COUNTY OF DARE
NORTH CAROLINA

RODANTHE-WAVES-SALVO WATER SYSTEM ENVIRONMENTAL ASSESSMENT

BLACK & VEATCH
ASHEBORO, NORTH CAROLINA

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DARE COUNTY

RODANTHE, WAVES, SALVO WATER SYSTEM

ENVIRONMENTAL ASSESSMENT

CONTENTS

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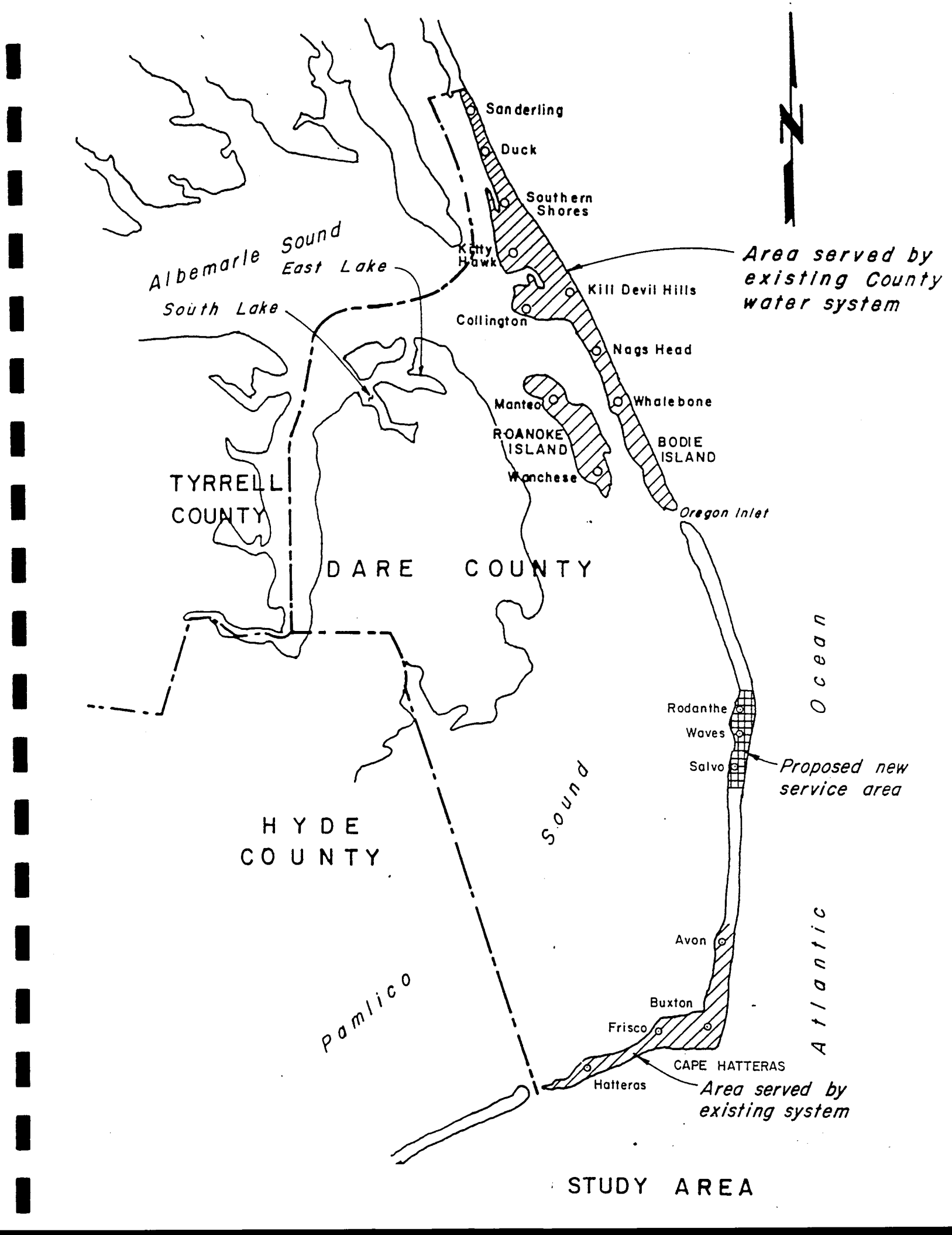
ENVIRONMENTAL ASSESSMENT

INTRODUCTION

Pursuant to the requirements of the North Carolina Environmental Policy Act and the Coastal Area Management Administration, the County of Dare has prepared an Environmental Assessment (EA) for the construction of a water system to serve the Hatteras Island villages of Rodanthe, Waves, and Salvo (refer to map following this page). This Environmental Assessment is required to obtain necessary approvals to construct the facilities which have been in the formative stage for several years. In 1986, Dare County acquired a tract of land in the Village of Rodanthe for the purpose of constructing a water treatment plant, a well, and the water storage tanks. The well was constructed at that time, and pumping tests were conducted to verify the quantity and quality of water. Subsequent to the well construction, pilot tests were conducted to determine the suitability of using membrane treatment (reverse osmosis) for the water. Tests verified that the water could be treated for potable use using reverse osmosis. In fact, tests indicated that the water would be of better quality than the water at the Kill Devil Hills RO plant.

Plans are to design the system to accommodate water needs of the three villages to the year 2010. The projected needs are based on The Carrying Capacity study prepared by Booz, Allen and Hamilton in 1986, and the Comprehensive Engineering Report prepared by Black & Veatch, Inc. in 1984. The maximum day demand in 2010 is anticipated to be 1.0 million gallons. The annual average day in 2010 is estimated to be 310,000 gallons, or 113,000,000 gallons per year. Considering that the recovery of potable water is 80% of the feed water, the annual withdrawal from the aquifer is projected to be 141,000,000 gallons.


Sanderling
Duck
Southern Shores
Albemarle Sound
East Lake
South Lake
Kitty Hawk
Area served by existing County water system
Kill Devil Hills
Collington
Nags Head
Manteo
Whalebone
ROANOKE ISLAND
BODIE ISLAND
Wanchese
TYRRELL COUNTY
Oregon Inlet
DARE COUNTY
Ocean
Rodanthe
Waves
Salvo
Proposed new service area
Sound
HYDE COUNTY
Avon
Pamlico
Buxton
Frisco
Atlantic
CAPE HATTERAS
Hatteras
Area served by existing system
STUDY AREA

This EA addresses an array of potential primary, secondary, and cumulative impacts associated with the project construction and operation. Results of the assessment indicate that the project will not impose any significant impact on the environment, provided the design is completed in accordance with the impact avoidance/mitigation measures described in this report, as well as those required by the contract drawings and specifications. Conformance with these measures will be ensured during construction through construction management and observation by the Engineer, the County of Dare, and the North Carolina Department of Environmental Health and Natural Resources (NCDEHNR).

PROJECT DESCRIPTION

Water System Design. It is proposed to use deep wells for the water supply using reverse osmosis treatment to remove the chlorides and dissolved solids. The plant will have an initial RO capacity of 1,000,000 gallons per day, with the ability to be expanded.

Storage will be provided by means of 200,000 gallons in an elevated tank and 1,000,000 gallons in a ground level tank.

The distribution system will be comprised of a basic 12-inch diameter line along Highway 12 through the three villages, with other lines being 2 inches through 8 inches in diameter. Fire hydrants will be located an average of every 1000 feet along all lines 6-inches and larger in diameter. As proposed, the distribution system can deliver 1,800 gallons per minute of water with a minimum pressure of 35 pounds per square inch. This will provide the ability to meet not only the peak day demand, but simultaneously deliver 500 gallons per minute fire flow. Based on the population projections established in the Carrying Capacity Report, the system as proposed would be adequate to the year 2010. Tables 1 and 2 summarize anticipated projections.

Water Supply. The existing water supply in the Rodanthe, Waves, and Salvo area consists of individual shallow wells of the upper water table aquifer that are mainly captured rainfall. A previous study estimates that approximately 25 percent of the annual rainfall (45 inches) is retained in this aquifer as a potential water supply.

TABLE 1

POPULATION PROJECTION - PERMANENT AND SEASONAL

	1985	1990	1995	2000	2005	2010
Comprehensive Engineering Report (1984)	4,123	5,876	6,000	6,160	7,339	7,500
Carrying Capacity Study (1986):						
Low Growth	5,555	5,813	6,151	6,514	6,800	7,200
Medium Growth	5,555	6,116	6,850	7,806	8,600	9,500
Rapid Growth	5,555	6,963	9,028	11,942	13,000	15,000

TABLE 2

WATER REQUIREMENTS (mgd)

	1995	2000	2005	2010
Maximum Day [1]	0.72	0.82	0.92	1.02
Maximum Hour [2]	1.44	1.64	1.84	2.04
Annual Average [3]	0.22	0.25	0.28	0.31

[1] 105 gpcd

[2] 2 times Maximum Day

[3] 0.30 times Maximum Day

Previous studies have identified a need in this area for a safe and dependable potable water supply that would serve current and future development.

A testing project was undertaken to determine whether any groundwater exists which can be treated by desalination. A test well was drilled approximately 300 feet south of the Chicamacomico Lifesaving Station located in Rodanthe. The well drilling anticipated finding the same aquifers that were found in the test well drilled in Kill Devil Hills for the northern Dare County desalination project, although the aquifers were expected to be deeper due to the general slope of the geological plates. The drilling located the following aquifers:

- Upper Aquifer. This is a watertable aquifer located approximately 8 to 30 feet deep containing fresh water and currently is used as the primary water source for private wells in the three villages.

- Lower Aquifer. This is a confirmed aquifer of loose sand, located approximately 200 to 250 feet deep. The water, as tested at a depth of 211 to 216 feet, has the same salinity as seawater. Apparently there is a direct connection between this water and the Atlantic Ocean.

- Yorktown Aquifer. The Yorktown aquifer was found at elevations 330 to 600 feet, approximately the same depths as in Kill Devil Hills. Water is of varying quality ranging from moderately brackish at the top to half seawater strength at the bottom of aquifer.

- Castle Hayne Aquifer. The Castle Hayne aquifer was not found, although drilling continued to a depth of 1,400 feet. Further drilling was not done since, in all likelihood, the water would be highly saline and costs would prohibit deep well drilling.

The Yorktown aquifer at the test well consists mainly of confined sand. Driller's observation of the aquifer indicates that the well could yield in excess of 1,000 gpm, not considering the effect on water quality. Water samples were taken from 332 to 342 feet deep and 507 to 517 feet deep. These samples were analyzed, both at the well head and in the laboratory. Results of these analyses are shown in Table 3.

TABLE 3

YORKTOWN AQUIFER WATER ANALYSIS

	DEPTH OF SAMPLE	
	332-342 ft.	507-517 ft.
BOD_5 (mg/l)	<1.5	<1.5
Alkalinity, as C_aCO_3	603	528
Chloride (mg/l)	439	4,920
Color (PCU)	35	10
Conductivity @ 25 C (umhos/cm^2)	2,250	14,000
Fluoride (mg/l)	1.58	1.56
Total Hardness (mg/l)	94	890
Nitrate-Nitrogen (mg/l)	0.055	0.062
Nitrate-Nitrogen (mg/l)	<0.002	<0.002
pH (units)	8.0	7.5
Total Phosphorus (mg/l)	0.074	0.048
Total Solids (mg/l)	1,430	9,480
Total Volatile Solids (mg/l)	177	468
Total Suspended Solids (mg/l)	10	19
Total Dissolved Solid (mg/l)	1,410	9,430
Sulfate (mg/l)	<2	530
Turbidity (NTU)	1.3	7.3
TOC (mg/l)	151	134
Free Chlorine (mg/l)	<0.1	<0.1
Silica (mg/l)	28.8	18.6
Strontium (mg/l)	0.63	0.44
Silver (mg/l)	<0.005	<0.005
Aluminum (mg/l)	<0.5	<0.5
Arsenic (mg/l)	0.0005	0.0077
Barium (mg/l)	0.20	<0.05
Calcium (mg/l)	11.51	93.6
Cadmium (mg/l)	<0.005	<0.005
Total Chromium (mg/l)	<0.005	<0.005
Hexavalent Chromium (mg/l)	<0.01	<0.01
Copper (mg/l)	0.009	<0.005
Iron (mg/l)	0.635	1.236
Mercury (mg/l)	<0.0005	<0.0005
Potassium (mg/l)	33.5	142
Magnesium (mg/l)	36.2	187
Manganese (mg/l)	0.014	0.028
Sodium (mg/l)	540	3,330
Lead (mg/l)	<0.05	0.032
Selenium (mg/l)	<0.0005	<0.001
Zinc (mg/l)	0.03	0.087
SDI (units)	Void	7
Temperature (deg F)	74	72

The characteristics of the aquifer were further studied by setting an 8-inch well screen at a depth of 300 feet to 450 feet, and conducting pump tests. To complete the tests, an 8-inch diameter stainless steel casing was increased to 12-inch diameter to accommodate the pump. The pump tests conducted were step drawdown, 24-hour pumping and recovery, and a long-duration pumping test. The latter test was performed to assess the potential for salt water intrusion and hydrologic connections between aquifers. The pumping rate for the 24-hour and long-duration tests was 450 gpm, or less than half of the driller's estimate of well capacity. This pumping rate and the screen setting depth were selected to attempt to draw only from the top part of the aquifer and limit the TDS of the potential supply to 2,500 mg/l or less. Although terminated after 11 days due to equipment problems, the long-duration pump test was originally intended to pump for 15 to 20 days.

Table 4 depicts the results of the analyses of water samples from the test well during the long-duration pump test. Analysis consisted of tests at the well head for silt density index, temperature, pH, turbidity, and iron concentration. These tests were conducted each weekday with samples sent to the laboratory weekly to be analyzed for a broad range of constituents which are factors in desalination process design.

The analyses concluded that the water is slightly brackish, high in alkalinity and TOC, and relatively high in silica and fluoride. Iron concentration is relatively low, and no problems are anticipated with iron scaling of reverse osmosis membranes. However, the high level of alkalinity, when combined with the low calcium concentration, creates a problem. The finished water will be corrosive due to the excellent removal of membranes of calcium and alkalinity, but not carbon dioxide. To compensate, the treated water will require post treatment of degasification for carbon dioxide reduction, followed by the addition of lime or caustic soda to raise pH to stabilize the water. Blending of raw water with RO permeate will also help to stabilize the treated water, but blending may be limited by other factors.

The evaluation of the water quality of Rodanthe's Yorktown aquifer confirms that treatment of this water by a desalination process is feasible. There are no constituents in the water which would prohibit its use as a feedwater for desalting. However, the plant design should carefully consider all factors listed above to ensure that the plant can successfully treat this water.

TABLE 4

YORKTOWN AQUIFER WATER ANALYSIS

	DAY OF SAMPLE	
	2	7
BOD_5 (mg/l)	<0.2	<0.3
Alkalinity, as C_aCO_3	597	601
Chloride (mg/l)	435	435
Color (PCU)	30	30
Conductivity @ 25 C (umhos/cm^2)	2,200	2,350
Fluoride (mg/l)	1.96	1.95
Total Hardness (mg/l)	98	100
Nitrate-Nitrogen (mg/l)	0.054	0.025
Nitrate-Nitrogen (mg/l)	<0.002	<0.002
pH (units)	7.8	7.9
Total Phosphorus (mg/l)	0.086	0.05
Total Solids (mg/l)	1,480	1,470
Total Volatile Solids (mg/l)	271	221
Total Suspended Solids (mg/l)	4	7
Total Dissolved Solid (mg/l)	1,460	1,467
Settable Solids (mg/l)	<0.1	<0.1
Sulfate (mg/l)	<2	44
Turbidity (NTU)	0.3	3.0
TOC (mg/l)	115	117
Free Chlorine (mg/l)	<0.1	<0.1
Silica (mg/l)	6.1	27
Strontium (mg/l)	0.75	0.72
Silver (mg/l)	<0.01	<0.01
Aluminum (mg/l)	<0.2	<0.2
Arsenic (mg/l)	<0.002	<0.002
Barium (mg/l)	<0.1	<0.11
Calcium (mg/l)	9.48	9.40
Cadmium (mg/l)	<0.005	<0.005
Total Chromium (mg/l)	<0.02	<0.02
Hexavalent Chromium (mg/l)	<0.02	<0.02
Copper (mg/l)	<0.02	<0.02
Iron (mg/l)	0.052	0.048
Mercury (mg/l)	<0.0005	<0.0005
Potassium (mg/l)	38.5	35.8
Magnesium (mg/l)	20.6	19.9
Manganese (mg/l)	<0.01	<0.01
Sodium (mg/l)	588	527
Lead (mg/l)	<0.05	<0.09
Selenium (mg/l)	0.0023	0.0025
Zinc (mg/l)	0.024	0.026
SDI (units)	0.8	0.6
Temperature (deg F)	70	70

The quantity of water which can be withdrawn from the Yorktown aquifer for treatment in the area of the three villages, from either a single well or from a well field, depends on the geological characteristics of the formation, the amount of water stored in the aquifer, and preservation of water quality. As mentioned previously, the physical characteristics of the formation will allow high yielding wells, in excess of 1,000 gpm, and perhaps as high as 2,000 gpm. This is confirmed by drawdown measurements taken during pump testing. The apparent specific capacity of the completed well is 20 gpm/foot. At well yield of 1,000 gpm, the drawdown is 50 feet. This is within usual well design parameters.

Due to the relatively small raw water requirements for this area, a detailed study of overall aquifer characteristics was not made. Comparison of this part of the aquifer with the detailed information about the aquifer obtained from the test well in Kill Devil Hills indicates that the raw water requirements of Rodanthe-Waves-Salvo can be met from the Yorktown aquifer.

The projected wells required for the design period are shown in Table 5.
As illustrated, two wells will be sufficient to supply the area's needs through 2010. However, this is based on an average well production of 450 gpm.

It is also projected that one additional well be provided to serve as an emergency back-up. Construction of this well could be delayed until sufficient data is available to determine actual need. GMI, a groundwater consulting firm, analyzed the data of the test well near Kill Devil Hills. GMI's typical well construction design is shown in Figure 1. This typical well design was used to determine the probable well construction cost.

Since only two wells are required, no significant raw water transmission main is necessary. Raw water piping should be of inert material, preferably PVC or fiberglass.

The pretreatment normally required for a groundwater desalination plant is less stringent than for desalination of surface water.

TABLE 5

PRODUCTION WELLS REQUIRED

Design Year	Water Demand (mgd)	Well Capacity (mgd)	No. of Wells*
1995	0.72	1.29	2.00
2000	0.82	1.29	2.00
2005	0.92	1.29	2.00
2010	1.02	1.29	2.00

* A total of two wells will be required for 1995 as well as 2010.

For desalination by reverse osmosis of the water sampled and analyzed, the pretreatment required is acid addition for pH adjustment, scale inhibitor chemical addition to increase recovery, and 5 micron cartridge filtration to protect the membranes from suspended matter. This level of pretreatment is typical of a majority of RO plants.

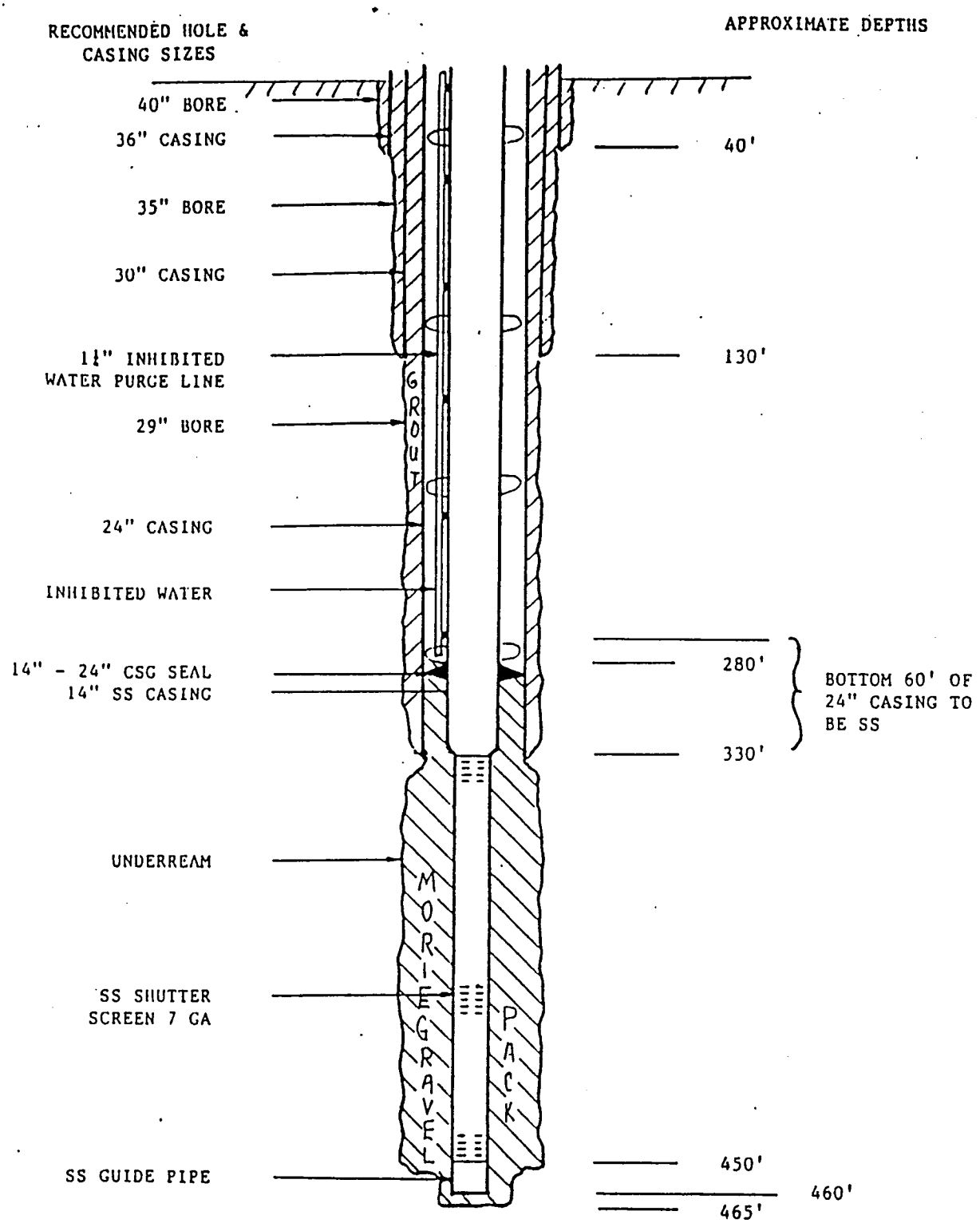
Water Treatment. Previous studies have evaluated all alternatives for the area's water supply and treatment. The most effective method to supply the long-range need is desalination by the reverse osmosis process using the Yorktown aquifer's brackish groundwater.

Desalination processes are used when water contains dissolved solids that cannot be removed by conventional treatment or when total dissolved solids are present in sufficient quantity to make desalination processes cost effective. Typical dissolved solids which, when present in sufficient quantity, require the use of a desalination process include sodium, calcium, magnesium, sulfate, chloride, and bicarbonate. Saline water is defined as water with chloride concentration greater than 250 mg/l and total dissolved solids (TDS) concentrations greater than 500 mg/l. Saline waters include salt water, which is undiluted seawater typically containing 35,000 mg/l TDS, and brackish water, containing up to 10,000 mg/l TDS. Brackish waters include highly mineralized groundwater and diluted seawater.

Dare County has an abundance of saline waters which are potential drinking water supplies if desalination can be economically employed. Sources of saline water near Rodanthe, Waves, and Salvo include:

- The Atlantic Ocean.
- Pamlico Sound.
- Outer Banks groundwater, found in several aquifers of both brackish and salt water at depths exceeding 100 feet.

Water treatment costs, both capital and operating and maintenance, are considerably less for brackish water than for salt water. Since brackish water is available, salt



NOT TO SCALE

GROUNDWATER MANAGEMENT, INC.

FIGURE 1

PROPOSED WELL CONSTRUCTION DESIGN

JOB NO: HY-0147 DATE: SEPT. 8, 1986

water will not be considered further. Pamlico Sound has TDS concentration of 14,000 to 18,000 near the project area, which would require seawater desalination processes.

Reverse osmosis is a physical process that takes advantage of the natural tendency of water to dilute a concentrated solution. When salt water and fresh water are on opposite sides of a membrane that is permeable to water but not to solids dissolved in water, dilution of the salt water occurs as water molecules pass through the membrane. When an external pressure is applied to the salt water, the after flow across the membrane can be reversed and pure water is removed from the more concentrated salt solution. This process is reverse osmosis.

Figure 2 shows the reverse osmosis process in simplified form. Pressure is continuously applied to the feed stream by a high pressure pump, while product and brine are continuously withdrawn. Dissolved solids rejected by the membrane are continuously flushed from the system in the brine. The brine contains a high level of dissolved solids while the product contains a low level. A flow regulating valve on the brine discharge line controls the percentage of feedwater that is converted to product.

Currently available RO devices are either hollow fiber membrane permeators or spiral wound membrane permeators. The design and manufacture of these devices and of process systems incorporating these devices is high specialized. Performance of the process depends upon feedwater quality, applied pressure, and the presence of potential fouling or scaling ions which can harm membranes. RO is typically cost-effective at feedwater TDS concentrations of 1,000-6,000 mg/l. The primary operating costs include electric power for the high pressure pumps and membrane replacement.

RO is used mainly for treating groundwater. Surface waters usually require extensive pretreatment for removal of suspended solids and turbidity. Groundwater requires cartridge filtration for removal of fine suspended solids and possibly chemical addition. Other pretreatment requirements are specific to membrane materials nd configuration.

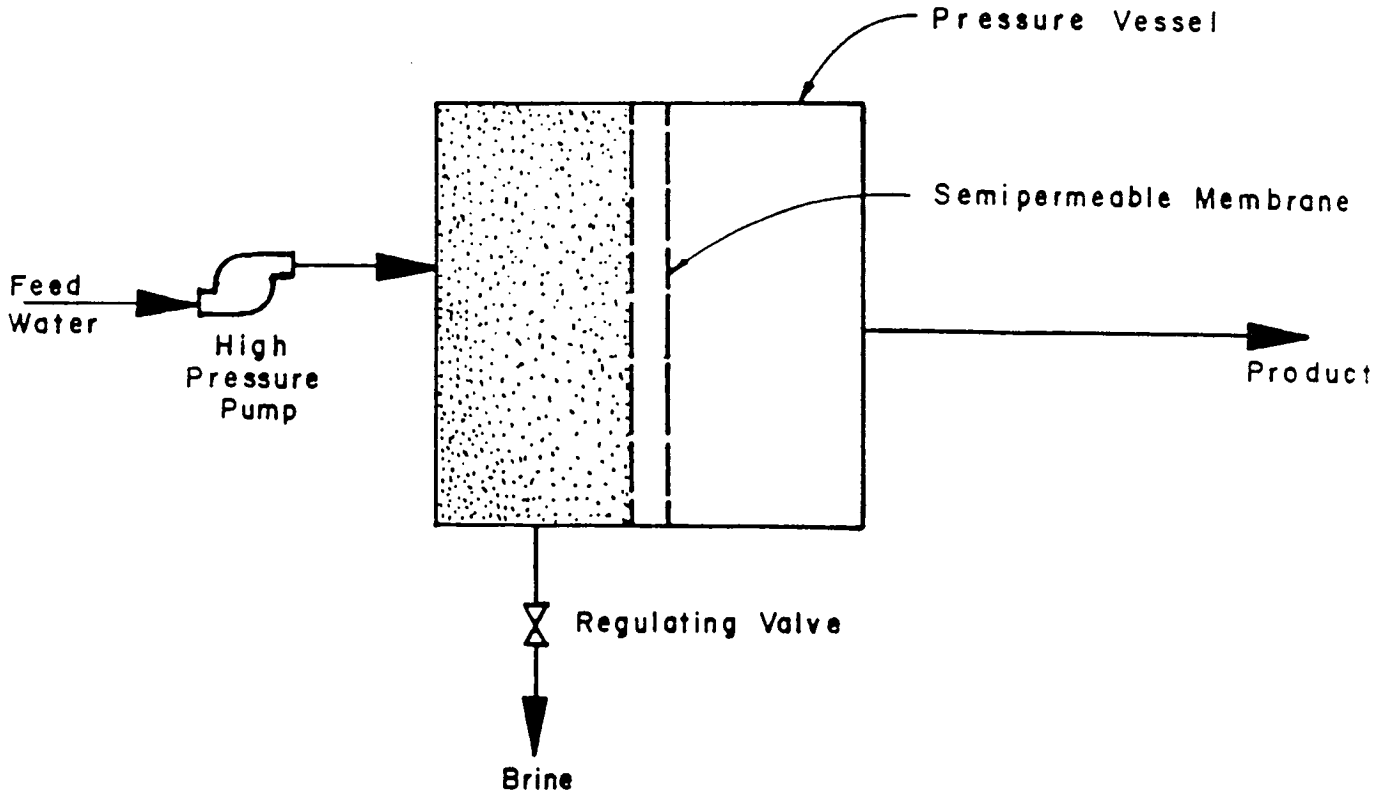


FIGURE 2 – REVERSE OSMOSIS SCHEMATIC

RO is a viable process for treating brackish groundwater in the three village area. Initially, up to 350,000 gallons per day of reject water (TDS 6-10,000 ppm) would be discharged to the Pamlico Sound via a drainage ditch to Blackmar Gut. Blackmar Gut is a boat harbor on the west side of Highway 12 opposite the plant site.

A RO plant to produce water for a water system for Rodanthe, Waves, and Salvo will consist of many RO membranes assembled in vessels and groups of vessels and staged. The major options are as follows:

- Spiral wound permeators consisting of sheets of membranes and spacers wound around a collection tube. Usually, several permeators are placed in series in a single pressure tube.

- Hollow fiber permeators consisting of many hair-like fibers in a bundle located inside a pressure tube.

- Parallel single-staged systems consisting of many permeators connected in parallel.

- Brine-staged systems wherein the brine from the first stage becomes the feedwater for the second stage. This approach both maximizes recovery and minimizes brine volumes.

- Product-staged systems where the products from the first stage are passed through a second stage to provide higher quality product water.

All of these options have much in common. Permeators are mounted on racks and connected by manifolds. Recovery is controlled by a valve on the brine manifold. Provisions must be made to sample and replace permeators individually and to clean permeator racks. RO systems usually have parallel racks of permeators that can be operated independently to increase or decrease plant flow. Several on-line instruments are needed to provide performance data for operating decisions.

Materials of construction must be carefully chosen for all parts of the RO system due to the potential for corrosion. Non-metallic materials should be used for all wet parts

wherever practical and economical. The high operating pressures also must be considered in material selection.

Pretreatment and other appurtenant systems are also required.

- Cartridge filtering system to remove suspended particles down to 5 microns.

- Chemical feed systems as required by detailed process design. The most likely chemicals that will be needed are acid for Ph control and a scale inhibitor.

Other equipment and facilities will be required at the RO water treatment plant. Facilities located at the plant are listed below:

- Treatment Plant Building. This building will house all the RO equipment, pretreatment equipment, chemical feed and storage systems, and transmission and transfer pumps. It will also house mechanical and electrical equipment, and include personnel facilities such as an operations room, laboratory, offices, conference rooms, locker rooms, etc.

- Storage Reservoir. A ground storage reservoir will be needed to provide a buffer between plant production rate and pumping rate and for times when the treatment plant is shut down. The size of the reservoir will be based on total water demand, and will be 1.0 million gallons.

- High Service Pumps. High service pumps will supply treated water to the distribution system. Studies will be made during the plant design to determine the correct discharge pressure of the pumps.

- Operations Room. There should be one room in the plant for centralized controls where operating decisions are made. This room would have all display instruments for monitoring plant processes, and contain control instruments for implementing process control decisions. The control system will include some microprocessor-based controls. Controls will be such that the plant's operation can be monitored at the Kill Devil Hills plant.

The plant will be arranged on-site to accommodate future expansion. The initial capacity will be 1.0 mgd, with a the ability to expand to 2.0 mgd if ever needed. The potential site purchased by the County will have adequate space for the plant without encroaching on wetlands.

A RO plant composed of several parallel treatment modules can be operated at various flow rates simply by starting or stopping modules. Proper shutdown procedures must be followed to prevent damage to the membranes while inactive. Thus, varying the flow rate should be done in increments and not to match water demands required for short durations. The plant flow rate should be selected, set, and maintained for as long as possible. During the off-peak season, the RO plant should operate at a reduced capacity, rotating the modules daily.

Water Distribution. The distribution system was designed using computer modeling performed by hydraulic analysis. The hydraulic analysis is an analytical method of predicting the hydraulic gradient pattern (pressure) that may occur over a system network based on a given set of water demands.

The distribution mains were sized based on 100 percent participation in the area and the design flow of 400 gallons per residential connection plus a 500 gpm fire flow demand on the system. The distribution system is designed to deliver a maximum flow of 2.6 mgd while maintaining a minimum pressure of 35 psi throughout the system. The system will have sufficient capacity to supply the projected 2010 maximum hour demand of 2.04 mgd.

The water distribution system will consist of a 12-inch diameter transmission main along Highway 12, from the elevated tank at Rodanthe, to the south side of Salvo. This size main is needed due to the elevated storage tank's location at the north end of the system. If the tank was located nearer the center of the overall distribution system, the transmission main could possibly be reduced to an 8-inch diameter. This would reduce the probable construction cost; however, this cost savings would need to be weighed against the cost of acquiring a centrally located tank site as well as the possibility of eventually supplying water to Avon. With an 8-inch transmission main, pressure would also drop below 20 psi with a fire flow of 500 gallons per minute at the north and south ends of the distribution system during the maximum day demand.

Storage. Storage is provided in a distribution system to alleviate heavy demand periods, supplying the difference between maximum day and maximum hour demands, and other emergency flow conditions. Normally, one-half of the total storage volume should satisfy maximum hour demand and the other half should be reserved for emergencies and fire fighting purposes. Using the above criteria and a 4-hour maximum duration, the area would need 340,000 gallons of storage to supply the maximum hour condition plus emergency reserve for the design period 2010. State regulations impose the additional requirement that sufficient storage be available to supply the peak demand for 24 hours.

The required storage volume based on both of the criteria listed above are shown in Table 6.

Based on the state regulation, approximately 1.0 MG of storage volume would be needed by 2010. This storage can be provided in any combination, ground storage, and/or elevated storage. The tentative plan is for the wells, treatment plant, and ground storage to be located at the same site which is owned by Dare County. Based on the location of these facilities, it will be most feasible to provide the majority of the storage required as ground storage.

It is proposed that 200,000 gallons of elevated storage and 1,000,000 gallons of ground storage be provided for a combined storage of 1,200,000 gallons. This would be sufficient to meet the needs of the area through 2010.

Primary Beneficiaries. The primary beneficiaries of this project will be the permanent and seasonal residents of the three villages of Rodanthe, Waves, and Salvo. The benefits will be a safe and reliable potable water supply that meets the 1986 Amendments to the Safe Drinking Water Act.

NECESSITY

Presently, water is obtained from the surficial aquifers which is groundwater replenished only by rainfall. This water, being surficial, is subject to various types of pollution such as effluent from septic tank drain lines and ocean or sound over-wash. Most recently, these villages had 150-160 private water supplies contaminated with

TABLE 6

REQUIRED STORAGE VOLUME

	1995	2000	2005	2010
Maximum Hour and Emergency	240,000	273,000	306,000	340,000
State Regulation	720,000	820,000	920,000	1,020,000

salt water from sound-side flooding during the March 13-14, 1993 hurricane. It was necessary to haul in potable water from March 15, 1993 to June 30, 1993 (three and one-half months).

The water quality is poor due to vegetation decay within this surficial zone. This poor quality is created by color, iron, hydrogen sulfide, and various organics. Pollution from septic tank drains is a real hazard. The porous soil type enables the water to move quickly through the ground, thus making it easier and faster for water to move from septic tank drain fields to well points.

Finally, all of the other villages on Hatteras Island enjoy safe, high quality water from a system operated under the State of North Carolina and Environmental Protection Agency requirements.

A copy of a memorandum to the Hatteras Island Commissioner in 1990 from Harry Johnson, Director of the Dare County Health Department is attached as Appendix A. This letter graphically points out the potential health problems in the villages of Rodanthe-Waves-Salvo. This memorandum, in addition to problems encountered with contamination of private wells by salt water during the March 13-14, 1993 hurricane, clearly established the need for a potable water system to serve residents of these three communities.

EXISTING ENVIRONMENTAL CONDITIONS

Topography. The map shown as Appendix B covers the topography of the three villages. Elevations range from a low of sea level at the ocean and sound to a high of 14.0 feet at the north end of the Village of Rodanthe. The tops of fore dunes, near the ocean, are generally at elevation 10.0 above sea level. The average elevation within the villages is approximately 6.0 feet. The 100-year flood level is 8.0 feet.

Wetlands. About one-half of the plant site owned by the County is comprised of wetlands. The western half is generally at elevation 5.0 and is sparsely vegetated. This is where the facilities are to be constructed. Additionally, the water lines constructed within the highway and street right-of-ways will cross several low areas and two drainage channels. These crossings have been be identified and sketches prepared for approval, as required by CAMA, and are included in the Appendix.

Water Quality. Ground water will be the water supply source. The reject water, 20-25% of what is pumped from the wells, will be returned to the Pamlico Sound via a drainage ditch and Blackman Gut. The TDS of the water in the Pamlico Sound varies between 14-17,000 ppm. It is anticipated that the reject water will have a TDS of 6-10,000 ppm, being lower at the beginning of operation. This will have no negative impact on the Pamlico Sound water. By the year 2010, approximately 32,000,000 gallons per year of reject water will be discharged to the sound. For example, in one year, 1,300,000 gallons of rain water falls on each one acre of the Pamlico Sound. This water has no TDS.

Soils. The soil in the three villages is primarily sand mixed with some silt and vegetable matter in the lower and marshy areas.

Land Use. The land area within the three villages is used primarily for seasonal and non-seasonal residents. Generally, the business areas are typically strip type development along Highway 12.

Air Quality. The project's nearest air monitoring stations are Plymouth, Roanoke Rapids, and Elizabeth City. The air quality of the area is considered extremely good, free from heavy industrial type of pollution. The prevailing winds are from the southwest and not effected by traveling pollution. The climate is such that periods of air stagnation, or inversion, occur infrequently and when present, lasts for extremely short periods. There are no air quality permits required for the proposed project. The particulate matter varied between 40 - 96 at Elizabeth City during 1990.

Solid Waste Management. Solid waste is collected by Dare County and disposed of in the regional landfill. This landfill was constructed and is operated in accordance with the requirements of the State of North Carolina. The only solid waste generated will be from residential housing units. The volume of waste generated will be that typical for a residential unit. There is no industrial or commercial activity in the area that generates solid waste other than that typical of small retail establishments.

Transportation. The project will not substantially affect the transportation along Highway 12. The installation of waterlines along state roads will be in conformance with North Carolina Department of Transportation's encroachment agreement.

Noise. The project may produce temporary noise impact associated with construction. After construction, noise should resume to its normal level.

Historical and Archaeological Areas. There are no known historical/archaeological sites in the project areas (within the DOT right-of-way) or on the plant and well sites. However, the plant will be near the historical Chicamacomico Coast Guard Station. This is addressed in more detail in the Appendix, including elevations and floor plan of the proposed building.

Wildlife and Endangered Species. Wildlife will not be directly affected by the construction of this project.

Energy. Electric power will be supplied by the Cape Hatteras EMC. The project will require a fair amount of energy, therefore, could have minor effect on the areas's energy supply. Actually energy usage should decrease due to two large pumps replacing almost 800 small well pumps. Because of the possible effect on the Cape

Hatteras EMC energy supply, complete diesel standby capability is being provided in order to allow the system to operate independently at times of peak power usage.

Construction. The adverse impacts of construction, noise, soil erosion, and vehicular traffic will be minimized through local and state regulations.

Toxic Substance. The use of toxic, hazardous, or radioactive substance will not be affected by this project.

Public Reaction. The project has received the approval of Dare County officials. No negative comments have been received to date, or at the public meetings held in connection with initiation of this project.

Alternatives to the Proposed Project. (a) There are no alternative locations for construction of water lines. Waterlines must be constructed within road and street rights-of-way; (b) there is no alternative design; (c) there are no alternative projects having similar value; (d) no project would result in continued problems due to an inadequate water supply and greater health hazards. In general, the environment would deteriorate without a public water system.

Mitigation Measures. The project will comply with all applicable laws to avoid any adverse impacts that may develop. Contractors for the project will be required to provide siltation and erosion control measures satisfactory to the State to minimize any environmental impact. They, likewise, will be required to provide traffic control measures to minimize traffic delays and potential for accidents in the vicinity of construction along roads and streets.

Permits. Construction and environmental health permits will be required. No permits have been obtained; however, the application for an NPDES Permit has been submitted to DEM and is in the review process.

Other Federal Actions. No federal agency or federal programs, other than permitting, will be involved on this project.

ENVIRONMENTAL IMPACT

Wetlands Impact. The plant and new well will be constructed outside of any wetlands areas. The waterlines, constructed in street and highway rights-of-way, will be crossing several wetland areas. Steps will be taken through erosion control and storm water control to minimize the wetlands impact. With the exception of two stream crossings, the wetland areas are surficial ground water with no outlet to the sound or ocean.

Land Use Impact. The proposed improvements will be constructed within the boundaries of property owned by the County, highway and street rights-of-way and easements obtained from property owners. This project will have no impact on land use.

Air Quality Impact. The only impact on air quality will be during construction. Emissions will be from diesel powered equipment primarily, thus having no impact on the ozone layer.

Scenic Area Impact. The water plant building is designed to compliment the historic Chicamacomico Coast Guard Station. Elevations and profiles of the plant are included in the Appendix, along with a site plan. The elevated water tank is designed to resemble a golf ball on a tee (such as the South Nags Head Tank). These steps have been taken to have a positive visual impact.

Water Quality Impact. The discharge of reverse osmosis reject water to Blackmar Cut will have no impact on the waters of the Pamlico Sound. The differences in the TDS will be such as to not alter the TDS of the sound water. The Ocracoke RO plant discharges its reject water to the Pamlico Sound and no adverse results have

been observed. A copy of the NPDES application to the Division of Environmental Management is included in the Appendix.

Water Resources Impact. Well yield and testing of different pumping rates indicate there will no impact on ground water in the area. The well spacing (2,000 feet) and pumping rate (450 gpm) will be such that no appreciable change in TDS will result from either lateral or vertical salt water encroachment. The expected well drawdown of 22-23 feet at 450 gpm will have no overlapping influence on the other well. Also, the wells will have ample time to rest.

Wildlife and Endangered Species Impact. This project will have no impact on wildlife or endangered species. All construction, with the exception of plant site and well site, will be within street and/or highway rights-of-way, where construction and land disturbing activities have already taken place.

Public Health Impact. The construction of this project will have a positive impact on the potential health of residents and tourists in the three villages. (Refer in the Appendix to Harry Johnson, Director of Dare County Health Department memo dated May 31, 1990.

APPENDICES

APPENDIX "A"

(4 pages)

DARE COUNTY DEPARTMENT OF HEALTH

MANTEO, NORTH CAROLINA 27954

HARRY D. JOHNSON
HEALTH DIRECTOR

May 31, 1990

P. O. BOX 1000
PHONE (919) 473-1101

MEMO

TO: Gack Austin
Commissioner, Hatteras Township

FROM: Harry Johnson, Director
Dare County Health Department

RE: Water Supply- Rodanthe, Waves, Salvo

I have for a number of years become increasingly concerned with the amount of development occurring in the Rodanthe, Waves, Salvo area. I have also from time to time voiced these concerns to the Health Board: and to individual commissioners. My most fundamental concern is that the rate of development is exceeding our ability to service the area with a reliable source of potable water, a reliable means of domestic wastewater disposal, and perhaps other county services which are outside my jurisdiction but nonetheless have some impact on public health and the quality of life. My concerns are heavily influenced by the following items:

1. Lot Size: The majority of the developable property in this area was platted many years ago. Regrettably, the lots were plotted in size ranging from 5,000 to approximately 10,000 square feet. Since 1981, of course, we have required the larger lot sizes of 15,000 and 20,000 square feet depending on potable water source but there are relatively few subdivisions currently existing in this area with lot sizes this large. Density therefore, is a major concern. It ranges from 4 to 8 dwelling units per acre, depending upon the size of the lot. Obviously that implies that there are also that many septic tanks and private wells per acre. From the prospective of 20-20 hindsight a density of 2 or 3 dwelling units per acre might be manageable. Greater density, I think, increases public health risk.

2. Soil Conditions: The soils in this area are generally unsuitable for septic systems in a very technical sense. Sand, with a very high infiltration rate, combined with a very high ground water table, make a very bad combination for septic system efficiency. The proximity of miscellaneous bodies of water simply compound the problem. Developmental pressures exerted by real estate interests as well as private property owners, coupled with occasional political pressure, have tended to create a situation wherein we are allowing the installation of septic systems on increasingly marginal property. As you are well aware, the health department creates considerable agitation when we deny a septic permit. Although no elected official has ever given me explicit instructions to issue a permit that I felt was unwarranted, I have sensed a general feeling that elected officials prefer that we try to find a way to modify the property in order to make it acceptable rather than denying the permit. Notwithstanding the fact that there are a large number of lots in the Rodanthe, Waves and Salvo area that have, in fact, been denied permits, we have been as lenient in issuing permits as we possibly can be in keeping with the spirit and intent of the State sewage rules.

3. Potable Water: One requirement for a septic permit as well as healthy living is a source of potable water. There are no public water sources available in this area, and although there are a few community systems, most all potable water must be obtained through private wells. The standard minimum separation distance between a septic system and a private well is 100 feet. There is, however, an exemption paragraph in the sewage rules that allows for lots platted prior to 1977 a discretionary reduction of this distance to as little as 50 feet. On the small lots, as indicated in item one above, it is physically impossible to obtain a 100 foot separation. Consequently, if we did not allow the reduction in separation distances the lots would have to be declared non-buildable, to the distress of many property owners. The only potable water source is a fresh water lens which lies approximately 10 to 25 feet below the surface of the ground. There is frequent salt water intrusion into this lens under natural circumstances. This fresh water lens is recharged exclusively via rainfall. In order to reach the fresh water aquifer the rainwater has to filter through the same soils

that also have to filter our septic system wastewater. Waste effluents enter the soil and move into the groundwater system as easily as rainfall. I am not a hydrologist but I expect that the high porosity of our soils allows all infiltration to infiltrate too quickly. In other words, I cannot be sure that the existing soils properly purify septic effluent before it gets to the fresh water lens. Increasing the number of septic systems, as well as all other pollutants created by human habitation, tends to increase the risk of pollution. The fresh water lens is highly variable, dependant entirely on adequate rainfall to recharge it and heavily influenced by user demand (discharge) placed upon it. It also is influenced frequently by ocean or sound overwash.

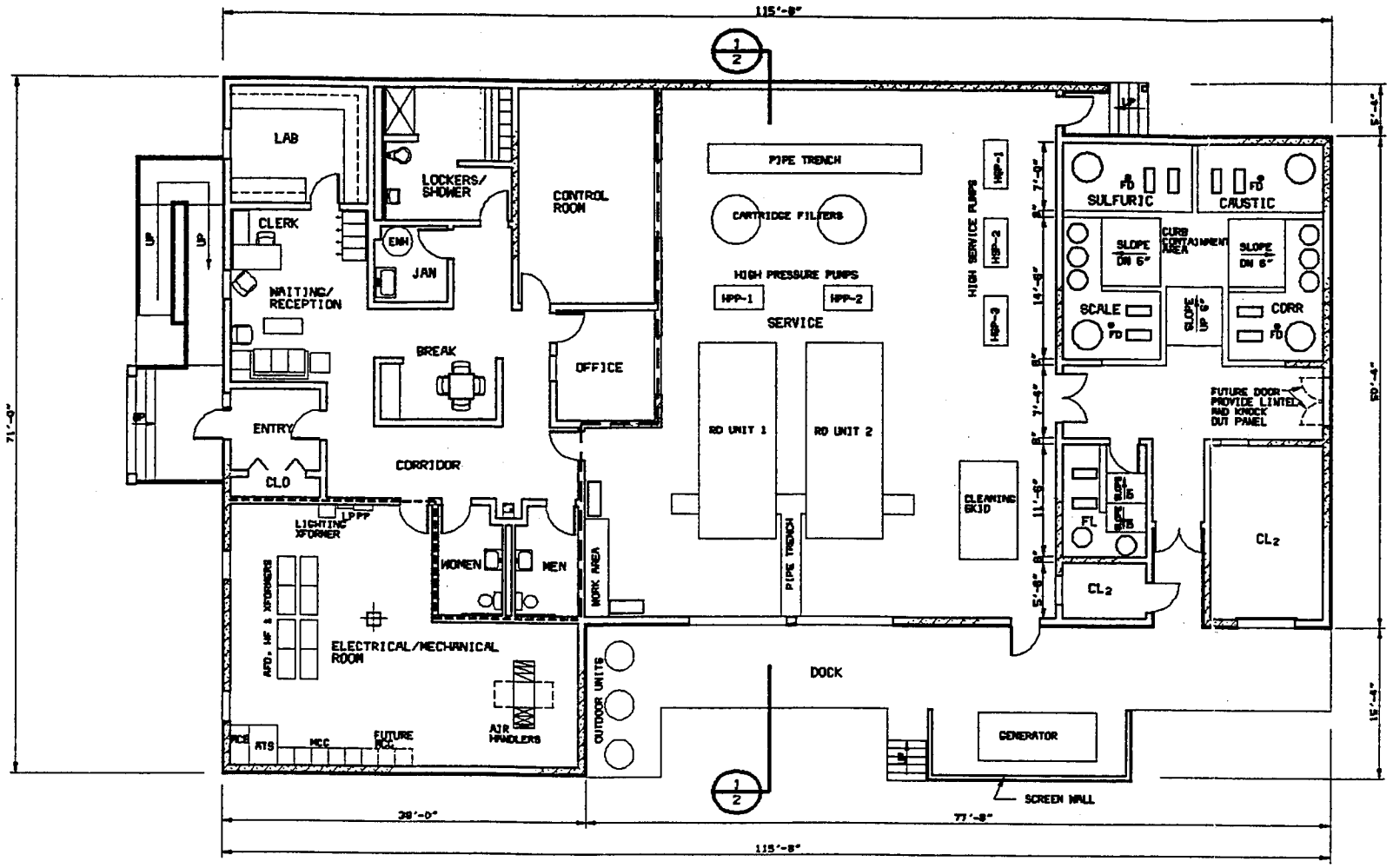
Our recent conversation generated a review of some old studies. There was a groundwater resources study done by the United States Geological Unit of the Department of the Interior in 1975. It depicts the groundwater resources for the entire Outer Banks from Whalebone Junction to Hatteras Inlet. I believe that this study is still very accurate. It substantuates the fact that in the Rodanthe, Waves, Salvo area there is very little in the way of groundwater resources that could be considered potable... There was a study on water supply and treatment entitled, "Alternatives for Villages of Rodanthe, Waves, Salvo", which was done in April 1982. It studied five alternatives for provision of water to this area and concluded that the most feasible method was connecting Rodanthe, Waves and Salvo to the Cape Hatteras Water Association Distribution System at Avon. Reverse Osmosis was a consideration, however it was ruled out at that time due primarily to the cost, particularly the operation and maintenance cost. This study was a fairly superficial study and is much outdated now. I am not even certain who authored it. Even so, there are a few tidbits of information in it that would still be applicable today. I also have a copy of the final Environmental Impact Statement done for the Avon Water Project in order to connect to the Cape Hatteras Water Association System. It was done by the Farmers Home Administration to discuss the environmental impact of tying in Avon to the Cape Hatteras Water Association water supply system. It was performed in 1977 and it too is obviously outdated now. Nonetheless, it still is interesting reading and much of what is contained in this study might still be applicable today, particularly in regard to ecological and environmental concerns. The Dare County Carrying Capacity Study done in 1985 addresses a great number of issues for all of Dare County, but in particular it addresses these issues by geographic district, one of which is the Rodanthe, Waves and Salvo area. I thought this was a very well done study but I am afraid that few people bother to read it anymore and that much of what is contained therein goes largely unheeded.

I have not been privy to any of the subsequent studies pertaining specifically to the Reverse Osmosis proposal for this area other than a general

awareness gleaned through newspaper accounts and informal discussions with various county officials. It is therefore risky for me to make assumptions based on a limited knowledge of what is contained in these studies. I believe, however, that there is not much argument in terms of the need for and the desirability of a reliable source of potable water for this area. I also suspect that Bob Slade and the current County Commissioners have a legitimate concern about the economic viability and feasibility of a reverse osmosis plant for this area. I have absolutely no quarrel with Mr. Slade's recommendation to update the existing studies involving this project. I would be very pleased to contribute to and be a part of these studies in any way that I can. I am afraid that if we don't do something fairly quickly about the water supply system that the Health Department may be put in a position of having to cease issuing septic system permits. As you know, I do not have the inhouse expertise to conduct a full blown study but our local intuitive knowledge about this area leads me to believe that the quality of water currently being consumed is exceedingly poor. It comes through the faucets looking like iced tea, smells like rotten eggs, and tastes like medicine. We know for a fact that it is easily infiltrated by salt water and although I cannot prove it, there may be reason to suspect eventual, if not present, contamination by septic effluent. Even though our permits precisely indicate where the wellpoints are located relative to the septic systems at the time of final inspections, I cannot verify that they remain in that location after the inspector has departed. Also, we do not inspect the quality or quantity of water produced by these wellpoints. If the county were to institute a formal testing program and if those samples proved to be contaminated to any degree, I might have no choice but to cease issuing permits.

If development is to continue in this area, it is absolutely essential that a potable water supply be developed. Whereas it may not resolve every public health problem or even other problems such as increased demand for municipal services, it would at least remove one variable in that we would not have to be concerned about contamination of wells. The overall issue of how much development should be allowed and what type development should be allowed are more appropriately issues for the Planning Board and the County Commissioners to resolve. At the present time, due largely to the lack of zoning for this area, the burden of whether or not a piece of property is developable and what type of use might be applied to that property falls squarely on the shoulders of the Health Department. If we can authorize a septic permit then there generally is no problem obtaining a building permit. Whether or not we should continue to be relatively lenient in issuing permits or whether or not we should be coming more restrictive is a legitimate concern. Lastly, as a counterpoint, I would hope that you and the other commissioners would realize that whereas provision of a reliable potable water source by a reverse osmosis treatment plant or any other means would solve one problem, in a broader prospective it may create even greater problems by creating more intense pressure to develop the land without regard to lack of an effective methodology of wastewater disposal or increased risk of pollution of our estaurine via septic seepage and surface water runoff, and by generation of greater demand for all other county services.

SOUND
ATLANTIC OCEAN
CAPE HATTERAS
HATTERAS ISLAND
NATIONAL SEASHORE
Clarks Bay
Campground
Cem
Camp
TELEPHONE
Salvo
Midgett Cove
Midgett Island
Great Island
Davids Pt
Waves Landing
Waves
Aunt Phoebes Marsh
North Drain
Campground
Salvo
Greens Pt
Blackmar Gut
Uncle Jimmys Landing
Pauls Ditch
Light
Light
Rejected water distribution line
Approximate location of Well & Elev. Tank
Location of Stream Crossings
Treatment plant site & Well Site
APPENDIX "B"
APPENDIX "B"



FLOOR PLAN

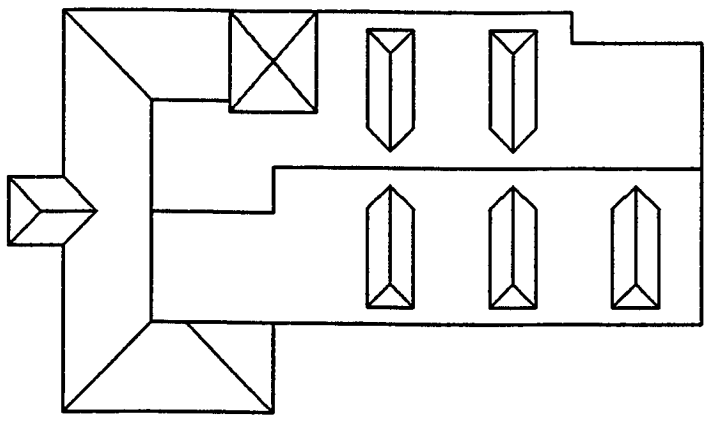
6870 SQ. FT

1/8" = 1'-0"

REF. SD

— — — — — DENOTES 2 HR WALL

---------- DENOTES 1 HR WALL



ROOF PLAN

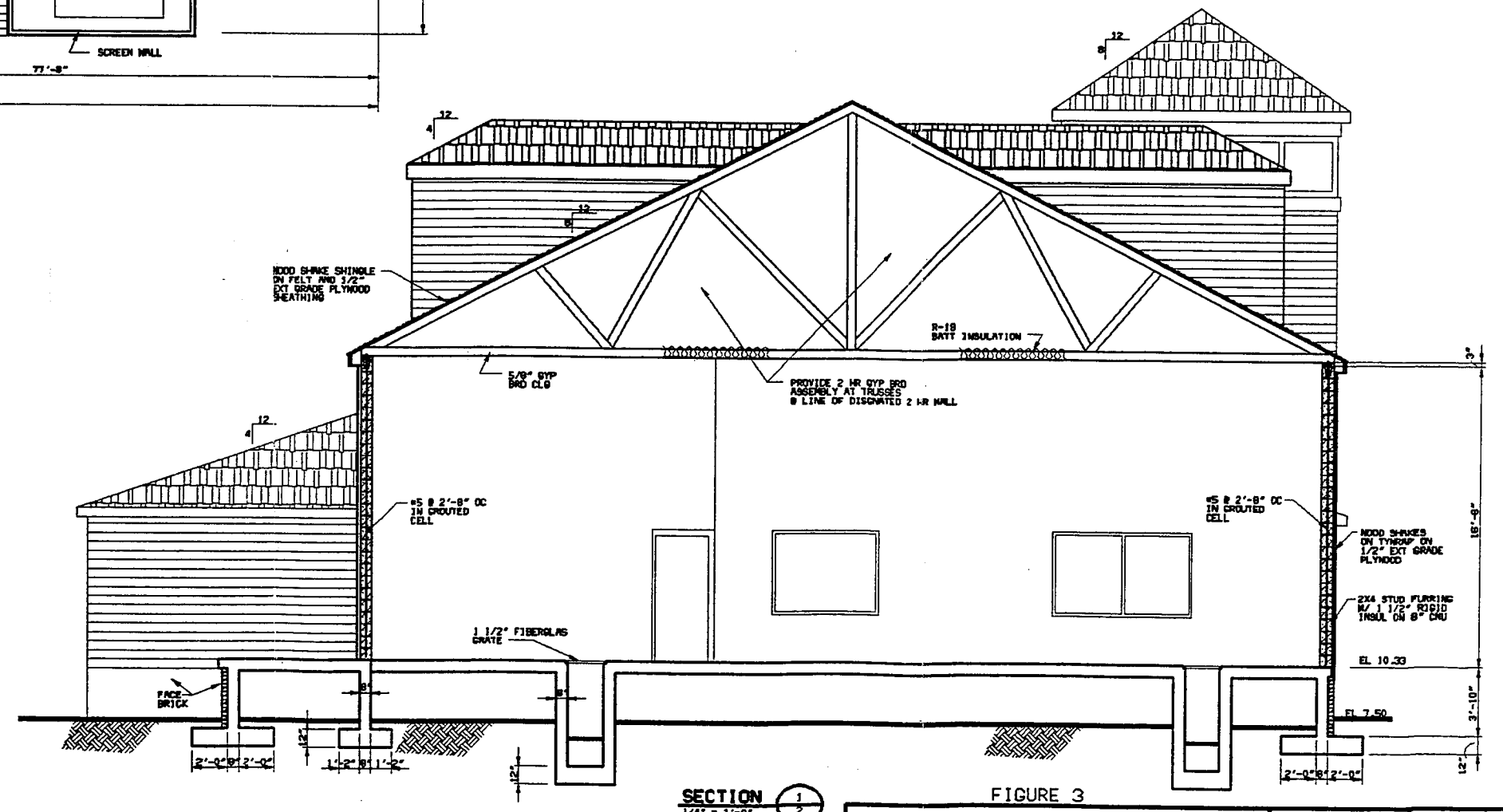
1/16" = 1'-0"

FINISH SCHEDULE

ROOM NO.	NAME	FLOOR FINISH	FLOOR BASE	WALLS SUBSTRATE	WALLS NORTH	WALLS SOUTH	WALLS EAST	WALLS WEST	CEILINGS HEIGHT	CEILINGS MATERIAL	CEILINGS FINISH	REMARKS
101	ENTRY	CT	CT	DW	PT	PT	PT	PT	8'-0"	DW	PT	
102	CLOSET	CT	CT	DW	PT	PT	PT	PT	8'-0"	DW	PT	
103	CORRIDOR	VCT	VINYL	DW	PT	PT	PT	PT	8'-0"	DW	PT	
104	ELEC/MECHANICAL ROOM	SCONC	NONE	CMU/DW	PT	PT	PT	PT	8'-0"	DW	PT	
105	WOMEN	CT	CT	DW	PT	PT	PT	PT	8'-0"	DW	PT	
106	MEN	CT	CT	CMU/DW	PT	PT	PT	PT	8'-0"	DW	PT	
107	OFFICE	VCT	VINYL	CMU/DW	PT	PT	PT	PT	8'-0"	DW	PT	
108	CONTROL ROOM	VCT	VINYL	CMU/DW	PT	PT	PT	PT	8'-0"	DW	PT	
109	LOCKERS/SHOWER	CT	CT	CMU-EM	SC	SC	SC	SC	8'-0"	DW	PT	
110	JANITOR	CT	CT	DW	EPX	EPX	EPX	EPX	8'-0"	DW	PT	
111	BREAK ROOM	VCT	VINYL	DW	PT	PT	PT	PT	8'-0"	DW	PT	
112	WAITING/RECEPTION	VCT	VINYL	CMU/DW	PT	PT	PT	PT	8'-0"	DW	PT	
113	LABORATORY	VCT	VINYL	CMU/DW	EPX	EPX	EPX	EPX	8'-0"	DW	PT	
114	SERVICE AREA	SCONC	NONE	CMU	SC	SC	SC	SC	16'-8"	DW	PT	
115	CONTAINMENT AREA	SC	CONC	CMU	SC	SC	SC	SC	16'-8"	DW	PT	
116	FL	SCONC	CONC	CMU	SC	SC	SC	SC	16'-8"	CONC	EXP	
117	CL2	SCONC	CONC	CMU	SC	SC	SC	SC	16'-8"	CONC	EXP	
118	CL2	SCONC	CONC	CMU	SC	SC	SC	SC	16'-8"	CONC	EXP	

LEGEND

SCONC — SEALED CONCRETE
CMU — CONCRETE MASONRY UNIT
CONC — CONCRETE
PT — PAINT
EPX — EPOXY
ACT — ACOUSTICAL CEILING TILE
F.FIN — FACTORY FINISH
CT — CERAMIC TILE
EXP — EXPOSED
VCT — VINYL COMPOSITION TILE
DW — DRYWALL
SC — SPECIAL COATING



SECTION 1/2

1/4" = 1'-0"

FIGURE 3

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP	

DESIGNED RLS
DETAILED TNJ
CHECKED
APPROVED
DATE

Black & Veatch
Asheboro, North Carolina

PROJECT NO. 24420

WATER TREATMENT FACILITIES
DARE COUNTY, NORTH CAROLINA
RODANTHE - WAVES - SALVO

FLOOR PLAN, CROSS SECTION SCHEDULE AND ROOF PLAN

SHEET OF

PLAN-F 01035 F000000

01/06/94 10:53:55 ACD-1

APPENDIX C

(2 pages)

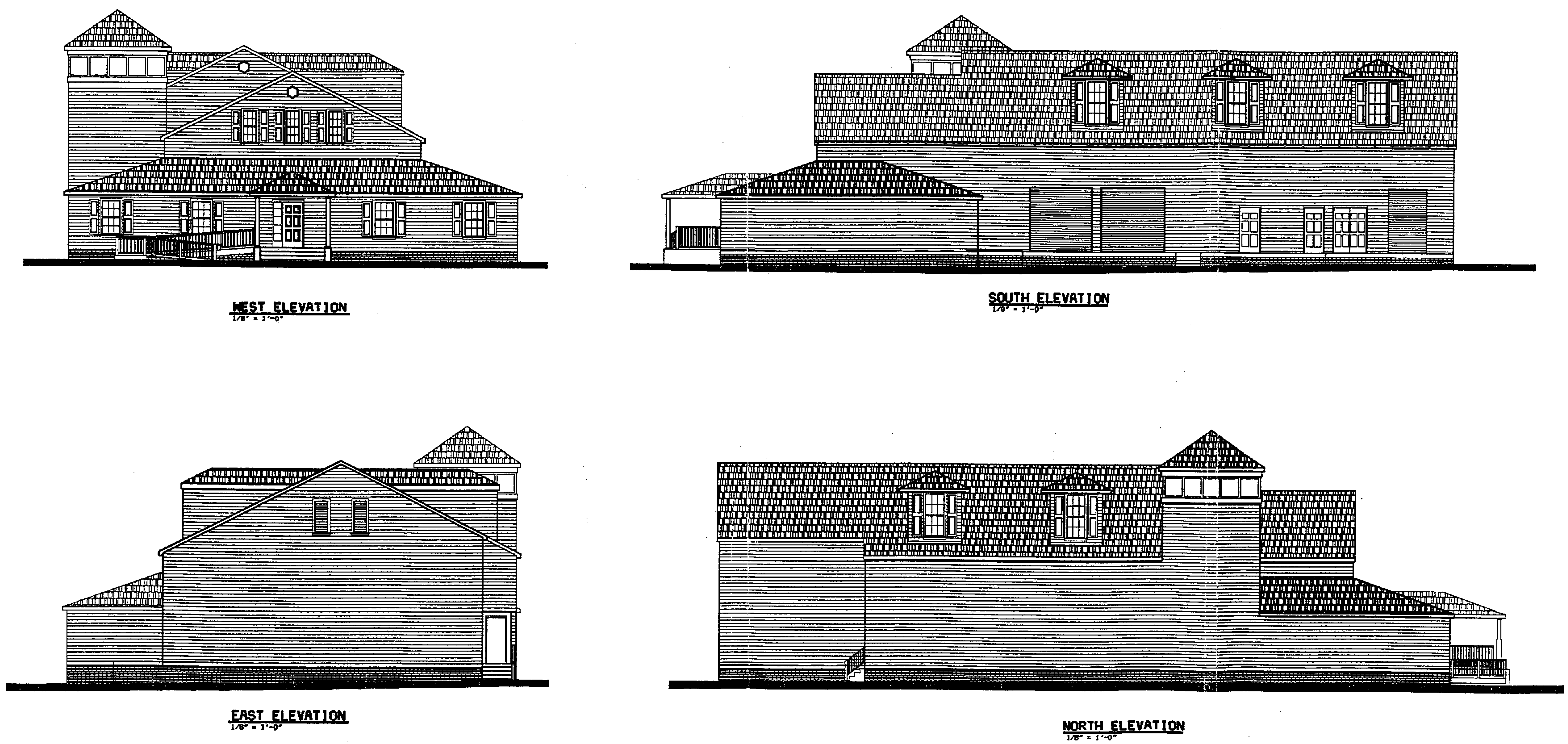


FIGURE 4

WATER TREATMENT FACILITIES
DARE COUNTY, NORTH CAROLINA
RODANTHE - WAVES - SALVO

ELEVATIONS

Black & Veatch
Asheboro, North Carolina

PROJECT NO. 24420

DESIGNED RLS
DETAILED TMJ
CHECKED
APPROVED
DATE

SHEET
OF

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

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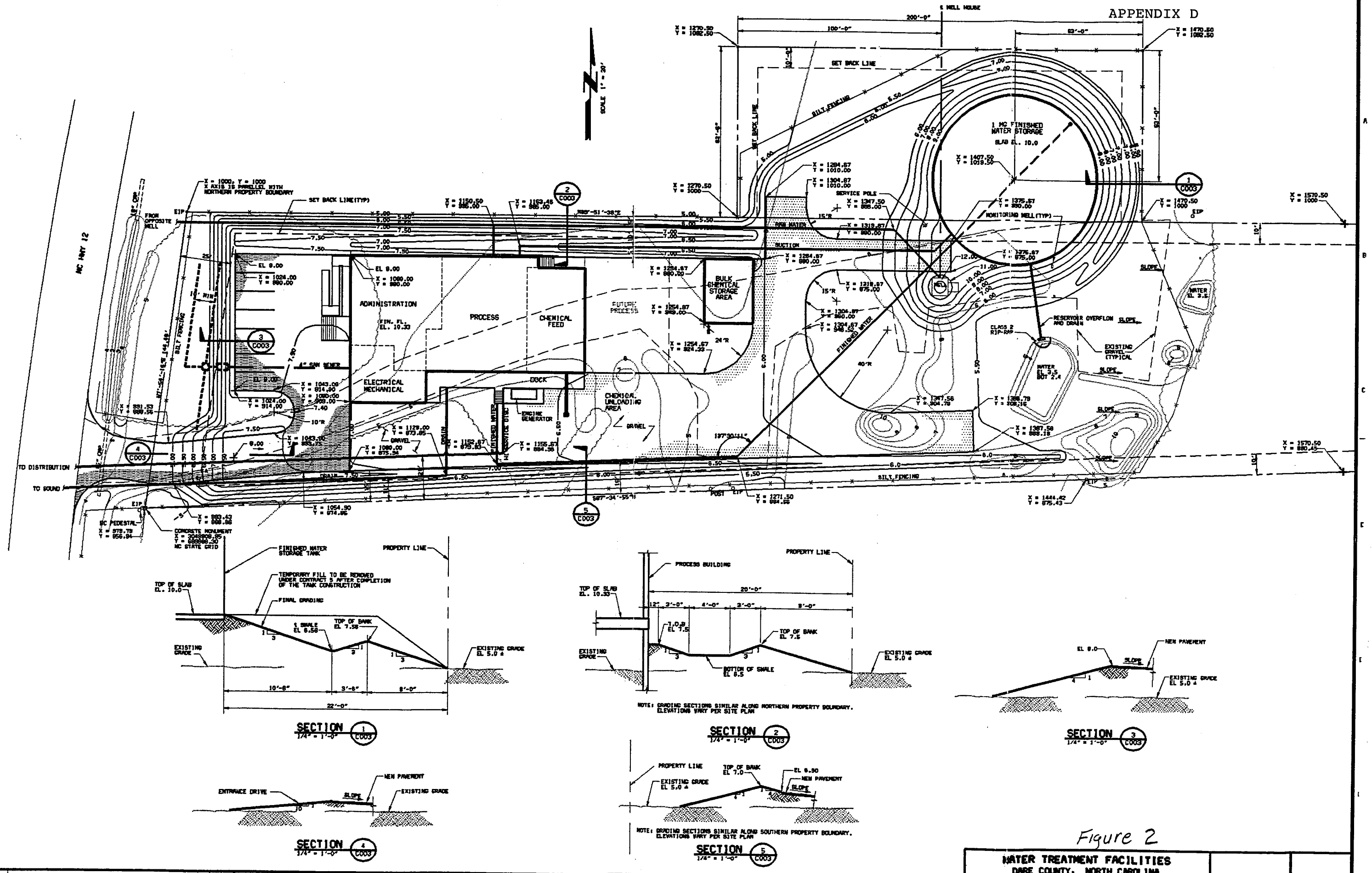


SECTION 1/4" = 1'-0" (1 C003)

SECTION 1/4" = 1'-0" (2 C003)

SECTION 1/4" = 1'-0" (3 C003)

SECTION 1/4" = 1'-0" (4 C003)

SECTION 1/4" = 1'-0" (5 C003)

Figure 2

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

DESIGNED MKP
DETAILED BLS
CHECKED
APPROVED
DATE

Black & Veatch, Asheboro, North Carolina

PROJECT NO. 24420

WATER TREATMENT FACILITIES
DARE COUNTY, NORTH CAROLINA
RODANTHE - WAVES - SALVO

SITE PLAN

SHEET OF

24420-220-222-C003
01025
FD00000

12/16/03 11:47:43 ACD-1

VIEW LOOKING NORTH
1" = 20'

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

DESIGNED RLS
DETAILED RLS
CHECKED
APPROVED
DATE

Black & Veatch
Asheboro, North Carolina

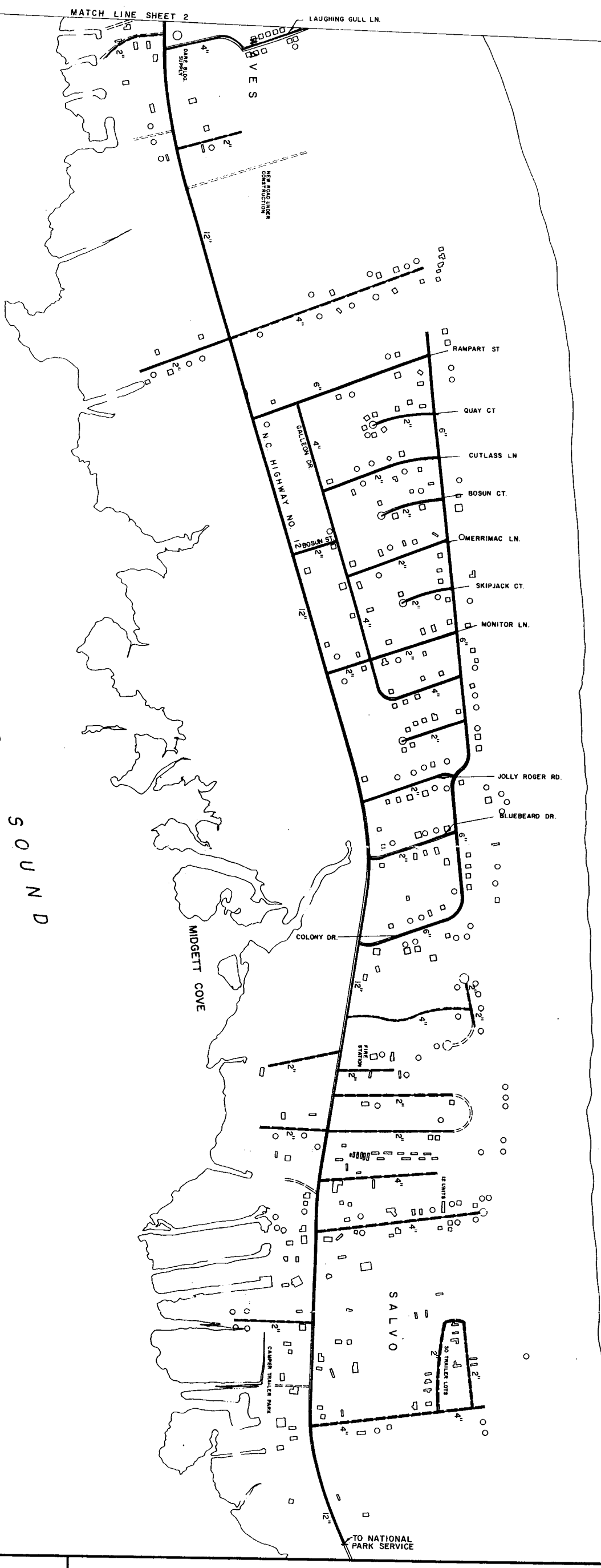
PROJECT NO.

WATER TREATMENT FACILITIES
DARE COUNTY, NORTH CAROLINA
RODANTHE - WAVES - SALVO

PROFILE VIEW

SHEET
OF

PROF
01035
FQ00000



400 200 0 400 800
SCALE IN FEET

BLACK & VEATCH, INC.
CONSULTING ENGINEERS
ASHEBORO, N C

RODANTHE, WAVES & SALVO

WATER FEASIBILITY STUDY

SHEET 1 OF 3

APPENDIX F
(3 pages)

MATCH LINE SHEET 3

RODANTHE

ELEV. TANK

WTP

WELL

4 TRAILERS CPT. JOHN ALLEN MOTEL

99 LOTS

127 TRAILER LOTS

SWIMMING POOL

POST OFFICE

4 DUPLEX COTTAGES

HOLIDAY BLVD

5 UNITS

POOL

MARINELAND ST

FISHING PIER

ATLANTIC DR

COTTAGES

OLD MOTEL AT RODANTHE PIER - 2 STORIES 100+ UNITS

MOTEL & POOL 14 UNITS

CAMPER CENTER

FIRE STA.

WATER SLIDE

N.C. HIGHWAY NO. 12

KOA CAMPGROUND & TRAILER HOOKUPS

CLUB HOUSE

PLAYGROUND

CAMP GROUND

MAC - OCA REEF DR.

KOA TRAILER HOOKUPS

POOL

AUNT PHOEBES MARSH

WIMBLE SHORES NO. SUBDIVISIONS

POST OFFICE

CAMP GROUND

BOLD DUNE DR.

SEA ISLE HILLS DR

WAVES

WAVES LANDING

MATCH LINE SHEET 1

LAUGHING GULL LN.

PAMLICO SOUND

ATLANTIC OCEAN

400 200 0 400 800

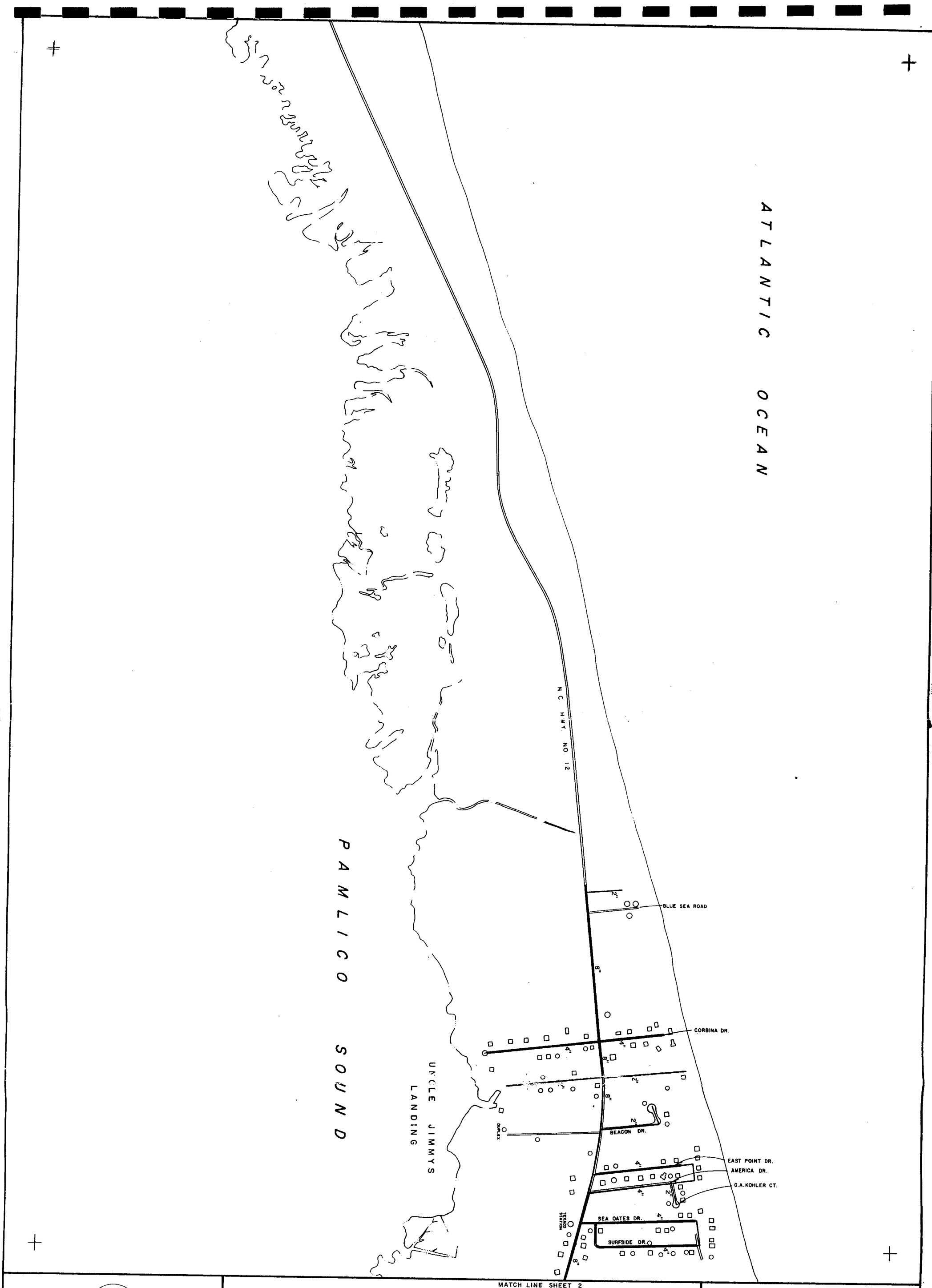
SCALE IN FEET

BLACK & VEATCH, INC.
CONSULTING ENGINEERS
ASHEBORO, N.C.

RODANTHE, WAVES & SALVO

WATER FEASIBILITY STUDY

SHEET 2 OF 3



BLACK & VEATCH, INC.
CONSULTING ENGINEERS
ASHEBORO, N.C.

RODANTHE, WAVES & SALVO

WATER FEASIBILITY STUDY

SHEET 3 OF 3

APPENDIX G

(4 pages)

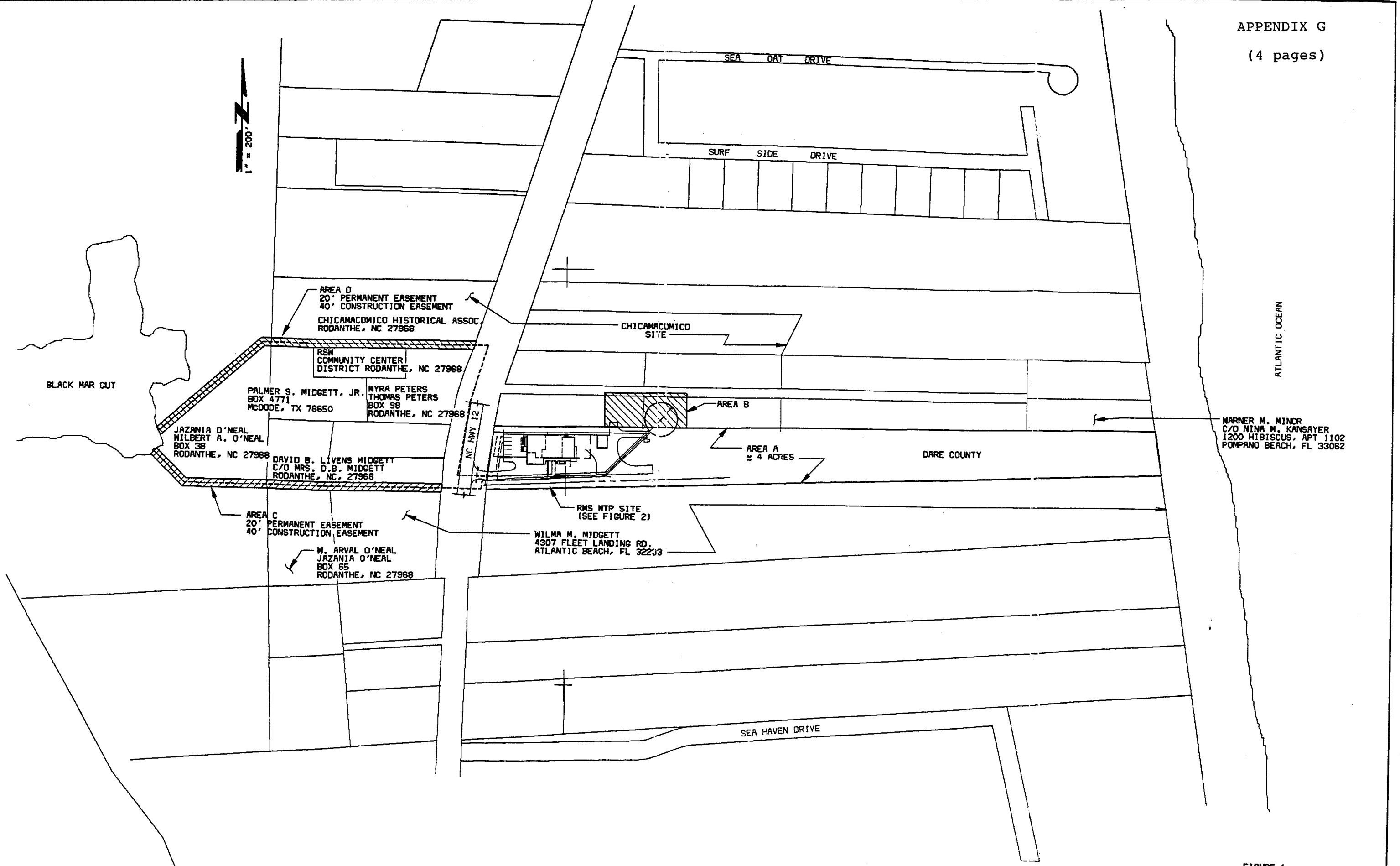


FIGURE 1

WATER TREATMENT FACILITIES
DARE COUNTY, NORTH CAROLINA
RODANTHE - WAVES - SALVO

PROPERTY AND EASEMENTS
PLANT VICINITY

STATE OF NORTH CAROLINA Real Estate Excise Tax DEC29'86 150.00

BOOK 490 PAGE 305

FILED
'86 DEC 29 PM 1 43
DORRIS A. FRY
REGISTER OF DEEDS
DARE COUNTY, N.C.

APPROVED
DARE COUNTY TAX COLLECTOR
NO. 7256-86

Excise Tax 150.00

Recording Time, Book and Page

Tax Lot No. DARE COUNTY REAL ESTATE TRANSFER TAX ... Parcel Identifier No. ...
Verified by ... County on the ... day of ..., 19 ...
by ... 7256-86 1500.00

Mail after recording to Dwight H. Wheless, Attorney at Law, P. O. Box 500, Manteo, NC 27954

This instrument was prepared by Dwight H. Wheless

Brief description for the Index: Rodanthe property

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this 22nd day of December, 19 86, by and between

GRANTOR	GRANTEE
ANDREW A. MIDGETT and wife, NORMA S. MIDGETT; JOHN DAVID MIDGETT and wife, JUDY MIDGETT; BETTY JO MIDGETT BAILEY and husband, D. W. BAILEY, III; and ROBERT O. YEAGER, widower and not remarried	COUNTY OF DARE a body politic and corporation P. O. Box 1000 Manteo, NC 27954

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g. corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the ~~City of~~ Village of Rodanthe, Kinnakeet Township, Dare County, North Carolina and more particularly described as follows:

BEGINNING at a concrete monument lying in and on the East margin of the right of way of N. C. Highway #12, sometimes known as the Hatteras Highway, said point of beginning being further identified as having the coordinates on the North Carolina Grid System of: X=3049308.95; Y=689968.30; said point of beginning also lying and being North 54 deg. 38 min. 59 sec. West 2,354.58 feet from a concrete monument marked "Corley 1985", said monument having the coordinates on the North Carolina Grid System of: X=3051729.41; Y=688605.99; said point of beginning also lying and being in the Northwest corner of the lands now or formerly owned by Wilma Midgett lying on the East side of said highway; proceeding thence from the point of beginning along the East margin of the aforesaid highway North 7 deg. 5? min. 16 sec. East 144.48 feet to an existing iron shaft, thence along the lands now or formerly owned by Alma Midgett and others North 89 deg. 51 min. 38 sec. East 1,609.63 feet to a concrete monument lying on the line of the Cape Hatteras National Seashore at a point on said line which lies South 9 deg. 12 min. 18 sec. East 93.96 feet from another concrete monument which other concrete monument itself lies South 9 deg. 12 min. 18 sec. East 100.38 feet from a National Park Service monument marked "WP 6"; thence from the terminal point along the lands of the United States of America South 9 deg. 12 min. 18 sec. East 78.70 feet to a concrete monument lying in the Northeast corner of the lands now or formerly owned by Wilma Midgett, thence along the North line of Midgett South 87 deg. 34 min. 55 sec. West [illegible].55 feet to the point or place of beginning.

VERIFIED

See the map or plat entitled "Survey for County of Dare" prepared by Southern Surveying and Land Planning, said plat dated 12-16-86.

...of the parties of the first part being the successors of Joseph Midgett. See the ... recorded in Will Book 5 at page 65, Dare County Registry. See also the deed ...corded in Deed Book P at page 375, Dare Registry. Robert O. Yeager, grantor, being ...successor to the interest of Edna Midgett Yeager who died intestate in 1984. See ...certain quit-claim deeds from the children of Edna M. Yeager.

...above described was acquired by Grantor by instrument recorded in .....

...showing the above described property is recorded in Plat Book ..... page .....

...AVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to ... its simple.

...Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey ...same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant ...defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated. ...The property hereinabove described is subject to the following exceptions:

...easements as may appear of record in the Dare County Registry.

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its ...duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first ...

...(Corporate Name)

...President

...Secretary (Corporate Seal)

...(Corporate Name)

...President

...Secretary (Corporate Seal)

USE BLACK INK ONLY

USE BLACK INK ONLY

Andrew A. Midgett (SEAL)

Norma W.S Midgett (SEAL)

John David Midgett (SEAL)

Judy Midgett (SEAL)

Betty Jo Midgett Bailey (SEAL)

D. W. Bailey, III (SEAL)

Robert O. Yeager (SEAL)

(SEAL)

BOOK 490 PAGE 307

SEAL-STAMP NOTARY PUBLIC CARTERET COUNTY

NORTH CAROLINA, CARTERET County.

I, a Notary Public of the County and State aforesaid, certify that ANDREW A. MIDGETT and wife, NORMA S. MIDGETT Grantor

personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 24 day of DEC 1986

My commission expires: 2/18/88 Kenneth N. Putnam Notary Public

Use Black Ink

SEAL-STAMP NOTARY PUBLIC CARTERET COUNTY

NORTH CAROLINA, CARTERET County

I, a Notary Public of the County and State aforesaid, certify that JOHN DAVID MIDGETT and wife, JUDY MIDGETT Grantor,

personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 24 day of DEC 1986

My commission expires: 2/18/88 Kenneth N. Putnam Notary Public

Use Black Ink

SEAL-STAMP NOTARY PUBLIC CARTERET COUNTY

NORTH CAROLINA, CARTERET County.

I, a Notary Public of the County and State aforesaid, certify that BETTY JO MIDGETT BAILEY & husband, D. W. BAILEY, III Grantor,

personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 24 day of DEC 1986

My commission expires: 2/18/88 Kenneth N. Putnam Notary Public

Use Black Ink

SEAL-STAMP NOTARY PUBLIC CARTERET COUNTY

NORTH CAROLINA, CARTERET County.

I, a Notary Public of the County and State aforesaid, certify that ROBERT O. YEAGER (widower and not remarried) Grantor,

personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 24 day of DEC 1986

My commission expires: 2/18/88 Kenneth N. Putnam Notary Public

Use Black Ink

SEAL-STAMP

NORTH CAROLINA, ...County.

I, a Notary Public of the County and State aforesaid, certify that ....

personally came before me this day and acknowledged that .... he is .... Secretary of

.... a North Carolina corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its .... President, sealed with its corporate seal and attested by .... as its .... Secretary.

Witness my hand and official stamp or seal, this ...... day of .... 19......

My commission expires: .... Notary Public

Use Black Ink

SEAL-STAMP

NORTH CAROLINA, ...County.

I, a Notary Public of the County and State aforesaid, certify that ....

personally came before me this day and acknowledged that .... he is .... Secretary of

.... a North Carolina corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its .... President, sealed with its corporate seal and attested by .... as its .... Secretary.

Witness my hand and official stamp or seal, this ...... day of .... 19......

My commission expires: .... Notary Public

Use Black Ink

The foregoing Certificate(s) of Kenneth N. Putnam a Notary Public of Carteret County, N.C.

....

....

are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

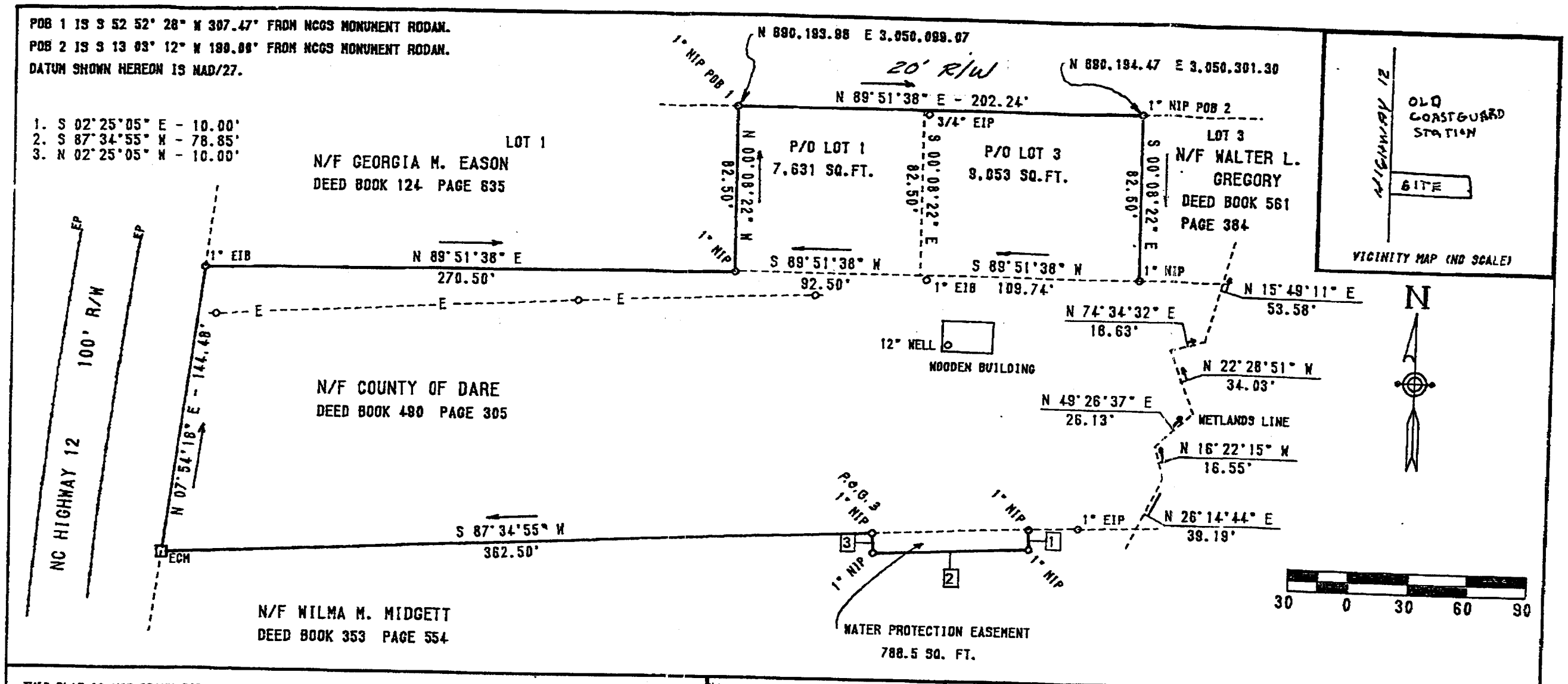
DORRIS A. FRY REGISTER OF DEEDS FOR Dare COUNTY

By Barbara B. Gallimore Deputy/Assistant-Register of Deeds.

RECORDED

POB 1 IS S 52 52' 28" W 307.47' FROM NCGS MONUMENT RODAN.
POB 2 IS S 13 03' 12" W 189.88' FROM NCGS MONUMENT RODAN.
DATUM SHOWN HEREON IS NAD/27.

1. S 02°25'05" E - 10.00'
2. S 87°34'55" W - 78.85'
3. N 02°25'05" W - 10.00'



THIS PLAT IS NOT DRAWN FOR RECORDATION

THIS IS TO CERTIFY THAT I HAVE SURVEYED THE PROPERTY SHOWN HEREON AND THAT THE TITLE LINES AND THE WALLS OF THE BUILDING(S), IF ANY, ARE SHOWN HEREON.

THE PROPERTY SHOWN HEREON (IS) (IS NOT) WITHIN A FLOOD HAZARD ZONE ACCORDING TO FIRM MAP PANEL NO. 0630 D DATED 4-2-93 ZONE AE

THIS PLAT WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT, WHICH MAY REVEAL ADDITIONAL CONVEYANCES, EASEMENTS, RIGHTS OF WAYS, OR BUILDING RESTRICTION LINES NOT SHOWN HEREON.

UNLESS OTHERWISE NOTED, THIS IS A SURVEY OF AN EXISTING LOT OR PARCEL OF LAND.

PLAT PREPARED BY JAMES L. DUNLOP, RLS NO. L-1346
P.O. BOX 703 AVON, NORTH CAROLINA PHONE & FAX (919) 995-3973

NORTH CAROLINA REGISTERED SEAL L-1346 LAND SURVEYOR JAMES L. DUNLOP

BOUNDARY SURVEY FOR LAND AQUISITION

PREPARED FOR THE COUNTY OF DARE

VILLAGE OF RODANTHE DARE COUNTY
KINNAKEET TOWNSHIP NORTH CAROLINA

SCALE: 1" = 60' DATE : JANUARY 18, 1994 JOB # 67-93-27.288

8. Maximum amount of principal product produced or raw material consumed, expressed in Item 7, above, is measured (Check one):

A.☐ pounds B.☐ tons C.☐ barrels D.☐ bushels E.☐ square feet

F.☒ gallons G.☐ pieces or units H.☐ other, specify _____

9. (a) Check here if discharge occurs all year ☒, or

(b) Check the month(s) discharge occurs:

1.☐ January 2.☐ February 3.☐ March 4.☐ April 5.☐ May 6.☐ June

7.☐ July 8.☐ August 9.☐ September 10.☐ October 11.☐ November 12.☐ December

(c) Check how many days per week: 1.☐ 1 2.☐ 2-3 3.☐ 4-5 4.☒ 6-7

10. Types of waste water discharged to surface waters only (check as applicable)

Discharge per operating day	Flow, gallons per operating day					Volume treated before discharging (percent)				
	0.1-999 (1)	1000-4999 (2)	5000-9999 (3)	10,000-49,999 (4)	50,000- or more (5)	None (6)	0.1-29.9 (7)	30-64.9 (8)	65-94.9 (9)	95-100 (10)
A. Sanitary, daily average										
B. Cooling water, etc. daily average										
C. Process water, daily average					X	X				
D. Maximum per operating day for total discharge (all types)					X					

11. If any of the three types of waste identified in item 10, either treated or untreated, are discharged to places other than surface waters, check below as applicable.

Waste water is discharged to:	Average flow, gallons per operating day				
	0.1-999 (1)	1000-4999 (2)	5000-9999 (3)	10,000-49,999 (4)	50,000 or more (5)
A. Municipal sewer system					
B. Underground well					
C. Septic tank					
D. Evaporation lagoon or pond					
E. Other, specify					

12. Number of separate discharge points: A.☒ 1 B.☐ 2-3 C.☐ 4-5 D.☐ 6 or more

13. Name of receiving water or waters Pamlico Sound @ Blackmar Gut

14. Does your discharge contain or is it possible for your discharge to contain one or more of the following substances added as a result of your operations, activities, or processes: ammonia, cyanide, aluminum, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, phenols, oil and grease, and chlorine (residual). A.☐ yes B.☒ no

I certify that I am familiar with the information contained in the application and that to the best of my knowledge and belief such information is true, complete, and accurate.

Terry Wheeler — Printed Name of Person Signing

County Manager — Title

Date Application Signed

Signature of Applicant

North Carolina General Statute 143-215.6(b)(2) provides that: Any person who knowingly makes any false statement representation, or certification in any application, record, report, plan, or other document files or required to be maintained under Article 21 or regulations of the Environmental Management Commission implementing that Article, or who falsifies, tampers with, or knowly renders inaccurate any recording or monitoring device or method required to be operated or maintained under Article 21 or regulations of the Environmental Management Commissi implementing that Article, shall be guilty of a misdemeanor pumishable by a fine not to exceed $10,000, or by imprisonment not to exceed six months, or by both. (18 U.S.C. Section 1001 provi a punishment by a fine of not more than $10,000 or imprisonment not more than 5 years, or both f a similar offense.)

NORTH CAROLINA DEPT. NATURAL RESOURCES AND COMMUN DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT, P.O. BOX 27687, RALEIGH, NC 27611

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
APPLICATION FOR PERMIT TO DISCHARGE - SHORT FORM C

FOR AGENCY USE

APPLICATION NUMBER									
DATE RECEIVED									
YEAR		MO.		DAY					

To be filed only by persons engaged in manufacturing and mining

Do not attempt to complete this form before reading accompanying instructions

Please print or type

1. Name, address, location, and telephone number of facility producing discharge

A. Name Dare County

B. Mailing address

1. Street address P.O. Drawer 1000
2. City Manteo
3. State North Carolina
4. County Dare
5. ZIP 27954

C. Location:

1. Street Blackmar Gut
2. City Rodanthe
3. County Dare
4. State North Carolina

D. Telephone No. 919 (Area Code) 473-1101 Ext. 288

2. SIC [ ][ ][ ][ ] (Leave blank)

3. Number of employees 3

If all your waste is discharged into a publicly owned waste treatment facility and to the best of your knowledge you are not required to obtain a discharge permit, proceed to item 4. Otherwise proceed directly to item 5.

4. If you meet the condition stated above, check here ☐ and supply the information asked for below. After completing these items, please complete the date, title, and signature blocks below and return this form to the proper reviewing office without completing the remainder of the form.

A. Name of organization responsible for receiving waste

B. Facility receiving waste:

1. Name
2. Street address
3. City
4. County
5. State
6. ZIP

5. ☒ Principal product, ☐ raw material (Check one)

6. Principal process Reverse Osmosis Water Treatment

7. Maximum amount of principal product produced or raw material consumed per (Check one)

Basis	Amount							
	1-99 (1)	100-199 (2)	200-499 (3)	500-999 (4)	1000-4999 (5)	5000-9999 (6)	10,000-49,999 (7)	50,000 or more (8)
A. Day								X
B. Month								
C. Year								

PREVIOUS EDITION MAY BE USED UNTIL SUPPLY IS EXHAUSTED

Ms. Coleen Sullins
Division of Environmental Management
NC Department of Environment
Health & Natural Resources
P.O. Box 29535
Raleigh, North Carolina 27626-0535

Dear Ms. Sullins:

We are enclosing three copies of NPDES permit application along with an application fee of $400.00, for discharge of reject water from a proposed Reverse Osmosis Water Treatment Plant, to serve the Dare County villages of Rodanthe, Waves, and Salvo. Attached to the application is a brief description of the raw water supply and the potential TDS of the reject water, along with a complete analysis of the raw water. Also attached is a map showing the location of Blackmar Gut, the proposed discharge location.

Should you have questions, please contact Joe Hardee with Black & Veatch at (910) 672-3610 or (919) 859-7203.

Very truly yours,

Terry Wheeler, Manager
Dare County

jph
cc: Joe Hardee, Black & Veatch

APPENDIX I

(8 pages)

BLACK & VEATCH

110 West Walker Avenue, Asheboro, North Carolina 27204-0728, (919) 672-3600, Fax: (919) 672-3640

Dare County
Water Improvements
Rodanthe, Waves, Salvo

B&V Project 24420.910

November 17, 1993

Mr. Terry Wheeler, Manager
Dare County
P.O. Drawer 1000
Manteo, North Carolina 27954

Dear Terry:

Enclosed are four copies of NPDES permit application for reject water discharge from the RO Plant at Rodanthe. Would you sign all copies and forward three copies to Ms. Sullins at DEM, along with check for application fee of $400.00. Keep the fourth copy for your files. We have prepared a draft transmittal letter to Ms. Sullins for your use.

Should you have any questions, please give me a call.

Very truly yours,

BLACK & VEATCH

Joseph E. Hardee

jph
Enclosures

BEGINNING at a 1" new iron pipe set on the south side of a 20.00 foot wide right of way, said iron pipe being on the north line of a parcel of land now or formerly owned by Walter L. Gregory, a deed of which is recorded in Deed Book 561 at Page 384 in the Dare County Registry, said iron pipe being 109.74 feet from the northwest corner of said parcel and also being South 13 degrees 03 minutes 12 seconds West 190.00 feet from USC&GS Monument Rodan, said iron pipe also having the NAD/27 Coordinates of North 690,194.47' and East 3,050,301.30'; thence, by a new line of division through the land of the grantors herein,

1. South 00 degrees 08 minutes 22 seconds East 82.50 feet to a 1" new iron pipe set on the north line of a parcel of land now or formerly owned by the County of Dare (Deed Book 490 Page 305); thence, with a part of their north line,

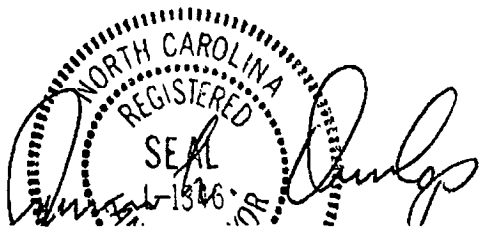
2. South 89 degrees 51 minutes 38 seconds West 109.74 feet to the southeast corner of a parcel of land now or formerly owned by Georgia M. Eason (Deed Book 124 Page 635); thence, with her east line,

3. North 00 degrees 08 minutes 22 seconds West 82.50 feet to a point on the south side of the aforementioned right of way; thence, with said right of way,

4. North 89 degrees 51 minutes 38 seconds East 109.74 feet to the point of beginning and containing 9,053 square feet of land by computer.

Being a part of Deed Book 561 at Page 384 as surveyed for the County of Dare in the NAD/27 Datum by James L. Dunlop, RLS # L-1346.

WITNESS my hand and seal this 10th day of January, 1994.



Beginning at a 1" new iron pipe set on the south line of a parcel of land now or formerly owned by the County of Dare, a deed of which is recorded in Deed Book 490 at Page 305 in the Dare County Registry, said iron pipe being North 87 degrees 34 minutes 55 seconds East 362.50 feet from an existing concrete monument found on the east right of way line of NC Highway 12 at the southwest corner of said county parcel; thence, with a part of said county line,

1. North 87 degrees 34 minutes 55 seconds East 78.85 feet to a 1" new iron pipe set on said line; thence, by the new easement lines through a part of the lands of the grantors herein,

2. South 02 degrees 25 minutes 05 seconds East 10.00 feet to a 1" new iron pipe set; thence,

3. South 87 degrees 34 minutes 55 seconds West 78.85 feet to a 1" new iron pipe; thence,

4. North 02 degrees 25 minutes 05 seconds West 10.00 feet to the point of beginning and containing 788.5 square feet of land by computer.

Being a water quality protection easement over that parcel of land now or formerly owned by Wilma M. Midgett (Deed Book 353 Page 554), as surveyed for the County of Dare in the NAD/27 Datum by James L. Dunlop, RLS # L-1346.

WITNESS my hand and seal this 10th day of January, 1994.

BEGINNING at a 1" new iron pipe set on the south side of a 20.00 foot wide right of way, said iron pipe being on the north line of a parcel of land now or formerly owned by Georgia M. Eason, a deed of which is recorded in Deed Book 124 at Page 635 in the Dare County Registry, and being 92.50 feet from the northeast corner of said parcel, said iron pipe also being South 52 degrees 52 minutes 26 seconds East 307.47 feet from USC&GS Monument Rodan and said iron pipe having the NAD/27 coordinates of North 690,193.98' and East 3,050,099.07 ; thence, with a part of the north line of said parcel,

1. North 89 degrees 51 minutes 38 seconds East 92.50 feet to the northwest corner of a parcel of land now or formerly owned by Walter L. Gregory (Deed Book 561 Page 384); thence, with his west line,

2. South 00 degrees 08 minutes 22 seconds East 82.50 feet to a point on the north line of a parcel of land now or formerly owned by the County of Dare (Deed Book 490 Page 305); thence, with a part of their north line,

3. South 89 degrees 51 minutes 38 seconds West 92.50 feet to a 1" new iron pipe; thence, by a new line of division through the land of the grantors herein,

4. North 00 degrees 08 minutes 22 seconds West 82.50 feet to the point of beginning and containing 7,631 square feet of land by computer.

Being a part of Deed Book 124 at Page 635 as surveyed for the County of Dare in the NAD/27 Datum by James L. Dunlop, RLS # L-1346.

WITNESS my hand and seal this 10th day of January, 1994.

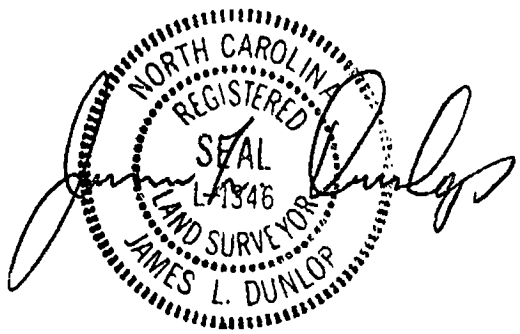


TABLE 4-7

YORKTOWN AQUIFER BLENDED WATER ANALYSIS

	DAY OF SAMPLE	
	2	7
BOD_5 (mg/l)	<0.2	0.3
Alkalinity, as $CaCO_3$ (mg/l)	597	601
Chloride (mg/l)	435	435
Color (PCU)	30	30
Conductivity @ 25 C (umhos/cm^2)	2,200	2,350
Fluoride (mg/l)	1.96	1.95
Total Hardness (mg/l)	98	100
Nitrate-Nitrogen (mg/l)	0.054	0.025
Nitrite-Nitrogen (mg/l)	<0.002	<0.002
pH (units)	7.8	7.9
Total Phosphorus (mg/l)	0.086	0.05
Total Solids (mg/l)	1,480	1,470
Total Volatile Solids (mg/l)	271	221
Total Suspended Solids (mg/l)	4	7
Total Dissolved Solids (mg/l)	1,460	1,467
Settleable Solids (mg/l)	<0.1	<0.1
Sulfate (mg/l)	<2	44
Turbidity (NTU)	0.3	3.0
TOC (mg/l)	115	117
Free Chlorine (mg/l)	<0.1	<0.1
Silica (mg/l)	6.1	27
Strontium (mg/l)	0.75	0.72
Silver (mg/l)	<0.01	<0.01
Aluminum (mg/l)	<0.2	<0.2
Arsenic (mg/l)	<0.002	<0.002
Barium (mg/l)	<0.1	<0.11
Calcium (mg/l)	9.48	9.40
Cadmium (mg/l)	<0.005	<0.005
Total Chromium (mg/l)	<0.02	<0.02
Hexavalent Chromium (mg/l)	<0.02	<0.02
Copper (mg/l)	<0.02	<0.02
Iron (mg/l)	0.052	0.048
Mercury (mg/l)	<0.0005	<0.0005
Potassium (mg/l)	38.5	35.8
Magnesium (mg/l)	20.6	19.9
Manganese (mg/l)	<0.01	<0.01
Sodium (mg/l)	588	527
Lead (mg/l)	<0.05	<0.09
Selenium (mg/l)	0.0023	0.0025
Zinc (mg/l)	0.024	0.026
SDI (units)	0.8	0.6
Temperature (deg F)	70	70

DARE COUNTY REVERSE OSMOSIS
WATER TREATMENT PLANT
TO SERVE
RODANTHE, WAVES, SALVO

The water supply will be brackish well water drawn from the Yorktown aquifer at a depth of 300-450 feet with ultimately anticipated TDS of 2,500 ppm. The analysis of water from test well after 2 and 7 days of continuous pumping is attached for your information. With an eventual TDS of 2,500 ppm and 75% recovery, the reject water will have a TDS of approximately 10,000 ppm. The current RO Plant at Kill Devil Hills has a reject water TDS of 11,690 ppm (9-19-93). Initially the recovery would result in a TDS of reject water of approximately 7,500 ppm.

BLACK & VEATCH

110 West Walker Avenue, Asheboro, North Carolina 27204-0728, (919) 672-3600, Fax: (919) 672-3640

Dare County
Blackmar Gut RO Water Treatment
NPDES Permit Application
NPDES Permit No. NC0083909

B&V Project 24420
B&V File F
January 3, 1993

NC Department of Environment,
Health and Natural Resources
Division of Environmental Management
P.O. Box 29535
Raleigh, North Carolina 27626-0535

Attention: Mr. Randy Kepler

Gentlemen:

This is in response to your correspondence of December 9, 1993 to Terry Wheeler, Dare County Manager, regarding NPDES Permit No. NC0083909. In this correspondence other information, consisting of an Alternative Analysis Report, was requested.

The Alternative Analysis consists of the evaluation of three non-discharge alternatives for waste water. These are: (1) Connection to an existing sewerage system; (2) Subsurface disposal system; (3) Spray irrigation system. The reject water from membrane treatment of brackish water consists of the same constituents as in the raw ground water. The only difference is they are concentrated about four times since the recovery of demineralized water is 75% of the raw water. In the case of discharge to Blackmar Gut, the water being discharged will have a total dissolved solids content of approximately 7-8,000 ppm. The TDS of raw water is currently 1,500 ppm, and the plant design is based upon the TDS increasing over time to 8,000 ppm.

Response to the three non-discharge alternatives is as follows:

(1) Connection To An Existing Sewerage System - There are no existing systems in the three villages that can accommodate this reject water, and if so, a normal biological plant would not reduce the TDS - only dilute it.

(2) Subsurface Disposal System - This would necessarily consist of the water going back into either the surficial aquifer or a deeper aquifer that has a TDS equal to or greater than 8,000 ppm. Currently the Ground Water Division of DEHNR does

not allow deep well injection, and if it were discharged to the surficial aquifer it would raise the TDS to an undesirable level.

(3) Spray Irrigation System - Spray irrigation would essentially return the water to the surficial aquifer. This would in turn raise the TDS to an undesirable level.

Currently Dare County has two NPDES Permits to discharge RO reject water from the treatment plant at Kill Devil Hills. Also, the Ocracoke Sanitary District has a permit to discharge RO reject water to the Pamlico Sound. The TDS of Pamlico Sound, in vicinity of Blackmar Gut, varies seasonally between 14,000 and 17,000 ppm.

Should you have questions please give me a call at (910)672-3610 or (919)859-7203.

Very truly yours,

BLACK & VEATCH

Joseph E. Hardee

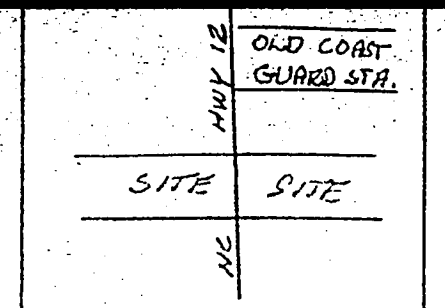
jph

cc: Mr. Terry Wheeler
Mr. Bob Oreskovich
Mr. Bill Bizzell
Mr. John Hendrick

THIS CERTIFIES THAT THIS COPY OF THIS PLAT IDENTIFIES AS WETLANDS ALL AREAS OF WETLANDS REGULATED PURSUANT TO SECTION 404 OF THE CLEAN WATER ACT AS DETERMINED BY THE UNDERSIGNED ON THIS DATE. UNLESS THERE IS A CHANGE IN THE LAW OR OUR PUBLISHED REGULATIONS, THIS DETERMINATION OF SECTION 404 JURISDICTION MAY BE RELIED UPON FOR A PERIOD NOT TO EXCEED THREE YEARS FROM THIS DATE. THIS DETERMINATION WAS MADE UTILIZING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL.

NAME [signature] TITLE Biologist DATE 1-24-94

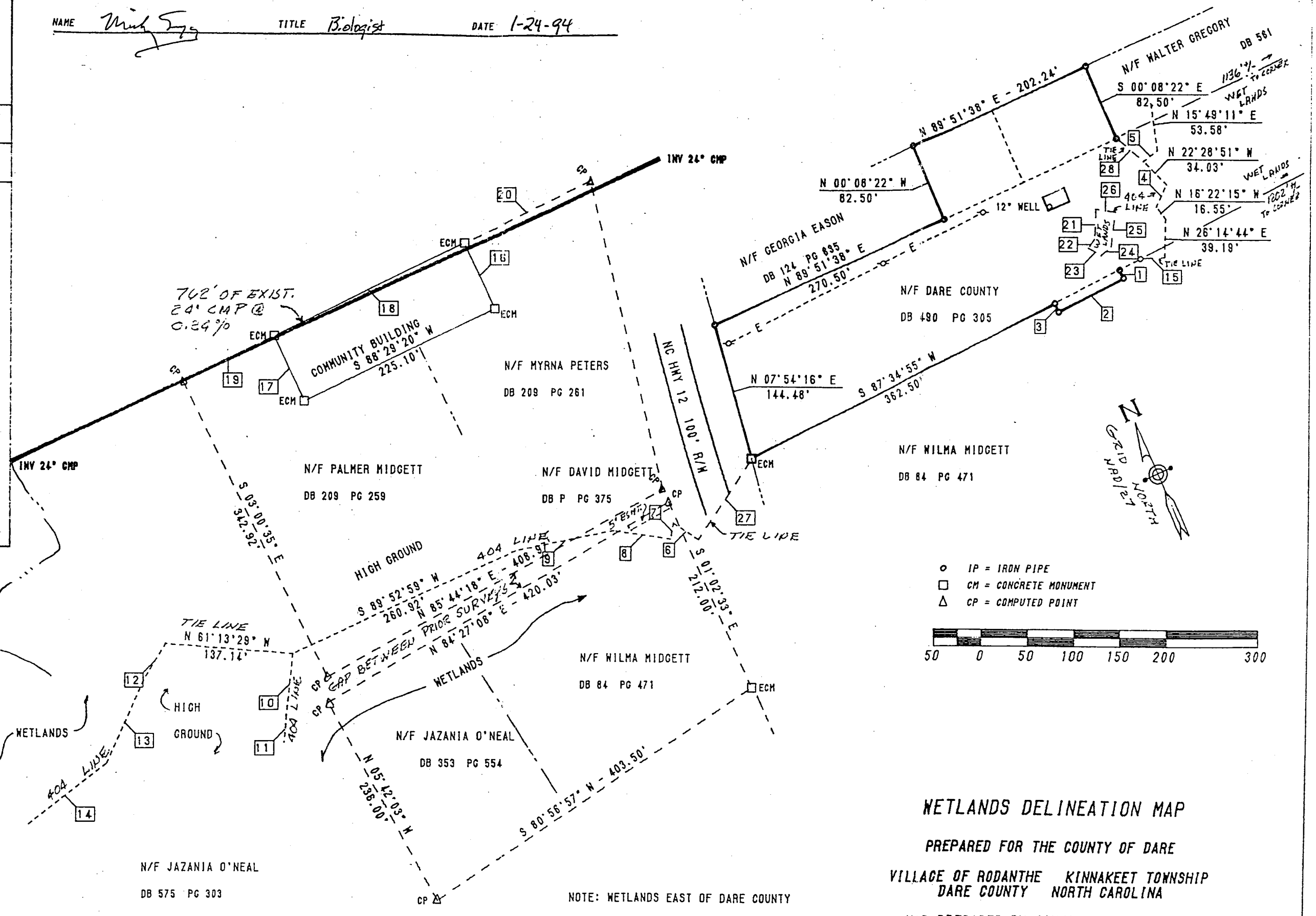
APPENDIX "J"



VICINITY MAP (NO SCALE)

LINE TABLE

LINE	QUADRANT BEARING	DIST.
1.	S 02°25'05" E	- 10.00'
2.	S 87°34'55" W	- 78.85'
3.	N 02°25'05" W	- 10.00'
4.	N 49°26'37" E	- 26.13'
5.	N 74°34'32" E	- 18.63'
6.	N 34°11'26" W	- 32.32'
7.	S 34°17'39" W	- 16.52'
8.	N 58°31'02" W	- 61.46'
9.	N 76°44'32" W	- 107.92'
10.	S 29°55'36" W	- 64.21'
11.	S 29°08'11" W	- 28.35'
12.	S 56°28'35" W	- 44.94'
13.	S 48°49'45" W	- 95.56'
14.	S 77°05'06" W	- 108.20'
15.	S 69°40'44" E	- 25.72'
16.	S 01°25'29" E	- 74.85'
17.	N 01°34'37" W	- 74.95'
18.	N 88°28'25" E	- 225.30'
19.	S 88°29'25" W	- 109.00'
20.	S 88°29'25" W	- 150.00'
21.	S 27°04'21" W	- 31.53'
22.	S 58°07'29" W	- 10.65'
23.	S 35°08'01" E	- 15.50'
24.	N 74°36'04" E	- 14.58'
25.	N 31°41'03" E	- 36.46'
26.	N 58°29'36" W	- 21.97'
27.	S 57°55'44" W	- 101.51'
28.	S 26°10'07" E	- 37.94'



NOTE: WETLANDS EAST OF DARE COUNTY PROPERTY EXTEND TO THE DUNE LINE.

NORTH CAROLINA REGISTERED SEAL L-1946 LAND SURVEYOR JAMES L. DUNLOP

THIS MAP IS NOT DRAWN FOR RECORDATION

WETLANDS DELINEATION MAP

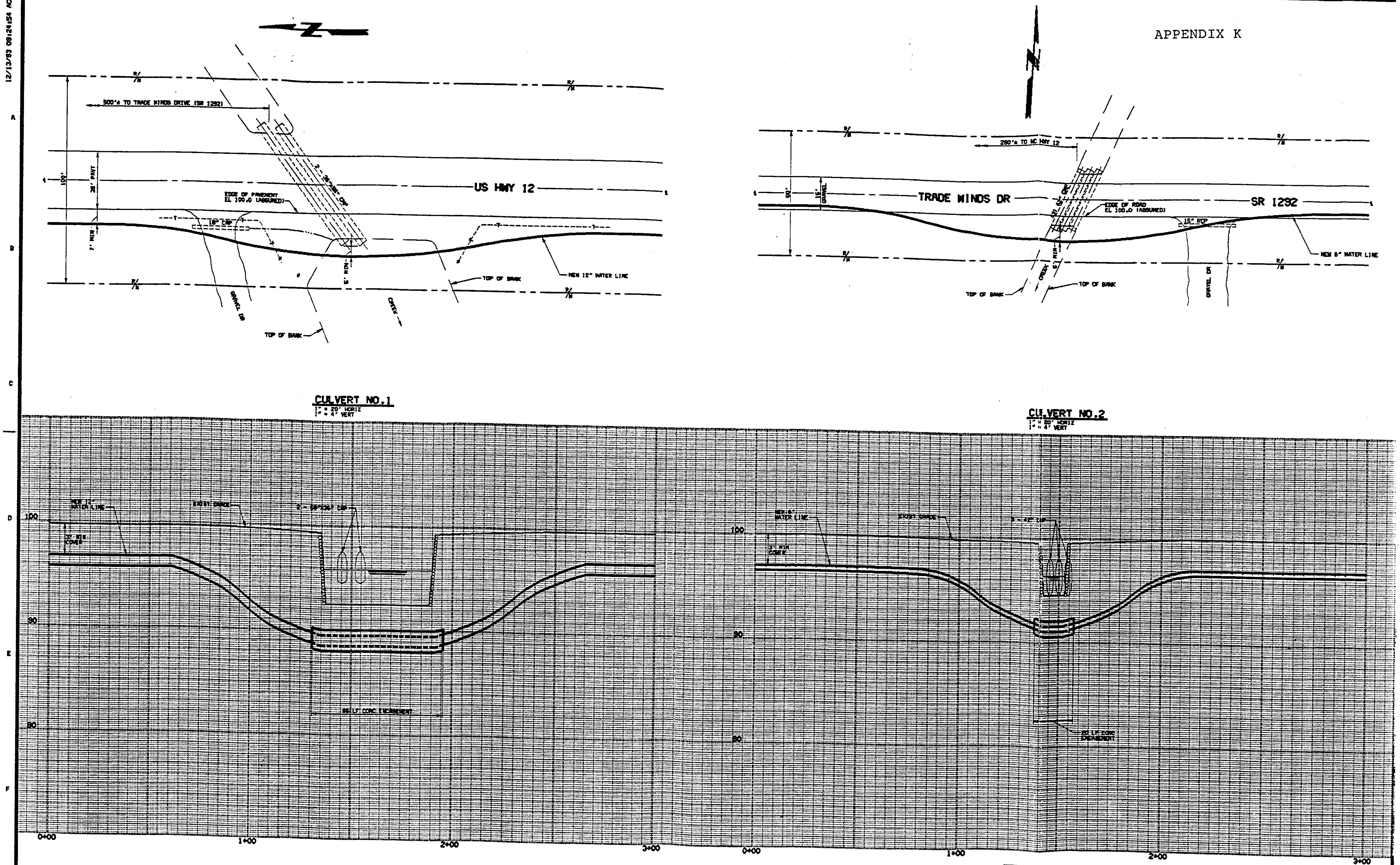
PREPARED FOR THE COUNTY OF DARE

VILLAGE OF RODANTHE KINNAKEET TOWNSHIP
DARE COUNTY NORTH CAROLINA

MAP PREPARED BY JAMES L. DUNLOP, RLS
P.O. BOX 703 AVON, NC 919 995-3973

SCALE: 1" = 100' DATE: JANUARY 20, 1993 DRAWING NO. 87-93WL.200

APPENDIX K



12/13/93 08:24:54 KCD

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY CK APP

DESIGNED
DETAILED CCL
CHECKED
APPROVED
DATE

Black & Veatch
Asheboro, North Carolina

PROJECT NO.
24420

WATER DISTRIBUTION SYSTEM
DARE COUNTY, NORTH CAROLINA
RODANTHE - WAVES - SALVO

STREAM CROSSINGS

SHEET
OF

24420-010-205-C100
01035
FC00000

APPENDIX L

RIPARIAN OWNERS NEAR PLANT SITE AND STREAM CROSSINGS

Warner M. Minor
c/o Nina M. Kansayer
1200 Hibiscus, Apartment 1102
Pompano Beach, FL 33062

Wilma M. Midgett
4307 Fleet Landing Road
Atlantic Beach, FL 32233

Chicamacomico Historical Association
Rodanthe, NC 27968

Rodanthe-Salvo-Waves
Community Center District
Rodanthe, NC 27968

Myra Peters & Thomas Peters
Box 98
Rodanthe, NC 27968

Palmer S. Midgett, Jr.
Box 4771
McDade, TX 78650

Jazania O'Neal & Wilbert A. O'Neal
Box 38
Rodanthe, NC 27968

Ellen Susan Peel
1739 Lexington Avenue
San Mateo, CA 94402

George & Ritoa Merjos
P.O. Box 122
Rodanthe, NC 27968

George Merjos
P.O. Box 122
Rodanthe, NC 27968

ADDENDUM

APPENDIX L

RIPARIAN OWNERS NEAR WELL SITES 2 & 3

Jimmy C. Oneal
17522 Long Street Circle
Sharpsburg, MD 21782

Mary B, Midgett
c/o Joseph B. Boyce, Jr.
6006 Shaffer Drive
Alexandria, VA 22312

A. Thomas Murphy, Jr., Etux
Mary Helen Goodloe-Murphy
P. O. Box 147
Rodanthe, NC 27968

Hatteras Island Motel Ltd.
c/o Millard V. Oakley
Hatteras Partners
P. O. Box 520
Livingston, TN 38570

Holiday Shores Limited Partnership
c/o J. Phelan Realty
4048 Martins Point Road
Kitty Hawk, NC 27949

Patrick T. Dick, Etux
Carole A. Dick
842 Commerce Street
Wellsburg, WV 26070

P. W. Trueblood, Jr.
Route 3, Box 67
Roper, NC 27970

January 3, 1994

Inside Address

Dear _____:

Dare County is in the process of planning and constructing a potable water system to serve residents in the Hatteras Island Villages of Rodanthe, Waves, and Salvo. As a part of this process, a water line will be installed under an unnamed stream which fronts or abuts your property. Certain permits require that you be notified of this proposed construction activity.

Should you have any questions or concerns (environmental or otherwise) regarding this proposed installation, please respond to me in writing or call me at (919) 473-1101, Extension 308.

Thank you for your attention to this matter.

Sincerely,

Al Cole
Dare County Attorney