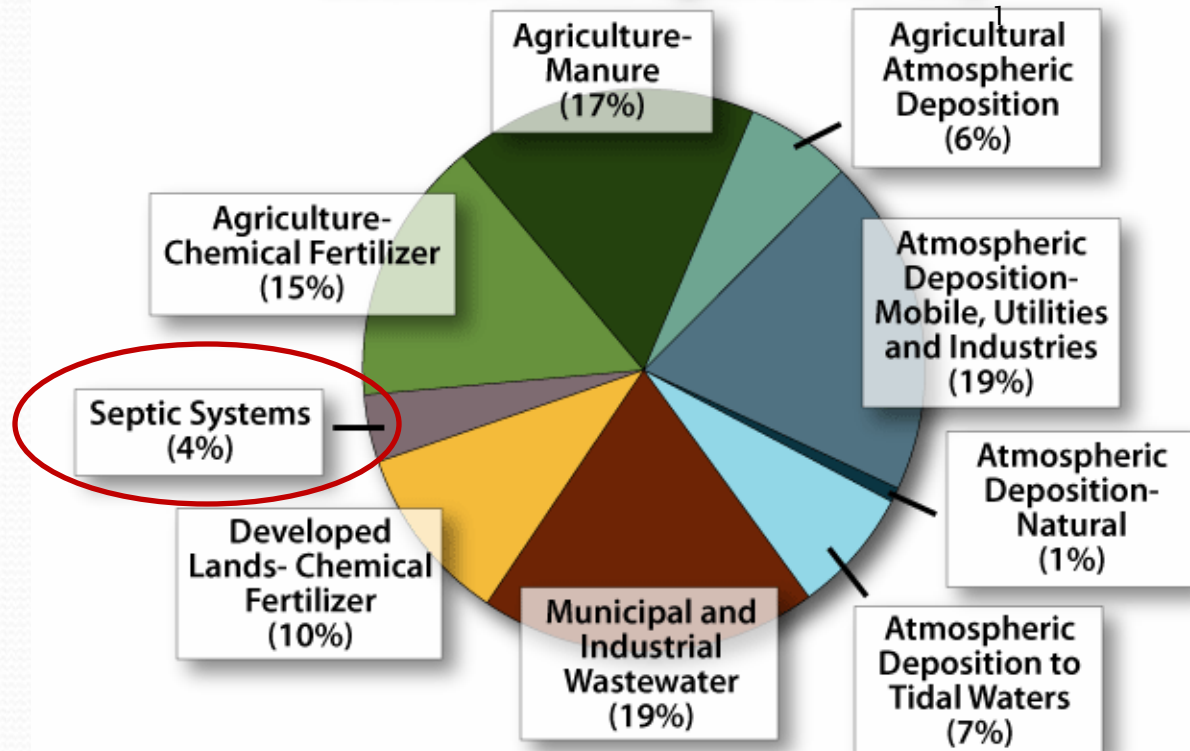


Seven Questions Regarding the State's WIP to Limit the Use of Onsite Systems for New Homes

1. Are the large differences in nitrogen loading to the Bay that are reported from septic systems versus sewers/wastewater treatment plants accurate?
2. How much Nitrogen does the 411,000 residential septic systems in Maryland contribute to the to the Bay each year?
3. Is there a difference in Nitrogen load from wastewater disposal if population growth occurs in high density sewerred versus low density unsewered?
4. Does the WIP reduce the Nitrogen Load to the Bay?
5. What does the WIP accomplish?
6. Is proposed legislation to limit number and use of Onsite Disposal Systems justified?
7. What are the costs associated with the various alternatives for managing wastewater going forward?

What's the Problem?

Sources of Nitrogen to the Bay



Note: Does not include loads from the ocean or tidal shoreline erosion. Wastewater loads are based on measured discharges; other loads are based on an average-hydrology year using the Chesapeake Bay Program Watershed Model Phase 4.3 (Chesapeake Bay Program Office, 2009). Values do not add up to 100% due to rounding.

1 From CBP Website. Relates to the entire Bay Watershed including the states of NY, PA, WV, MD, VA, DE, DC

What is MD's Portion of the Bay's Nitrogen Loading?



*

Microsoft Office
Excel Worksheet

- Based on 2007 data provided by the CBP, the load from all septic systems in MD¹ is 1.4% of the Chesapeake Bay watershed total.
- The State of Maryland through MDE, the CBP and other jurisdictions compute the impact of septic systems differently
 - Impact of Delivery Ratio Assumptions on Estimated Total Annual OSDS Nitrogen Delivered to Surface Waters in Anne Arundel County²
 - Delivery Ratio Assumption Annual Load, lbs
 - 40 Percent 640,000 (CBP method)
 - 80/50/30 880,000 (MDE method)
 - 60 Percent 960,000
 - TM1 40–100 Percent Scale 1,240,000 (AA County method)
- The multiple measurement standards create confusion and inconsistency

1– 3,606,376 pounds in 2007

2– From **Onsite Sewage disposal Systems Evaluation Study: Management Strategy and Implementation Plan, 2008**, AA County/CH2M. User identification added.

* – Link is to EXCEL data link below pie chart on CBP web page that is shown on previous slide

How Accurate are Estimates of Septic System TN Loadings?

- The paragraph below immediately follows the listing of nitrogen load estimating methods presented in the previous slide

“As noted above, **there are little or no data underlying any of these assumptions.** Additional research on delivery ratios would be extremely valuable in improving the accuracy of OSDS load and load reduction estimations, and would result in more reliable and efficient OSDS plans. It would also facilitate additional refinements to the OSDS hookup credits. It is strongly recommended that the Chesapeake Bay Program and Maryland initiate and support research on OSDS delivery ratios as part of the Tributary Strategy implementation.”¹

- There must be data that allows a calculation as opposed to a guess.

1- From Onsite Sewage Disposal Systems Evaluation Study: Management Strategy and Implementation Plan, 2008, AA County/CH2M.

A comparison of load from seweraged and unsewered areas based on CBP published estimates¹

- **Septic Systems and Sewage Treatment**

- When development occurs in existing urban and suburban areas, wastewater generated by new residents is typically treated by a public wastewater treatment plant. But when new homes are built far from public infrastructure, their wastewater is usually treated by on-site septic systems.
- Discharges from septic systems depend on a variety of technological and geographic factors; however, on average:
- **Municipal wastewater treatment plants annually deliver about 3.1 pounds of nitrogen per person to the Bay and its rivers.**
- **Septic systems annually deliver about 9.5 pounds of nitrogen per person.**

¹ - http://www.chesapeakebay.net/landuse_urbansuburban.aspx?menuitem=19557

A look behind the numbers

- Per person impact requires an estimate of the population using septic systems or sewer
 - There are 411,000 residential septic systems in MD
 - There are 2.63¹ people per residence
 - Therefore there are 1,080,930 persons served by septic systems or 19% of the total population
 - Maryland's population is 5,773,552¹
 - Less the people on septic, the number served by sewers is 4,692,622 or 81% of total population

¹ - US Census Data 2010

CBP data for 2007¹

<i>TN</i>	<i>TN</i>	<i>TN</i>	
2007	2007	2007	
Load	Load	Load	
(lbs/yr)	(lbs/yr)	(lbs/yr)	
Municipal & Industrial Wastewater	Septic	TOTAL	
1,671,452	624,505	16,839,687	NY
12,872,790	4,056,765	103,876,572	PA
13,760,265	3,606,376	53,200,291	MD
21,827,371	3,505,270	73,843,532	VA
542,532	470,797	6,681,004	WV
170,098	238,844	4,554,934	DE
2,590,857	0	2,945,887	DC
53,435,365	12,502,557	261,941,906	Chesapeake Bay Watershed

1 - http://www.chesapeakebay.net/status_nitrogensources.aspx?menuitem=19797 See Download Data File

Comparing

- Sewer based on data
 - 13,760,265 lbs ÷ 4,692,622 😊 = 2.93 lbs of TN per person
- Septic based on data
 - 3,606,376 lbs ÷ 1,080,930 😊 = 3.34 lbs of TN per person

These values almost the same

- Sewer based on http://www.chesapeakebay.net/landuse_urbanurban.aspx?menuitem=19557
- 3.1 lbs per person
- Septic based on http://www.chesapeakebay.net/landuse_urbanurban.aspx?menuitem=19557
- 9.5 lbs per person

Why do these values differ by 300%?

What if the loading based on the data is correct?

- The 2.93 lbs per person would decrease somewhat as 66 of the 483 significant wastewater plants are upgraded to ENR however the final result remains to be seen
- However, if existing septic systems were modified with approved BAT technology¹, the loading per person would fall to 1.1 lbs²

1 - There are 4 approved BAT systems. The Hoot system averages 64.3% removal, the Advantex system 71.4%, the Norweco system 68.6%, and the SeptiTech system 67%. The average removal is 67.8%. The average removal was used to calculate the 1.1 lbs presented in the second bullet

2 - $3.34 \times .32 = 1.068$ round to 1.1

What if the estimate with the 300% difference is correct?

- The 2.93 lbs per person would decrease somewhat as 66 of the 483 significant wastewater plants are upgraded to ENR however the final result remains to be seen
- However, if existing septic systems were modified with approved BAT technology¹, the loading per person would fall to 3.04 lbs²
- These loadings (2.93/3.04) are almost equal

1 - There are 4 approved BAT systems. The Hoot system averages 64.3% removal, the Advantex system 71.4%, the Norweco system 68.6%, and the SeptiTech system 67%. The average removal is 67.8%. The average removal was used to calculate the 3.06 lbs presented in the second bullet

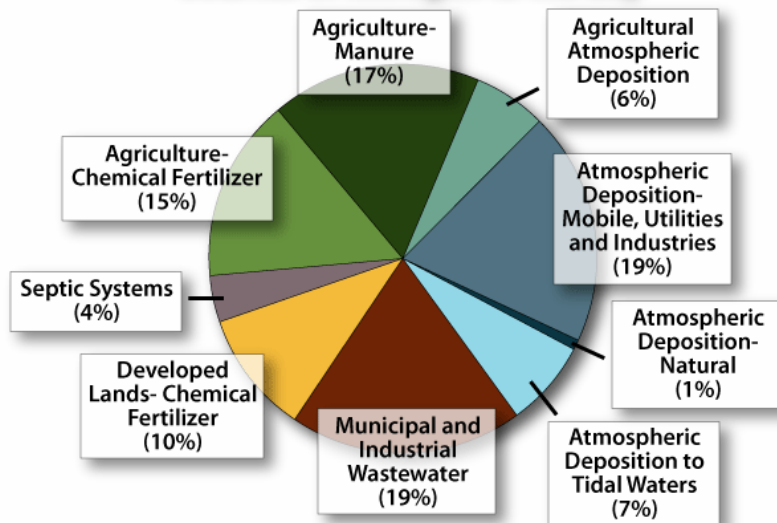
2 - $9.5 \times 0.32 = 3.04$

Loading Conclusion

- The Nitrogen loadings to the Bay from either sewer/wastewater treatment systems using improved nutrient removal techniques or from septic systems using approved BAT technologies are extremely low and almost equal
- Some representations of the impacts are greatly exaggerated

How much do the 411,000 septic systems in Maryland contribute to the Nitrogen load to the Bay?

Sources of Nitrogen to the Bay

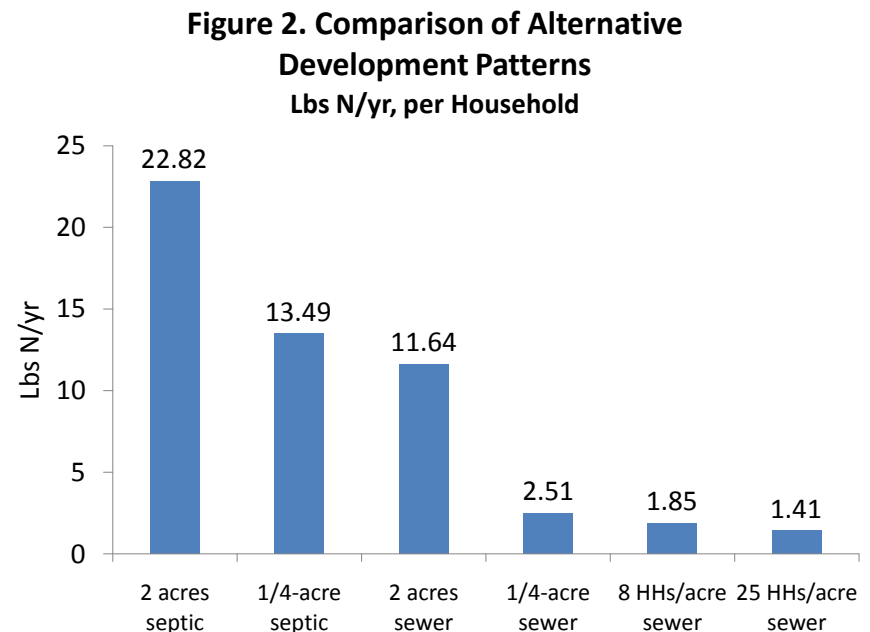


	NY	624,505	16,839,687
	PA	4,056,765	103,876,572
	MD	3,606,376	53,200,291
	VA	3,505,270	73,843,532
	WV	470,797	6,681,004
	DE	238,844	4,554,934
	DC	0	2,945,887
	Chesapeake Bay Watershed	12,502,557	261,941,906
	MD Septics % of MD Load		6.77%
	MD Septics % of Total Bayshed Load		1.38%

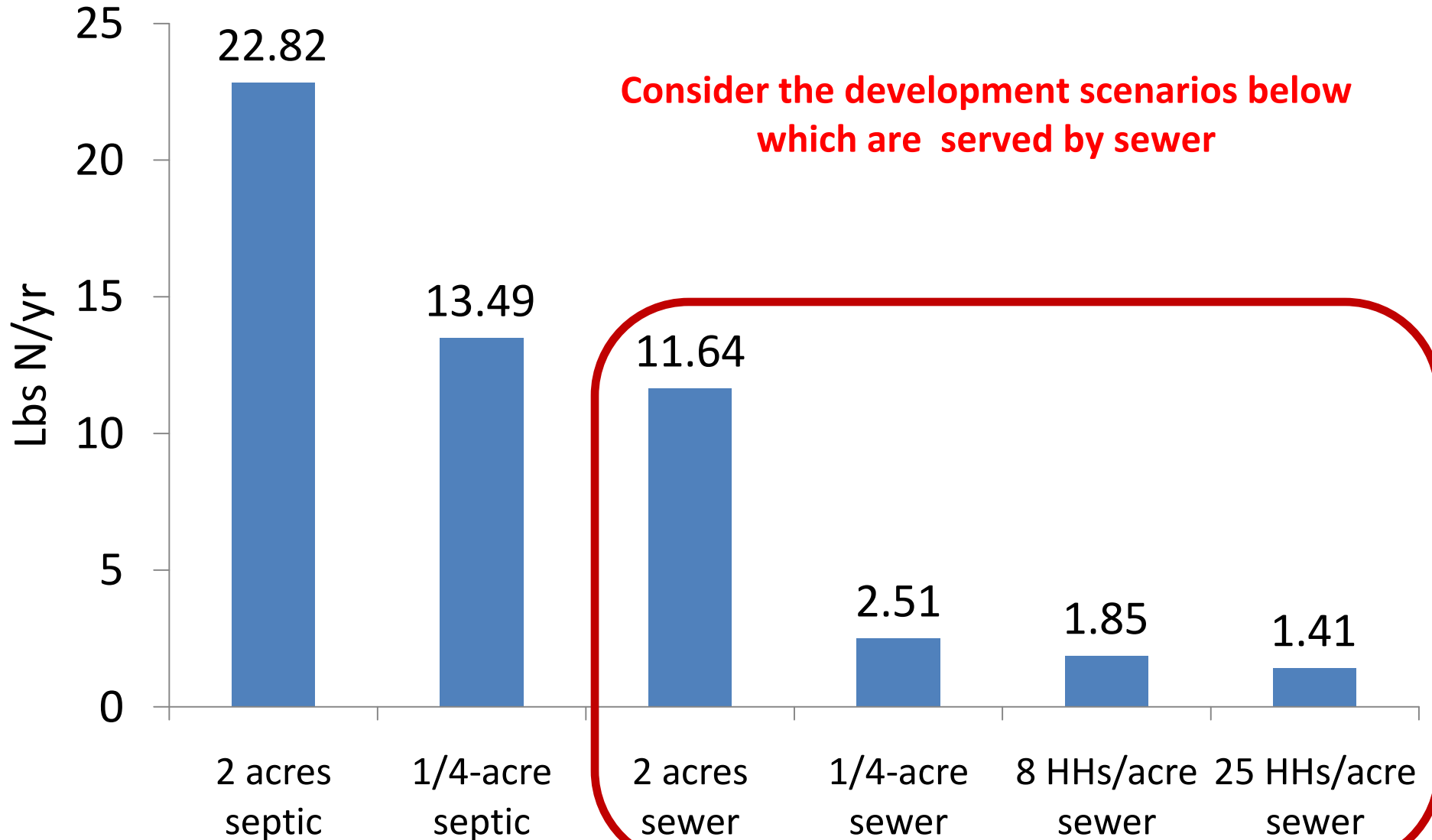
Note: Does not include loads from the ocean or tidal shoreline erosion. Wastewater loads are based on measured discharges; other loads are based on an average-hydrology year using the Chesapeake Bay Program Watershed Model Phase 4.3 (Chesapeake Bay Program Office, 2009). Values do not add up to 100% due to rounding.

Getting the numbers straight

- The bar chart opposite was presented to the Governors Septic System Task Force
- The chart purports to illustrate and quantify the nitrogen contribution to the bay per household under different development scenarios
- **It is impossible to discern from the chart the projected N contribution from stormwater, WWTP effluent, septic systems, etc.**
- **If the projected N loading is from multiple sources the graph may mislead some to conclude that all N is from domestic wastewater discharge**
- The following slides analyze the chart and the conclusions it suggests

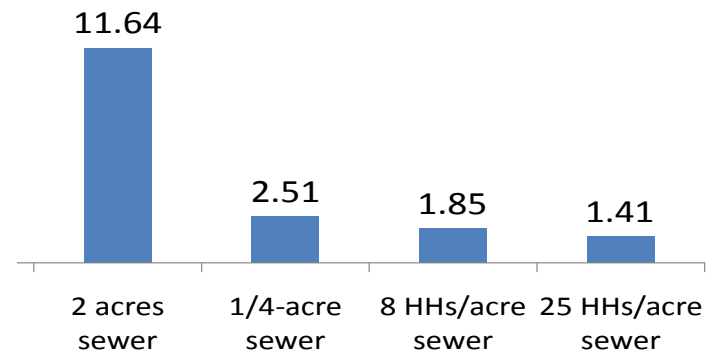


**Figure 2. Comparison of Alternative
Development Patterns
Lbs N/yr, per Household**



Why is the N load from 2 acre per household on sewer so much larger than high density development?

- Under all development scenarios served by sewer the sanitary wastewater load per household should be the same
- Therefore, the N load per household from domestic wastewater must be 1.41 lbs or less
- The 10.23 pounds difference between high density and 2 acre development **must come from other sources**

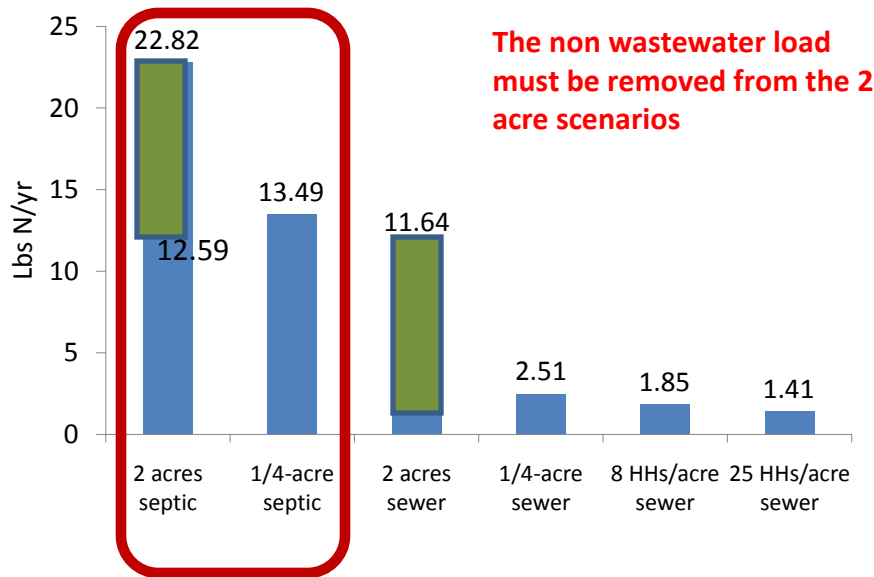


It is suspected that the chart authors applied a large value to the N loading from lawn fertilizing

- If so,
 - Any projection of fertilizer N loads is a guess
 - A March 2011 report by Environment Maryland states “It is difficult to know how much fertilizer is being applied to Maryland lawns, since the state does not keep track of homeowners’ fertilizer usage or compile a statewide estimate of use by lawn companies, golf courses and managers of other large properties.”

Correcting the obvious overestimate and understatement of N loading

Figure 2. Comparison of Alternative Development Patterns
Lbs N/yr, per Household

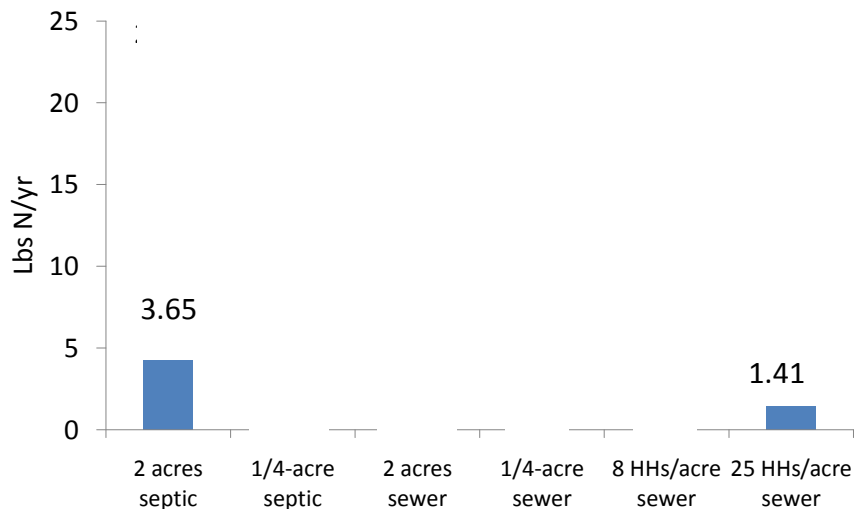


- Subtracting 10.23 lbs¹ from the 22.82 lbs projected 2 acre septic wastewater N load reduces the septic load to 12.59 lbs/household

$$1 - 11.64 - 1.41 = 10.23$$

A comparison of N loading from high density municipal treated and 2 acre with the most effective BAT treatment¹

Figure 2. Comparison of Alternative Development Patterns
Lbs N/yr, per Household



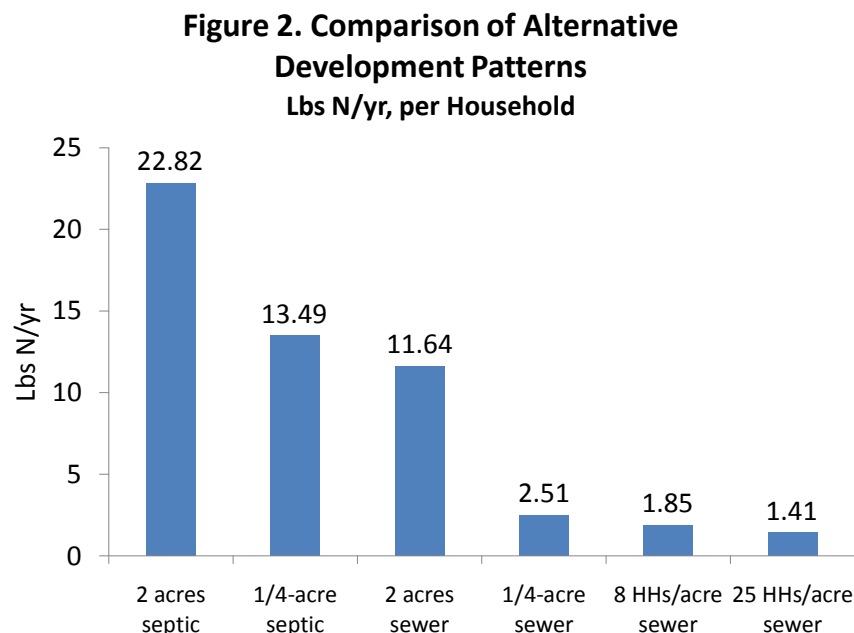
- The high density N load of represents a base load of 1.41 lbs/yr following municipal treatment
- 3.65 lbs/yr represents septic tank effluent that has been treated using the most effective of the approved BAT systems²

1 – The performance of the BAT system cited, is based on BAT performance data obtained from the MDE website

2 – According to MDE data the Advantix system by Orenco achieves an average TN removal of 71 percent.

The comparison presented by the chart is not accurate

- The comparison is apples to oranges
 - Treatment of sewerage is compared to the discharge of septic tank effluent without treatment
 - Any assumptions regarding the treatment of septic tank effluent by soil are not provided
- A massive and unjustified N load is added to the septic and 2 acre development scenarios
- Furthermore, the projected loading from septic systems ignores the availability of BAT treatment systems that provide a minimum of 50% reduction in total N¹
 - Approved BAT systems remove as much as 71% of TN reducing the household discharge to 3.65 lbs/yr
- Lastly, the projected 1.41 lb/year loading from high density development may be biased low if based on ENR treatment. There are only a few operating ENR treatment plants in Maryland and conversion of the remaining plants is likely to be delayed given the current economy



1 – The load using the least capable BAT system would reduce the wastewater load by half to 6.30 lbs/yr/household

How Much Would New Construction Increase the N Load Each Year?

- In 2008 1,500 new septic systems were constructed in Maryland¹
- At 9.5 lbs/capita² and 2.63³ persons per residence, the N load increase from OSDS would be 37,478 lbs.
- At 3.34 lbs/capita the OSDS load would be 13,176 lbs
- If the same population located in sewer service areas the increase in TN load would be 11,559 lbs⁴.
- If 1175 onsite systems were constructed using the average approved BAT system and 325 with standard septic systems, the impact would be 11,591 lbs which is less than 11,559⁵.
- **The exercise demonstrates that no increase is achievable based on the mix of standard septic and BAT systems used**

1 - 2/6/2009 HB 176 support document from MDE to Environment Matters Committee

2 - Worst Case

3 - US Census for Maryland 2010

4 - Based on 2.93 lbs per capita

5 - This calculation uses 9.5 lbs per person as opposed to the lesser and justifiable 3.34 lbs.

No Matter What, People are Going to Move into Maryland

- Whether new residents are served by a sewer or not, they will increase the TN load to the Bay.
- The technology exists to limit the N load from OSDS so that any increase is less than the equivalent load from the most advanced wastewater treatment systems in use today in Maryland.

Does the WIP reduce the Nitrogen Load to the Bay?

- Existing septic systems are the source of the 3,606,376 pound load that along with 49,593,915 pounds from other sources in Maryland are contributing to the degradation of water quality in the Chesapeake Bay.
- The funding for SB 554 is sufficient to retrofit 733 OSDS a year with Nitrogen Removal technology. At this rate, it will take 561 years to correct the 411,000 septic systems that are the source of some of the Nitrogen that is degrading the Bay.

What Does the WIP Accomplish?

- There are over 52,000 systems in the Critical area.
- Based on MDE's estimate of OSDS failure rates in the Critical area (240/yr) it will take 217 years to retrofit all Critical Area Systems unless there is a substantial increase in voluntary OSDS upgrades
- The cost of new onsite systems will increase by at least \$13,000 making homes less affordable
- The unjustified indictment of all existing onsite systems as major polluters of the Bay and the adoption of what are likely the highest financial penalties in the nation for failure to comply with the proposed regulations will dampen the suburban real estate market and devalue/impede the sale of existing homes.
- Lenders will be motivated to require OSDS upgrade on sale or transfer of title

Is proposed legislation to limit number and use of Onsite Disposal Systems justified?

- The planned legislation (Plan) does nothing to reduce the Nitrogen load from existing septic systems
- The Plan disregards the availability of technology to treat residential wastewater that is as or more effective than the latest urban wastewater treatment technology
- The Plan will have a major impact on suburban and rural real estate values and sales of existing homes
- The Plan will have a major State wide economic and employment impact on the contracting and real estate industries
- The Plan is being sold with data not supported by the available facts

Costs¹

**TABLE 2
SUMMARY OF COST ESTIMATES**

	Estimated Cost per Property Served			Equivalent Annual Cost per Pound of Nitrogen Removed	
	Capital Cost	Annual O&M Cost	Equivalent Annual Cost	\$/Lb N	Premium over 3.0-mgd Centralized System
<u>Individual Systems</u>					
Title 5	\$13,000	\$ 110	\$1,150	N/A	Not Applicable
Nitrogen-removing --current practice	\$24,000	\$1,250	\$3,180	\$820	187%
Nitrogen-removing--enhanced current practice	\$26,000	\$2,000	\$4,090	\$580	102%
Nitrogen-removing --for TMDL compliance	\$28,000	\$3,200	\$5,450	\$770	169%
<u>Cluster Systems</u>					
Current practice	\$48,300	\$1,050	\$4,920	\$820	186%
For TMDL compliance	\$52,000	\$2,800	\$6,940	\$710	149%
<u>Satellite Systems</u>					
50,000 gpd	\$55,100	\$1,670	\$6,080	\$680	138%
100,000 gpd	\$51,300	\$1,360	\$5,480	\$590	109%
200,000 gpd	\$47,700	\$1,030	\$4,860	\$510	79%
300,000 gpd	\$46,300	\$860	\$4,570	\$470	64%
<u>Centralized Systems</u>					
1.5 mgd	\$42,900	\$ 500	\$3,940	\$305	7%
3.0 mgd	\$40,900	\$ 400	\$3,680	\$285	----

Notes: Equivalent annual costs are based on 5%, 20-year financing.

Watershed-wide costs must consider the number of properties served and the average cost per property; see Figure 9 and text.