

**Supplement to Technical Report on a Claim of  
Water Right Impairment, dated, July 2016**

Water Right File No. 7,571

Quantification of the Impairment  
of Water Right File No. 7,571 for 2008-2020

Kansas Department of Agriculture  
Division of Water Resources  
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**Introduction.**

This is a Supplement (“Supplement”) to the Technical Report on a Claim of Water Right Impairment, dated July, 2016 (“Technical Report”), which was part of the Final Report of the Chief Engineering Concerning a Claim of Water Right Impairment, dated July, 2016, regarding Water Right File No. 7,571 (“Final Report”), owned and operated by the U.S. Fish and Wildlife Service (the “Service”), and concerning the Quivira National Wildlife Refuge (“Refuge”). This Supplement is prepared in accordance with the Kansas Water Appropriation Act, K.S.A. § 82a-701 *et seq.*, and the regulations on impairment investigations found in K.A.R. § 5-4-1 *et seq.* This Supplement is data-driven, based on newly available data to the Chief Engineer, and does not reexamine nor reach a different conclusion that upstream, junior groundwater pumping regularly and significantly impairs the Service’s ability to use its Water Right File No. 7,571. The Chief Engineer reserves all rights duly authorized and granted by Kansas law.

**Discussion of Supplemental Data.**

The Kansas Department of Agriculture-Division of Water Resources (“KDA-DWR”) has extended the impairment analysis that was presented in the Technical Report to include data from the years 2008-2020, which was not previously available or included in the Technical Report. The data in the Technical Report ended in 2007. Using the methodology from the Technical Report and the newly available data, it is demonstrated that Water Right File No. 7,571 was impaired in 9 of the 13 years ending with 2020. The impairments ranged from a high of 8711 acre-feet in 2012 to a low of 2250 acre-feet in 2020. The average annual impairment over 2008-2020 was 4039 acre-feet (6 cfs). The average annual impairment 2011-2018 was 6282 acre-feet (9.0 cfs).

In February 2023, Balleau Groundwater, Inc, under the direction of Big Bend Groundwater Management District #5 (“GMD5”) delivered to the KDA-DWR an update to the 2010 GMD5 Model. The original 2010 version of the model analyzed in the Technical Report simulated the period 1940-2007 and was built with available historical records including reported pumping, gaged streamflow, and reported precipitation. The 2023 update to the model extends the records to cover 2008-2020.

The Final Report includes a Technical Report that describes the methodology for identifying and quantifying the impairment of Water Right File No. 7571 based on the 2010 GMD5 Model. This Supplement extends that impairment analysis by adding the 2008-2020 modeled results.

The impairment analysis is based on the stream flow at the Zenith gage on Rattlesnake Creek (United States Geological Survey (USGS) Gage No. 07142575), which has been recorded since 1973. The GMD5 model is used here to simulate what the stream flow would have been in the absence of pumping by water rights junior to Water Right File No. 7571.

To evaluate the effects that junior pumpers upstream of the Refuge have had on the flows of Rattlesnake Creek at the Refuge, two simulations of the model were compared. In one simulation, pumping junior to the Refuge's water right was "turned off," or omitted from the simulation, and the amount and timing of groundwater that discharged from the aquifer to the stream was observed. This simulation is called "no junior pumping." The other simulation, called the "baseline," simulates the effects on streamflow caused by the actual recorded historical pumping. The "baseline" results were subtracted from the "no junior pumping" results and the effects of junior pumping on Rattlesnake Creek simulated streamflow over time were observed.

This Supplement shows the timing and amount of impairment for the original and updated modeled periods 1940-2020. When comparing the supplemental impairment analysis with the 2016 analysis for the years 1973-2007, some differences in the amount of historical impairment are evident. When the Technical Report was being developed, the analysis was limited to the Rattlesnake Creek surface water basin. Shortly after the Technical Report was published and work began to identify solutions, it became clear that pumping outside of the basin should be considered since groundwater is not constrained by surface water drainages. In the case where the sum of modeled impacts to streamflow and gaged streamflow is less than the Refuge's need, the impairment equals the modeled impact. Including the impacts caused by pumping outside the basin in the analysis increased the historical level of impairment in those cases.

In acknowledgement of the fact that there are times when the Refuge chose not to divert available water because of an operational decision (e.g., construction, maintenance), this supplemental analysis adds a new case wherein the Refuge's water right was not impaired if the gaged flow was greater than 80% of the mean flow for that Refuge management period, and the Refuge diverted less than 80% of the available gaged flow.

And finally, in acknowledgement of the evaporation element of Water Right File No. 7571, this supplemental analysis considers the evaporation of water from Little Salt Marsh ("LSM") as water used. In the absence of reliable records of the surface area of LSM over time, this analysis holds the surface area at 864 acres which was stated on the water right certificate. Evaporation at LSM is 31 inches per year as prescribed by K.A.R. 5-6-3. For the analysis, the evaporation quantity is distributed over refuge operational periods in the monthly proportions described in NOAA Technical Report NWS 34. Consideration of evaporative use has the general effect of lessening the magnitude of the historical impairment.

Impairment of Water Right File No. 7,571 by Year  
Evaporation from LSM considered as water used

