Chesapeake Bay Restoration

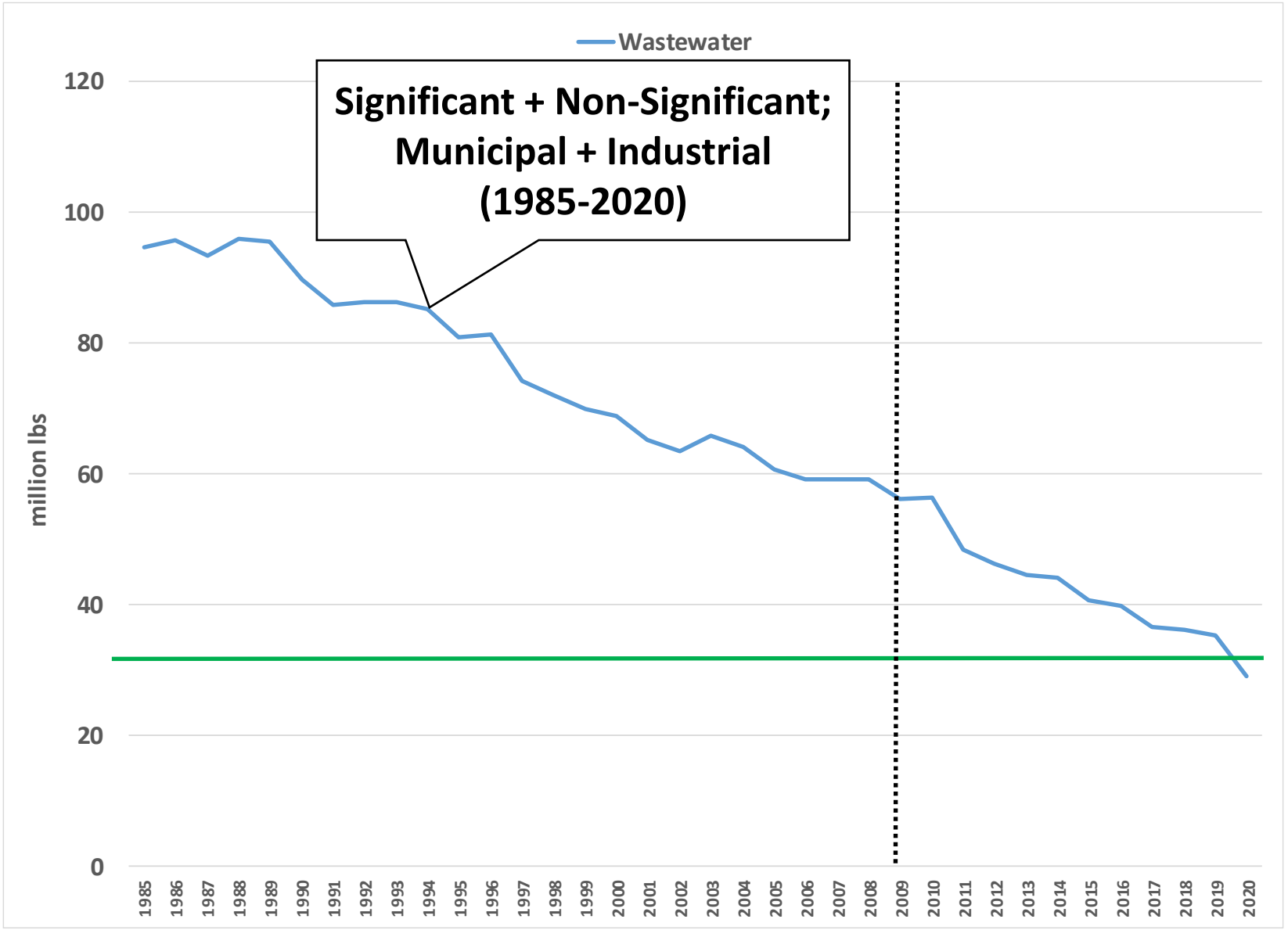
Wastewater Progress Through 2020

Jeff Sweeney
EPA, Chesapeake Bay Program Office

Wastewater Treatment Workgroup Meeting

November 2, 2021

CBW Wastewater Nitrogen Loads Delivered to CB



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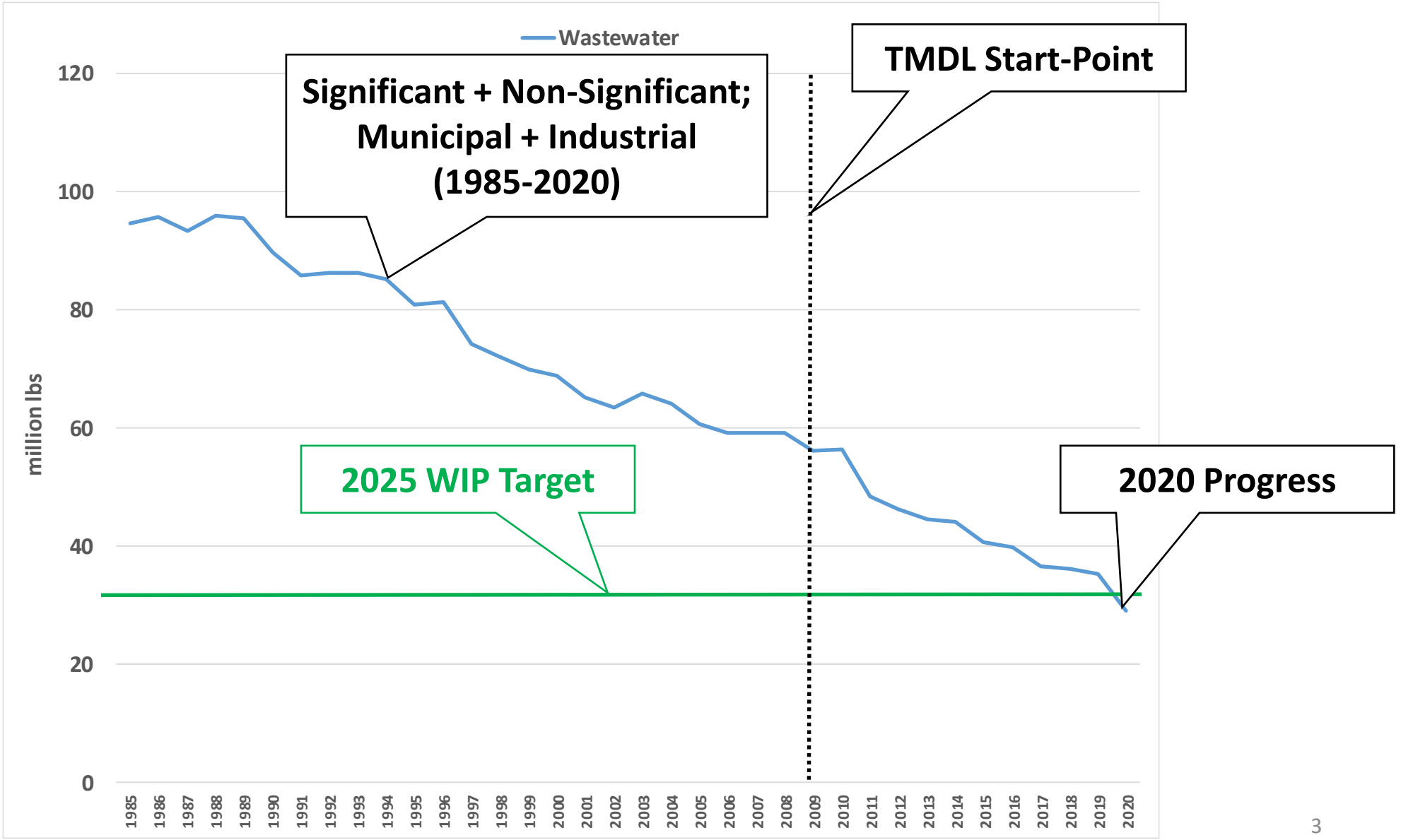
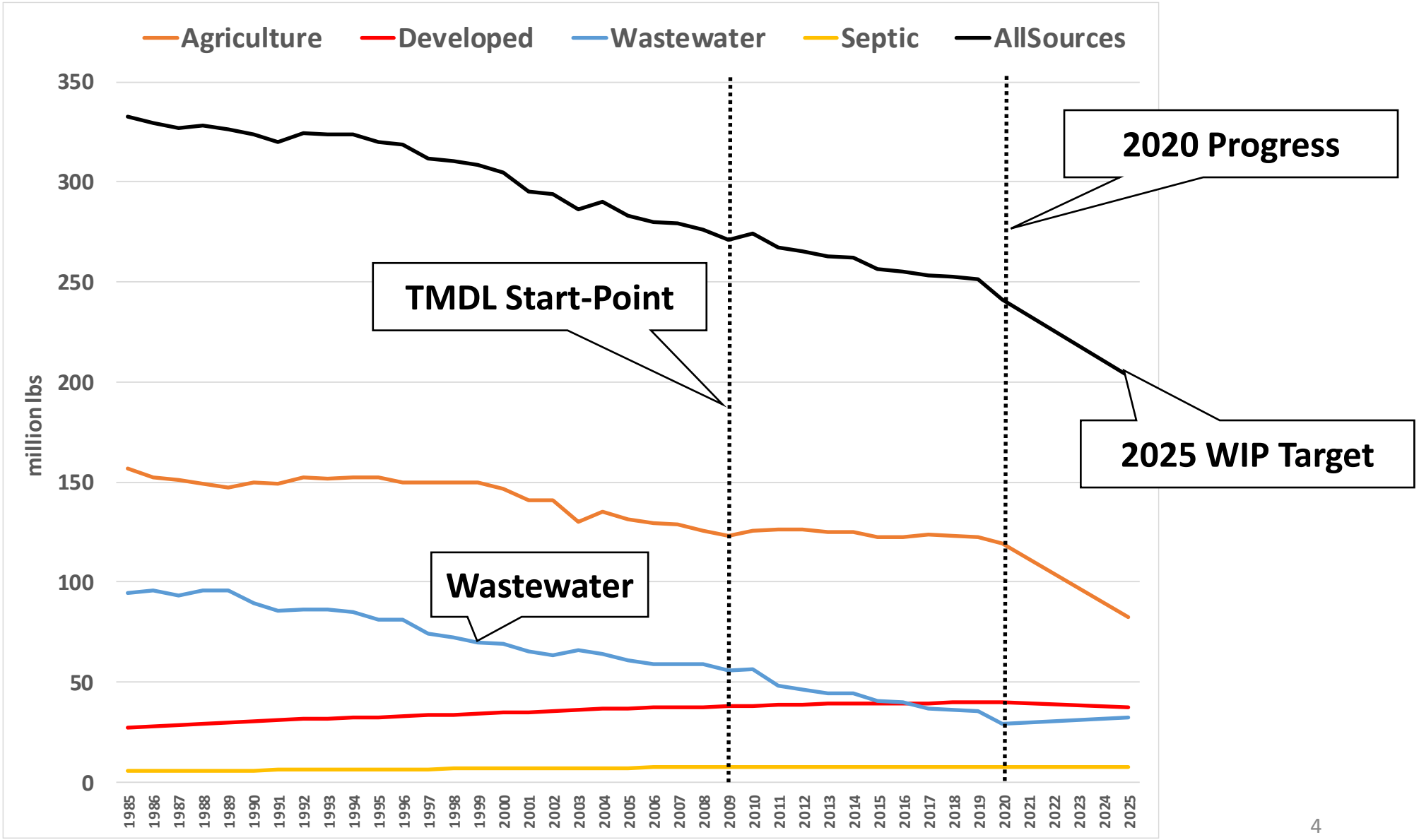
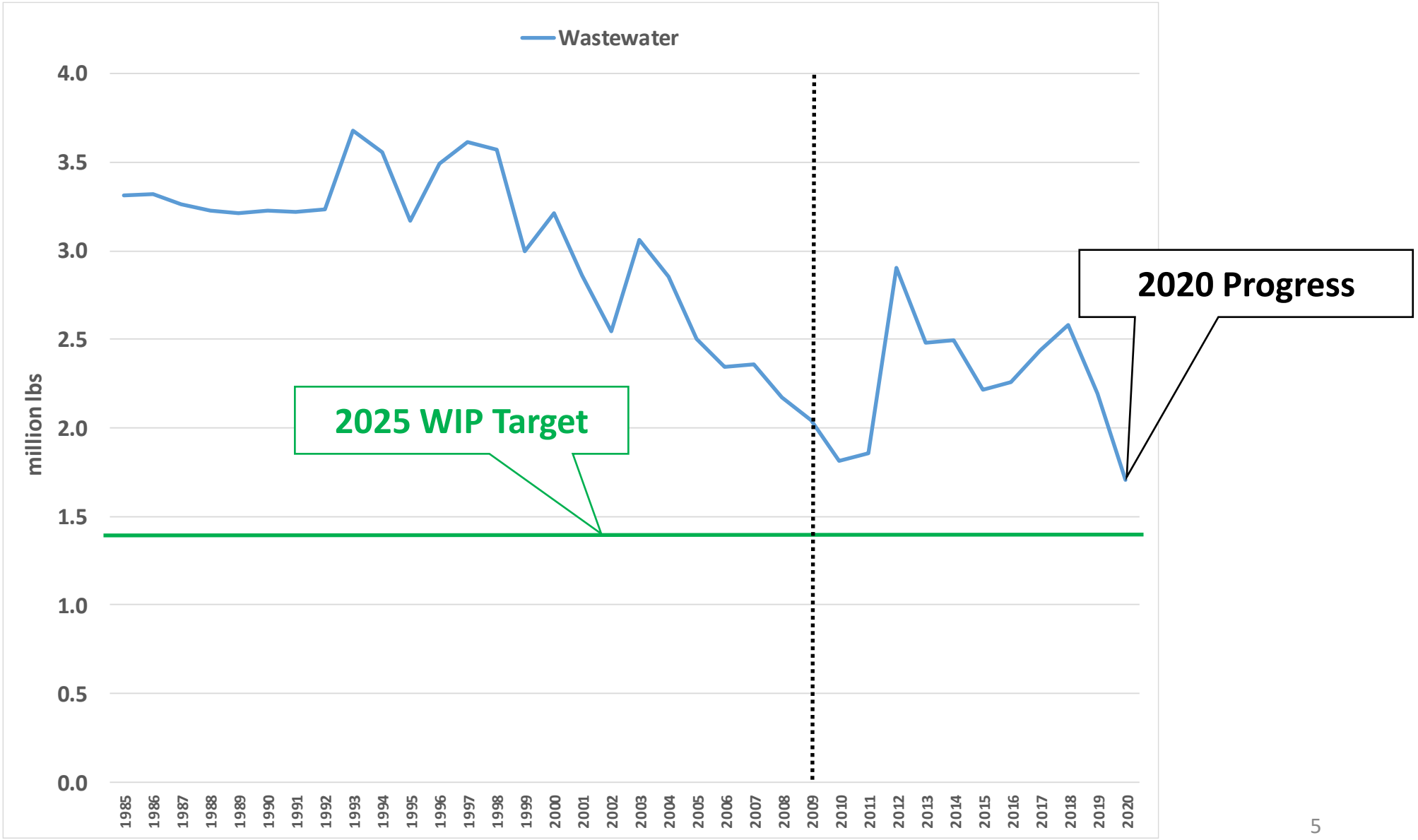


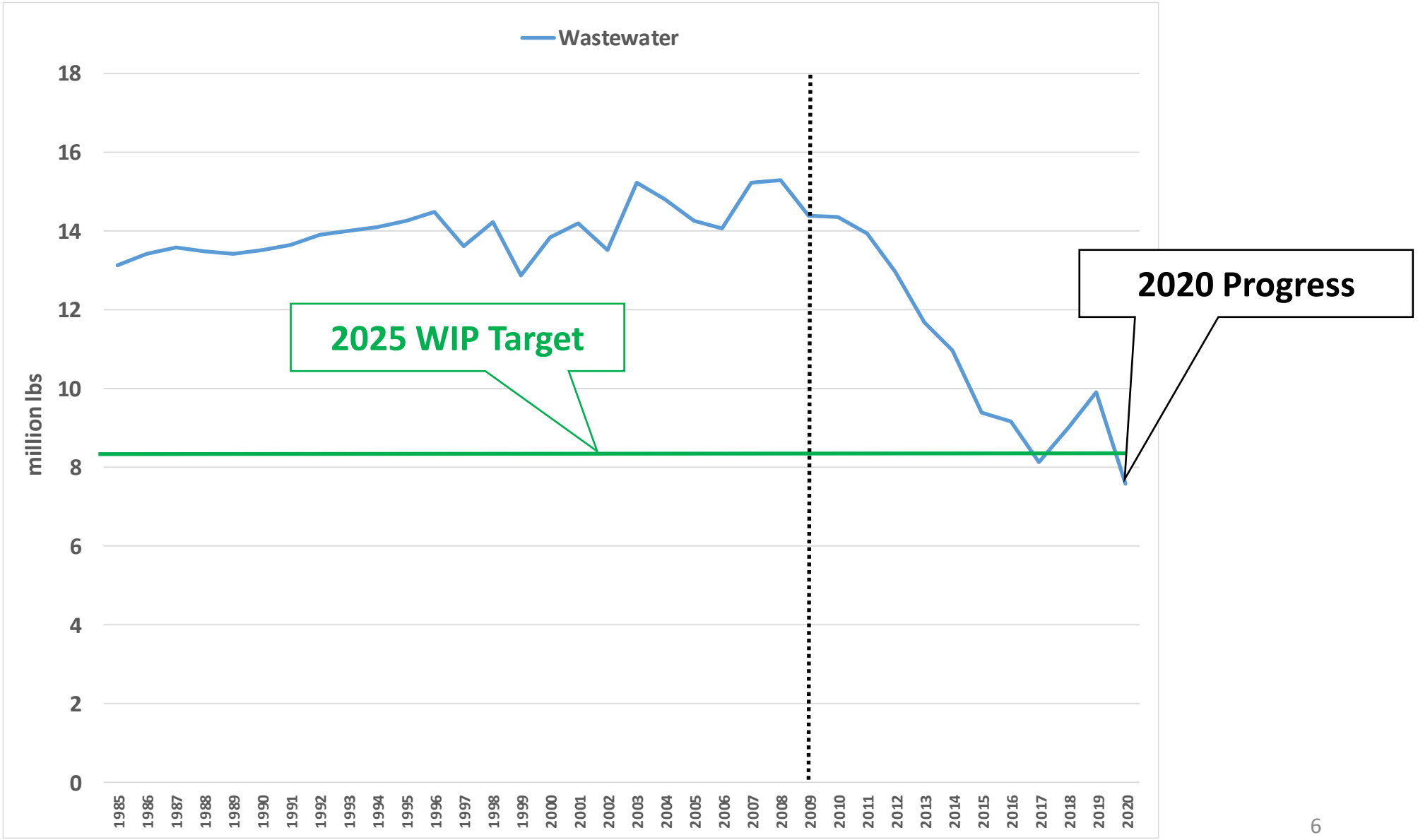
CBW Nitrogen Loads Delivered to CB



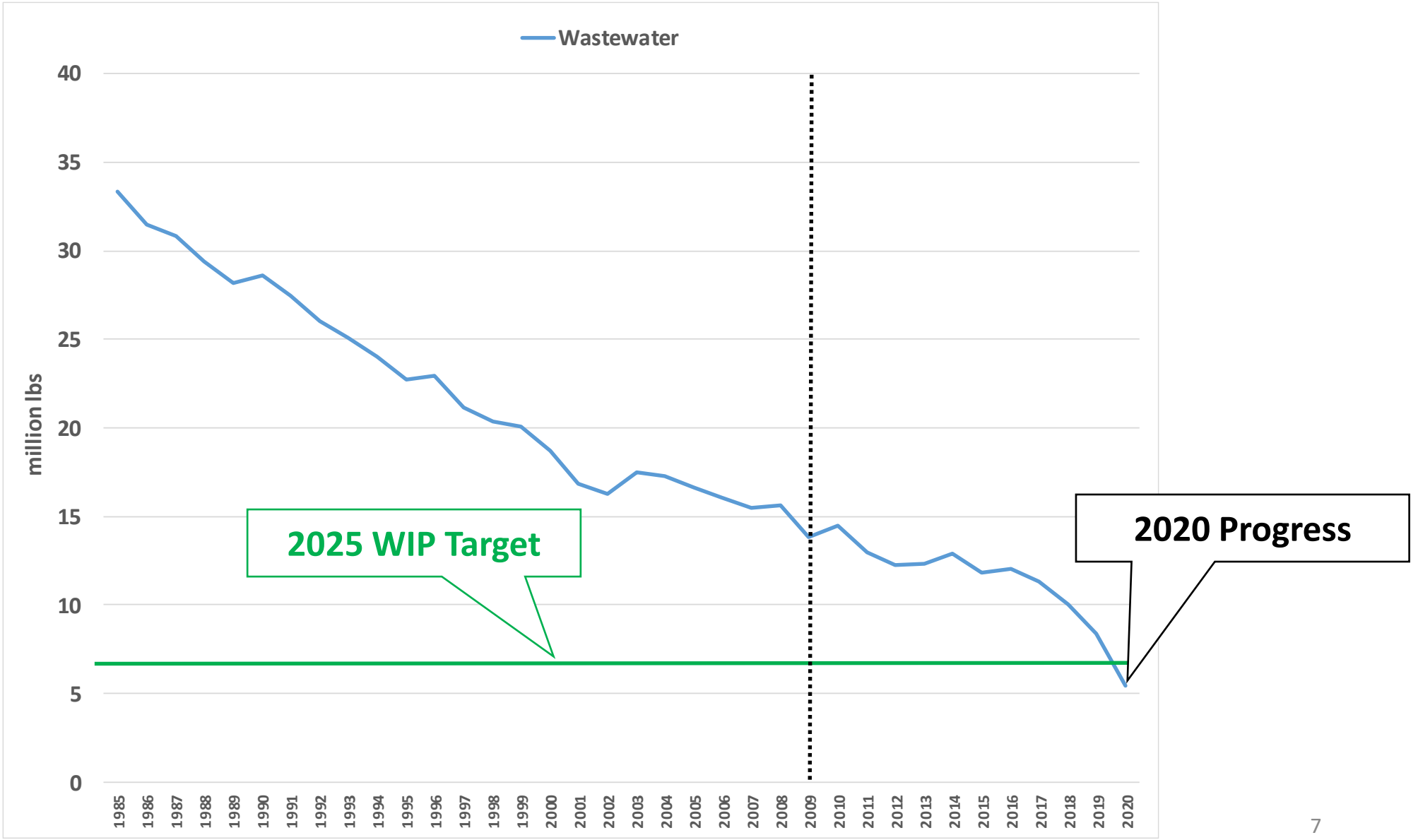
NY Wastewater Nitrogen Loads Delivered to CB



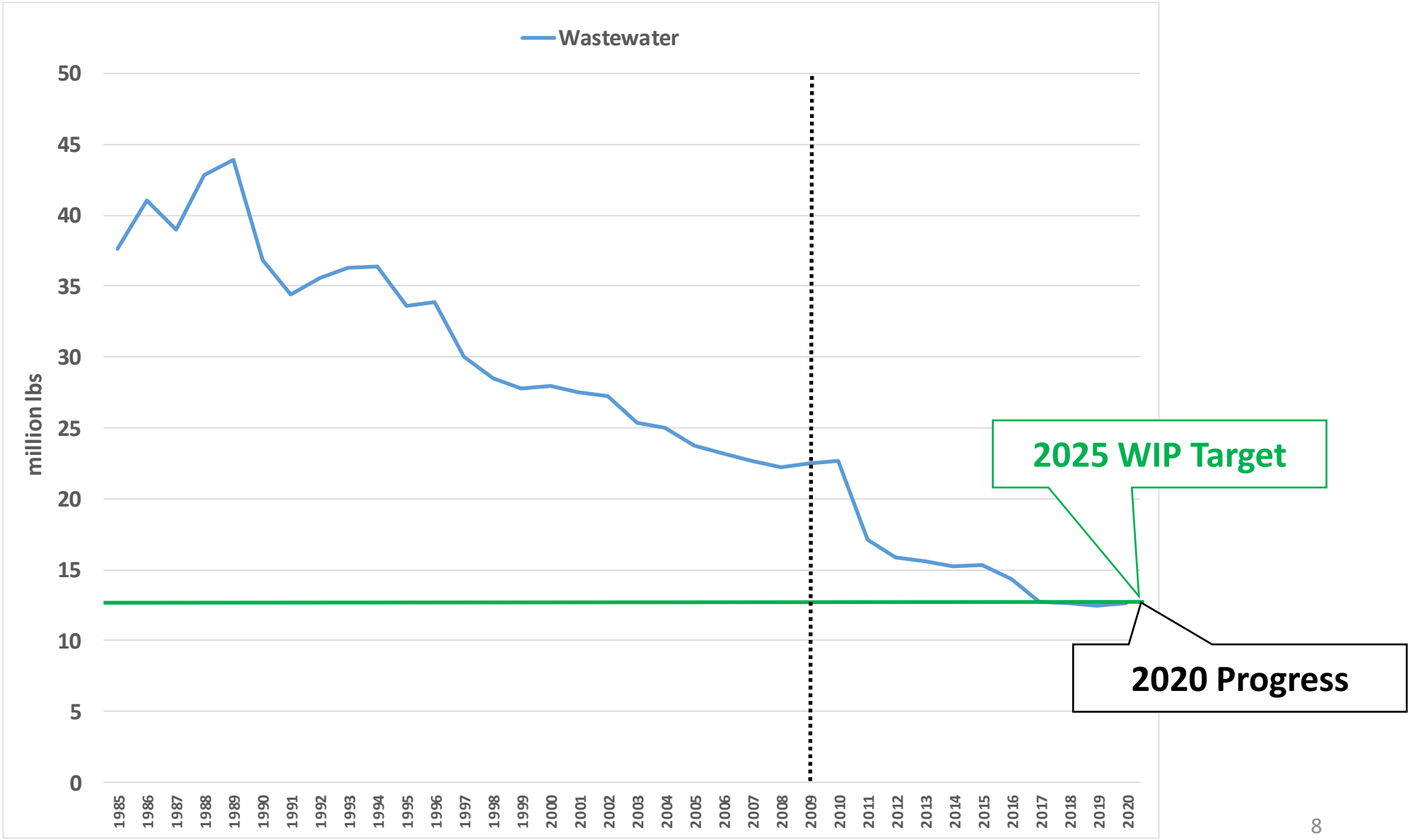
PA Wastewater Nitrogen Loads Delivered to CB



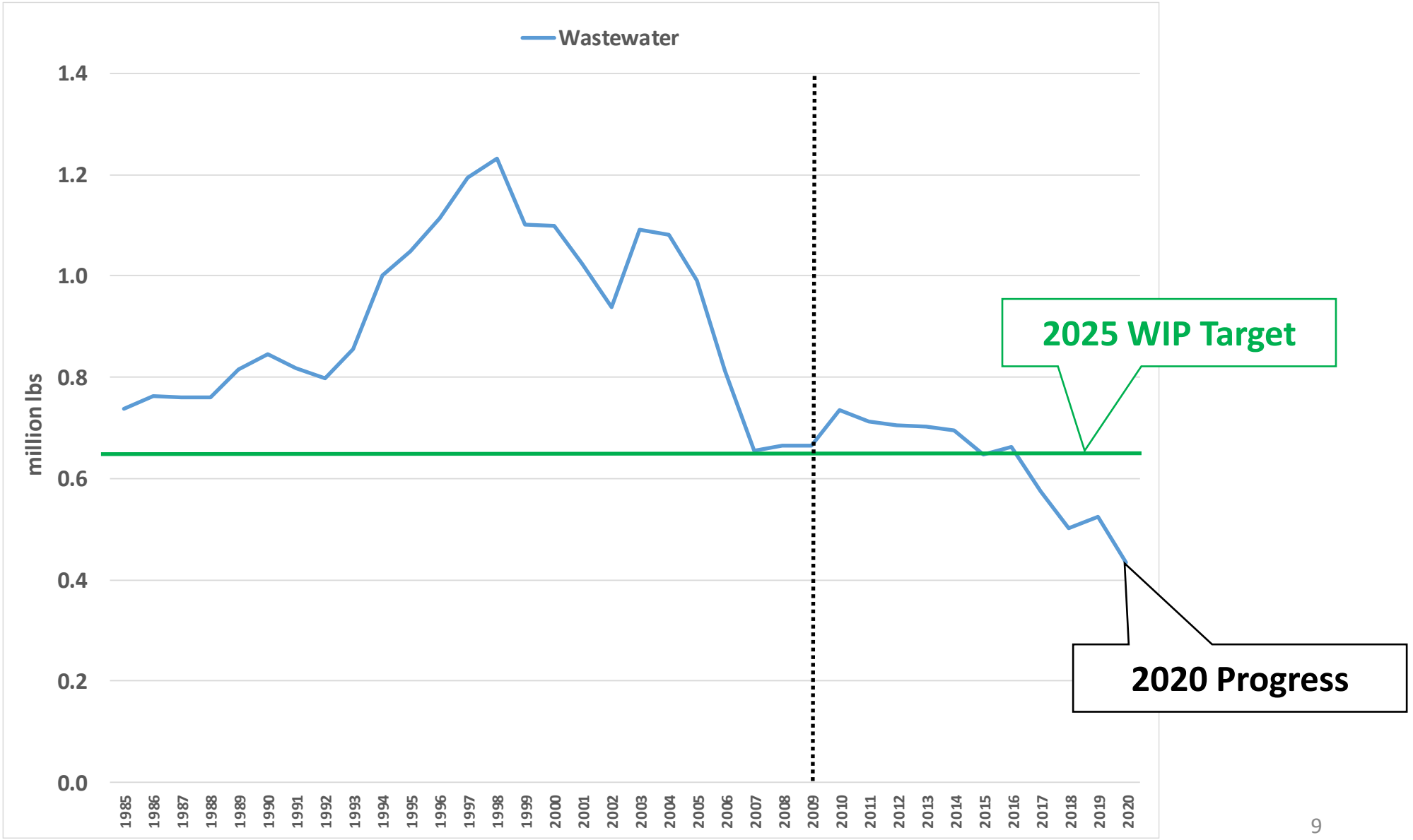
MD Wastewater Nitrogen Loads Delivered to CB



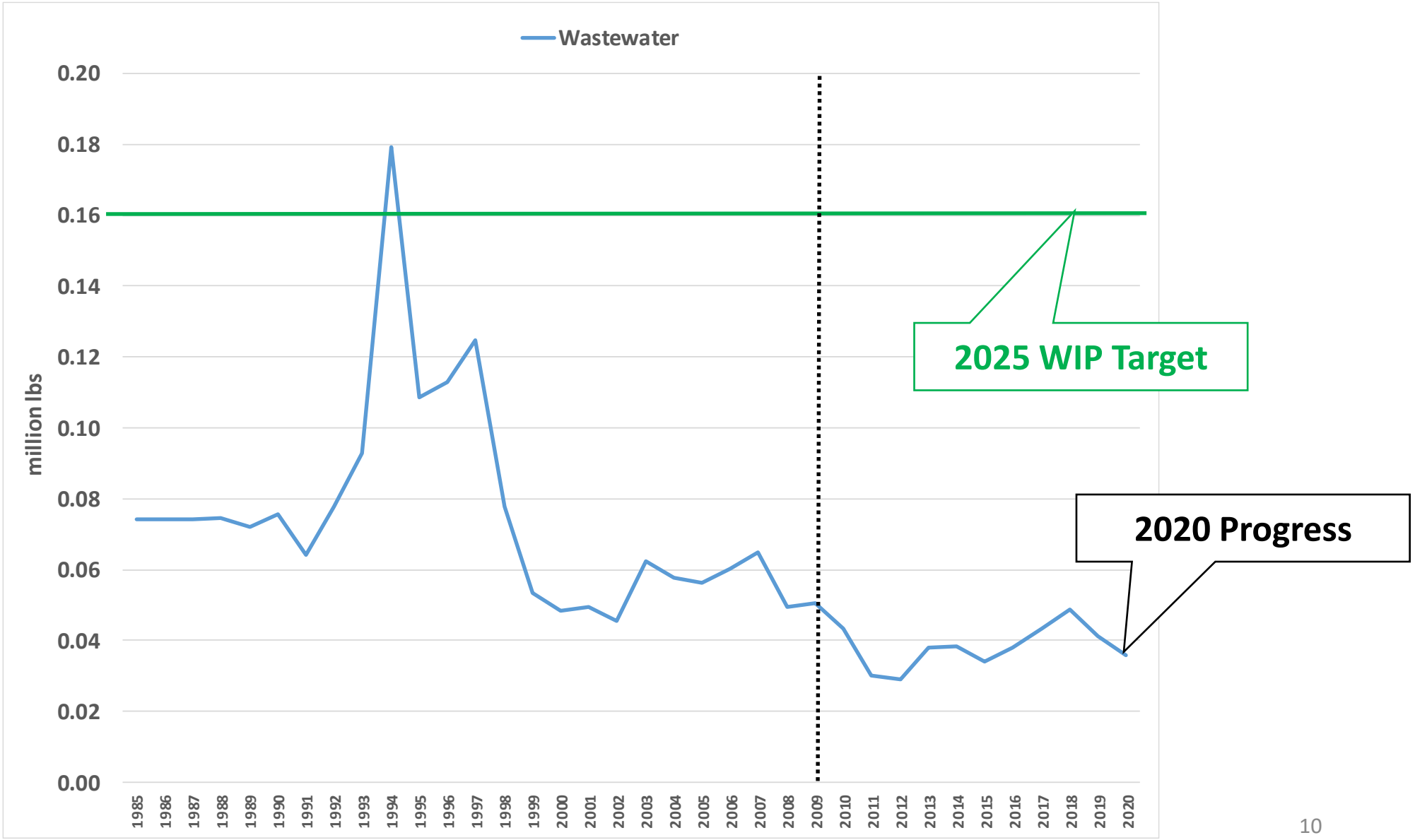
VA Wastewater Nitrogen Loads Delivered to CB



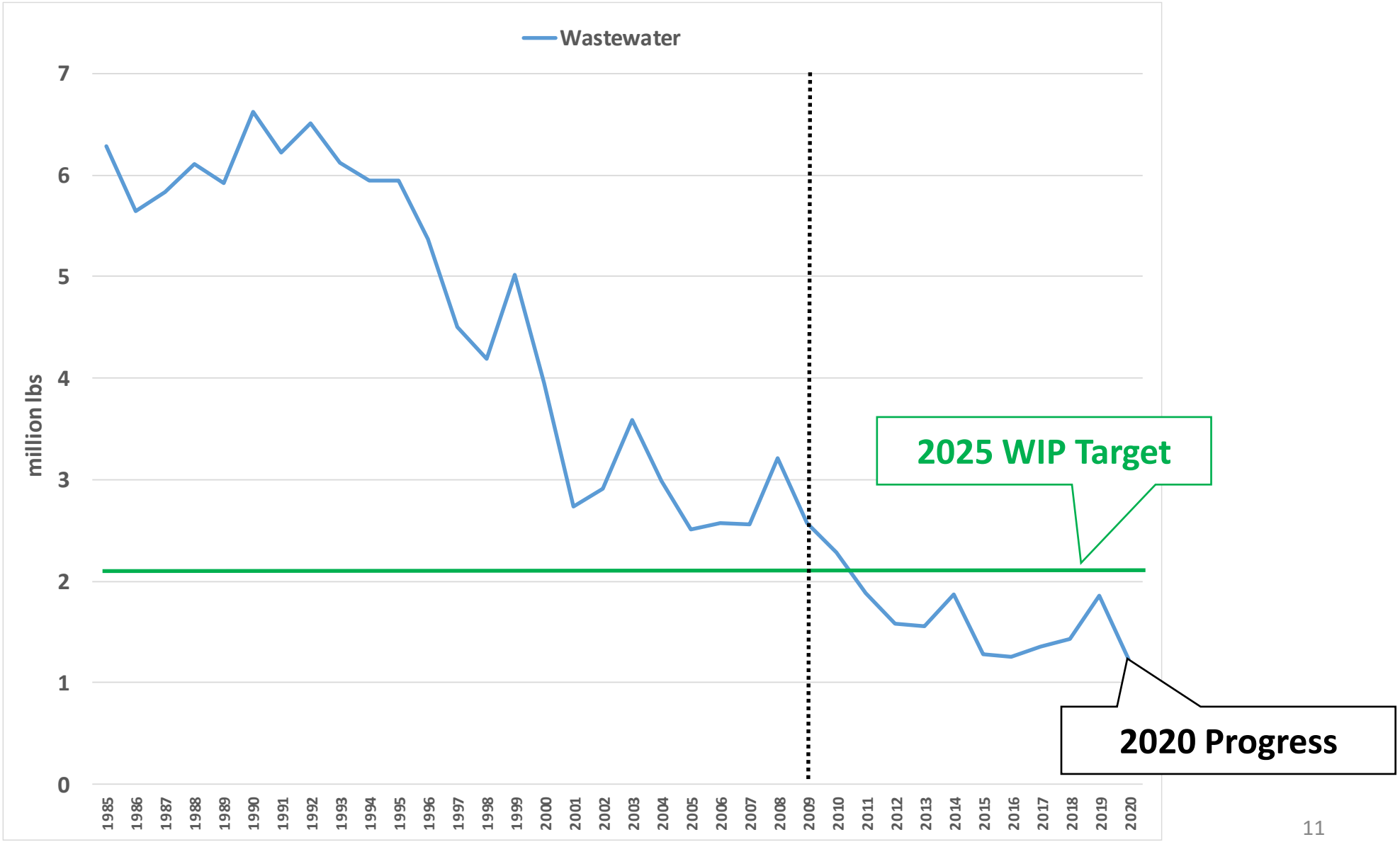
WV Wastewater Nitrogen Loads Delivered to CB



DE Wastewater Nitrogen Loads Delivered to CB



DC Wastewater Nitrogen Loads Delivered to CB



Historic, Current & Future WW Discharge Changes

Jurisdiction	Nitrogen Discharge Reduction Annual Average Since TMDL lbs (%)	Nitrogen Discharge Reduction 2019-2020 lbs (%)	Nitrogen Discharge Reduction Annual Average Needed by 2025 lbs (%)
VA	1,075,000 (5%)	-1,408,000 (-10%)	147,000
MD	564,000 (5%)	3,043,000 (35%)	0
PA	612,000 (3%)	3,196,000 (23%)	0
WV	20,000 (2%)	101,000 (16%)	0
DC	71,000 (2%)	634,000 (34%)	0
DE	2,000 (2%)	5,000 (12%)	0
NY	-25,000 (-2%)	732,000 (21%)	91,000
CBW	2,318,000 (4%)	6,303,000 (14%)	0

Historic, Current & Future WW Discharge Changes

Jurisdiction	Phosphorus Discharge Reduction Annual Average Since TMDL lbs (%)	Phosphorus Discharge Reduction 2019-2020 lbs (%)	Phosphorus Discharge Reduction Annual Average Needed by 2025 lbs (%)
VA	91,600 (5%)	-9,800 (-1%)	12,800
MD	19,800 (1%)	192,500 (28%)	16,100
PA	87,600 (4%)	187,300 (12%)	0
WV	19,300 (12%)	5,300 (8%)	0
DC	500 (-1%)	600 (1%)	0
DE	100 (-0.3%)	1,500 (29%)	0
NY	18,000 (4%)	94,000 (30%)	12,300
CBW	236,800 (5%)	471,400 (12%)	14,300

CBW Historic and Planned Nitrogen Reductions

- Currently, 12% of the Nitrogen load delivered to the Bay is estimated to be from wastewater.
- Since the Chesapeake Bay TMDL, 86% of Nitrogen reductions to the Bay have been estimated to be attributed to wastewater and 12% to the agriculture sector.
- In the next five years according to jurisdiction's WIPs, 89% of the Nitrogen reductions are planned to come from agriculture, 6% from the developed sector, and 0% from wastewater.

CBW Historic and Planned Phosphorus Reductions

- Currently, 16% of the Phosphorus load delivered to the Bay is estimated to be from wastewater.
- Since the Chesapeake Bay TMDL, 76% of Phosphorus reductions to the Bay have been estimated to be attributed to wastewater and 12% to the agriculture sector.
- In the next five years according to jurisdiction's WIPs, 64% of the Phosphorus reductions are planned to come from agriculture, 8% from the developed sector, 5% from wastewater, and the remaining from stream restoration + shoreline erosion control.

MD Response to 2019-2020 Discharge Changes

- Maryland diagnosed WWTP data several ways. 2019-2020 wastewater reductions are attributable to a combination of lower flows (~100 MGD when compared to 2019) and much lower statewide average (50% of 2018) concentrations when compared with previous progress years. This trend is particularly stark for major WWTPs where the bulk of the reductions are attributable. See the table below for a summary of avg. flows, total nitrogen load change, and the flow-weighted nitrogen concentration.
- According to WWTP input data, reductions for Nitrogen were realized at 84% of High Flow Major Municipal facilities, with the largest reductions being realized at the Patapsco, Mattawoman, Back River, and WSSC Piscataway facilities. These 4 plants provided 1.897 million lbs of nitrogen reduction. The remaining balance for HF major facilities was the reduction of 342,602 lbs of nitrogen. No upgrades to these facilities occurred during this progress year, but these were relatively new upgrades that have begun to dial in their ENR processes with a higher degree of treatment.
- Similarly, in the Minor Flow Major Municipal facilities, reductions at 100% of wastewater treatment plants were seen albeit with a more modest collective reduction of roughly 81,000 lbs of nitrogen.
- Blue Plains was not included in this analysis.

Year	Average Flow [MGD]	TN Load (EOS) [lbs/yr]	Annual statewide municipal TN conc [mg/L]
2018	537.02	9,330,341	5.7
2019	660.3	7,734,723	3.85
2020	535.19	4,706,646	2.89

PA Response to 2019-2020 Discharge Changes

- DEP has significantly increased the reporting of actual data versus estimated data in the past year, particularly regarding insignificant facilities. Past estimates were based on worst- case discharges. As more actual data is being submitted, the actual loads are significantly lower than historically estimated. High reductions in significant facilities can be attributed in part to the significant decrease in rainfall between the previous and current reporting periods. For example, the loads from Lancaster City (PA0026743) and Wyoming Valley (PA0026107) accounted for a large portion of the reduction. The average flows in the 2019-2020 reporting period were notably lower than the 2018-2019 reporting period. Both facilities have combined sewers and are directly impacted by rainfall. DEP also notes that some significant and insignificant facilities did not discharge as frequently, at least partially due to business shutdowns during the COVD-19 pandemic. PPL Montour (PA0008443), a power plant that does not continually operate, reported a discharge during 10months of the previous reporting period and only reported a discharge during 4 months of the 2019- 2020 reporting period. Additionally, the Chesapeake Bay Point Source App has provided more tools to reduce reporting errors, particularly in reported units, sometimes by an order of magnitude. For the 2019-2020 reporting period, DEP identified and corrected several facilities that had reported incorrect flow units, making their discharges appear significantly larger in past years.
- In 2018, the first year the CB App was provided by EPA, the data checks included within the tool did not include a review for flows reported as GPD instead of MGD, nor was this caught in the subsequent EPA review. As the data checks within the CB App continue to evolve each year, data outliers are more easily identified, hence the apparent reduction in flow from 2018 to 2019.
- For Significant facilities, DMR data since 2009 is in ICIS and available to EPA. For non-significant facilities, data is in ICIS from eReporting Rule implementation or from the time they started using DEP's eDMR system. All other values were previously estimated using information from permit application and renewal reviews. This estimated data was submitted in a spreadsheet format and was accepted by EPA at that time.
- To reiterate the DEP response dated January 26, 2021, the 2020 data set is the most accurate to date. This is primarily due to implementation of the eReporting Rule. The most significant change in the last few years is that the amount of actual data is steadily increasing and the amount of estimated data decreasing, leading to a drastic improvement in data quality.

WV Response to 2019-2020 Discharge Changes

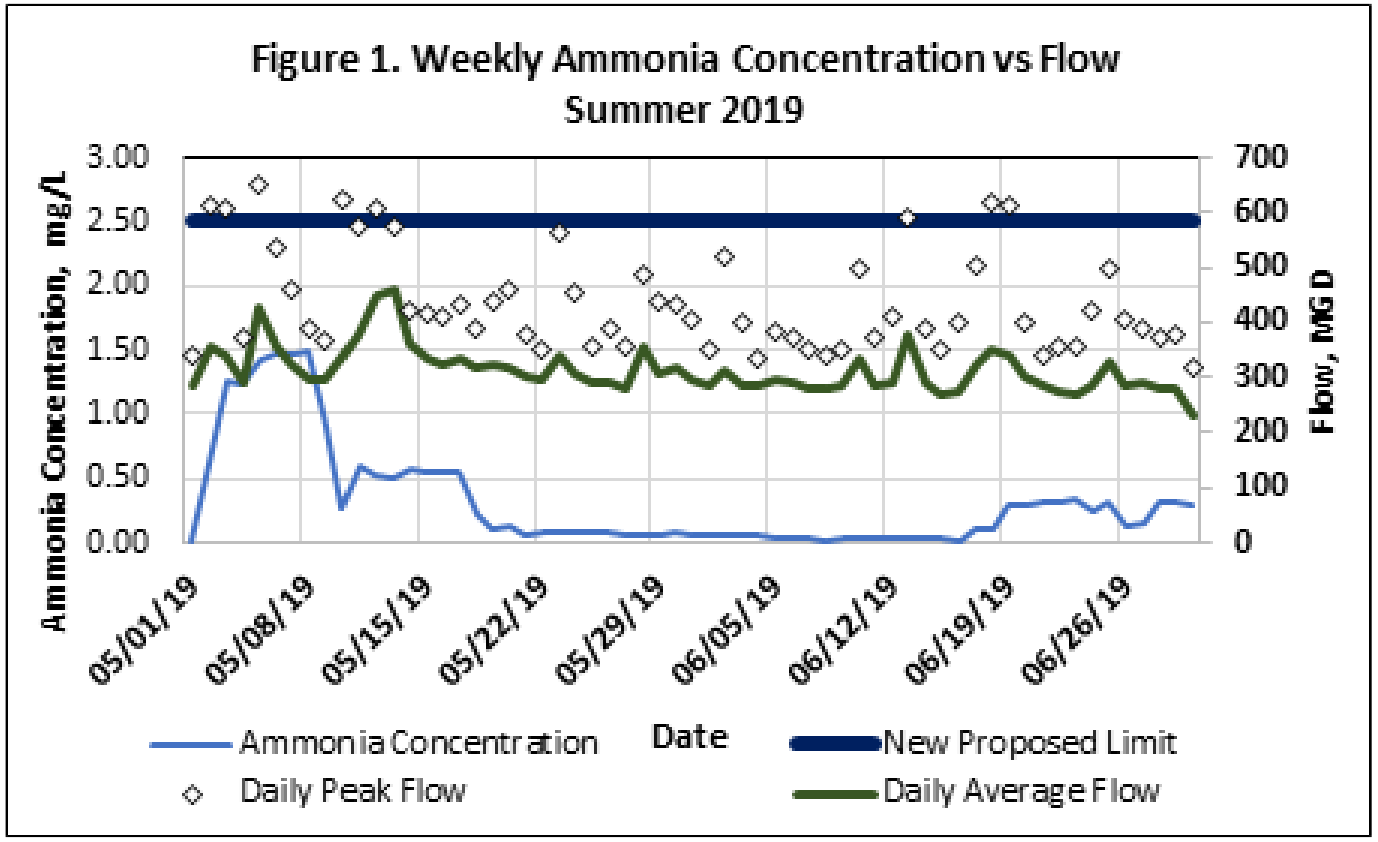
- West Virginia primarily attributes the improved 2019-2020 performance in the wastewater sector to the increased loads experienced in 2019 due to wet weather. The wet weather influence can be seen across sectors but is particularly evident in the wastewater sector, and with respect to both WWTP and CSO component loadings. Comparing performance 2018-2020, reductions are more consistent with historical rates.
- For total wastewater, 2019 Progress EOT TN loads were greater than 2018 Progress EOT loads (approx. 4.5% increase as compared to 2017-2018 12% decrease). For WWTP, 2019 EOT TN loads were slightly improved over 2018 (<1% decrease as compared to 2017-2018 13% decrease). For CSO, 2019 Progress EOT TN and TP loads were much greater than 2018 Progress EOT loads (approx. 160% TN and 140% TP increases as compared to stable 2017-2018 loadings for both parameters).
- The extreme 2019 poor CSO performance was related primarily to Martinsburg. Martinsburg has historically been a good CSO performer with a very small number of annual overflows. But the weather in 2019 caused greater than six overflows, a scenario that under prior protocols resulted in WV reporting 0% reduction. Good performance returned in 2020. The low numbers for 2020 Progress (as compared to 2018 Progress) can also be attributed to real, improved CSO control that has been accomplished by Keyser and Piedmont. As an aside and as recommended by CBPO, WV has modified its CSO reporting protocols to dampen the annual influence of weather. WV assessed, community-by-community, the level of CSO control achieved has been achieved and will continue to report 2020 rates of reduction unless new information documenting on-the-ground change is received.
- WV reviewed reported data from significant facilities and confirmed that loads reported in 2020 Progress accurately reflect those reported by the facilities. WV did not attempt to explain individual facility performance, but it is possible that the reduced loads reported by some are the result of both lower influent flows and treatment performance fine-tuning. WV also reviewed our reporting for nonsignificant facilities and found no substantial difference from that reported in 2019.

DC Response to 2019-2020 Discharge Changes

- DOEE believes that a large portion of the decrease that was observed in the 2020 reporting cycle was due to a decrease in rainfall and flow at the Blue Plains Waste Water Treatment Plant compared to the previous year. In 2020, EPA has noted a 34% decrease in Nitrogen compared to the previous year (2019). It should be noted that during the 2019 EPA Verification process, EPA noted that nitrogen loads increased 31% over the previous year (2018). As the graph provided by EPA below shows, the load change follows an overall downward trend that has a peak during the 2019 reporting period. Therefore, it might be best to consider 2019 an outlier year, rather than to see the 2020 load as a deviation from the norm. DOEE previously explained that the increase in nitrogen load in 2019 was likely due to an increase in rainfall and the additional processing of water from CSO tunnels constructed by DC Water a part of the Long Term Control Plan coming online. This explanation continues to make sense considering the rainfall data observed during the 2020 reporting cycle. Below is a table that shows the rainfall data for each recent reporting year and the modeled flow in CAST for two outfalls at DC Water. It can be seen that there is a 40% increase in precipitation from the 2018 reporting year to the 2019 reporting year. In 2020, the precipitation returns to levels below the 2018 reporting year, and thus explains the reduction observed. It can also be seen that the combined flow from the two outfalls at DC Water increases significantly from 2018 to 2019 and then returns to lower levels in 2020. This explanation is also in agreement with the justification provided below by DC Water that explains the average flow and monthly nitrogen loads decreasing during the 2020 reporting cycle compared to the 2019 reporting cycle.
- Additionally, DOEE was able to coordinate with representatives from PEPCO-Benning Generating Station, a nonsignificant facility, during the 2020 reporting year. After conversation, DOEE now has an accurate representation of the Outfalls at the facility that discharge to surface waters. The total number of Outfalls reported on during the 2020 period was lower than the 2019 report and while nonsignificant facilities make up a small percentage of the total wastewater load, the fewer outfalls also contributed to the decrease.

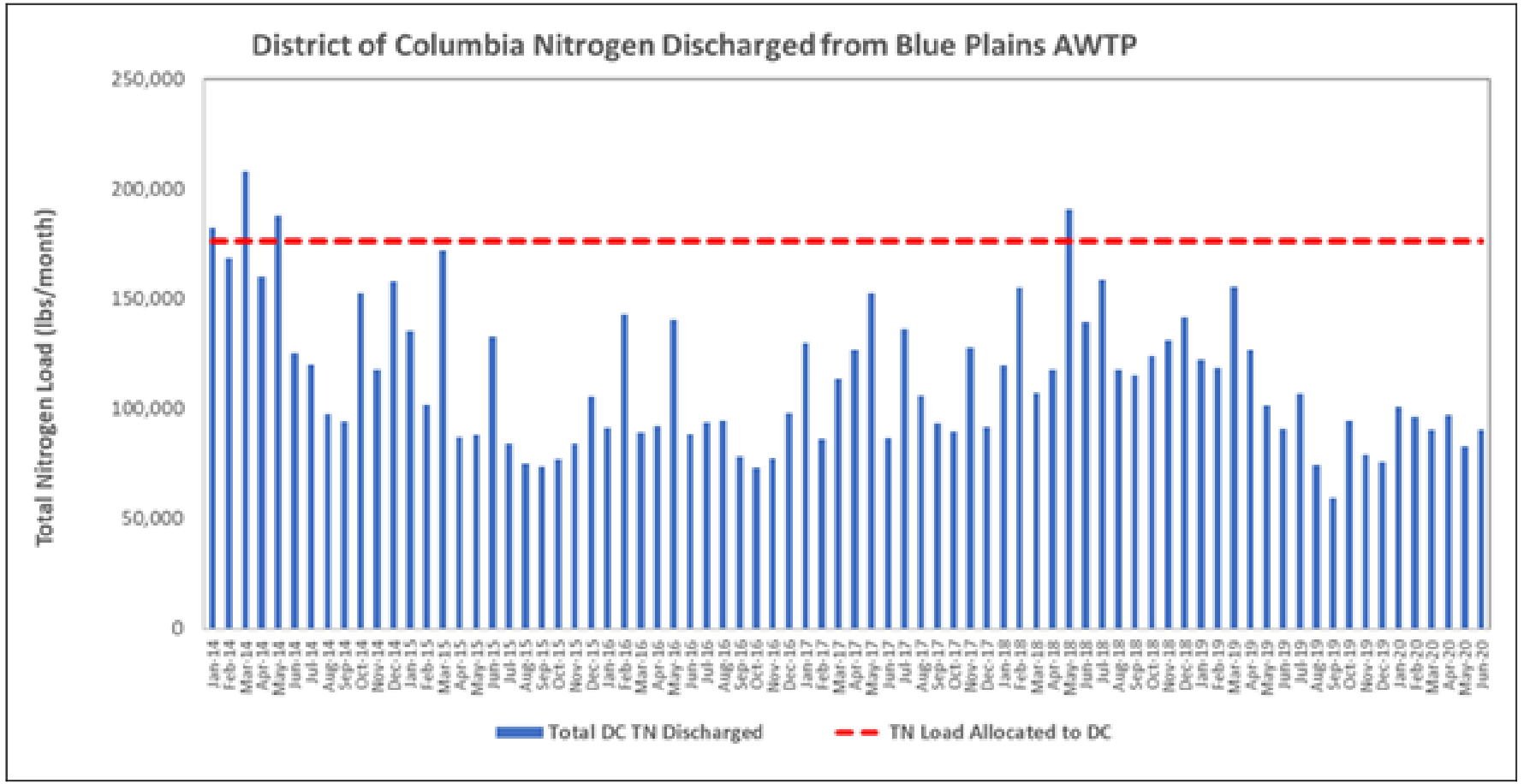
DC (continued)

- "The 2019 reporting period was one of the wettest periods in recent history, which resulted in daily average flow of 334 MGD. The 2020 reporting period was more in line with the recent hydrological conditions, which resulted in a daily average flow of 284 MGD. Elevated ammonia concentrations in nitrification during wet weather events, caused higher TN concentrations and loads in the effluent, as demonstrated as an example in the Figure 1 below. Therefore, frequent wet weather events resulted in higher TN loading in the effluent compared to average years.



DC (continued)

- The below graph shows the TN discharged each month in the CBP reporting period of 2018-2019 is generally higher than the 2019-2020 period.



DC (continued)

- The comparison of recent performances also highlights the need to maintain the current TN load allocated to Blue Plains and DC. The graph shows significant monthly variations in TN removal performance as expected. Because nitrogen is removed using a biological process, the performance is affected by a variety of factors, including variations in the wastewater flow, incoming loads, and temperature. Effluent performance substantially below allocations in any year or month do not mean there is excess capacity in the plant. Instead, that capacity is intended to address cold temperatures, variations in influent loading, and wet weather flows and loads that a plant serving a combined sewer system must expect to occur, and that may be further exacerbated by the impacts of climate change. DC Water invested over $1 billion in the ENRF program to meet the current annual TN treatment limit at the design capacity of 384 MGD average flow and minimum wastewater temperature of 12 deg C. As the plant approaches this design capacity, DC Water would no longer see the same safety factor in meeting this stringent permit limit."

DE Response to 2019-2020 Discharge Changes

- Seaford Wastewater Treatment Facility (NPDES # DE0020265) accounts for most (if not all) of the 2019-2020 wastewater nitrogen load reduction (see table below). The data has been rechecked and no errors have been found. The facility has not had any upgrades. There was a closure of an industrial discharger to the facility however no significant changes to the flow were noted following the closure. Some fluctuations in the flow have been noted but they are believed to be attributed to inflow & infiltration (I&I) caused by precipitation. In other words, more flow will be observed in a wet year. Some minor variations in the effluent concentration have also been noted. The concentration is a function of loading and the treatment/removal efficiency. With the removal efficiency being relatively "fixed", changes in the loading of the facility will result in corresponding concentration variations. The nitrogen load varies "significantly" year to year as seen in the table below.

NPDES ID	Facility Name	2019-2020	2018-2019	2017-2018
DE0000035	INV Performance Material, LLC (Former INVISTA)	7,277.81	6,830.48	18,172.41
DE0020125	LAUREL	3,355.63	2,821.23	3,109.86
DE0020249	BRIDGEVILLE	---	14.15	---
DE0020265	SEAFORD	26,108.45	32,067.08	28,334.72
DE0050725	MOBILE GARDENS TRAILER PARK	69.52	14.51	38.86

NY Response to 2019-2020 Discharge Changes

- For the first time since 1985, NY updated the combined sewer overflow (CSO) connections based on the Long Term Control Plan annual reports for each CSO facility.

CSO NAME	NPDES	% Flow Reduction
JOHNSON CITY (V) OVERFLOWS	NY0023981	99.95
BINGHAMTON (C) CSO'S	NY0024406	91.54
CHEMUNG CO ELMIRA SD STP	NY0035742	88

- Binghamton-Johnson City wastewater treatment plant (NY0024414) completed their reconstruction during this reporting period. The facility is currently achieving their permitted effluent limits for the first time since 2011. This resulted in a reduction of 362,285 lbs of nitrogen at edge of stream from 2019 progress to 2020 progress.
- I3 Electronics (NY0003808) had a large reduction in nitrogen (59,047 lbs edge of stream) from 2019 progress to 2020 progress due to the facility operational changes that resulted in a significant reduction in flow.

Wastewater Data Resources

- The Wastewater Data app is at: https://pointsource.chesapeakebay.net/
  - Log in to run reports
  - CBP office also has detailed data
- CAST has the wastewater mapped over time for each site at: https://cast.chesapeakebay.net/TrendsOverTime/wastewater/
  - Also, CAST houses detailed wastewater reports for flows and loads. Login is needed

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