SPILL AND TDG UPDATE TO TMT

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5/2/2018

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FACTORS THAT IMPACT TDG BESIDES SPILL

Mixing with powerhouse flow and upstream TDG
Temperature
Barometric Pressure
Dissipation to atmosphere -- wind
Stratification and lateral variation (no slides)

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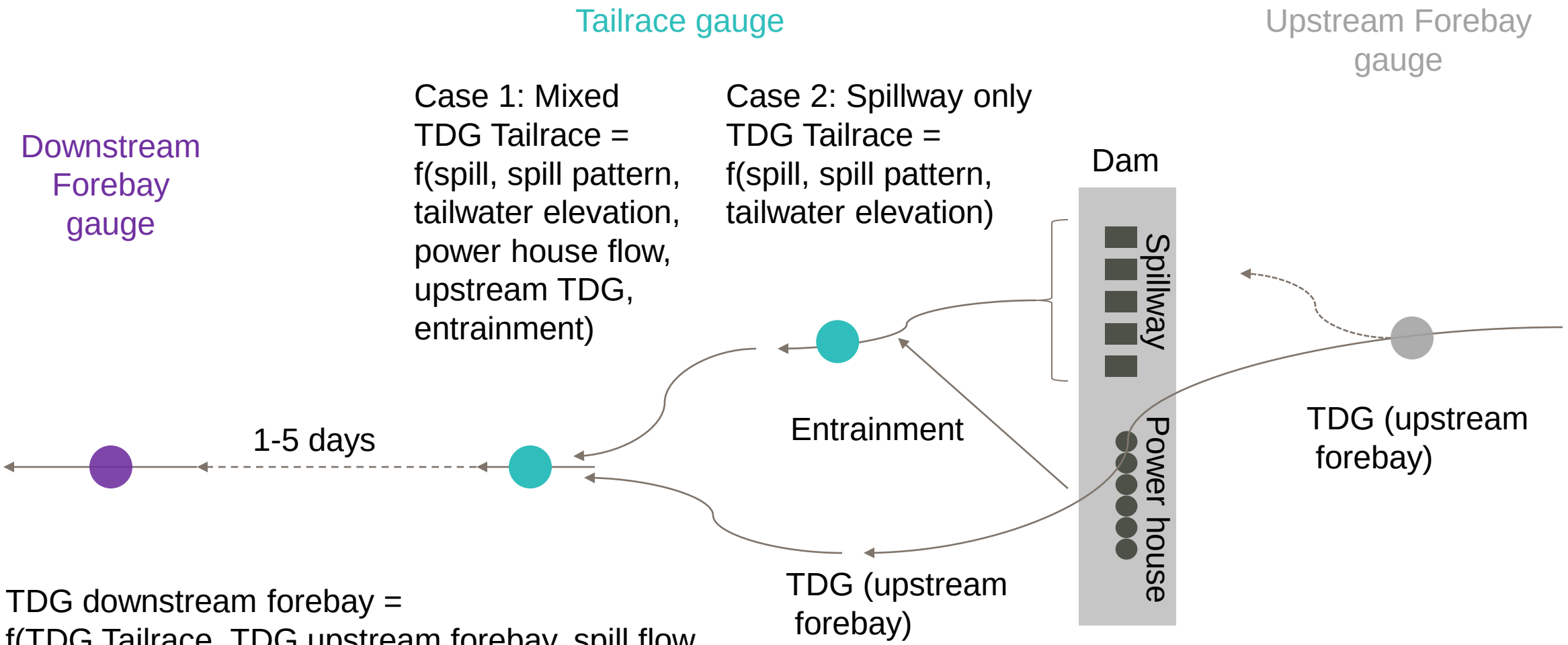
MIXING WITH POWERHOUSE



TDG downstream forebay = f(TDG Tailrace, TDG upstream forebay, spill flow, powerhouse flow, travel time, wind speed, water temperature, barometric pressure, dispersion)

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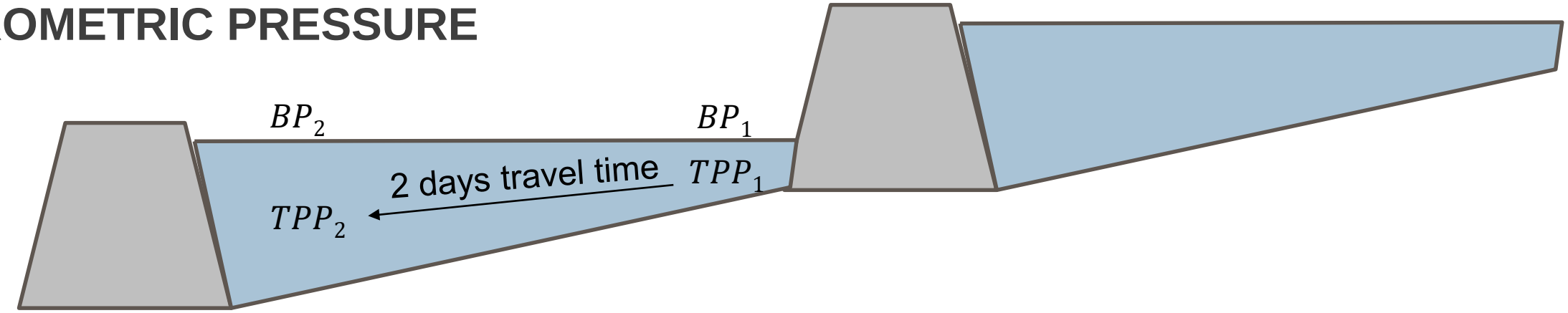
BAROMETRIC PRESSURE



$$TDG\ (\%\ of\ saturation) = \frac{TPP\ (mmHg)}{BP\ (mmHg)} * 100$$

TPP = Partial pressure of all dissolved gases

BP = Barometric pressure

$TDG_1 = \frac{TPP_1}{BP_1}$ and $TDG_2 = \frac{TPP_2}{BP_2}$

If TPP doesn't change (i.e. $TPP_2 = TPP_1$) but BP does, then:

$$TDG_2 = TDG_1 \frac{BP_1}{BP_2}$$

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TEMPERATURE

$$TPP\ (mmHg) = C_i \left[\frac{A_i}{\beta_i}\right]$$

From a table:
Depends on water temperature

C_i = Concentration of i^{th} gas, mg/L;
β_i = Bunsen coefficient of i^{th} gas, L/(L atm)
A_i = 760/1000 K_i
K_i=ratio of molecular weight to molecular volume

Rule of thumb:
The TDG (%) will increase by 2% for every 1˚ C (2˚ F) of warming of the water.

From Colt, 1984, Computation of Dissolved Gas Concentrations in Water as Functions of Temperature, Salinity, and Pressure

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WIND DEGASSING, PER EVERY HOUR, FROM LGS SYSTDG

$$TDG_{new} = TDG_{old} - Max\left(a \times wind^{b}, c\right) \times (TDG_{old} - BP)$$

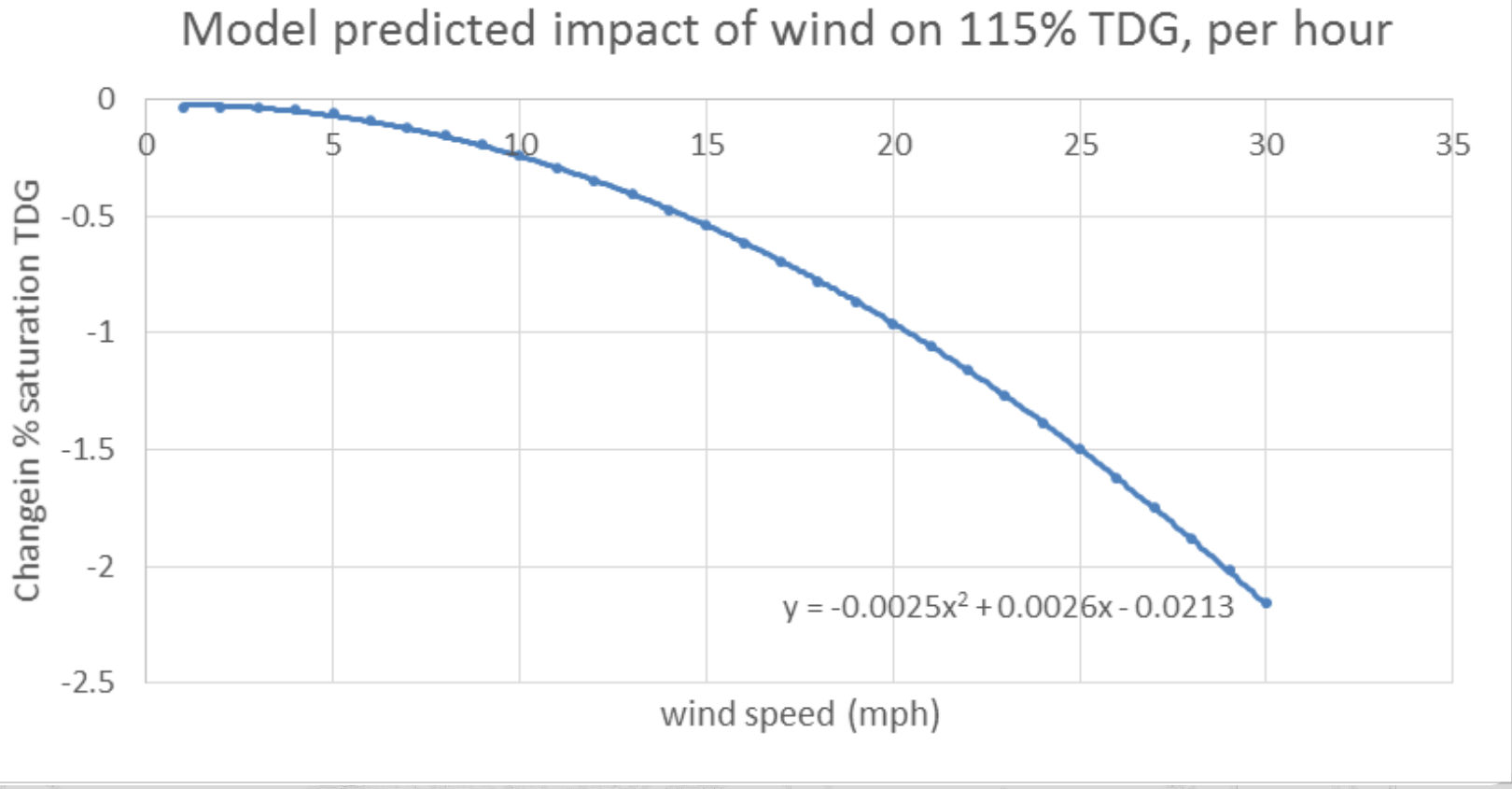
Where:

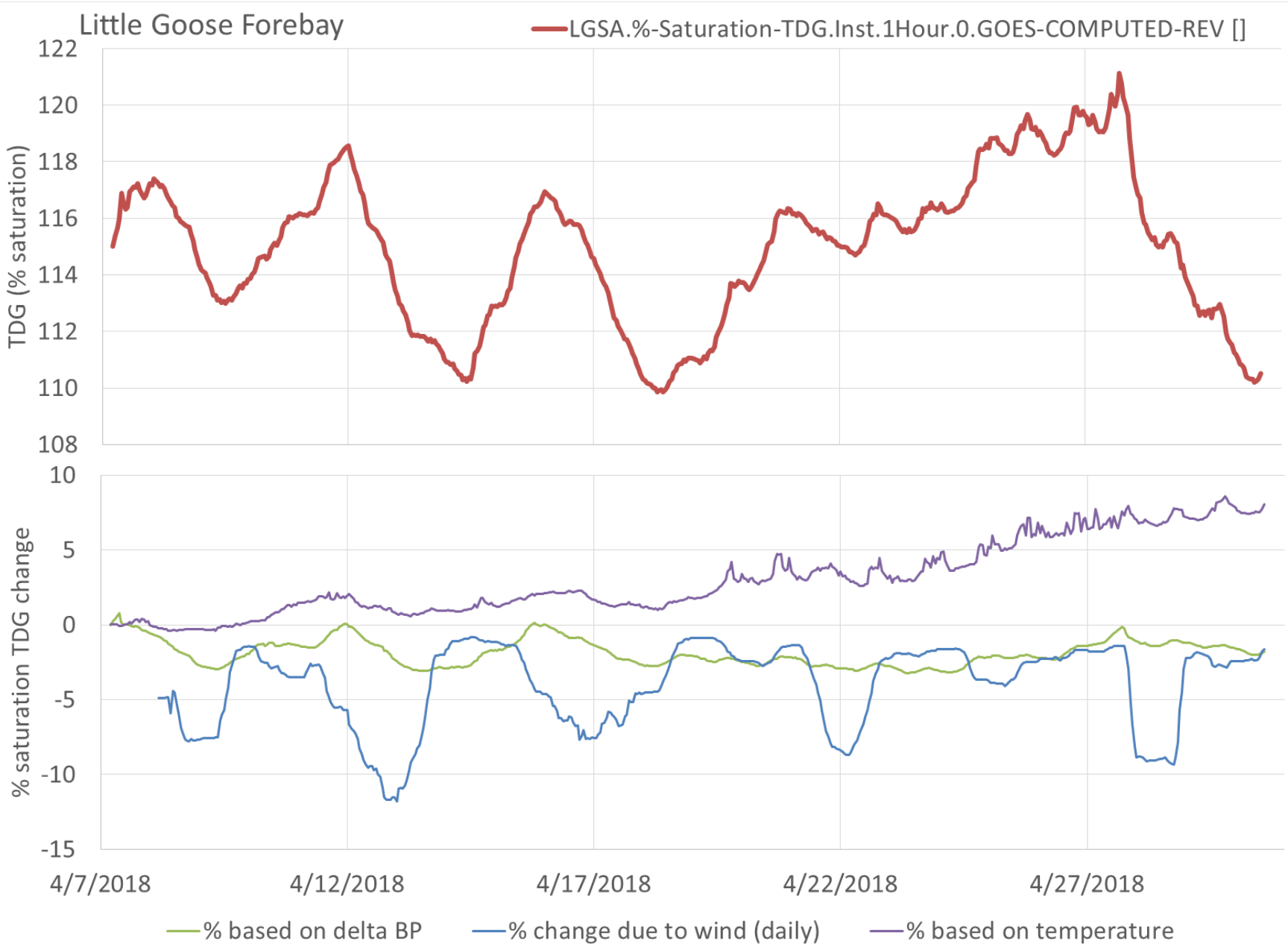
a,b,c = coefficients

= 0.0008, 2, 0.0025

Wind =

wind speed (m/s)





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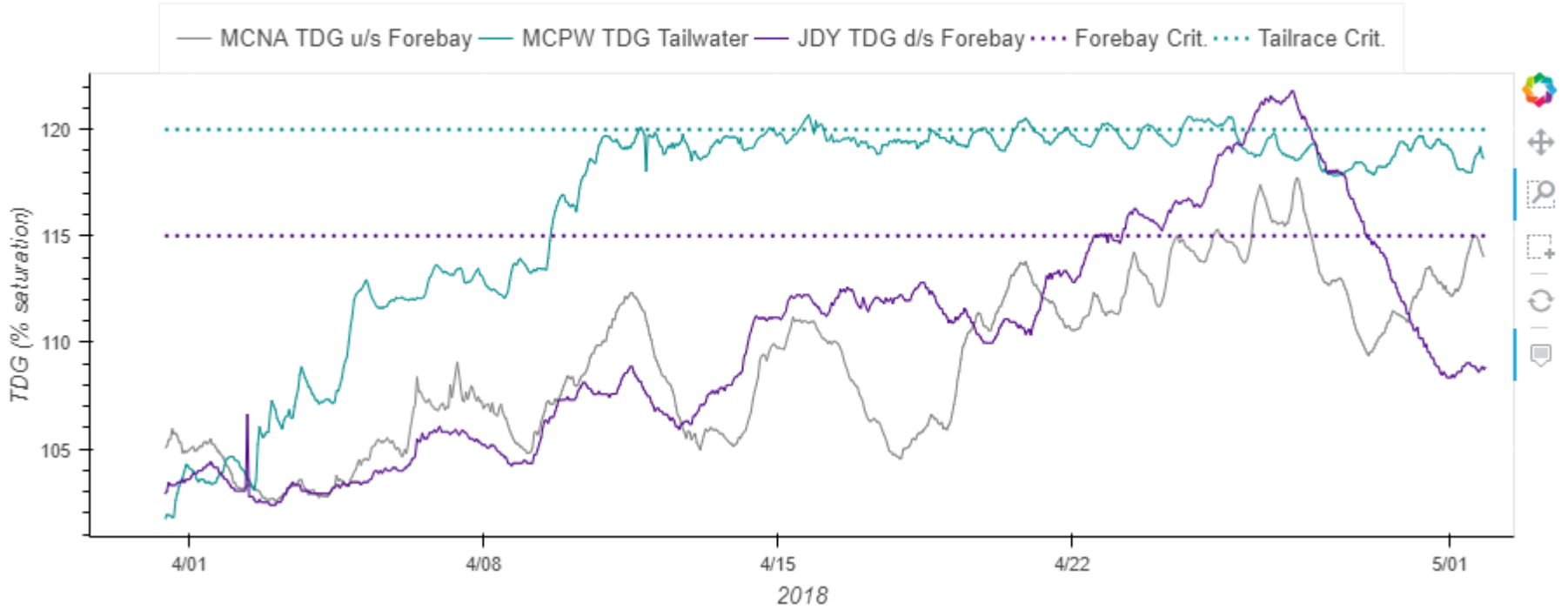
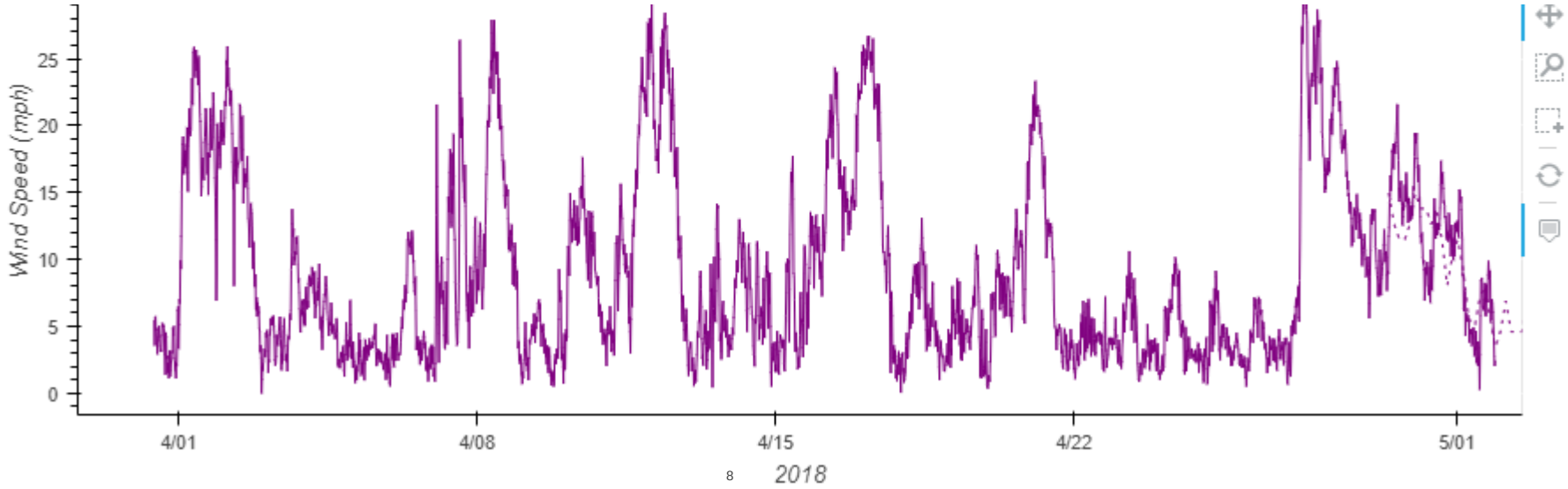
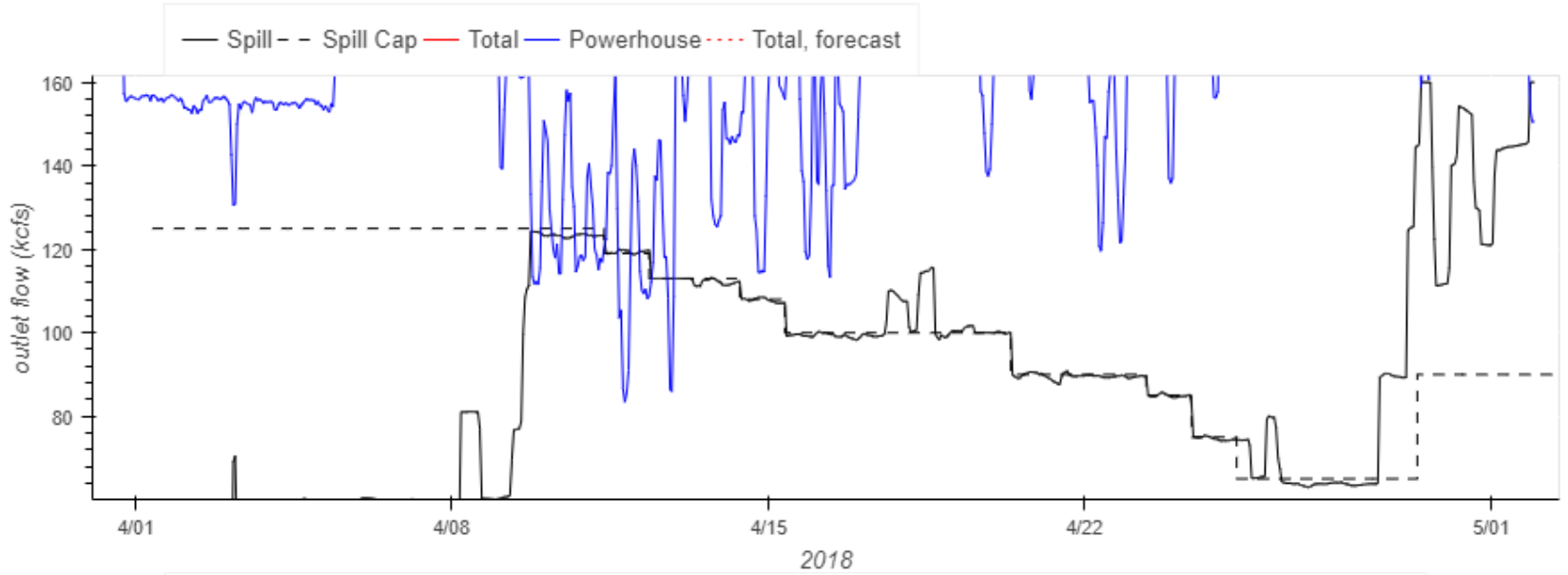
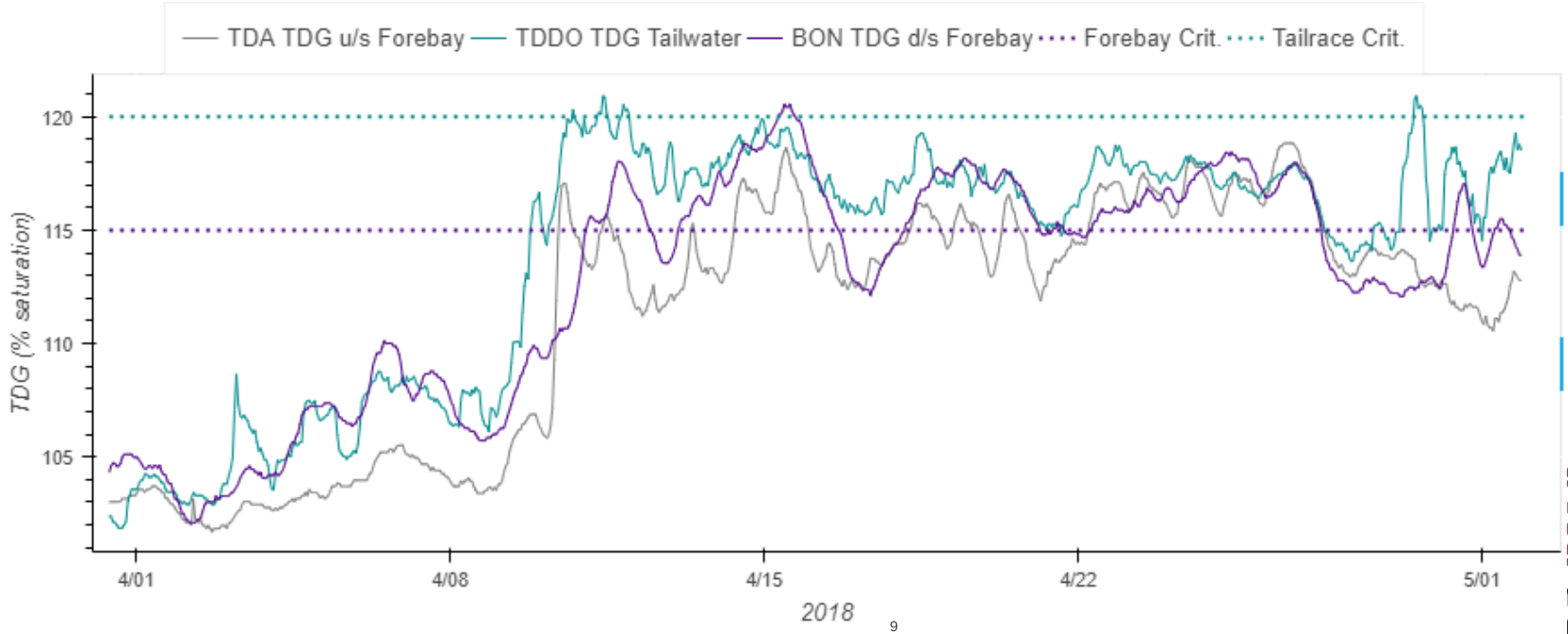
McNary


MCNA TDG u/s Forebay
MCPW TDG Tailwater
JDY TDG d/s Forebay
Forebay Crit.
Tailrace Crit.
TDG (% saturation)
120
115
110
105
4/01
4/08
4/15
4/22
5/01
2018

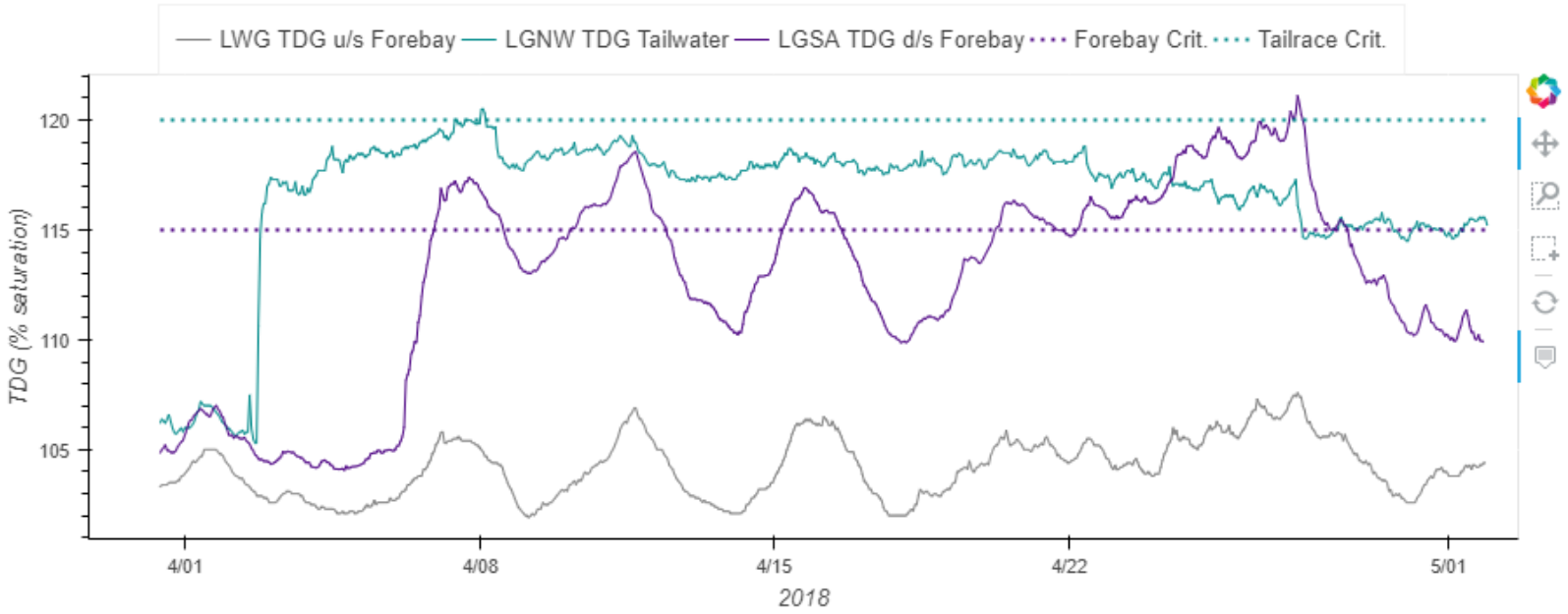

Wind Speed (mph)
25
20
15
10
5
0
4/01
4/08
4/15
4/22
5/01
2018

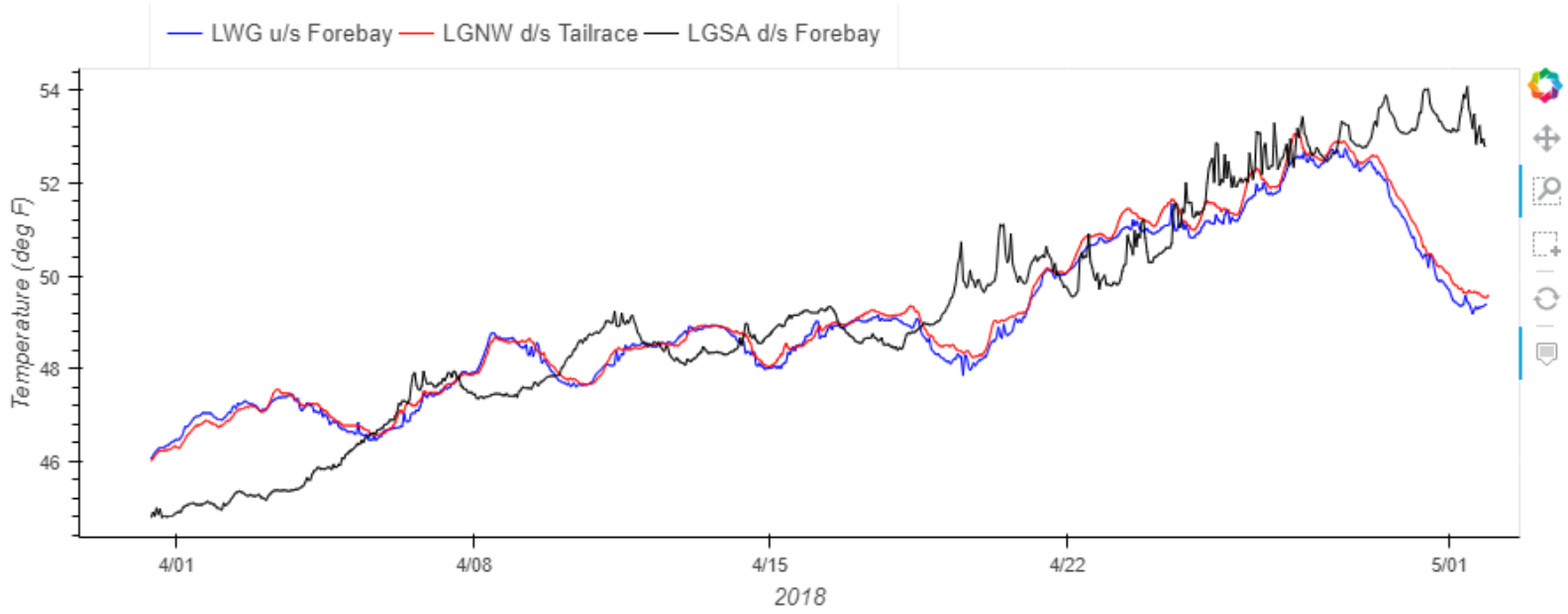
The Dalles


Spill
Spill Cap
Total
Powerhouse
Total, forecast
outlet flow (kcfs)
160
140
120
100
80
4/01
4/08
4/15
4/22
5/01
2018


TDA TDG u/s Forebay
TDDO TDG Tailwater
BON TDG d/s Forebay
Forebay Crit.
Tailrace Crit.
TDG (% saturation)
120
115
110
105
4/01
4/08
4/15
4/22
5/01
2018

Lower Granite





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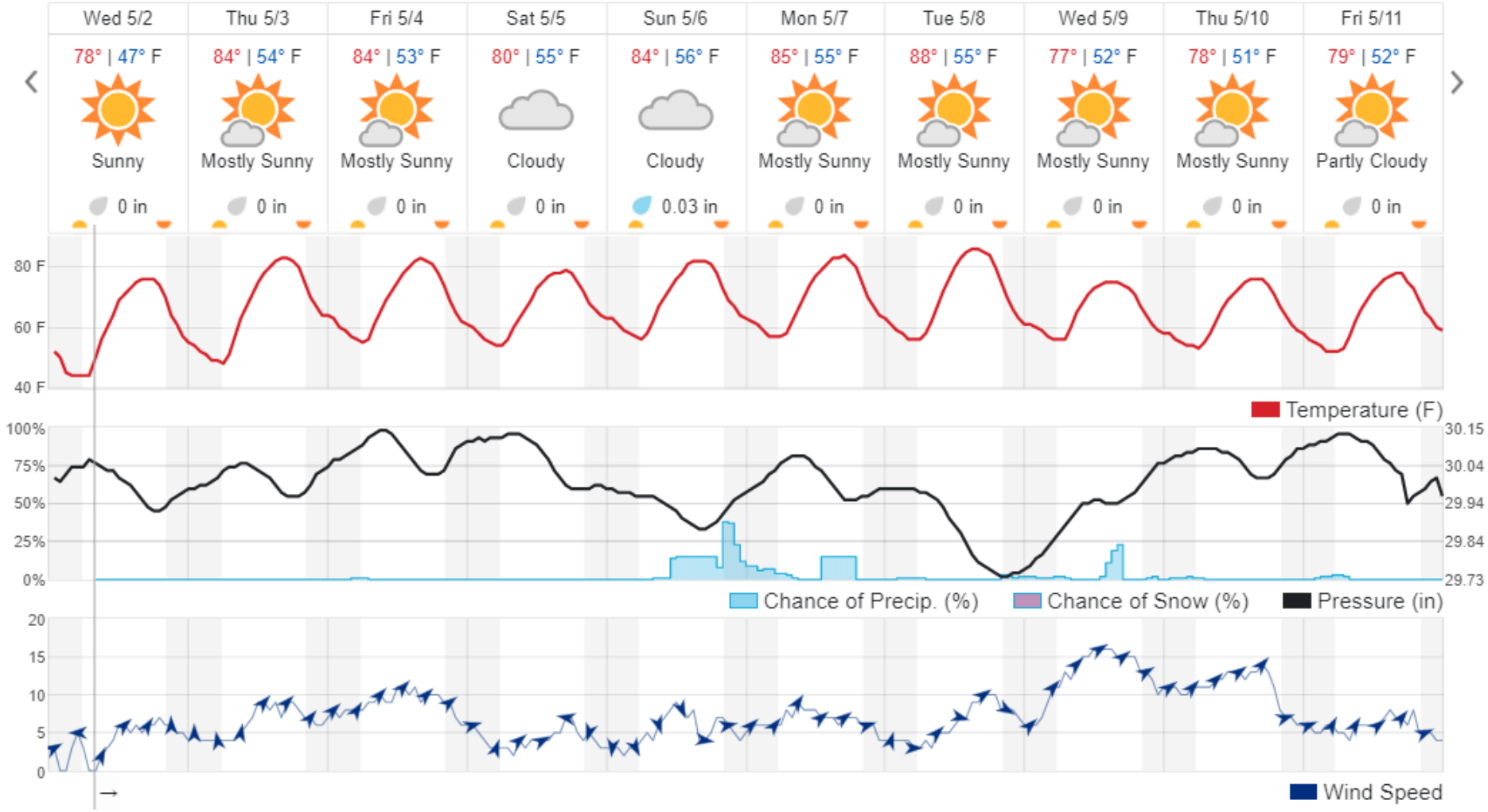
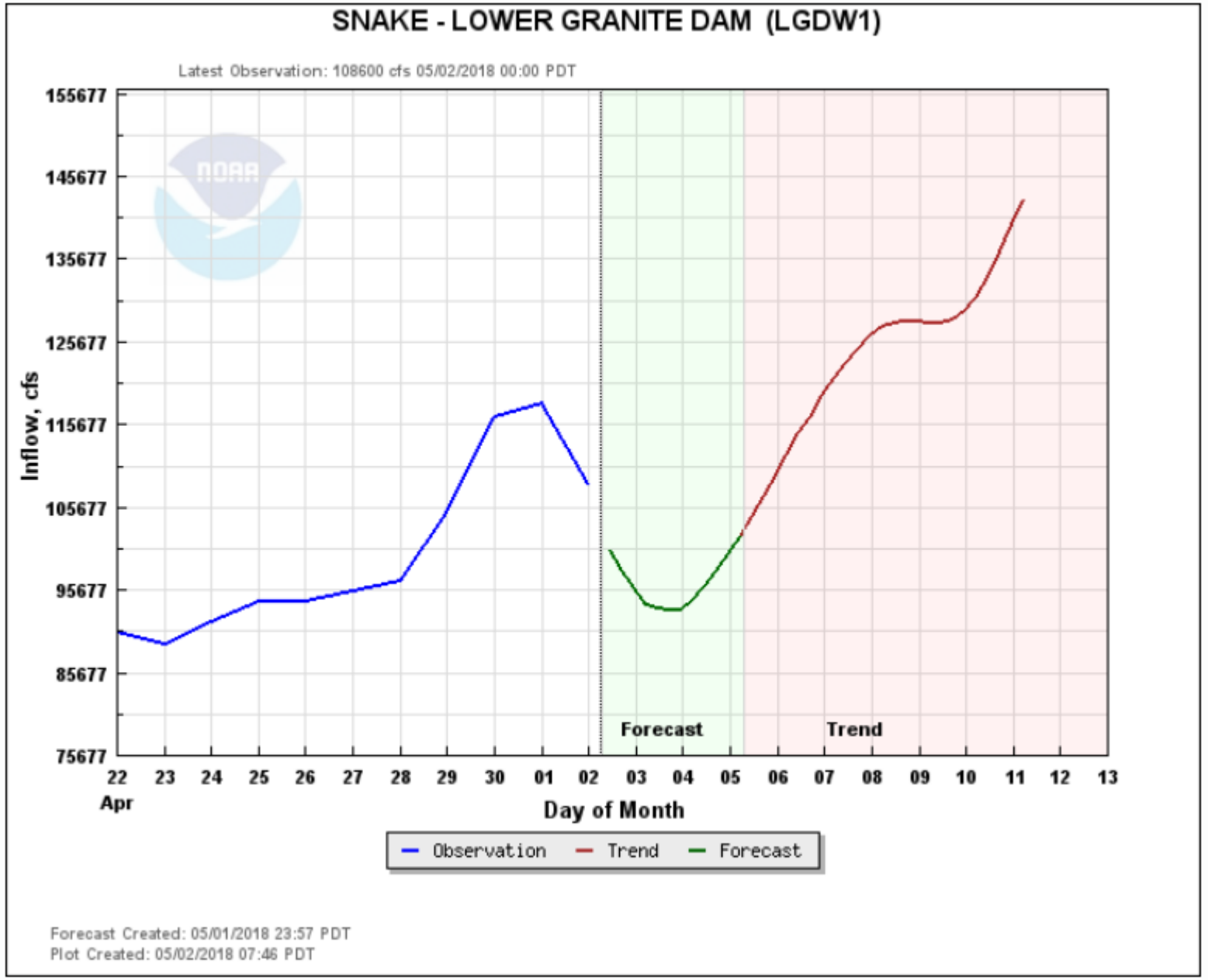
Pasco weather forecast



From https://www.wunderground.com/forecast/us/wa/pasco at 5/2/2018 at 0741



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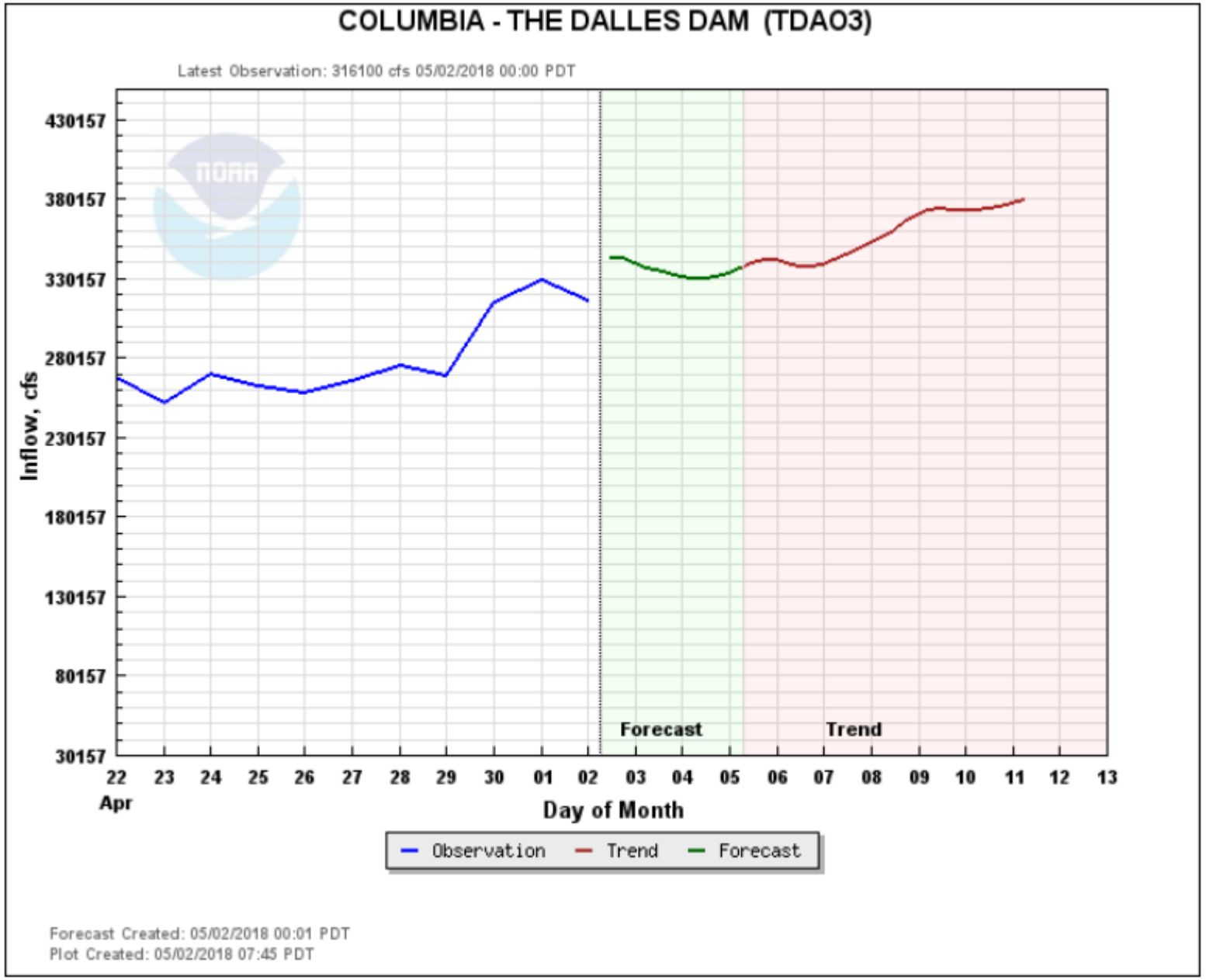

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