the Lake Corpus Christi/ Choke Canyon system in the Nueces Basin in the 1990's of 183,000 acft that occurred from August 1994 to July 1996 and was the driver of the previous drought of record.

The hydrology update used the same methodology that was used to develop the Nueces WAM hydrology.

5. Are you requesting to use a reservoir safe yield? If yes, please describe in detail how the safe yield would be calculated and defined, which reservoir(s) it would apply to, and why the modification is needed or preferable for drought planning purposes.

Yes

Existing Supply

Similar to the 2021 Plan cycle, the annual safe yield assumes 75,000 ac-ft remains in CCR/LCC system storage during the critical month of the drought of record. The Coastal Bend Regional Water Planning Group requests use of safe yield for supply planning, instead of the firm yield with zero remaining storage during historical drought of record conditions, due to historical trends showing increasing severity with each successive drought as described in Chapter 1.10. Background and supporting information related to this request is provided in Attachment 1 supplement.

6. Are you requesting to use a reservoir yield other than firm yield or safe yield? If yes, please describe, in a bulleted list, each modification requested including how the alternative yield was calculated, which reservoir(s) it applies to, and why the modification is needed or preferable for drought planning purposes. Examples of alternative reservoir yield analyses may include using an alternative reservoir level, conditional reliability, or other special reservoir operations.

No

Choose an item.

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7. Are you requesting to use a different model (such as a RiverWare or Excel-based models) than RUN 3 of the applicable TCEQ WAM? If yes, please describe the model being considered including how it incorporates water rights and prior appropriation and how it is more conservative than RUN 3 of the applicable TCEQ WAM.

Yes

Existing Supply

The Corpus Christi Water Supply Model (CCWSM) focuses on the operations of the CCR/LCC/Lake Texana/MRP Phase II System and is capable of simulating this system subject to the City of Corpus Christi's Phased Operations Plan and the 2001 Agreed Order governing freshwater inflow passage to the Nueces Estuary. It includes water rights and simulates availability through prior appropriation subject to hydrologic availability.

8. Are you requesting to use a modified TCEQ WAM? If yes, please describe in a bulleted list all modifications in detail including all specific changes to the WAM and whether the modified WAM is more conservative than the TCEQ WAM RUN 3. Examples of WAM modifications may include adding subordination agreements, contracts, updated water rights, modified spring flows, updated lake evaporation, updated sedimentation², system or reservoir operations, or special operational procedures into the WAM.

No

Choose an item.

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² Updating anticipated sedimentation rates does not require a hydrologic variance under 31 TAC § 357.10(14). The Technical Memorandum will require providing details regarding the sedimentation methodology utilized. Please consider providing that information with this request.

9. Are you requesting to include return flows in the modeling? If yes, are you doing so to model an indirect reuse water management strategy (WMS)? Please provide complete details regarding the proposed methodology for determining reuse WMS availability.

No

Existing Supply

10. Are any of the requested Hydrologic Variances also planned to be used by another region for the same basin? If yes, please indicate the other Region. Please indicate if unknown.

No

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11. Please describe any other variance requests not captured on this checklist or add any other information regarding the variance requests on this checklist.

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Attachment 1-

Hydrologic variance request to use the Corpus Christi Regional Water Supply Model for regional water supply availability instead of TCEQ Water Availability Model (WAM) Run # 3

At the Coastal Bend Meeting on May 18, 2023, the Coastal Bend (Region N) Regional Water Planning Group approved the submittal of a hydrologic variance request to the TWDB Executive Administrator to (1) use the Corpus Christi Water Supply Model to evaluate water availability for the Corpus Christi Regional Water Supply System and (2) use of safe yield with 75,000 acft reserve and the City's reservoir operating policies to calculate water availability from the Corpus Christi Regional Water Supply System for the 2026 Region N Water Plan.

Request for hydrologic variance for use of the Corpus Christi Water Supply Model to Evaluate Water Availability for the Corpus Christi Regional Water Supply System-

Background: The TWDB guidelines¹ state that planning groups must use the unmodified TCEQ Water Availability Model (WAM) Run # 3 for determining current and future water supplies *unless a hydrologic variance approval is granted by the TWDB Executive Administrator for variations in modeling requirements*. TCEQ's WAM Run # 3, includes all water rights at full authorizations and no return flows.

The TCEQ Nueces Basin WAM Run # 3 does not accurately simulate the City's system operation policy within permit allowances nor does it reflect all aspects of the TCEQ 2001 Agreed Order. Furthermore, the hydrology ends in 1996 and doesn't cover the recent drought of record. WAM Run #3 is not reasonable for drought planning purposes or to reflect conditions expected in near term, actual drought conditions.

The previous Region N Plans (2006, 2011, 2016, and 2021 Plans) have received hydrologic variances to use the Corpus Christi Water Supply Model (formerly NUBAY model) to evaluate water availability for the Corpus Christi Regional Supply System. Since the original model developed in 1990, the Texas Water Development Board, U.S. Army Corp of Engineers, and City of Corpus Christi have made significant investments in the Corpus Christi Water Supply Model to simulate water availability for the regional water supply system, which spans multiple river basins.

All other run-of-river rights will be evaluated using the Nueces WAM Run #3 to estimate yields.

Supporting Information for Use of the Corpus Christi Water Supply Model to Evaluate Water Availability for the Corpus Christi Regional Water Supply System:

All previous Region N Plans have used the Corpus Christi Water Supply Model (formerly NUBAY model) to determine water availability for the City's Regional Water Supply System.

The Corpus Christi Regional Water Supply Model includes:

- Hydrology through 2015 for total model period of 82 years (1934 to 2015), to include the most recent drought of record
- New TWDB volumetric survey data for Lake Corpus Christi and Choke Canyon Reservoir with updated sedimentation rates

¹ First Amended General Guidelines for Development of the 2026 Regional Water Plans, October 2022.

- Integrated recent hydrology for Lake Texana and Colorado River (for Mary Rhodes Phase II supplies)
- Includes all provisions of the TCEQ 2001 Agreed Order
- Simulates current contracted supplies from Lake Texana, which includes the LNRA exercised call-back for local water users in Jackson County pursuant to City of Corpus Christi contract terms
- Operational flexibility to exercise water supply calls on the Garwood water right on the Colorado River at a variable rate according to diversion rate and priority date of the rights and based on MRP Phase II system capacities.
- Other updates

Request for hydrologic variance for use of Safe Yield of 75,000 acft reserve and City’s Reservoir Operations Policy to Evaluate Surface Water Supplies for the Corpus Christi Regional Supply System-

Background: The TWDB guidelines² state that planning groups must use firm yield *unless a hydrologic variance approval is granted by the TWDB Executive Administrator for variations in modeling requirements.*

Firm yield is defined as the maximum water volume a reservoir can provide each year under a repeat of a drought of record, using anticipated sedimentation rates and assuming all senior rights are utilized and no return flows are included such that the reservoir storage draws down to zero or some other defined dead pool storage with no shortages.

Safe yield is a provision for climate and growth uncertainty and has been used in previous Region N plans and City of Corpus Christi water planning. Safe yield is defined as the maximum amount of supply that can be diverted from a reservoir system such that a *specified reserve amount remains* in storage during the modeled critical drought. A description of the City’s existing reservoir operating policy and safe yield assumptions from the 2021 Region N Plan is included in Section 3.1:

https://www.twdb.texas.gov/waterplanning/rwp/plans/2021/N/RegionN_2021RWP.pdf?d=3050.7000000029802

The previous Region N Plans (2006, 2011, and 2016) have received hydrologic variances to use safe yield and the City’s reservoir system operations policy for water supply planning for the Corpus Christi Regional Water Supply System.

Supporting Information for Use of Safe Yield and City’s Reservoir Operations Policy: The City’s regional water supply system includes water supplies from the Nueces, Lavaca/Navidad, and Colorado basins. The City operates the reservoirs as a system and receives roughly half of its water supplies to meet current water demands from the Choke Canyon Reservoir/Lake Corpus Christi system and the other half from the east (i.e. Mary Rhodes Pipeline supplies originating from Lake Texana and Colorado River). The City operates their reservoirs and run-of-the-river rights on the Colorado River within the four corners of their permits and in conjunction with their contract with Lavaca Navidad River Authority (LNRA) for Lake Texana supplies, with the aggregated system yield being greater than individual reservoir yields when supplies are considered separately.

² First Amended General Guidelines for Fifth Cycle of Regional Water Plan Development, April 2017.

A significant amount of water supplied to the region is provided by Lake Texana in Region P and the Colorado River (Mary Rhodes Phase II) in Region K which helps mitigate drought impacts in the Nueces Basin. For example, on September 27, 2013, while the combined storage in Choke Canyon Reservoir and Lake Corpus Christi was at 33% of capacity, storage in Lake Texana was at 81.9% of capacity. Often, drought occurs at different times and at different levels of severity in the Nueces, Lavaca-Navidad, and Colorado River basins. This frequent situation gives the City flexibility in operating the CCR/LCC/Texana/MRP Phase II system to optimize water supplies³. The DOR for the Lavaca-Navidad and Colorado River basins are December 1952 to April 1957 and October 2007 to April 2015, respectively.⁴

The City's regional water supply system is prone to severe drought. Average annual inflows to Lake Corpus Christi and Choke Canyon System is lower with each successive drought. With the Corpus Christi Water Supply Model update in the 2021 Region N Plan cycle to include recent hydrology through 2015, a new drought of record was confirmed. In terms of severity and duration, the drought from 2007-2013 is considered to be a new DOR for the Region N planning area. Although the LCC/CCR system has not yet returned to full capacity, rainfall events in October 2013 and June 2015 ameliorated the severity of drought during this time and replenished stored water levels. The combined CCR/LCC system has not been full since September 2007 and system storage as of February 2020 is approximately 52%, hence, it is important to understand that estimates of firm or safe yield reported herein represent maximums.

The 2021 Region N Plan indicated that the critical drawdown was 73 months from October 2007 to October 2013 during which time the reservoirs went from full to a minimum storage of 32.6% before inflows restored lake storage. From 2010-2012, inflows into LCC and CCR were 32% less (or 59,000 ac-ft less) than the inflows from 1994-1996 into LCC and CCR. For additional comparison, the 2010-2012 inflows were almost 50% less (or 98,200 ac-ft less) than the inflow into LCC and CCR from 1954-1956. Annual inflow to the CCR/LCC System for the model period from 1934 to 2015 is shown in Figure 1. The 3-year moving average shows the severity and duration of the recent drought relative to other droughts since the 1930s, and includes the recovery in 2013 and 2015.

In the previous 2021 Region N Plan, the Corpus Christi Water Supply Model was used to estimate firm yield of the system for 2020 and 2070 sediment conditions, which is the maximum amount of water volume that can be provided under a repeat of drought of record (DOR) conditions assuming that all senior water rights will be totally utilized and all permit conditions met. In this case, this is the yield that would be available such that reservoir active storage would be equal to zero during the worst month of the drought of record. Figure 2 shows a storage trace for the LCC/CCR system under a hypothetical 2020 firm yield demand of 194,000 ac-ft/yr. The critical month of the DOR is September 2013.

Figure 3 shows the CCR/LCC system trace based safe yield to maintain a reserve in storage during the worst, historical drought of record that occurred from 2007 to (at least) 2013. The storage trace for the LCC/CCR system is similar to Figure 2 except that a 75,000 ac-ft reserve is maintained during the critical month of the DOR (September 2013) resulting in a 2020 safe yield of 178,000 ac-ft/yr. The safe yield maintains the 75,000 ac-ft reserve through the planning period (2020-2070) and declines to 167,000 ac-ft/yr by 2070 due to sedimentation.

³ Subject to permitted or contracted supply amounts.

⁴ <https://www.lcra.org/download/2020-water-management-plan/?wpdmdl=11923> p. 3-2

Safe yield supply from the City's Regional Water Supply System is requested to serve as the basis of the needs analysis for entities relying on surface water supplies from the City and the City's wholesale customers (San Patricio Municipal Water District and South Texas Water Authority).

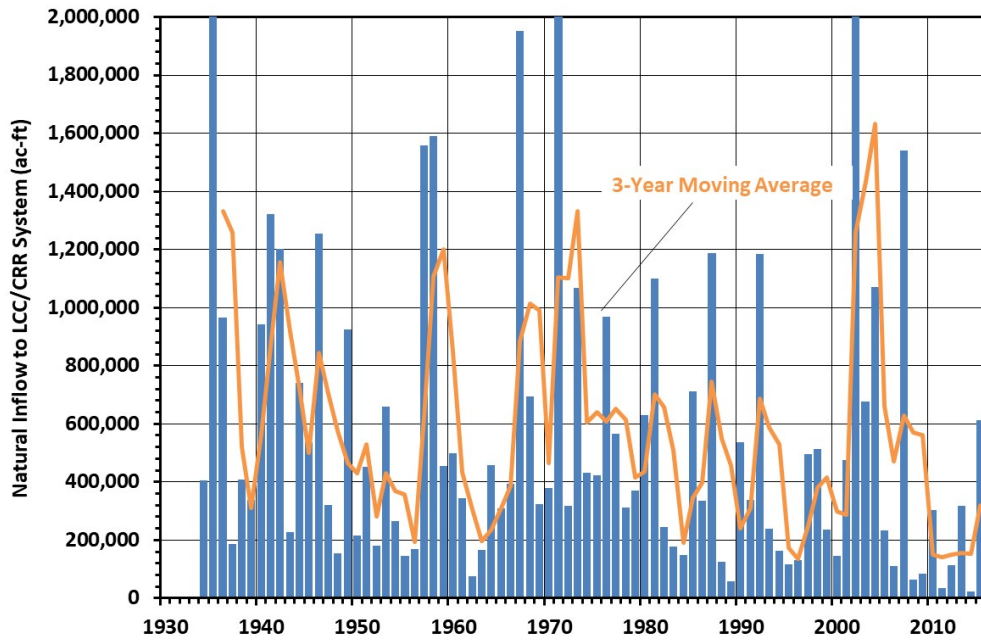


Figure 1
Annual Natural Inflow to the CCR/LCC System

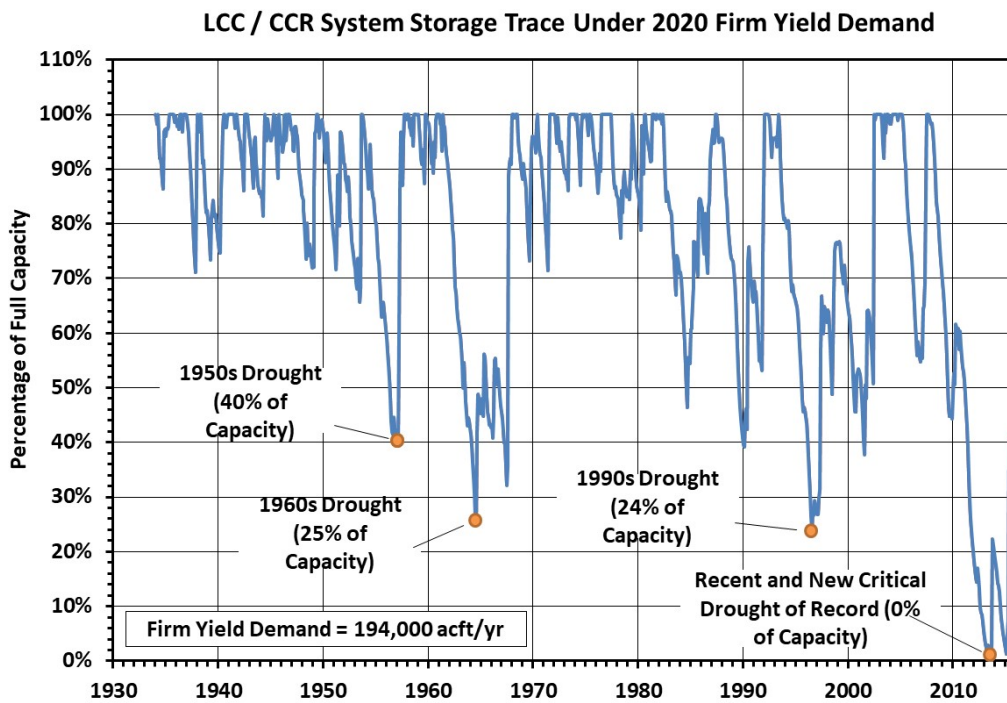


Figure 2
CCR/LCC System Storage Trace- 2020 Firm Yield of 194,000 ac-ft/yr

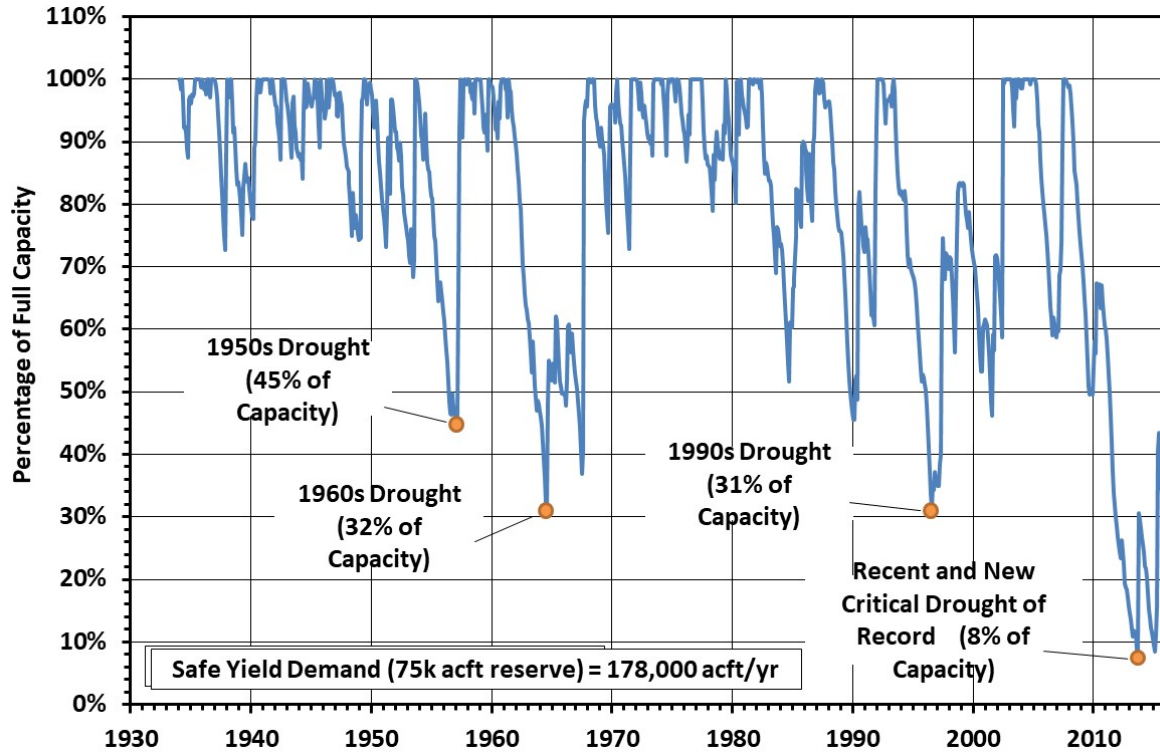


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CCR/LCC System Storage Trace- 2020 Safe Yield of 178,000 ac-ft/yr