Freese and Nichols

MEMORANDUM

TO: Bruce Turner

FROM: Jon S. Albright

SUBJECT: Scenario 3c of Joint BRA-TXU Modeling

DATE: September 28, 2008

1. This memorandum describes modeling performed as part of the joint TXU/BRA study of water availability for the proposed new units at Comanche Peak. Scenario 3c was one of the last performed during that study. The original modeling assumes a demand of 109,000 acre-feet per year diverted from Lake Granbury for the new units, with a blowdown of 49,800 acre-feet per year (a net consumptive demand of 59,200 acre-feet per year). The scenarios described in this memorandum use the demands in the Brazos G Water Plan amendment of 103,717 acre-feet per year with a blowdown of 42,100 acre-feet per year (a net consumptive demand of 61,617 acre-feet per year). The blowdown from the new units re-enters the basin at Lake Granbury. Part of the new demand is met from new contract between BRA and TXU for 76,270 acre-feet of water. The remaining water for the new units comes from the existing contract/options of 27,447 acre-feet per year currently not assigned to any particular location by TXU. All runs in this scenario are under 2060 conditions. According to the regional water plans, by 2060 existing water rights and the System Operation Permit will be fully utilized in the Brazos River Basin.
2. Scenario 3c has several sub-scenarios that examine the following:
   - *Consideration of additional demands from Possum Kingdom Lake for the City of Abilene.* In the process of negotiation with the City of Abilene, the city was given the option for 20,000 acre-feet per year from Possum Kingdom Lake. It is possible that Abilene will have exercised this option by 2060. This option was not considered in the 2006 regional water plans.
   - *Analysis of the impacts of assumptions about ownership of water returned to the system.* The initial analyses in the joint BRA/TXU study assumed that BRA could retain ownership of spills from Squaw Creek Reservoir and blowdown from the new units. Because of the uncertainty involved with this assumption, two new variations were examined in Scenario 3c:
     - Analyses of the impact of assuming that blowdown from the new units is distributed in priority order instead of being retained by BRA
     - Analyses of the impact of assuming that both blowdown from the new units and spills from Squaw Creek Reservoir are distributed in priority order

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instead of being retained by BRA.

Table 1 is a summary of the sub-scenarios and the assumptions used in the sub-scenarios.

3. Scenarios 3cAbil, 3cAbilRF1, and 3cAbilRF2examine the impact of reserving 20,000 acre-feet of supply from Possum Kingdom Lake for use by the City of Abilene, using different assumptions about distribution of blowdown from the new units and Squaw Creek spills.
4. Previous modeling of the TXU purchase assumed that BRA could keep possession of the blowdown from the new units. In other words, blowdown from the units would be still be BRA water, which could be used other BRA contracts and water rights downstream without regard to claims by other water rights or instream flows. It is possible that blowdown from the new units could be classified in a similar fashion to municipal return flows. In the System Operation Permit Application, municipal return flows are distributed in priority order. Two scenarios (3cRF1 and 3cRF1Abil) were added to determine the impact on yield if the blowdown is distributed in priority order instead of preferentially used for BRA water rights and contracts.
5. Under current TXU operations, most of the BRA contract water transferred from Lake Granbury to Squaw Creek Reservoir simply spills from the reservoir. TXU does this to maintain acceptable water quality in the lake. This water is not first "used" in any conventional sense, and is therefore not what is typically referred to as a "return flow". Therefore, under the System Operation Permit Application it is possible that these flows could be considered a bed-and-banks transfer of water from Lake Granbury to users or for storage downstream. The original modeling used this assumption. However, it is possible that BRA could lose possession of these flows and the water would then be distributed in priority order. Two scenarios (3cRF2 and 3cRF2Abil) were added to determine the impact of this assumption. (Because spills from natural inflow into Squaw Creek do not originate as BRA contract water, they are distributed in priority order to downstream water rights in every scenario.)
6. Table 2 is a summary of the run results. Looking at these results, we can make the following observations:

    - Reserving 20,000 acre-feet of supply for Abilene has more impact than 20,000 acre-feet on supplies in the lower basin. System Operation yield in the lower basin relies on having some water available in Possum Kingdom at the end of the critical drought period. As demand increases in the upper basin, more water has to be reserved to meet these demands, leaving less water to back up supplies in the lower basin at the end of the critical drought period. The amount of this impact varies depending on return flow scenario.

Table 1
Description of Third Round Modeling Scenarios

Scenario	Diversion Location for New Units	Return Flow Location	Return Flow Distribution	Distribution of Squaw Creek Spills	Squaw Creek Contract (48,300 acre-feet per year)	Unassigned Contract/Option Water (27,447 acre-feet per year)	New Contract Water	20,000 acre-feet per year Abilene Contract from PK
3c Lake	Granbury	**Lake Granbury**	**Retained by BRA for downstream water rights & contracts**	**Retained by BRA for downstream water rights & contracts**	Full amount transferred to Squaw Creek each year, unconsumed water spilled from reservoir	Full amount used to meet demands at new units.	Full amount used to meet demands at new units.	**No**
3cAbil	Same as above	**Same as above**	**Same as above**	**Same as above**	Same as above	Same as above	Same as above	**Yes**
3cRF1	Same as above	**Same as above**	**Distributed in priority order**	**Retained by BRA for downstream water rights & contracts**	Same as above	Same as above	Same as above	**No**
3cRF1Abil	Same as above	**Same as above**	**Same as above**	**Same as above**	Same as above	Same as above	Same as above	**Yes**
3cRF2	Same as above	**Same as above**	**Same as above**	**Distributed in priority order**	Same as above	Same as above	Same as above	**No**
3cRF2Abil	Same as above	**Same as above**	**Same as above**	**Same as above**	Same as above	Same as above	Same as above	**Yes**

- Retaining ownership of blowdown and Squaw Creek spills has a substantial impact on supplies. In the RF1 and RF2 scenarios the blowdown and spills are claimed not only by non-BRA water rights, but also by instream flow requirements. The most significant of instream flow requirements are associated with Allens Creek Reservoir and the System Operation Permit.

7. Knowing the impact of reserving 20,000 acre-feet for the City of Abilene is important for BRA for their planning purposes. This demand was not considered in the 2006 regional water plans.

Table 2
Summary of Third Round Run Results
(Values in Acre-Feet per Year)

Scenario	Description	Demand for New CP Units	Return Flow	New BRA-TXU Contract	New Brazoria/ Fort Bend Supplies	New Brazoria/ Fort Bend Shortage
3c	New units direct from Lk Granbury, return to Lk Granbury	103,717	42,100	76,200	231,471	13,084
3cAbil	Same as 3c with 20,000 AF option for Abilene	103,717	42,100	76,200	208,971	35,584
3cRF1	Same as 3c with new unit return flow distributed in priority order	103,717	42,100	76,200	217,471	27,084
3cAbilRF1	Same as 3cRF1 w 20,000 AF option for Abilene	103,717	42,100	76,200	193,471	51,084
3cRF2	Same as 3c with new unit return flow & Squaw Creek spills distributed in priority order	103,717	42,100	76,200	206,471	38,084
3cAbilRF2	Same as 3cRF2 w 20,000 AF option for Abilene	103,717	42,100	76,200	176,471	68,084