For further information contact:

- Paul Steinbrecher, President, Florida Water Environment Association Utility Council, 904-536-8885
- Rod Reardon, Carollo Engineers 407-478-4642, rreardon@carollo.com

Roderick D. Reardon
P.E. No. 26858

FLORIDA WATER ENVIRONMENT ASSOCIATION UTILITY COUNCIL

COSTS FOR UTILITIES AND THEIR RATEPAYERS TO COMPLY WITH EPA NUMERIC NUTRIENT CRITERIA FOR FRESHWATER DISCHARGERS

November 1, 2010

1089 WEST MORSE BOULEVARDD, SUITE A • ORLANDO, FLORIDA 32789 • (407) 478-4642 • FAX (407) 478-4643

FLORIDA WATER ENVIRONMENT ASSOCIATION UTILITY COUNCIL

COSTS FOR UTILITIES AND THEIR RATE PAYERS TO COMPLY WITH EPA NUMERIC NUTRIENT CRITERIA FOR FRESHWATER DISCHARGERS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Acronym List

AWT	advanced wastewater treatment
AWWTP	advanced wastewater treatment plant
gpcd	gallons per capita per day
CUP	consumptive use permit
DIW	deep injection wells
EPA	Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
FWEAUC	Florida Water Environment Association Utility Council
HLD	high level disinfection
MF	microfiltration
NNC	numeric nutrient criteria
O&M	operation and maintenance
RO	reverse osmosis
WRF	water reclamation facility

COSTS FOR UTILITIES AND THEIR RATE PAYERS TO COMPLY WITH EPA NUMERIC NUTRIENT CRITERIA FOR FRESHWATER DISCHARGERS

In response to the Draft *Water Quality Standards for the State of Florida's Lakes and Flowing Waters* proposed by EPA, a cost estimate for compliance with this rule that is specific to utilities with freshwater discharges has been prepared. A previous cost estimate was prepared to estimate increases in annual user fees that typical utility customers could experience from implementation of EPA's proposed numeric nutrient criteria approach for both fresh and marine/estuarine discharges. The updated cost estimate for freshwater dischargers only is summarized herein. Section 1 lists the assumptions used in preparing the cost estimates. The assumptions are also listed in the Excel file (Carollo_Freshwater_NNC_Costs.xls). The Florida Department of Environmental Protection (FDEP) prepared an independent cost analysis, which is also referred to in this report and attached as Appendix A. The original and updated Florida Water Environment Association Utility Council (FWEAUC) cost estimates as well as the FDEP cost estimate are provided.

Capital and operating cost increases, and the resulting increases in customer charges, are expected to vary greatly depending upon the physical location of each utility, its current treatment system, the suitability of local geologic formations for deep well disposal, and other factors. The range of estimated total project costs is between $4.2 and $6.7 billion, and the annual debt service, including incremental operating and maintenance costs, is expected to range from $430 million to $620 million per year. These costs are translated into estimated increases in annual customer charges for typical utilities to comply with the rule. Typical increases in customer charges are expected to range from $570 to $990 per year. The estimated rate increases to customers varies by category of solution, such as by use of deep well injection or by installation of extensive, tertiary treatment infrastructure. The typical increases in customer charges are summarized in Figure 1, which highlights the variability of costs that each utility could face.

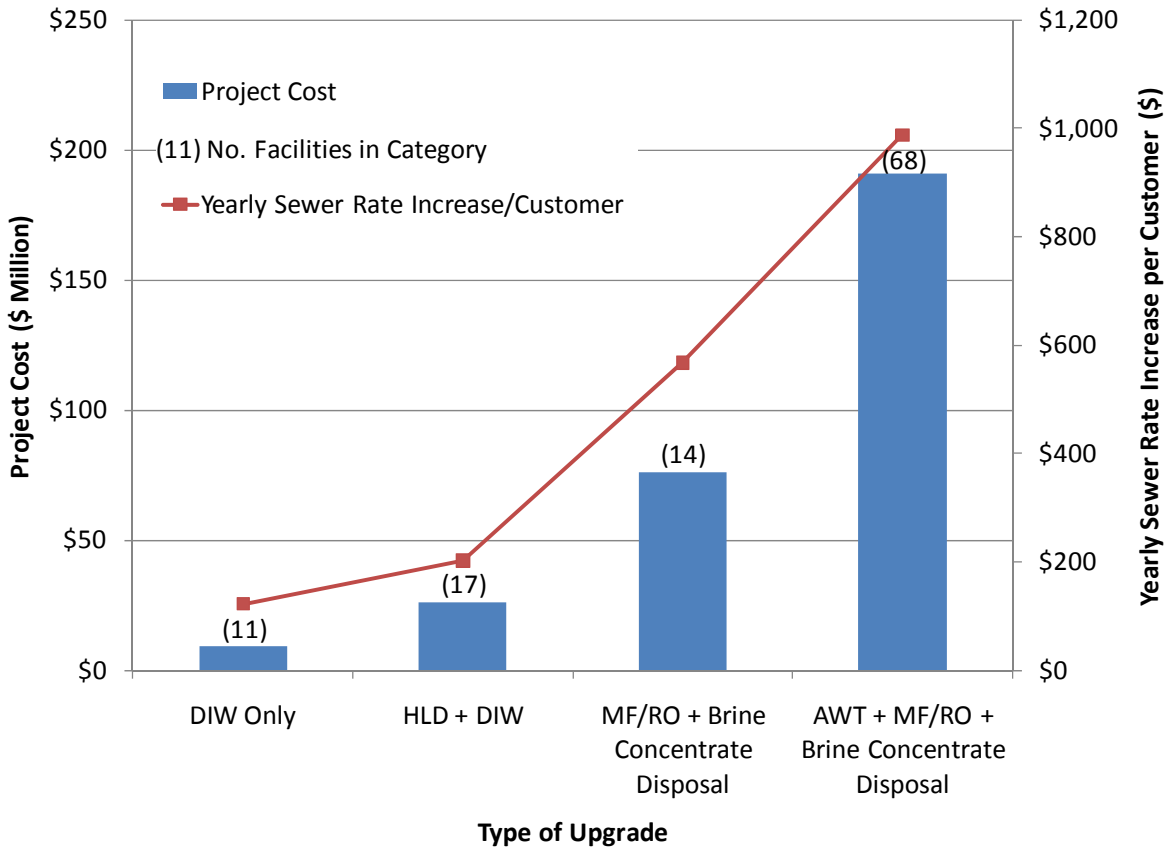

Figure 1: Estimated Project Costs and Annual Sewer Rate Increases by Upgrade Type

1.0 ASSUMPTIONS / BASIS OF ESTIMATES

The assumptions used to determine the updated costs are as follows:

- All water reclamation facilities listed in the current FDEP inventory of wastewater treatment facilities available on the FDEP website are assumed to be active facilities unless noted. Inactive facilities and septage/residuals disposal facilities were not included in the analysis. (http://www.dep.state.fl.us/water/wastewater/facinfo.htm).
- No industrial facilities are included.
- The FDEP list of Class I municipal injection wells is assumed current. (http://www.dep.state.fl.us/Water/uic/index.htm).
- Project costs include estimated construction costs plus 30% of the estimated construction costs for contingencies and another 20% of the construction costs for administrative, legal, engineering, and financing costs.
- The costs to upgrade privately owned domestic treatment facilities are included in this estimate.
- All plants that currently discharge to freshwater, that are located in Counties that already have deep injection wells (DIW) of any kind (industrial wastewater, RO concentrate, etc.), will be allowed to construct a DIW as their method of disposal with

the exception of Polk County. Polk County's one industrial well is so deep that municipal wells of that nature are assumed to be unlikely.

- Annual debt service is based on 30-year amortization schedule and 5% interest.
- Capital upgrades are assumed to be required for the existing design flow of each facility, while operating costs are based on an estimate of actual usage. Incremental O&M costs assume that all facilities are operating at 50% of design flow.
- The average customer size assumes 2.1 persons per household based on US Census information.
- A per capita flow of 100 gallons per day flow is assumed to estimate the population served by the listed water reclamation facilities.
- The range of project costs is based on two scenarios. In the base scenario, the cost estimate was prepared assuming that only existing facilities that are direct dischargers to freshwater as listed in the FDEP estimate of the cost to comply with the EPA freshwater numeric nutrient rule would be required to comply with the proposed nutrient criteria by either DIW effluent disposal or by upgrading to microfiltration MF/RO. The second, higher estimate of project costs, assumes that all the plants listed in the FDEP cost estimate and facilities listed by FDEP as wet weather and wetlands dischargers would be required to comply with the proposed nutrient rule by upgrading to MF/RO.
- Capital costs to upgrade existing facilities to meet Florida advanced wastewater treatment (AWT) limits are assumed to be $8.20/gallon per day of permitted treatment capacity.
- A capital cost of $5.00/gallon per day of permitted treatment capacity (feed water flow) is assumed to add tertiary microfiltration (MF) and reverse osmosis (RO) to existing facilities.
- A capital cost of $3.10/gallon per day of treatment capacity (feed water flow) is assumed to construct brine concentrators and crystallizers for concentrate treatment.
- A capital cost of $1.00/gallon per day of treatment capacity is assumed to construct necessary upgrades for tertiary filtration and high-level disinfection prior to deep well injection.
- Dried RO residuals were assumed to be acceptable for landfill disposal in sanitary landfills (i.e. the residuals are not hazardous materials)
- A water recovery of 80% is assumed for MF/RO treatment.
- A capital cost of $1.10/gallon per day of treatment capacity is assumed to add a new deep well to a facility for effluent disposal.
- An incremental cost of $1.00/1000 gallons treated is assumed for the annual operation and maintenance (O&M) costs associated with running AWT and MF/RO.
- An incremental cost of $0.50/1000 gallons treated is assumed for the annual O&M costs associated with running equipment associated with tertiary filters and high-level disinfection (HLD).
- A cost of $3.00/1000 gallons treated is assumed for the O&M cost associated with running a brine concentrator/crystallizer. This is based on the facility flow and is in addition to the costs for operating the AWT and MF/RO facilities.

- All water reclamation facilities are assumed to incur similar construction and operating costs (i.e. the differences that are expected from plant to plant in actuality are averaged out in this analysis).
- No costs were included for plants with existing DIWs.
- Where any flow discrepancies existed between the FDEP and the FWEAUC cost estimate, the flow listed in the EPA PCS database was used.
- No plants discharging to marine waters or South Florida canals are included in this cost estimate.

2.0 DISCUSSION

The minimum costs to the utility sector from EPA's proposed rule on numeric nutrient criteria for freshwaters were prepared using a base list of existing treatment facilities that currently discharge reclaimed water to freshwater lakes, rivers, and streams. This base list for this updated cost estimate includes the facilities used in the FDEP cost estimate with the exception of the Pinellas County's South Cross Bayou Water Reclamation Facility (WRF), the City of Clearwater's Northeast Advanced Wastewater Treatment Plant (AWWTP), and the Seacoast Utilities PGA WWTP. The South Cross Bayou WRF and Northeast AWWTP both discharge to marine waters. The PGA WWTP discharges to a South Florida canal. The upper end of the cost range was developed by adding to the base list those facilities that discharge to wetlands and intermittently to freshwaters during wet weather. The estimate for the base list plus wetland and wet weather dischargers includes those facilities listed as such by FDEP.

The following example is provided to illustrate how the unit cost assumptions were used to estimate the costs to upgrade facilities to meet the EPA rule. A 10 mgd facility supplying reclaimed water for reuse needs to upgrade their treatment process to provide AWT and MF/RO to meet the proposed numeric nutrient criteria. Upgrading to AWT costs $8.20 per gallon of treatment capacity, or $82 million for this example. The addition of MF/RO costs $5.00 per gallon of treatment capacity, costing this plant an additional $50 million. Concentrate disposal will be accomplished with a brine concentrator and crystallizer because DIWs are not possible in this area. At $3.10 per gallon of treatment capacity, this is an additional $31 million for the concentrators and crystallizers. The total capital cost for this project would be $163 million, plus 30% of the construction cost for contingencies and another 20% for project costs for a total of $254 million. Incremental O&M costs for the upgraded plant were estimated by assuming that the facility is operating at 50% of the total plant design capacity, or 5 mgd for this example. The additional O&M for AWT and MF/RO is $1.00 per 1000 gallons treated, which equates to an additional $5,000 per day or $150,000 per month. The brine disposal O&M is an additional $3.00 per 1000 gallons treated, which equates to another $15,000 per day or $450,000 per month. This is a total of $600,000 per month in additional O&M costs for this facility.

The debt service at 5% interest over 30 years for the capital cost of the upgrades will be $16.5 million per year. This equates to a debt service per 1000 gallons treated of $4.53. To estimate the population for the service area of the 10 mgd facility at 50 percent capacity, a unit flow rate of 100 gallons of wastewater per capita per day (gpcd) is assumed. The

estimated population of this area is 50,000 people. Therefore, the capital cost per household per month, assuming an average household of 2.1 people, is $57. Similarly, the O&M cost per household per month is $25. This is a total additional cost of $82 per month, or $988 per year, for each household. A similar calculation was done for each freshwater discharger.

The updated FWEAUC cost estimates for facilities discharging to freshwaters is provided in Table 1. The original FWEAUC and FDEP cost estimates are also provided in Table 1 for comparison. The estimated total project costs for utilities in the State to comply with the Proposed Final Rule for Freshwaters is between $4.2 and $6.7 billion, depending on how wetland, wet weather and reuse systems are regulated. This agrees very well with the FDEP estimate of $4.2 billion, which was based only on direct dischargers. Actual costs to the utility sector will be higher than this minimum base cost and are dependent upon how many predominately reuse and wet weather or wetland discharge facilities also are required to meet the more stringent discharge standards. At this time, the language in the rule is unclear as to how wetland, wet weather, and reuse systems will be regulated.

The annual debt service, including incremental operating and maintenance costs, is expected to range from a low of $430 million up to $620 million. Converting this debt service to average residential wastewater rates results in estimated increases in annual customer sewer rates needed to fund compliance with the rule that range from $578 to $696 per customer per year. These are the average values for all users in the entire state that now discharge to freshwaters.

The actual sewer rate increase by utility will be highly variable, depending upon the proximity of a utility to a geological area where deep well disposal is allowed, the extent of the utility's existing reuse system, the utility's desire to supplement existing groundwater supplies with the reclaimed water from MF/RO treatment to augment potable supplies indirectly, and other factors.

Table 1 **Summary of Estimated Project Costs and the Estimated Average Increase in Annual Sewer Rates for Affected Utilities and their Ratepayers to Implement Numeric Nutrient Criteria.**

Source of Estimate	Plants Included	Project Cost	Annual Debt Service	Annual Debt Service (Including O&M)	Increase in Annual Operating Costs
Updated FWEAUC	Base List of Florida Freshwater Dischargers (Direct Discharges Only)	$4,200,000,000	$276,000,000	$430,000,000	$155,000,000
	Base List + All Other Freshwater Dischargers	$6,700,000,000	$438,000,000	$619,000,000	$181,000,000
Original FWEAUC	Florida Facilities with NPDES Permits	$24,400,000,000	$1,600,000,000	$2,000,000,000	$433,000,000
	All Florida Facilities	$50,700,000,000	$3,300,000,000	$4,600,000,000	$1,300,000,000
FDEP	Base List of Florida Freshwater Dischargers (Direct Dischargers Only[(1)]	$4,200,000,000	$271,000,000	$456,000,000	$185,000,000

Notes:

1. The FDEP Base List includes South Cross Bayou WRF, Clearwater Northeast AWWTP, and Seacoast Utilities PGA WWTP, which are not included in the updated base list. These were excluded from the updated base list because they discharge to marine waters or South Florida Canals.

Table 2 Summary of Estimated Project Costs and the Estimated Average Increase in Annual Sewer Rates Per the Extent of Upgrades Required		
Type of Upgrade (Number of Facilities in this Estimate)	**Project Cost**	**Estimated Yearly Sewer Rate Increase per Customer**
AWT + MF/RO + Brine Concentrate Disposal (68)	$191,000,000	$990
MF/RO + Brine Concentrate Disposal (14)	$76,000,000	$570
HLD + DIW (17)	$26,000,000	$200
DIW Only (11)	$9,000,000	$120

The corresponding estimated increases in annual costs by the type of treatment plant upgrades assumed to be required are provided in Table 2. The types of upgrades listed in Table 2 are representative of those that would be required for plants to comply with the proposed numeric nutrient criteria for Florida's lakes and flowing waters. The type of upgrades required for a freshwater discharger to comply with the proposed rule will depend on the existing level of treatment at the plant and the proximity of the plant to a DIW. As a result of this variability, the required increases in sewer rates might be as low as $120 per year for those areas able to use deep well injection, to nearly $990 per year for those utilities relying on extensive MF/RO treatment. Only facilities in the same county as an existing DIW are assumed to have the option to discharge to a DIW, all others must use MF/RO. Facilities that are not meeting AWT limits must also upgrade their plants to AWT if using MF/RO, or upgrade to HLD if using DIW. Also shown in Table 2, is the number of facilities used in this cost estimate that were estimated to fall into each of these categories. As shown here, most of the facilities will require the more costly upgrades.

The availability of DIWs for effluent disposal will be a lower cost alternative for a utility when compared to construction of a new or expanded reuse system or upgraded treatment facilities. This could unfortunately reduce the amount of reclaimed water that is reused, and is contrary to the State's desire to promote the use of reclaimed water as an alternative water supply. Utilities that do not have the option of a DIW, must find another method to meet the numeric nutrient criteria such as extensive reuse or implementing a high performance treatment technology like MF/RO. The feasibility and cost competitiveness of reuse as a disposal alternative will depend on how reuse facilities can treat and discharge or store excess flows generated during wet weather. Currently the Apricot Rule encourages reuse by allowing reuse systems to discharge excess water during wet weather if the reclaimed water meets Florida AWT standards. If wet weather discharges must meet the numeric water quality criteria as currently proposed, there would be a strong disincentive for communities to implement, continue, or expand reuse systems. Other utilities faced with consumptive use permit (CUP) conditions for reuse and the need to meet the NNC rule, and unable to use a

DIW, may find it more economical to implement MF/RO to meet drinking water standards and directly inject the water into a potable aquifer. Ultimately, a currently unknown number of communities will be forced to implement MF/RO with brine concentrate disposal. These customers are expected to experience an increase in user chargers of $570 to $990 per year per household.

This updated estimate includes costs for 110 facilities that will likely be affected by EPA's *Water Quality Standards for the State of Florida's Lakes and Flowing Waters*. These plants have a total capacity to discharge to freshwater of about 370 mgd. The majority of surface water dischargers in the State of Florida discharge to marine waters. An additional 81 facilities in Florida, with a total capacity of nearly 900 mgd, have NPDES permits. These facilities could be regulated under the second phase of EPA's proposed NNC rules. Therefore, these estimated costs to freshwater dischargers represent a fraction of the total cost that may be ultimately incurred for meeting the proposed numeric nutrient criteria.

APPENDIX A – FDEP INDEPENDENT COST ESTIMATE

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

FDEP Review of EPA's "Preliminary Estimate of Potential Compliance Costs and Benefits Associated with EPA's Proposed Numeric Nutrient Criteria for Florida"

Prepared January 2010 by the Environmental Protection Agency

Division of Environmental Assessment and Restoration

4/28/2010

Contents

Preliminary Estimate of Potential Compliance Costs and Benefits Associated with EPA's Proposed Numeric Nutrient Criteria for Florida

EPA's Economic Analysis stated

> *EPA conducted a preliminary estimate of the potential incremental compliance and state resource costs associated with EPA's proposed nutrient criteria for lakes and streams in Florida. Incremental costs associated with the proposed rule represent the costs above and beyond the costs that would be incurred for compliance with the baseline criteria. For this analysis, baseline costs represent the costs necessary for compliance with FDEP's draft water quality standard (WQS) changes (Chapter 62-302 and 62-303; July 2009), and any costs incurred to reduce nutrient loads to waters on the existing state Clean Water Act (CWA) Section 303(d) list or with an existing total maximum daily load (TMDL). The preliminary cost estimates described in **Attachment #1** to this Report are based on criteria representative of these draft changes1, and thus, represent potential baseline expenditures.*
>
> *The incremental costs (cost savings) associated with implementation of the proposed numeric nutrient criteria include incremental compliance and government resource costs. **Exhibit ES-1** summarizes the preliminary estimates of compliance costs; actual costs will depend on the procedures for assessing waters for compliance and the site-specific source reductions needed to attain the criteria.*
>
> ***Exhibit ES-1. Preliminary Estimates of Potential Annual Control Costs Under the Proposed Rule (2009 dollars)*** [DEP note – the costs listed in Exhibit ES-1 of the EPA document did not match the summary costs in the summary table (Exhibit 8-1) in Chapter 8 – it is assumed that the Chapter 8 costs, which are consistent with those set forth in the individual chapters, are correct. Therefore, the corrected costs are shown in the revised table below]

Source Sector	Potential Controls	Annual Costs (millions)
Major Municipal WWTPs	BNR to reduce TN and/or TP	$42.7
Minor Municipal WWTPs	BNR to reduce TN and/or TP	$9.3
Industrial Dischargers	Process optimization/source control	$2.3
General Dischargers	Process optimization/source control	$0.6
Urban Storm Water	Uncertain	Not estimated[1]
Agriculture	Nutrient management Riparian forest buffers Livestock fencing	$27.9 $5.1 $1.9
Septic Systems	Upgrade to advanced nutrient treatment	$12.4 – $40.2
Total		$102.1 – $130.0

BNR= Biological Nutrient Removal
TN = total nitrogen
TP = total phosphorus
WWTP = wastewater treatment plant
[1]Costs are not estimated because the need for incremental controls is uncertain.

The EPA report also notes that *"In addition, state resource costs to complete TMDLs for the 973 potential incrementally impaired waters could be approximately $2.5 million per year, based on national average costs, assuming a 9-year implementation schedule. This estimate does not include the potential cost saving that could be associated with the 39 waters currently listed as impaired for nutrients that may not exceed the numeric criteria, or incremental costs and cost savings associated with completed TMDLs for which the current TN and TP targets are higher or lower than FDEP's draft criteria."*

[1] Note that FDEP's draft numeric nutrient criteria differ slightly from those used to estimate preliminary baseline compliance costs.

Overall Comment: The above cost estimates significantly underestimate those that would be incurred for compliance with EPA's proposed criteria.

The Department performed a cost estimate that indicates that the EPA significantly underestimated the costs to achieve the proposed EPA criteria. One of the primary reasons is that EPA assumed for all the estimates that certain costs would have already been incurred in order to meet the Department's proposed numeric nutrient criteria (NNC). This assumption is invalid because the Department's proposed NNC have not yet been adopted. Therefore, all of the Department's estimates are based on additional costs that would be incurred above the currently implemented controls in order to achieve EPA's proposed criteria. In addition, the Department has used the best available technical information to perform a more comprehensive analysis, which has also resulted in increases in the cost estimates. The specific reasons for the increases are as follows and are described in more detail in the discussion regarding each of the assessed source sectors:

- For domestic wastewater facilities, the level of technology used by EPA to estimate costs was not sufficient to achieve the proposed criteria. Additional technologies, such as reverse osmosis, will likely be required to meet the proposed criteria.
- For industrial wastewater facilities, EPA used an assumption that process controls on the order of $25,000 per year would be sufficient for industrial wastewater facilities to meet the proposed criteria. However, source controls alone will not be sufficient to meet the proposed criteria. Some industrial facilities, such as pulp mills, have organic wastewaters similar to domestic wastewater in nature, and will require tertiary treatment similar to domestic wastewater treatment systems to meet the proposed criteria. Other industrial facilities, such as fertilizer manufacturing facilities, have inorganic wastewater streams high in nitrogen and phosphorus that are not amenable to biological treatment and will require the use of chemical and physical treatment systems, such as reverse osmosis, to meet the proposed criteria.
- EPA failed to estimate any costs for the treatment of urban stormwater needed to meet the proposed criteria. Even though Florida has had stormwater treatment requirements for new development since the early 1980s, it is highly likely that "older" urban areas will need to construct stormwater system retrofits to meet the proposed EPA criteria.
- For agriculture, EPA significantly underestimated the affected acreage of agriculture (6.13 million acres versus 13.6 million acres for the FDACS estimate). In addition, the EPA cost estimate assumed that only a subset of typical BMPs (nutrient retention, forested buffers and livestock fencing) would be needed to achieve the criterion. In contrast, the FDACS estimate assumed that ALL typical BMPs would be necessary (FDACs has developed BMP manuals for a variety of agricultural operations, and the BMP

manuals developed to date and a map showing the locations of BMPs implemented are provided as supplemental information to DEP's comments). In fact, based on modeled reduction estimates for typical BMPs, the FDACs estimate concluded that additional on-farm water treatment/retention facilities would be necessary to achieve the EPA's proposed criteria.

A comparison of the Department's estimated annual costs for each source sector with the EPA estimated cost for that source sector is shown in Table 1, below.

Table 1 – A Comparison of FDEP estimated annual costs with EPA estimated annual costs (M$)

	Annual Costs (in Millions)[1]			
	FDEP Estimate		EPA Estimate	
Source Sector	Low	High	Low	High
Municipal WWTPs	$456		$52	
Industrial & General Dischargers	$2,113		$3	
Urban Storm Water	$1,967		-	
Agriculture[2]	$271	$974	$35	
Septic Systems	$937	$2,888	$12	$40
Total	$5,744	$8,398	$102	$130

[1]Assumptions for annual cost estimates are set forth in individual source sector methodology descriptions.
[2]FDEP estimate for agricultural source sector prepared by Florida Department of Agriculture and Consumer Services, in cooperation with the University of Florida Institute for Food and Agricultural Sciences and Soil and Water Engineering Technology, Inc.
[3]FDACS estimates cover annual capital costs + O&M. Additional lost revenues would also be incurred and are described in more detail in the agricultural section.

Background on Preliminary Cost Estimates

The Department performed a cost estimate for each source sector identified in the EPA cost estimates. The methodology and assumptions used in deriving these estimates are described in detail in the section covering each source sector. Table 2 shows the potential source controls employed in the Department's estimate for each source sector and the resultant annual costs associated with those controls.

Table 2 – FDEP potential controls and associated annual costs for source sectors

Source Sector	Potential Controls	Annual Costs (Millions)
Municipal WWTPs	Advanced Waste Treatment +Reverse Osmosis and brine disposal or Injection well[1]	$456
Industrial Dischargers	Reverse Osmosis and brine disposal	$2,113
Urban Storm Water	Retrofit to current stormwater treatment standards (retention & detention + chemical treatment)	$1,967
Agriculture	All typical owner-implemented BMPs + on-farm water treatment/retention facilities	$271 - $974
Septic Systems	Upgrade to high nutrient removal Septic Systems	$937 - $2888
Total		$5,744 - $8,398

[1]In counties with existing injection wells

Municipal WWTPs

EPA estimated 47 major and 53 minor municipal discharges to lakes and freshwater streams that would be affected by the proposed rule. EPA considered the limit of technology (LOT) for biological nutrient removal to be 3 mg/L for TN and 0.1 mg/L for TP. EPA's cost estimate acknowledged that "All of the proposed TN criteria are below the LOT" and "Proposed TP criteria for flowing waters are at or below the LOT in three of the five regions" and "proposed TP criteria for lakes are below the LOT". The EPA cost estimates were based on retrofitting existing biological treatment trains to achieve the LOT for TN and TP. The estimates noted that "where it may be technologically infeasible to attain the standards, a use attainability analysis may be needed".

The Department performed a cost estimate, which assumed technologies such as reverse osmosis could be used to meet the proposed criteria, or that facilities may elect to cease their surface water discharges through the use of less costly deep well injection. The Department's analysis indicates that the EPA estimates significantly underestimate the costs to achieve the proposed criteria for the following reasons:

- The EPA cost estimate assumed that only a few facilities would be required to upgrade to meet the EPA WQC because most facilities would already be upgraded to meet the proposed DEP numeric nutrient criteria (NNC). This assumption is invalid, since the proposed DEP NNC have not yet been adopted. This estimate includes costs associated with meeting the proposed EPA NNC over and above the cost of meeting current discharge limitations.
- The EPA cost estimate was based on a level of treatment (LOT) for biological nutrient removal that would not meet the EPA WQC. For example, in the panhandle region the EPA cost estimate was based on a LOT of TN < 3 mg/L and TP < 0.1 mg/L. However, EPA's WQC for the region was TN < 0.824 mg/L and TP < 0.043 mg/L.
- For the most part, the EPA Report used capital and Operational and Maintenance (O & M) unit costs derived from CAPDETWorks for various treatment schemes. Unit costs that were used in the EPA Report appeared to be low when compared to comparable facilities constructed in Florida.
- Costs for two facilities on EPA's list were not included since one was inactivated and the other no longer discharges to surface water.

To highlight EPA's significant under-estimation of costs, the city of Cross City (0.4 million gallons/day permitted capacity) estimated its capital costs to comply with the proposed nutrient criteria to be $5,800,000. The EPA Report estimated Cross City's capital costs at $422,799 (see Appendix A of EPA Report).

Table 3 below summarizes the Department's estimates for total capital costs, O & M costs, and annual costs for domestic wastewater treatment facilities in the State that currently discharge to freshwater streams and lakes:

Table 3 – Cost Estimates for Domestic Wastewater Facilities

Total Capital Cost for Retrofit (M$)	Annual O & M costs (M$)	30-year Annualized Costs (M$)
$4,167	$185	$456

Assessment Procedure

1. Only domestic wastewater facilities discharging to fresh waters (streams and lakes) with NPDES permits were included in the estimate. The lists of domestic wastewater facilities contained in both Exhibit 8 (page 7) and Appendix A of the EPA's *Preliminary Estimate of Potential Compliance Costs and Benefits Associated with EPA's Proposed Numeric Nutrient Criteria for Florida*, January 2010, ("EPA Report") were used.
2. Advanced biological treatment and reverse osmosis were assumed to be needed to meet the proposed EPA water quality criteria (WQC) for both nitrogen and phosphorus prior to discharge to surface waters. Disposal by injection wells after filtration/high level disinfection instead of surface water discharge were assumed feasible in lieu of advanced biological treatment and reverse osmosis in Florida counties with existing domestic injection well disposal systems.
3. Permitted flow capacity was used to calculate capital costs.
4. Unit capital costs to upgrade were based on:
    - For facilities that do not currently provide advanced biological wastewater treatment - $16.30/gallon (advanced treatment ($8.20/ gallon)+ reverse osmosis ($5.00/ gallon)+ brine disposal ($3.10/ gallon));
    - For facilities that currently provide advanced biological wastewater treatment - $8.10/gallon (reverse osmosis ($5.00/ gallon)+ brine disposal ($3.10/ gallon)); and
    - For facilities that are located in counties with existing domestic injection wells that are assumed to cease their current surface water discharges - $2.10/gallon (filtration/high level disinfection ($1.00/gallon) + and injection well disposal ($1.10/gallon)).
5. Twenty five percent was added to unit capital costs for planning, engineering and construction contingencies.
6. Fifty percent of the permitted flow capacity was used to calculate O&M costs as facilities typically operate at less than their permitted capacities.
7. Unit operation and maintenance costs were based on:
    - For facilities that do not currently provide advanced waste treatment - $4.00/1000 gallons (advanced treatment/membrane filter/reverse osmosis ($1.00/1000 gallons) + brine disposal ($3.00/1000 gallons));
    - For facilities that currently provide advanced biological wastewater treatment - $3.00/1000 gallons (brine disposal ($3.00/ 1000 gallons)); and
    - For facilities that are located in counties with existing domestic injection wells that are assumed to cease their current surface water discharges - $1.60/1000 gallons (filtration/high level disinfection ($0.50/1000 gallons) + injection well disposal ($1.10/1000 gallons)).
8. The 30-year annualized cost assumed a 5% interest rate.
9. The following unit costs were obtained from the report prepared for the Florida Water Environment Association Utilities Council, *Technologies to Meet Numeric Nutrient Criteria at Florida's Domestic Wastewater Reclamation Facilities*, March 2, 2010, by Carollo Engineers ("FWEA Report"). The unit costs

contained in the FWEA Report were extensively documented and determined by the Department to be reasonable.

- Unit capital costs - advanced treatment ($8.20/ gallon), reverse osmosis ($5.00/ gallon), brine disposal ($3.10/ gallon), and injection well disposal ($1.10/gallon); and
- Unit operation and maintenance costs - advanced treatment/membrane filter/reverse osmosis ($1.00/1000 gallons), brine disposal ($3.00/1000 gallons), and injection well disposal ($1.10/1000 gallons).

10. The following unit costs were obtained from cost curves contained in EPA's Innovative and Alternative Technology Assessment Manual (EPA-430/9-78-009) updated for 2010 costs:

- Unit capital costs - filtration/high level disinfection ($1.00/gallon); and
- Unit operation and maintenance costs - filtration/high level disinfection ($0.50/1000 gallons).

Detailed costs for each NPDES domestic wastewater facility are set forth in Appendix 1.

Industrial Dischargers

The EPA estimate noted that "In most cases, it is more cost effective for industrial dischargers to control the source of nutrients in the effluent through BMPs, product substitution, process modifications, or process optimization than to treat the entire effluent prior to discharge." Their estimate also noted that such costs would be highly site specific. To illustrate the potential magnitude of costs, EPA estimated that, if dischargers spend an average of $25,000 per year on source control and process optimization to reduce nutrient loads, total annual costs to the industrial and general-permitted dischargers (Exhibit 2-2) would be $2.9 million.

The Department performed a cost estimate, which assumes that source controls alone would be insufficient to meet the proposed criteria, and that reverse osmosis would be required to meet the proposed criteria. The Department's analysis indicates that the EPA estimates significantly underestimate the costs to achieve the proposed criteria for the following reasons:

- For industrial wastewater facilities EPA used an assumption that process controls in the order of $25,000 per year would be sufficient for industrial wastewater facilities to meet the proposed criteria. However, source controls alone will not be sufficient to meet the proposed criteria. Some industrial facilities, such as pulp mills, have organic wastewaters similar to domestic wastewater in nature, and therefore will require tertiary treatment similar to domestic wastewater treatment systems to meet the proposed criteria. Other industrial facilities, such as fertilizer manufacturing facilities have inorganic wastewater streams high in nitrogen and phosphorus that are not amenable to biological treatment, and will require the use of chemical and physical treatment systems, such as reverse osmosis to meet the proposed criteria.
- EPA assumed 94 Industrial Wastewater (IW) facilities would be affected by numeric criteria. The Department excluded certain Standard Industrial Code (SIC) categories unlikely to discharge nutrients and added other SIC categories, resulting in a net total of 78 facilities.

- EPA assumed a 20 year payment period with a fixed interest rate of 7%. The Department used the values of 30 years and 5% to be consistent with the estimates for domestic wastewater and urban runoff.

Table 4 below summarizes the Department's estimates for total capital costs, operational and maintenance costs, and annual costs for industrial wastewater facilities discharging to fresh water streams or lakes:

Table 4 – Cost Estimates for Retrofit of Industrial and General Dischargers

Total Capital Cost for Retrofit (M$)	Annual O & M costs (M$)	30-year Annualized Costs (M$)
$23,792	$493	$2,113

Assessment Procedure

1. This estimate is restricted to IW facilities that discharge to freshwater flowing streams and lakes under individual NPDES permits.
2. The list of facilities is further restricted to:
   a. facilities that have numeric discharge limitations for any form of nitrogen and/or phosphorus in their NPDES IW permits,
   b. facilities that are required to report the concentration of any form of nitrogen and/or phosphorus in their NPDES IW permits, and
   c. other NPDES permitted IW facilities that are not currently required to monitor nutrients, but are in the SIC categories for a and b, above.
3. The following facilities are not included:
   a. Potable water facilities (SIC 4941) that use membrane processes, primarily Reverse osmosis (RO), for demineralization are not included in this exercise. This exercise assumes that the reject wastewater stream from membrane separation processes will be disposed by other means than surface water discharge;
   b. Stormwater Treatment Areas (STAs) (SIC 3822) developed for Everglades restoration efforts within the Everglades Protection Area have separate criteria and are not included.
   c. NPDES permitted facilities in various SIC categories that meet the criteria in items 1 and 2, above, but which have not discharged to surface water within the past five years, based on U.S. Environmental Protection Agency's (EPA) Permit Compliance System (PCS) database.
4. RO is likely needed for treating IW effluent to meet numeric nutrient criteria. RO produces a concentrated wastewater stream that will need to be disposed by other means than surface water discharge.
5. Discharge estimation assumptions are as follows:

a. The discharge flows used are based on data obtained from WAFR/PCS, as reported on Discharge Monitoring Reports (DMRs) from permitted facilities for the five year period from January 1, 2005 through December 31, 2009. Only data for outfalls with nutrient limits are used in the analysis.
b. Estimated annual discharges were assumed for 340 days/year of discharge, except for facilities that are known to have intermittent discharges, in which case actual or estimated days/year for discharge were used.
c. Monthly average flows were used as the flow basis in estimating annual O&M costs.
d. Daily maximum flow data were used as a rough equivalent of maximum design capacity for estimating capital costs.

6. Cost estimation assumptions are as follows:

a. Costs assume that reverse osmosis (RO) will be used to provide tertiary treatment to meet the proposed numeric nutrient criteria.
b. Unit costs for reverse osmosis from the FWEA Report were used, under the assumption the unit costs were applicable to both domestic and industrial wastewater. However, costs for reverse osmosis for industrial wastewaters are likely to be significantly higher than those for domestic wastewater. Industrial wastewaters may be concentrated, higher strength wastewaters with more variation in their characteristics that may result in low RO membrane recoveries and require additional pre and post RO treatment.
c. A unit cost of $3.00/1,000 gallons RO treatment with brine concentrator, cited in the FWEA Report, was used to estimate annual O&M costs.
d. Capital cost estimates assumed a rate of $8.10/gallon of maximum design capacity per facility for construction ($5.00/gal for RO system construction + $3.10/gal for brine disposal system construction). An additional 25% was added to the construction cost for engineering and contingency.
e. The thirty year annualized cost assumed a 5% interest rate.

7. There is some limited experience and cost data available in the use of RO to treat process waters from gypsum stack systems associated with fertilizer manufacturing facilities (SIC 2874). These costs have been in the range of $15-$25 per thousand gallons of water treated using RO and are indicative of the high strength nature of process wastewater. These costs included both capital and O&M costs. During operation a fertilizer manufacturing plant does not discharge, except during unusual rain events. However, when a plant ceases operation, process water contained in the Gypsum stacks and cooling ponds must be treated and discharged over a five year closure period, followed by post-closure treatment and discharge of water draining from the gypsum stack systems over periods of up to 50 years. An average unit cost of $20/1000 gallons was multiplied by the estimated process water volumes over the closure and post closure periods obtained from closure cost estimates developed by the owners of the gypsum stacks and maintained by the Department's

Bureau of Mining and Minerals Regulation. The total additional costs for treating 55.54 billion gallons of process water from gypsum stacks by RO to meet the proposed EPA criteria are estimated at $1,110,800,000. A 30-year annualized cost was calculated using a 5% interest rate. The resultant annual costs were $72 million.

Detailed costs for NPDES Industrial wastewater facilities in affected SIC categories are provided in Appendix 2.

Urban Storm Water

The EPA did not estimate costs for implementation of additional nonpoint source controls because "the need for incremental controls is uncertain", although the EPA document did note that "Numeric nutrient criteria may affect urban storm water dischargers through changes to permit requirements or the TMDL and BMAP process." In order to provide an estimate for such potential costs, the Department performed analyses as set forth in the following procedure. The estimate is restricted to NPDES municipal separate storm sewer systems (MS4) that are covered under either a Phase I individual permit or the Phase II Generic Permit and only those permitted MS4s that either have 100% of the stormwater discharge to freshwater bodies, or the relative portion of the MS4 that has a discharge to freshwater bodies. Total costs, O&M costs, annual costs and annual costs per household are in Table 5 below:

Table 5 – Cost Estimates for Retrofit of MS4 Projects[1]

Capital Cost for Retrofit (M$)	Annual O & M costs (M$)	30-year Annualized Costs (M$)	30-year Annual Cost per Household ($)
$17,101	$855	$1,967	$359

[1]The above costs do not account for urban nonpoint source runoff coming from lands within local government jurisdictions, especially for counties, that are not part of the permitted MS4 system. This urban nonpoint stormwater is covered by a Load Allocation within an adopted TMDL and local governments are responsible for meeting these load reductions. This, this estimation of urban stormwater costs underestimates the total costs likely to be incurred to reduce urban stormwater loadings as needed to meet the proposed EPA criteria.

Assessment Procedure

1. The estimated total urban land area for the MS4s in Florida was determined from the 2000 U.S. Census[1].
2. The subtotal of the pre-1982 urban area that discharged to freshwater was estimated from a GIS analysis. The analysis involved creating overlaying GIS layers of the urban areas and the freshwater WBIDs that overlapped the pre-1982 urban areas and then determining the freshwater subtotal from the resultant overlapping layers. The total urban area discharging to freshwater was determined to be 3,009,297 acres.
3. The subtotal of the area determined in step 2 that was developed prior to 1982 was then determined. For the purposes of this estimate, it was assumed that implementation of urban stormwater measures subsequent to the 1982 stormwater rules would achieve the proposed EPA criteria, but that urban areas

[1] The Florida Statutes that regulate the MS4 program reference the urbanized areas of the most recent decennial U.S Census as the method for determining the regulated MS4 community. In addition, the urban boundaries were readily available as a GIS layer that could be used to estimate their area.

without such measures would not. The urban land use data from 1982[2] indicated that there were 3,141,631 urban land use acres at that time. That area increased to 4,032,659 acres based on the 2000 U.S. Census urban area information, for a percent change of approximately 22%. Therefore, for the purpose of this estimate it was assumed that this relative percentage would apply uniformly to all urban areas assessed. Therefore the urban area requiring treatment was determined by multiplying the urban areas discharging to freshwaters by 78% (3,009,297 x ~78% = 2,344,242 acres).

4. Florida has undertaken numerous retrofit projects to address pollutant loading from municipal stormwater runoff, many of which required monitoring in order to show the effectiveness of the retrofit. The data from these projects have been compiled into a database by the Department, which include information on the acreage of the area that was retrofitted. This information was used to derive a cost per unit acre to retrofit urban areas for nutrient removal. The median cost per acre for such retrofit projects was $7,295 per acre, with a range of $863 per acre to $37,002 per acre from the 10th to the 90th percentile. For the purposes of this estimate, the median value was used.
5. Using the acreage derived in step 3 and the unit area retrofit costs in step 4, the total capital cost to implement such retrofit projects was estimated as $17,100,683,851.
6. The O&M costs were estimated based on literature available[3]. Although actual costs can often exceed this rate, a conservative estimate of 5% of the capital outlay was chosen for this estimate. The O & M costs were not escalated for inflation. The resultant estimated annual O & M costs were $855,034,192.
7. A 30-year annualized cost was calculated using a 5% interest. The resultant annual costs were $1,967,458,217.92
8. Using the 2000 Census data, the number of households in the State of Florida within the freshwater portion of the urban area was calculated at 5,475,652. This value was determined by dividing the urban area population (13,470,104) by the average number of persons per household (2.46) in 2000. The 30 year annualized cost per household was then calculated by dividing the 30 year annualized costs by the number of households. The resultant annual cost per household was approximately $359.

Detailed costs for each MS4 are set forth in Appendix 3.

Agriculture

EPA estimated that annual costs for implementation of agricultural Best Management Practices (BMPs) would be $27.8 million for nutrient management, $5.0 million for forest buffers, and $1.9 million for livestock fencing. Nutrient management costs were based on a useful life of 3 years and a discount rate of 7%, the forest buffer costs were based on a useful life of 30 years and a discount rate of 7%, and the livestock fencing costs were based on a 10-year useful life and a rate of 7%. These estimates assume that there are no O & M costs and that the Department's proposed numeric nutrient criteria are already in place.

[2] The 78 percent value is a statewide percentage taken from the document entitled *Land Use Changes in Florida's Urbanized Areas* (UF, 1991).

[3] *The Use of Best Management Practices (BMPs) in Urban Watersheds* – U.S. EPA, 2004; Stormwater: The Journal for Surface Water Quality Professionals, Nov.-Dec., 2008.

The Florida Department of Agriculture and Consumer Services (FDACS), in coordination with the University of Florida Institute for Food and Agricultural Science and Soil and Water Engineering Technology, Inc., performed an independent cost estimate[4] (Appendix 4) that indicates that the EPA estimates significantly underestimate the costs to achieve the proposed criteria for the following primary reasons:

- The EPA cost estimate assumed that only 6.13 million acres of agricultural land would be required to implement BMPs to meet the EPA WQC because most agriculture in the state would already have BMPs implemented to meet the proposed DEP numeric nutrient criteria (NNC) and that the proposed EPA criteria would have only an "incremental" impact. This assumption is invalid, since the proposed DEP NNC have not yet been adopted. The full estimate resulted in a gross area of affected agricultural land of 13.60 million acres.
- The EPA cost estimate assumed that only a subset of typical BMPs (nutrient retention, forested buffers and livestock fencing) would achieve the criterion. The FDACS estimate assumed that ALL typical BMPs would be necessary. In addition, based on modeled reduction estimates for typical BMPs, the FDACs estimate concluded that additional on-farm water treatment/retention facilities would be necessary to achieve the EPA's proposed criteria. Thus, additional costs for the on-farm water treatment/retention facilities would be incurred. These additional costs account are reflected in the upper end of the range shown.

Total capital costs, annual operational and maintenance costs, and 20-year annual costs are in Table 6 below:

Table 6 – Cost Estimates for Agriculture

Total Capital Cost for BMPs (M$)	Annual O & M costs (M$)	20-year Annualized Costs (M$)
855 – 3,069	171 - 614	271 - 974

In addition to the additional capital and O & M costs estimated to be incurred by the agricultural industry, the FDACS estimate also estimated regional economic impacts of production land displacement, since approximately 10 percent of agricultural land was estimated to be taken out of production due to implementation of on-farm water treatment/retention systems. Those economic impacts were estimated to be a $631 million direct loss of annual agricultural industry output and a total direct loss (includes other affected sectors) of $1.148 billion. The loss of employment was estimated to be 7,780 agricultural jobs and 14,545 total jobs.

Assessment Procedure

1. The net and gross area (acres) of land used in Florida for each agricultural industry or commodity subject to the proposed EPA standards was taken from the 2007 Census of Agriculture[5] and the Forest Inventory and Analysis[6] (USDA-Forest Service). Agricultural sectors were classified according the North American Industry Classification System (NAICS).

[4] *Economic Impacts and compliance Costs of Proposed EPA Numeric Nutrient Criteria for Florida Agriculture*. FDACS, U of F/IFAS, SWET, Inc. April 22, 2010.
[5] USDA-NASS, *2007 Census of Agriculture*, Florida, Vol 1, Geographic Area Series, Part 9, State and County Data
[6] USDA-Forest Service, *Forest Inventory and Analysis*. Data for Florida, 2007

2. The estimated per-acre costs for agricultural producers to implement BMPs were taken from a report prepared for the South Florida Water Management District[7]. BMPs included the full range of typical owner-implemented practices, such as fertilizer management, grazing management, and livestock exclusion from waterways. Additional on-farm water treatment/retention practices include wetland restoration, water recovery/re-use systems, and on-site water treatment/retention systems.
3. Initial capital cost estimates include materials, labor and engineering.
4. Total annual costs include O & M (estimated at 20 percent of the capital costs) and amortization of the capital investment at 10 percent interest over 20 years.

Septic Systems

The EPA cost estimate assumed that only a limited number of septic system upgrades would be necessary to meet the EPA proposed numeric nutrient criteria because many septic systems in the state would already have septic system upgrades necessary to meet the proposed DEP numeric nutrient criteria (NNC) and that the proposed EPA criteria would have only an "incremental" impact. As we have noted previously, this assumption is invalid, since the proposed DEP NNC have not yet been adopted. The EPA analysis estimated the number of septic systems in incrementally impaired waters at approximately 177,200. The EPA noted that the septic systems could be required to upgrade when they failed and based their annual costs on an average failure rate of 3.49%[8]. Their estimated costs to upgrade the failed systems to achieve nutrient removal were in the range of $2000 to $6500 per system. The annualized costs were estimated to range from $12.4 million to $40.2 million.

The Department performed a cost estimate for septic system upgrades necessary to achieve the proposed EPA criteria. The Department's analysis assumed that conventional septic systems on lots larger than three acres would be able to achieve the proposed EPA criteria[9], thus no additional costs were assumed

Assessment Procedure

1. Florida Department of Health reviewed permit records to determine how many of Florida's 2.6 million septic systems are on lots less than 3 acres in size. The review indicated that approximately 83% of new septic systems were on lots less than 3 acres[1]. For the purpose of this estimate a value of 85% was chosen.
2. The Department's estimate for urban stormwater indicated that approximately 75% of Florida's urban areas discharge to fresh waters. It was assumed that proportion would be a reasonable assumption to make in order to calculate septic system costs.

---

[7] Soil & Water Engineering Technologies, Inc. (SWET), 2008. *Nutrient Loading Rates, Reduction Factors and Implementation Costs Associated with BMPs and Technologies*, Appendix A.

[8] Florida Department of Health (DOH). 2009. Onsite Sewage Treatment and Disposal Systems Installed in Florida. http://www.doh.state.fl.us/environment/OSTDS/statistics/ostdsstatistics.htm.

[9] FDEP/FDOH developed a draft spreadsheet calculation tool that can be used to estimate appropriate type of septic system to achieve certain levels of treatment for various lot sizes. The 3 acre lot size is based on a standard 3 bedroom house with an estimated sewage flow of 300 gpd (Shanin SpeasFrost, FDEP, Personal Communication).

3. Construction costs for estimate were taken from an Interim Report prepared for the Department entitled *Onsite Sewage Treatment and Disposal Systems Evaluation for Nutrient Removal* January 7, 2010, Stormwater Management Academy, University of Central Florida. Costs for septic systems with high levels of nutrient removal ranged from $9,320 to $18,200 per unit. Operation and maintenance costs were also estimated from this report, which indicated values ranging from $200 - $1,800 per year.
4. 20-year annualized costs were calculated using an assumed interest rate of 5%. The O & M costs were not escalated for inflation.
5. The above method is a worst case scenario based on a complete replacement in the first year of all systems on smaller lots than 3 acres and discharging to groundwater that eventually becomes freshwater. The method produces annual cost estimates ranging from approximately $1.6 – $5.5 billion. Since immediate replacement of septic systems may not be justifiable or feasible, a more reasonable estimate and one more consistent with the EPA estimate would be a replacement rate of 5% a year, which is still higher than the repair rates of 0.5 – 1 % per year[10]

The resultant total capital costs, annual operational and maintenance costs, and 20-year annual costs are in Table 7 below:

Table 7 – Cost Estimates for Septic Systems

SEPTIC SYSTEM COST ESTIMATE CALCULATIONS		
Number of Septic Systems in Florida=	2,500,000	
Proportion of Septic Systems on Lots < 3 acres=	90%	
Proportion of Septic Systems discharging to fresh waters=	75%	
Total Number of Septic Systems to be Upgraded	1,687,500	
	Low	**High**
Costs for High Nutrient Removal Septic Systems=	$9,320	$18,200
O & M per Septic System=	$200	$1,800
Instant Replacement Total Cost=	$15,727,500,000	$30,712,500,000
Instant Replacement Total O & M over 20 years	$337,500,000	$3,037,500,000
Instant Replacement Annual Costs=	$1,599,515,290	$5,501,950,459
5% per year replacement annual costs	936,612,536	2,887,762,828

Benefits Analysis

The Department did not undertake a separate benefit analysis to compare with the EPA estimate. However, we would note that the Department's cost estimates lead to an annual cost of approximately $313 - $458 per person[11], compared to the Willingness to Pay values in EPAs estimate of $0.34 - $0.37 per person.

[10] Eberhard Roeder, FDOH, Personal Communication.
[11] Based on the FDEP costs in Table 1 and an assumed Florida population of 18,328,340 people.

Conclusions

In summary, the cost estimates to comply with EPA's proposed numeric nutrient criteria compiled by the Department indicate that EPA underestimated the costs. The Department's estimates indicate annual costs ranging from $6 - $12+ billion a year. While the State of Florida is very interested in ensuring our waters are restored and protected, the magnitude of these costs underscore the need to develop correct and accurate criteria using the best science available. In addition, the costs also underscore the need to ensure that the implementation of numeric nutrient criteria is done in a manner that makes efficient and effective use of Florida's resources.