MASTER PLAN FOR WATER AND WASTEWATER FACILITIES PROJECT 9065

TOWN OF URBANNA

VIRGINIA

Appendix 67

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FINAL REPORT
AUGUST 21, 1991

R. STUART ROYER & ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
RICHMOND, VIRGINIA

TOWN OF URBANNA
VIRGINIA

MASTER PLAN FOR WATER AND WASTEWATER FACILITIES
PROJECT 9065

FINAL REPORT
AUGUST 21, 1991

PREPARED BY:

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THIS MASTER PLAN FOR WATER AND WASTEWATER FACILITIES WAS FUNDED, IN PART, BY THE VIRGINIA COUNCIL ON THE ENVIRONMENT'S COASTAL RESOURCES MANAGEMENT PROGRAM THROUGH GRANT # NA 90AA-H-CZ796 OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION UNDER THE COASTAL ZONE MANAGEMENT ACT OF 1972 AS AMENDED.

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SUMMARY

The Town of Urbanna prepared a comprehensive plan showing areas of possible future growth around the corporate limits. This information has been used to evaluate the present and future needs of the utility systems serving the Town as well as the surrounding area.

Within the present Town there is approximately 23 percent of the area which is available for future development. As land becomes less available development is forced to move outside of Town and the ability of the utility system to expand to meet the needs of growth is questionable.

The soils in the area around Urbanna are not good for the construction of septic tank drain fields and therefore new development will be limited if municipal services are not provided.

The Town-owned water facilities should be sufficient to serve the Town and the surrounding area as long as adequate storage is provided. The existing network of water mains inside of Town should be upgraded to provide a minimum of 6 diameter pipe loops. This will greatly improve pressure in the system and allow water for fire protection which is not now available.

The water main upgrade within Town is estimated to cost around $143,000.

Wastewater is collected and treated in a Town-owned system. The treatment plant is permitted for an average daily flow of 100,000 gallons. During periods of peak use the average daily flow equals the design and the facility experiences some short-term hydraulic problems. If these deficiencies are corrected the present plant should be adequate to treat the wastewater generated within the present corporate limits for perhaps another 15 years. However, the Town cannot expand the system much beyond its present sewer service area before the present plant will be required to expand.

The estimated cost of improvements to the present treatment plant is around $286,000. This will provide a surge tank to handle peak flows, correct hydraulic problems, and if necessary lower nitrogen and phosphorous levels in the effluent.

The recommended water and sewer improvements can be financed through the monthly service charge for water and sewer service if the present rate is increased. An average single family unit in Town would have to have a combined water and sewer bill of $28.00 and a similar out of Town water customer's bill should be $21.00 with the rate increased 2% annually to keep up with inflation.

Consideration for future expansion of either the water or sewer systems should be undertaken only after joint planning for the area between the Town and County is completed. This planning should consider the affect of growth on the utility systems as well as other needs of the entire area.

INTRODUCTION

PURPOSE AND SCOPE

The Town of Urbanna recognizing the need to investigate its present and future utility needs commissioned the preparation of a Water and Sewer Master Plan Study. This study is to investigate the present utility system to determine its adequacy to meet the present needs of the Town and those customers outside of Town using the facility. If deficiencies are found improvements will be recommended and estimated costs will be presented for the work. In addition to investigating the present system the study will include a discussion of long range needs and show possible projections of water and sewer facility needs based on assumptions of growth.

Recommendations are presented for action by the Town and in some cases the County to formulate plans which will help assure a community growth which can be accommodated without undue stress to the financial resources available or to the environment.

The data upon which the report is based has been provided for the most part by the Town in an effort to hold down the cost. The mapping was taken from the recently prepared Comprehensive Plan. Data on utility customers, water consumption and revenue were compiled by the Town. And a variety of reports and other data were furnished which helped greatly in compiling the report.

There are decisions which must be made which will influence the final report. Therefore, this first draft is presented for review

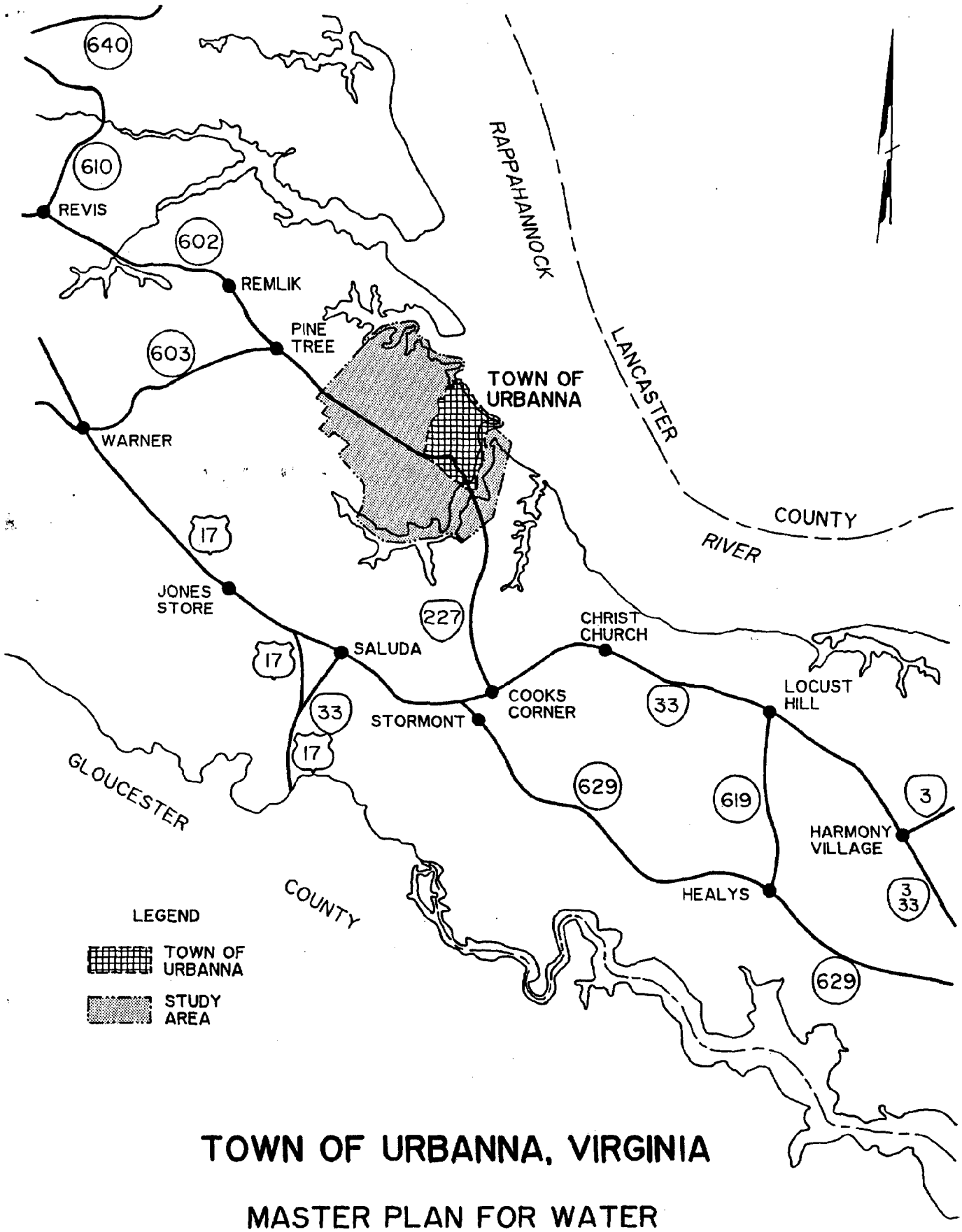
by Council. Once Council has reviewed the document and provided input a final report will be presented with recommendations for first phase improvements as well as a course of action for financing.

STUDY AREA DESCRIPTION

The area of Middlesex County around the Town has experienced growth primarily as a result of the Town's willingness to extend water service beyond its corporate limits. The pressure for growth outside of Town has continued to the present and the Town recognizes that its system may not be capable of serving the needs of the area. The area studied in this plan includes the six study areas delineated in the Town's Comprehensive Plan plus a seventh area across Urbanna Creek referred to as the Rosegill Project.

The Town has extended water service into study areas 1 and 4 and has decided against additional water service outside of Town until the recommendations of this report are released.

Plate 1 illustrates the study area and vicinity of Middlesex County. The various study areas are shown on Map No. 1 in the rear of the report.



TOWN OF URBANNA, VIRGINIA

MASTER PLAN FOR WATER AND SEWER FACILITIES

STUDY AREA AND VICINITY MAP

PLATE I

CURRENT SITUATION

EXISTING LAND USE

The predominant land use within the study area is residential with the largest concentration located within the Town of Urbanna. Table 1 illustrates the breakdown of major use categories in the study area.

Within the Town only 23% of the land is available for new development while the remainder of the study area has 75% of the land undeveloped.

In any utility study it is necessary to estimate present as well as future projections of usage. While population data is useful the more important data are connections. The number of connections served by a community when related to equivalent single family usage will indicate the equivalent population served. For planning purposes, this is more useful than pure census population data since many communities serve facilities which include a population not reflected in the census. Another example of utility users not indicated by census data are retail, commercial and industrial establishments.

TABLE 1

EXISTING LAND USE

ACRES IN STUDY AREAS

LAND USE CATEGORY	STUDY AREAS 1	2	3	4	5	6	7	TOWN	TOTAL
Residential	87.02	22.86	18.05	55.42	19.27	40.18	2.2	143.93	388.93
Commercial	4.95	-0-	-0-	-0-	38.31	4.40	-0-	16.48	64.14
Industrial	2.94	-0-	-0-	0.44	-0-	3.85	-0-	2.31	9.54
Public Service	13.99	-0-	0.73	-0-	-0-	-0-	-0-	11.71	26.43
Open Uses	78.61	105.48	150.47	104.82	219.10	146.25	151.97	52.04	1008.74
Wetlands	-0-	-0-	-0-	1.47	-0-	-0-	-0-	1.69	3.16
Total	187.5	128.3	169.3	162.1	276.7	194.7	154.2	228.2	1500.9

The land uses and their respective areas were derived from maps furnished by the Town. The areas were determined by planimeter.

Therefore, no attempt is made in this study to determine population within the study areas. However, preliminary 1990 census data indicate the Town to have a population of 528 in 349 housing units, 80 of which are vacant. This would seem to indicate about 2 persons per occupied unit.

It is assumed that the surrounding study areas will have approximately the same number of persons per dwelling.

Within the study area there are a significant number of housing units which are occupied seasonally. However, when planning for water and sewer utilities all units must be able to be served.

SOILS

Soils within the study area are for the most part unsuitable for development of septic tank drain fields as shown in the Soil Survey of Middlesex County. While the survey is generalized and detailed analysis for a specific site may show that the soil would support such facilities the maps are an excellent guide to the suitability of soils for drain fields. Knowing this it is safe to assume that no extensive development can occur without centralized sewer facilities. Plate 2 illustrates the location of soils rated as severe for use with septic tank drain fields as well as areas where land has failed percolation tests.

WATER FACILITIES

The average annual water use for a residential unit in Town is about 144 gallons per day (GPD) while that for an out of Town unit is 137 GPD. Therefore the per capita consumption is around 70 gallons per person per day. This is slightly higher than similar data from other communities and may be an indication of leaks in the individual house service lines.

At present the Town has approximately 511 water connections and 374 sewer connections as shown in Table 2.

TABLE 2

WATER CONNECTION DATA

Water Connections	In Town	Out of Town	Total
Residential	321	124	445
Business	62	4	66
Total	383	128	511

The Town water service is from two deep wells and storage is in one 5000 gallon pressure tank and a 250,000 gallon elevated storage tank. The wells are designated as No. 3 and No. 4.

Well No. 3 is reported to have a yield of 430 GPM, with pump capacity of 450 GPM. The capacity of Well No. 4, is 175 GPM which is the rated pump capacity. Therefore the well supply should be able to furnish about 605 GPM or 870,000 gallons per day. Based on a peak of 2.5 and a design of 100 gallons per person per day the

supply should be adequate for an equivalent population of 3,480 persons. However, the permitted capacity is only 1000 equivalent connections due to constraints in the water distribution system. An inquiry was made of the Health Department to determine the restriction of 1000 equivalent connections. There did not appear to be an explanation for the restriction, however it is possible that with the small line sizes which result in pressure drops, the Health Department felt it should restrict the number of connections.

Using water records of the Town, the connections were converted into equivalent single family units (SFU) to estimate the equivalent connected load on the system. Table 3 shows the estimate of the equivalent connected load as SFU.

TABLE 3

EQUIVALENT CONNECTIONS

TO TOWN OF URBANNA

WATER SYSTEMS

User Classification	ERU In Town	ERU Out of Town	ERU Total
Residential	321	118	439
Business	159	8	167
Total	480	126	606

The State Guidelines suggest a storage volume of 200 gallons per equivalent single family unit (ERU). Therefore with approximately

606 ERU the required volume of storage is about 121,000 gallons and the 250,000 gallons of storage is more than required.

In an effort to develop water data for use as a planning tool current records were analyzed to estimate consumption in relation to land use. Table 4 presents the estimated population density of developed land in the Town of Urbanna, together with calculated water use associated with each category of land use at the present time. This estimate correlates well with the actual water use data from Town records and is used to project future consumption.

TABLE 4

ESTIMATED DEVELOPMENT DENSITY

WITHIN TOWN AND WATER USE

General Land Use Category	Population Per Acre		Estimated Total Water Use in Town
Residential			
Low Density	3.4		36,800 gal/day
Medium Density	6.0		10,400 gal/day
Business/Commercial	10.0		21,000 gal/day
		Total	68,200 gal/day

In addition to the 68,200 GPD water used within Town out of town customers consume an average of 18,000 GPD for a total present use of about 86,000 GPD.

WASTEWATER FACILITIES

The Town of Urbanna owns and operates its wastewater system. The system consists of a contact stabilization type treatment plant,

several pump stations and a system of gravity sewers which receive flow from the individual customers.

The plant presently receives an estimated average annual daily flow of 52,000 GPD. This is less than the average daily water consumption since out of town customers are not connected to the treatment plant and some of the in Town water is not returned to the treatment plant. The sewer system serves 374 customers in Town. No out of town sewer service is provided at the present time. The present customers are equivalent to 471 single family units. Table 5 presents a breakdown of present customers and their equivalent connected load to the treatment plant.

TABLE 5

TOWN OF URBANNA

SEWER CUSTOMERS AND

EQUIVALENT CONNECTIONS

Type Customer	Number	ERU
Residential	312	312
Business	62	159
Total	374	471

With a permitted capacity of 100,000 GPD the plant has capacity to handle waste from Town customers for several years. In fact it will be shown in the discussion of the future situation the plant is estimated to be adequate for the Town until 2005 based on projected flows.

Peak flows, primarily during the Oyster Fest, present short term overloading of the wastewater plant. In November of 1990, the maximum daily flow was reported at 100,000 GPD. The two and four consecutive daily total flows during November of 1990 were 200,000 and 380,000 gallons respectively. Therefore, three day sustained flow was about 100,000 GPD and the daily peaks can be expected to exceed 200,000 GPD which is the design maximum flow rate to the present plant. Because of the high peak flow rates it is suggested that the Town install a flow equalization tank at the plant. Such a unit will prevent shock loads from reaching the facility.

Discussions with the plant operator indicate that hydraulic overloading of weirs occurs before the flow through the plant reaches the 100,000 GPD rate. This should not occur. The plant should be able to pass 200,000 GPD flow without overflowing. This does not mean the plant can successfully treat more than its 100,000 GPD rated capacity. Several Suggestions for possible causes are:

1. Partially blocked pipes
2. Improper weir setting
3. Inadequate pipe size
4. Pumping rate to plant is too high

It is suggested that an investigation of the plant be performed to determine what is causing the facility to overload and to correct the problem.

FUTURE SITUATION

GENERAL

The Town of Urbanna has prepared a comprehensive plan which envisions development surrounding the present corporate limits. If this development occurs it will place increasing demands on the Town water and wastewater systems. This section will investigate the impact of the future development on these systems.

The comprehensive plan shows the study area to be developed with the generalized land uses as shown in Table 6.

FORECAST OF WATER USE

While the Town land use plan does not address the rate of development it illustrates current trends for growth to occur around centers which have public utilities. This trend is evidenced in the Town where the presence of a water system has led to growth outside of the present corporate limits. Using the land development densities of the present Town, and assuming future development will be similar, the total water use when full development occurs can be estimated. Table 7 shows the estimated water use at the time of full development and is based on 70 gallon per capita per day.

TABLE 6

FUTURE LAND USE

ACRES IN STUDY AREAS

LAND USE CATEGORY	STUDY AREAS 1	2	3	4	5	6	7	TOWN	TOTAL
Residential	150.07	79.24	100.52	49.77	227.28	99.82	88.15	146.10	940.95
Commercial	17.80	-0-	-0-	26.35	-0-	7.34	12.99	28.22	92.70
Waterfront	-0-	-0-	-0-	-0-	-0-	-0-	14.53	8.22	22.75
Industrial	-0-	-0-	-0-	40.92	-0-	3.16	-0-	-0-	44.08
Public Service	-0-	-0-	-0-	4.48	-0-	3.49	16.52	8.62	33.11
Open Land	19.63	49.10	68.74	40.58	49.4	80.88	21.99	.37	367.32
Total Used	167.87	79.24	100.52	121.52	227.28	113.81	132.19	191.16	1133.59
Total	187.5	128.34	169.26	162.10	276.68	194.69	154.18	228.16	1500.91

TABLE 7

ESTIMATE OF

WATER USE AT BUILD OUT

LAND USE CATEGORY	STUDY AREAS 1	2	3	4	5	6	7	TOWN	TOTAL
Residential									
Low Density	35,717	18,859	23,924	8,430	32,056	13,092	13,050	3,380	148,507
Medium Density	-0-	-0-	-0-	6,027	38,888	18,820	8,677	55,398	127,810
High Density	-0-	-0-	-0-	-0-	-0-	-0-	8,862	-0-	8,862
Commercial	12,460	-0-	-0-	18,445	-0-	5,138	9,093	19,754	64,890
Light Industrial	-0-	-0-	-0-	9,739	-0-	752	-0-	-0-	10,491
Waterfront	-0-	-0-	-0-	-0-	-0-	-0-	10,171	5,754	15,925
Total	48,177	18,859	23,924	42,641	70,944	37,803	49,853	84,286	376,485

The following Table 8 is an estimated projection of water use in each study area and the Town. The table assumes that water and sewer services will be made available in all study areas. If sewer service is not available growth would not be as rapid and therefore water demands would be reduced. However, the data shows several facts:

1. If the Town served all of its present water customers with sewer the average plant flow would be approximately 86,000 GPD today.

2. If the Town allows no additional connections outside of Town but continues to grow within the present corporate limits the sewerage flow is estimated to be around 94,000 GPD in year 2015.

3. The two wells should have adequate capacity to serve the future needs of the area.

4. If service is provided to the Town plus the present study areas receiving water (areas 1 and 4) the estimated flow to the wastewater plant will be about 98,000 GPD in 1995. Therefore as soon as a decision is made to serve these areas the Town will be required to plan for a plant expansion.

The State's suggested storage volume is 200 gallons per equivalent single family unit. Table 9 shows the estimated ERU at build out

TABLE 8

PROJECTED WATER USE[1]

STUDY AREA	YEAR 1990	1995	2000	2005	2010	2015	BUILD OUT
1	6000	12508	19017	25525	32033	38541	48177
2	-0-	3220	4772	6325	7877	9430	18859
3	-0-	4060	4839	5619	6398	7177	23924
4	12000	15570	19139	22709	26279	29849	42641
5	-0-	8680	10290	11901	13511	15121	37803
6	-0-	8680	10290	11901	13511	15121	37803
7	-0-	-0-	3739	7478	11217	14956	49853
TOWN	68000	69571	71143	72714	74286	75857	84286
TOTAL	86000	122289	148318	174346	200374	226403	376485

[1]Table based on 70 GPD

of the study area. Table 10 shows the estimated volume of storage in five year increments.

Therefore, it is seen that the Town's present water storage is adequate for its present service area which includes the Town and Study areas 1 and 4. The estimated storage required for present service area in year 2015 is 206,067 gallons which is less than the 250,000 gallons available.

On the other hand, if all study areas are to be served, new storage capacity will be required around year 2005, or at such time as development reaches 1250 equivalent residential connections.

FORECAST OF WASTEWATER USE

Actual quantities of wastewater delivered to a plant depend on water use and the amount returned to the sewer as well as infiltration and inflow.

As shown previously, the present flow per connection to the wastewater treatment plant is less than the water used per connection. However, for design and planning 100 g.p.c.d. should be used. Table 11 shows an estimate of projected wastewater flows. The table is based on the assumption that all units are connected to the system and that in year 2015 each study area has developed to the point shown. Growth is assumed as a straight line between 1990 and 2015 for areas 1, 4 and the Town. Areas 2, 3, 5, 6 and 7, are assumed to be served in 1995 and grow in a straight line from 1995 to 2015.

TABLE 9

ESTIMATE OF

EQUIVALENT SFU WATER CONNECTIONS AT BUILD OUT

LAND USE CATEGORY	STUDY AREAS 1	2	3	4	5	6	7	TOWN	TOTAL
Residential									
Low Density	255	135	171	60	229	94	93	24	1,061
Medium Density	-0-	-0-	-0-	43	278	134	62	396	913
High Density	-0-	-0-	-0-	-0-	-0-	-0-	63	-0-	63
Commercial	89	-0-	-0-	132	-0-	37	65	141	464
Light Industry	-0-	-0-	-0-	70	-0-	5	-0-	-0-	75
Waterfront	-0-	-0-	-0-	-0-	-0-	-0-	73	41	114
Total	344	135	171	305	507	270	356	602	2,689

TABLE 10

ESTIMATE OF WATER STORAGE REQUIREMENTS

MILLION GALLONS

	YEAR						
STUDY AREA	1990	1995	2000	2005	2010	2015	BUILD OUT
1	8000	17412	26824	36235	45647	55059	68824
2	-0-	23	3385	6747	10109	13471	29642
3	-0-	29	2585	5141	7697	10253	34177
4	17200	22288	27376	32465	37553	42641	60916
5	-0-	62	12715	25368	38021	50674	101349
6	-0-	62	5447	10832	16217	21602	54004
7	-0-	-0-	5341	10683	16024	21365	71218
TOWN	96000	98473	100947	103420	105894	108367	120408
TOTAL STORAGE	121200	138349	184620	230891	277162	323432	537836

TABLE 11

PROJECTED SEWER USE[1]

STUDY AREA OUT	1990	# UNITS IN 1995	1995	2000	2005	2010	% DEVELOPED IN 2015	2015	BUILD
1	6000		15812	25624	35435	45247	.80	55059	68824
2	-0-	23	3220	5783	8345	10908	.50	13471	26942
3	-0-	29	4060	5608	7157	8705	.30	10253	34177
4	12000		18128	24256	30385	36513	.70	42641	60916
5	-0-	62	8680	19179	29677	40176	.50	50674	101349
6	-0-	62	8680	11910	15141	18371	.40	21602	54004
7	-0-	-0-	-0-	5341	10683	16024	.30	21365	71218
TOWN	68000		76073	84147	92220	100294	.90	108367	120408
TOTAL	86000		134653	181848	229043	276238		323432	537836

[1]Based on 100 g.p.c.d.

Based on the projection shown in Table 11, the Town treatment plant with capacity for 100,000 GPD should be sufficient for Town service for another 15 years. However, as discharge criteria change there may be a need to make modifications from time to time. If additional service areas are added, the time before new facilities are required is decreased. In fact, if the Town were to consider providing sewer service to Study Areas 1 and 4, the present water service areas, the estimated flow in year 1995 is 110,013 GPD. This would require new facilities or modification of the present plant to begin in the near future to design the necessary upgrade to handle the increased flow.

WATER SYSTEM IMPROVEMENTS

SOURCE OF WATER

No additional wells are proposed in this study since estimates show the present wells with capacity for over 600 GPM should provide water for the projected needs of the area.

STORAGE

There is no immediate need for additional storage. If growth should continue there will be a need for more storage in the future. The Water Facilities Map in the rear of the report shows a suggested location for a future tank. The volume of the future tank should be determined in the future, based on the Town's projected service area at that time. But, based on current projections with service to the Town and all seven study areas an additional 100,000 gallons would be necessary before year 2015. An additional 300,000 gallons of storage would be needed to serve the entire study area when it is fully developed.

DISTRIBUTION SYSTEM

Map No. 2, in the rear of this report shows a suggested modification and expansion of the present system to serve the entire service area. This system would be expected to provide at minimum 800 GPM for fire protection with a minimum residual pressure of 20 psi. This will require upgrading some water distribution lines within the present Town.

If fire protection is not desired, then individual well systems should be considered in each of the study areas not presently served by the Town. Each area should be easily capable of developing a well to supply the domestic needs of their respective areas.

The table in the Appendix shows the present day estimated cost of the facilities illustrated on Map No. 3. Those costs separated into total study areas are shown in Table 12 below.

TABLE 12

ESTIMATED COST OF FUTURE

OUT OF TOWN WATER IMPROVEMENTS

STUDY AREA	ESTIMATED TOTAL COST
1	105,150
2	235,225
3	131,550
4	103,775
5	332,795
6	427,615
7	194,250

The cost of installing water lines for future development should be borne by the developer.

In addition the Town should require lines to be sized as shown on the Water Master Plan.

Table 13 shows suggested improvements within Town which will improve service to the present as well as future customers.

TABLE 13

RECOMMENDED WATER IMPROVEMENTS

TOWN OF URBANNA

LOCATION	LENGTH (FT.)	SIZE (IN.)	ESTIMATED COST
Virginia St.	500	10	$ 21000
Howard St.	600	6	18000
Rappahannock Ave.	550	6	165000
Rappahannock Ave.	500	6	15000
Cross St.	350	6	10500
Cross St.	400	6	12000
Maiston Ave.	600	6	18000
		Subtotal	$111000
		Engineering	11100
		Inspection	10000
		Contingencies	11000
		Total	$143100

ALTERNATE WASTEWATER TREATMENT SYSTEMS

GENERAL

As has been previously shown the present wastewater treatment plant is estimated to have capacity for service to the Town until approximately year 2005. This is based on estimates of growth and density of land use similar to that of the current Town.

For planning purposes the evaluation of future treatment systems will be based on a plant with capacity of 250,000 GPD which is the size necessary to treat the projected flow from the Town and Study Areas 1 and 4.

DISCHARGE LIMITS

As the Town flow approaches the design quantity of 100,000 GPD it will be necessary to evaluate the next stage of expansion and the discharge limits which will be required. For the purpose of this report the following limits will be assumed for any new treatment plant or modified plant discharge.

CHARACTERISTIC	LIMITS
BOD_5	25 mg/L Average Mo.
Suspended Solids	25 mg/L Average Mo.
TKN	4 mg/L Average Mo.
Phosphorous	4 mg/L Average Mo.

The present plant has a limit of 30 mg/L for both BOD and suspended solids. There is no limit on TKN at this time; however, it is suggested that for planning purposes the Town should investigate modification of existing plant to include both nitrogen and phosphorous removal.

FUTURE PLANT SITES

The site suggested for consideration for future expansion or relocation of the plant is shown on Plate 3. This site is suggested for the following reasons:

1. There is sufficient land to construct a 250,000 GPD plant with room for expansion.

2. The discharge location in Urbanna Creek will allow good dispersal of effluent into the channel.

3. The buffer strip required by State Design Guidelines can be obtained with minimum adverse impact to existing or potential development.

4. Urbanna Creek with the marinas is unlikely to ever be re-classified for commercial oyster harvesting. And, the upgraded Town discharge would only help the present water quality.

5. A proposal to move the discharge to the river or a new tidal estuary would possibly result in significantly more opposition both local and state than that of a relocation on Urbanna Creek.

Several other sites were considered; however, when the permitting problems and difficulties of constructing a suitable outfall and discharge were evaluated they were not felt to be as good. Another factor was possible environmental concern. Urbanna Creek presently hosts several marinas in addition to the Town wastewater discharge. To move the Town discharge would do very little to improve water quality in the creek and depending on which other site was considered could pose a threat to a site which is presently free of point source pollution.

EXISTING PLANT MODIFICATIONS

As stated previously the present plant should have capacity for treating wastewater from the Town for approximately 15 years if the present deficiencies are corrected.

A surge tank should be constructed ahead of the plant to hold peak flows. This will allow more efficient treatment of the wastewater. In addition the hydraulics of the facility should be studied to determine the cause of hydraulic overloading and to prepare plans for corrective action.

When a surge tank is installed there is a chance that the State will take the opportunity to require either nitrogen or phosphorous

limits. Therefore for the purpose of this study cost estimates for nitrogen and phosphorous removal will be included with improvements recommended for the first stage work.

The present plant can be converted to biologically remove nitrogen and phosphorous fairly easily by adding some pipes, adjusting baffles and possibly installing a small pump. This could be done on the present plant site and the reliability of the Biological Nutrient Removal (BNR) technology is well documented.

The nutrients may also be reduced to some degree by utilizing one of several natural systems presently being used in other locations in the State. Aquatic ponds and constructed wetlands may be options. Each of these will require additional land and the plant effluent will have to be pumped to the facility.

The suggested site for construction of either aquatic ponds or a wetland is the site which has been recommended for future expansion as shown on Plate 2. In either case the plant discharge would be relocated from the present point to the new site of final treatment.

The estimated cost of the three alternatives for first phase improvements to be considered for planning are shown in Tables 14, 15, and 16.

TABLE 14

ESTIMATED COST
BNR MODIFICATION OF EXISTING PLANT TO TREAT
100,000 GPD AT HIGHER LIMITS

UNIT	ESTIMATED COST
Two New Surge Tanks (50,000 gallons each)	$150,000
Analysis and Correction of Existing Hydraulic Problem	20,000
Modification to BNR	50,000
Estimated Construction	$220,000
Engineering	22,000
Inspection	22,000
Contingencies	22,000
Total Estimated Cost	$286,000

TABLE 15

ESTIMATED COST
AQUATIC POND MODIFICATION
TO TREAT 100,000 GPD AT HIGHER LIMITS

UNIT	ESTIMATED COST
New Surge Tank	$ 150,000
Pump Station	90,000
Force Main	207,000
Analysis and Modification of Existing Hydraulic Problem	20,000
Pond	120,000
Harvesting Equipment	35,000
Construction Cost	$617,000
Land 6 Acres @ $3000	18,000
Contingency	62,000
Engineering	62,000
Inspection	30,000
Estimated Total Cost	$789,000

TABLE 16

ESTIMATED COST
CONSTRUCTED WETLANDS MODIFICATION OF
EXISTING PLANT TO TREAT
100,000 GPD AT HIGHER LIMITS

UNIT	ESTIMATED COST
New Surge Tank	$150,000
Pump Station	90,000
Force Main	207,000
Analysis and Modification of Existing Hydraulic Problem	20,000
Wetland Construction	80,000
Construction Cost	$547,000
Land 6 Acres @ $3000	18,000
Contingency	55,000
Engineering	55,000
Inspection	30,000
Estimated Total Cost	$705,000

Another consideration for the existing plant would be to abandon the facility and rebuild a new low operation cost facility. Such a plant could consist of a aquatic lagoon. Table 17 shows an estimate of the facilities and cost to provide a new natural system to replace the present contact stabilization plant.

TABLE 17

ESTIMATED COST TO CONSTRUCT
NEW AQUATIC POND TREATMENT
AND ABANDON PRESENT PLANT

UNIT	ESTIMATED COST
Pump Station	$125,000
Force Main	207,000
Pond Construction	173,500
Harvesting Equipment	35,000
Construction Cost	$540,500
Land 10 Acres @ $3000	30,000
Contingency	54,000
Engineering	54,000
Inspection	30,000
Estimated Total Cost	$708,500

Operating costs for the four preceding alternatives are estimated as shown in Table 18.

From the above discussion it is seen that the conversion of the present plant for removal of nutrients is the more economical course of action to follow when planning the first stage improvements.

However, if during the process of planning for the future growth of the area the decision is made to serve areas outside of Town and the present plant is unable to handle the proposed flow the Town should consider constructing an aquatic pond facility at the proposed new site. The increased operating cost is only slightly higher than that to modify the present plant. If this is done the Town should also consider purchasing the land necessary to expand the first-stage facility to the anticipated future size.

ALTERNATIVE FUTURE TREATMENT SYSTEMS

Before the present plant reaches its design capacity the Town must consider the type, size and location of a new facility. The size and location have been discussed. The type of treatment should be selected to provide the most economical treatment to meet the criteria established for discharge.

Three (3) systems will be presented herein for consideration as types of treatment. These will be activated sludge, constructed wetlands and aquatic ponds.

TABLE 18

ESTIMATED ANNUAL OPERATING EXPENSES
FOR
FIRST STAGE IMPROVEMENTS

	UPGRADED PLANT WITH BNR AND SEWAGE TANKS	EXISTING PLANT WITH SURGE AND AQUATIC POND	EXISTING PLANT WITH SURGE AND WETLAND	NEW SURGE TANK AND AQUATIC POND
General Salaries	12,000	12,000	12,000	12,000
Salaries:				
Administrative	22,000	22,000	22,000	22,000
Operators	59,000	59,000	59,000	48,000
Maintenance & Repairs	18,000	18,000	18,000	6,000
Laboratory	4,900	4,900	4,900	4,900
Utilities	14,000	16,000	16,000	5,000
Other:				
Depreciation	54,000	54,000	54,000	54,000
Existing Debt Service	44,000	44,000	44,000	44,000
New Debt Service (2)	31,400	86,000	77,400	77,800
Miscellaneous	7,000	7,000	7,000	7,000
Total Expenses	$265,900	$223,500	$314,300	$280,700

(1) Costs are based on 1991 figures and are not esculated for time.

(2) Debt service for new capital improvements is calculated as capital recovery of estimated cost using 7% interest for 15 year loan. Capital recovery factory = 0.10979.

ACTIVATED SLUDGE TREATMENT

The present plant would have to be expanded substantially to treat 250,000 GPD and due to land requirements would probably not be cost effective compared to constructing a new facility.

Units which will be necessary to construct and their estimated cost are presented below in Table 19.

TABLE 19

ESTIMATED COST
250,000 GPD
ACTIVATED SLUDGE BNR TREATMENT PLANT

	UNIT	ESTIMATED COST
1.	Raw Sewage Pump Station 0.5 MGD Capacity	$ 130,000
2.	Force Main 8"	207,000
3.	Surge Tank (Use Existing STP Conversion)	40,000
4.	BNR Plant 250,000 GPD	1,200,000
5.	Disinfection	60,000
6.	Control Building and Lab	100,000
7.	Land 10 Acres @ 3,000/Acre	30,000
8.	Outfall Line and Discharge	50,000
	Estimated Construction	$1,807,000
	Engineering	130,000
	Inspection	50,000
	Contingencies	180,000
	Estimated Total Cost	$2,177,000

CONSTRUCTED WETLANDS

These systems generally remove about 80% of the Biological Oxygen Demand (BOD), Total Suspended Solids (TSS) and nitrogen. Therefore if such a system is expected to achieve the limits stated earlier the pretreatment unit must deliver an effluent of 30 mg/L BOD and

SS. An activated sludge type plant would achieve such limits. However, when properly designed and operated, the assumed limits could also be met without the wetlands. Therefore at this point in time there does not appear to be an advantage in considering a future facility which will polish flow through the use of a constructed wetland.

AQUATIC POND

Construction of an aquatic pond in the future to replace the present plant could meet the assumed discharge limits. Table 20 shows the estimated cost of such a system.

TABLE 20

ESTIMATED COST
250,000 GPD
AQUATIC POND TREATMENT PLANT

	UNIT	ESTIMATED COST
1.	Raw Sewage Pump Station	$ 130,000
2.	Force Main	207,000
3.	Surge Tank (Use Existing STP Conversion)	40,000
4.	Pond - 6 Acres	397,500
5.	Disinfection	60,000
6.	Laboratory/Office	75,000
7.	Land - 20 Acres @ 3000	60,000
8.	Outfall Line and Discharge	50,000
	Estimated Construction	$1,019,500
	Engineering	75,000
	Contingency	102,000
	Inspection	30,000
	Estimated Total Cost	$1,226,500

DISCUSSION

At such time as the Town of Urbanna considers the need to upgrade and relocate the present plant the use of an aquatic pond should be investigated as a cost effective solution.

WASTEWATER TRANSPORT AND COLLECTION

GENERAL

Due to the topography of the study area gravity collection of wastewater will have to be accomplished in small areas and pumped to the treatment plant for disposal. Such a system will be quite expensive to develop and operate due to the number of pump stations which are necessary to allow full development of the area.

A second method of providing sewer service would be through installation of a vacuum collection system. These systems do not require gravity and therefore minimize the number of pump stations. Since the waste is flowing under negative pressure line sizes are reduced from that of a gravity system.

The following discussion will present data on two types of systems to serve the study area.

GRAVITY SEWER SYSTEM

Map No. 3 in the rear of this report illustrates one scheme of installing gravity sewers and pump stations to serve the area. The potential total present day cost for this system is about $3,944,000.

If a decision is made to expand the system the general plan shown on this map should be used as a master plan when establishing sizes for future lines and pump stations.

VACUUM SEWER SYSTEM

Map No. 4 in the rear of this report shows a general plan for serving the area with a vacuum system. While the exact lines sizes and pump capacities and location may vary somewhat from that shown the layout, the estimated costs are thought to be sufficiently close to provide an indication of long-term economies of developing a vacuum system.

The estimated present day cost for developing the vacuum system as shown is about $2,304,000. In addition valve pits are necessary to collect waste from individual customers. While the location of valve pits is dependent upon several factors in general it is estimated that two will serve an acre of developed land and cost about $1,850 each. Therefore, with roughly 1,000 acres of land outside of Town which would be developed according to the comprehensive plan the cost of valve pits would be around $370,000. Combining these costs gives approximately $2,674,000 for the cost of developing vacuum collection facilities to serve the entire study area.

DISCUSSION

Based on the estimates of construction cost it would appear that the vacuum system will cost less to install than the conventional gravity system. However, the gravity system will also require around 17 pump stations to serve the area outside of the town. The vacuum system will require only two. Two valve pits per acre will have to be maintained for the vacuum system.

It is estimated that the overall cost of installing and operating a vacuum system will be less than that of a conventional gravity system. Therefore, if the Town decides to extend service to out of Town areas the use of a vacuum system should be considered.

RECOMMENDED FIRST STAGE

WATER AND SEWER IMPROVEMENTS

Until such time as specific plans are made for development outside of Town and the policy for extending services outside the Town no recommendation will be made for out of Town improvements.

The improvements recommended in Town are to improve service to customers on the water system and protect the wastewater plant from peak loads thereby improving the quality of treatment and extending the life of the unit.

Tables 21 and 22 present a list of improvements for the water system and wastewater treatment plant.

The estimated total cost of recommended improvements is $367,100.

It is recommended that the cost of improvements be funded through water and sewer service charges and connection fees. The financing of these costs is discussed further in the section on Financing.

TABLE 21

RECOMMENDED WATER IMPROVEMENTS

TOWN OF URBANNA

LOCATION	LENGTH (FT.)	SIZE (IN.)	ESTIMATED COST
Virginia St.	500	10	$ 21000
Howard St.	600	6	18000
Rappahannock Ave.	550	6	165000
Rappahannock Ave.	500	6	15000
Cross St.	350	6	10500
Cross St.	400	6	12000
Maiston Ave.	600	6	18000
		Subtotal	$111000
		Engineering	11100
		Inspection	10000
		Contingencies	11000
		Total	$143100

TABLE 22

RECOMMENDED INITIAL IMPROVEMENTS

WASTEWATER TREATMENT PLANT

1.	New Surge Tanks	$150,000
2.	Hydraulic Modification to Existing Plant	20,000
	Construction Cost	$170,000
	Engineering	17,000
	Inspection	20,000
	Contingencies	17,000
	Total Estimated Cost	$224,000

FINANCING

GENERAL

At the present time the funds available to communities in the form of grants is limited. From time to time the Community Block Development Grant program has grants for qualifying projects, and the Chesapeake Bay Initiative program has small grants. Several programs have loan funds available. These include Farmers Home Administration and the Revolving Loan program. However, for purposes of this report funding will be estimated without any grant assistance. This will present a worst case scenario and if grants can be obtained the customer costs may be reduced.

EXISTING SITUATION

Customers receiving water and sewer service from the Town currently pay the monthly service charge shown in Table 23.

An analysis of the revenue received by the Town indicates that the average Equivalent Residential Unit (ERU) in Town is billed $9.41 per month each, water and sewer service, or a total of $18.82 per month. An ERU outside of Town is billed $17.38 for water service.

Looking at the rate schedule the minimum residential water bill is $7.50 for 3000 gallons plus a $2.30 surcharge for debt service, for a total of $9.80. The reason that the average bill per equivalent residential unit is less lies in the fact that customers using over 3000 gallons per month are paying less per 1000 gallons than one which uses less than 3000 gallons per month.

TABLE 23

MONTHLY WATER AND SEWER

SERVICE CHARGES

	TOWN	OUT OF TOWN
Water Charge		
0-3000 Gallons	7.50	11.25
Over 3000 Gallons	1.63/1000 Gallons	2.45/100 gallons
Sewer	100% of Water	--
Total		

Sewer connection fees are $1250 and water connection fees are $750 plus all costs of materials and labor.

In addition to the water and sewer service charges the Town collects a surcharge for debt service.

CATEGORY OF USE	IN TOWN	OUT OF TOWN
0 - 5000 gallons	2.30	3.45
5001 - 15000 gallons	3.30	4.95
15001 - 50000 gallons	6.00	9.00
over 50,000 gallons	7.50	12.00

The water and sewer budget for 1991-92 shows $234,486 as expenses for the year. Included in this is a $54,300 line item for depreciation. If the Town uses the utility as an enterprise fund the revenue should cover expenses. With an annual water sale of

approximately 31,778,000 gallons the cost of water assuming 50% for water and 50% for sewer is about $3.69 for 1000 gallons.

Therefore, for 3000 gallons the average minimum monthly charge for water only should be about $11.07 and the charge per 1000 gallons for all over 3000 should be $3.69.

If the depreciation is not funded the average minimum monthly charge for 3000 gallons would be $8.56 with a $2.84 per 1000 gallons for all use over 3000 gallons.

With the assumption that half of the cost is for wastewater the sewer charges should equal those of water.

There are many ways that the fee structure can be tailored to produce the revenue required and the example above is only one of the many. However, it is apparent from the proposed budget that revenue will not cover expenses if depreciation is to be funded.

It is recommended that the Town consider funding depreciation in the rate structure.

FIRST STAGE IMPROVEMENTS

There are many combinations of water and sewer rate structures which will generate sufficient revenue to pay for the suggested initial improvements. One system to finance a $367,000 loan would be to raise rates in Town to produce an average monthly water and sewer bill of $28.00, and that outside of Town for an average water

bill of $21.00 and increase the rate annually 2%. This would pay for the loan in 15 years assuming a 7% interest loan. The full description of assumptions for the loan and the estimated revenue, expenses, and debt retirement schedule are shown in the Appendix.

Of course, if a lesser interest rate is available or if grant funds can be applied the rates can be reduced accordingly.

IMPLEMENTATION

PLANNING CONSIDERATIONS

The town of Urbanna should consider what steps are necessary to provide water and sewer service to customers inside of the Town. These considerations should include requirements for developers. And, it is felt that the Town should coordinate with the County and discuss the long term growth impacts of the area. This should include no growth considerations in the event that the Town decides not to continue extending service into the County.

At the present time growth outside of Town is somewhat limited due to soil conditions and the fact that septic tank drain fields cannot be constructed in many areas and therefore construction is limited to those areas where such fields can be used.

The following points are suggested for consideration of Town Council.

1. All water line extensions should be 6 inch minimum where a fire hydrant could be connected.

2. No water lines smaller than 4 inches should be allowed.

3. Developers should be required to provide loops in water system where possible.

APPENDIX

ESTIMATED FUTURE WATER IMPROVEMENTS

	LENGTH (FT.)	SIZE (IN.)	COST ($)
AREA 1			
Laurel Drive	200	6	6000
Laurel Drive	350	6	10500
Easement	150	6	4500
Meadow Lane	1250	6	3750
Laurel Drive	350	6	10500
Route 1010	250	6	7500
		SUBTOTAL	$ 76500
		ENGINEERING	7650
		INSPECTION	10000
		CONTINGENCY	11000
		TOTAL	$105150

	LENGTH (FT.)	SIZE (IN.)	COST ($)
AREA 2			
Route 1011	1050	8	36750
Route 1011	850	8	29750
Route 1011	550	8	19250
Easement	300	6	9000
Easement	350	6	10500
Route 1011	1100	8	38500
Route 1011	1700	6	51000
		SUBTOTAL	$194750
		ENGINEERING	19475
		INSPECTION	10000
		CONTINGENCY	11000
		TOTAL	$235225

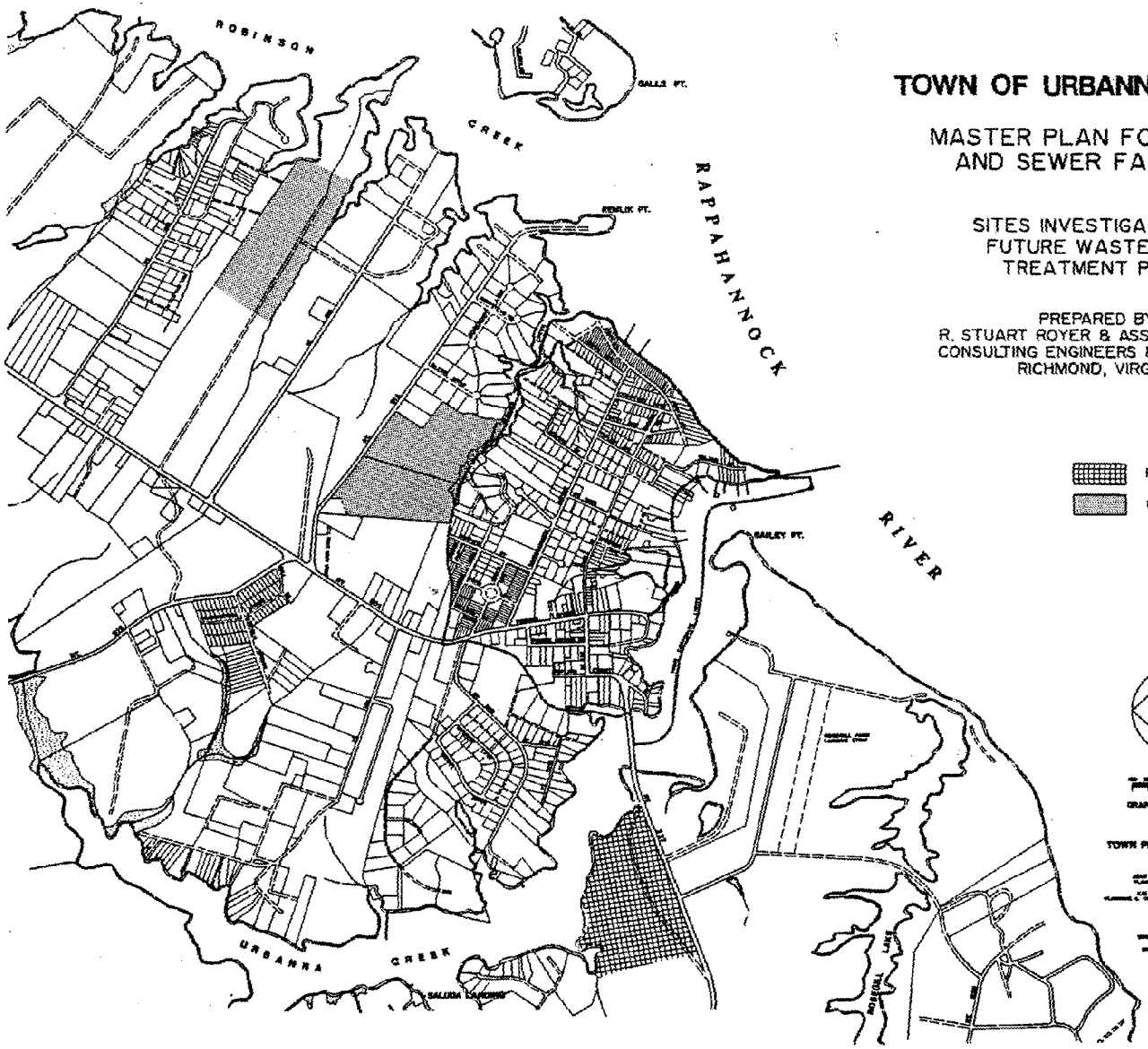
	LENGTH (FT.)	SIZE (IN.)	COST ($)
AREA 3			
Route 602	350	10	14700
Route 615	900	6	27000
Route 615	1400	10	58800
		SUBTOTAL	$100500
		ENGINEERING	10050
		INSPECTION	10000
		CONTINGENCY	11000
		TOTAL	$131550

	LENGTH (FT.)	SIZE (IN.)	COST ($)
AREA 4			
Easement	2150	8	75250
		SUBTOTAL	$ 75250
		ENGINEERING	7525
		INSPECTION	10000
		CONTINGENCY	11000
		TOTAL	$103775

	LENGTH (FT.)	SIZE (IN.)	COST ($)
AREA 5			
Route 602	1250	10	52500
Easement to Tank	450	12	20250
Route 684	1100	10	46200
Easement	1300	8	45500
Route 684	1800	8	63000
Route 684	1600	8	56000
		SUB TOTAL	$283450
		ENGINEERING	28345
		INSPECTION	10000
		CONTINGENCY	11000
		TOTAL	$332795

	LENGTH (FT.)	SIZE (IN.)	COST ($)
AREA 6			
Route 602	2300	10	96600
Route 680	950	10	39900
Easement	2300	8	80500
Route 680	2000	8	70000
Route 680	1600	6	48000
Road	55	6	1650
Road	1100	6	33000
		SUBTOTAL	$369650
		ENGINEERING	36965
		INSPECTION	10000
		CONTINGENCY	11000
		TOTAL	$427615

	LENGTH (FT.)	SIZE (IN.)	COST ($)
AREA 7			
Virginia St.	300	8	10500
Prince George St.	300	8	10500
Easement	500	8	17500
Watling St.	500	8	17500
Watling St.	500	8	17500
Route 227	2400	8	84000
Bridge Crossing	1000	8	40000
		SUBTOTAL	$157500
		ENGINEERING	15750
		INSPECTION	10000
		CONTINGENCY	11000
		TOTAL	$194250



TOWN OF URBANNA, VIRGINIA

MASTER PLAN FOR WATER AND SEWER FACILITIES

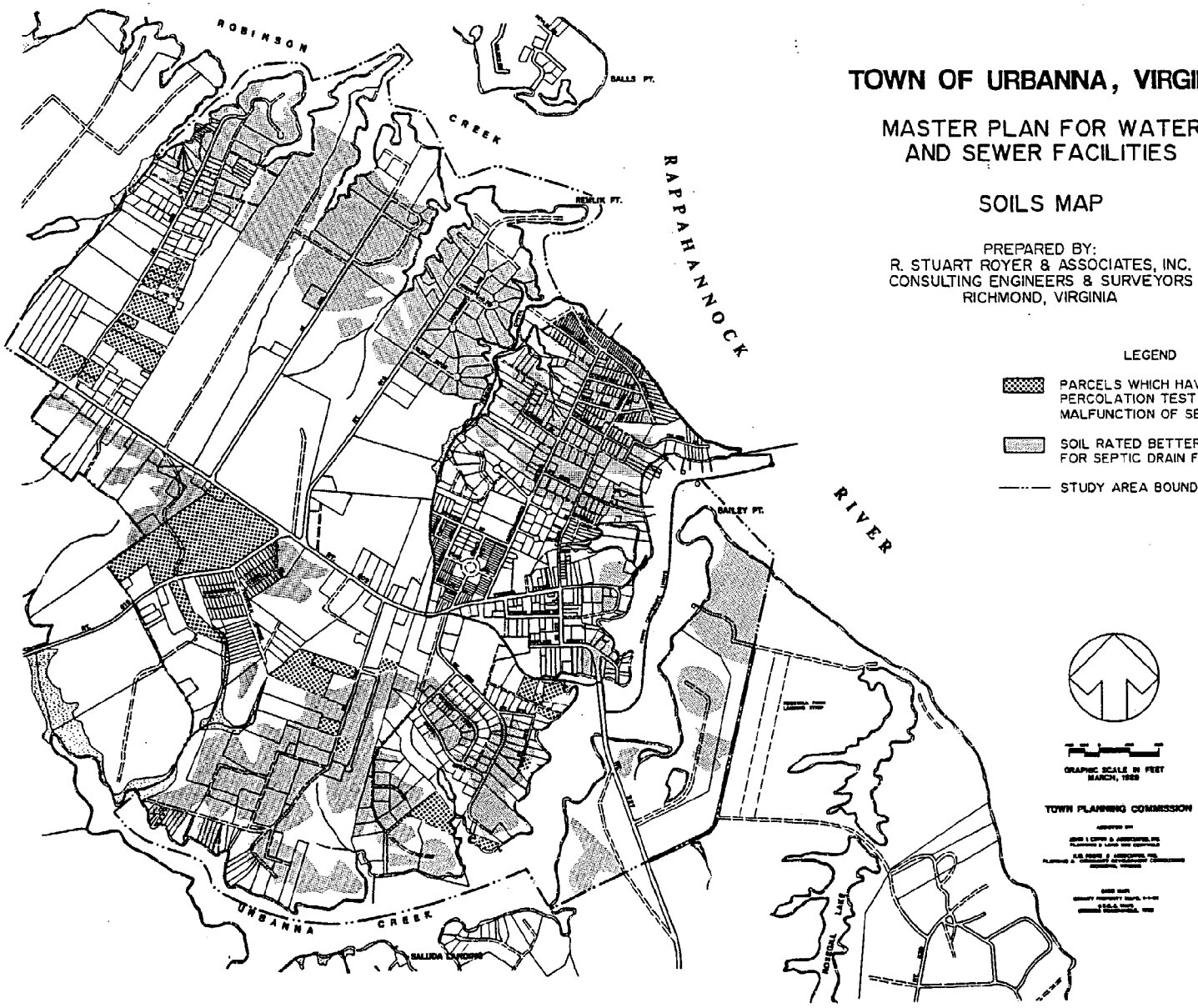
SITES INVESTIGATED FOR FUTURE WASTEWATER TREATMENT PLANT

PREPARED BY:
R. STUART ROYER & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
RICHMOND, VIRGINIA

LEGEND

RECOMMENDED SITE

OTHER SITES INVESTIGATED



TOWN OF URBANNA, VIRGINIA

MASTER PLAN FOR WATER AND SEWER FACILITIES

SOILS MAP

PREPARED BY:
R. STUART ROYER & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
RICHMOND, VIRGINIA

LEGEND

- PARCELS WHICH HAVE FAILED PERCOLATION TEST OR MALFUNCTION OF SEPTIC FIELD
- SOIL RATED BETTER THAN SEVERE FOR SEPTIC DRAIN FIELD
- STUDY AREA BOUNDARY

PLATE 2

SAMPLE ESTIMATE OF REVENUE, EXPENSE AND DEBT RETIREMENT FOR $286,000 PROJECT COST

LOCATION.....	TOWN OF URBANNA	NO.INCREASE FIRST YEAR..	0
ALTERNATIVE #	1	ANNUAL GROWTH %	0.50
PROJECT NO.	9065	WATER CONNECTION FEE....	750.00
FIRST YEAR.....	1995	SEWER CONNECTION FEE....	1,250.00
NUMBER YEARS.....	15.00	IN TOWN	
GRANT (in %)	0.00	MON.WATER BILL.....	14.00
LOAN INTEREST %	7.50	MON. SEWER BILL.....	14.00
TOTAL PROJECT COST.....	286,000.00	OUT OF TOWN	
CAPITAL AVAILABLE GRANT.	0.00	MON.WATER BILL.....	21.00
TOWN..	0.00	MON. SEWER BILL.....	21.00
LOAN REQUIRED.....	286,000.00	ANNUAL RATE INCREASE (%)	2
RET. INC. YR.....	5.00	ANNUAL O & M.....	162,000.00
IN TOWN		O & M GROWTH %	2.00
NO. ERU WATER CONNECTIONS.	480	TRANSFER TO GEN. FUND ..	0.00
NO. ERU SEWER CONNECTIONS.	471	DECREASE PER YEAR (%)...	0
OUT OF TOWN		CONSTR. TIME (YRS.).....	1
NO. ERU WATER CONNECTIONS.	126	BOND RETIREMENT (YRS.)..	15
NO. ERU SEWER CONNECTIONS.	0	AVG. ANNUAL DEBT SERVICE	32,400.15

YEAR	PRINCIPAL	YEAR	PRINCIPAL	YEAR	PRINCIPAL	YEAR	PRINCIPAL	YEAR	PRINCIPAL	YEAR	PRINCIPAL
1996	5,000.00	2001	20,100.00	2006	32,100.00	2011	0.00	0	0.00	0	0.00
1997	5,000.00	2002	20,100.00	2007	32,100.00	2012	0.00	0	0.00	0	0.00
1998	5,000.00	2003	20,100.00	2008	32,100.00	2013	0.00	0	0.00	0	0.00
1999	5,000.00	2004	20,100.00	2009	32,100.00	2014	0.00	0	0.00	0	0.00
2000	5,000.00	2005	20,100.00	2010	32,100.00	2015	0.00	0	0.00	0	0.00
TOTAL	25,000.00		125,500.00		286,000.00		286,000.00		286,000.00		286,000.00

YEAR	IN TOWN NUMBER OF CONNECTIONS WATER	IN TOWN NUMBER OF CONNECTIONS SEWER	IN TOWN INCREASE OF CONNECTIONS WATER	IN TOWN INCREASE OF CONNECTIONS SEWER	OUT OF TOWN NUMBER OF CONNECTIONS WATER	OUT OF TOWN NUMBER OF CONNECTIONS SEWER	OUT OF TOWN INCREASE OF CONNECTIONS WATER	OUT OF TOWN INCREASE OF CONNECTIONS SEWER	TOTAL REVENUE WATER	TOTAL REVENUE SEWER	GRAND TOTAL REVENUE	OPERATING EXPENSES	TRANSFER TO GENERAL FUND	NET OPERATING REVENUE	OUTSTANDING LOAN	PRINCIPAL PAYMENT	INTEREST PAYMENT	DEBT SERVICE	ANNUAL SURPLUS	CUMULATIVE SURPLUS
1995	480	471	0	0	126	0			112,392.00	79,128.00	191,520.00	162,000.00	0.00	29,520.00	286,000.00	0.00	21,450.00	21,450.00	8,070.00	8,070.00
1996	482	473	2	2	127	0	0	0	117,013.04	82,614.11	199,627.15	165,240.00	0.00	34,387.15	286,000.00	5,000.00	21,450.00	26,450.00	7,937.15	16,007.15
1997	485	476	2	2	127	0	1	0	119,913.89	84,650.08	204,563.96	168,544.80	0.00	36,019.16	281,000.00	5,000.00	21,075.00	26,075.00	9,944.16	25,951.32
1998	487	478	2	3	128	0	1	0	122,887.36	87,487.14	210,374.51	171,915.70	0.00	38,458.81	276,000.00	5,000.00	20,700.00	25,700.00	12,758.81	38,710.13
1999	490	480	2	2	129	0	1	0	125,935.29	88,876.60	214,811.89	175,354.01	0.00	39,457.88	271,000.00	5,000.00	20,325.00	25,325.00	14,132.88	52,843.01
2000	492	483	2	2	129	0	1	0	129,059.54	91,069.75	220,129.29	178,861.09	0.00	41,268.20	266,000.00	5,000.00	19,950.00	24,950.00	16,318.20	69,161.21
2001	495	485	2	3	130	0	1	0	132,262.03	94,067.95	226,329.98	182,438.31	0.00	43,891.67	261,000.00	20,100.00	19,575.00	39,675.00	4,216.67	73,377.88
2002	497	488	2	2	130	0	1	0	135,564.71	95,622.58	231,187.29	186,087.08	0.00	45,080.22	240,900.00	20,100.00	18,067.50	38,167.50	6,912.72	80,290.60
2003	500	490	2	3	131	0	1	0	138,909.61	98,735.06	237,644.66	189,808.82	0.00	47,835.84	220,800.00	20,100.00	16,560.00	36,660.00	11,175.84	91,466.44
2004	502	493	2	2	132	0	1	0	142,358.77	100,406.83	242,765.60	193,605.00	0.00	49,160.61	200,700.00	20,100.00	15,052.50	35,152.50	14,008.11	105,474.55
2005	505	495	3	3	132	0	1	0	145,894.32	103,639.39	249,533.72	197,477.10	0.00	52,056.62	180,600.00	20,100.00	13,545.00	33,645.00	18,411.62	123,886.17
2006	507	498	3	2	133	0	1	0	149,518.43	105,434.27	254,952.70	201,426.66	0.00	53,526.06	160,500.00	32,100.00	12,037.50	44,137.50	9,388.56	133,274.73
2007	510	500	3	3	134	0	1	0	153,233.31	108,793.02	262,026.33	205,455.17	0.00	56,571.16	128,400.00	32,100.00	9,630.00	41,730.00	14,841.16	148,115.89
2008	512	503	3	2	134	0	1	0	157,041.25	110,717.25	267,758.50	209,564.27	0.00	58,194.22	96,300.00	32,100.00	7,222.50	39,322.50	18,871.72	166,987.61
2009	515	505	3	3	135	0	1	0	160,944.57	114,208.60	275,153.17	213,755.56	0.00	61,397.61	64,200.00	32,100.00	4,815.00	36,915.00	24,482.61	191,470.23
2010	517	508	3	2	136	0	1	0	164,945.68	116,268.76	281,214.44	218,030.67	0.00	63,183.77	32,100.00	32,100.00	2,407.50	34,507.50	28,676.27	220,146.49
2011	520	510	3	3	136	0	1	0	169,047.02	119,899.46	288,946.48	222,391.28	0.00	66,555.19	0.00	0.00	0.00	0.00	66,555.19	286,701.69

SAMPLE ESTIMATE OF REVENUE, EXPENSE AND DEBT RETIREMENT FOR $224,000 PROJECT COST

LOCATION.....	TOWN OF URBANNA	NO.INCREASE FIRST YEAR..	0
ALTERNATIVE #	1	ANNUAL GROWTH %	0.50
PROJECT NO.	9065	WATER CONNECTION FEE....	750.00
FIRST YEAR.....	1995	SEWER CONNECTION FEE....	1,250.00
NUMBER YEARS.....	15.00	IN TOWN	
GRANT (in %)	0.00	MON.WATER BILL.....	13.50
LOAN INTEREST %	7.50	MON. SEWER BILL.....	13.50
TOTAL PROJECT COST.....	224,000.00	OUT OF TOWN	
CAPITAL AVAILABLE GRANT.	0.00	MON.WATER BILL.....	20.50
TOWN..	0.00	MON. SEWER BILL.....	20.50
LOAN REQUIRED.....	224,000.00	ANNUAL RATE INCREASE (%)	2
RET. INC. YR.....	5.00	ANNUAL O & M.....	162,000.00
IN TOWN		O & M GROWTH %	2.00
NO. ERU WATER CONNECTIONS.	480	TRANSFER TO GEN. FUND ..	0.00
NO. ERU SEWER CONNECTIONS.	471	DECREASE PER YEAR (%)...	0
OUT OF TOWN		CONSTR. TIME (YRS.).....	1
NO. ERU WATER CONNECTIONS.	126	BOND RETIREMENT (YRS.)..	15
NO. ERU SEWER CONNECTIONS.	0	AVG. ANNUAL DEBT SERVICE	25,376.34

YEAR	PRINCIPAL	YEAR	PRINCIPAL	YEAR	PRINCIPAL	YEAR	PRINCIPAL	YEAR	PRINCIPAL	YEAR	PRINCIPAL
1996	5,000.00	2001	15,000.00	2006	24,800.00	2011	0.00	0	0.00	0	0.00
1997	5,000.00	2002	15,000.00	2007	24,800.00	2012	0.00	0	0.00	0	0.00
1998	5,000.00	2003	15,000.00	2008	24,800.00	2013	0.00	0	0.00	0	0.00
1999	5,000.00	2004	15,000.00	2009	24,800.00	2014	0.00	0	0.00	0	0.00
2000	5,000.00	2005	15,000.00	2010	24,800.00	2015	0.00	0	0.00	0	0.00
TOTAL	25,000.00		100,000.00		224,000.00		224,000.00		224,000.00		224,000.00

YEAR	IN TOWN NUMBER OF CONNECTIONS WATER	IN TOWN NUMBER OF CONNECTIONS SEWER	IN TOWN INCREASE OF CONNECTIONS WATER	IN TOWN INCREASE OF CONNECTIONS SEWER	OUT OF TOWN NUMBER OF CONNECTIONS WATER	OUT OF TOWN NUMBER OF CONNECTIONS SEWER	OUT OF TOWN INCREASE OF CONNECTIONS WATER	OUT OF TOWN INCREASE OF CONNECTIONS SEWER	TOTAL REVENUE WATER	TOTAL REVENUE SEWER	GRAND TOTAL REVENUE	OPERATING EXPENSES	TRANSFER TO GENERAL FUND	NET OPERATING REVENUE	OUTSTANDING LOAN	PRINCIPAL PAYMENT	INTEREST PAYMENT	DEBT SERVICE	ANNUAL SURPLUS	CUMULATIVE SURPLUS
1995	480	471	0	0	126	0			108,756.00	76,302.00	185,058.00	162,000.00	0.00	23,058.00	224,000.00	0.00	16,800.00	16,800.00	6,258.00	6,258.00
1996	482	473	2	2	127	0	0	0	113,285.78	79,717.18	193,002.96	165,240.00	0.00	27,762.96	224,000.00	5,000.00	16,800.00	21,800.00	5,962.96	12,220.96
1997	485	476	2	2	127	0	1	0	116,093.07	81,680.43	197,773.50	168,544.80	0.00	29,228.70	219,000.00	5,000.00	16,425.00	21,425.00	7,803.70	20,024.66
1998	487	478	2	3	128	0	1	0	118,970.64	84,442.96	203,413.60	171,915.70	0.00	31,497.91	214,000.00	5,000.00	16,050.00	21,050.00	10,447.91	30,472.56
1999	490	480	2	2	129	0	1	0	121,920.26	85,756.00	207,676.27	175,354.01	0.00	32,322.26	209,000.00	5,000.00	15,675.00	20,675.00	11,647.26	42,119.82
2000	492	483	2	2	129	0	1	0	124,943.74	87,870.83	212,814.57	178,861.09	0.00	33,953.48	204,000.00	5,000.00	15,300.00	20,300.00	13,653.48	55,773.30
2001	495	485	2	3	130	0	1	0	128,042.92	90,788.74	218,831.65	182,438.31	0.00	36,393.34	199,000.00	15,000.00	14,925.00	29,925.00	6,468.34	62,241.64
2002	497	488	2	2	130	0	1	0	131,219.70	92,261.06	223,480.76	186,087.08	0.00	37,393.68	184,000.00	15,000.00	13,800.00	28,800.00	8,593.68	70,835.32
2003	500	490	2	3	131	0	1	0	134,476.04	95,289.16	229,765.20	189,808.82	0.00	39,956.38	169,000.00	15,000.00	12,675.00	27,675.00	12,281.38	83,116.70
2004	502	493	2	2	132	0	1	0	137,813.92	96,874.44	234,688.36	193,605.00	0.00	41,083.37	154,000.00	15,000.00	11,550.00	26,550.00	14,533.37	97,650.06
2005	505	495	3	3	132	0	1	0	141,235.39	100,018.34	241,253.74	197,477.10	0.00	43,776.64	139,000.00	15,000.00	10,425.00	25,425.00	18,351.64	116,001.71
2006	507	498	3	2	133	0	1	0	144,742.56	101,722.33	246,464.89	201,426.64	0.00	45,038.25	124,000.00	24,800.00	9,300.00	34,100.00	10,938.25	126,939.96
2007	510	500	3	3	134	0	1	0	148,337.57	104,987.91	253,325.48	205,455.17	0.00	47,870.31	99,200.00	24,800.00	7,440.00	32,240.00	15,630.31	142,570.27
2008	512	503	3	2	134	0	1	0	152,022.62	106,816.63	258,839.25	209,564.27	0.00	49,274.98	74,400.00	24,800.00	5,580.00	30,380.00	18,894.98	161,465.25
2009	515	505	3	3	135	0	1	0	155,799.98	110,210.08	266,010.06	213,753.56	0.00	52,256.50	49,600.00	24,800.00	3,720.00	28,520.00	23,736.50	185,199.75
2010	517	508	3	2	136	0	1	0	159,671.95	112,169.88	271,841.83	218,080.67	0.00	53,811.16	24,800.00	24,800.00	1,860.00	26,660.00	27,151.16	212,350.91
2011	520	510	3	3	136	0	1	0	163,640.92	115,697.69	279,338.61	222,391.28	0.00	56,947.33	0.00	0.00	0.00	0.00	56,947.33	269,298.24