

# **Initial Analysis on the SSO and Bypass Issues For Future Model**

A Presentation to the CBP Wastewater Workgroup  
April 4, 2017

Ning Zhou, CBPO



# SSO and Bypass Issues For Future Model

**Background:** SSO is considered as illegal discharge and has traditionally been avoided in the Bay Models. Bypass has been permitted mainly as storm driven bypass of partially treated wastewater but not included in the reported DMR data for many plants.

## **Problems:**

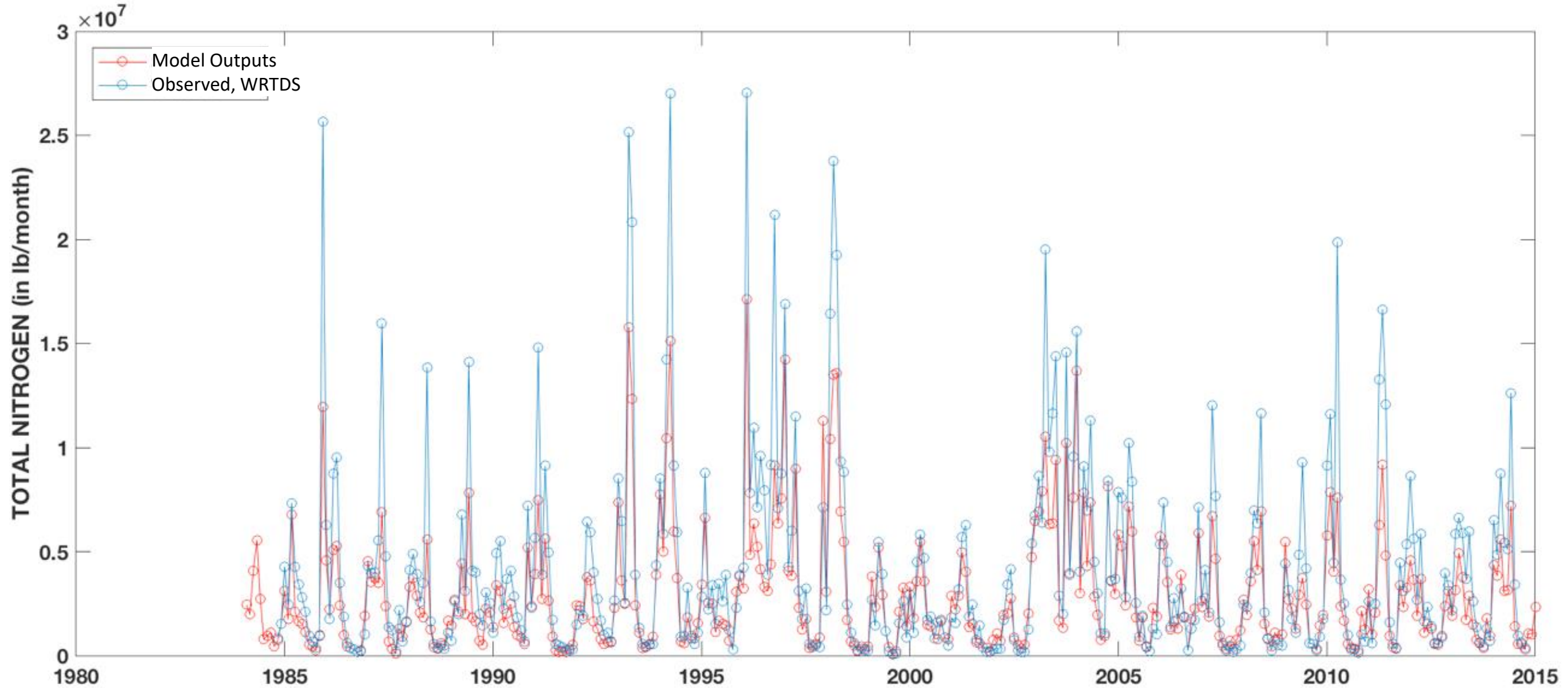
- A. The phase 6 model has the same issue that the previous versions had:
  - the model underestimates during storm events in many major river basins.
- B. Many NGOs, such as Blue Water Baltimore, have asked about how the Bay models handle the sewage spills.

**Data Analysis:** Maryland SSO and Bypass data (2005-2016) are summarized and compared with MD CSO data to show the magnitude of SSO and Bypass contributions.

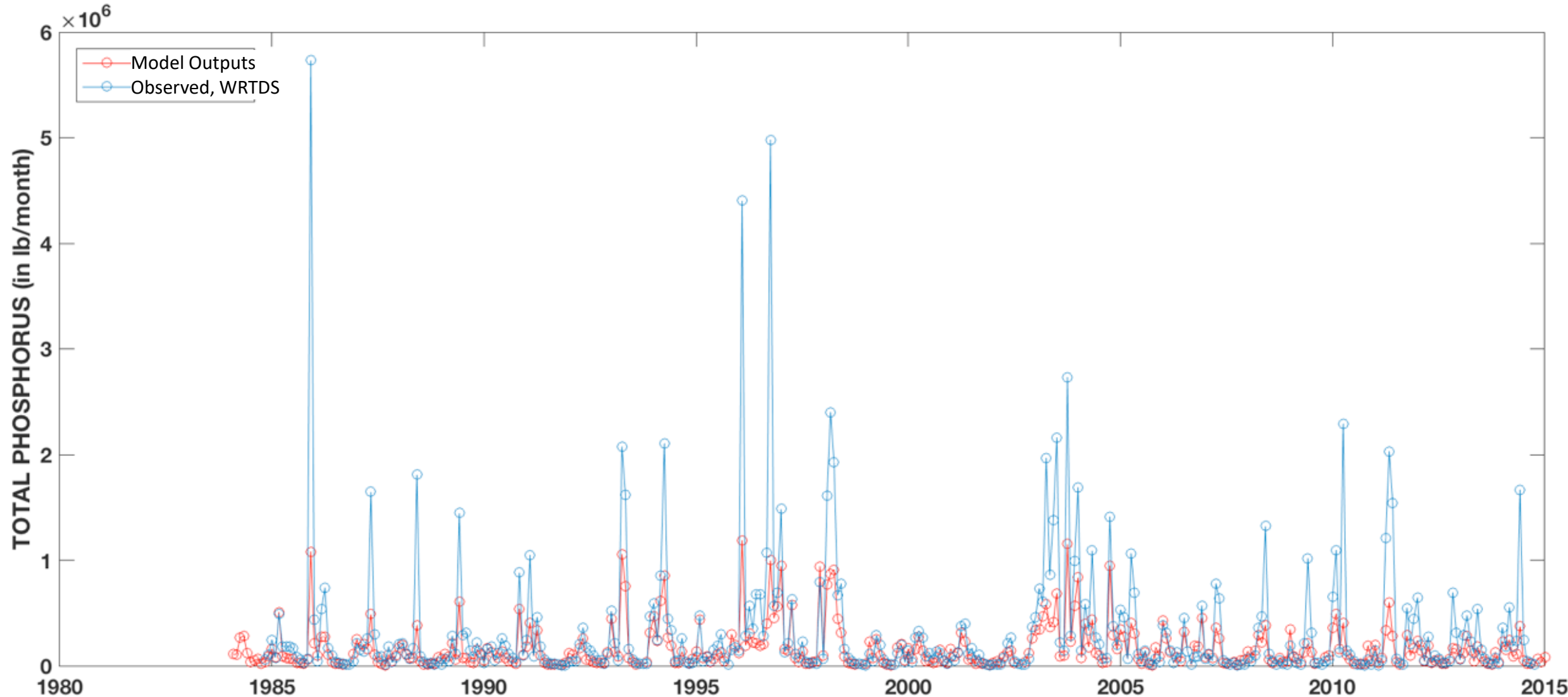
## **Options:**

- 1. Workgroup provides a recommendation to WQGIT to include SSO and Bypass in future model (phase 7?) and starts to check the availabilities of the SSO and Bypass data.
- 2. Workgroup continues to investigate these issues.

# Potomac River TN Loads– model output vs observed



# Potomac River TP Loads– model output vs observed



# SSO and Bypass Issues For Future Model

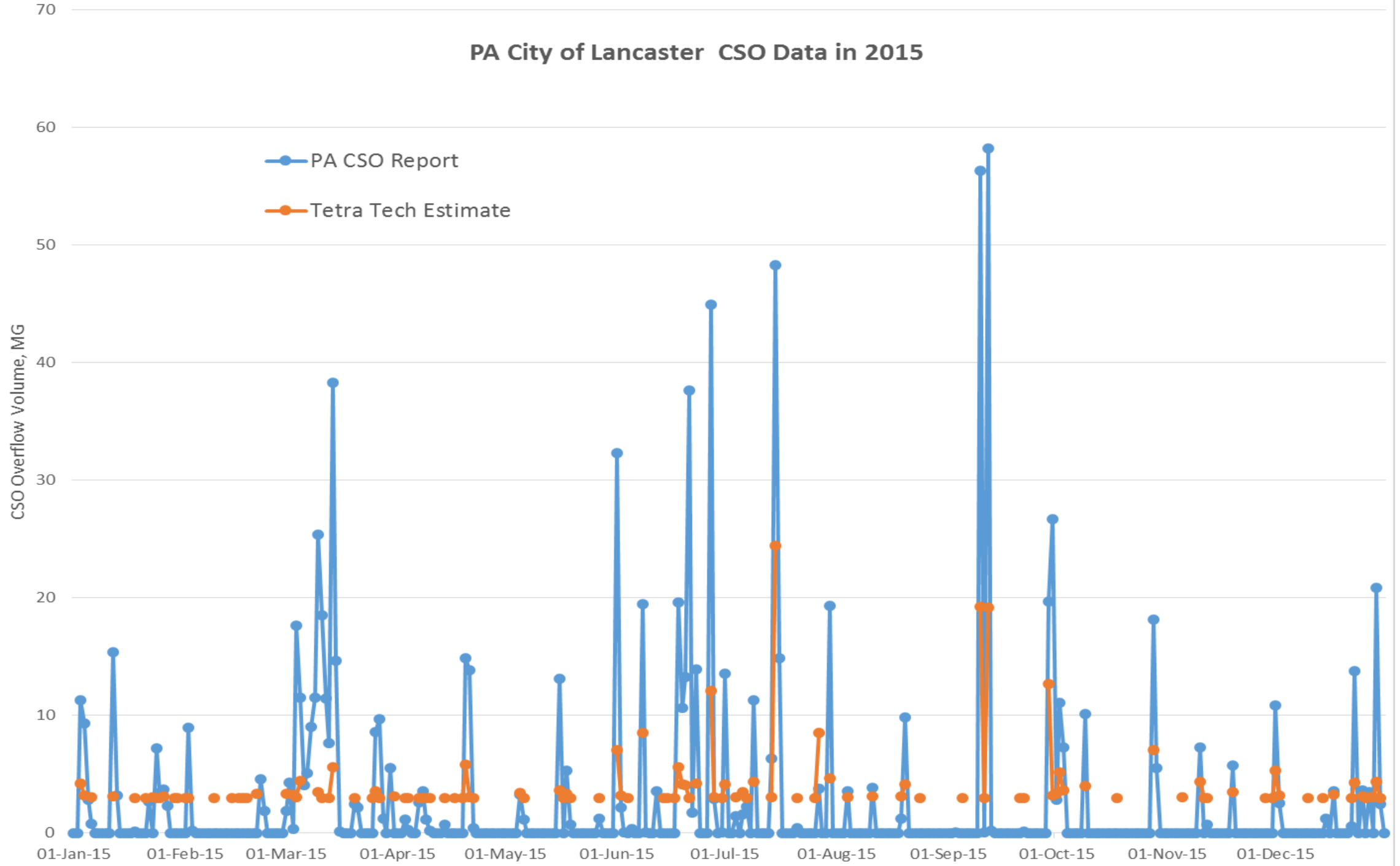
The underestimation could be caused by many storm related event inputs, such as urban runoff, ag land runoff, CSO, SSO, Bypass, and etc. Further research is needed to study the causes to improve the model.

CSO, SSO and Bypass are in the domain of WWTWG. We know SSO and Bypass are missing in the models.

We decided to use a hybrid approach to handle CSO data before we can collect more reported CSO data. Example CSO data from Lancaster PA is presented on next slides to show the differences between the state reported CSO data and the Tetra Tech estimates.

Are SSO and Bypass significant enough to contribute the model underestimation during storm event?

## PA City of Lancaster CSO Data in 2105



# SSO and Bypass Issues For Future Model

Are SSO and Bypass significant enough to contribute to the model underestimation during storm events?

Let us take a look at the Maryland SSO and Bypass data.

The screenshot shows a web browser window displaying the Maryland Department of the Environment's "Reported Sewer Overflow Database" page. The browser's address bar shows the URL: <http://www.mde.state.md.us/programs/Water/OverFlow/Pages/ReportedSewerOverflow>. The page header features the MDE logo and the text "THE DEPARTMENT OF THE ENVIRONMENT". A navigation menu includes links for HOME, MARYLANDER, ABOUT MDE, PERMITS, and NEWSROOM. A search bar is located in the top right corner. The main content area is titled "Maryland Reported Sewer Overflow Database" and contains a paragraph about the "New Overflow or Bypasses Regulation" effective on March 28, 2005. It also provides a detailed description of the database, stating it contains bypasses, combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs) reported from January 2005 through the most recent update. A search section is located at the bottom, with instructions on how to use the search criteria and a note to use the IE browser for Excel spreadsheets. The search form includes dropdown menus for "Type of Overflow" and "Year", and text input fields for "Municipality/Facility" and "NPDES No.".

http://www.mde.state.md.us/programs/Water/OverFlow/Pages/ReportedSewerOverflow

Reported Sewer Overflow

THE DEPARTMENT OF THE ENVIRONMENT

HOME MARYLANDER ABOUT MDE PERMITS NEWSROOM

email friend print

### Maryland Reported Sewer Overflow Database

New Overflow or Bypasses Regulation - Regulations that address reporting and public notification regarding sewage overflows and wastewater treatment plant bypasses became effective on March 28, 2005.

The Maryland Reported Sewer Overflow Database contains bypasses, combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs) reported to the Maryland Department of the Environment (MDE) from January 2005 through the most recent update. MDE updates this database regularly. Although MDE requires that all public sewer system owners or operators report overflows to us, there may be incidents that were not reported. Note that overflow amounts provided by the person reporting the overflow may be estimated using professional judgment or they may be actual readings from flow measurement devices when available.

If you have any questions about this database, please contact Ms. Sharon Talley, Mr. Jesse Salter or Mr. William Lee at 410-537-35

#### SEARCH

Database records will be searched using valid criteria entered. Text searches are done by keywords only. **The date format is mm/dd/yyyy with no leading zeros.** For example, 8/21/2001 and 11/1/2001 are valid entries; 08/21/2001 and 11/01/2001 are not. The zip has five digits only. You may leave any of the input boxes blank.

**Please use the IE browser when generating an Excel spreadsheet.**

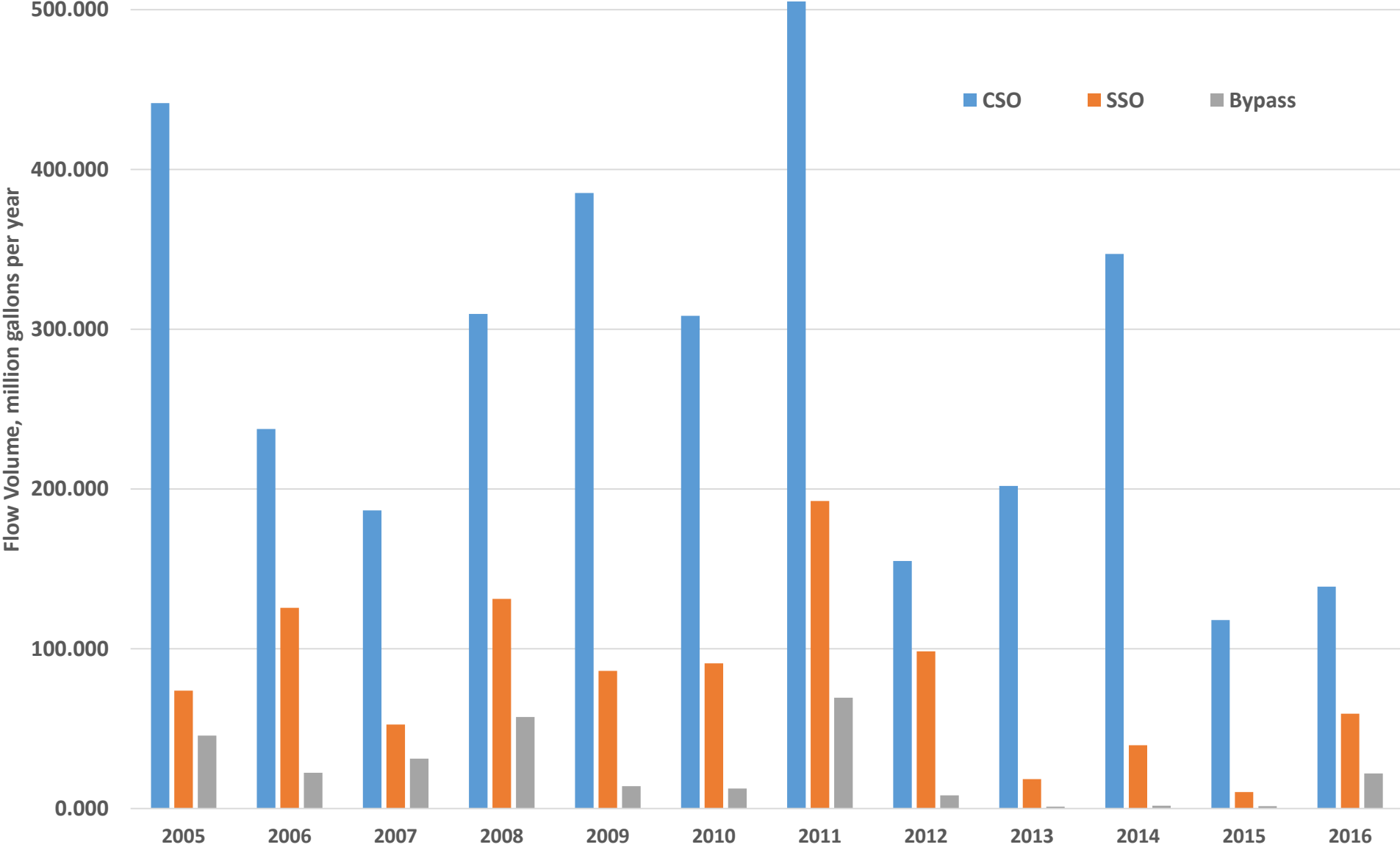
Type of Overflow  ▼

Year  ▼

Municipality/Facility

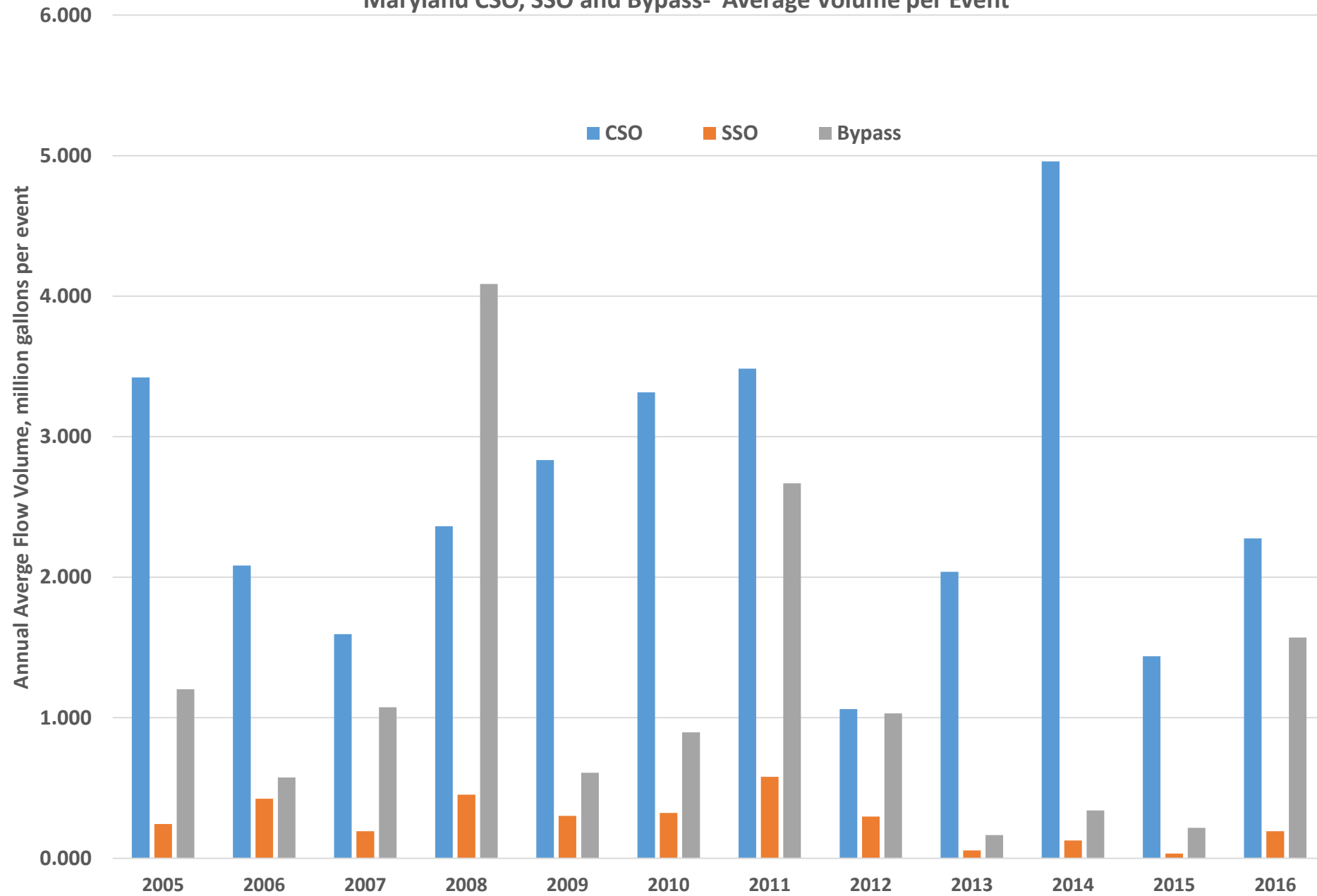
NPDES No.

Maryland CSO, SSO and Bypass Flow Annual Volumes

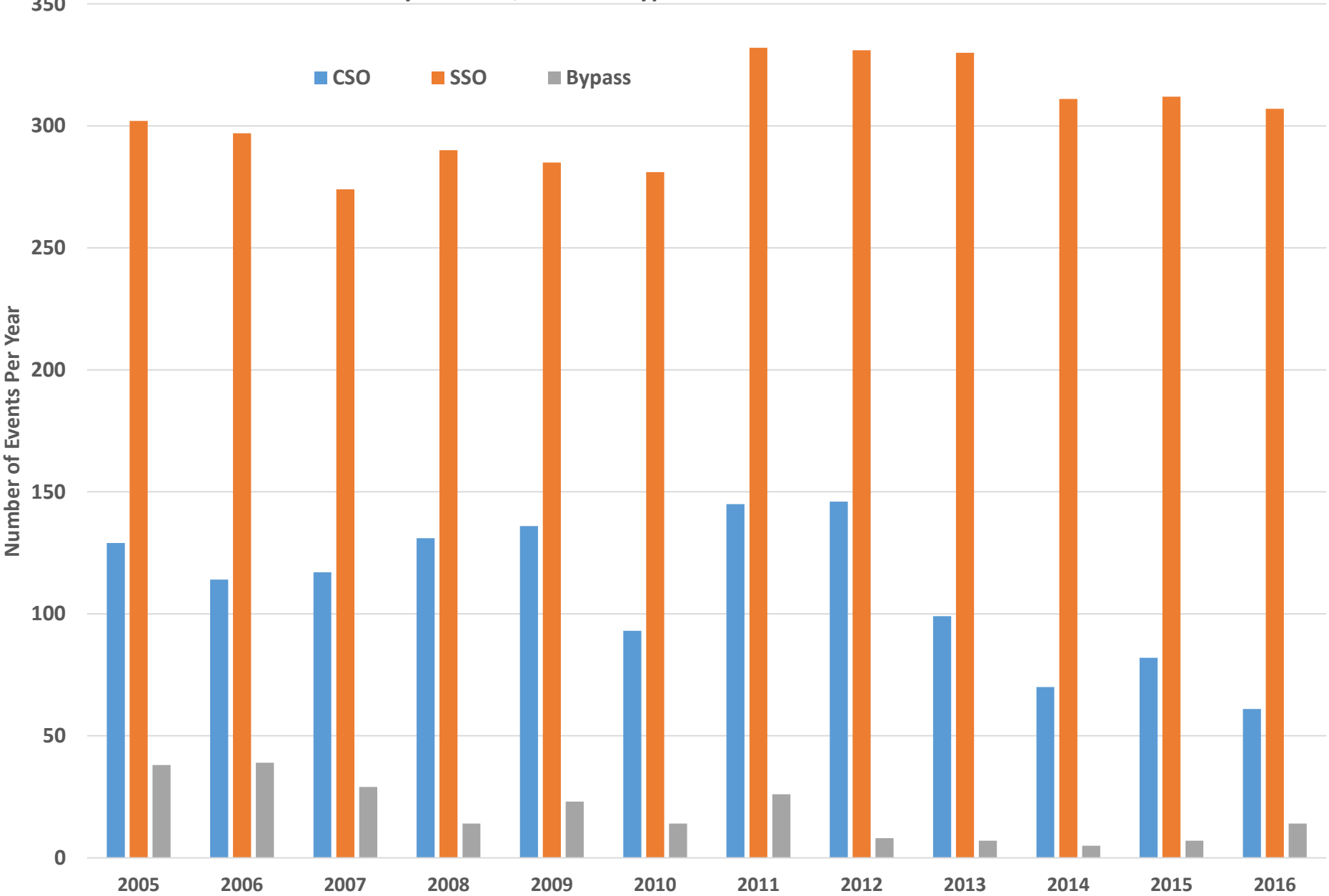




Maryland CSO, SSO and Bypass- Average Volume per Event



Maryland CSO, SSO and Bypass - Number of Events Per Year



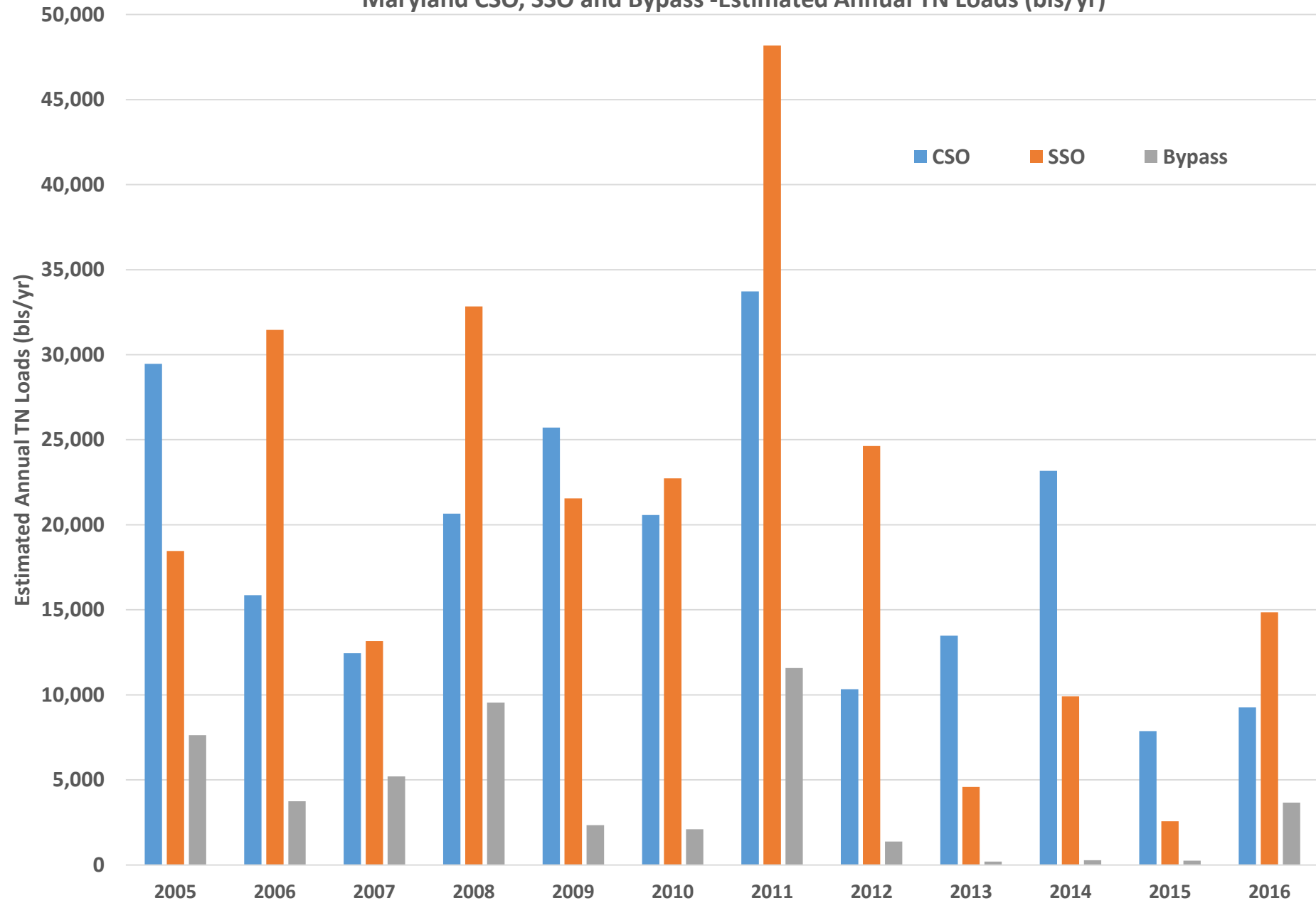
## Maryland Reported CSO, SSO and Bypass Data

|      | CSO      |                        |                         | SSO      |                        |                         | Bypass   |                        |                         |
|------|----------|------------------------|-------------------------|----------|------------------------|-------------------------|----------|------------------------|-------------------------|
| Year | # Events | Annual Total FLOW (MG) | Avg Flow per event (MG) | # Events | Annual Total FLOW (MG) | Avg Flow per event (MG) | # Events | Annual Total FLOW (MG) | Avg Flow per event (MG) |
| 2005 | 129      | 441.477                | 3.422                   | 302      | 73.761                 | 0.244                   | 38       | 45.701                 | 1.203                   |
| 2006 | 114      | 237.591                | 2.084                   | 297      | 125.669                | 0.423                   | 39       | 22.414                 | 0.575                   |
| 2007 | 117      | 186.593                | 1.595                   | 274      | 52.582                 | 0.192                   | 29       | 31.175                 | 1.075                   |
| 2008 | 131      | 309.496                | 2.363                   | 290      | 131.166                | 0.452                   | 14       | 57.210                 | 4.086                   |
| 2009 | 136      | 385.290                | 2.833                   | 285      | 86.114                 | 0.302                   | 23       | 13.998                 | 0.609                   |
| 2010 | 93       | 308.320                | 3.315                   | 281      | 90.783                 | 0.323                   | 14       | 12.547                 | 0.896                   |
| 2011 | 145      | 505.174                | 3.484                   | 332      | 192.476                | 0.580                   | 26       | 69.370                 | 2.668                   |
| 2012 | 146      | 154.902                | 1.061                   | 331      | 98.386                 | 0.297                   | 8        | 8.248                  | 1.031                   |
| 2013 | 99       | 201.873                | 2.039                   | 330      | 18.342                 | 0.056                   | 7        | 1.154                  | 0.165                   |
| 2014 | 70       | 347.102                | 4.959                   | 311      | 39.649                 | 0.127                   | 5        | 1.704                  | 0.341                   |
| 2015 | 82       | 117.867                | 1.437                   | 312      | 10.262                 | 0.033                   | 7        | 1.515                  | 0.216                   |
| 2016 | 61       | 138.818                | 2.276                   | 307      | 59.360                 | 0.193                   | 14       | 21.984                 | 1.570                   |

To convert the flow volumes to TN loads, we need to assume some draft TN concentrations for the calculation purpose. These draft concentrations are picked only for testing in this analysis and not citable.

|        | Draft TN | Justification  |
|--------|----------|--|
| CSO    | 8 mg/l   | Default value recommended for CSO by Tetra Tech  |
| Bypass | 20 mg/l  | Based on the flow weighted average of Blue Plains bypass outfall TN values in 2015 and 2016. |
| SSO    | 30 mg/l  | Considered with both wet and dry weather events  |

Maryland CSO, SSO and Bypass -Estimated Annual TN Loads (bls/yr)



## CSO was eliminated, but SSO is still running

| Municipality      | Year | # SSO Events | Annul SSO (Gallons) | Avg SSO (Gallons) per event | # CSO Events   | CSO (Gallons) | Avg CSO (Gallons) per event |
|-------------------|------|--------------|---------------------|-----------------------------|----------------|---------------|-----------------------------|
| City of Baltimore | 2005 | 84           | 4,749,943           | 56,547                      | 4              | 4,885         | 1,221                       |
| City of Baltimore | 2006 | 61           | 69,483,139          | 1,139,068                   | 2              | 22,255        | 11,128                      |
| City of Baltimore | 2007 | 61           | 549,564             | 9,009                       | CSO Eliminated |               |                             |
| City of Baltimore | 2008 | 104          | 1,620,464           | 15,581                      | 0              | 0             | 0                           |
| City of Baltimore | 2009 | 152          | 2,167,752           | 14,262                      | 0              | 0             | 0                           |
| City of Baltimore | 2010 | 136          | 1,578,754           | 11,608                      | 0              | 0             | 0                           |
| City of Baltimore | 2011 | 240          | 10,857,511          | 45,240                      | 0              | 0             | 0                           |
| City of Baltimore | 2012 | 287          | 259,440             | 904                         | 0              | 0             | 0                           |
| City of Baltimore | 2013 | 279          | 963,690             | 3,454                       | 0              | 0             | 0                           |
| City of Baltimore | 2014 | 238          | 13,586,924          | 57,088                      | 0              | 0             | 0                           |
| City of Baltimore | 2015 | 260          | 968,168             | 3,724                       | 0              | 0             | 0                           |
| City of Baltimore | 2016 | 172          | 8,444,691           | 49,097                      | 0              | 0             | 0                           |

## Baltimore County has no CSO, but it has SSO

| Municipality         | Year | # SSO<br>Evens | Annual SSO<br>(Gallons) | Avg SSO<br>(Gallons) per<br>event |
|----------------------|------|----------------|-------------------------|-----------------------------------|
| Baltimore County DPW | 2005 | 73             | 11,450,966              | 156,863                           |
| Baltimore County DPW | 2006 | 68             | 13,675,408              | 201,109                           |
| Baltimore County DPW | 2007 | 51             | 3,107,394               | 60,929                            |
| Baltimore County DPW | 2008 | 54             | 15,626,542              | 289,380                           |
| Baltimore County DPW | 2009 | 40             | 24,064,011              | 601,600                           |
| Baltimore County DPW | 2010 | 44             | 36,994,319              | 840,780                           |
| Baltimore County DPW | 2011 | 57             | 120,765,533             | 2,118,694                         |
| Baltimore County DPW | 2012 | 39             | 63,458,808              | 1,627,149                         |
| Baltimore County DPW | 2013 | 46             | 2,908,692               | 63,232                            |
| Baltimore County DPW | 2014 | 45             | 10,951,409              | 243,365                           |
| Baltimore County DPW | 2015 | 37             | 1,864,382               | 50,389                            |
| Baltimore County DPW | 2016 | 19             | 2,612,258               | 137,487                           |

# SSO and Bypass Issues For Future Model

**Background:** SSO is considered as illegal discharge and has traditionally been avoided in the Bay Models. Bypass has been permitted mainly as storm driven bypass of partially treated wastewater but not included in the reported DMR data for many plants.

## **Problems:**

- A. The phase 6 model has the same issue that the previous versions had:
  - the model underestimates during storm events in many major river basins.
- B. Many NGOs, such as Blue Water Baltimore, have asked about how the Bay models handle the sewage spills.

**Data Analysis:** Maryland SSO and Bypass data (2005-2016) are summarized and compared with MD CSO data to show the magnitude of SSO and Bypass contributions.

## **Options:**

1. Workgroup provides a recommendation to WQGIT to include SSO and Bypass in future model (phase 7?) and starts to check the availabilities of the SSO and Bypass data.
2. **Workgroup continues to investigate these issues.**