

# Accounting For Growth



## Calculating Offsets

# Sources of Load to Offset

- Direct Load
  - Stormwater
  - Wastewater
    - Onsite System
    - WWTP
- Indirect Load
  - Mobile Emissions

# Wastewater - Onsite

Conventional system, N reaching drain field

$$8.82 \text{ lb/person/yr} \times 2.63 \text{ person/household} = 23.2 \text{ lb/yr/HH}$$

CBP Model Documentation      2010 Census

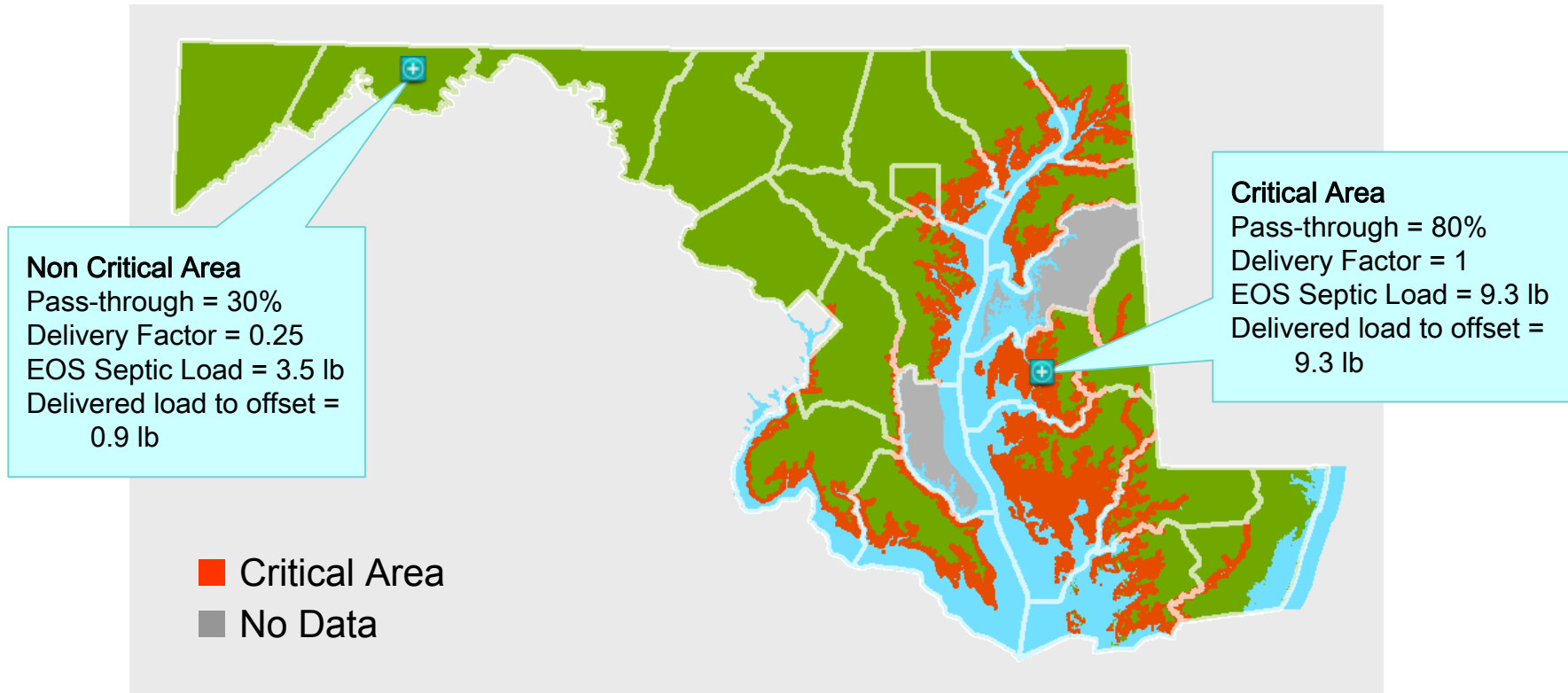
BAT system = 50% Reduction = 11.6 lb/yr/HH

- BAT systems must remove at least 50% to be approved
- Removal rates as high as 76% have been field verified in Maryland

# Wastewater - Onsite

- Only part of the N entering the drain field reaches the nearest stream
  - 3 zones in Maryland
  - 30%, 50% and 80% passes through
  - Statewide weighted average is 42.5%
- Only part of the N reaching the stream reaches the Bay, represented by Delivery Factor

# Delivered Septic Load



- No offset required if connecting to a plant with capacity
- Capacity is determined using upgrade year and projected flow
- If there is no capacity then an offset is required



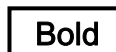


# Projected flows from WWTPs Calculated by Region (MGD)

- How do you know a WWTP has capacity?

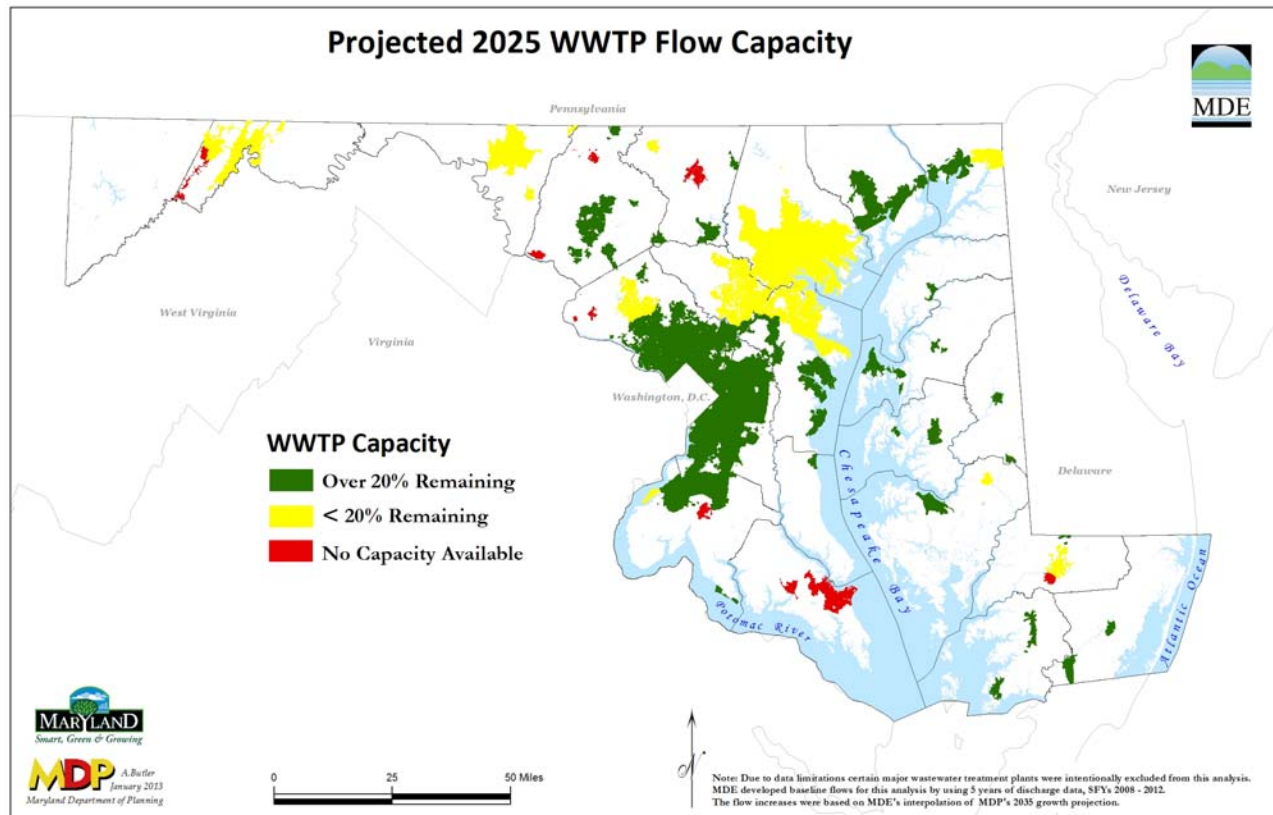
		DMR 2012	Proje cted 2013	Proje cted 2014	Proje cted 2015	Proje cted 2016	Proje cted 2017	Proje cted 2018	Proje cted 2019	Proje cted 2020	Proje cted 2021	Proje cted 2022	Proje cted 2023	Proje cted 2024	Proje cted 2025	Des ign
MD0021822	BALLENGER-MCKINNEY	5.75	5.59	5.68	<b>5.76</b>	<b>5.85</b>	<b>5.94</b>	<b>6.03</b>	<b>6.12</b>	<b>6.20</b>	<b>6.29</b>	<b>6.38</b>	<b>6.47</b>	<b>6.56</b>	<b>6.65</b>	18.00
DC0021199	BLUE PLAINS	119	122	123	124	125	<b>125</b>	<b>126</b>	<b>127</b>	<b>128</b>	<b>129</b>	<b>130</b>	<b>131</b>	<b>132</b>	<b>133</b>	170
MD0021628	BOWIE WWTP	<b>2.04</b>	<b>1.93</b>	<b>1.93</b>	<b>1.94</b>	<b>1.94</b>	<b>1.95</b>	<b>1.95</b>	<b>1.96</b>	<b>1.96</b>	<b>1.96</b>	<b>1.97</b>	<b>1.97</b>	<b>1.98</b>	<b>1.98</b>	3.30
MD0020958	BRUNSWICK WWTP	<b>0.56</b>	<b>0.59</b>	<b>0.66</b>	<b>0.73</b>	<b>0.80</b>	<b>0.86</b>	<b>0.93</b>	<b>1.00</b>	<b>1.07</b>	<b>1.14</b>	<b>1.20</b>	<b>1.27</b>	<b>1.34</b>	<b>1.41</b>	1.40
MD0020982	DAMASCUS WWTP	0.83	0.85	0.85	<b>0.86</b>	<b>0.86</b>	<b>0.87</b>	<b>0.88</b>	<b>0.88</b>	<b>0.89</b>	<b>0.89</b>	<b>0.90</b>	<b>0.91</b>	<b>0.91</b>	<b>0.92</b>	1.50
MD0020257	EMMITSBURG WWTP	0.44	0.48	0.49	0.50	<b>0.51</b>	<b>0.52</b>	<b>0.53</b>	<b>0.54</b>	<b>0.55</b>	<b>0.56</b>	<b>0.57</b>	<b>0.58</b>	<b>0.59</b>	<b>0.60</b>	0.75
MD0021610	FREDERICK CITY WWTP	6.03	<b>6.59</b>	<b>6.69</b>	<b>6.80</b>	<b>6.90</b>	<b>7.01</b>	<b>7.11</b>	<b>7.22</b>	<b>7.32</b>	<b>7.42</b>	<b>7.53</b>	<b>7.63</b>	<b>7.74</b>	<b>7.84</b>	8.00
MD0021725	PARKWAY WWTP	6.44	<b>6.42</b>	<b>6.48</b>	<b>6.53</b>	<b>6.59</b>	<b>6.65</b>	<b>6.71</b>	<b>6.76</b>	<b>6.82</b>	<b>6.88</b>	<b>6.94</b>	<b>6.99</b>	<b>7.05</b>	<b>7.11</b>	7.50
MD0021539	PISCATAWAY WWTP	22.1	22.1	<b>22.3</b>	<b>22.5</b>	<b>22.7</b>	<b>22.9</b>	<b>23.1</b>	<b>23.3</b>	<b>23.5</b>	<b>23.7</b>	<b>23.9</b>	<b>24.1</b>	<b>24.3</b>	<b>24.5</b>	30.0
MD0023001	POOLESVILLE WWTP	<b>0.65</b>	<b>0.64</b>	<b>0.65</b>	<b>0.66</b>	<b>0.67</b>	<b>0.68</b>	<b>0.69</b>	<b>0.70</b>	<b>0.71</b>	<b>0.72</b>	<b>0.72</b>	<b>0.73</b>	<b>0.74</b>	<b>0.75</b>	0.75
MD0021491	SENECA WWTP	15.4	16.7	17.1	17.6	<b>18.0</b>	<b>18.5</b>	<b>18.9</b>	<b>19.4</b>	<b>19.8</b>	<b>20.2</b>	<b>20.7</b>	<b>21.1</b>	<b>21.6</b>	<b>22.0</b>	26.0
MD0021121	THURMONT WWTP	0.87	<b>0.90</b>	<b>0.91</b>	<b>0.92</b>	<b>0.93</b>	<b>0.95</b>	<b>0.96</b>	<b>0.97</b>	<b>0.99</b>	<b>1.00</b>	<b>1.01</b>	<b>1.03</b>	<b>1.04</b>	<b>1.05</b>	1.00
MD0021741	WESTERN BRANCH WWTP	20.4	20.7	20.9	<b>21.0</b>	<b>21.2</b>	<b>21.4</b>	<b>21.6</b>	<b>21.8</b>	<b>22.0</b>	<b>22.2</b>	<b>22.3</b>	<b>22.5</b>	<b>22.7</b>	<b>22.9</b>	30.9

- Function of year upgraded and Cap

 No projected flow capacity
  Less than 20% of capacity remaining
  ENR upgrades completed

# Wastewater - WWTP

- No offset required for connecting to plant operating under it's nutrient cap (i.e., Bay TMDL cap)





# Wastewater - WWTP

- If an offset calculation is required

ENR WWTP =

$$\begin{aligned}
 & \left[ \begin{array}{c} \text{septic EOF load} \\ 8.82 \text{ lb/person/yr} \times 2.63 \text{ person/household} \end{array} \div \begin{array}{c} \text{septic EOF} \\ \text{concentration} \\ 39 \text{ mg/l} \end{array} \right] \times \begin{array}{c} \text{WWTP} \\ \text{concentration} \\ 4 \text{ mg/l} \end{array} \\
 & \quad \underbrace{\hspace{15em}}_{\text{Simplified to 0.6 multiplier}} = 2.4 \text{ lb N/yr}^1 \\
 & P = 0.6 \times 0.3 \text{ mg/l} = 0.18 \text{ lb P/yr}^1 \\
 & \text{BNR} = 4.8 \text{ lb N/yr}^1 \\
 & \text{Secondary Treatment} = 10.8 \text{ lb N/yr}^1
 \end{aligned}$$

<sup>1</sup> Per Household or Equivalent Dwelling Unit

# Air Deposition

- Nitrogen - not phosphorus - is predominant pollutant
- Increased vehicle miles = increased deposition in MD watershed
- Changes in vehicle emissions standards will have impacts
- Difficult to quantify

# Air Deposition from Mobile Emissions

- Offset for residential development only
- Based on vehicle miles travelled

Density of Census Tract (persons/mi <sup>2</sup> )	NOx (lbs/year) <sup>1</sup>
≤10,000	1.0
>10,000	0.5

<sup>1</sup> Per Household or Equivalent Dwelling Unit

# Re-Development

- Not a change in landuse
- Retrofit stormwater practices are expected to achieve the following site reductions:
  - TN – 25%
  - TP – 35%
  - TSS – 65%
- Because ESD will achieve at least this amount, there is no new stormwater load
- Still need offset for wastewater

# Stormwater – New Development

- As indicated earlier, no allocation for growth in WIP
- Allocations are fixed, 100% offset
- Do not undermine other important State policies (e.g., preserving farmland)

# Stormwater Load - Background

- Starting point is developed land with no BMPs
- Bay Model (Phase 5.3.2) statewide average no-BMP EOS loading rates

Land use	N (lbs/acre/year)	P (lbs/acre/year)
Impervious	15.34	1.70
Pervious	10.78	0.43
Forested	3	0.08



# Stormwater Load by Household

- Single household on a 2 acre lot
- 10% impervious
- 90% pervious
- 0% forest

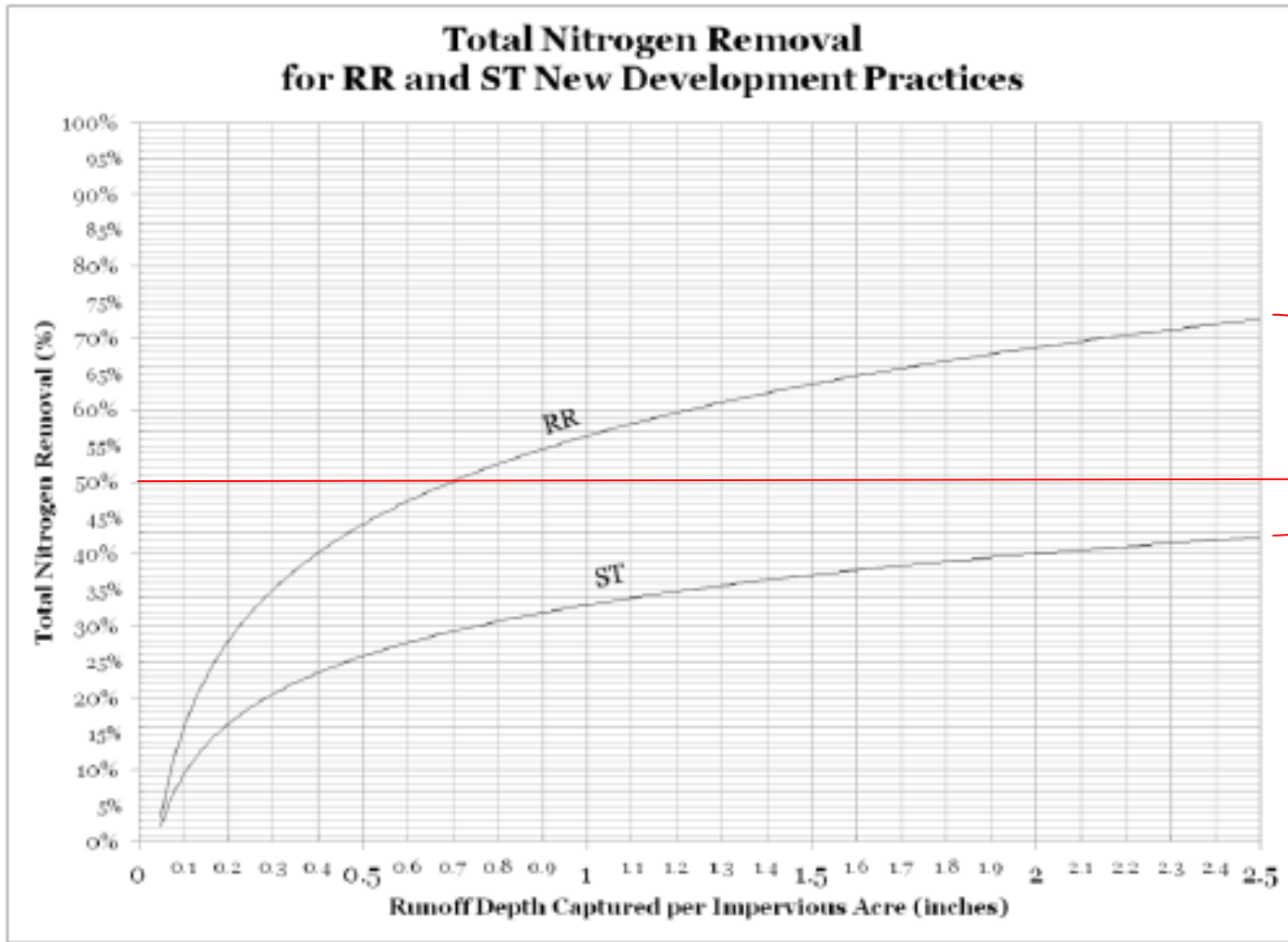
Post-development nitrogen load =

$$\begin{aligned}
 & \left[ \begin{array}{c} \text{impervious} \\ (15.34 \text{ lb/yr/ac} \times 0.1) \end{array} + \begin{array}{c} \text{pervious} \\ (10.78 \text{ lb/yr/ac} \times 0.9) \end{array} \times \begin{array}{c} \text{reduction} \\ (1-0.5) \end{array} \right. \\
 & \left. + \begin{array}{c} \text{forest} \\ (3 \text{ lb/yr/ac} \times 0) \end{array} \right] \times \begin{array}{c} \text{site} \\ 2 \text{ acres} \end{array} = 11.24 \text{ lb N / HH / yr}
 \end{aligned}$$

# Expected Reductions New Development

- New stormwater practices defined as ESD to the MEP are expected to achieve the following reductions:
  - TN – 50%
  - TP – 60%
  - TSS – 90%
- Current analysis indicate that reductions can vary depending on types of practices applied
- The magnitude of the TSS reductions suggest that post development TSS may not be a concern

# ESD Can Vary by SWM Practice



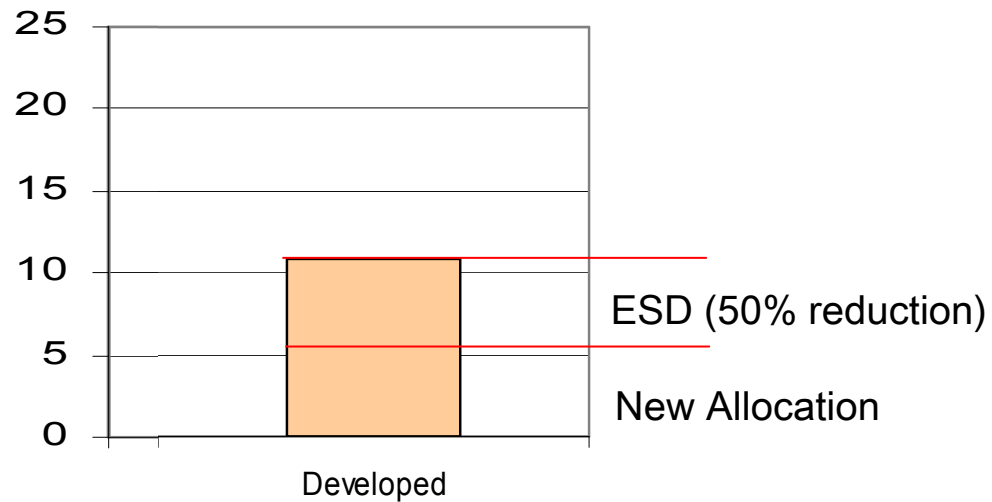
45- 70

# Stormwater

Case: 1 Acre, 10% impervious, 90% Pervious

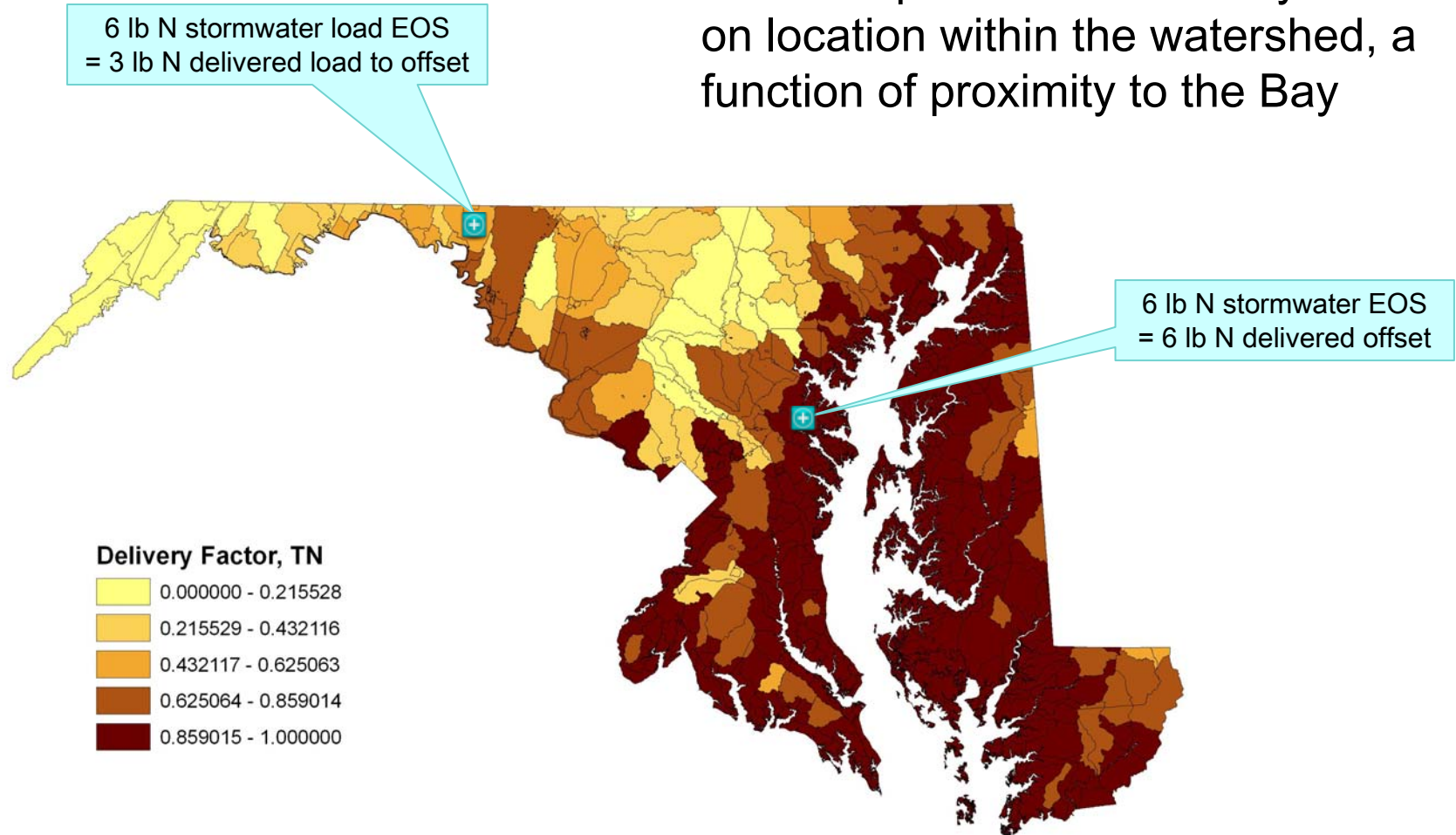
## Load Accounting:

- Development sector must secure a New Allocation.
- New Allocation amount can be reduced by taking additional actions on-site and off-site.

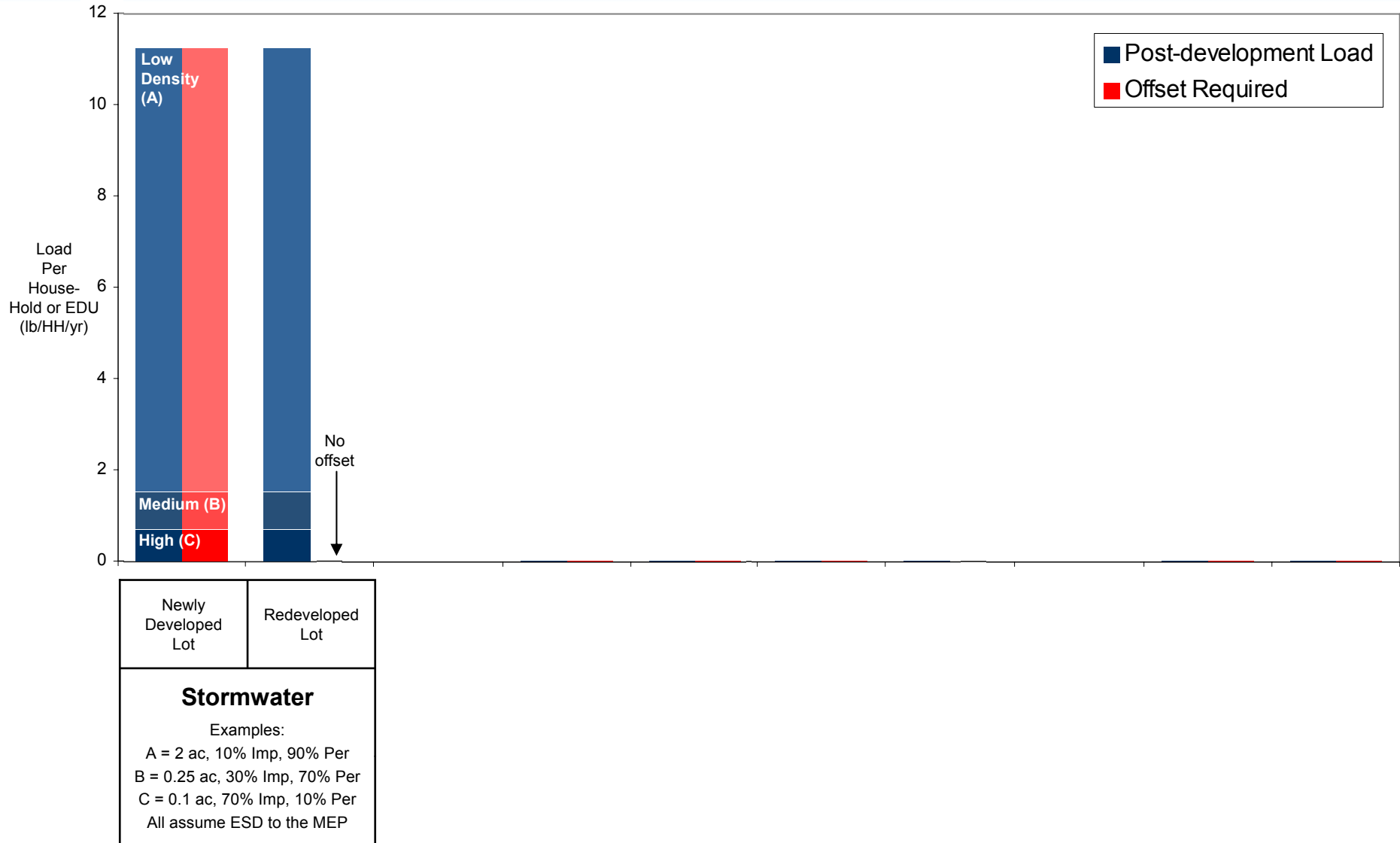


# Location within the Watershed

- Offset requirements can vary based on location within the watershed, a function of proximity to the Bay

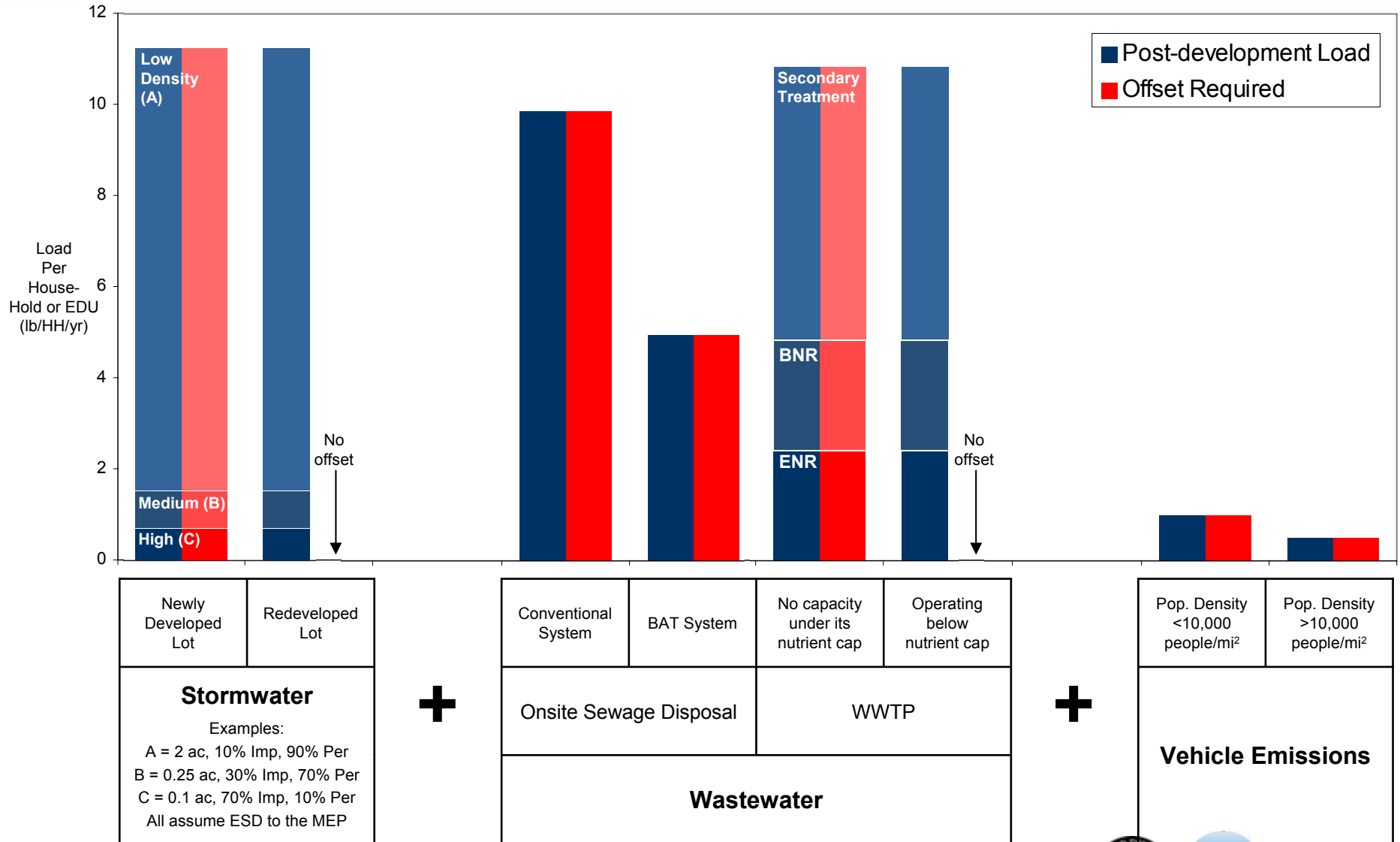


# Stormwater by HH – Lot Size

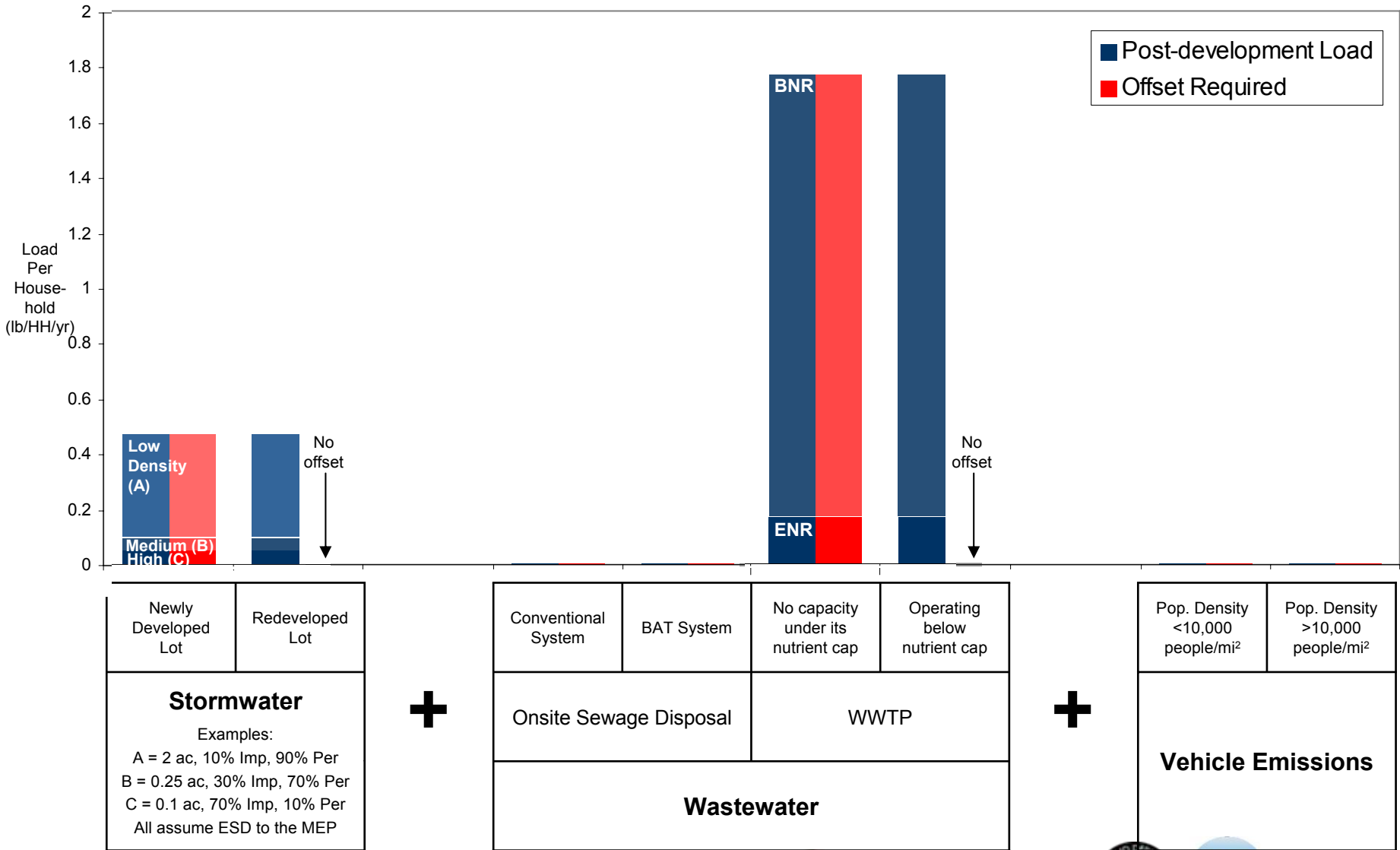




# Total Offset – Nitrogen – By HH



# Total Offset – Phosphorus – By HH



# Concluding Remarks

- No allocation for new loads from septic, stormwater and new vehicle emissions, therefore an accounting for growth policy needed
- No offset required for redevelopment and/or for the wastewater load when connecting to a WWTP with available capacity
- Analysis suggest that addressing nitrogen and phosphorus will achieve Bay water quality goals
- ESD to MEP achieves 50% reduction for TN and 60% reduction for TP when compared to “No BMP” condition
- Geographic location is a significant factor when determining the offset requirement
- When estimating offset requirement per household, increased density can significantly reduce the per household required offset

