Forecast of Allowable Depletions in the Republican Basin During 2014 and 2024

Nebraska Department of Natural Resources
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Background

Pursuant to *Neb. Rev. Stat.* § 46-715(6), the Nebraska Department of Natural Resources (Department) in consultation with the Lower Republican Natural Resources District, Middle Republican Natural Resources District, and Upper Republican Natural Resources District (Districts), is required to provide an annual short-term and long-term forecast of maximum allowable depletions to streamflow that will ensure compliance with interstate compacts. The Department has determined that the short-term forecast should apply to the upcoming year (2014), and that the long-term forecast should be for a decade later. Therefore, this document includes the dry-year forecast of allowable depletions to streamflow in 2014 and 2024.

Short-Term Forecast

The outcome of the Department's short-term forecast is largely dependent on three key elements. The first key element is the identification of the averaging period that will be utilized for assessing compliance for the upcoming year. The averaging period is determined based on irrigation water supplies contained in Harlan County Lake (HCL). The Bureau of Reclamation (Reclamation) is responsible for projecting these water supplies and determining if a Water-Short Year (two-year averaging[1]) designation is warranted. The current projection by Reclamation is that 2014 will be a Water-Short Year and thus, the two-year averaging compliance standard above Guide Rock will be in effect.

The second key element in the short-term forecast is an evaluation of the recent Republican River Compact (Compact) balances for the State of Nebraska as determined using the current Republican River Compact Administration (RRCA) accounting procedures. These procedures allow for the determination of Nebraska's Compact balance for years through the current year (2013).

The third key element is the forecast of available water supplies and consumption within Nebraska for the upcoming year. To carry out this forecast the Department has determined a simplified method of estimating the streamflow-related available water supply of the Republican River Basin for Nebraska's use. The water supply is related to eight variables:

- Surface water consumptive use in Colorado,
- Surface water consumptive use in Kansas,
- Surface water consumptive use in Nebraska,

[1] Nebraska did submit an Alternative Water-Short Year Administration Plan to the RRCA for approval in 2012. This plan would have provided for three-year averaging in 2013 and 2014 but this plan was rejected by the State of Kansas.

- Groundwater consumptive use in Colorado,
- Groundwater consumptive use in Kansas,
- Groundwater consumptive use in Nebraska,
- Nebraska's Imported Water Supply Credit, and
- Surface water flow at the Kansas – Nebraska state line.

These eight variables may be estimated for the next year:

- Surface water consumption in Colorado has reduced to a low near-constant number in recent years, and may be estimated using a two-year average,
- Surface water consumption in Kansas is related to evaporation from lakes in Kansas and the water available for irrigation in Harlan County Lake at the end of each year,
- Surface water consumption in Nebraska is related to water available for irrigation in the five Bureau of Reclamation project reservoirs in Nebraska at the start of each year,
- Groundwater consumption and the Imported Water Supply Credit show little variation from year to year and may be estimated in all three states using a two-year average, and
- Streamflow, assuming that the upcoming year is a dry year, may be estimated from the volume of water in Harlan County Lake and the most recent five years of streamflow.

Historically, Nebraska's share of the available water supply has been approximately half of the total water supply calculated using these methods. The information used to estimate the 2013 Compact balance as well as forecast the available water supply and allowable depletions for 2014 is summarized in Table 1.

Table 1. Information Used for 2013 Provisional Accounting and 2014 Forecast of Allowable Depletions.

Year	Item	Information Source
2013 Provisional	Pumping	Power records estimates and NRD data
	Surface Water Use	Estimated from preliminary data and previous years values
	Streamflow	Provisional records through December 27, 2013, end of year estimated
	Evaporation	T-1 and 2013 records
2014 Forecast	Groundwater Consumptive Use and Imported Water Supply Credit	Average of 2012 and 2013
	Surface Water Consumptive Use	Colorado: Previous two-year average
		Kansas: + (0.1858 x HCL content) + 9,575
		Nebraska: - (0.0000004) x (NE lake volume)^2 + (0.5151) x (NE lake volume) – 41,518
	Streamflow	+ (5-year average of state line flows) x 0.41 + 0.23 x HCL content - 27,450

Utilizing the data sources outlined in Table 1 the required components of the forecast can be calculated (Table 2).

Table 2. 2014 Forecast Values for Basin Upstream of Hardy.

Forecast Component	Forecast Value
Colorado GWCBCU[1]	20,300
Kansas GWCBCU	8,690
Nebraska GWCBCU	182,190
Nebraska Imported Water Supply Credit	13,940
Colorado SWCBCU[2]	160
Kansas SWCBCU	32,800
Nebraska SWCBCU	42,750
Stateline Streamflows	96,760

[1]GWCBCU – groundwater computed beneficial consumptive use
[2]SWCBCU – surface water computed beneficial consumptive use

Combining the results from the current RRCA accounting procedures and forecast procedures contained in the Monitoring and Studies Section of the Districts' Integrated Management Plans, an early estimate of Nebraska's 2013 and 2014 Compact balances can be obtained (Table 3).

Table 3. Estimated Allocations (available water supply), Computed Beneficial Consumptive Use (groundwater and surface water consumption), and Imported Water Supply Credit for 2013 and 2014 (the projected compliance period for next year).

Year	Allocation	Computed Beneficial Consumptive Use	Imported Water Supply Credit	Allocation - (CBCU - IWS Credit)
2013 Provisional	216,660	239,900	13,100	-10,140
2014 Forecast	178,490	224,940	13,940	-32,510
Two-Year Average				-21,325
Two-Year Total				-42,650

Note: 2013 values are based on current RRCA accounting procedures at the Guide Rock location. Forecast values are computed at the Guide Rock location. 2013 values are not finalized by the RRCA.

The resulting two-year average is approximately -21,325 acre-feet (two-year sum is -42,650 acre-feet). Thus, given that the projected balance is negative, a Compact Call Year will be in effect in 2014.

A Compact Call Year designation requires that each District within the basin that has a projected negative two-year balance submit a plan to the Department by January 31, 2014, describing the actions they will take to ensure that its groundwater consumption is less than the District's

allowable groundwater depletions. If the Department determines that a District's plan is insufficient, then that District will be required to curtail all groundwater uses in the Rapid Response Area. A summary of the District's provisional 2013 balance, forecast 2014 balance, and summed balances for the compliance period is provided in Table 4 below.

Table 4. Summary of Balances for each District within the Basin.

Year	LRNRD	MRNRD	URNRD
2013 Provisional	-4,980	-6,880	1,720
2014 Forecast	-12,390	-4,250	-15,870
Two-Year Total	-17370	-11,130	-14,150

Note: 2013 values are based on current RRCA accounting procedures at the Guide Rock location. Forecast values are computed at the Guide Rock location. 2013 values are not finalized by the RRCA. The provisional 2013 balances for each District reflect the management actions taken in 2013. The forecast 2014 balances for MRNRD and LRNRD reflect the terms of the memorandum of agreement (MOA) signed in 2013 (crediting/debiting of 1,870 acre-feet). The forecast 2014 balance for MRNRD also reflects the permanent retirement of Riverside Canal.

In addition to the actions that will be taken by the Districts, the Department will issue an order designating next year as a Compact Call Year and carry out the necessary administration of natural flow and storage surface water appropriations within the basin.

Long-Term Forecast

Due to the absence of a long-term trend in water supply, the lowest water supply in the future is likely to be similar to the lowest available supply in the past. So, the allowable depletion during 2024, assuming several dry years, is estimated to be approximately 200,000 acre-feet.

Summary

Utilizing the best available information, the current RRCA accounting procedures, and the forecast procedures developed by the Department, it is currently predicted that if next year is dry and the two-year averaging period (2013-2014) is in effect that additional management actions will be necessary to ensure compliance. The implementation of these management actions will be carried out in a manner consistent with the procedures set forth in the Monitoring and Studies Section of the Districts' Integrated Management Plans.