

Pender County Planning and Community Development

Planning Division

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Application Information

Conditional Rezoning – Rocky Point Wastewater Treatment Facility

Case Number: REZONE 2024-71

Application Type: Conditional Rezoning

Applicant: Stroud Engineering, PA

Owner: B Squared, LLC

Location: The subject site is located south of Ashton Road in the Rocky Point Township.

Property ID #(s): 3235-09-3918-0000

Description: Conditional Rezoning request to permit a wastewater treatment facility.

Current Zoning: RA, Rural Agricultural

Proposed Zoning: Conditional Zoning District

Technical Review Committee Meeting: August 1st, 2024

Board of County Commissioners/Planning Board Meeting: TBD

Application Materials

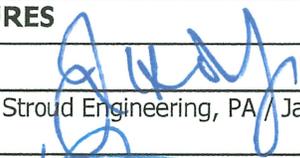
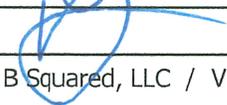
Application

Narrative

Site Plan

APPLICATION

APPLICATION FOR CONDITIONAL REZONING

THIS SECTION FOR OFFICE USE			
Application No.	ZMA-CD	Date	
Application Fee	\$	Invoice Number:	
Pre-Application Conference		Hearing Date	
SECTION 1: APPLICANT INFORMATION			
Applicant's Name:	Stroud Engineering PA	Owner's Name:	B Squared, LLC
Applicant's Address:	102 D Cinema Drive	Owner's Address:	1979 Eastwood Rd, Suite 101
City, State, & Zip	Wilmington, NC 28403	City, State, & Zip	Wilmington, NC 28403
Phone Number:	910-815-0775	Phone Number:	(910)-378-7610
Email Address:	jfentress@stroudengineer.com	Email Address:	vinceb@burgesscorporation.net
Legal relationship of applicant to landowner:		Correct PIN #3235-09-3918-0000	
SECTION 2: PROJECT INFORMATION			
Property Identification Number (PIN):	3225-99-5982-0000	Total property acreage:	10AC
Current Zoning District:	RA	Acreage to be Rezoned:	10AC
Project Address or Location:	11763 Ashton Rd. Burgaw, NC 28452	Proposed Zoning District:	RA
Proposed Uses to be Considered (Include NAICS Code): 221320			
Sewage Treatment Facility			
Proposed Uses to be Eliminated from Consideration (Include NAICS Code):			
Township:	Rocky Point	Road Type:	Public/Private/Both
Water Provider:		Waste Water Provider:	
SECTION 3: SIGNATURES			
Applicant's Signature		Date:	7/3/2024
Applicant's Name Printed	Stroud Engineering, PA / James H. Fentress, Jr.	Date:	
Owner's Signature		Date:	3 July 2024
Owner's Name Printed	B Squared, LLC / Vince Burgess	Date:	
NOTICE TO APPLICANT			
<ol style="list-style-type: none"> 1. Applicant must also submit the information described on the Rezoning Checklist. 2. Applicant or agent authorized in writing must attend the public hearing. 3. Once the public hearing has been advertised, the case will be heard unless the applicant withdraws the application or unless the Planning Board or other authorized person agrees to table or delay the hearing. 4. All fees are non-refundable 5. A complete application packet must be submitted prior to the deadline in order to be placed on the next Planning Board Agenda 			

NARRATIVE



STROUD ENGINEERING, P.A.

CONSULTING ENGINEERS
102-D CINEMA DRIVE
WILMINGTON, NORTH CAROLINA 28403
WWW.STROUDENGINEER.COM
LICENSE NO. C-0647

WASTE WATER TREATMENT PLANT CONDITIONAL ZONING NARRATIVE FOR **B SQUARED, LLC**

Stroud Engineering
April 26, 2024

Project Summary

B Squared, LLC is proposing to construct a wastewater treatment plant on approximately 10 acres of land located off Ashton Road near Rocky Point, NC in the south eastern edge of Pender County. The plant is proposed in preparation for future development on the adjoining properties in the immediate area. Pender County requires waste water treatment facilities to be an allowed or conditioned use. This submittal is fashioned to address the requirements of the Pender County Conditional Use Zoning application.

The wastewater treatment facility will be located on a proposed ten-acre parcel within property owned by B Squared, LLC. This is intended to provide ability to deed the property and all improvements to a utility going forward should such conveyance become beneficial to all stakeholders. In the absence of any utility company suitors, B Squared, LLC will build the plant and create a utility for its operation. The intent here is to realize a sustainable water source for a sod farm.

The proposed waste water treatment method will be membrane bioreactor, MBR treatment as described by the attached EPA fact sheet. To meet the State of North Carolina's administrative code for water reuse the waste water treatment plant will treat the water to a quality exceeding that required for consideration as clean groundwater. The treatment processes will include aeration, flocculation, membrane filtration, and disinfection. The treated water will be discharged to a distribution system dedicated to irrigating the adjacent sod farm use planned by B Squared, LLC. The sod farm will provide the vegetative assimilation of the wastewater treatment plant effluent. This sustainable system will provide carbon sequestration through the development of the sod cover crop. All of these facilities and processes will require permitting through the North Carolina Department of Environment and Natural Resources, Water Quality Section.

Site Description

The topography of the site has little variance, with slopes ranging from 0% to 2% throughout the entire site. This property exists within an Opportunity Zone as defined by the Tax Cuts and Jobs Act of 2017 ([Public Law No. 115-97](#)). The site presently exists as rural agricultural land. There are no wetlands located on the proposed site. The majority of the site drains to Kellys Creek. Kellys Creek is tributary to Rileys Creek, Long Creek, and on to the North East Cape Fear River. Long Creek is classified as C, Sw. The property is zoned RA by Pender County. The CAMA Land Use classification is Forestry Area.

Permits Required

One of the prior landowners, Prometheus Properties, LLC secured a Special Use Permit through Pender County SUP 09-02-02-02 for wastewater treatment and disposal on this property (see attached). The effort here will be to resurrect that use for the present landowner B Squared, LLC. The RA zoning no longer allows waste water treatment by special use permit. The current proposal will be to Conditionally Zone the property for the specific use of waste water treatment. The wastewater processes described above will require approval through the North Carolina Department of Environmental Quality, NCDEQ, Division of Water Resources. State Stormwater, Soil Erosion and Sedimentation Control Permitting will also be required through the NCDEQ Division of Energy, Mineral and Land Resources. The proposed driveway onto Ashton Road will require North Carolina Department of Transportation approval. A Jurisdictional Determination will be renewed from the United States Army Corps of Engineers albeit, at this time, no wetland encroachments are proposed.

Adjoining Property

Adjoining property is primarily undeveloped RA and undeveloped R-20 by the Pender County Zoning Map. The property adjoining to the north, east, and west are currently zoned RA. The property adjoining to the south of proposed site is zoned RA by Pender County. There exists a few existing residences fronting an extension of an abandon Seaboard Coastline Railroad R/W, from McCrary Road. This R/W abuts the eastern boundary line of adjoining property owned by B Squared, LLC.

[CONTINUED]

Soils

Soils in the project area are mapped in the Pender County Soil Survey as Torhunta mucky fine sandy loam, and Woodington fine sandy loam. Torhunta mucky fine sandy loam is characterized as poorly drained soils on broad uplands and stream terraces. Woodington fine sandy loam is characterized as poorly drained soils on broad uplands and in depressions. The locations of these soils has been given due consideration in the site location of the treatment facility.

Potential Impacts

The environmental benefits of the treatment facility include a net improvement of groundwater quality when compared to a large number of individual septic systems that have been the traditional means for providing wastewater disposal in the region. Adjacent high quality surface waters will be protected through utilization of the sophisticated treatment process proposed and required to permit the facility with NCDENR. The increased value of homes due to a community wastewater treatment system will ultimately have a positive impact on adjacent properties as the area becomes more desirable.

Supporting Information-Required Findings

The use permitted by the proposed change will be appropriate in the area proposed, including that the proposed rezoning will not:

1) be detrimental to the natural environment,

The requested use is intended to be supportive of agriculture consistent with adjacent uses given the wastewater effluent's conjunctive use as irrigation water for a sod farm. This specialized treatment of wastewater will enable the development of the adjacent properties in a manner which is consistent with adjacent and historical uses however minimizing the environmental impacts of future development in an environmentally and economically valuable portion of the county.

2) adversely affect the health, safety, or welfare of residents or workers in the area,

Measures will be taken to reduce or eliminate sights, sounds, and odors which can accompany wastewater treatment facilities. The use of catalytic air scrubbers effectively neutralizes odors. Noisy mechanical equipment will be placed inside a building to eliminate the sound and prolong the life of the components.

3) be detrimental to the use or development of adjacent property,

The treatment facility will be screened with landscaping within regulated buffers at its property line to mitigate nuisances commonly associated with such facilities. Fencing will be installed around the immediate facility to prevent unauthorized entry.

4) materially or adversely affect the character of the general neighborhood,

The proposed Wastewater treatment use will be buffered by its own property boundary being much larger than necessary as well as vegetatively per the Pender County Zoning Ordinance all in effort to isolate the use and safeguard the adjacent properties.

5) be reasonable as it relates to the public interest. B. Whether adequate public facilities/services (i.e.- water, wastewater, roads, schools, etc.) exist, are planned, or can be reasonably provided to serve the needs of any permitted uses likely to be constructed as a result of such change; C. Whether the proposed change is consistent with the County's Comprehensive Land Use Plan, CAMA Land Use Plan, and any other adopted land use document

The requested use will enable the development of the subject property in a manner which is consistent with the Pender County Land Use Plan. The property currently exists as forestry consistent to agriculture. The proposed use will support an adjacent agricultural use. This property exists within an Opportunity Zone.

Attachments

JHF/jf

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Wastewater Management Fact Sheet

Membrane Bioreactors

INTRODUCTION

The technologies most commonly used for performing secondary treatment of municipal wastewater rely on microorganisms suspended in the wastewater to treat it. Although these technologies work well in many situations, they have several drawbacks, including the difficulty of growing the right types of microorganisms and the physical requirement of a large site. The use of microfiltration membrane bioreactors (MBRs), a technology that has become increasingly used in the past 10 years, overcomes many of the limitations of conventional systems. These systems have the advantage of combining a suspended growth biological reactor with solids removal via filtration. The membranes can be designed for and operated in small spaces and with high removal efficiency of contaminants such as nitrogen, phosphorus, bacteria, biochemical oxygen demand, and total suspended solids. The membrane filtration system in effect can replace the secondary clarifier and sand filters in a typical activated sludge treatment system. Membrane filtration allows a higher biomass concentration to be maintained, thereby allowing smaller bioreactors to be used.

APPLICABILITY

For new installations, the use of MBR systems allows for higher wastewater flow or improved treatment performance in a smaller space than a conventional design, i.e., a facility using secondary clarifiers and sand filters. Historically, membranes have been used for smaller-flow systems due to the high capital cost of the equipment and high operation and maintenance (O&M) costs. Today however, they are receiving increased use in larger systems. MBR systems are also well suited for some industrial and commercial applications. The high-quality effluent produced by MBRs makes them particularly applicable to reuse applications and for surface

water discharge applications requiring extensive nutrient (nitrogen and phosphorus) removal.

ADVANTAGES AND DISADVANTAGES

The advantages of MBR systems over conventional biological systems include better effluent quality, smaller space requirements, and ease of automation. Specifically, MBRs operate at higher volumetric loading rates which result in lower hydraulic retention times. The low retention times mean that less space is required compared to a conventional system. MBRs have often been operated with longer solids residence times (SRTs), which results in lower sludge production; but this is not a requirement, and more conventional SRTs have been used (Crawford et al. 2000). The effluent from MBRs contains low concentrations of bacteria, total suspended solids (TSS), biochemical oxygen demand (BOD), and phosphorus. This facilitates high-level disinfection. Effluents are readily discharged to surface streams or can be sold for reuse, such as irrigation.

The primary disadvantage of MBR systems is the typically higher capital and operating costs than conventional systems for the same throughput. O&M costs include membrane cleaning and fouling control, and eventual membrane replacement. Energy costs are also higher because of the need for air scouring to control bacterial growth on the membranes. In addition, the waste sludge from such a system might have a low settling rate, resulting in the need for chemicals to produce biosolids acceptable for disposal (Hermanowicz et al. 2006). Fleischer et al. 2005 have demonstrated that waste sludges from MBRs can be processed using standard technologies used for activated sludge processes.

MEMBRANE FILTRATION

Membrane filtration involves the flow of water-containing pollutants across a membrane. Water permeates through the membrane into a separate channel for recovery (Figure 1). Because of the cross-flow movement of water and the waste constituents, materials left behind do not accumulate at the membrane surface but are carried out of the system for later recovery or disposal. The water passing through the membrane is called the *permeate*, while the water with the more-concentrated materials is called the *concentrate* or *retentate*.

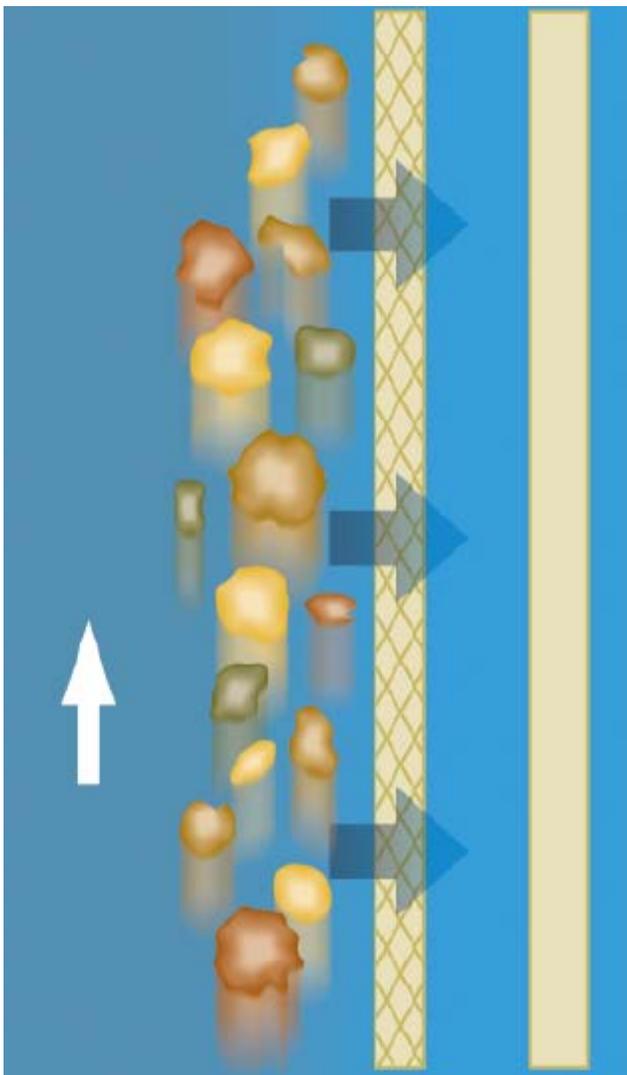


Figure 1. Membrane filtration process (Image from Siemens/U.S. Filter)

Membranes are constructed of cellulose or other polymer material, with a maximum pore size set during the manufacturing process. The require-

ment is that the membranes prevent passage of particles the size of microorganisms, or about 1 micron (0.001 millimeters), so that they remain in the system. This means that MBR systems are good for removing solid material, but the removal of dissolved wastewater components must be facilitated by using additional treatment steps.

Membranes can be configured in a number of ways. For MBR applications, the two configurations most often used are hollow fibers grouped in bundles, as shown in Figure 2, or as flat plates. The hollow fiber bundles are connected by manifolds in units that are designed for easy changing and servicing.



Figure 2. Hollow-fiber membranes (Image from GE/Zenon)

DESIGN CONSIDERATIONS

Designers of MBR systems require only basic information about the wastewater characteristics, (e.g., influent characteristics, effluent requirements, flow data) to design an MBR system. Depending on effluent requirements, certain supplementary options can be included with the MBR system. For example, chemical addition (at various places in the treatment chain, including: before the primary settling tank; before the secondary settling tank [clarifier]; and before the MBR or final filters) for phosphorus removal can be included in an MBR system if needed to achieve low phosphorus concentrations in the effluent.

MBR systems historically have been used for small-scale treatment applications when portions of the treatment system were shut down and the

wastewater routed around (or bypassed) during maintenance periods.

However, MBR systems are now often used in full-treatment applications. In these instances, it is recommended that the installation include one additional membrane tank/unit beyond what the design would nominally call for. This “N plus 1” concept is a blend between conventional activated sludge and membrane process design. It is especially important to consider both operations and maintenance requirements when selecting the number of units for MBRs. The inclusion of an extra unit gives operators flexibility and ensures that sufficient operating capacity will be available (Wallis-Lage et al. 2006). For example, bioreactor sizing is often limited by oxygen transfer, rather than the volume required to achieve the required SRT—a factor that significantly affects bioreactor numbers and sizing (Crawford et al. 2000).

Although MBR systems provide operational flexibility with respect to flow rates, as well as the ability to readily add or subtract units as conditions dictate, that flexibility has limits. Membranes typically require that the water surface be maintained above a minimum elevation so that the membranes remain wet during operation. Throughput limitations are dictated by the physical properties of the membrane, and the result is that peak design flows should be no

more than 1.5 to 2 times the average design flow. If peak flows exceed that limit, either additional membranes are needed simply to process the peak flow, or equalization should be included in the overall design. The equalization is done by including a separate basin (external equalization) or by maintaining water in the aeration and membrane tanks at depths higher than those required and then removing that water to accommodate higher flows when necessary (internal equalization).

DESIGN FEATURES

Pretreatment

To reduce the chances of membrane damage, wastewater should undergo a high level of debris removal prior to the MBR. Primary treatment is often provided in larger installations, although not in most small to medium sized installations, and is not a requirement. In addition, all MBR systems require 1- to 3-mm-cutoff fine screens immediately before the membranes, depending on the MBR manufacturer. These screens require frequent cleaning. Alternatives for reducing the amount of material reaching the screens include using two stages of screening and locating the screens after primary settling.

Membrane Location

MBR systems are configured with the mem-

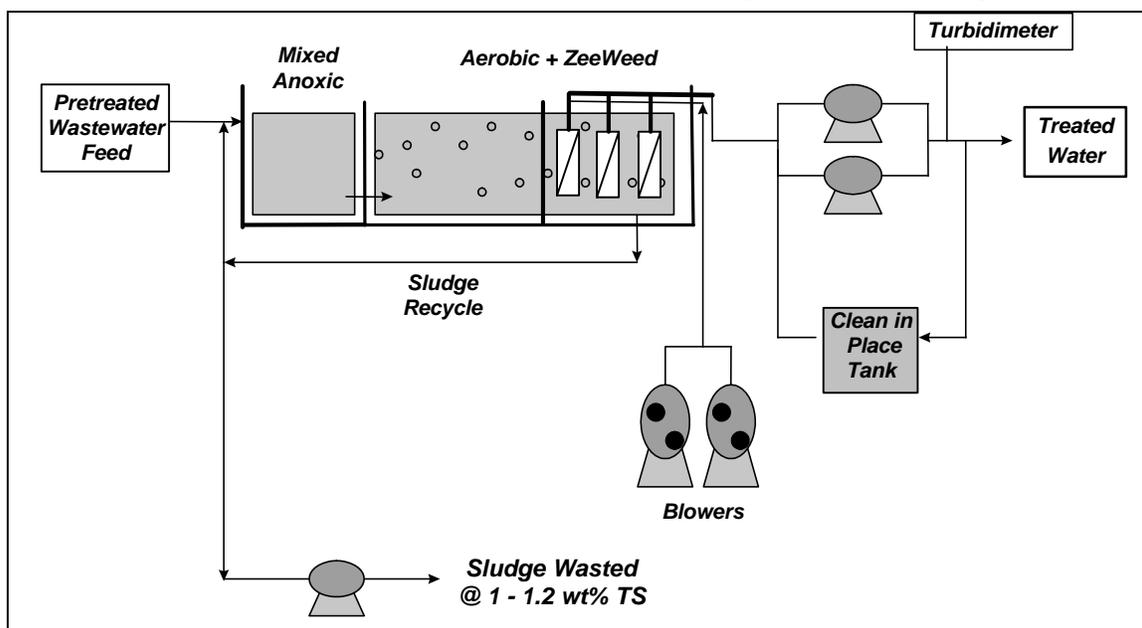


Figure 3. Immersed membrane system configuration (Image from GE/Zenon)

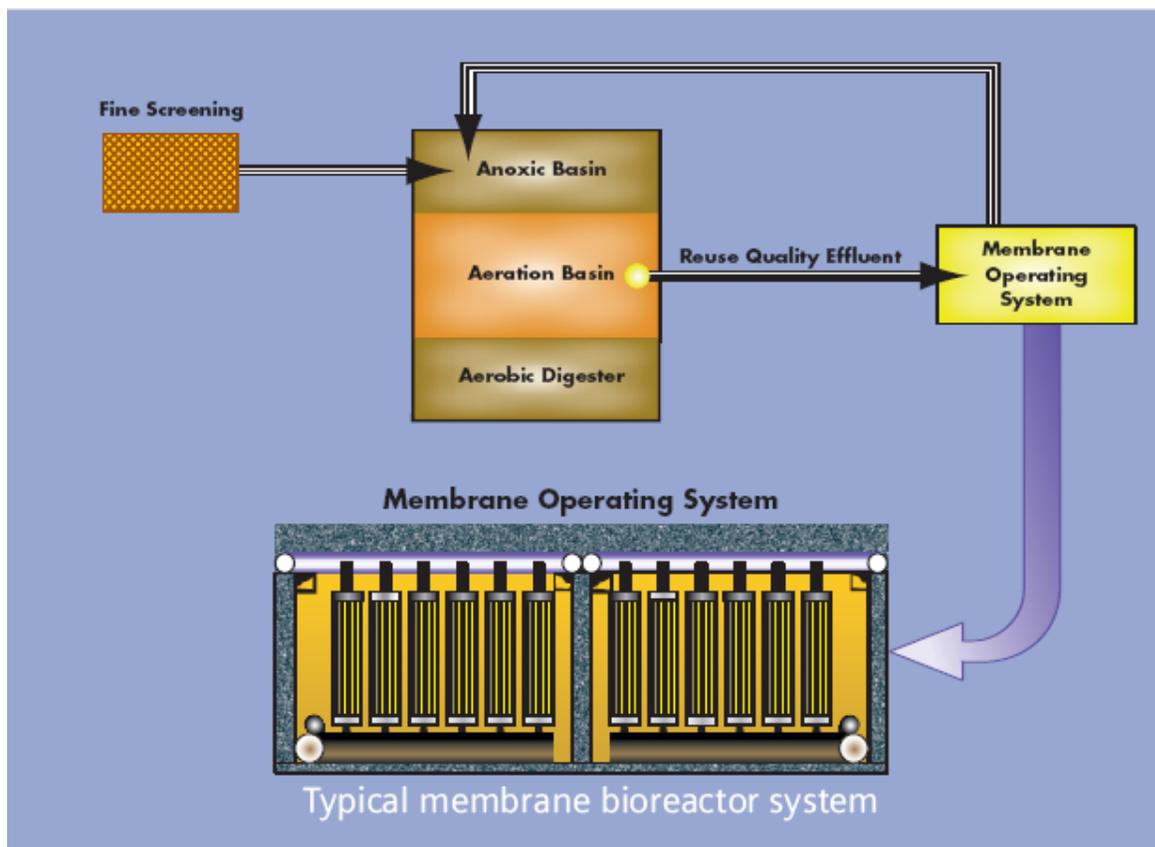


Figure 4. External membrane system configuration (Image from Siemens/U.S. Filter)

branes actually immersed in the biological reactor or, as an alternative, in a separate vessel through which mixed liquor from the biological reactor is circulated. The former configuration is shown in Figure 3; the latter, in Figure 4.

Membrane Configuration

MBR manufacturers employ membranes in two basic configurations: hollow fiber bundles and plate membranes. Siemens/U.S.Filter's Memjet and Memcor systems, GE/Zenon's ZeeWeed and ZenoGem systems, and GE/Ionics' system use hollow-fiber, tubular membranes configured in bundles. A number of bundles are connected by manifolds into units that can be readily changed for maintenance or replacement. The other configuration, such as those provided by Kubota/Enviroquip, employ membranes in a flat-plate configuration, again with manifolds to allow a number of membranes to be connected in readily changed units. Screening requirements for both systems differ: hollow-fiber membranes typically require 1- to 2-mm screening, while

plate membranes require 2- to 3-mm screening (Wallis-Lage et al. 2006).

System Operation

All MBR systems require some degree of pumping to force the water flowing through the membrane. While other membrane systems use a pressurized system to push the water through the membranes, the major systems used in MBRs draw a vacuum through the membranes so that the water outside is at ambient pressure. The advantage of the vacuum is that it is gentler to the membranes; the advantage of the pressure is that throughput can be controlled. All systems also include techniques for continually cleaning the system to maintain membrane life and keep the system operational for as long as possible. All the principal membrane systems used in MBRs use an air scour technique to reduce buildup of material on the membranes. This is done by blowing air around the membranes out of the manifolds. The GE/Zenon systems use air scour, as well as a back-pulsing technique, in which permeate is occasionally pumped back

into the membranes to keep the pores cleared out. Back-pulsing is typically done on a timer, with the time of pulsing accounting for 1 to 5 percent of the total operating time.

Downstream Treatment

The permeate from an MBR has low levels of suspended solids, meaning the levels of bacteria, BOD, nitrogen, and phosphorus are also low. Disinfection is easy and might not be required, depending on permit requirements..

The solids retained by the membrane are recycled to the biological reactor and build up in the system. As in conventional biological systems, periodic sludge wasting eliminates sludge buildup and controls the SRT within the MBR system. The waste sludge from MBRs goes through standard solids-handling technologies for thickening, dewatering, and ultimate disposal. Hermanowicz et al. (2006) reported a decreased ability to settle in waste MBR sludges due to increased amounts of colloidal-size particles and filamentous bacteria. Chemical addition increased the ability of the sludges to settle. As more MBR facilities are built and operated, a more definitive understanding of the characteristics of the resulting biosolids will be achieved. However, experience to date indicates that conventional biosolids processing unit operations are also applicable to the waste sludge from MBRs.

Membrane Care

The key to the cost-effectiveness of an MBR system is membrane life. If membrane life is curtailed such that frequent replacement is required, costs will significantly increase. Membrane life can be increased in the following ways:

- Good screening of larger solids before the membranes to protect the membranes from physical damage.
- Throughput rates that are not excessive, i.e., that do not push the system to the limits of the design. Such rates reduce the amount of material that is forced into the membrane and thereby reduce the amount that has to be re-

moved by cleaners or that will cause eventual membrane deterioration.

- Regular use of mild cleaners. Cleaning solutions most often used with MBRs include regular bleach (sodium) and citric acid. The cleaning should be in accord with manufacturer-recommended maintenance protocols.

Membrane Guarantees

The length of the guarantee provided by the membrane system provider is also important in determining the cost-effectiveness of the system. For municipal wastewater treatment, longer guarantees might be more readily available compared to those available for industrial systems. Zenon offers a 10-year guarantee; others range from 3 to 5 years. Some guarantees include cost prorating if replacement is needed after a certain service time. Guarantees are typically negotiated during the purchasing process. Some manufacturers' guarantees are tied directly to screen size: longer membrane warranties are granted when smaller screens are used (Wallis-Lage et al. 2006). Appropriate membrane life guarantees can be secured using appropriate membrane procurement strategies (Crawford et al. 2002).

SYSTEM PERFORMANCE

Siemens/U.S. Filter Systems

Siemens/U.S.Filter offers MBR systems under the Memcor and Memjet brands. Data provided by U.S. Filter for its Calls Creek (Georgia) facility are summarized below. The system, as Calls Creek retrofitted it, is shown in Figure 5. In essence, the membrane filters were used to replace secondary clarifiers downstream of an Orbal oxidation ditch. The system includes a fine screen (2-mm cutoff) for inert solids removal just before the membranes.

The facility has an average flow of 0.35 million gallons per day (mgd) and a design flow of 0.67 mgd. The system has 2 modules, each containing 400 units, and each unit consists of a cassette with manifold-connected membranes. As shown in Table 1, removal of BOD, TSS, and ammonia-nitrogen is excellent; BOD and TSS in the effluent are around the detection limit. Phosphorus is also removed well in the system, and the effluent

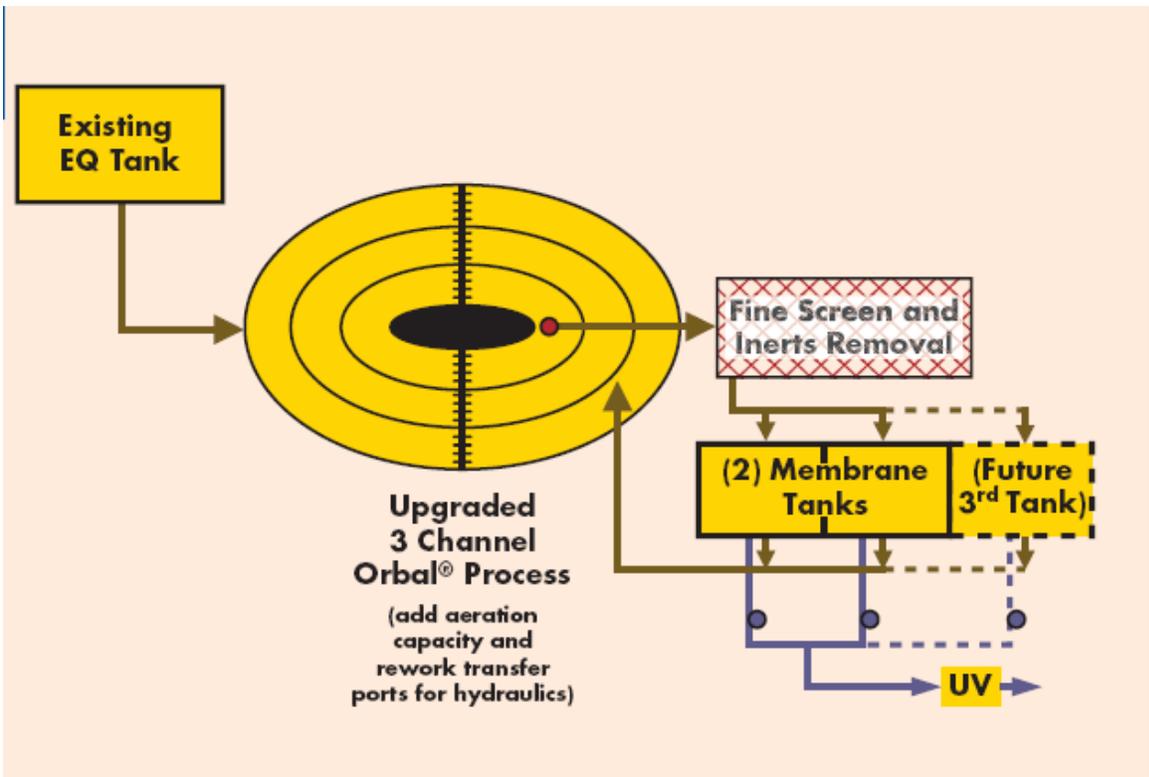


Figure 5. Calls Creek flow diagram (courtesy of Siemens/U.S. Filter)

Table 1.
Calls Creek results 2005

Parameter	Influent	Effluent		
	Average	Average	Max Month	Min Month
Flow (mgd)	0.35	--	0.44	0.26
BOD (mg/L)	145	1	1	1
TSS (mg/L)	248	1	1	1
Ammonia-N (mg/L)	14.8	0.21	0.72	0.10
P (mg/L)	0.88	0.28	0.55	0.12
Fecal coliforms (#/100 mL)	--	14.2	20	0
Turbidity (NTU)	--	0.30	1.31	0.01

has very low turbidity. The effluent has consistently met discharge limits.

Zenon Systems

General Electric/Zenon provides systems under the ZenoGem and ZeeWeed brands. The ZeeWeed brand refers to the membrane, while ZenoGem is the process that uses ZeeWeed.

Performance data for two installed systems are shown below.

Cauley Creek, Georgia. The Cauley Creek facility in Fulton County, Georgia, is a 5-mgd wastewater reclamation plant. The system includes biological phosphorus removal, mixed liquor surface wasting, and sludge thickening using a ZeeWeed system to minimize the required volume of the aerobic digester, according to information provided by GE. Ultraviolet disinfection is employed to meet regulatory limits. Table 2 shows that the removal for all parame-

Table 2.
Cauley Creek, Georgia, system performance

Parameter	Influent	Effluent		
	Average	Average	Max Month	Min Month
Flow (mgd)	4.27	--	4.66	3.72
BOD (mg/L)	182	2.0	2.0	2.0
COD (mg/L)	398	12	22	5
TSS (mg/L)	174	3.2	5	3
TKN (mg/L)	33.0	1.9	2.9	1.4
Ammonia-N (mg/L)	24.8	0.21	0.29	0.10
TP (mg/L)	5.0	0.1	0.13	0.06
Fecal coliforms (#/100 mL)	--	2	2	2
NO3-N (mg/L)	--	2.8		

ters is over 90 percent. The effluent meets all permit limits, and is reused for irrigation and lawn watering.

Traverse City, Michigan. The Traverse City Wastewater Treatment Plant (WWTP) went through an upgrade to increase plant capacity and produce a higher-quality effluent, all within the facility's existing plant footprint (Crawford et al. 2005). With the ZeeWeed system, the facility was able to achieve those goals. As of 2006, the plant is the largest-capacity MBR facility in North America. It has a design average annual flow of 7.1 mgd, maximum monthly flow of 8.5 mgd, and peak hourly flow of 17 mgd. The membrane system consists of a 450,000-gallon tank with eight compartments of equal size. Secondary sludge is distributed evenly to the compartments. Blowers for air scouring, as well as permeate and back-pulse pumps, are housed in a nearby building.

Table 3 presents a summary of plant results over a 12-month period. The facility provides excellent removal of BOD, TSS, ammonia-nitrogen, and phosphorus. Figure 6 shows the influent, effluent, and flow data for the year.

Operating data for the Traverse City WWTP were obtained for the same period. The mixed liquor suspended solids over the period January to August averaged 6,400 mg/L, while the mixed liquor volatile suspended solids averaged 4,400 mg/L. The energy use for the air-scouring blow-

ers averaged 1,800 kW-hr/million gallons (MG) treated.

COSTS

Capital Costs

Capital costs for MBR systems historically have tended to be higher than those for conventional systems with comparable throughput because of the initial costs of the membranes. In certain situations, however, including retrofits, MBR systems can have lower or competitive capital costs compared with alternatives because MBRs have lower land requirements and use smaller tanks, which can reduce the costs for concrete. U.S. Filter/Siemens's Memcor package plants have installed costs of \$7–\$20/gallon treated.

Fleischer et al. (2005) reported on a cost comparison of technologies for a 12-MGD design in Loudoun County, Virginia. Because of a chemical oxygen demand limit, activated carbon adsorption was included with the MBR system. It was found that the capital cost for MBR plus granular activated carbon at \$12/gallon treated was on the same order of magnitude as alternative processes, including multiple-point alum addition, high lime treatment, and post-secondary membrane filtration.

Operating Costs

Operating costs for MBR systems are typically higher than those for comparable conventional systems. This is because of the higher energy

Table 3.
Summary of Traverse City, Michigan, Performance Results

Parameter	Influent	Effluent		
	Average	Average	Max Month	Min Month
Flow (mgd)	4.3	--	5.1	3.6
BOD (mg/L)	280	< 2	< 2	< 2
TSS (mg/L)	248	< 1	< 1	< 1
Ammonia-N (mg/L)	27.9	< 0.08	< 0.23	< 0.03
TP (mg/L)	6.9	0.7	0.95	0.41
Temperature (deg C)	17.2	--	23.5	11.5

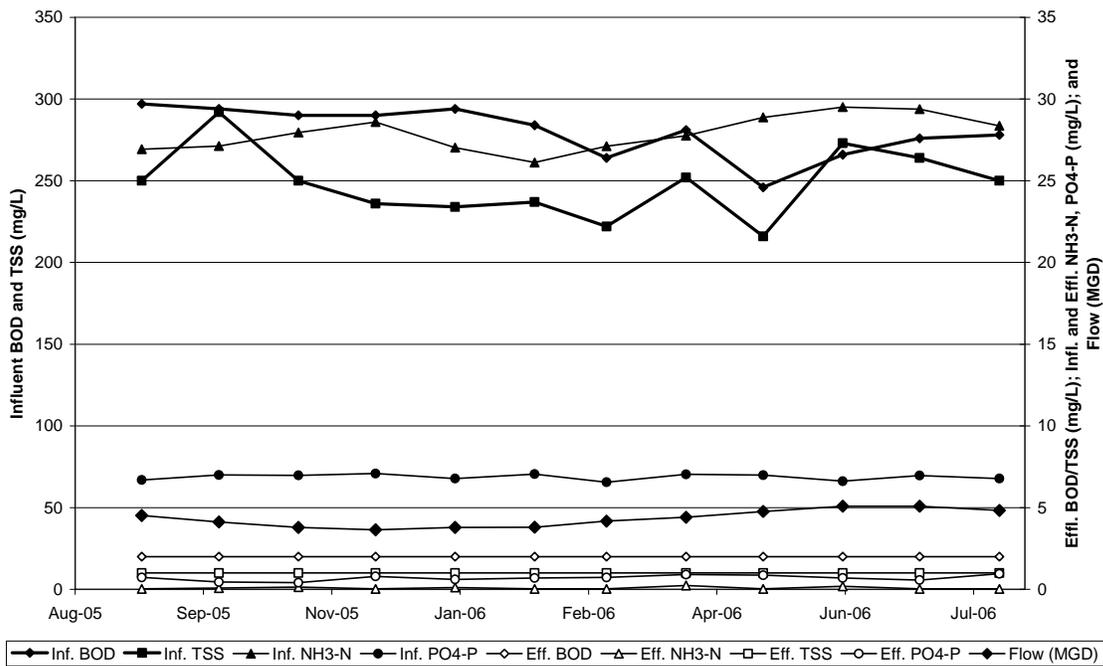


Figure 6. Performance of the Traverse City plant

costs if air scouring is used to reduce membrane fouling. The amount of air needed for the scouring has been reported to be twice that needed to maintain aeration in a conventional activated sludge system (Scott Blair, personal communication, 2006). These higher operating costs are often partially offset by the lower costs for sludge disposal associated with running at longer sludge residence times and with membrane thickening/dewatering of wasted sludge.

Fleischer et al. (2005) compared operating costs. They estimated the operating costs of an MBR system including activated carbon adsorption at \$1.77 per 1,000 gallons treated. These costs were

of the same order of magnitude as those of alternative processes, and they compared favorably to those of processes that are chemical-intensive, such as lime treatment.

ACKNOWLEDGMENTS

The authors acknowledge Dr. Venkat Mahendrakar, GE/Zenon, Mr. John Irwin, Siemens/U.S. Filter, and Mr. Scott Blair and Mr. Leroy Bonkoski of the Traverse City WWTP for their assistance in obtaining data and system information. EPA acknowledges external peer

reviewers Pat Brooks, Alan Cooper, and Glenn Daigger for their contribution.

PRODUCT LITERATURE USED

Enviroquip/Kubota. Sales literature.

Siemens. Product literature.

<http://www.usfilter.com/en/Product+Lines/Envirex_Products/Envirex_Products/envirex_mbr_xpress_packaged_plant.htm>.

Zenon. Case studies: Cauley Creek, Georgia.

<http://www.zenon.com/resources/case_studies/water_reuse/CauleyCreek.shtml>.

Zenon. Case studies: Traverse City, Michigan.

<http://www.zenon.com/resources/case_studies/wastewater/TraverseCity.shtml>.

REFERENCES

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PLANNING AND COMMUNITY DEVELOPMENT

PLANNING • CODE ENFORCEMENT • BUILDING INSPECTIONS • CENTRAL PERMITTING



February 17, 2009

Stroud Engineering, P.A.
102-D Cinema Drive
Wilmington, NC 28403

Re: Special Use Permit-09-02-02-02

To Whom It May Concern:

The Pender County Board of Commissioners, at their February 16, 2009 meeting, voted unanimously to approve your request for the construction/operation of a 500,000 gallon/day wastewater treatment facility located south of Ashton Road and west of Fords Lane, Rocky Point, NC. The property may be identified as parcel number 3235-19-0385-0000.

You will find attached, the signed resolution for your request. Please read and understand all conditions listed.

If you have any questions, feel free to contact me at the information provided below.

Sincerely,

Kyle M. Breuer, Planner
Pender County Planning & Community Development
805 S. Walker Street
Burgaw, NC 28425
breuerk@pender-county.com
P: 910.259.1403



BURGAW

PHONE: 910.259.1202
FAX: 910.259.1295

PO BOX 1519
BURGAW, NC 28425

HAMPSTEAD

PHONE: 910.270.2505
FAX: 910.270.5021

248 TRANSFER STATION RD.
HAMPSTEAD, NC 28443

PLANNING STAFF REPORT
Special Use Permit

SUMMARY:

Hearing Date: February 16, 2009
Case Number: 09-02-016-02
Applicant: Stroud Engineering, P.A.
Property Owner: Prometheus Properties

Land Use Proposed: The applicant is proposing the construction of a wastewater treatment facility.

Property Record Number and Location: The property is identified by record number 3235-19-0385-0000 and is located south of Ashton Road and west of Fords Lane, Rocky Point, N.C.

Zoning District of Property: The property is zoned RA, Rural Agricultural District, and Wastewater Treatment Facilities are permitted via Special Use Permit.

PROJECT DESCRIPTION:

The applicant is requesting a special use permit to construct and operate a wastewater treatment plant on a 184 acre tract of land. The plant will provide wastewater service to accommodate future growth in the surrounding and immediate area.

The facility will be located near the center of the tract. The project will consist of a 500,000 gallon per day treatment plant, a 2.5 million gallon, 5-day upset pond, and two (2) 6.7 acre infiltration basins. The proposed waste water disposal method will have a state classification as a High Rate Infiltration System. The facility will treat the water to a quality exceeding that required for consideration as clean groundwater

All mechanical equipment associated with the operation of a waste water treatment plant will be located within an enclosed building to minimize any noise associated with this project; also, catalytic air scrubbers will be utilized to neutralize any associated odors with this project as well.

A maximum of two feet of tank will be visible above ground and the installation of appropriate buffers and landscaping will be consistent with Pender County's Zoning Ordinance and commercial site plan review. In addition to a commercial site plan review by county planning staff, all applicable local, state, and federal permits must be obtained prior to operation of the facility.

EVALUATION:

- A) Public Notifications:** Advertisements for the proposal have been placed in the Topsail Voice and Pender Post. Adjacent property owners were notified by first class mail. Special Use Permit signs were posted on or near the proposed site.
- B) Basis for Granting SUP:** See attachment A for approval procedures (15.3 of Zoning Ordinance) and revocation procedures (15.4b of Zoning Ordinance).
- C) Zoning Ordinance Compliance:** This property is zoned RA, Rural Agricultural District, and *Wastewater Treatment Facilities* are permitted via Special Use Permit.
- D) 2005 Land Use Plan Compliance:** This property contains two separate land use classifications: Urban Growth and Rural Areas. The eastern portion of the tract, closest to US 117 & I-40 is classified as Urban Growth which mimics the commercial nature of the I-40/NC 210/US 117 intersection and where Pender

County expects to offer utility services. The western portion of the tract contains Rural Area classification. Staff feels that this classification was given due to the mostly undeveloped land north of NC 210 in this vicinity. With the expected growth of this area, this project is consistent with providing services to the growing Rocky Point Area. Almost the entire tract, according to the 2005 CAMA Land Use Plan, contains conservation Area II classification which includes non-coastal wetlands and water supply watersheds. According to the applicant's preliminary wetland studies, there are none located on this site (See attached CAMA Land Use map). The overall classifications surrounding this site are either Urban Growth or Transition Areas.

- E) Existing Land Use in Area:** There are no structures within one thousand feet (1000') of the proposed Wastewater Treatment Facility. There are a few single-family structures along Lanier Avenue, McCrary Road and Everette Road, which all branch off of US 117. There is a ±170' rail right of way located along the eastern boarder of the project site.
- F) Site Access Conditions:** The property has direct access via easement to Ashton Road, which is approximately 1 ¼ miles north of the property. Site access conditions would have to be brought up to NCDOT standards prior to final zoning being issued.
- G) Conditions To Consider In Issuing A Revision of the Special Use Permit For This Project:**
1. Unless approved otherwise as a condition of the permit, a Special Use Permit shall expire and become void, if a final zoning permit has not been issued for the project within 12 months.
 2. No junk, debris trash or inoperable vehicles, recycled or salvaged materials shall be stored on the site outside a completely enclosed building.
 3. No project activity shall commence on the site including clearing and grading until a Final Zoning Permit has been issued.
 4. No permanent personnel occupancy on-site will be allowed.
 5. All operations must follow federal, state, and local standards, regulations, ordinances, permits, statutes, and/or laws.
 6. The project must have commercial site plan review for a zoning permit.
 7. The project shall be developed in accord with the provisions of the Pender County Zoning Ordinance and the applicant's final revised site plan as approved by the Zoning Administrator and the conditions contained in this permit.
 8. Any physical relocation and/or expansions, after completion of the original wastewater treatment plant, will require an amendment to this Special Use Permit.
 9. The obligations imposed by this permit will be the responsibility of the property owner and operator and shall continue in affect until all conditions of this permit and other permits have been complied with and the Pender County Planning Department has made a final inspection of the site and provided a written certification that the site is in compliance.

RESOLUTION

NOW, THEREFORE BE IT RESOLVED by the Pender County Board of Commissioners that:

On February 16, 2009 the Pender County Board of Commissioners (approved, modified, denied) a special use permit for the operation of a Wastewater Treatment Facility, as described herein, and Jimmy T. Tate, Chairman to the Board, is authorized to execute the order implementing this resolution and provide notice to the applicant of the action taken herein.

AMENDMENTS:

MOVED Brown SECONDED Williams

APPROVED X DENIED UNANIMOUS

YEA VOTES: Tate Brown Blanchard Rivenbark Williams

Jimmy T. Tate

Jimmy T. Tate, Chairman

2/16/09
Date

R. Bent
ATTEST

2/16/09
Date

SITE PLAN



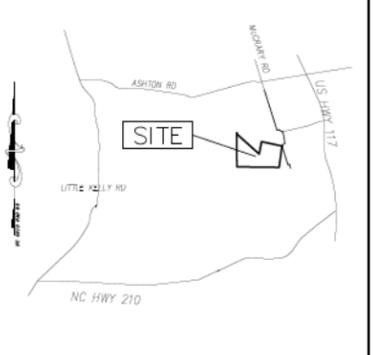
Ashton Rd.

ASHTON ROAD
S.R. 1411

McCRARY ROAD S.R. 1433

EVERETT RD.

US HWY 117



VICINITY MAP

SITE DATA

PROJECT PIN	3225-99-5682-0000
PROJECT AREA	10 AC
EXISTING ZONING	RP
PROPOSED CONDITIONAL USE	WASTE WATER TREATMENT
PROPOSED WASTE WATER TREATMENT FACILITY	4,272 SF
PROPOSED OFFICE BUILDING	1,440 SF
BUILDING SIZE	1,440 SF
PROPOSED PARKING SPACES	7 SP
DEED REFERENCE	DB 4813, PG 1885
PLAT REFERENCE	MB 14, PG 10
PENDER COUNTY CONDITIONAL USE ZONING FOR: PROPOSED WATER TREATMENT FACILITY TO BE LOCATED WITHIN A PROPOSED 10.0 AC TRACT WITHIN THE EX. 177.7 AC.	

PROPOSED
WASTEWATER
TREATMENT
CONDITIONAL
ZONING SITE
10.0AC

500'
ADJACENCY

SHAW BRY
PROPERTIES, LLC
PIN 3225-70-0488-0000
DB 4881, PG 415
MB 01, PG 75

SHAW BRY
PROPERTIES, LLC
PIN 3225-40-2423-0000
DB 4881, PG 415

B SQUARED, LLC
PIN 3225-49-0903-0000
DB 4803, PG 1885
MB 14, PG 10

B SQUARED, LLC
PIN 3225-49-0903-0000
DB 4717, PG 445
MB 5, PG 24

B SQUARED, LLC
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MB 5, PG 24

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MB 5, PG 24

B SQUARED, LLC
PIN 3225-49-0903-0000
DB 4717, PG 445
MB 5, PG 24

CONDITIONAL ZONING PLAN

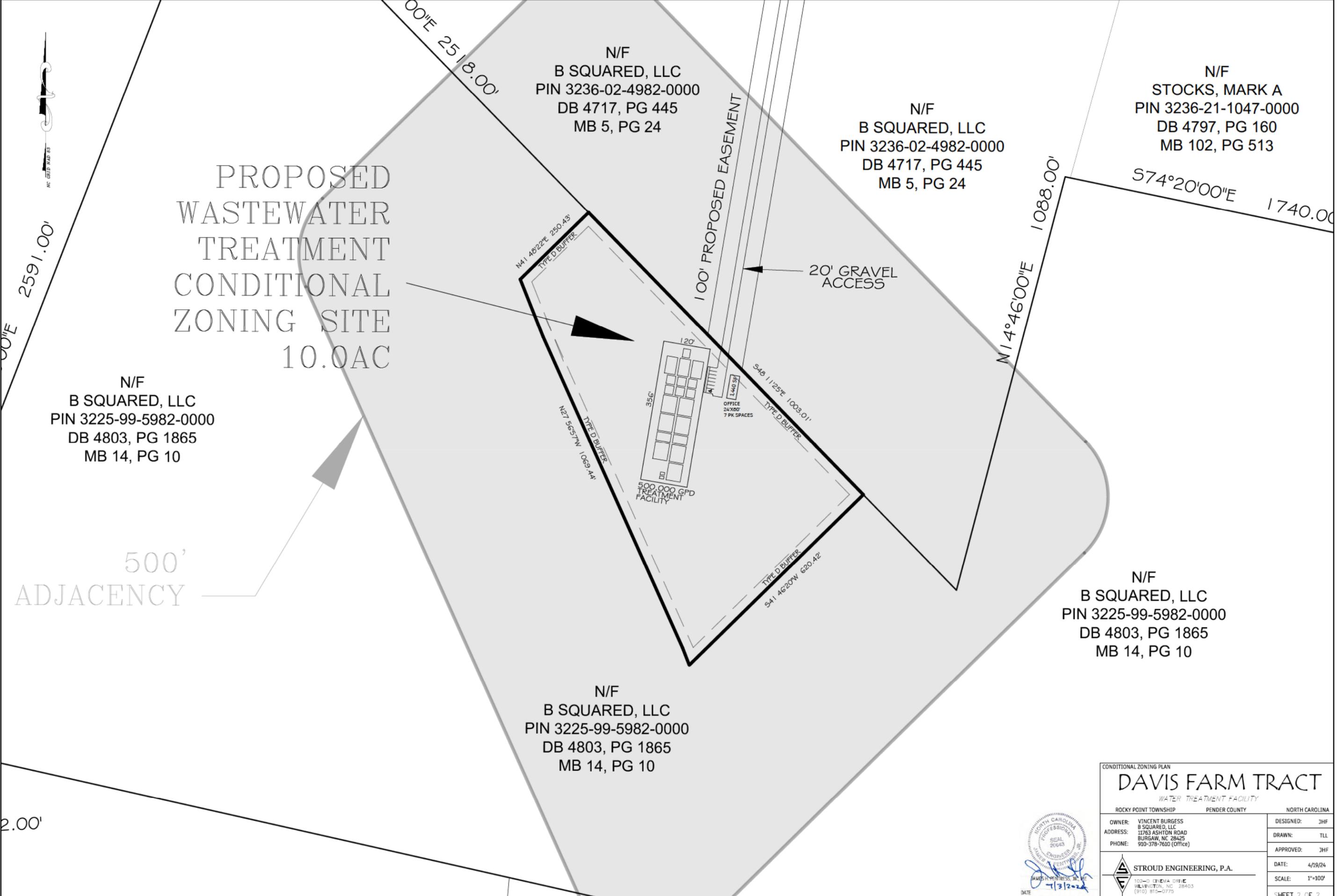
DAVIS FARM TRACT

WATER TREATMENT FACILITY

ROCKY POINT TOWNSHIP PENDER COUNTY NORTH CAROLINA

OWNER: B SQUARED, LLC	DESIGNED: JHF
ADDRESS: 11763 ASHTON ROAD	DRAWN: TLL
BURGAU, NC 28425	APPROVED: JHF
PHONE: 910-378-7610 (Office)	DATE: 4/19/24
STRoud ENGINEERING, P.A.	
102-D CINEVA DRIVE	
WILMINGTON, NC 28403	
(910) 815-9775	
SCALE: 1"=500'	SHEET 1 OF 2





CONDITIONAL ZONING PLAN		
DAVIS FARM TRACT		
WATER TREATMENT FACILITY		
ROCKY POINT TOWNSHIP PENDER COUNTY NORTH CAROLINA		DESIGNED: JHF
OWNER: VINCENT BURGESS B SQUARED, LLC ADDRESS: 11763 ASHTON ROAD BURSAW, NC 28425 PHONE: 910-378-7610 (Office)	DATE: 4/19/24	DRAWN: TLL
STROUD ENGINEERING, P.A. 102-D CINEMA DRIVE WILMINGTON, NC 28403 (910) 815-0775		APPROVED: JHF
DATE: 7/3/24		SCALE: 1"=100'
		SHEET 2 OF 2

