Models such as EGRET rely on discrete samples which need to be collected throughout the year and throughout the range of flow conditions. The EGRET models used here had a sufficient number of discrete samples to produce results with low bias, but it is generally impossible to have a sufficient number of discrete samples to adequately characterize the full range of concentrations (Pellerin et al., 2014). Most of the discrete samples were collected at a frequency of about twice a month. Water quality sensors can be used to collect data continuously and at a much higher sampling frequency. A nitrate sensor has been used at the Sacramento River at Freeport site since 2013. A plot of modeled nitrate concentration using EGRET and measured nitrate concentration using a sensor at a frequency of 15 minutes is shown in Figure xx. It is evident from Figure xx that the EGRET model does not capture the higher concentrations which are mostly associated with runoff events.

Discharge and load at this site for the period of time of sensor deployment are shown in Figure xx. Discharge is sometimes negative because of a tidal influence. This was most pronounced prior to 2017 because of drought conditions and corresponding lower river flows. Similarly, the calculated loads are sometimes negative because of the reverse flow. The nitrate sensors require a considerable amount of maintenance and sometimes stop collecting data. Gaps can be extrapolated for short time frames and under conditions where changes in concentration are not particularly great. There is one large gap in 2017 under changing flow conditions where the missing concentrations could not be filled in.

Calculated load from EGRET and directly measured load using the nitrate sensor can be compared for a few years. The EGRET calculation for water year 2014 was very close to the measured sensor load at 102%. The water year 2015 and 2016 EGRET loads were less at 69 and 78%. A sensor load could not be calculated for water year 2017 because of the large gap in record. The calculated load for water year 2018 was 125% of the measured sensor load. For the years that a comparison can be made, the EGRET load averaged 93% of the measured sensor load.