

11. Reshanau Lake

Reshanau Lake is a 342-acre lake located in the City of Lino Lakes and is within the Middle Rice Creek Planning Region. Flow enters the lake through County Ditch No. 25 on the east. Discharge is through a 42-inch RC pipe at elevation 878.75 (NGVD 29) leading to Rice Lake. The ordinary high water level, as recorded by the Minnesota DNR, is 883.5 (NGVD 29). Only six years of historic lake levels were available for the 1981 FIS study, so a statistical analysis was not possible. The 1981 FIS assumed that the flood levels on Reshanau Lake are the result of reverse flows from Rice Lake, and therefore the flood levels in Reshanau Lake were assumed identical to those in Rice Lake. Since the 1981 FIS, the DNR has been collecting lake level data on Reshanau Lake. This data is plotted along with the Rice Lake data on **Figure 11a1**. West Shadow Lake Drive, which is the roadway separating the two lakes, overtops at elevation 883.79 (NGVD 29). The lake level data above this elevation are nearly equal for both lakes.

The DNR Lake Finder website provided lake level data for a consistent period of record from 1990-2018 (see **Figure 11a2**). Due to only one data point collected in 1980 and 1986, these years were not included in the study. The maximum annual values were determined, and along with the 6 high water values listed in the 1981 FIS, were plotted on probability paper, and a polynomial line was fit to determine the elevations for the various recurrence intervals (see **Figure 11b**). This method is considered valid for Reshanau Lake levels below the overtopping of the West Shadow Lake Drive at elevation 883.79 (NGVD 29). However, detailed hydrologic and hydraulic modeling,¹ as well as the observed lake level data shown on **Figure 11a1**, indicate that flood elevations in Reshanau Lake are due to backwater effects from Rice Lake and that the lake levels equalize when lakes levels are above the road overtopping elevation. The frequency analysis for Reshanau Lake does not adequately reflect this due to the relatively small number of historic maximum annual lake levels available. Therefore, the 10-, 50-, and 100-year flood elevations are adopted from the Rice Lake level frequency analysis which has a period of record of 42 years (see Section 12 of this report).

Both the maximum annual series used in the 1981 FIS analysis and the combined data are shown in **Table 11a**. The differences are the result of both a different maximum annual series (length of data set) and the fact that in the 1981 study, a straight line was fitted through the points, as opposed to the graphically fitted line in this study.

¹ "Rice Creek HEC-RAS Model Report," 2010, performed under District-wide Modeling.

Table 11a: Estimated Flood Elevations for Reshanau Lake

Return Period	Lake Level Data Source		
	1981 FIS (assumed same as Rice Lake)	1981 FIS and DNR (used in this study) (n = 35)	
	(NGVD 29)	(NGVD 29)	(NAVD 88)**
2	--	882.4	882.6
5	--	883.1	883.3
10	884.4	884.2*	884.4*
50	885.6	886.0*	886.1*
100	886.0	886.8*	887.0*
500	886.9	--	--

*adopted from Rice Lake Frequency Analysis (see narrative above)

**0.15 feet is added to NGVD 29 datum to convert to NAVD 88 datum

An additional component of this study consists of creating a non-exceedance frequency graph based on all daily measurements available (see **Figure 11c**). For Reshanau Lake, the period of record consists of the data found on the MnDNR Lake Finder website, which consists of 705 days of measurements, from 1980 to 2018 (see **Figure 11a**). The results are presented in **Table 11b**.

Table 11b: Daily Non-Exceedance Frequency of Lake Levels for Reshanau Lake

Non-Exceedance Frequency	Lake Level	
	(NGVD 1929)	(NAVD 1988)
2.5%	880.3	880.5
10%	880.6	880.8
25%	880.9	881.1
50%	881.5	881.6
75%	882.2	882.3
90%	882.6	882.8
99.5%	884.0	884.1

Reshanau Lake and Rice Lake Levels (DNR LakeFinder NGVD 29)

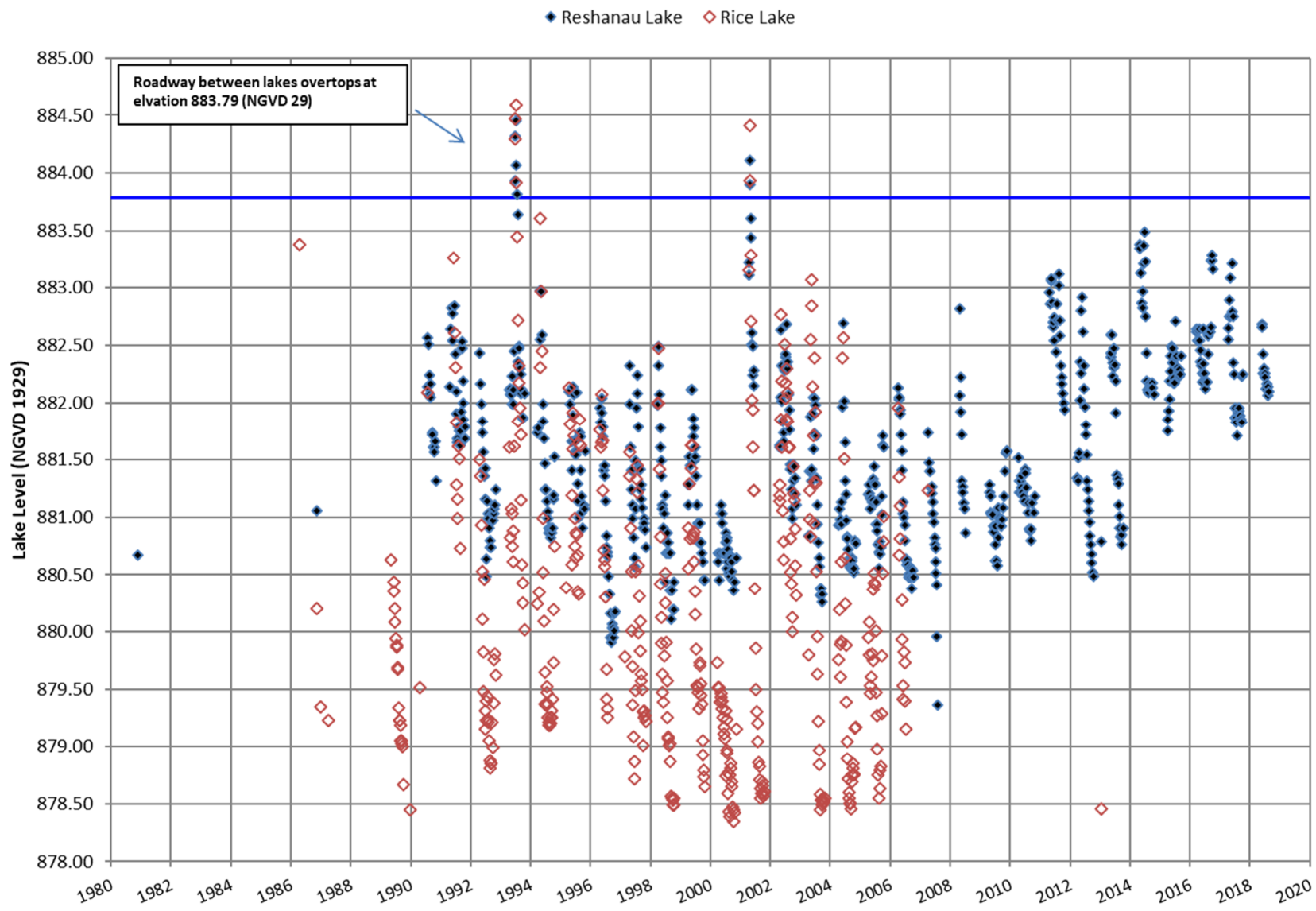


Figure 11a1

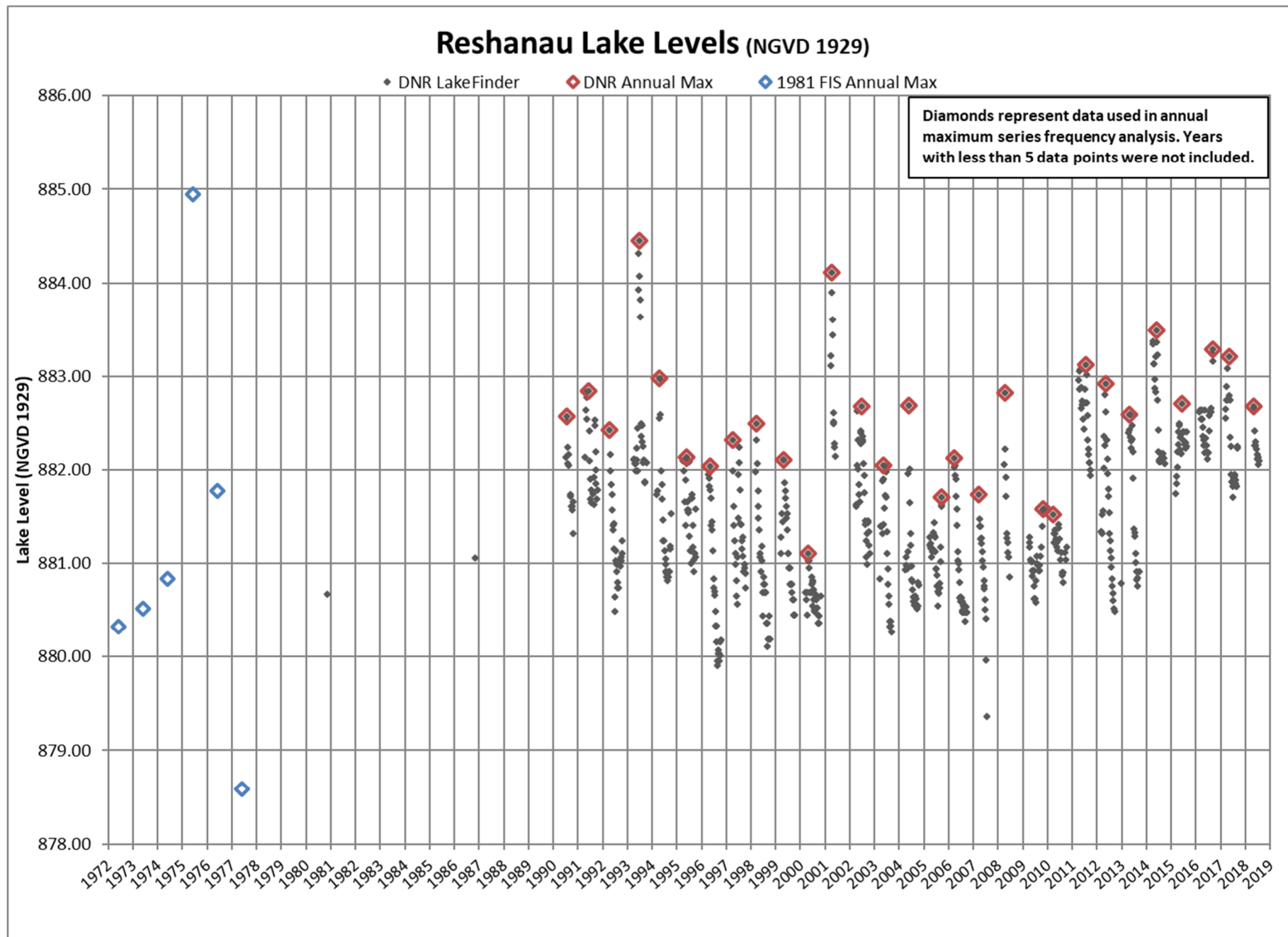
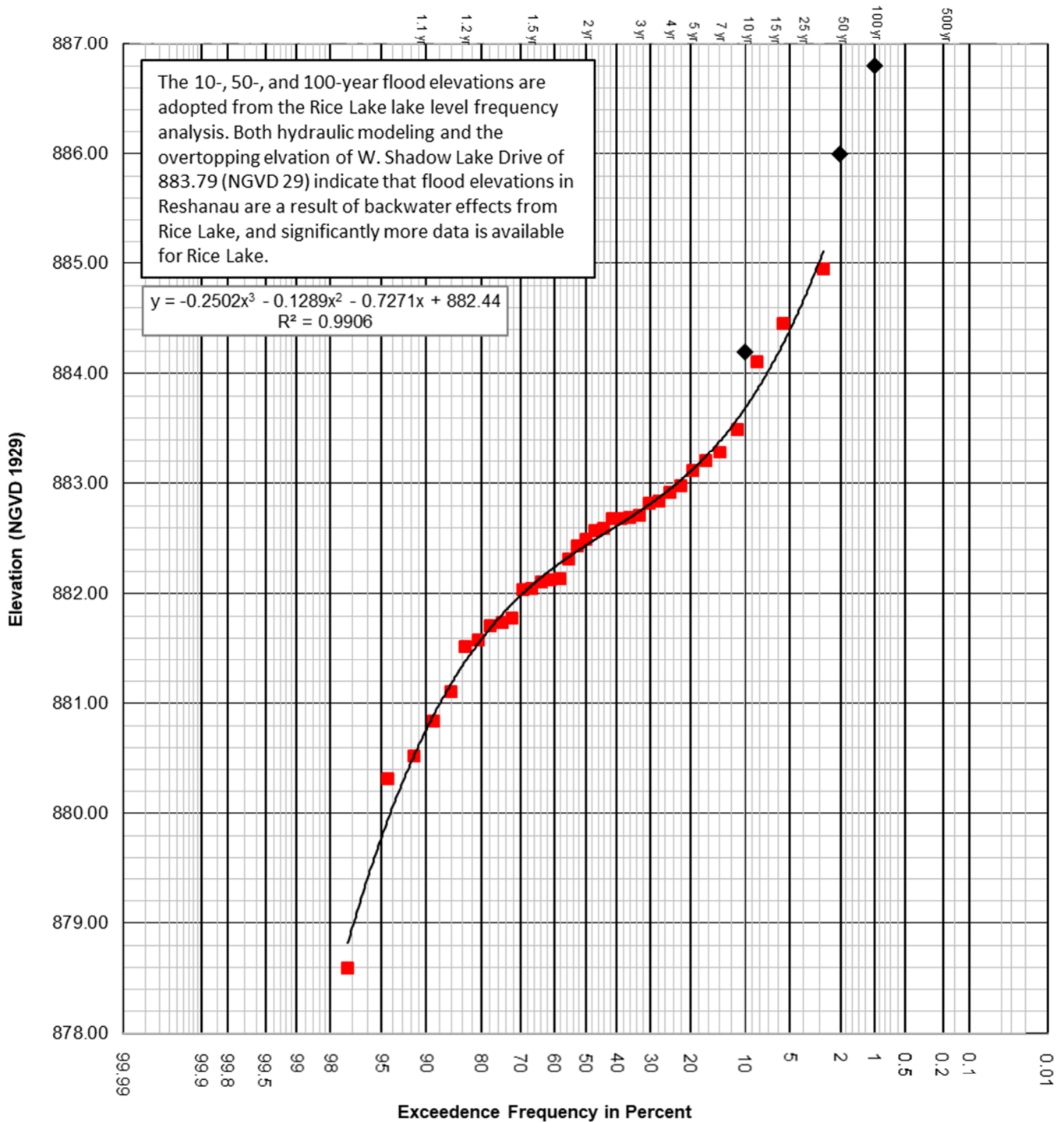


Figure 11a2

Reshanau Lake Levels (NGVD 1929) **Maximum Annual Series Frequency Curve** **(Weibull Plotting Positions)**



Note: 1981 FIS assumed lake levels and frequency analysis identical to Rice Lake.
However, 6 annual high water elevations were available (1972-1977)

■ DNR and 1981 FIS (n = 35 years)

Outlet:

42-inch RC pipe @ 878.75 (NGVD 29), 878.90 (NAVD 88)

Figure 11b

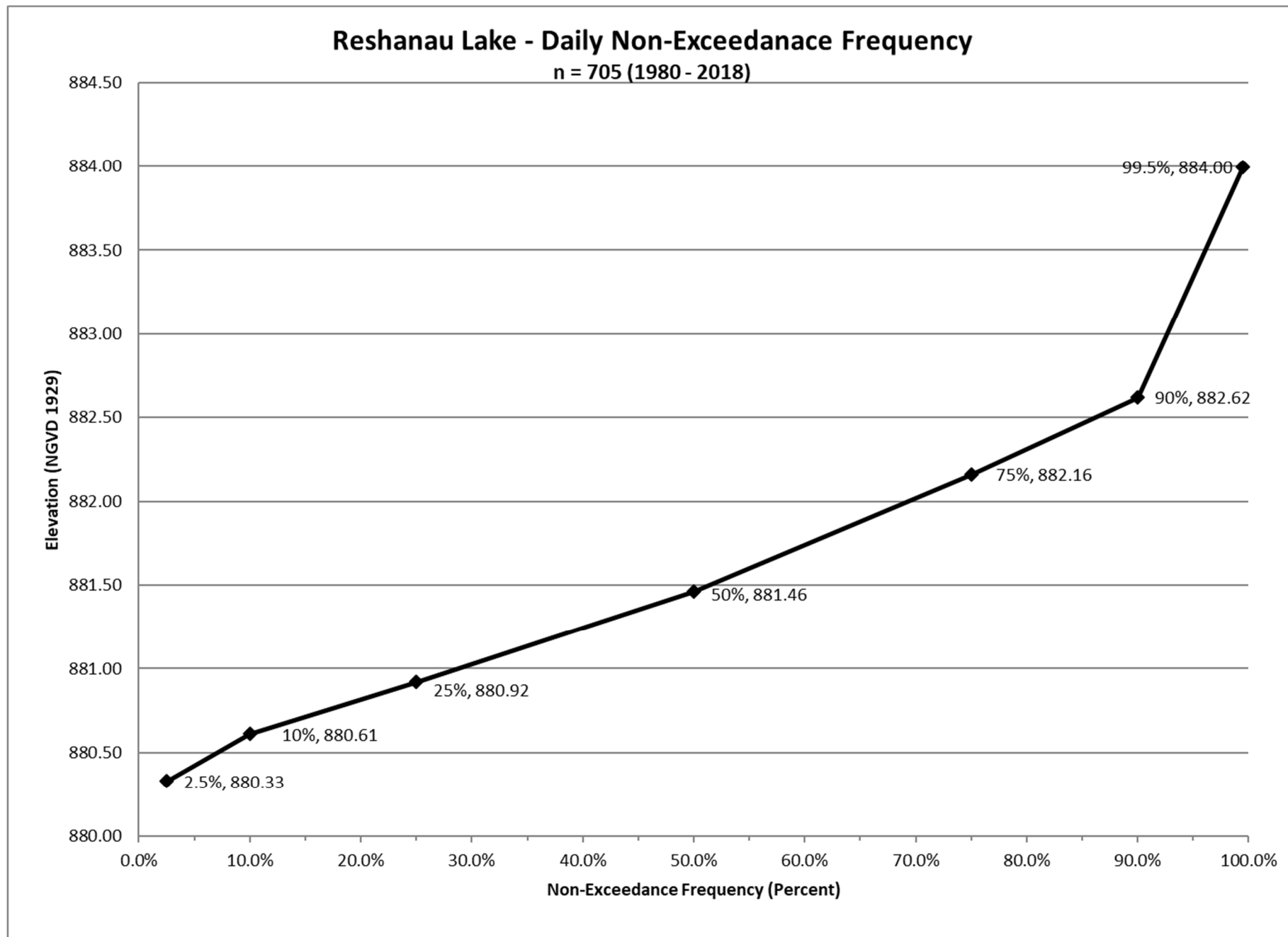


Figure 11c