EXECUTIVE SUMMARY

I. Background

The Federal Clean Water Act requires states to identify water bodies that do not meet water quality standards and to impose a "Total Maximum Daily Load" (TMDL) on both the point and non-point sources that discharge to the water body. The TMDL is intended to limit the pollutant discharges so that the water quality will improve. In 1996 portions of both the Indian River and the Rehoboth Bay were listed as water quality impaired and thus required the development of a TMDL. The TMDL was issued in August, 1998 and required that "all point source discharges which are currently discharging into the Indian River, Indian River Bay, Rehoboth Bay, and their tributaries shall be eliminated systematically." Thus, the Rehoboth Beach WWTP, which discharges into the Lewes-Rehoboth canal, was no longer allowed to discharge and had to find an alternate method to discharge its treated wastewater effluent.

Although there was considerable discussion regarding the impacts of the TMDL on the operation of the Rehoboth Beach WWTP, an extended period of negotiations over the details of its implementation resulted in an agreement in the form of a consent order to eliminate the discharge. The consent order provides a timetable for 1) meeting interim permit levels for nitrogen and phosphorus based on a 25% reduction from currently permitted levels; 2) study of alternatives for eliminating the discharge; 3) identifying sources of funding for the project; and 4) implementing the recommended improvements. Trading with non-point sources to reduce or "eliminate" the nutrient load discharged to the Inland Bays was also permitted.

The objective of this study was to evaluate various alternatives for the disposal of treated effluent from the Rehoboth Beach Wastewater Treatment Plant with the primary criteria for an acceptable alternative being that it not result in the discharge of any nitrogen or phosphorus to the inland bays. The various alternatives were evaluated to identify the alternative which was most technically feasible, cost effective and environmentally acceptable.

Preliminary evaluations of effluent discharge alternatives indicate that any proposed solution will most likely be very expensive and would place an economic burden on the City of Rehoboth Beach and its residents. A significant amount of state and federal funding will be required to make the project economically viable. At the same time, growth in the area of Rehoboth Beach and northern Sussex County is creating a demand for additional wastewater treatment capacity. The combined costs to comply with the TMDL and to serve the future needs of the communities in the area prompted the State to encourage a regional solution. A solution that serves the needs of the entire region of northern Sussex County including Rehoboth Beach, would spread the costs over a much larger base and thus could reduce the impact on the individual rate payer.

A total of four alternatives were identified for consideration through discussions with the City, the County and DNREC. These alternatives are briefly described as follows:

- **Land Application**
  Treated effluent is sprayed on agricultural land to irrigate crops and provide nutrients. The effluent percolates through the soil to the groundwater.
- **Rapid Infiltration Beds**
  Treated effluent is flooded on to sand beds allowing the water to percolate down into the groundwater.
- **Subsurface Injection**
  Treated effluent is injected either through a shallow well in an area where the groundwater is contaminated or through a deep well into an aquifer that is confined below the drinking water aquifers.
- **Ocean Outfall**
  Treated effluent is discharged through an outfall and diffuser into the ocean at a depth and distance from the shore that insures public health and environmental standards are met.

Only the ocean outfall alternative offers an opportunity to dispose of treated effluent on a regional basis. If both Sussex County and the City of Rehoboth Beach pursued any of the other alternatives, then each would look for a site as close as possible to their individual wastewater treatment facilities. Large tracts of land suitable for land application or rapid infiltration beds are difficult (if not impossible) to find. This, plus the fact that pumping to a central regional disposal site can add extra capital and operating costs, make such alternatives impractical.

II. Existing Conditions

A. Rehoboth Beach Wastewater Treatment Plant

The Rehoboth Beach Wastewater Treatment Plant (WWTP) is an advanced secondary treatment plant that produces a high quality effluent. The service area is primarily residential with some light commercial consisting of shops and restaurants. Thus, the influent wastewater is typical of domestic wastewater treatment facilities.

The design capacity of the plant is 3.4 mgd, but because of the seasonal nature of the area, the flows vary greatly between the summer and winter with peak flows occurring on summer holiday weekends. The 2003 summer and winter average flows were approximately 2.1 mgd and 0.8 mgd, respectively. The existing WWTP was built in 1989 and was upgraded in 1994 and 1997 to implement biological nutrient removal (BNR) and chemical phosphorus removal.

The current discharge permit for nitrogen and phosphorus is based on a 12 month moving cumulative load of nitrogen and phosphorus discharged in the effluent. The total allowable load (based on the sum of the previous 12 months) is 32,427 pounds of nitrogen and 7,077 pounds of phosphorus. The plant is actually performing at a level which is better than the discharge permit requires. The consent order that enforces the requirements of the TMDL will impose further restrictions on the discharge of nitrogen and phosphorus until it is finally eliminated completely.

B. Sussex County Wastewater Treatment Facilities

Sussex County owns and operates several wastewater treatment facilities serving different areas of the County. These include:

- Wolfe Neck Regional Wastewater Facility (WNRWF)
- Inland Bays Regional Wastewater Facility (IBRWF)

- Piney Neck Regional Wastewater Facility (PNRWF)
- South Coastal Regional Wastewater Facility (SCRWF)

The Wolfe Neck, Inland Bays and Piney Neck RWFs are all aerated lagoon systems with effluent disposal by spray irrigation. The service area of the SCRWF is in the southern portion of the County, outside an area that would realistically be considered as part of a regional solution with the City of Rehoboth Beach. The plant is relevant to this study because it currently discharges its treated effluent through an ocean outfall. The effluent discharge permit imposed by DNREC on this facility will be the model used by DNREC in permitting any additional ocean outfalls. The service areas of the Wolfe Neck and Inland Bays RWFs could conceivably become part of a regional solution. These areas, as well as many of the unsewered areas in northern Sussex County, are growing and will be in need of additional wastewater treatment capacity.

C. Summary of Flows

A summary of the wastewater treatment flow requirements that are considered in this study are presented in Table ES-1.

Table ES-1: Wastewater Treatment Flow Requirements

	Rehoboth Beach	Sussex County	Total
Average Daily	3.4	8.0	11.4
Max Month	6.8	16.0	22.8
Peak Instantaneous	10.2	24.0	34.2

III. Evaluation of Alternatives

A. Land Application

1. Description

Land application involves the spray of treated wastewater effluent over a vegetated site at agronomic rates appropriate for irrigating the crop. It is considered a form of beneficial reuse since the practice involves the indirect recycle of water. This process accomplishes several objectives including irrigation of the crop, additional wastewater treatment and disposal of the effluent through recycling to the groundwater.

2. Summary of Advantages / Disadvantages

Advantages

- Well established and accepted practice in Delaware
- Recharges groundwater
- Preserves agricultural use of land

Disadvantages

- Lack of available land
- High cost of property
- Significant effluent wastewater storage volume required

3. Discussion

Approximately 740 acres of land are required for the disposal of the treated effluent from the City of Rehoboth Beach. Land is becoming increasingly scarce, especially in the vicinity of the City, and the cost of the land is increasing dramatically. Ideally, the land application site selected for effluent disposal would be fairly rectangular or square, have soil conditions that allow good percolation and adequate depth to ground water, be free of wells, streams and structures, be relatively flat and not be wooded. Anything that varies form the ideal increases the amount of property required.

A great deal of effort was expended in attempting to locate an actual site that could be used and which could be purchased or leased. Professional assistance was retained to search for properties and both private properties and land preserved by the Agricultural Land Preservation Act was considered. A group of properties was identified, centered around one property that expressed some interest in selling. The site is approximately 11.5 miles from the Rehoboth Beach WWTP. However, in order for land application to be feasible, the surrounding properties would also have to agree to sell and it was clear that agreement to sell was not going to be obtained. Despite this, the property was pursued and a purchase offer was extended. The offer was not accepted because of the conditions which are required in order to protect the City. In general, there appeared to be considerable objection on the part of individual landowners to the use of their property for the application of treated wastewater effluent.

B. Rapid Infiltration Beds

1. Description

Rapid infiltration involves the percolation of treated effluent into the ground water through a soil bed at a fairly high rate. The basins are typically flooded and then allowed to dry and rest for a period of time. Thus the rapid infiltration beds (RIBs) rotate in and out of service. The soil that provides the bed for percolation of the effluent is typically either sand or the natural soils on the site. A minimal amount of additional treatment is achieved through filtration but the treatment level is less than provided by spray irrigation which involves effluent application rates that are much lower and the use of crops to take up nutrients. Filtration through the soil may remove some minor amount of BOD and solids. A very minor amount of nitrogen, present as organic nitrogen in particulate form, may be removed but ammonia and oxidized nitrogen (nitrate) which are soluble, will pass through to the ground water. Ammonia can be oxidized to nitrate through the process of nitrification by bacteria present in the soil, if sufficient amounts of oxygen is present.

2. Summary of Advantages / Disadvantages

Advantages

- Proven technique for effluent disposal
- Recharges groundwater
- Relatively low impact in terms of amount of land required (compared to land application) and cost

Disadvantages

- Potential to contribute nutrients to Inland Bays through contact with surface water
- Potential for local mounding of groundwater
- Use would prevent public access to land

3. Discussion

Rapid infiltration Beds require less land than does spray irrigation; approximately 300 acres of land would be required. However, for all the same reasons discussed relative to the land application alternative, the land required for this alternative could not be identified. In addition, the rapid infiltration bed alternative involves a permit issue which could potentially disqualify it from any further consideration. The TMDL developed for the inland bays requires that there be absolutely no discharge of nutrients from the Rehoboth Beach WWTP to the inland bays. RIBs, if located within the inland bays watershed, will discharge some amount of nutrients into the ground water which then moves with the ground water toward a receiving stream that then flows to the inland bays. Thus their use would technically be prohibited in the watershed. Ground water modeling would be required to prove that the ground water did not carry nutrients to the inland bays.

C. Underground Injection

1. Description

Underground injection is the disposal of wastewater below ground by pumping or gravity flow to an aquifer. A well is defined as any bored, drilled or driven shaft or dry hole that is deeper than it is wide. There are five classes of wells regulated by EPA and DNREC; however, there are basically two types of underground injection systems that could potentially be used to dispose of the treated effluent from the Rehoboth Beach WWTP. These are Shallow Well Injection (Class V) and Deep Well Injection (Class I).

Deep Wells are wells that inject waste below the lowermost geological formation containing an existing or potential drinking water aquifer defined in the Underground Injection Control (UIC) program as an Underground Source of Drinking Water (USDW). A USDW is an aquifer that is presently used for drinking water, has the potential to be used for drinking water or has a total dissolved solids (TDS) concentration less than 10,000 mg/L. Deep wells inject into aquifers below USDWs and are regulated as Class I wells. A confining geologic layer must be present between the USDW and the contaminated aquifer to protect the USDW from potential contamination. The porosity and permeability in the injection zone must be sufficient to prevent excessive pressure buildup in the aquifer. The depth of Class I wells varies but can be as deep as 12,000 feet or more.

Shallow wells would typically include any system that injects treated wastewater into a shallow aquifer either by pumping into the aquifer or by infiltration. This type of well system is regulated as a Class V well. There are many types of Class V wells including agriculture drainage wells, storm water drainage wells, large capacity septic systems, fossil fuel recovery wells in addition to municipal wastewater effluent disposal wells.

With shallow injection wells, the aquifer is not confined and the injected wastewater effluent is free to migrate as determined by the pressure gradients. The greatest concern with this type of disposal system is the protection of all USDW aquifers and there are two situations under which this type of well may be permittable. The two conditions under which this type of well may be permitted are that either the treated effluent must meet safe drinking water standards or the shallow aquifer must already be contaminated to the point where it would no longer be considered as a potential source of drinking water. This latter situation could possibly exist in coastal areas where salt water has intruded into the shallow drinking water aquifer.

2. Summary of Advantages / Disadvantages

Advantages

- Relatively small land requirement
- Recharge of ground water
- Potential to form barrier to salt water intrusion (shallow well)

Disadvantages

- Extensive pilot testing would be required to determine design requirements and permitability.
- Risk associated with initial testing investment without the assurance of obtaining discharge permits.
- Public acceptance of an unknown disposal method.
- Operational issues related to the potential for plugging of the injection well.

- Long-term risk, based on experience elsewhere, associated with potential to contaminate other aquifers.

3. Discussion

There are no known areas of groundwater contamination in the watershed, within an existing shallow drinking water aquifer, that would allow the injection of treated effluent. Previous test wells have located areas with some level of salt water intrusion as indicated by Total Dissolved Solids levels in the range of several hundred mg/L but not exceeding the 10,000 mg/L level that would classify it as not suitable as a drinking water source. It is also understood that DNREC would never allow an existing USDW aquifer, that could be a potential source of drinking water, to be declassified as a USDW and therefore to be used for shallow well injection.

A potential deep well formation, identified by the Maryland Geologic Survey, exists at a depth of approximately 5,000 feet or greater. This formation known as the Waste Gate Formation is believed to contain very high TDS levels and is confined by impervious layers above. This formation was used as the basis of developing cost estimates for this form of effluent disposal. However, a great deal of information is not known about the geology of the formation and there is considerable technical, financial and environmental risk inherent in pursuing this option.

D. Ocean Outfall

1. Description

This method of effluent disposal is based on the discharge of the treated effluent wastewater into the ocean at a distance offshore and depth where the potential public health and environmental impacts are negligible. The initial dilution and dispersion of the treated effluent insures compliance with all water quality regulations and public health standards

2. Summary of Advantages / Disadvantages

Advantages

- Minimal operating requirements
- Minimal maintenance requirements
- No potential nutrient transport into the inland bays

- Perceived as ultimate solution
- Potential as regional solution

Disadvantages

- Public acceptance
- Permitting issues
- No ground water recharge

3. Discussion

The ocean outfall alternative is the only alternative that can be considered as a regional solution in addition to serving the needs of the City of Rehoboth Beach alone. Dilution modeling of the outfall diffuser was completed under two different scenarios; one with the flows expected from the City alone and two, with the flows from both the City and the County under a regional approach. The modeling indicated that there would be excellent initial and farfield dilution under the various operating conditions and ambient conditions and that the outfall would meet all expected discharge permit and public health requirements. Some improvements at the Rehoboth Beach WWTP and the Sussex County plants would be required in addition to the outfall. Although several outfall locations were considered, the proposed location, based on the modeling effort and other considerations, is to extend 6,000 feet off of Rehoboth Beach as shown in Figure ES-1.

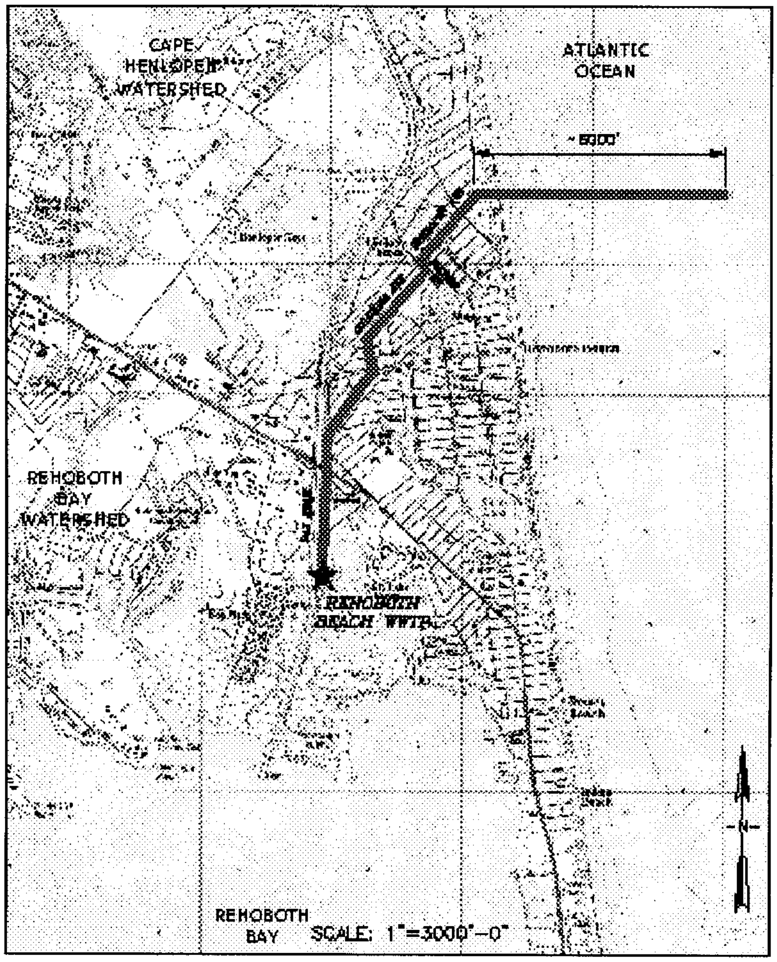

Figure ES-1: Proposed Location of Ocean Outfall and Force Main

E. Costs

A summary of the capital, operations and maintenance, and present worth costs are presented in Table ES-2.

Table ES-2: Alternative Cost Summary

Effluent Disposal Alternative	Capital Cost (2005$)	20-year O&M Present Worth Costs (2005$)	Present Worth Cost (2005$)
Spray Irrigation	$61,300,000	$1,990,000	$63,290,000
Rapid Infiltration Bed	$53,350,000	$1,920,000	$55,270,000
Deep Well Injection	$112,800,000	$2,210,000	$115,010,000
Ocean Outfall			
Rehoboth Beach	$36,630,000	$2,240,000	$38,870,000
Regional – Rehoboth Beach	$16,800,000	$2,240,000	$19,040,000
Regional – Sussex County	$50,100,000	$8,560,000	$58,660,000

IV. Recommended Plan

A. Comparison of Alternatives

A comparison of the various alternatives on the basis of a number of subjective issues is presented in Table ES-3.

Table ES-3: Comparison of Alternatives

Issue	Land Application	RIB	Underground Injection		Ocean Outfall
			Shallow	Deep	
Public Acceptance	+	0	-	-	-
Environmental Impacts	+	-	-	0	0
Nutrient Loading to Inland Bays	0	-	-	+	+
Permitting Issues	+	-	-	-	0
Reliability	0	0	-	-	+
Operability	0	+	-	-	+
Constructability	0	+	-	-	0
Long Term Solution	0	-	0	0	+
Groundwater Recharge	+	+	+	-	-
Land Requirement	-	-	0	0	+
Risk	+	0	-	-	+
Cost	0	0	0	-	+
Summary +	**5**	**3**	**1**	**1**	**7**
0	**6**	**4**	**3**	**3**	**3**
-	**1**	**5**	**8**	**8**	**2**

Notes:
1. A (+) indicates that, in regards to the particular issue the alternative is generally considered to be positive or beneficial.
2. A (0) indicates a neutral response.
3. A (-) indicates that the alternative is negative or detrimental with regards to the issue.
4. AA Indicates an issue, which essentially eliminates the alternative from further consideration.

B. Discussion

It is recommended that the City of Rehoboth Beach pursue an ocean outfall as the method of effluent disposal. Based on evaluations of the various methods of effluent disposal available to the City, an ocean outfall is the only technically feasible approach available to the City that has a realistic potential to be sited and permitted. A summary of the primary reasons for selecting this alternative follows:

- Land Application, while technically feasible, is not a viable option because the land required to implement this option is not available. Also the cost to purchase land, were it to be available, is becoming increasingly expensive.
- Rapid Infiltration Beds would not be permitted within the watershed because they would result in the flow of nutrients through the ground water to the inland bays. In addition, adequate land to site the RIBs could not be located.
- Underground Injection, while technically feasible, is not a practical option because of the cost and risk associated with permitting and developing the wells.
- Preliminary modeling indicates that, even under the worst-case scenario regarding the performance of the wastewater treatment plant and ocean currents, public health requirements are met at or in close proximity to the diffuser.
- Ocean outfalls have a well-documented history of protecting public health and compliance with environmental regulations.
- An ocean outfall can be considered a final solution in the sense that, once it is built and in operation, the discharge is immune from future regulatory issues and environmental concerns related to the TMDL program for the Inland Bays, which regulates the discharge of nutrients in the watershed.
- An ocean outfall is the only alternative that has the potential to be a regional solution and thus possibly further reduces the impact on the individual user charges.
- Considering the City of Rehoboth Beach alone, the ocean outfall is the most cost-effective alternative.

C. Impact on User Charges

1. General

The impact of the estimated capital and the operation and maintenance for the ocean outfall and associated improvements on the user charges for both the City of Rehoboth Beach (Rehoboth Beach only solution and Regional solution) and for Sussex County (Regional solution) was determined. The basis of this determination was the current actual rate structure for both the City and the County. Several funding scenarios were considered including:

- No grant funding available
- Grant funding provided to limit user charge increase to 50%

2. Rehoboth Beach Only

<u>Scenario 1 – Finance Entire Capital Project Cost</u>

The capital and operating costs were escalated to 2012 dollars to better determine the impact of the Rehoboth Beach solution. The capital cost for the Rehoboth Beach ocean outfall in year 2012 dollars is $43,740,000. Based on the assumption of no grant funding, the annual costs associated with the Rehoboth Beach Ocean Outfall are summarized in Table ES-4. Table ES-4 includes the projected debt service to repay the loan plus the existing and projected annual operation and maintenance costs for the recommended plan.

Table ES-4: Annual Cost for Ocean Outfall

Source	Value
Existing O&M Costs[1]	$1,530,000
Additional O&M Costs (Ocean Outfall)[2]	$189,000
Additional WWTP O&M Costs[3]	$418,000
Annual Interest[4]	$1,750,000
Annual Principal[5]	$1,470,000
Total Annual Cost	$5,360,000

Notes:

1. From Rehoboth Beach 2004 – 2005 budget escalated to 2012 at 3% per year.
2. For detailed computation see Appendix K.
3. From Table 9-5 Annual Costs Associated with the Wastewater Treatment Plant escalated to 2012 at 3% per year
4. Based on $43,740,000 * 4% = $1,750,000
5. Principal = $43,740,000 * 0.0736 – Interest ($1,750,000)

The current revenue for the City is approximately $1,661,000 annually. An increase of 223% of the metered sewer rates, North Shores revenue, Dewey Beach revenue and Henlopen Acres revenue would be required to achieve an annual revenue of $5,360,000 (factor of 3.23 times existing rates). Table ES-5 summarizes the revenue associated with an increase of 223%.

Table ES-5: Annual Revenue with 223% Increase in User Charges[1]

Source	Value
Metered Sewers – Commercial	$2,070,000
Metered Sewers – Residential	$1,270,000
North Shores	$420,000
Dewey Beach	$1,480,000
Henlopen Acres	$120,000
Total	$5,360,000[2]

Notes:
1. For detailed computations see Appendix K. All revenue sources were increased by the 223%.
2. Rounded to the nearest ten thousand.

Based on the 2,115 customers with service connections less than 1-inch, an increase of 223% would result in an annual average user charge of $977.46, which is less than the maximum "reasonable" user charge of $1080.76 per the DNREC guidelines.

Scenario 2 – Grant Financing to Limit User Charge Increase to 50%

A more reasonable increase, but still a significant increase to the Rehoboth Beach users and other customers, over the next several years would be an increase of no more than 50% over the current charges. Table ES-6 summarizes the revenue expected with an increase of 50%. As shown in Table ES-6, the revenue is significantly less than the projects $5,360,000 required (see Table ES-4).

Table ES-6: Annual Revenue with 50% Increase in User Charges[1]

Source	Value
Metered Sewers – Commercial	$960,000
Metered Sewers – Residential	$590,000
North Shores	$200,000
Dewey Beach	$690,000
Henlopen Acres	$60,000
Total	$2,500,000[2]

Notes:
1. For detailed computations see Appendix K. All revenue sources were increase by 50%.
2. Rounded to the nearest ten thousand.

With an increase of 50% in user charges, significant grant money would be required to build the Rehoboth Beach Ocean Outfall. With an annual budget of $2,500,000, a grant for 88.7% of the total capital cost, $43,740,000, is required resulting in a loan of approximately, $4,940,000. The annual costs associated with the loan are summarized in Table ES-7.

Table ES-7: Annual Cost for Ocean Outfall with 88.7% Grant Funding

Source	Value
Existing O&M Costs[1]	$1,530,000
Additional O&M Costs (Ocean Outfall)[2]	$189,000
Additional WWTP O&M Costs[3]	$418,000
Annual Interest[4]	$198,000
Annual Principal[5]	$162,000
Total Annual Cost	$2,500,000[6]

Notes:
1. From Rehoboth Beach 2004 – 2005 budget escalated to 2012 dollars.
2. For detailed computation see Appendix K.
3. From Table 9-5 Annual Costs Associated with the Wastewater Treatment Plant escalated to 2012 dollars
4. Based on $4,940,000 * 4% = $198,000
5. Principal = $4,940,000 * 0.0736 – Interest ($198,000)
6. Rounded to the ten thousand.

3. Regional Solution

The capital and operating costs were escalated to 2012 dollars to better determine the impact of the Regional ocean outfall solution. Table ES-8 summarizes the capital and operating cost for Rehoboth Beach and Sussex County for the Regional Ocean Outfall.

Table ES-8: Regional Solution Capital and Operating Costs

Source	Capital Cost (2012$)	Existing O&M Costs (2012$)	Additional O&M Cost (2012$)	Additional O&M Cost for WWTP (2012$)
City of Rehoboth Beach	$20,060,000	$1,530,000	$189,000	$418,000
Sussex County	$59,820,000	N/A(1)	$720,000	N/A[1]
Total Cost	$79,880,000			

Note:
1. Not available at this time.

A. Impact on Rehoboth Beach User Charges

Scenario 1 – Finance Entire Capital Project Costs

The City of Rehoboth Beach would have to finance its portion of the regional solution. The capital cost for the Rehoboth Beach Ocean Outfall is estimated to be $20,060,000 (year 2012 dollars). Based on the assumption of no grant funding, the annual costs for the City of Rehoboth Beach associated with the Regional Ocean Outfall are summarized in Table ES-9.

Table ES-9: Rehoboth Beach Annual Cost for Regional Ocean Outfall

Source	Value
Existing O&M Costs[1]	$1,530,000
Additional O&M Costs (Ocean Outfall)[2]	$189,000
Additional WWTP O&M Costs[3]	$418,000
Annual Interest[4]	$678,000
Annual Principal[5]	$802,000
Total Annual Cost	$3,620,000[6]

Notes:
1. From Rehoboth Beach 2004 – 2005 budget escalated to years 2012 dollars.
2. For detailed computation see Appendix K.
3. From Table 9-5 Annual Costs Associated with the Wastewater Treatment Plant escalated to year 2012 dollars.
4. Based on $20,060,000 * 4% = $802,000
5. Principal = $20,060,000 * 0.0736 – Interest ($802,000)
6. Rounded to the ten thousand.

The current revenue for the City is approximately $1,661,000 annually. An increase of 118% of the metered sewer rates, North Shores revenue, Dewey Beach revenue and Henlopen Acres revenue would be required to achieve an annual revenue of $3,620,000. Table ES-10 summarizes the revenue associated with an increase of 118%.

Table ES-10: Annual Revenue with 118% Increase in User Charges[1]

Source	Value
Metered Sewers – Commercial	$1,400,000
Metered Sewers – Residential	$860,000
North Shores	$280,000
Dewey Beach	$1,000,000
Henlopen Acres	$80,000
Total	$3,620,000[2]

Notes:
1. For detailed computations see Appendix K. All revenue sources were increased by the 118%.
2. Rounded to the nearest ten thousand.

Based on the 2,115 customers with service connections less than 1-inch, an increase of 118% would result in an annual average user charge of $660.73, which is less than the maximum "reasonable" user charge of $1080.76 per the DNREC guidelines.

Scenario 2 – Grant Financing to Limit User Charge Increase to 50%

A more reasonable increase but still a significant increase to the Rehoboth Beach users and other customers over the next several years would be an increase of no more than 50% over the current charges. Table ES-11 summarizes the revenue expected with an increase of 50%. As shown in Table ES-11, the revenue is significantly less than the projected $3,620,000 required (see Table ES-10).

Table ES-11: Annual Revenue with 50% Increase in User Charges[1]

Source	Value
Metered Sewers – Commercial	$960,000
Metered Sewers – Residential	$590,000
North Shores	$200,000
Dewey Beach	$690,000
Henlopen Acres	$60,000
Total	$2,500,000[2]

Notes:
1. For detailed computations see Appendix K. All revenue sources were increase by 50%.
2. Rounded to the nearest ten thousand.

With an increase of 50% in user charges, significant grant money would be required to build the Regional Ocean Outfall. With an annual budget of $2,500,000, a grant for 75.5% of the total capital cost, $15,150,000, is required resulting in a loan of approximately, $4,910,000. The annual costs associated with the loan are summarized in Table ES-12.

Table ES-12: Annual Cost for Ocean Outfall with 75.5% Grant Funding

Source	Value
Existing O&M Costs[1]	$1,530,000
Additional O&M Costs (Ocean Outfall)[2]	$189,000
Additional WWTP O&M Costs[3]	$418,000
Annual Interest[4]	$164,000
Annual Principal[5]	$196,000
Total Annual Cost	$2,500,000[6]

Notes:

1. From Rehoboth Beach 2004 – 2005 budget escalated to year 2012 dollars.
2. For detailed computation see Appendix K.
3. From Table 9-5 Annual Costs Associated with the Wastewater Treatment Plant escalated to year 2012 dollars.
4. Based on $4,910,000 * 4% = $196,000
5. Principal = $4,910,000 * 0.0736 – Interest ($196,000)
6. Rounded to the ten thousand.

B. Impact on Sussex County User Charges

Scenario 1 – Finance Entire Capital Project Costs

The impact to the Sussex County users was determined by the County with the estimated capital cost and operating costs from Table ES-2. The cost estimates were escalated to year 2012 dollars. The capital and O&M costs associated with the WWTP improvements and regional ocean outfall are $59,822,000 and $720,000 (year 2012 dollars). For the determination of the annual debt service associated with the construction of the WWTP plant upgrades and the ocean outfall, a 40-year bond with an interest rate of 5.5% was assumed. Table ES-13 summarizes the Sussex County cost associated with the WWTP improvements and the operation of the ocean outfall.

Table ES-13: Sussex County Annual Costs[1]

Source	Value
Annual Loan Cost (Interest & Principal)	$3,714,000
Additional O&M (WWTP & Regional Ocean Outfall)	$720,000
Total	$4,434,000[2]

Notes:
1. All cost shown in Year 2012 dollars.
2. Annual Loan Cost based on 40-year bond at 5.5% annual interest

Based on the 2006 Budget, the estimated number of users is 15,348. The estimated number of users was increased at 3% per year to 2012. Table ES-14 summarizes the impact of the WWTP and Regional Ocean Outfall solution to the Sussex County users.

Table ES-14: Annual Revenue for WWT Costs[1]

Source	Value
Additional Annual Cost for WWTP & Regional Ocean Outfall[2]	$4,434,000
Number of Users (Year 2012)	18,326
Additional Cost per User for WWTP and Ocean Outfall	$242
2012 Estimated User Charger[3]	$741
Total 2012 User Charge	$983
Percent Increase in User Charge[4]	58%

Notes:
1. All cost shown in Year 2012 dollars.
2. Annual Loan Cost based on 40-year bond at 5.5% annual interest. See Table ES-13.
3. Estimated 2005 user charge of $621 escalated to 2012 at 3% for 6 years
4. Increase = Project User Charge / Current User Charge - 1

Scenario 2 – 50% Grant Funding

Table ES-15 summarizes the cost to Sussex County if 50% grant funding is awarded for the Regional Ocean Outfall solution including the cost for upgrading the WWTP.

Table ES-15: Sussex County Annual Costs with 50% Grant Funding[1]

Source	Value
Total Capital Cost (Year 2012 dollars)	$58,820,000
Grant Funding	$29,910,000
Loan	$29,910,000
Annual Loan Cost (Interest & Principal)	$1,857,000
Additional O&M (WWTP & Regional Ocean Outfall)	$720,000
Total	$2,577,000[2]

Notes:
1. All cost shown in Year 2012 dollars.
2. Annual Loan Cost based on 40-year bond at 5.5% annual interest

Table ES-16 summarizes the impact of the WWTP and Regional Ocean Outfall solution to the Sussex County users.

Table ES-16: Annual Revenue for WWT Costs[1]

Source	Value
Additional Annual Cost for WWTP & Regional Ocean Outfall	$2,577,000
Number of Users (Year 2012)	18,326
Additional Cost per User for WWTP and Ocean Outfall	$141
2012 Estimated User Charger[3]	$741
Total 2012 User Charge	$882
Percent Increase in User Charge[4]	42%

Notes:
1. All cost shown in Year 2012 dollars.
2. Annual Loan Cost based on 40-year bond at 5.5% annual interest. See Table ES-13.
3. Estimated 2005 user charge of $621 escalated to 2012 at 3% for 6 years
4. Increase = Project User Charge / Current User Charge - 1