Appendix I1

Flow Raw Data Source Description

DRAFT

Lower Hillsborough River Recovery Strategy Master Flow Data README

Southwest Florida Water Management District

2024-07-03

Summary

This document summarizes the individual flow datasets and calculations used to create a master dataset of flows for the Lower Hillsborough River (LHR) Recovery Strategy for the period of January 1, 1996 – December 31, 2023 as part of the Task 10 data deliverable for District TWA: 22TW0003992. All daily average flow data needed to assess the LHR Recovery Strategy has been included. This document is produced from R software code that reads in raw datasets provided by the District and produces summary histograms for the key variables of interest followed by summary distribution statistics and a list of quality codes where available. Individual refined datasets are then combined into a master dataset named LHR_Daily_Masterflow in both .csv and R format.

United States Geological Service Data

This subsection describes the individual United States Geological Service (USGS) data files required to calculate the total flows to the LHR.

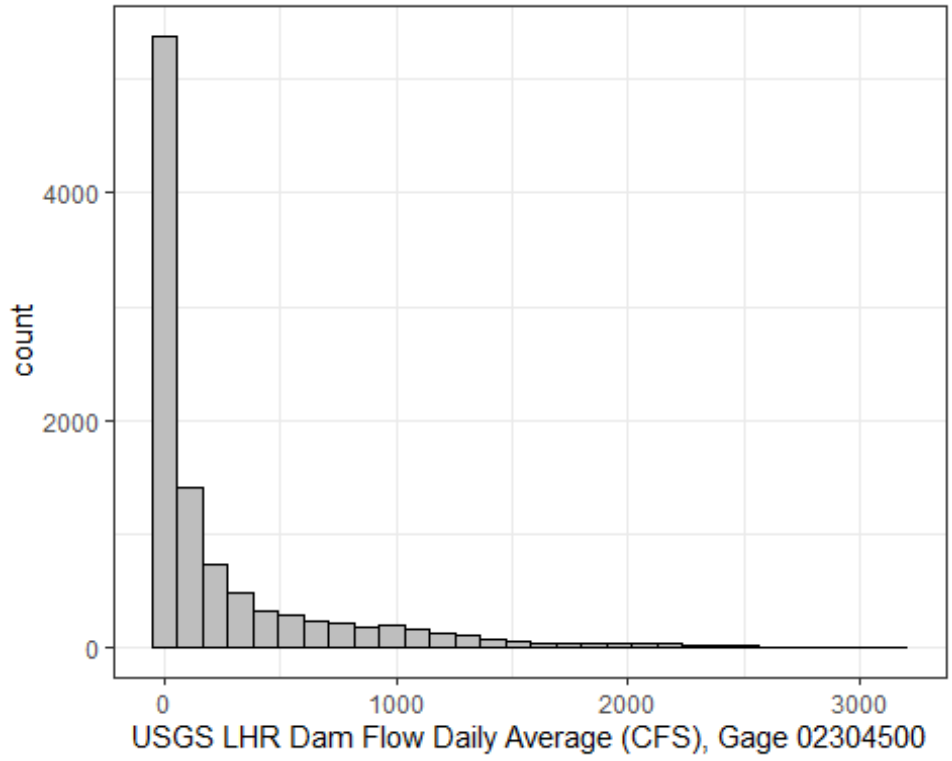
USGS_Dam_Flow - USGS Hillsborough River Near Tampa FL - 02304500

File name and path: /USGS/Dam/USGS_Dam_Daily.xlsx

Metadata: USGS daily average flow data for Hillsborough River Near Tampa FL - 02304500 downloaded via an R Script by the District. Includes provisional data.

The period of record for this dataset is from January 1, 1996 through December 31, 2023. The full timeseries should contain 10,227 observations. This dataset had 69 missing dates in the timeseries. These dates appear to be missing at short time intervals or at random rather than completely consecutive and therefore were filled in using linear interpolation. The missing dates are listed below the summary statistics.

DRAFT




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##    0.00    0.00   37.85  250.54  292.75 3160.00      69

## [1] "A"   "A e" "P"

## $Date
##  [1] "2013-11-27 UTC" "2014-09-24 UTC" "2014-12-12 UTC" "2014-12-18 UTC"
##  [5] "2014-12-27 UTC" "2015-01-06 UTC" "2015-01-07 UTC" "2015-01-16 UTC"
##  [9] "2015-01-26 UTC" "2015-05-13 UTC" "2015-05-28 UTC" "2015-06-11 UTC"
## [13] "2015-06-13 UTC" "2015-06-14 UTC" "2015-06-15 UTC" "2015-07-16 UTC"
## [17] "2015-07-22 UTC" "2015-07-23 UTC" "2015-07-24 UTC" "2015-09-02 UTC"
## [21] "2015-09-03 UTC" "2015-09-04 UTC" "2015-09-08 UTC" "2015-09-09 UTC"
## [25] "2015-09-10 UTC" "2015-09-11 UTC" "2015-09-12 UTC" "2015-09-14 UTC"
## [29] "2015-09-15 UTC" "2015-09-16 UTC" "2015-10-01 UTC" "2015-10-11 UTC"
## [33] "2016-02-04 UTC" "2016-02-05 UTC" "2016-02-09 UTC" "2016-02-10 UTC"
## [37] "2016-06-27 UTC" "2016-06-28 UTC" "2016-06-29 UTC" "2016-07-15 UTC"
## [41] "2016-07-16 UTC" "2016-07-17 UTC" "2016-07-18 UTC" "2016-07-19 UTC"
## [45] "2016-07-20 UTC" "2016-07-21 UTC" "2016-07-22 UTC" "2017-07-18 UTC"
## [49] "2017-07-19 UTC" "2017-07-20 UTC" "2017-07-21 UTC" "2017-08-03 UTC"
## [53] "2018-07-10 UTC" "2018-07-11 UTC" "2018-07-12 UTC" "2018-08-20 UTC"
## [57] "2018-12-27 UTC" "2018-12-28 UTC" "2018-12-30 UTC" "2018-12-31 UTC"
## [61] "2019-01-01 UTC" "2019-01-02 UTC" "2019-01-03 UTC" "2019-01-07 UTC"
## [65] "2019-01-08 UTC" "2019-01-09 UTC" "2020-08-31 UTC" "2023-10-03 UTC"
## [69] "2023-10-04 UTC"
```

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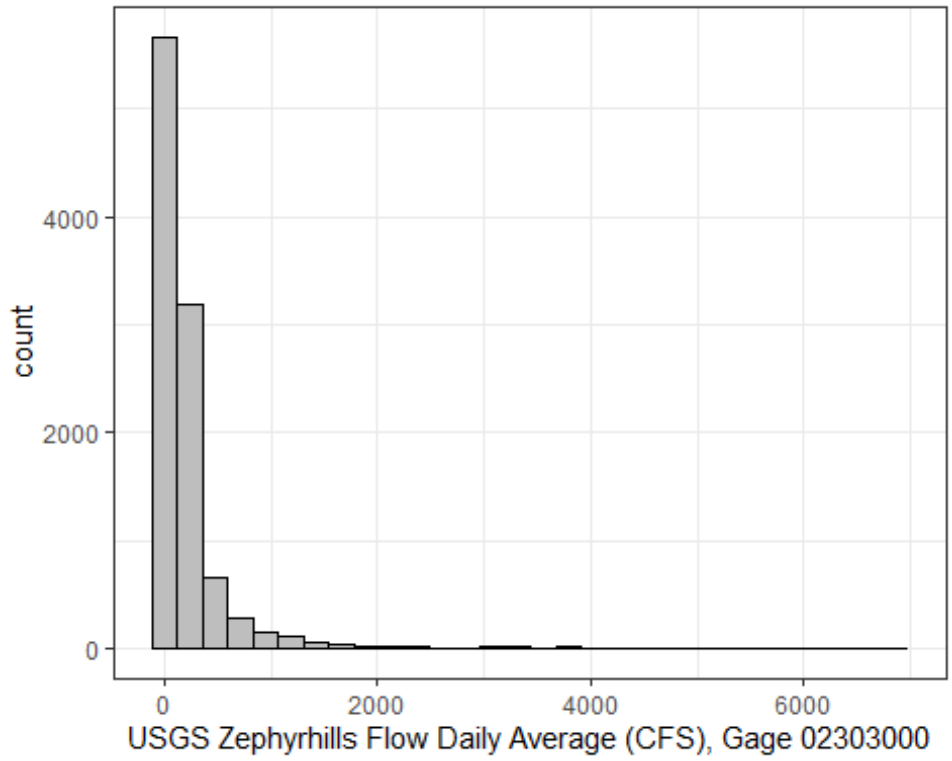
USGS_Zep_Flow - USGS Hillsborough RV at State Park NR Zephyrhills, FL - 02303000

File name and path: /USGS/Zephyrhills/USGS_Zephyrhills_Daily2.xlsx

Metadata: USGS daily average flow data for Hillsborough RV at State Park NR Zephyrhills, FL - 02303000 downloaded via an R Script by the District. Includes provisional data.

The period of record for this dataset is from January 1, 1996 through December 31, 2023. There were two missing dates in the timeseries which were filled in using linear interpolation. The missing dates are listed below the summary statistics.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##      27      75     108     219     205    6900       2

## [1] "A"   "A e" "A R" "P"

##         Date
## 1 2006-09-30
## 2 2006-10-01
```

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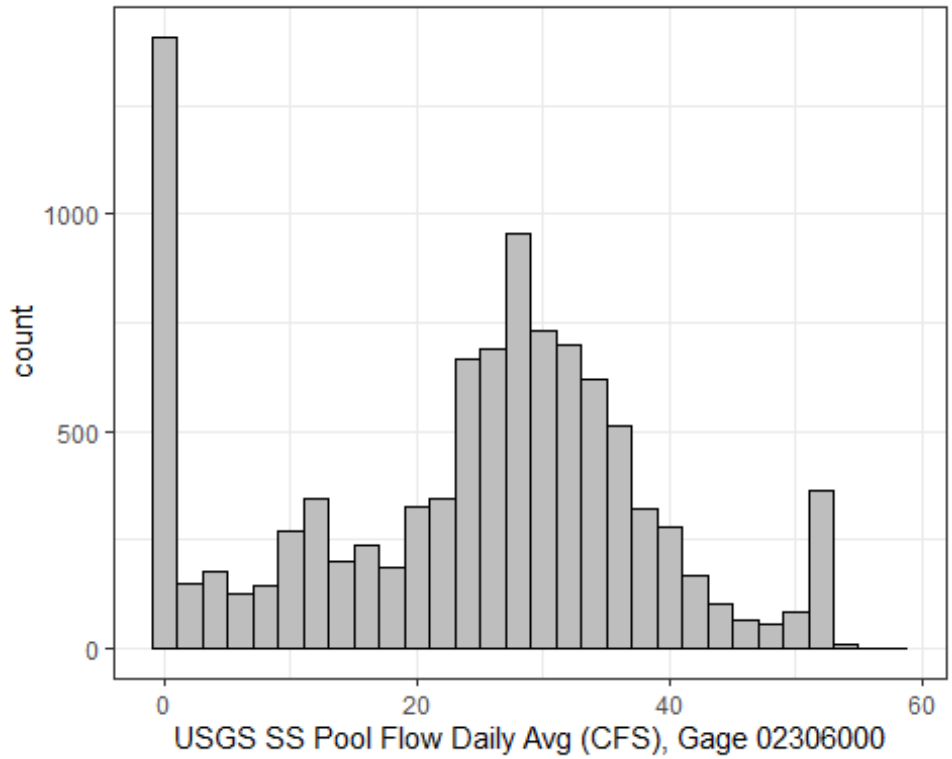
USGS_SSP_Flow - USGS Sulphur Springs at Sulphur Springs FL (Sulphur Springs Pool) 02306000

File name and path: /USGS/SSP/USGS_SSP_Daily.xlsx

Metadata: USGS daily average flow data for Sulphur Springs at Sulphur Springs FL – 02306000 (Sulphur Springs Pool) were acquired via an R Script by the District.

Water temperature, gage height, specific conductivity, and salinity (calculated from specific conductivity) data are also included in the source file but are not included in this master dataset.

The period of record for this dataset is from January 1, 1996 through December 31, 2023. There were no missing dates in the timeseries.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00   12.80   26.60   23.81   33.20   58.00

## [1] "A"   "A e" "P"
```

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City of Tampa Data

The City of Tampa (COT) contributes the flows necessary to implement the required minimum flows for the LHR. In some cases, multiple files exist representing different periods of record and various entities that reported the data.

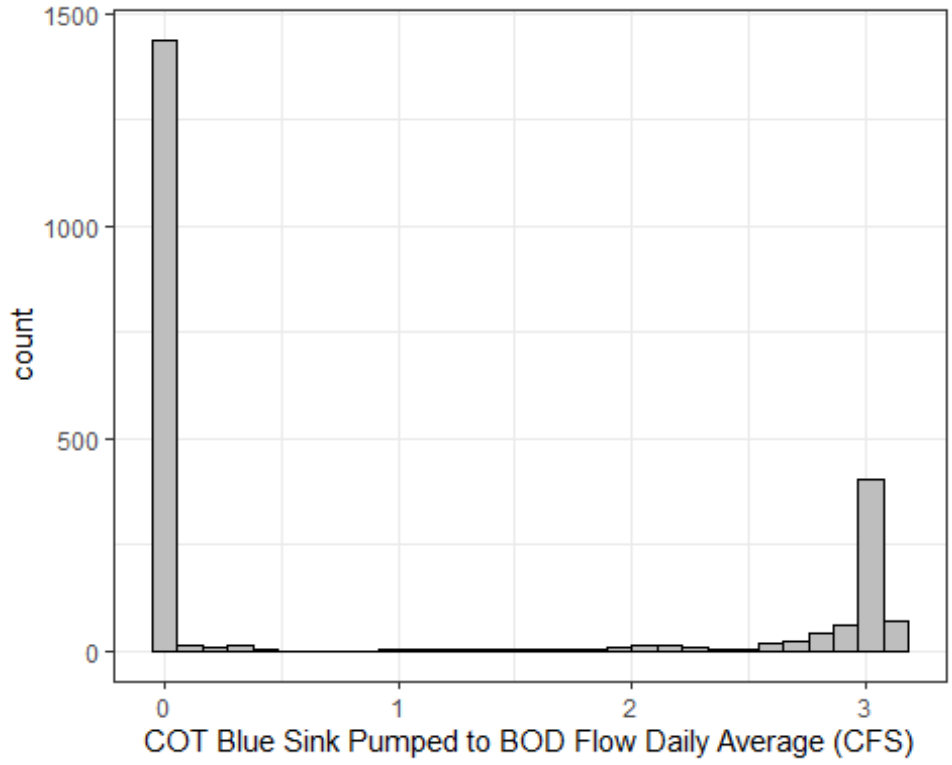
No values are interpolated for these datasets. Any missing data is treated as a zero in any calculation regarding minimum flows implementation.

BS_2_BOD - COT Blue Sink Flow Contribution

File name and path:
/COT/BlueSink_to_BOD/COT_BS_Pumped_2_BOD_DailyAverage_20171217_20231231.xlsx

Metadata: This data is the pumpage sent from Blue Sink to the base of the dam for minimum flow implementation by the COT. This spreadsheet is the consolidated daily average cfs pumpage data as reported daily by the COT to the Environmental Flows and Levels (EFL) Section, Southwest Florida Water Management District. Questions about this data should be sent to the City of Tampa directly. The source for this data is the consolidated spreadsheet stored by the EFL section in SharePoint called CombinedPDFComplianceReportsData.xlsx

The period of record for this dataset is from January 1, 2018, through December 31, 2023. This dataset has a few random values prior to 2018 which are censored from this file. The full timeseries should contain 2,191 observations and the dataset contains 2,191 observations, indicating a complete period of record. Summary statistics are listed below.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.9314  2.8550  3.1360
```

SS_2_BOD – Combined Data Flow Contribution

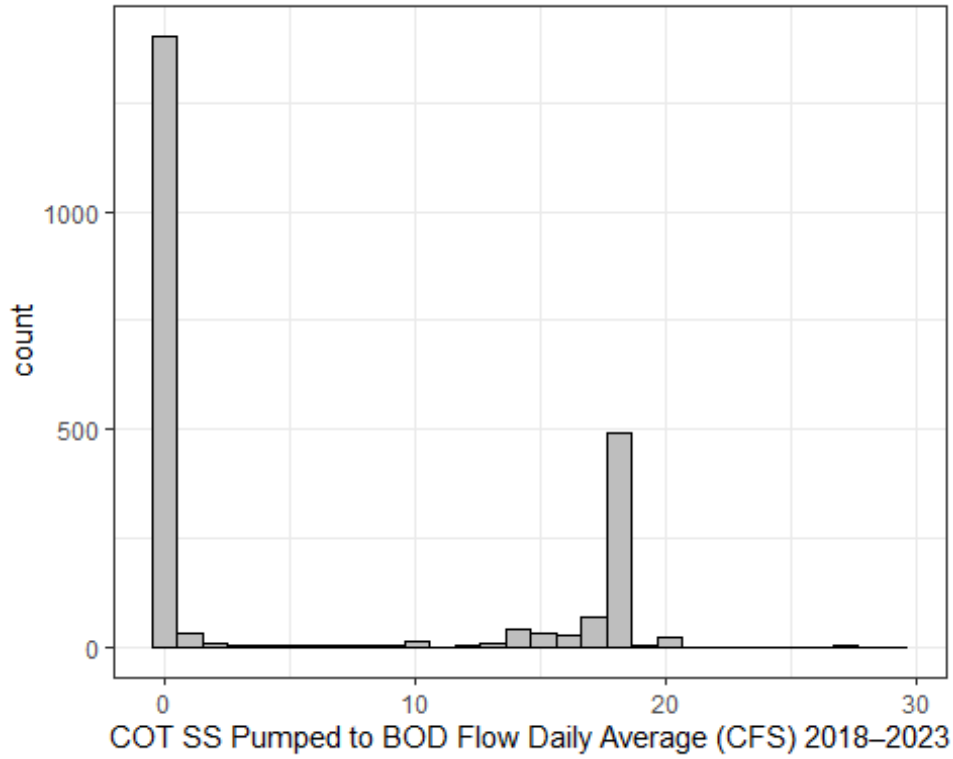
The three datasets described below are consolidated into one data column (SS_2_BOD) to represent the pumpage sent from the Sulphur Springs Pool to the base of the dam for minimum flow implementation. The consolidated period of record is January 1, 2002 through December 31, 2023

COT Sulphur Springs Pumped to Dam 2018 - 2023

File name and path:
/COT/SS_to_BOD/COT_SS_Pumped_2_BOD_DailyAverage_20180101_20231231.xlsx

Metadata: This data is the pumpage sent from the Sulphur Springs Pool to the base of the dam for minimum flow implementation by the City of Tampa from January 1, 2018, through December 31, 2023. This spreadsheet is consolidated daily average cfs pumpage data as reported daily by the City of Tampa to the EFL Section, Southwest Florida Water Management District. Questions about this data should be sent to the City of Tampa directly. The source for this data is the consolidated spreadsheet stored by the EFL section in SharePoint called CombinedPDFComplianceReportsData.xlsx.

The period of record for this dataset is from January 1, 2018, through December 31, 2023. The full timeseries should contain 2,191 observations. This dataset contains 2,191 observations, indicating a complete period of record. Summary statistics are listed below.



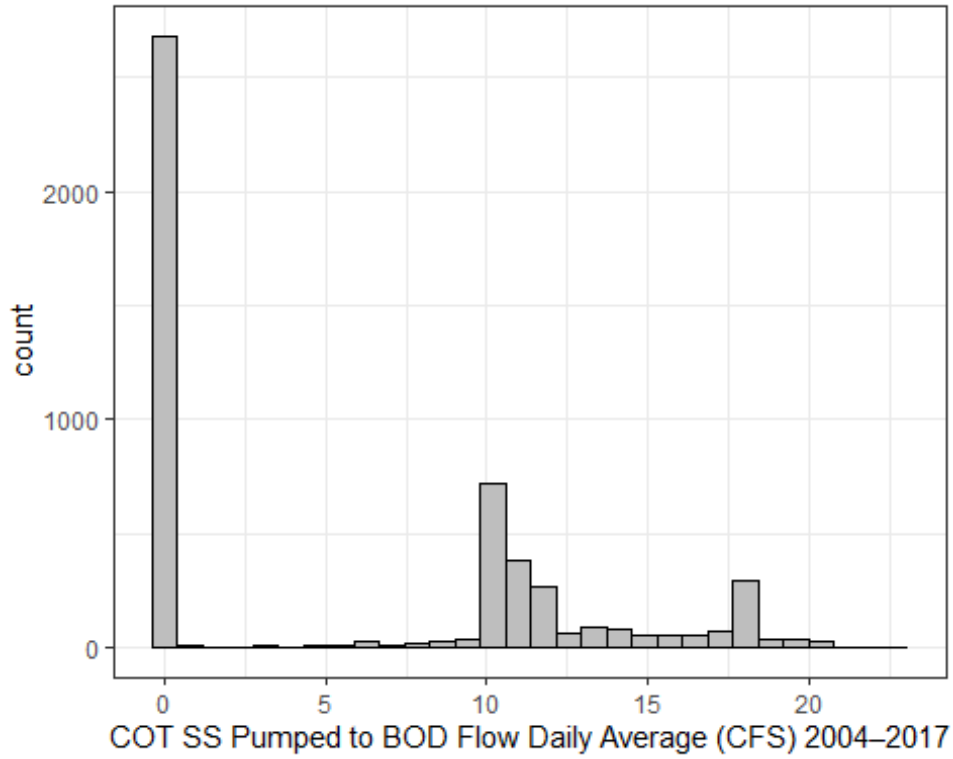

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   5.872  17.543  29.222
```

COT Sulphur Springs Pumped to Dam 2004 - 2017

File name and path:
/COT/SS_to_BOD/COT_SS_Pumped_2_BOD_DailyAverage_20040401_20171231.xlsx

Metadata: This data is the pumpage sent from the Sulphur Springs Pool to the base of the dam for minimum flow implementation by the COT from April 1, 2004, through December 31, 2017. The original data was received by Tampa Bay Water (TBW) from the COT to support the INTB model development. TBW shared the data with Danielle Rogers, Southwest Florida Water Management District on 12/9/2022. The original file named "LHRAugmentationSummary_ForTampa.xlsx", contained daily average pumpage in cfs from April 1, 2004 - December 31, 2019 for water pumped from the Sulphur Springs Pool to the base of the dam at the Lower Hillsborough River. Since this data partially overlapped with the dataset listed above, it was truncated to April 1, 2004, through December 31, 2017.

The period of record for this dataset is from April 1, 2004 through December 31, 2017. The full timeseries should contain 5,023 observations. This dataset contains 5,023 observations, indicating a complete period of record. Summary statistics are listed below.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   5.825  10.975  22.728
```

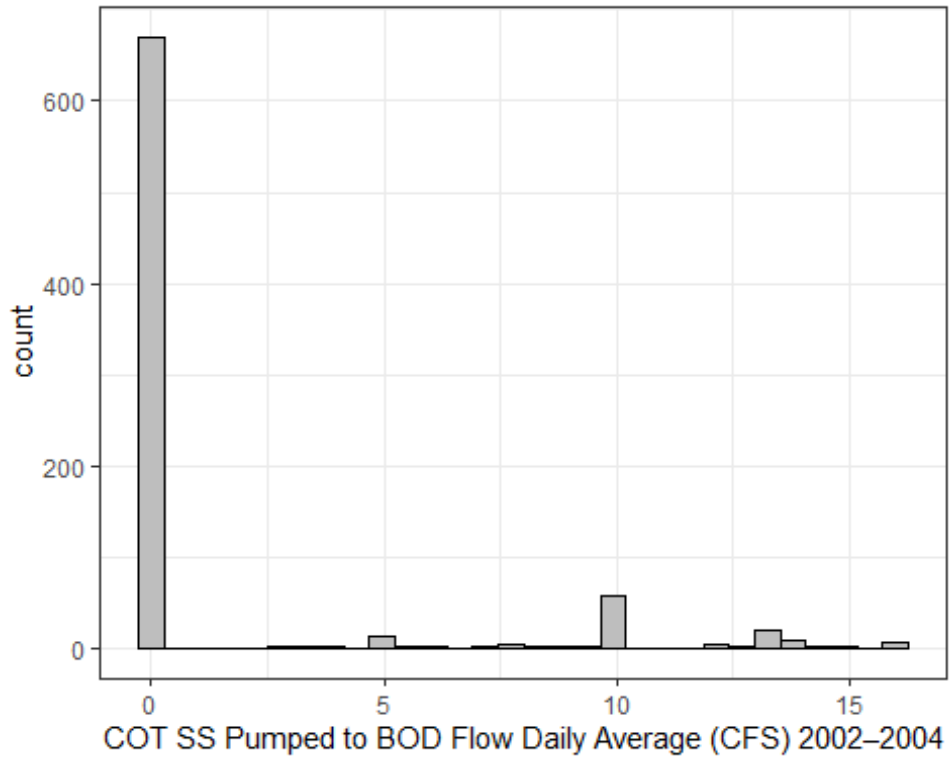
COT Sulphur Springs Pumped to Dam 2002 -2004

File name and path:
/COT/SS_to_BOD/COT_SS_Pumped_2_BOD_DailyAverage_20020101_20040331.xlsx

Metadata: This data is the pumpage sent from the Sulphur Springs Pool to the base of the dam for minimum flow implementation by the City of Tampa from January 1, 2002, through March 31, 2004. This data file was provided by Sid Flannery on September 26, 2023 to Danielle Rogers, EFL Section, Southwest Florida Water Management District. This is the data file Mr. Flannery used in the first Five Year Assessment for the Lower Hillsborough River Recovery Strategy. This data file has been truncated to only display data for January 1 2002 - March 31 2004 for Sulphur Springs pumped to base of dam. Units are cubic feet per second (cfs). This file contains 821 observations.

The period of record for this dataset is from January 1, 2002, through March 31, 2004. The full timeseries should contain 821 observations. This dataset contains 821 observations,

indicating a complete period of record. However, 19 days contain missing values which are treated as zeros in subsequent calculation. Summary statistics are listed below.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##   0.000   0.000   0.000   1.697   0.000  16.000      19
```

SS_Pumped_2_Run - Sulphur Springs Pumped To Run Flow

The two datasets described below are consolidated into one data column (SS_Pumped_2_Run) to represent the pumpage sent from the Sulphur Springs Pool to the the Sulphur Springs Run for minimum flow implementation of Sulphur Springs.

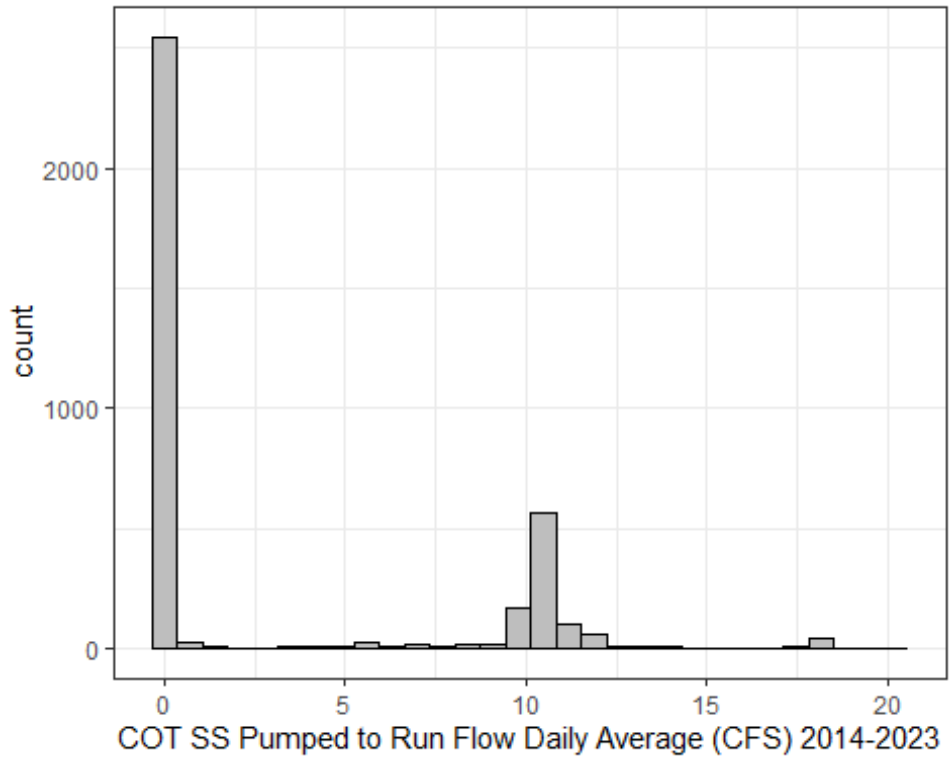
COT Sulphur Springs Pumped to Run 2014 - 2023

File name: COT_SS_Pumped_2_Run_DailyAverage_20140101_20231231.xlsx

Metadata: This data is the pumpage sent from the Sulphur Springs Pool to Sulphur Springs Run for minimum flow implementation for Sulphur Springs by the City of Tampa from January 1, 2014, through December 31, 2023. This spreadsheet is consolidated daily average cfs pumpage data as reported daily by the City of Tampa to the EFL Section, Southwest Florida Water Management District. Questions about this data should be sent to the City of Tampa directly.

The source for this data is the consolidated spreadsheet stored by the EFL section in SharePoint called CombinedPDFComplianceReportsData.xlsx, including a total of 3,652 observations beginning in 2014.

The period of record for this dataset is from January 1, 2014, through December 31, 2023. The full timeseries should contain 3,652 observations. This dataset contains 3,652 observations, indicating a complete period of record. Summary statistics are listed below.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   3.099  10.000  20.245
```

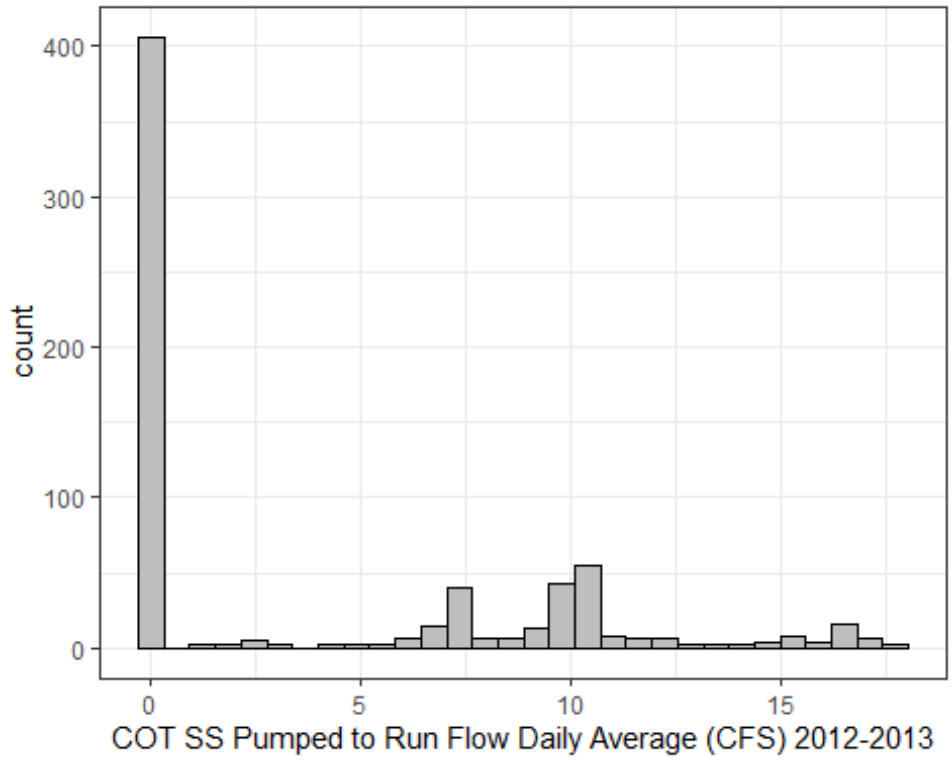
COT Sulphur Springs Pumped to Run 2012 – 2013

File name and path:
/COT/SS_Pumped_to_Run/COT_SS_Pumped_2_Run_DailyAverage_20120222_20131231.xlsx

Metadata: This data is the pumpage sent from the Sulphur Springs Pool to Sulphur Springs Run for minimum flow implementation for Sulphur Springs by the City of Tampa from February 22, 2012, through December 31, 2013. The original data was received by the Tampa Bay Water (TBW) from the City of Tampa to support the INTB model development. TBW shared the data with Danielle Rogers, Southwest Florida Water Management District on 12/2/2022 original file name PumpSulphur SpringsPoolToSulphurSprRun_FromCOT.xlsx The original file contained daily average pumpage in cubic feet per second for water pumped from the Sulphur Springs Pool to the

Sulphur Springs Run. The data in the original file was 2/22/2012 - 12/31/2019. The data in this file is truncated to 2/22/2012 - 12/31/2013.

The period of record for this dataset is from February 22, 2012, through December 31, 2013. The full timeseries should contain 679 observations. This dataset contains 679 observations, indicating a complete period of record. Summary statistics are listed below.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   4.002   9.360  17.740
```

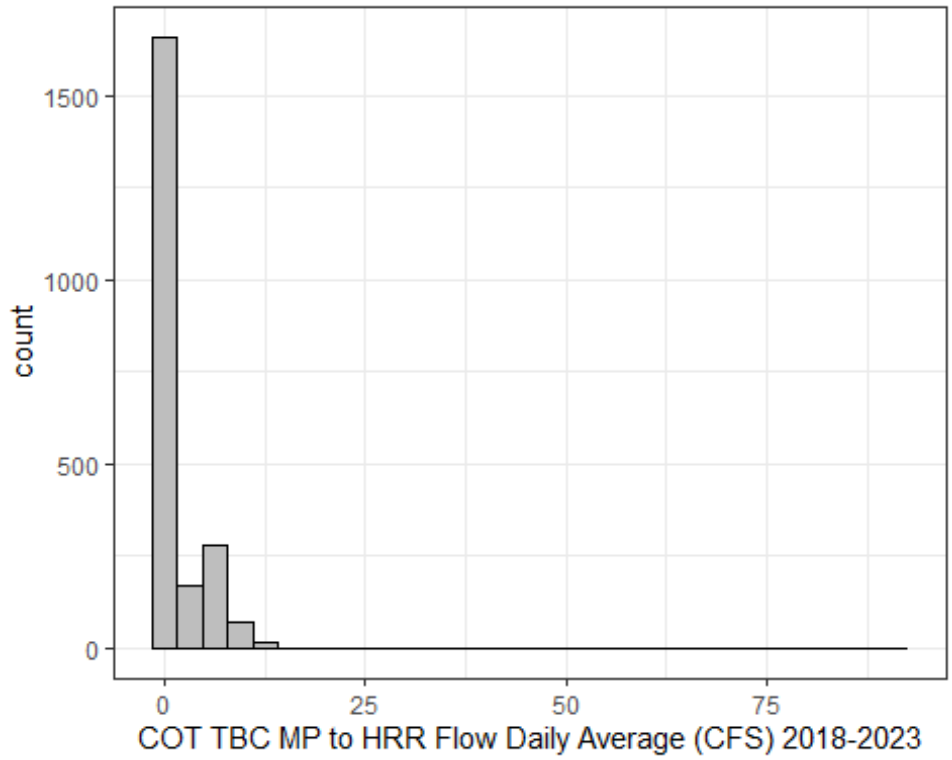
COT_MP_2_HRR_S161 - Middle Pool Contribution

File name:
/COT/TBC_MP_to_HRR/COT_TBCMP_Pumped_2_HRR_DailyAverage_20180101_20231231.xlsx

Metadata: This data is the pumpage sent from the Tampa Bypass Canal Middle Pool to the Hillsborough River Reservoir over the S-161 water control structure for minimum flow implementation by the City of Tampa from January 1, 2018 – December 31, 2023. This spreadsheet is consolidated daily average cfs pumpage data as reported daily by the City of Tampa to the EFL Section, Southwest Florida Water Management District. Questions about this data should be sent to the City of Tampa directly. The source for this data is the consolidated spreadsheet stored by the EFL section in SharePoint called CombinedPDFComplianceReportsData.xlsx. These flows do not directly contribute to LHR

total flow calculation but are supplied to Hillsborough River Reservoir to be used for minimum implementation. This data will be combined with the WMD_MP_2_HRR_S161 data to create one column of data “MP_2_HRR_S161”.

The period of record for this dataset is from January 1, 2018 through December 31, 2023. The full timeseries should contain 2,191 observations. This dataset contains 2,191 observations, indicating a complete period of record. Summary statistics are listed below.



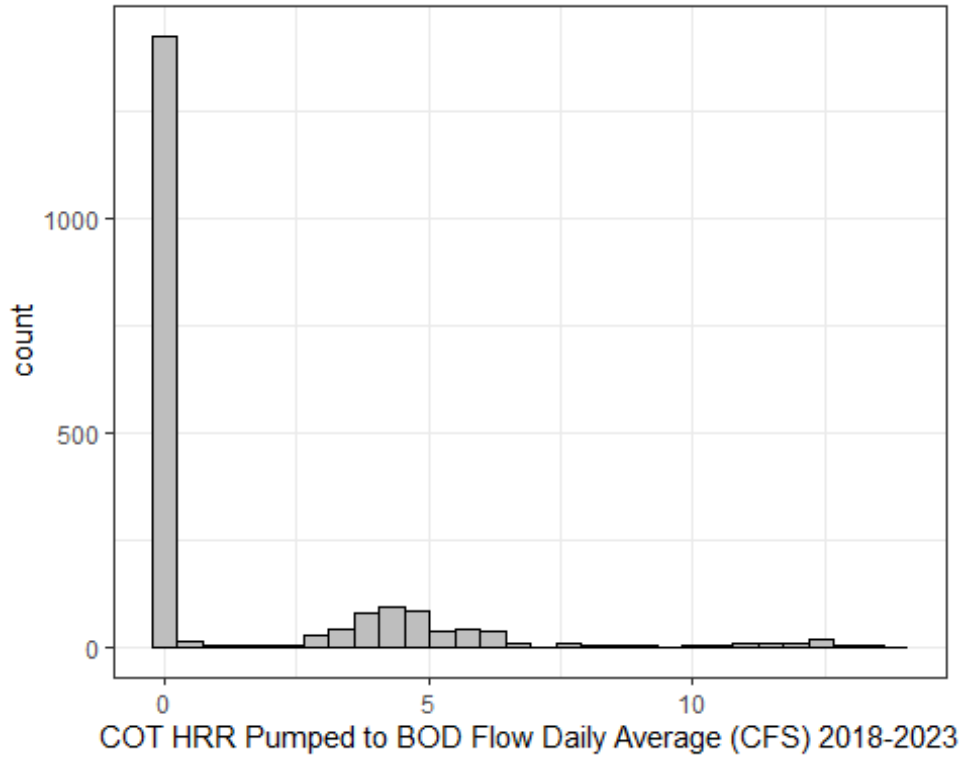

```
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.000   0.000   0.000   1.535   0.156  91.157
```

COT_HRR_2_BOD - COT Hillsborough River Reservoir(HRR) Pumped to Base of Dam Flow Contribution

File name:
/COT/HRR_to_BOD/COT_HRR_Pumped_2_BOD_DailyAverage_20180101_20231231.xlsx

Metadata: This data is the daily average flow (initially pumped over the dam and subsequently discharged via sluice gate after its completion) sent from the Hillsborough River Reservoir to the base of the dam for minimum flow implementation by the COT. This spreadsheet is consolidated daily average flow (cfs) data as reported daily by the COT to the EFL Section, Southwest Florida Water Management District. Questions about this data should be sent to the City of Tampa directly. The source for this data is the consolidated spreadsheet stored by the EFL section in SharePoint called CombinedPDFComplianceReportsData.xlsx. This data will be combined with the WMD_HRR_2_BOD data to create one column of data “HRR_2_BOD”.

The period of record for this dataset is from January 1, 2018, through December 31, 2023. The full timeseries should contain 2,191 observations. This dataset contains 2,191 observations, indicating a complete period of record. Summary statistics are listed below.




```
##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##    0.000   0.000   0.000   1.472   3.100  13.861     211
```

Southwest Florida Water Management District Data

WMD_HRR_2_BOD - WMD Hillsborough River Reservoir Pumped to Base of Dam Flow Contribution

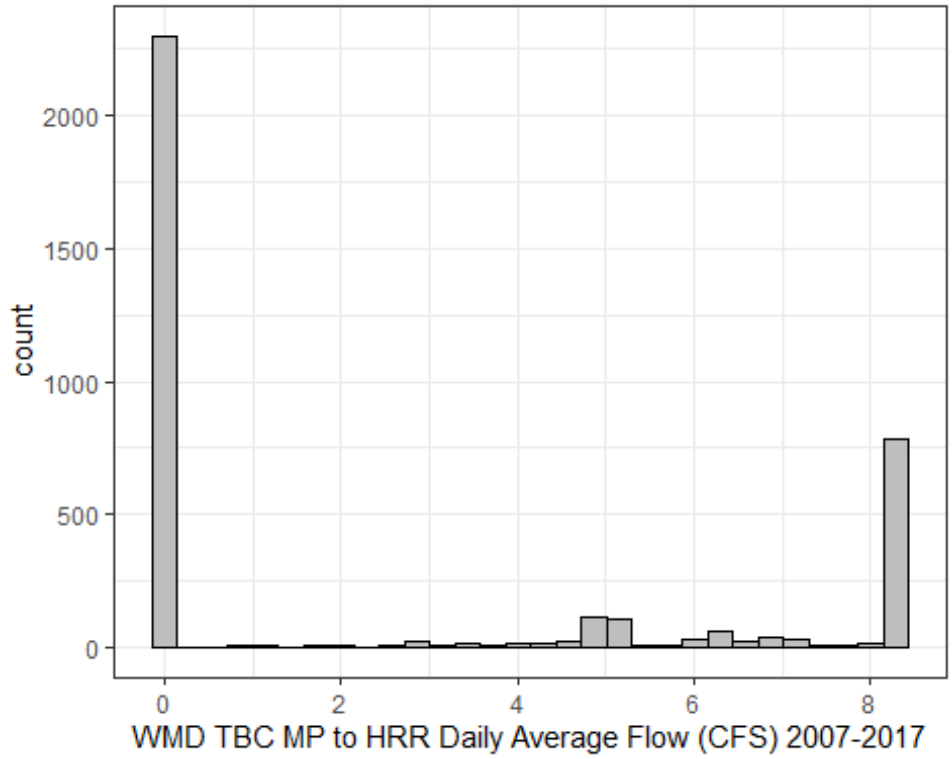
File name and path:
/WMD/Dam_Pump_WMD_Operated/DamPump_20071231_20171231_Final_WMD_OPERATED.xlsx

Metadata: This data is the daily average pumpage sent from the Tampa Bypass Canal Middle Pool over the S-161 water control structure via the Hillsborough River Reservoir to the base of the dam for minimum flow implementation for the LHR by the District from December 31, 2007, to December 31, 2017. This spreadsheet was created by Danielle Rogers, EFL Section, Southwest Florida Water Management District, on March 23, 2021. This spreadsheet contains Southwest Florida Water Management District operational daily

average data for the pump at the Lower Hillsborough River Dam as it pertains to the Lower Hillsborough River Recovery Strategy. This period of record represents the time S161 and the pump at the Lower Hillsborough River Dam were operated by the Southwest Florida Water Management District. This data should be used for minimum flow analysis and takes precedence over existing SCADA data or previously prepared spreadsheets. This data was created from various sources and has been approved by Mike Bartlett (former operator) and Patrick Casey (current operator) of the District. This data will be combined with the COT_HRR_2_BOD data to create one column of data "HRR_2_BOD".

Flows are in million gallons per day (MGD) and are converted to CFS within code using a conversion factor of 1.5472286365101.

The period of record for this dataset is from December 31, 2007, through December 31, 2017. There are a total of 3,654 observations in the dataset indicating there are no missing dates. Summary statistics (in cfs) are provided for these data below.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   2.585   6.204   8.293
```

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WMD_MP_2_HRR_S161 - Middle Pool Contribution Reported by the District 2007-2017

File name and path:
161_TBC_MP_2_HRR_WMD_OPERATED161_20071231_20171231_Final_WMD_OPERATED.xlsx

Metadata: This spreadsheet was created by Danielle Rogers, Environmental Flows and Levels Section, Southwest Florida Water Management District, on March 23, 2021. This spreadsheet contains Southwest Florida Water Management District operational daily average data for the Tampa Bypass Canal (TBC) as it pertains to the Lower Hillsborough Recovery Strategy for S161, i.e., water moved from the middle pool (Harney Canal) to the Hillsborough River Reservoir. This period of record represents the time S161 and the pump at the Lower Hillsborough River Dam were operated by the Southwest Florida Water Management District. This data should be used for minimum flow analysis, and takes precedence over existing SCADA data or previously prepared spreadsheets. This data was created from various sources and has been approved by Mike Bartlett (former operator) and Patrick Casey (current operator) of the District. This data will be combined with the COT_MP_2_HRR_S161 data to create one column of data "MP_2_HRR_S161".

Flows are in million gallons per day (MGD) and are converted to CFS within code using a conversion factor of 1.5472286365101.

The period of record for this dataset is from December 31, 2007, through December 31, 2017. There are a total of 3,654 observations in the dataset indicating there are no missing dates . Summary statistics (in cfs) are provided for these data below.

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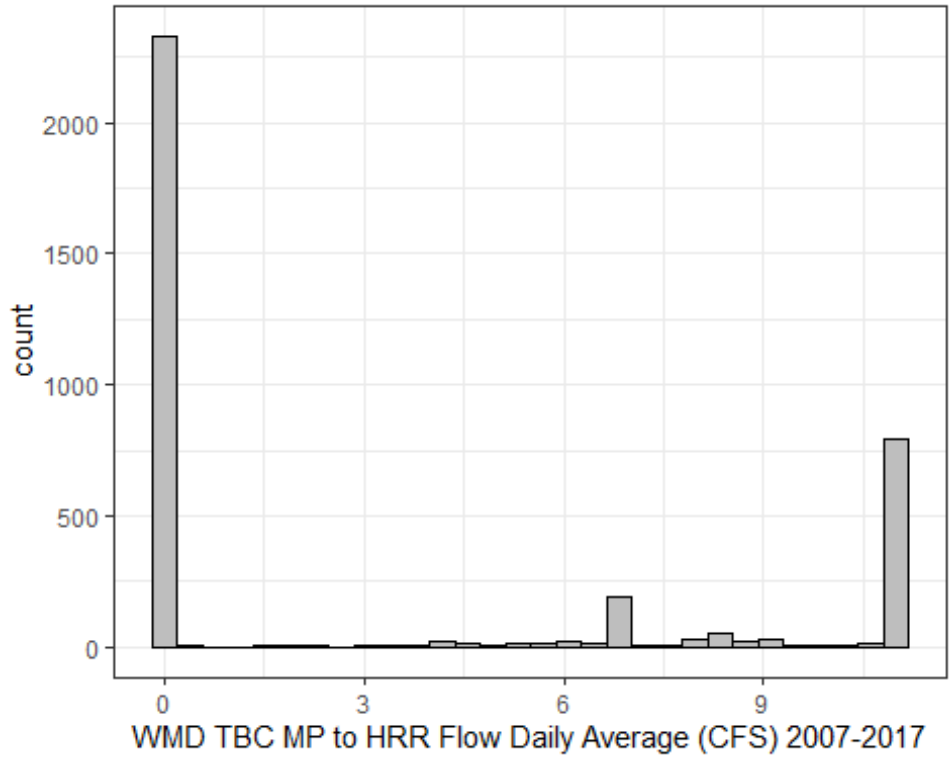


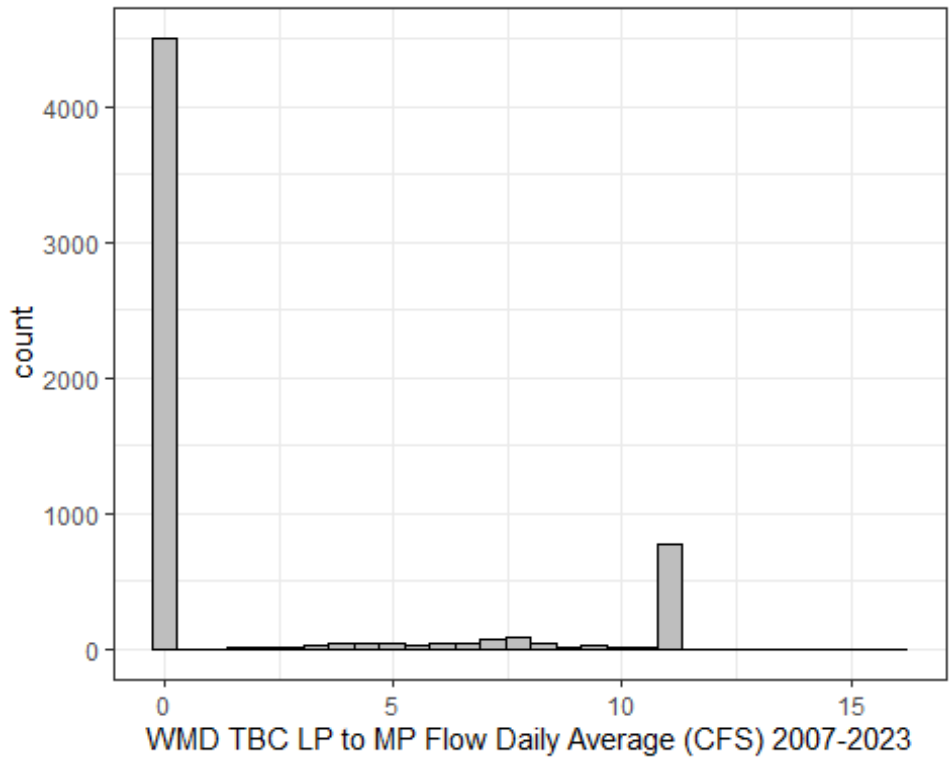

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   3.385   8.200  11.001
```

WMD_LP_2_MP - WMD TBC Lower Pool To Middle Pool

File name and path: /WMD/S162_TBC_LP_2_MP/S162 Pumpage Data 12-31-2007 Through Most Recent.xlsx

Metadata: Spreadsheet was created by Danielle Rogers, EFL Section, SWFWMD. This spreadsheet is updated as additional data is provided by the Structures & Operations Section and reflects the pumpage values at Structure S162. These values represent the pumpage rate for water that was moved from the Lower Pool to the Middle Pool in the Tampa Bypass Canal and is intended to be used for review of minimum flow implementation for the Lower Hillsborough River at structure S-162. Tab titled "POR Daily Average" contains the S162 daily average pumpage in cfs, as calculated on the other tabs in this workbook, rounded to the hundredths. This tab was imported for this dataset.

The period of record for this dataset is from December 31, 2007, through December 31, 2023. There are a total of 5,845 observations in the dataset indicating there are no missing dates. Summary statistics (in cfs) are provided for these data below.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   2.078   0.000  16.000
```

Calculations

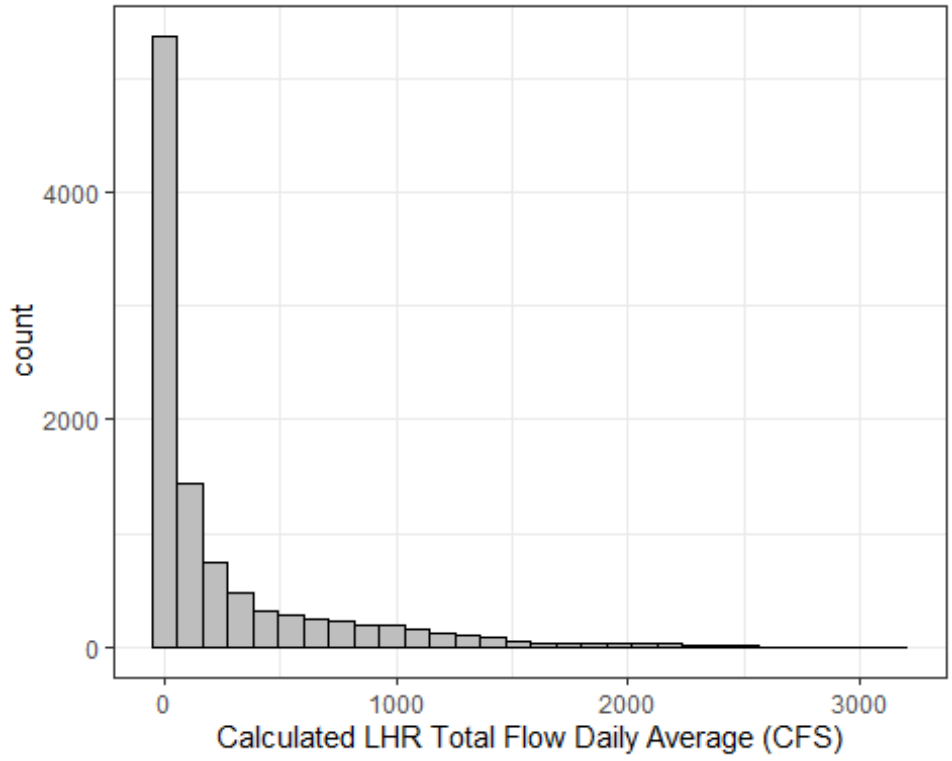
Several calculations are required to generate total flows required and provided to the LHR.

LHR_Totflow – Lower Hillsborough River Calculated Total Flow

The total flow to the LHR (LHR_Totflow) is calculated as the sum of the USGS dam flow, COT flows pumped from Blue Sink and Sulphur Springs to the base of the dam, and diversions from HR Dam Pump Station (or Sluice Gate):

LHR_Totflow = USGS_Dam_Flow + BS_2_BOD + SS_2_BOD + HRR_2_BOD

Provisional data from USGS gages were accepted along with all reported values. 15 days with missing values for USGS Dam Flow were filled using linear interpolation. which results in the total flow over the dam always being greater than zero. See checkflow dataframe generated by code for details.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00   15.61   41.00  257.55  297.00 3160.00
```

Base_MFL

The Base_MFL is a time-dependent criterion value that provided a foundation when establishing the required minimum flows for the LHR. This Base_MFL does not include any adjustments subsequently defined as part of the recovery strategy to calculate the final minimum flow required by rule for the LHR which is defined below as the "Applied MFL".

Base_MFL:

• Prior to January 1, 2000 = 0

• January 1, 2000 to September 30, 2007 = 10 cfs

• After September 30, 2007, seasonally dependent Base MFL

- 24 cfs from April through June
- 20 cfs otherwise

Zephyrhills Gage Adjustments

Beginning on October 1, 2007 an adjustment to the required minimum flow for the Lower Hillsborough River was implemented in the R code. When flows at the USGS 02303000 Hillsborough RV at State Park NR Zephyrhills, FL gage are below 58 cfs, an adjustment to the minimum flows is made based on the difference between Zephyrhills flow and 58 cfs. This difference is multiplied by a seasonal adjustment factor which is then subtracted from the base minimum flow criteria (Base_MFL) to derive an adjusted criterion value ("MFL_Adjusted"). The adjustment rate factor is defined as:

Adj_Rate

Seasonal adjustment factors used if the USGS 02303000 Hillsborough RV at State Park NR Zephyrhills, FL gage is less than 58 cfs AND the date is October 1, 2007 or later:

• 0.35 (July 1 through March 31)

• 0.40 (April 1 through June 30)

ZEP_CHANGE

Amount below 58 cfs for the Zephyrhills gage.

• USGS_Zep_Flow< 58

- `ZEP_CHANGE = 58 - USGS_Zep_Flow`

• USGS_Zep_Flow >= 58

- `ZEP_ CHANGE = 0`

MFL_CHANGE

Proportionate amount should be applied to the base minimum flow:

• ZEP_CHANGE > 0

- `MFL_CHANGE = ZEP_CHANGE * Adj_Rate`

• ZEP_CHANGE <= 0

- `MFL_CHANGE = 0`

MFL_ADJUSTED

Value of minimum flow after adjustment based on Zephyrhills gage and prior to freshwater equivalents being applied.

• < October 1, 2007

- `Base MFL`

• >= October 1, 2007

- Base_MFL – MFL_CHANGE

Applied_MFL

A 3 cfs freshwater equivalent (FWE) was instituted on October 1, 2007 in the R code. Beginning on October 1 2007, 3 cfs is added on to the adjusted criterion value to derive the final minimum flow requirement ("Applied_MFL") for the LHR. The Applied_MFL parameter can be visualized in the plot at the end of this document and represents the final rule required minimum flow, accounting for all temporal, Zephyrhills Gage, and freshwater equivalents adjustments.

Bio Select

The Bio_Select parameter is used to subset the water quality and biology data to only those samples collected when the fully implemented MFL would have been in effect throughout the entire period of analysis (i.e. 1996-2023).

Bio_Select = post 2007 Base_MFL + FWE - MFL_CHANGE,

IMP_Req

Indicates if minimum flow implementation is required.

• USGS_Dam_Flow < Applied_MFL = Yes

• USGS_Dam_Flow > = Applied_MFL = No

MFL_Met_FWE

Indicates if minimum flow required with freshwater equivalents applied is achieved.

• LHR_Totflow >= Applied_MFL = Yes

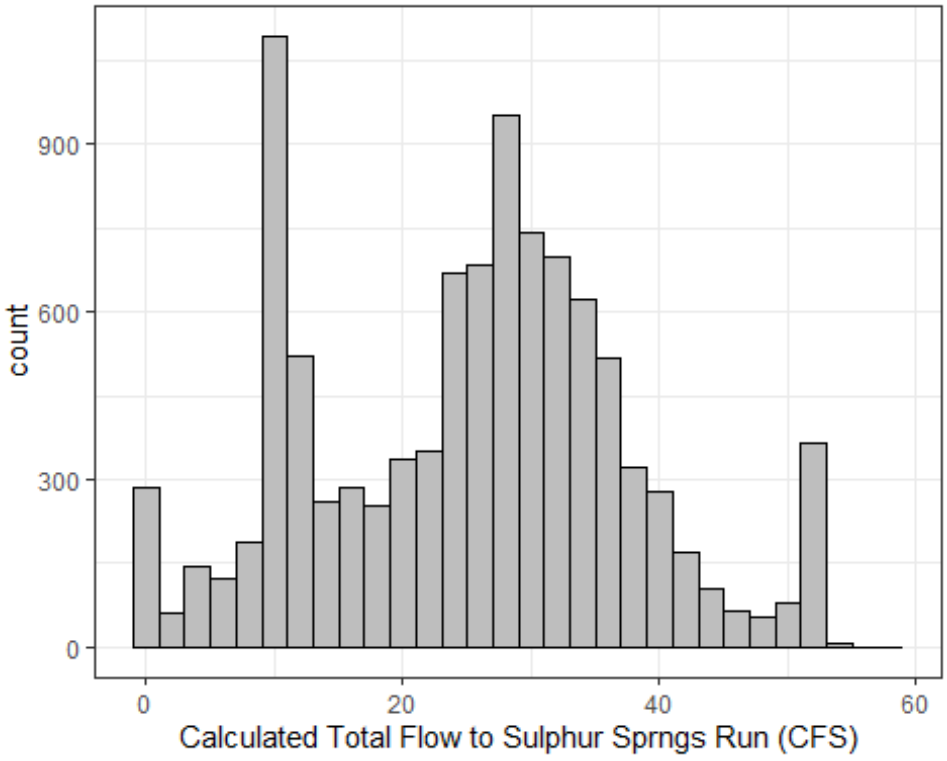
• LHR_Totflow < Applied_MFL = No

SSR_Totflow - Sulphur Springs Run Calculated Total Flow

The total flow to Sulphur Springs Run (SSR_Totflow) is also provided in this dataset. SSR_Totflow is calculated as the sum of the USGS Sulphur Springs Pool flow (Gage# 02306000) and the COT Sulphur Springs pumped to run flow:

SSR_TotFlow = USGS_SSP_Flow + SS_Pumped_2_Run

Provisional data from USGS gages were accepted along with all reported values. Missing values for either individual term are ignored and the total consists of the sum of available data.




```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00   14.10   26.60   25.18   33.20   58.00
```

Combine and Export Master Dataset

File name: LHR_Daily_Masterflow

Final Master Flow dataset is exported as R dataset and csv file which is subsequently read into MS Access as a deliverable format. Variable labels are embedded in the R file and listed at the bottom of this document which is also included as a separate table in the MS Access database.

Descriptive statistics (median and interquartile range) are provided for each variable below. The term “unknown” refers to missing values.

Below the table is a plot of the contributing flows to the total LHR flow and a crosswalk of the variable names and labels.

```
## Input object size:    2378392 bytes;  21 variables    10227 observations
## New object size: 2348912 bytes;  21 variables    10227 observations
```

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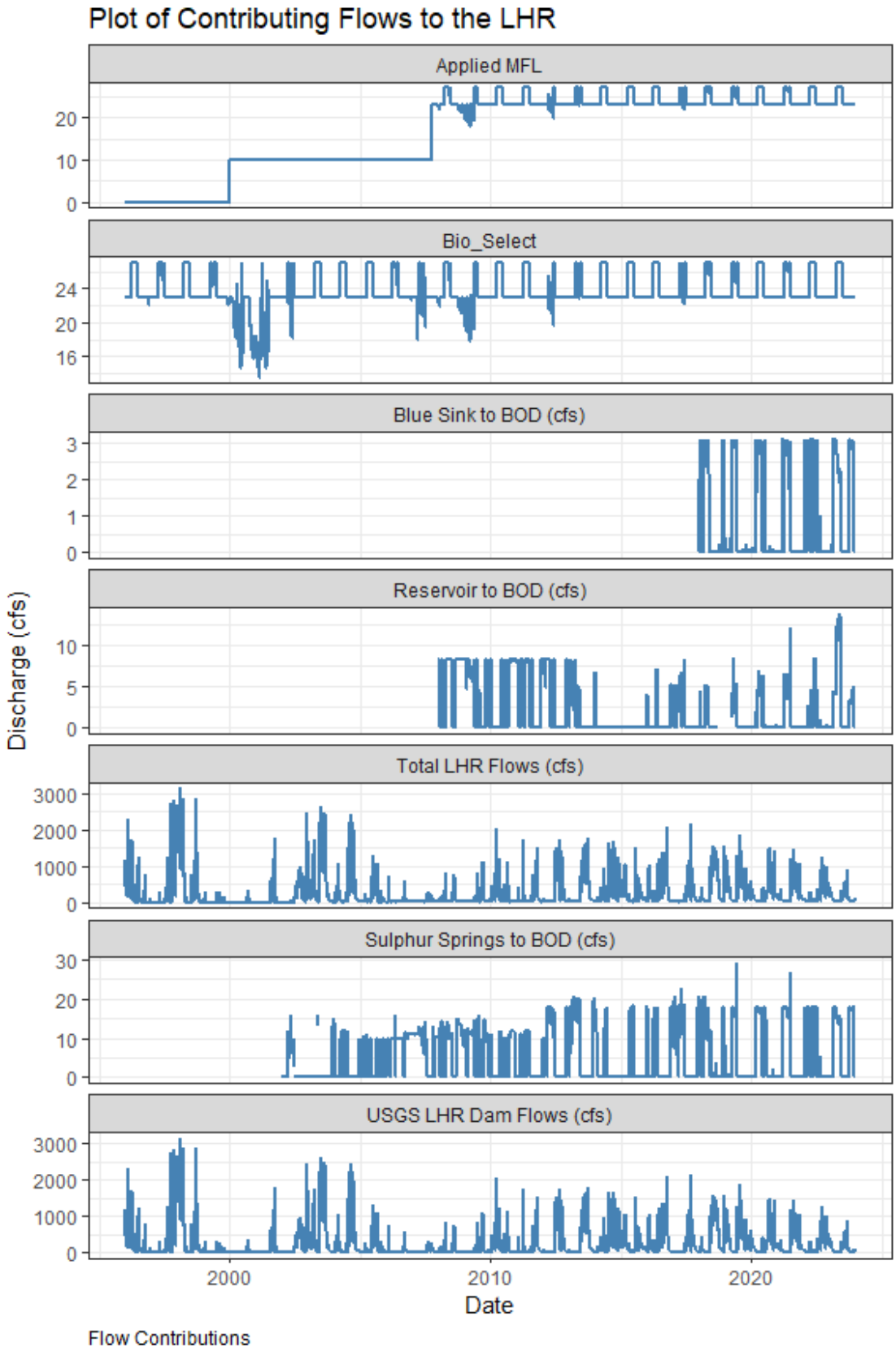
Characteristic	N = 10,227[1]
Date	1996-01-01 to 2023-12-31
USGS 02304500 Lower Hillsborough River Dam Flow (CFS)	39 (0, 297)
USGS 02303000 Zephyrhills Flow (CFS)	108 (75, 205)
COT Sulphur Springs Pumped to Base of Dam Flow Contribution (CFS)	0.0 (0.0, 11.0)
Unknown	2,211
COT Blue Sink Flow Contribution (CFS)	0.00 (0.00, 2.86)
Unknown	8,036
HRR to Base of Dam Flow Contribution (CFS)	0.00 (0.00, 4.98)
Unknown	4,593
Calculated Total Flows to LHR (CFS)	41 (16, 297)
Zephyrhills Adjustment Rate	
0.35	7,679 (75%)
0.4	2,548 (25%)
Time Dependent Base MFL (CFS)	
0	1,461 (14%)
10	2,830 (28%)
20	4,480 (44%)
24	1,456 (14%)
Amount below 58 for Zephyrhills Gage (CFS)	0.0 (0.0, 0.0)
ZEP_Change * adj_rate (CFS)	0.00 (0.00, 0.00)
Adjusted MFL requirement (CFS)	20 (10, 20)
Time Dependent MFL including Fresh Water Equivalent (i.e. 3 cfs)	23 (10, 23)
Cut off criterion value for subsetting data for Biological Analysis (CFS)	23.00 (23.00, 23.00)
MFL Implementation Required	3,889 (38%)
Was MFL WITH FWE Met? (yes/no)	7,340 (72%)
USGS 02306000 Sulphur Springs Pool Flow (CFS)	27 (13, 33)
COT Sulphur Springs Pumped to Run Flow (CFS)	0.0 (0.0, 10.0)
Unknown	5,896
COT TBC Middle Pool to HR Reservoir Diversion Flow (CFS)	0.0 (0.0, 6.0)
Unknown	4,382
TBC Lower Pool to Middle Pool Flow Diversions (CFS)	0.0 (0.0, 0.0)
Unknown	4,382
Calculated Total Flow to Sulphur Sprngs Run (CFS)	27 (14, 33)

[1]Range; Median (IQR); n (%)

Unknown refers to missing values

DRAFT



Flow Contributions

Variables Names and Labels

BS_2_BOD = “COT Blue Sink Flow Contribution (CFS)”,

HRR_2_BOD = “HRR to Base of Dam Flow Contribution (CFS)”,

SS_2_BOD = “COT Sulphur Springs Pumped to Base of Dam Flow Contribution (CFS)”,

USGS_Dam_Flow = “USGS 02304500 Lower Hillsborough River Dam Flow (CFS)”,

USGS_Zep_Flow = “USGS 02303000 Zephyrhills Flow (CFS)”,

LHR_Totflow = “Calculated Total Flows to LHR (CFS)”,

Base_MFL = “Time dependent Base MFL (CFS)”,

Adj_Rate = “Zephyrhills Adjustment Rate”,

ZEP_CHANGE = “Amount below 58 for Zephyrhills Gage (cfs)”,

MFL_CHANGE = “ZEP_Change * adj_rate (CFS)”,

MFL_Adjusted = “Adjusted MFL requirement (CFS)”,

Applied_MFL = “Time Dependent MFL including Fresh Water Equivalent (i.e. 3 cfs)”,

MFL_Met_FWE = “Was MFL WITH FWE Met? (yes/no)”

SS_Pumped_2_Run = “COT Sulphur Springs Pumped to Run Flow (CFS)”,

MP_2_HRR_S161 = “TBC Middle Pool to HR Reservoir Diversion Flow (CFS)”,

USGS_SSP_Flow = “USGS 02306000 Sulphur Springs Pool Flow (CFS)”,

LP_2_MP_Flows = “TBC Lower Pool to Middle Pool Flow Diversions (CFS)”

Imp_Req = “Min Flow Implementation Required”

SSR_TotFlow = “Calculated Total Flow to Sulphur Springs Run (CFS)”

Bio_Select = “Cut off criterion value for subsetting data for Biological Analysis (CFS)”