

Wastewater Discharge Quality: an Attempted Analysis

By: Katelyn Tarrío, Kaitlin Walker, Casey Kelly



Research objectives

Part I

- Identify facilities that could be contributing to a waterbody impairment
 - Analyze trends in these particular sites
 - Pollutant types
 - Annual pollutant loads
 - Compliance history

Part II

- Record data issues encountered
- Recommend user-interface options

Methods



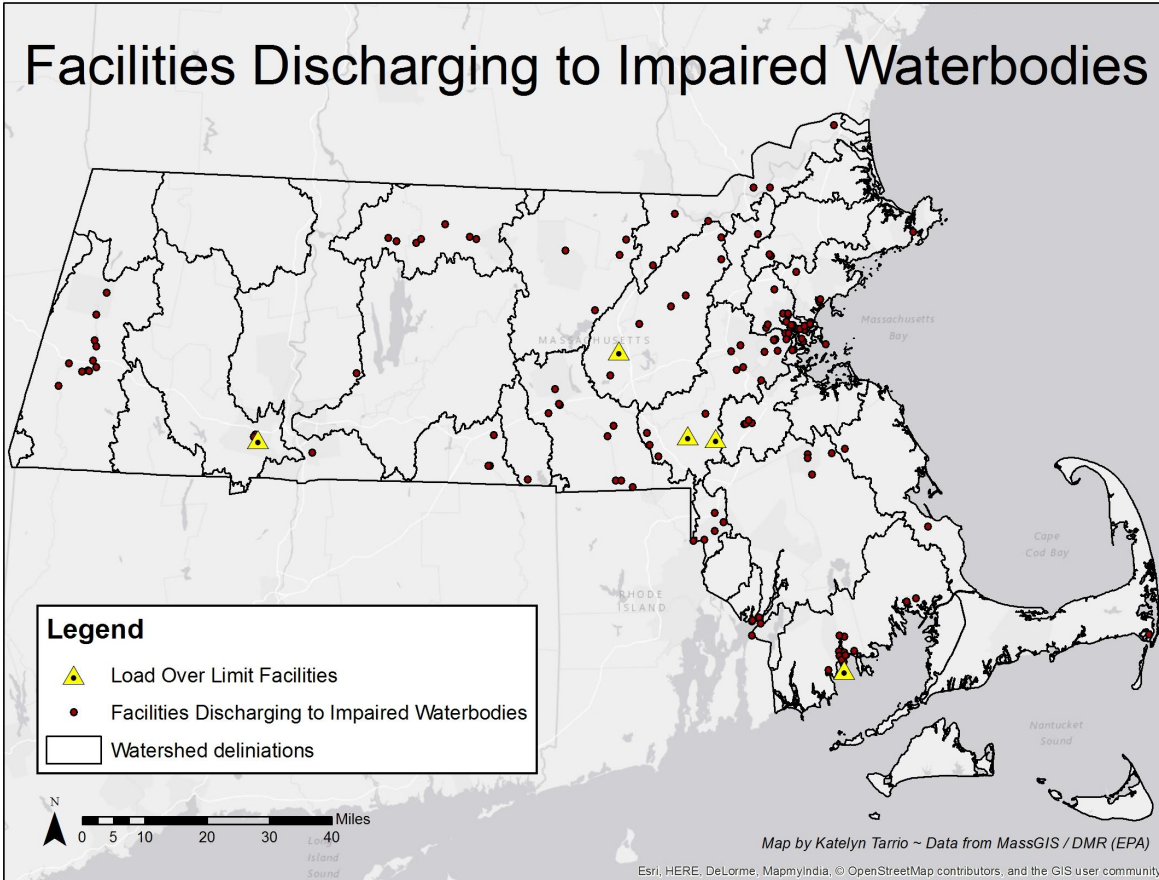
1. Use DMR pollutant loading tool to filter/identify
2. Mapped sites alongside impaired waterbodies
 - > Mass DEP's 2014 Integrated List of Waters (305(b)/303(d))
3. Assess trends in facility-specific data from the EPA Discharge Monitoring Report (DMR)

Results: Load Over Limit Facilities

| Facility Name | NPDES Permit Number | Parameter Description | Load Over Limit (Option 1) (kg/yr) |
|---|---------------------|----------------------------------|------------------------------------|
| Westfield WasteWater Treatment Plant | MA0101800 | Phosphorus, total (as P) | 98.5614 |
| Charles River WasteWater Facility | MA0102598 | Nitrogen, ammonia total (as N) | 81.63265306 |
| Westerly Wastewater Treatment Facility | MA0100480 | Phosphorus, total (as P) | 24.356475 |
| MA Correctional Institution (Norfolk/Walpole) | MA0102253 | Phosphorus, total (as P) | 3.1909064 |
| New Bedford Wastewater Treatment Facility | MA0100781 | Polychlorinated biphenyls (PCBs) | 0.152781525 |

Results

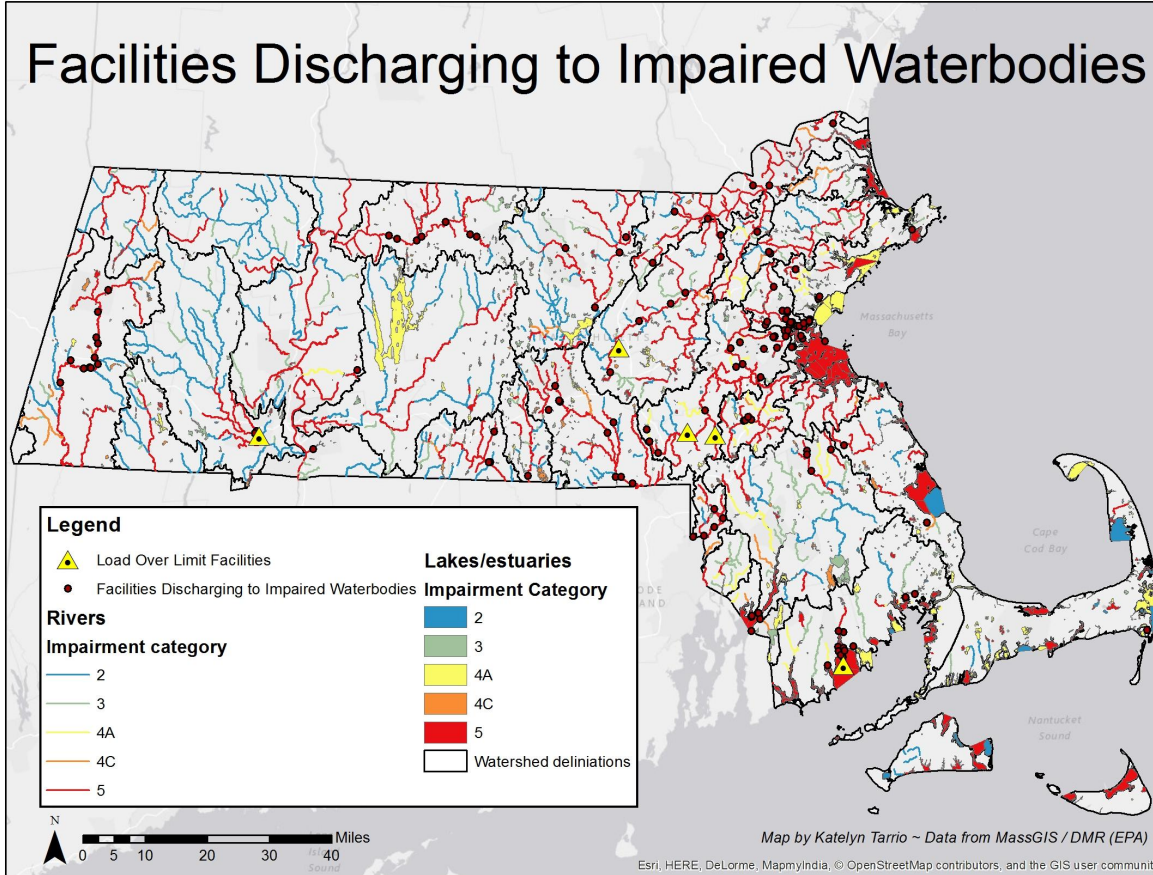
Facilities Discharging to Impaired Waterbodies



| Facility | Town |
|--|-----------------|
| Westfield Wastewater Treatment Plant | Westfield |
| Westerly Wastewater Treatment Facility | Marlborough |
| Charles River Wastewater Treatment Facility | Medway |
| Massachusetts Correctional Institution (MCI) | Norfolk/Walpole |
| New Bedford Wastewater Treatment Facility | New Bedford |

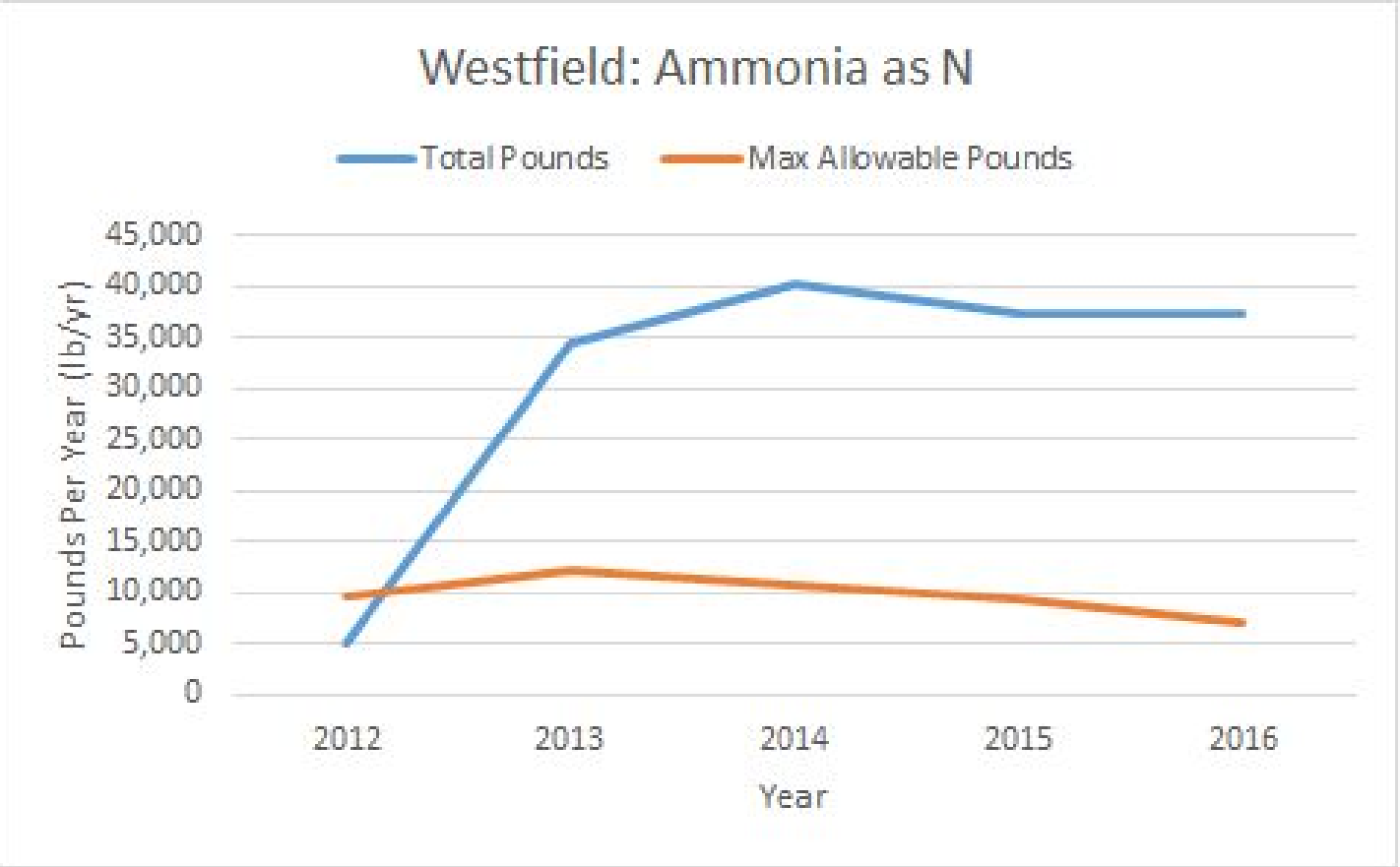
Results

Facilities Discharging to Impaired Waterbodies

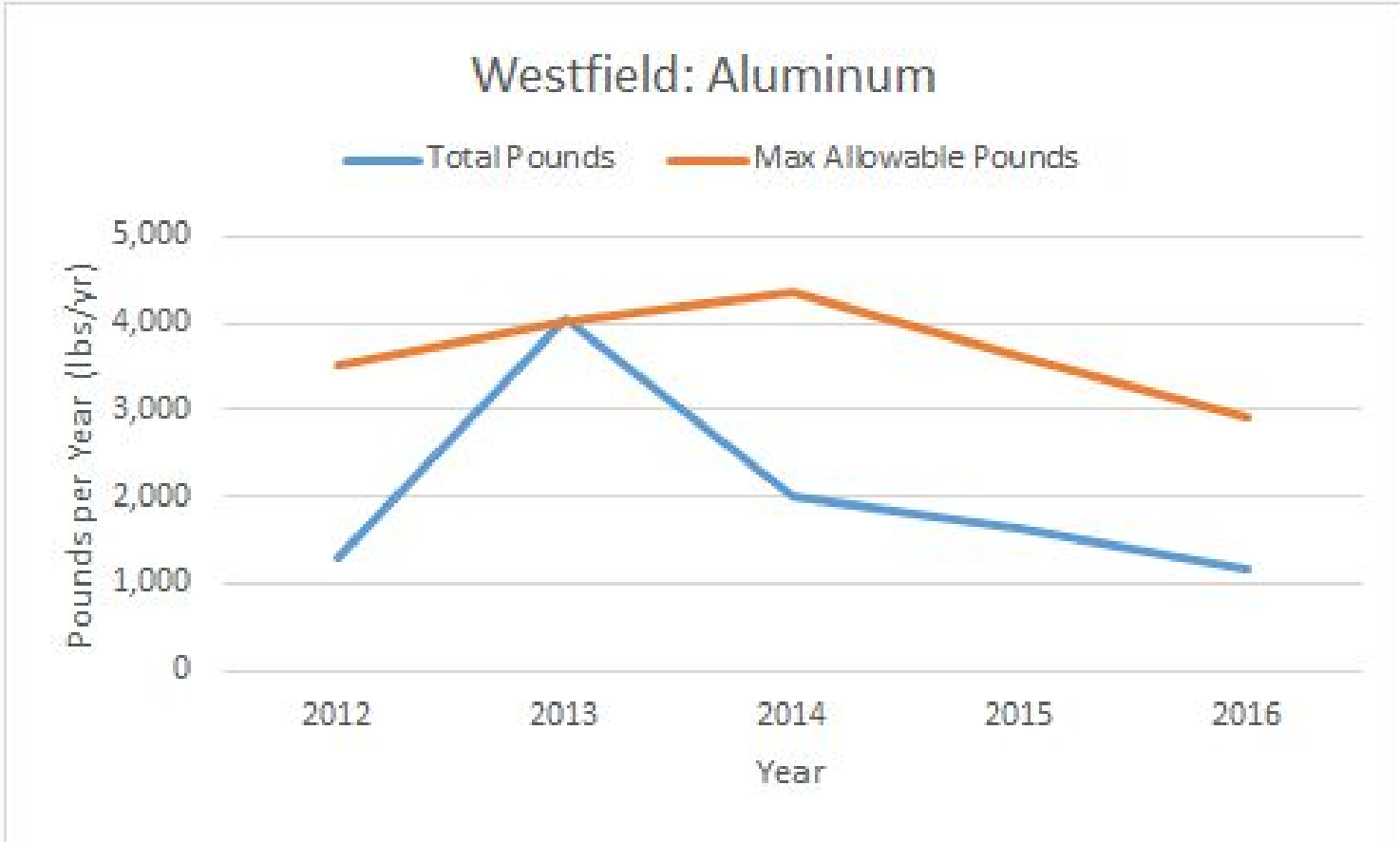


| Facility | Town |
|--|-----------------|
| Westfield Wastewater Treatment Plant | Westfield |
| Westerly Wastewater Treatment Facility | Marlborough |
| Charles River Wastewater Treatment Facility | Medway |
| Massachusetts Correctional Institution (MCI) | Norfolk/Walpole |
| New Bedford Wastewater Treatment Facility | New Bedford |

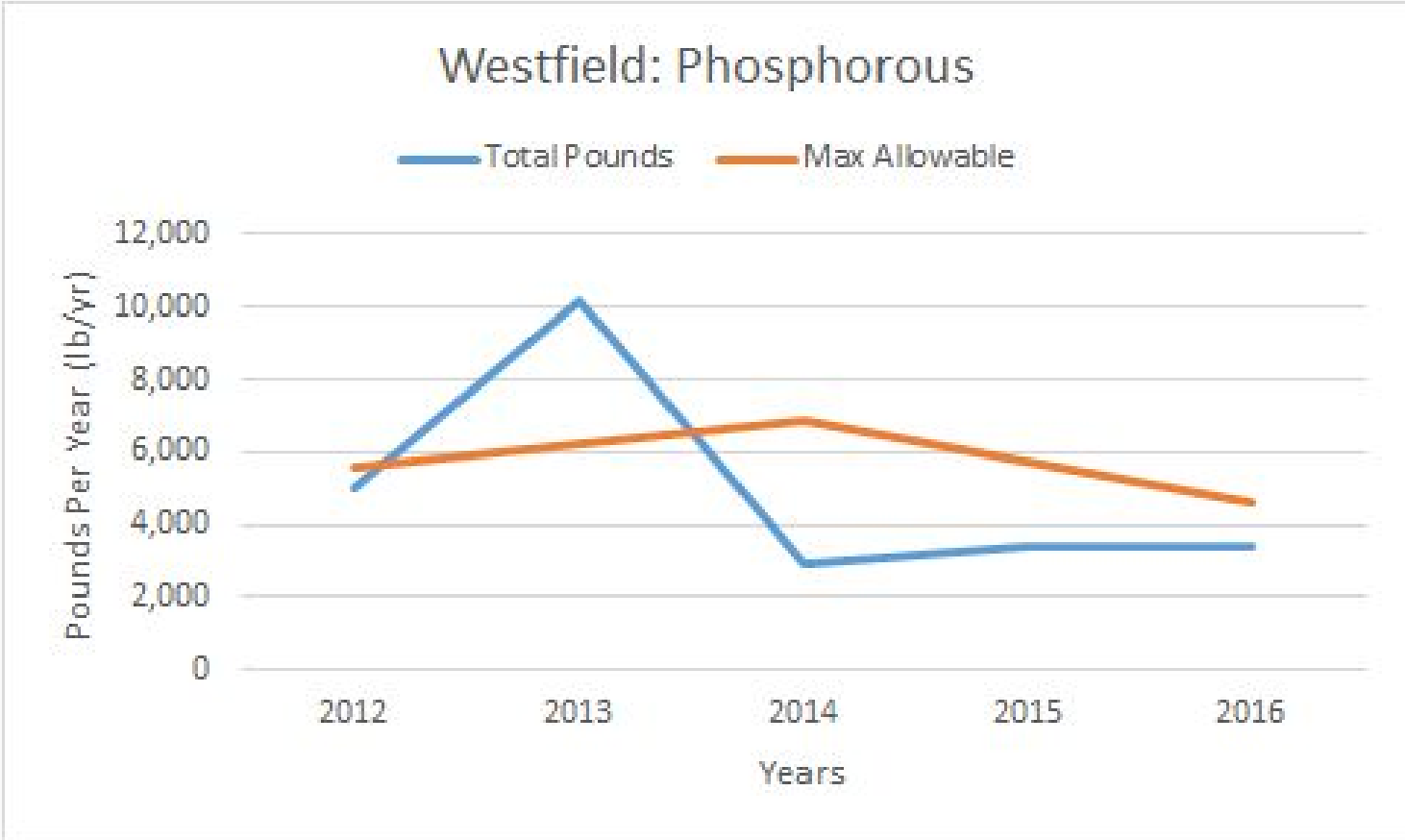
Pollutant Trends: Westfield Wastewater Treatment Facility



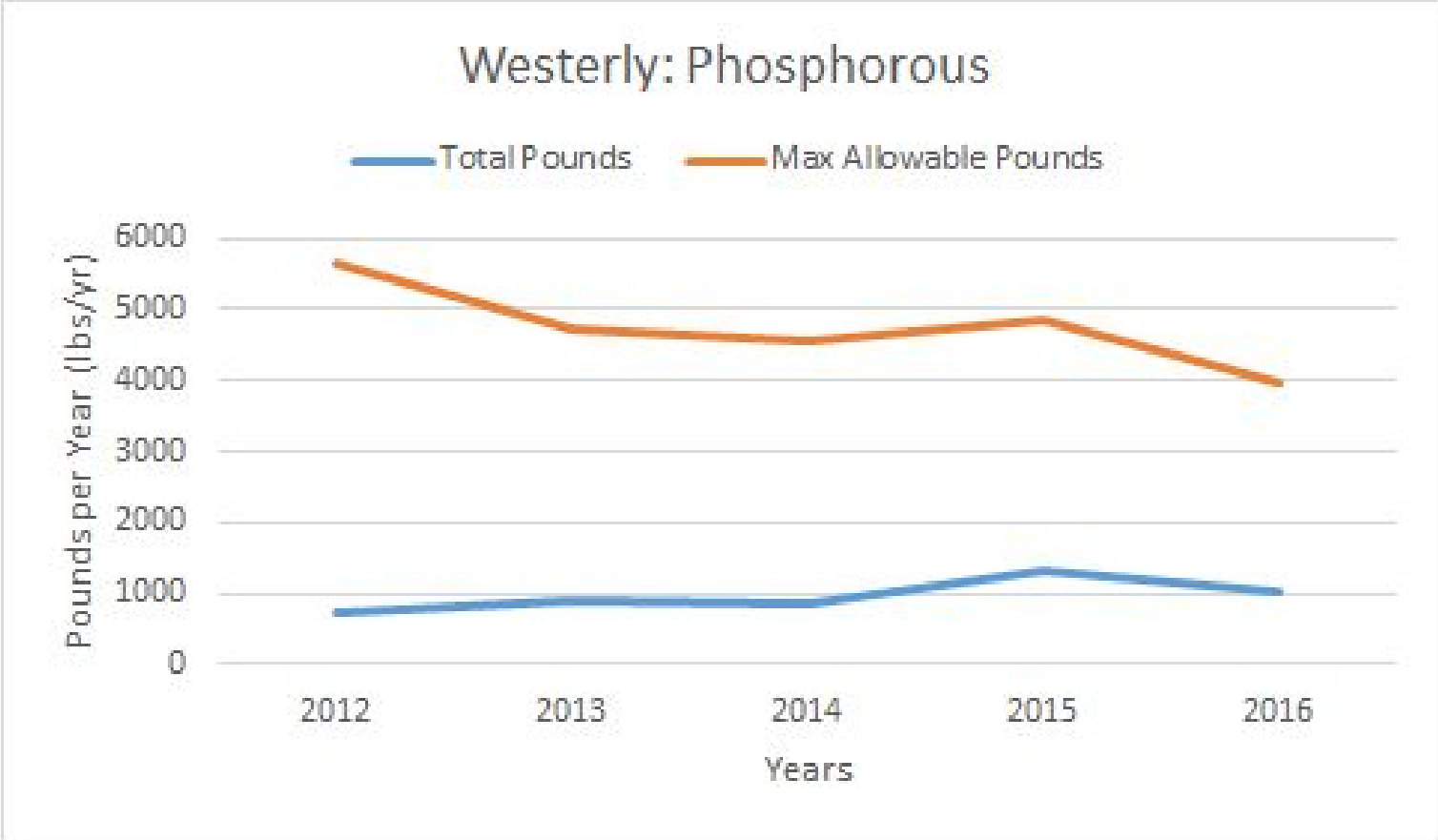
Pollutant Trends: Westfield Wastewater Treatment Facility



Pollutant Trends: Westfield Wastewater Treatment Facility

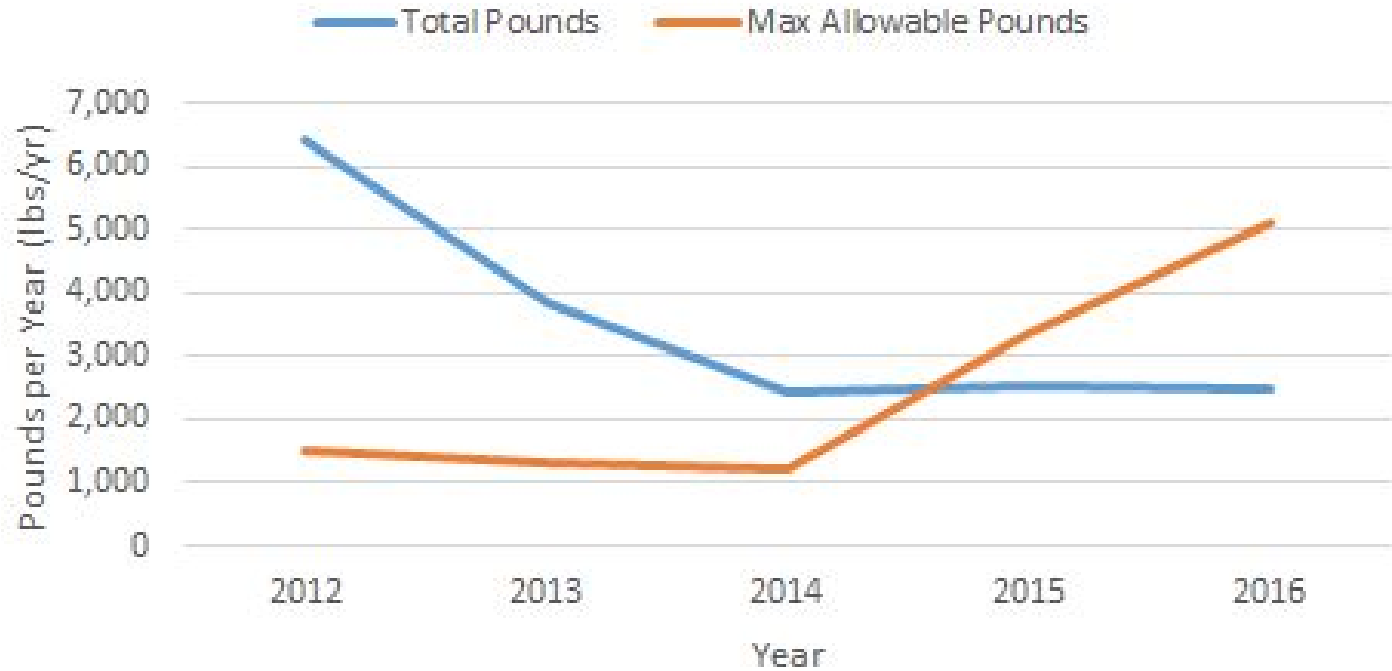


Pollutant Trends: Westerly Wastewater Treatment Facility

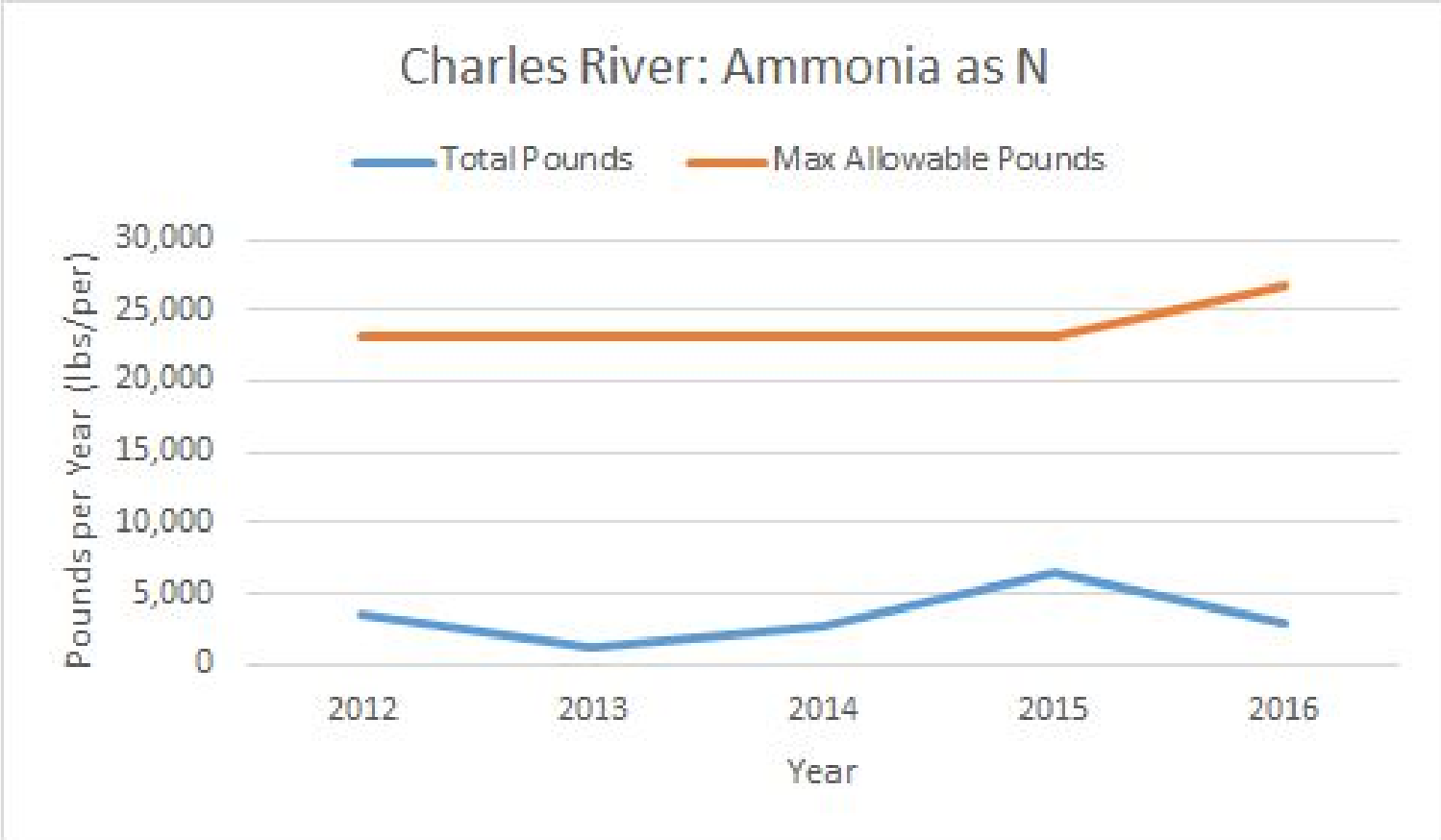


Pollutant Trends: Charles River Wastewater Treatment Facility

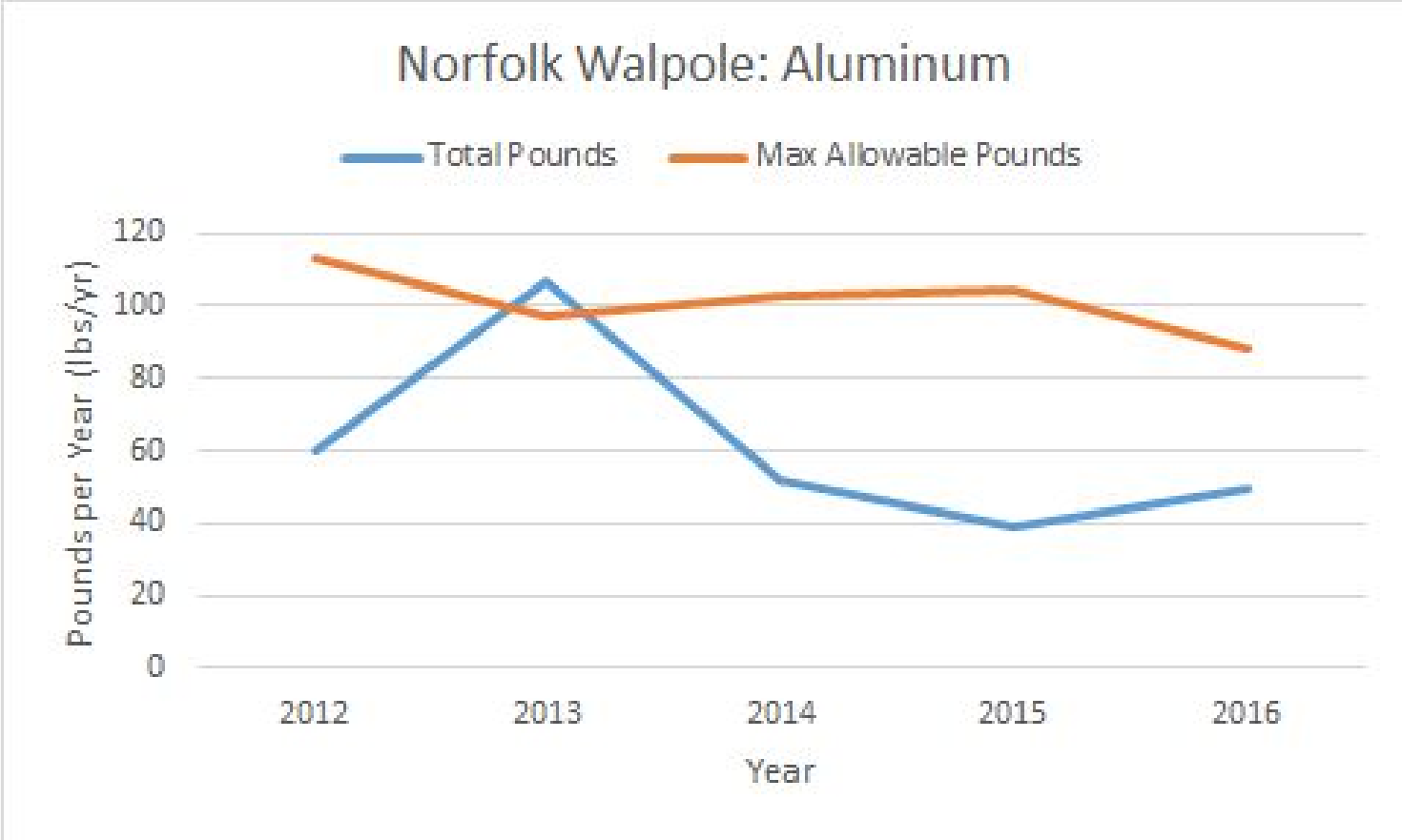
Charles River: Phosphorous



Pollutant Trends: Charles River Wastewater Treatment Facility

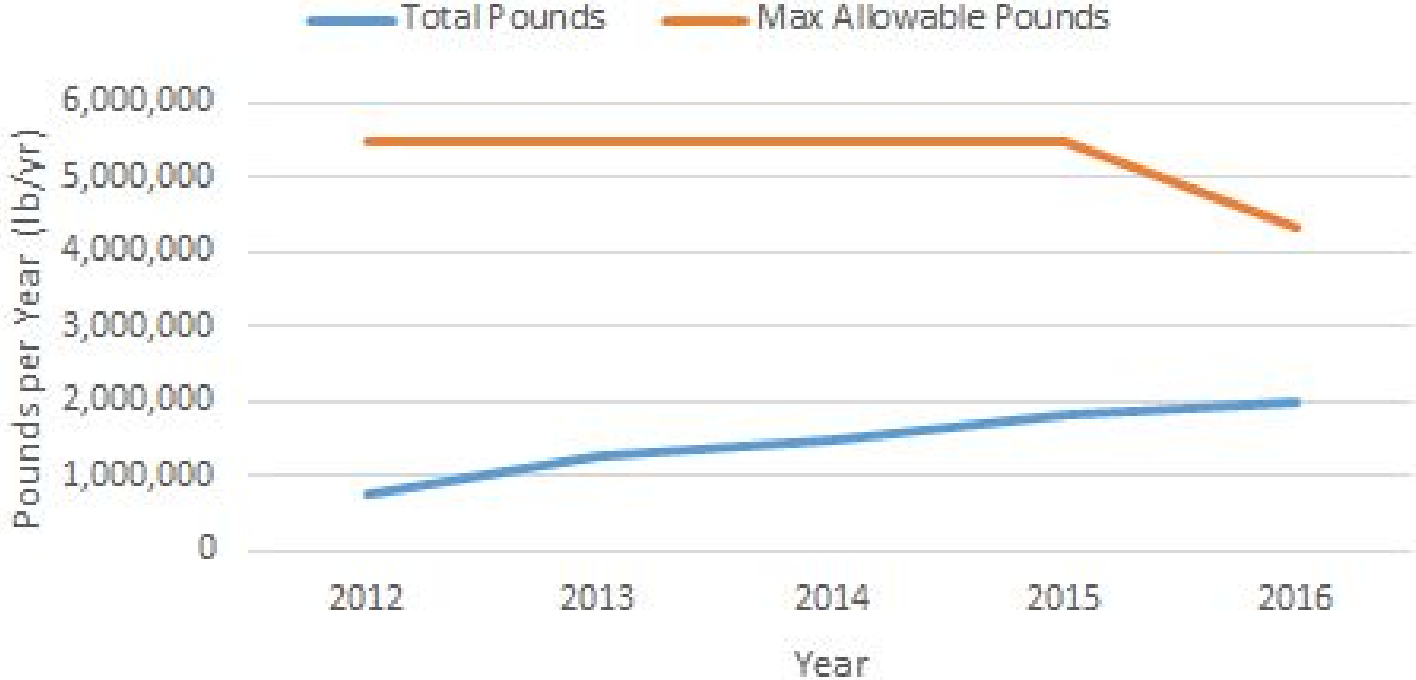


Pollutant Trends: MA Correctional Institution (Norfolk/Walpole)



Pollutant Trends: New Bedford Wastewater Treatment Facility

New Bedford: Solids Total Suspended



Discussion

- Pollutant trends not robust
- We were able to create data visualization tools
- Analysis hindered by data issues
 - Limited data availability
 - Pollutant load inconsistencies

Inconsistencies: PLT and FSS

Top Pollutants by Pounds
(DMR, 2016)

| Pollutant Name | Total Pounds (lbs/yr) | Max Allowable Load (lbs/yr) |
|---------------------------------|---|-----------------------------|
| BOD, carbonaceous, 05 day, 20 C | 17,492 | 133,155 |
| Solids, total suspended | 15,863 | 133,155 |
| Ammonia as N | 2,880  | 26,798 |
| Phosphorus | 2,479 | 5,100 |
| Copper | 81.2 | 138 |
| Total Residual Chlorine | 3.39 | 180 |

Pollutant Loading Tool Output

| Facility | Pollutant | Pollutant Load (lb/yr) |
|---|--------------------------------|------------------------|
| Charles River Wastewater Treatment Facility | Nitrogen, ammonia total (as N) | 3128.36 |

Inconsistencies: PLT and FSS

| Waterbody Name | Listed | Imps | Parameter Description | Pollutant Load (kg/yr) | Max Allowable Load (kg/yr) | Load Over Limit (Option 1) (kg/yr) | Load Over Limit (Option 2) (k |
|-----------------------|--------|------|--------------------------------|------------------------|----------------------------|------------------------------------|-------------------------------|
| Westfield River | Y | 5 | Phosphorus total (asP) | 1788.900765 | 1615.90734 | 98.5614 | -423.30683 |
| Charles River | Y | 5 | Nitrogen, ammonia total (asN) | 1419.251701 | 9426.75737 | 81.63265306 | -8675.782313 |
| Otter River | Y | 5 | Phosphorus total (asP) | 561.0925635 | 1325.137963 | 24.356475 | -951.0762535 |
| Stop River | Y | 5 | Phosphorus total (asP) | 41.2284153 | 125.739214 | 3.1909064 | -98.2536038 |
| NEW BEDFORD HARBOR, / | Y | 5 | Polychlorinated biphenyls (PCB | 0 | 0.152781525 | 0.152781525 | 0.152781525 |

Expired Permits

| | | | | | |
|-----|--|------|-----|------------|------------|
| 184 | WEBSTER WASTEWATER TREATMENT FACILITY | POTW | NPD | 6/1/2006 | 11/30/2014 |
| 185 | WEBSTER WASTEWATER TREATMENT FACILITY | POTW | NPD | 6/1/2006 | 11/30/2014 |
| 186 | GREATER LAWRENCE WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/11/2005 | 12/31/2015 |
| 187 | GREATER LAWRENCE WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/11/2005 | 12/31/2015 |
| 188 | GREATER LAWRENCE WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/11/2005 | 12/31/2015 |
| 189 | GREATER LAWRENCE WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/11/2005 | 12/31/2015 |
| 190 | WESTERLY WASTEWATER TREATMENT FACILITY | POTW | NPD | 7/26/2005 | 12/31/2015 |
| 191 | WESTERLY WASTEWATER TREATMENT FACILITY | POTW | NPD | 7/26/2005 | 12/31/2015 |
| 192 | MILFORD WASTEWATER TREATMENT FACILITY | POTW | NPD | 1/1/2011 | 12/31/2015 |
| 193 | MILFORD WASTEWATER TREATMENT FACILITY | POTW | NPD | 1/1/2011 | 12/31/2015 |
| 194 | MILFORD WASTEWATER TREATMENT FACILITY | POTW | NPD | 1/1/2011 | 12/31/2015 |
| 195 | MILFORD WASTEWATER TREATMENT FACILITY | POTW | NPD | 1/1/2011 | 12/31/2015 |
| 196 | PLYMOUTH WASTEWATER TREATMENT FACILITY | POTW | NPD | 9/1/2016 | 1/31/2016 |
| 197 | PLYMOUTH WASTEWATER TREATMENT FACILITY | POTW | NPD | 9/1/2016 | 1/31/2016 |
| 198 | PLYMOUTH WASTEWATER TREATMENT FACILITY | POTW | NPD | 9/1/2016 | 1/31/2016 |
| 199 | PLYMOUTH WASTEWATER TREATMENT FACILITY | POTW | NPD | 9/1/2016 | 1/31/2016 |
| 200 | PLYMOUTH WASTEWATER TREATMENT FACILITY | POTW | NPD | 9/1/2016 | 1/31/2016 |
| 201 | PLYMOUTH WASTEWATER TREATMENT FACILITY | POTW | NPD | 9/1/2016 | 1/31/2016 |
| 202 | PLYMOUTH WASTEWATER TREATMENT FACILITY | POTW | NPD | 9/1/2016 | 8/31/2016 |
| 203 | ATTLEBORO WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/1/2008 | 10/31/2016 |
| 204 | ATTLEBORO WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/1/2008 | 10/31/2016 |
| 205 | ATTLEBORO WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/1/2008 | 10/31/2016 |
| 206 | ATTLEBORO WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/1/2008 | 10/31/2016 |
| 207 | ATTLEBORO WASTEWATER TREATMENT FACILITY | POTW | NPD | 10/1/2008 | 2/28/2017 |
| 208 | GLOUCESTER WASTEWATER TREATMENT FACILITY | POTW | NPD | 11/1/2001 | 2/28/2017 |
| 209 | SOMERSET WATER POLLUTION CONTROL FACILITY | POTW | NPD | 5/11/2004 | 2/28/2017 |

User-interface recommendations

*Possible parameters to facilitate
public use of ECHO data*

- 1.) Search criteria for number of years in non-compliance
- 2.) Agreement/consistency between pollutant loading tool and facility-specific search
- 3.) Flags for expired permits to target facilities
- 4.) Same units for PLT and FSS (PLT is in kg and FSS is in lbs)
- 5.) Make facility coordinates more specific so that they are conducive to mapping analysis (from 3 to 6 - 7 decimal places)
- 6.) If data collected after the permit expires, indicate that the new permit was not added to the site

Thank You!