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PINELANDS COMMISSION MEETING
Richard J. Sullivan Center
Terrence D. Moore Conference Room
15 Springfield Road
New Lisbon, New Jersey

MINUTES

January 11, 2019

Commissioners Present

Alan W. Avery Jr., Bob Barr, Jordan P. Howell, Jane Jannarone, Ed Lloyd, Mark Lohbauer, William Pikolycky, Richard Prickett, Gary Quinn, and Chairman Sean Earlen. Also present were Executive Director Nancy Wittenberg, Governor's Authorities Unit representative Craig Ambrose and Deputy Attorney General (DAG) Kristina Miles.

Commissioners by Phone

D'Arcy Rohan Green.

Commissioners Absent

Candace Ashmun, Giuseppe Chila, Paul E. Galletta.

Chairman Earlen called the meeting to order at 9:33 a.m.

DAG Miles read the Open Public Meetings Act Statement (OPMA).

Executive Director Nancy Wittenberg called the roll and announced the presence of a quorum. (There were 11 Commissioners who participated in the meeting.)

The Commission and public in attendance pledged allegiance to the Flag.

Minutes

Chairman Earlen presented the minutes from the December 14, 2018 Commission meeting. Commissioner Prickett moved the adoption of the minutes. Commissioner Pikolycky seconded the motion.

The December 14, 2018 Commission meeting minutes were adopted by a vote of 8 to 0, with Commissioner Barr and Commissioner Quinn abstaining. Commissioner Lohbauer was not present for the vote.

Chairman Earlen presented the closed session minutes from the November 9, 2018 Commission meeting. Commissioner Barr moved the adoption of the minutes. Commissioner Avery seconded the motion.

The November 9, 2018 closed session Commission meeting minutes were adopted by a vote of 8 to 0, with Commissioner Howell and Commissioner Quinn abstaining from the vote. Commissioner Lohbauer was not present for the vote.

Committee Chairs' Reports

Chairman Earlen said there were no Committee meetings to report on. He said the next Policy and Implementation Committee meeting is scheduled for January 25, 2019.

Executive Director's Reports

ED Wittenberg updated the Commission on the following items:

- A meeting that was being scheduled with National Park Service representative Jonathan Meade has been temporarily placed on hold due to the federal government shutdown.
- Additional work on the visitor center was necessary based on the last construction inspection. It's very close to being complete.
- A stay request was received for the New Jersey Natural Gas (NJNG) Southern Reliability Link project. The Commissioners were provided with a copy earlier this week and were informed it might be discussed at today's meeting. NJNG's response to the stay request was also received. The Attorney General's office has completed its legal review, however Ms. Roth has been out of the office and has not had a chance to review the guidance for procedural accuracy. The Commission will be discussing the matter at a later date.

Commissioner Prickett asked if the Commission would need to vote on a resolution regarding the stay request.

ED Wittenberg said the Commission would need to take action by resolution on the stay request.

Director Chuck Horner provided information on the following regulatory matters:

- Staff met with Medford Township officials regarding the construction of a new municipal building.

- A meeting has been scheduled with Lacey Township and Ocean County officials regarding site improvements at a shooting range in Lacey.
- Staff is working with the Mayor of Estell Manor on some issues in the city, specifically a matter that involves recreational vehicles.

ED Wittenberg added that staff is still trying to find a meeting date for the new Committee that will address energy and sustainability.

Chief Planner Susan R. Grogan updated the Commission on the following:

- Staff held a public hearing on amendments to the Pinelands Infrastructure Trust Fund Master Plan on January 3, 2019. Only two members of the public attended the hearing and a total of five written comments were received. Staff is preparing the final amendment for the full Commission to vote on in February.
- The Commission's archaeologist, Tony McNichol, is currently preparing for an excavation at the Brotherton Indian Reservation in the Indian Mills section of Shamong Township. Mr. McNichol has been assisting in ground penetrating radar surveys to determine the boundary of the actual site of the excavation. The Archaeological Society of New Jersey will be conducting the excavation and the results of the dig will be shared at a future Commission meeting.

Commissioner Prickett asked how the excavation project came to fruition.

Chief Planner Grogan said Mr. McNichol knew of the site and during the Township's application for the new cemetery, the concept for an excavation at Brotherton was discussed. She said Shamong Township owns the property.

Communications Director Paul Leakan said the electrical work was completed for the visitor center. Once the Certificate of Occupancy is issued, the building can be re-opened for normal business. He said the 30th Annual Pinelands Short Course will be held on March 9, 2019. He said there will be 36 presentations, four of which will be conducted by Pinelands Commission staff.

Public Development Projects and Other Permit Matters

Chairman Earlen presented a resolution recommending approval of two public development applications. He said one is for the installation of a traffic control system in Hamilton and Egg Harbor Townships and the other is for the installation of potable water and sanitary sewer mains in Medford Township.

Commissioner Barr moved the adoption of a resolution Approving With Conditions Applications for Public Development (Application Numbers 2017-0052.001 & 2018-0096.001) (See Resolution # PC4-19-01). Commissioner Jannarone seconded the motion.

The Commission adopted the resolution by a vote of 10 to 0. Commissioner Lohbauer was not present for the vote.

Chairman Earlen presented a resolution for the construction of a roundabout (traffic circle) at the existing County Route 550 and 610 intersection in Woodbine Borough.

Commissioner Pikolycky said he would be recusing from the vote on this application and left the dais.

Commissioner Prickett moved the adoption of a resolution Approving With Conditions an Application for Public Development (Application Number 2018-0148.001) (See Resolution # PC4-19-02). Commissioner Barr seconded the motion.

The Commission adopted the resolution by a vote of 9 to 0. Commissioner Lohbauer was not present for the vote.

Commissioner Pikolycky returned to the meeting.

Commissioner Lohbauer joined the meeting at 9:51 a.m.

Public Comment on Public Development Applications and Items where the record is open
No one from the public spoke.

Ordinances Not Requiring Commission Action

Chairman Earlen asked if any Commissioners had questions regarding the ordinances not requiring Commission action:

- Hammonton Town 2018 Housing Element and Fair Share Plan
- Hammonton Town Ordinances 031-2018 and 045-2018
- Maurice River Township Ordinance 677
- Shamong Township Ordinance 2018-13
- Southampton Township Ordinance 2018-13
- Winslow Township Ordinance O-2018-024

No members of the Commission had questions.

Other Resolutions

Chairman Earlen presented a resolution accepting the Fiscal Year 2017 audit report.

Commissioner Avery moved the adoption of a resolution To Accept the Fiscal Year 2017 Audit Report (See Resolution # PC4-19-03). Commissioner Lloyd seconded the motion.

Commissioner Avery said he is pleased to announce that there were no findings in the FY 2017 Audit. He said both the Audit Committee and Personnel and Budget Committee recommended purchasing new accounting software. He said in addition the Commission staff has made some internal changes and the combination has resulted in a clean audit. He thanked the members of the Audit Committee including the two public members: Brian Logan and Mike Mansdoerfer. He also thanked former Commissioner McGlinchey for his role on the Audit Committee.

The Commission adopted the resolution by a vote of 11 to 0.

Commissioner Rohan Green left the meeting at 9:57 a.m.

Presentation: Buena Borough Municipal Utilities Authority (MUA) Water Pollution Control Plant

Mr. Ed Wengrowski outlined the history that led to the construction of a state of the art wastewater treatment plant in Buena Borough. He said water quality in a Pinelands stream improved significantly by upgrading the plant through an amendment to an existing Memorandum of Agreement between the Pinelands Commission, Buena Borough MUA and Buena Vista Township.

Mr. Wengrowski introduced Dennis Yoder, the Director of Engineering at Remington & Vernick Engineers and Mr. Alan Zorzi, Plant Superintendent. Mr. Yoder and Mr. Zorzi shared aerial photographs of the plant and described the membrane bioreactor technology (MBR) used to transform the wastewater. In addition, Mr. Yoder and Mr. Zorzi provided details of how the plant achieved 24 consecutive months of maintaining certain discharge limits with abnormally cold temperatures. A few Commissioners asked questions related to the following topics: cost of the plant, temperature spikes and other plants using the MBR technology. See attached slides for additional information.

General Public Comment

Paula Yudkowitz said the public cannot access the center of the Pinelands and families are unable to recreate because of damaged roads surrounding Wharton State Forest. She also said that things are getting "scary" and "iffy" "down there". She said "bands of big men in big trucks are threatening people in the woods". She said she would like the Commission to add these issues to its monthly agenda.

Rhyan Grech of the Pinelands Preservation Alliance said the Alliance recently released the 2018 Annual State of the Pinelands Report. She brought copies of the report for Commissioners and the public. She congratulated the Commission on its Roadside Best Management Practices, the Pinelands Science report and the Short Course. She said the Commission needs to move forward with the following: Pinelands Development Credit Amendments, CMP amendments to address the Kirkwood-Cohansey aquifer and amendments to protect the Black Run Watershed.

Debra Smith of Southampton said she feels the Commission is headed in the wrong direction and would like to see new Commissioners appointed who are more conservation minded.

Agnes Marsala of Chesterfield urged Commissioners to adopt a resolution to grant the stay for the NJNG pipeline. She said she was also urging the Burlington County Board of Freeholders to replace its representative on this Commission.

Margo Pellegrino of Medford Lakes said she was pleased to hear that the Commission created a new Committee to address the effects of climate change in the Pinelands. She said she was impressed with the Buena Borough treatment plant and hopes that the Commission will receive a lot of press on the success of the facility.

Fred Akers of the Great Egg Harbor Watershed Association said the Buena MOA is a good example of how the MOA process should work. He thanked Commissioner Pikolycky for his resolution through the League of Municipalities supporting the Payment in Lieu of Taxes (PILOT) program.

Commissioner Earlen responded to Ms. Yudkowitz's comments about Wharton State Forest and road access. He said staff will have a conversation with the New Jersey Department of Environmental Protection (NJDEP) about the issues she raised.

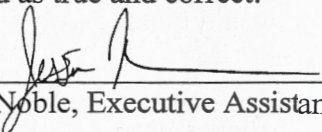
Commissioner Prickett asked ED Wittenberg if she could research whether it is appropriate for the Commission to draft a resolution supporting the PILOT program.

Commissioner Lohbauer requested an update from the Executive Director at the next Commission meeting regarding the status of the NJDEP's application to clear trees surrounding the Bass River Fire Tower.

Adjournment

Commissioner Lohbauer moved to adjourn the meeting. Commissioner Pikolycky seconded the motion. The Commission agreed to adjourn at 11:33 a.m.

Certified as true and correct:



Jessica Noble, Executive Assistant

Date: January 18, 2019



RESOLUTION OF THE NEW JERSEY PINELANDS COMMISSION

NO. PC4-19- 01

TITLE: Approving With Conditions Applications for Public Development (Application Numbers 2017-0052.001 & 2018-0096.001)

Commissioner Barr moves and Commissioner Jannarone seconds the motion that:

WHEREAS, the Pinelands Commission has reviewed the Public Development Application Reports and the recommendation of the Executive Director that the following applications for Public Development be approved with conditions:

2017-0052.001

Applicant: New Jersey Department of Transportation
Municipality: Egg Harbor Township
Hamilton Township
Management Area: Pinelands Regional Growth Area
Date of Report: December 20, 2018
Proposed Development: Installation of a traffic control system within the combined U.S. Route 40/322 right-of-way in Hamilton and Egg Harbor Townships; and

2018-0096.001

Applicant: Medford Township
Municipality: Medford Township
Management Area: Pinelands Regional Growth Area
Date of Report: December 20, 2018
Proposed Development: Installation of potable water and sanitary sewer mains within the Route 70 & Medford-Evesboro Road rights-of-way.

WHEREAS, no request for a hearing before the Office of Administrative Law concerning the Executive Director's recommendation has been received for any of these applications; and

WHEREAS, the Pinelands Commission hereby adopts the Conclusion of the Executive Director for each of the proposed developments; and

WHEREAS, the Pinelands Commission hereby determines that each of the proposed public developments conform to the standards for approving an application for public development set forth in N.J.A.C. 7:50-4.57 if the conditions recommended by the Executive Director are imposed; and

WHEREAS, pursuant to N.J.S.A. 13A-5h, no action authorized by the Commission shall have force or effect until ten (10) days, Saturdays, Sundays and public holidays excepted, after a copy of the minutes of the meeting of the Commission has been delivered to the Governor for review, unless prior to expiration of the review period and Governor shall approve same, in which case the action shall become effective upon such approval.

NOW, THEREFORE BE IT RESOLVED that Application Numbers 2017-0052.001 & 2018-0096.001 for public development are hereby **approved** subject to the conditions recommended by the Executive Director.

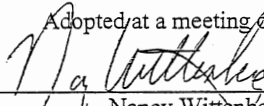
Record of Commission Votes

	AYE	NAY	NP	A/R*		AYE	NAY	NP	A/R*		AYE	NAY	NP	A/R*
Ashmun			X		Howell	X				Prickett	X			
Avery	X				Jannarone	X				Quinn	X			
Barr	X				Lloyd	X				Rohan Green	X			
Chila			X		Lohbauer			X		Earlen	X			
Galletta			X		Pikolycky	X								

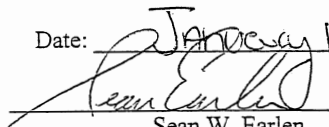
*A = Abstained / R = Recused

Adopted at a meeting of the Pinelands Commission

Date:



 Nancy Wittenberg
 Executive Director

January 11, 2019


 Sean W. Earlen
 Chairman



State of New Jersey
THE PINELANDS COMMISSION
PO Box 359
NEW LISBON, NJ 08064
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PHILIP D. MURPHY
Governor
SHEILA Y. OLIVER
Lt. Governor

General Information: Info@pinelands.nj.gov
Application Specific Information: AppInfo@pinelands.nj.gov

SEAN W. EARLEN
Chairman
NANCY WITTENBERG
Executive Director

December 20, 2018

Kathy Burger, Township Manager (via email)
Medford Township
17 North Main Street
Medford, NJ 08055

Re: Application # 2018-0096.001
New Jersey State Highway Route 70 & Medford-Evesboro Road
Medford Township

Dear Ms. Burger:

The Commission staff has completed its review of this application for the installation of potable water and sanitary sewer mains within the Route 70 & Medford-Evesboro Road rights-of-way. Enclosed is a copy of a Public Development Application Report. On behalf of the Commission's Executive Director, I am recommending that the Pinelands Commission approve the application with conditions at its January 11, 2019 meeting.

Any interested party may appeal this recommendation in accordance with the appeal procedure attached to this document. If no appeal is received, the Pinelands Commission may either approve the recommendation of the Executive Director or refer the application to the New Jersey Office of Administrative Law for a hearing.

Prior to any development, the applicant shall obtain any other necessary permits and approvals.

Sincerely,

Charles M. Horner, P.P.
Director of Regulatory Programs

Enc: Appeal Procedure

c: Secretary, Medford Township Planning Board (via email)
Medford Township Construction Code Official (via email)
Medford Township Environmental Commission (via email)
Secretary, Burlington County Planning Board (via email)
Christopher J. Noll, PE (via email)





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Lt. Governor

General Information: Info@pinelands.nj.gov
Application Specific Information: AppInfo@pinelands.nj.gov

SEAN W. EARLEN
Chairman
NANCY WITTENBERG
Executive Director

PUBLIC DEVELOPMENT APPLICATION REPORT

December 20, 2018

Kathy Burger, Township Manager (via email)
Medford Township
17 North Main Street
Medford, NJ 08055

Application No.: 2018-0096.001
New Jersey State Highway Route 70 & Medford-Evesboro Road
Medford Township

This application proposes the installation of 735 linear feet of potable water main and 1,690 linear feet of sanitary sewer main within the Route 70 & Medford-Evesboro Road rights-of-way located in Medford Township.

STANDARDS

The Commission staff has reviewed the proposed development for consistency with all standards of the Pinelands Comprehensive Management Plan (CMP). The following reviews the CMP standards that are relevant to this application:

Land Use (N.J.A.C. 7:50-5.28(a))

The proposed development is located in a Pinelands Regional Growth Area. The proposed utility mains are a permitted land use in a Pinelands Regional Growth Area.

Wetlands Standards (N.J.A.C. 7:50-6.6 & 6.13)

There are wetlands located within the project area. The CMP prohibits most development in wetlands and requires a buffer of up to 300 feet to wetlands.

The proposed sanitary sewer line will disturb approximately two square feet of wetlands located immediately adjacent to State Route 70. The proposed sanitary sewer line will be located in the required buffer to that wetland. The CMP permits the installation of linear improvement (utility mains) in wetlands and the required buffer to wetlands provided the applicant demonstrates that certain CMP specified conditions are met. The applicant has demonstrated that there is no feasible alternative to the proposed development that does not involve development in wetlands and the required buffer to wetlands or that will result in a less significant adverse impact to wetlands and the required buffer to wetlands. In addition, the proposed development will not result in a substantial impairment of the

resources of the Pinelands. With the conditions below, all practical measures are being taken to mitigate the impact on the wetlands and the required buffer to wetlands. The applicant had demonstrated that the need for the proposed development overrides the importance of protecting the wetlands.

Vegetation Management Standards (N.J.A.C. 7:50-6.23 & 6.26)

The proposed development will be located within existing agricultural fields, maintained grassed areas, and wooded areas. Approximately 0.056 acres of forest will be cleared to accommodate the proposed development. The proposed clearing and soil disturbance is limited to that which is necessary to accommodate the development.

The Landscaping and Revegetation guidelines of the CMP recommend the use of grasses that are tolerant of droughty, nutrient poor conditions. The applicant proposes to utilize a seed mixture which meets that recommendation.

Cultural Resource Standards (N.J.A.C. 7:50-6.151)

The Commission staff reviewed the application for evidence of cultural resources on the parcel. Based upon the lack of potential for significant cultural resources on the parcel, a cultural resource survey was not required.

PUBLIC COMMENT

The applicant has provided the requisite public notices. Newspaper public notice was completed on August 7, 2018. The application was designated as complete on the Commission's website on November 5, 2018. The Commission's public comment period closed on December 14, 2018. No public comment was submitted to the Commission regarding this application.

CONDITIONS

1. Except as modified by the below conditions, the proposed development shall adhere to the plan, consisting of five sheets, prepared by Environmental Resolutions, Inc. and dated as follows:

Sheet 1 - May 30, 2018
Sheets 2-5 - May 30, 2018; revised to September 4, 2018
2. Disposal of any construction debris or excess fill may only occur at an appropriately licensed facility.
3. Any proposed revegetation shall adhere to the "Vegetation" standards of the CMP. Where appropriate, the applicant is encouraged to utilize the following Pinelands native grasses for revegetation: Switch grass, Little bluestem and Broom-sedge.
4. Prior to any development, the applicant shall obtain any other necessary permits and approvals.
5. Prior to the construction of any portion of the proposed development which will result in the disturbance of any wetland area, a Freshwater Wetland Permit shall be obtained pursuant to the New Jersey Freshwater Wetlands Protection Act.

6. Appropriate measures shall be taken during construction to preclude sedimentation from entering wetlands and shall be maintained in place until all development has been completed and the area has been stabilized.

CONCLUSION

As the proposed development conforms to the standards set forth in N.J.A.C. 7:50-4.57, it is recommended that the Pinelands Commission **APPROVE** the proposed development subject to the above conditions.



Philip D. Murphy
Governor

Sheila Y. Oliver
Lt. Governor

State of New Jersey

THE PINELANDS COMMISSION

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NEW LISBON, NJ 08064

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Sean W. Earlen
Chairman

Nancy Wittenberg
Executive Director

General Information: Info@njpines.state.nj.us
Application Specific Information: AppInfo@njpines.state.nj.us

PINELANDS COMMISSION **APPEAL PROCEDURE**

The Pinelands Comprehensive Management Plan (N.J.A.C. 7:50-4.91) provides an interested party the right to appeal any determination made the by Executive Director to the Commission in accordance with N.J.A.C. 7:50-4.91. An interested party is someone who has a specific property interest sufficient to require a hearing on constitutional or statutory grounds. Only appeal requests submitted by someone meeting the definition of an interested party will be transmitted to the New Jersey Office of Administrative Law for a hearing. Any such appeal must be made in writing to the Commission and received at the Commission office no later than 4:00 PM on January 7, 2019 and include the following information:

1. the name and address of the person requesting the appeal;
2. the application number;
3. the date on which the determination to be appealed was made;
4. a brief statement of the basis for the appeal; and
5. a certificate of service (a notarized statement) indicating that service of the notice has been made, by certified mail, on the clerk of the county, municipal planning board and environmental commission with jurisdiction over the property which is subject of this decision.

Within 15 days following receipt of a notice of valid appeal, the Executive Director shall initiate the procedures for assignment of an Administrative Law Judge to preside at the hearing pursuant to the Administrative Procedures Act, N.J.S.A. 52:14B-1 et seq., and the procedures established by the Office of Administrative Law. The time, date and location of such hearing shall be designated by the Office of Administrative Law.



State of New Jersey

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General Information: Info@pinelands.nj.gov
Application Specific Information: AppInfo@pinelands.nj.gov

SEAN W. EARLEN
Chairman
NANCY WITTENBERG
Executive Director

December 20, 2018

Brendan Brock (via email)
New Jersey Department of Transportation
951 Parkway Ave.
Trenton, NJ 08625

Re: Application # 2017-0052.001
U.S. Routes 40 & 322
Egg Harbor and Hamilton Townships

Dear Mr. Brock:

The Commission staff has completed its review of this application for the installation of a traffic control system within the combined U.S. Route 40/322 right-of-way in Hamilton and Egg Harbor Townships. Enclosed is a copy of a Public Development Application Report. On behalf of the Commission's Executive Director, I am recommending that the Pinelands Commission approve the application with conditions at its January 11, 2019 meeting.

Any interested party may appeal this recommendation in accordance with the appeal procedure attached to this document. If no appeal is received, the Pinelands Commission may either approve the recommendation of the Executive Director or refer the application to the New Jersey Office of Administrative Law for a hearing.

Prior to any development, the applicant shall obtain any other necessary permits and approvals.

Sincerely,

Charles M. Horner, P.P.
Director of Regulatory Programs

- Enc: Appeal Procedure
- c: Secretary, Egg Harbor Township Planning Board (via email)
- Egg Harbor Township Construction Code Official (via email)
- Egg Harbor Township Environmental Commission (via email)
- Secretary, Hamilton Township Planning Board (via email)
- Hamilton Township Construction Code Official (via email)
- Atlantic County Department of Regional Planning and Development (via email)
- Amanda Mendoza (via email)





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Application Specific Information: AppInfo@pinelands.nj.gov

SEAN W. EARLEN
Chairman
NANCY WITTENBERG
Executive Director

PUBLIC DEVELOPMENT APPLICATION REPORT

December 20, 2018

Brendan Brock (via email)
New Jersey Department of Transportation
951 Parkway Ave.
Trenton, NJ 08625

Application No.: 2017-0052.001
U.S. Routes 40 & 322
Egg Harbor and Hamilton Townships

This application proposes the installation of a traffic control system within the combined U.S. Route 40/322 right-of-way in Hamilton and Egg Harbor Townships.

The proposed development includes the installation of 14 traffic detectors and four camera surveillance systems mounted on 16 poles. The poles are up to 25 feet in height. The proposed detectors and cameras will be located along a six mile stretch of the combined U.S. Route 40/322 right-of-way between the Garden State Parkway and the intersection of U.S. Route 40 with U. S. Route 322. The proposed development will be connected to the New Jersey statewide communication network by a proposed fiber optic communication line along the road right-of-way. The system will be utilized by the New Jersey Department of Transportation to improve traffic flow and safety at existing signalized intersections.

STANDARDS

The Commission staff has reviewed the proposed development for consistency with all standards of the Pinelands Comprehensive Management Plan (CMP). The following reviews the CMP standards that are relevant to this application:

Land Use (N.J.A.C. 7:50-5.28(a))

The proposed development is located in a Pinelands Regional Growth Area. The proposed development is a permitted land use in a Pinelands Regional Growth Area.

Wetlands Standards (N.J.A.C. 7:50-6.6 & 6.13)

There are wetlands located within 300 feet of the proposed development. No development is proposed in wetlands. The CMP requires up to a 300 foot buffer to wetlands. Sections of the underground fiber optic communication line will be located within the required buffer to wetlands.

The CMP permits linear improvements (fiber optic communications lines) in the required buffer to wetlands provided the applicant demonstrates that certain conditions are met. The applicant has demonstrated that there is no feasible alternative to the proposed development that does not involve development in wetland buffers or that will result in a less significant adverse impact to wetland buffers. In addition, the proposed development will not result in a substantial impairment of the resources of the Pinelands. With the conditions below, all practical measures are being taken to mitigate the impact on the wetland buffers. The applicant has indicated that the proposed development will improve traffic safety and reduce traffic congestion. The applicant has demonstrated that the need for the proposed development overrides the importance of protecting the wetland buffer.

Vegetation Management Standards (N.J.A.C. 7:50-6.23 & 6.26)

The proposed development will be located within existing paved areas and maintained grass shoulders. The proposed soil disturbance is limited to that which is necessary to accommodate the proposed development.

The Landscaping and Revegetation guidelines of the CMP recommend the use of grasses that are tolerant of droughty, nutrient poor conditions. To stabilize disturbed areas, the applicant proposes to utilize a seed mixture which meets that recommendation.

PUBLIC COMMENT

The CMP defines the proposed traffic control system as “minor” development. The CMP does not require public notice for minor public development applications. The application was designated as complete on the Commission’s website on December 3, 2018. The Commission’s public comment period closed on December 14, 2018. No public comment was submitted to the Commission regarding this application.

CONDITIONS

1. Except as modified by the below conditions, the proposed development shall adhere to the plan, consisting of 36 sheets, prepared by WSP USA Inc. and dated as follows:
 Sheet 1 - November 29, 2018
 Sheets 2-36 - November 28, 2018
2. Except as modified by the below conditions, the proposed development shall adhere to the plan, consisting of 50 sheets, prepared by Advantage Engineering Associates, P.C., all sheets dated November 24, 2018.
3. Except as modified by the below conditions, the proposed development shall adhere to the plan, consisting of four sheets, prepared by Greenman-Pedersen, Inc., all sheets dated July 14, 2018.
4. Disposal of any construction debris or excess fill may only occur at an appropriately licensed facility.
5. Any proposed revegetation shall adhere to the "Vegetation" standards of the CMP. Where appropriate, the applicant is encouraged to utilize the following Pinelands native grasses for revegetation: Switch grass, Little bluestem and Broom-sedge.

6. Prior to any development, the applicant shall obtain any other necessary permits and approvals.
7. Appropriate measures shall be taken during construction to preclude sedimentation from entering wetlands and shall be maintained in place until all development has been completed and the area has been stabilized.

CONCLUSION

As the proposed development conforms to the standards set forth in N.J.A.C. 7:50-4.57, it is recommended that the Pinelands Commission **APPROVE** the proposed development subject to the above conditions.



Philip D. Murphy
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Sheila Y. Oliver
Lt. Governor

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General Information: Info@njpines.state.nj.us
Application Specific Information: AppInfo@njpines.state.nj.us

PINELANDS COMMISSION **APPEAL PROCEDURE**

The Pinelands Comprehensive Management Plan (N.J.A.C. 7:50-4.91) provides an interested party the right to appeal any determination made the by Executive Director to the Commission in accordance with N.J.A.C. 7:50-4.91. An interested party is someone who has a specific property interest sufficient to require a hearing on constitutional or statutory grounds. Only appeal requests submitted by someone meeting the definition of an interested party will be transmitted to the New Jersey Office of Administrative Law for a hearing. Any such appeal must be made in writing to the Commission and received at the Commission office no later than 4:00 PM on January 7, 2019 and include the following information:

1. the name and address of the person requesting the appeal;
2. the application number;
3. the date on which the determination to be appealed was made;
4. a brief statement of the basis for the appeal; and
5. a certificate of service (a notarized statement) indicating that service of the notice has been made, by certified mail, on the clerk of the county, municipal planning board and environmental commission with jurisdiction over the property which is subject of this decision.

Within 15 days following receipt of a notice of valid appeal, the Executive Director shall initiate the procedures for assignment of an Administrative Law Judge to preside at the hearing pursuant to the Administrative Procedures Act, N.J.S.A. 52:14B-1 et seq., and the procedures established by the Office of Administrative Law. The time, date and location of such hearing shall be designated by the Office of Administrative Law.



RESOLUTION OF THE NEW JERSEY PINELANDS COMMISSION

NO. PC4-19- 02

TITLE: Approving With Conditions an Application for Public Development (Application Number 2018-0148.001)

Commissioner Prickett moves and Commissioner Barr seconds the motion that:

WHEREAS, the Pinelands Commission has reviewed the Public Development Application Report and the recommendation of the Executive Director that the following application for Public Development be approved with conditions:

2018-0148.001

Applicant:	Cape May County
Municipality:	Borough of Woodbine
Management Area:	Pinelands Town
Date of Report:	December 20, 2018
Proposed Development:	Construction of a roundabout (traffic circle) at the existing County Route 550 and 610 intersection.

WHEREAS, no request for a hearing before the Office of Administrative Law concerning the Executive Director's recommendation has been received for this application; and

WHEREAS, the Pinelands Commission hereby adopts the Conclusion of the Executive Director for the proposed development; and

WHEREAS, the Pinelands Commission hereby determines that the proposed public development conforms to the standards for approving an application for public development set forth in N.J.A.C. 7:50-4.57 if the conditions recommended by the Executive Director are imposed; and

WHEREAS, pursuant to N.J.S.A. 13A-5h, no action authorized by the Commission shall have force or effect until ten (10) days, Saturdays, Sundays and public holidays excepted, after a copy of the minutes of the meeting of the Commission has been delivered to the Governor for review, unless prior to expiration of the review period and Governor shall approve same, in which case the action shall become effective upon such approval.

NOW, THEREFORE BE IT RESOLVED that Application Number 2018-0148.001 for public development is hereby approved subject to the conditions recommended by the Executive Director.

Record of Commission Votes

AYE NAY NP A/R*				AYE NAY NP A/R*				AYE NAY NP A/R*			
Ashmun			X	Howell	X			Prickett	X		
Avery	X			Jannarone	X			Quinn	X		
Barr	X			Lloyd	X			Rohan Green	X		
Chila			X	Lohbauer		X		Earlen	X		
Galletta			X	Pikolycky			A				

*A = Abstained / R = Recused

Adopted at a meeting of the Pinelands Commission
Nancy Wittenberg
Nancy Wittenberg
Executive Director

Date: January 11, 2019
Sean W. Earlen
Sean W. Earlen
Chairman



State of New Jersey
 THE PINELANDS COMMISSION
 PO Box 359
 NEW LISBON, NJ 08064
 (609) 894-7300
 www.nj.gov/pinelands



PHILIP D. MURPHY
 Governor
 SHEILA Y. OLIVER
 Lt. Governor

General Information: Info@pinelands.nj.gov
 Application Specific Information: AppInfo@pinelands.nj.gov

SEAN W. EARLEN
 Chairman
 NANCY WITTENBERG
 Executive Director

December 20, 2018

Elizabeth Bozzelli (via email)
 Cape May County
 4 Moore Road - DN 402
 Cape May Court House, NJ 08210

Re: Application # 2018-0148.001
 Cape May County Routes 550 & 610
 Borough of Woodbine

Dear Ms. Bozzelli:

The Commission staff has completed its review of this application for construction of a roundabout (traffic circle) at the existing County Route 550 and 610 intersection. Enclosed is a copy of a Public Development Application Report. On behalf of the Commission's Executive Director, I am recommending that the Pinelands Commission approve the application with conditions at its January 11, 2019 meeting.

Any interested party may appeal this recommendation in accordance with the appeal procedure attached to this document. If no appeal is received, the Pinelands Commission may either approve the recommendation of the Executive Director or refer the application to the New Jersey Office of Administrative Law for a hearing.

Prior to any development, the applicant shall obtain any other necessary permits and approvals.

Sincerely,

Charles M. Horner, P.P.
 Director of Regulatory Programs

Enc: Appeal Procedure

c: Secretary, Borough of Woodbine Planning Board (via email)
 Borough of Woodbine Construction Code Official (via email)
 Secretary, Cape May County Planning Board (via email)
 Bradley Tombs (via email)





State of New Jersey
THE PINELANDS COMMISSION
PO Box 359
NEW LISBON, NJ 08064
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PHILIP D. MURPHY
Governor
SHEILA Y. OLIVER
Lt. Governor

General Information: Info@pinelands.nj.gov
Application Specific Information: AppInfo@pinelands.nj.gov

SEAN W. EARLEN
Chairman
NANCY WITTENBERG
Executive Director

PUBLIC DEVELOPMENT APPLICATION REPORT

December 20, 2018

Elizabeth Bozzelli (via email)
Cape May County
4 Moore Road - DN 402
Cape May Court House, NJ 08210

Application No.: 2018-0148.001
Cape May County Routes 550 & 610
Borough of Woodbine

This application proposes construction of a roundabout (traffic circle) at the existing County Route 550 and 610 intersection in the Borough of Woodbine.

The existing intersection is a four-way stop intersection with right-hand turn ramps. The applicant proposes to eliminate the four-way stop intersection and construct a roundabout to improve vehicular movement.

STANDARDS

The Commission staff has reviewed the proposed development for consistency with all standards of the Pinelands Comprehensive Management Plan (CMP). The following reviews the CMP standards that are relevant to this application:

Land Use (N.J.A.C. 7:50-5.27(a)1)

The proposed development is located in the Pinelands Town of Woodbine. The proposed roadway improvements are a permitted land use in a Pinelands Town.

Vegetation Management Standards (N.J.A.C. 7:50-6.23 & 6.26)

The proposed development will be located over existing pavement and within maintain grassed shoulders. The proposed soil disturbance is limited to that which is necessary to accommodate the proposed development.

The Landscaping and Revegetation guidelines of the CMP recommend the use of grasses that are tolerant of droughty, nutrient poor conditions. To stabilize disturbed areas, the applicant proposes to utilize a seed mixture which meets that recommendation.

Stormwater Management Standards (N.J.A.C.7:50-6.84(a)6)

The proposed development will result in a reduction of 8,965 square feet of impervious surfaces. The applicant has demonstrated that there will be no increase in the volume and rate of stormwater runoff from the project after the development then occurred prior to the proposed development.

Cultural Resource Standards (N.J.A.C. 7:50-6.151)

The Commission staff reviewed the application for evidence of cultural resources on the parcel. Based upon the lack of potential for significant cultural resources on within the proposed project area, a cultural resource survey was not required.

PUBLIC COMMENT

The applicant has provided the requisite public notice. Newspaper public notice was completed on September 7, 2018. The application was designated as complete on the Commission's website on November 21, 2018. The Commission's public comment period closed on December 14, 2018. No public comment was submitted to the Commission regarding this application.

CONDITIONS

1. Except as modified by the below conditions, the proposed development shall adhere to the plan, consisting of three sheets, prepared by Urban Engineers, Inc., all sheets dated September 14, 2018.
2. Disposal of any construction debris or excess fill may only occur at an appropriately licensed facility.
3. Any proposed revegetation shall adhere to the "Vegetation" standards of the CMP. Where appropriate, the applicant is encouraged to utilize the following Pinelands native grasses for revegetation: Switch grass, Little bluestem and Broom-sedge.
4. Prior to any development, the applicant shall obtain any other necessary permits and approvals.

CONCLUSION

As the proposed development conforms to the standards set forth in N.J.A.C. 7:50-4.57, it is recommended that the Pinelands Commission **APPROVE** the proposed development subject to the above conditions.



Philip D. Murphy
Governor

Sheila Y. Oliver
Lt. Governor

State of New Jersey

THE PINELANDS COMMISSION

PO Box 359

NEW LISBON, NJ 08064

(609) 894-7300

www.nj.gov/pinelands



Sean W. Earlen
Chairman

Nancy Wittenberg
Executive Director

General Information: Info@njpines.state.nj.us
Application Specific Information: AppInfo@njpines.state.nj.us

PINELANDS COMMISSION **APPEAL PROCEDURE**

The Pinelands Comprehensive Management Plan (N.J.A.C. 7:50-4.91) provides an interested party the right to appeal any determination made the by Executive Director to the Commission in accordance with N.J.A.C. 7:50-4.91. An interested party is someone who has a specific property interest sufficient to require a hearing on constitutional or statutory grounds. Only appeal requests submitted by someone meeting the definition of an interested party will be transmitted to the New Jersey Office of Administrative Law for a hearing. Any such appeal must be made in writing to the Commission and received at the Commission office no later than 4:00 PM on January 7, 2019 and include the following information:

1. the name and address of the person requesting the appeal;
2. the application number;
3. the date on which the determination to be appealed was made;
4. a brief statement of the basis for the appeal; and
5. a certificate of service (a notarized statement) indicating that service of the notice has been made, by certified mail, on the clerk of the county, municipal planning board and environmental commission with jurisdiction over the property which is subject of this decision.

Within 15 days following receipt of a notice of valid appeal, the Executive Director shall initiate the procedures for assignment of an Administrative Law Judge to preside at the hearing pursuant to the Administrative Procedures Act, N.J.S.A. 52:14B-1 et seq., and the procedures established by the Office of Administrative Law. The time, date and location of such hearing shall be designated by the Office of Administrative Law.



RESOLUTION OF THE NEW JERSEY PINELANDS COMMISSION

NO. PC4-19- 03

TITLE: To Accept the Fiscal Year 2017 Audit Report

Commissioner Avery moves and Commissioner Lloyd seconds the motion that:

WHEREAS, the audit of the Pinelands Commission Fiscal Year 2017 Financial Statements, Notes to the Financial Statements and Schedules of Federal and State Assistance was performed by the Office of the State Auditor; and

WHEREAS, the findings from the Fiscal Year 2016 Audit Report regarding the Internal Controls over the Bank Reconciliations (2016-001) and the Disaster Recovery Plan (2016-002) have been remedied. The Fiscal Year 2017 Audit Report confirms this compliance; and

WHEREAS, the Fiscal Year 2017 Audit Report has no findings; and

WHEREAS, pursuant to N.J.S.A. 13:18A-5h, no action authorized by the Commission shall have force or effect until ten (10) days, Saturdays, Sundays and public holidays excepted, after a copy of the minutes of the meeting of the Commission has been delivered to the Governor for review, unless prior to expiration of the review period the Governor shall approve same, in which case the action shall become effective upon such approval.

NOW, THEREFORE BE IT RESOLVED that the Pinelands Commission hereby accepts the Audit Report for Fiscal Year 2017 and directs that it be included as a publication available through the Pinelands Commission's website.

Record of Commission Votes

	AYE	NAY	NP	A/R*		AYE	NAY	NP	A/R*		AYE	NAY	NP	A/R*
Ashmun			X		Howell	X				Prickett	X			
Avery	X				Jannarone	X				Quinn	X			
Barr	X				Lloyd	X				Rohan Green	X			
Chila			X		Lohbauer	X				Earlen	X			
Galletta			X		Pikolycky	X								

*A = Abstained / R = Recused

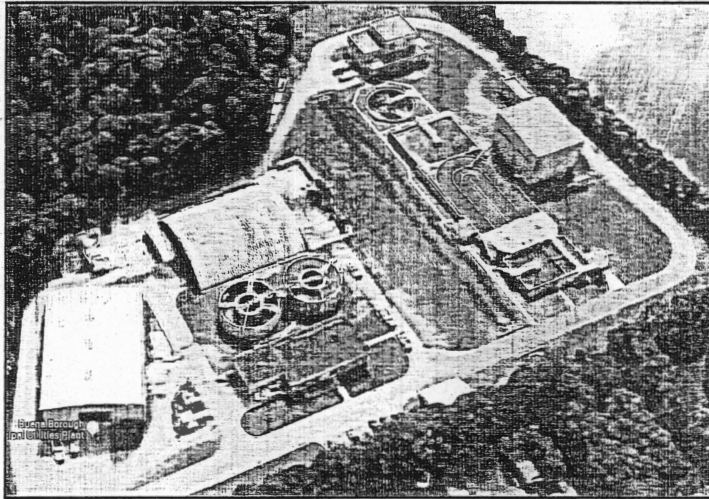
Adopted at a meeting of the Pinelands Commission

Date: January 11, 2019

Nancy Wittenberg
Nancy Wittenberg
Executive Director

Sean W. Earlen
Sean W. Earlen
Chairman

Buena Borough Municipal Utilities Authority
Water Pollution Control Plant

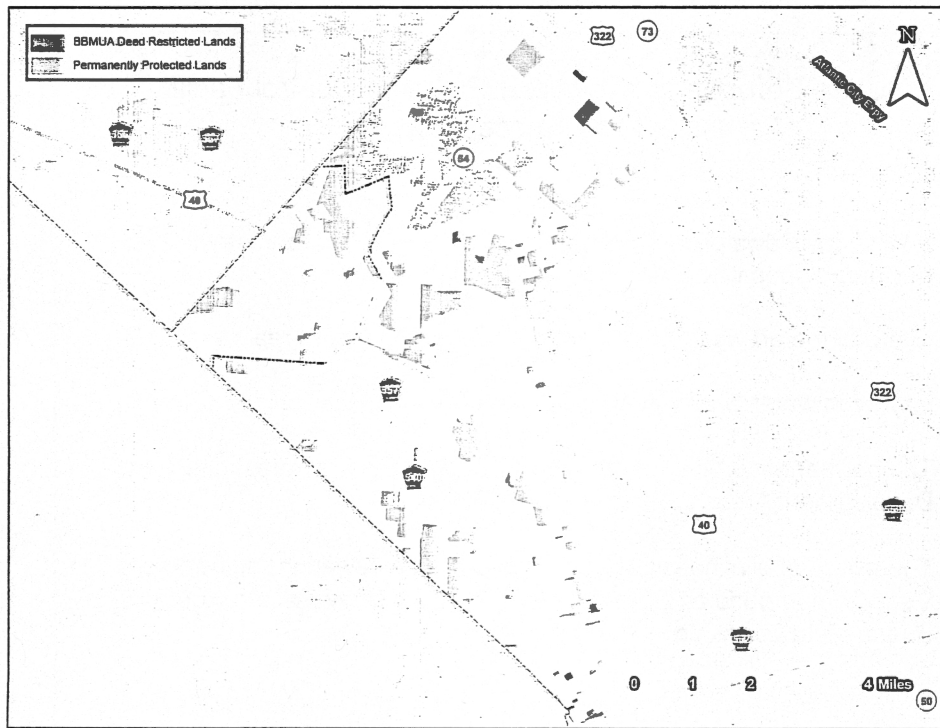
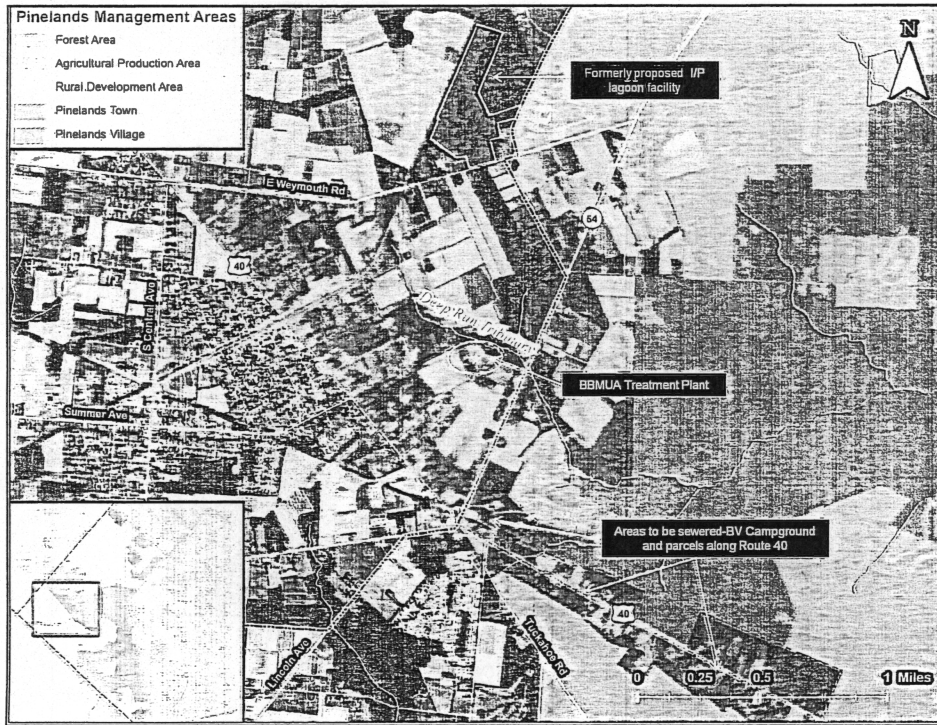


Pinelands Commission
January 11, 2019

Buena Borough MUA's Water Pollution Control Facility
An MOA Success Story

How local groundwater and soil permeability limitations that restricted wastewater disposal options in Buena Borough lead to:

- State of the art wastewater treatment in the Pineland Area
- Improved water quality in a Pinelands stream
- The permanent protection of at least 232 acres in the Forest and Rural Development Areas in Buena Vista Township
- The eventual elimination of septic systems (via sewerage) at the Buena Vista Campground and the extension of sewer service along Route 40 in Buena Vista Township.



Partners in the MOAs

Buena Borough Municipal Utilities Authority (BBMUA)

Buena Vista Township

The Pinelands Commission

- First MOA (March 27, 2007) To permit wastewater infrastructure (infiltration/percolation lagoons) in a Pinelands Agricultural Production Area
- Second MOA (May 26, 2011 amendment to first agreement) To permit the BBMUA to continue discharging treated effluent to the Deep Run using best available treatment technology.

Circumstances that lead the need for an MOA

- 1969 BBMUA's original wastewater treatment plant began operating with a permitted discharge to the Deep Run Creek, a tributary of the Great Egg Harbor River.
- 1988 Federal Water Pollution Control Act imposed new effluent discharge limits on all wastewater treatment plants.

Because the treatment plant couldn't meet new Federal and State discharge limits, the MUA and DEP entered into an Administrative Consent Order (ACO).

The ACO established a construction schedule for a new treatment plant that could meet the new (1988) State and Federal discharge limits.

The new plant would have a permitted flow greater than flow to the original plant.

Per the CMP, the increased flow triggered the need to eliminate the existing discharge to the Deep Run, a Pinelands surface water body.

Lead up to the MOAs

1990 New treatment plant capable of higher levels of nutrient removal is approved by the Commission (with conditions):

- * Completion of an effluent force main to convey effluent to a facility outside the Pinelands Area
- * Elimination of the Deep Run discharge by June 1, 1995.

1991 The new treatment system becomes operational

Three alternative methods for effluent disposal are evaluated:

- * Discharge to the Blackwater branch, outside the Pinelands Area
- * Land Application (via spray fields or infiltration lagoons)
- * Well injection (deep or shallow)

Lead up to the MOAs

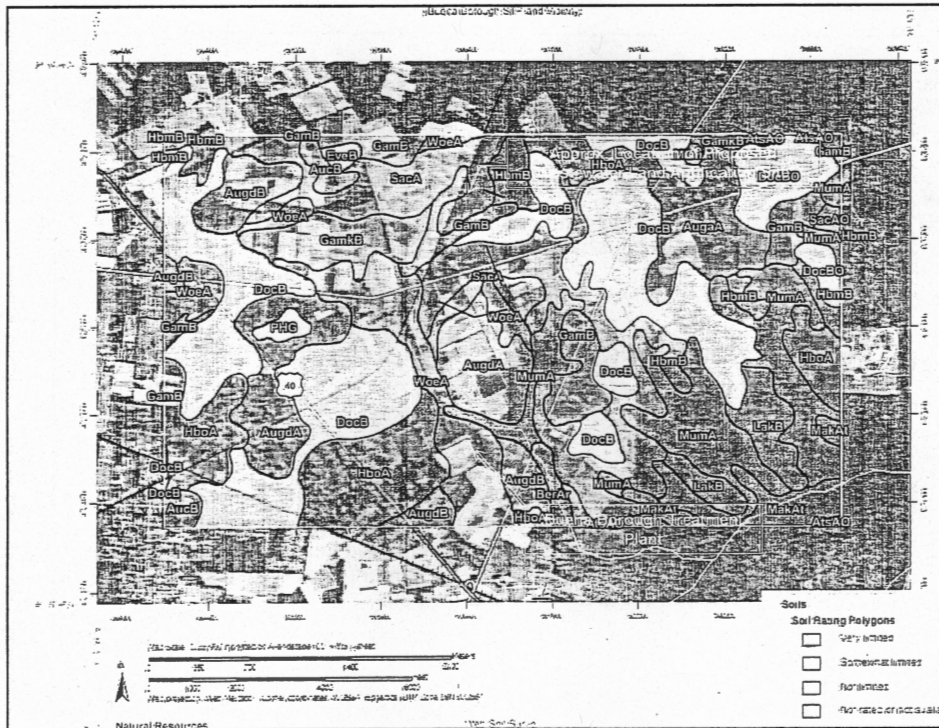
1990-1995 Alternatives are evaluated

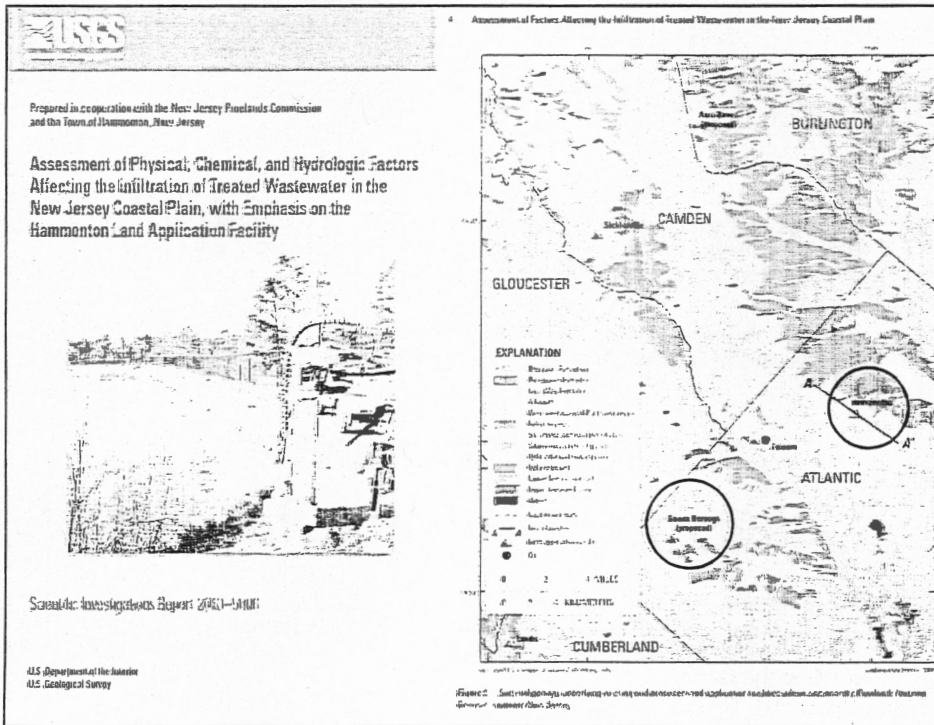
- ◊ Discharge to the Blackwater Branch (outside the Pinelands) ruled out:
 - Stream study finds insufficient flow in receiving stream
- ◊ Land application ruled out:
 - Spray irrigation would require 300 acres – nearby sites not available
 - Recharge basins (30 acres) -nearby sites are limited due shallow groundwater and/or restricted permeability.
- ◊ Deep and shallow well injection ruled out:
 - Deep injection to a brackish confined aquifer is not feasible due to silty and clayey conditions to a depth of over 2,000 feet.
 - Shallow injection to wells screened between 115 ft. and 195 ft. ruled out by DEP due to concerns over well screen fouling.

With continued discharge to the Deep Run beyond the June 1, 1995 deadline, no new connections to the treatment plant were permitted.

March 27, 2007 MOA

- 2003 BBMUA proposed infiltration/percolation lagoons on a 60-acre parcel in the Pinelands Agricultural Production Area (APA). An MOA was required to authorize wastewater infrastructure in the APA.
- 2007 BBMUA, Buena Vista Township and the Pinelands Commission executed the March 27, 2007 MOA to authorize development of the I/P lagoons in the APA.
- Buena Vista Township agreed to deed restrict approximately 232 acres of land as the environmental offset to the MOA.
 - BBMUA sought and obtained approximately \$4 million from the USDA to fund construction of the I/P lagoons.
- 2011 Under contract to the Pinelands Commission, USGS determines that groundwater mounding would severely interfere with the operation of the proposed I/P lagoon facility and the BBMUA was forced to abandon its plan to build the facility.





May 26, 2011 MOA Amendment

2011 All parties to the MOA conclude that alternatives to stream discharge are not feasible due to regional geology.

\$4 million in USDA funding presents an opportunity to upgrade the treatment plant to best available, membrane bioreactor (MBR) technology

The March 27, 2007 MOA is amended on March 27, 2007.

- Retains all of the environmental offsets of the original MOA
- Requires the plant to be upgraded to a Membrane Bioreactor
- Stipulates that there will be no increased flow to the plant until the plant achieves 24 consecutive months of significantly enhanced TN and TP discharge limits.

Membrane Bioreactor System Performance

February 2018

BBMUA satisfied the requirement for 24 consecutive months of compliance with TN and TP effluent discharge limits set forth in the amended MOA.

April 2018

Executive Director Wittenberg notified NJDEP of BBMUA's compliance, enabling :

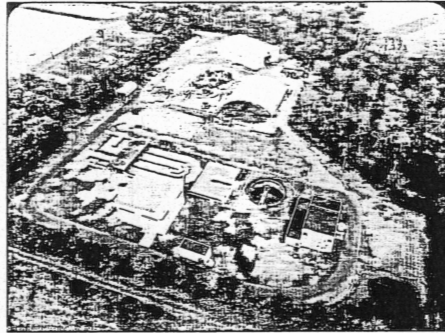
- An amendment to the Atlantic County Water Quality Management Plan (WQMP) and an increase in the permitted flow to the plant from 400,000 gpd to 600,000 gpd.

BBMUAs Water Pollution Control Professionals

Dennis K. Yoder, P.E., Director of Engineering , Remington & Vernick Engineers

Alan Zorzi, Plant Superintendent, Buena Borough Municipal Utilities Authority, NJDEP Licensed Wastewater Treatment Plant Operator, Collection System Operator and Water Treatment System Operator

Presentation to Pinelands Commission



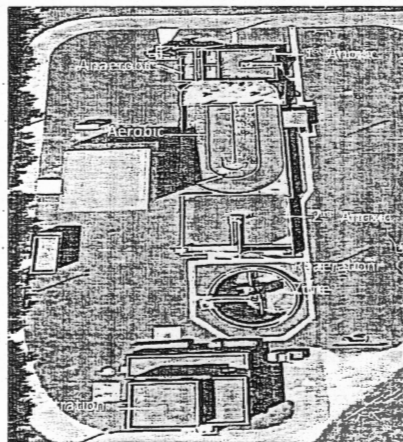
January 11, 2019

Buena Borough, NJ 5 - Stage Bardenpho Carrousel®

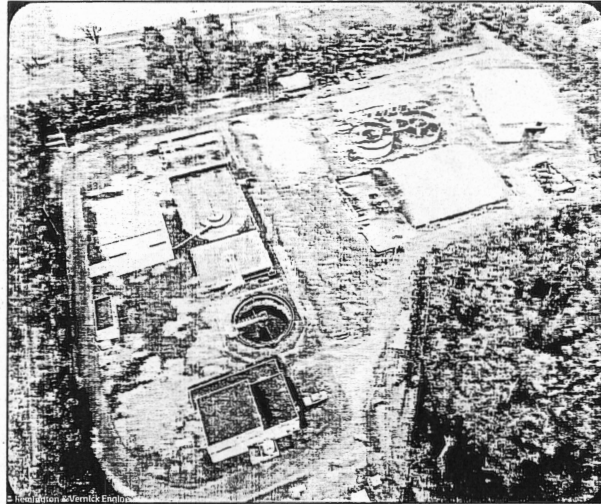
- 1992 WWTP process prior to 2013 upgrade to add membrane biological reactor

Process Flow

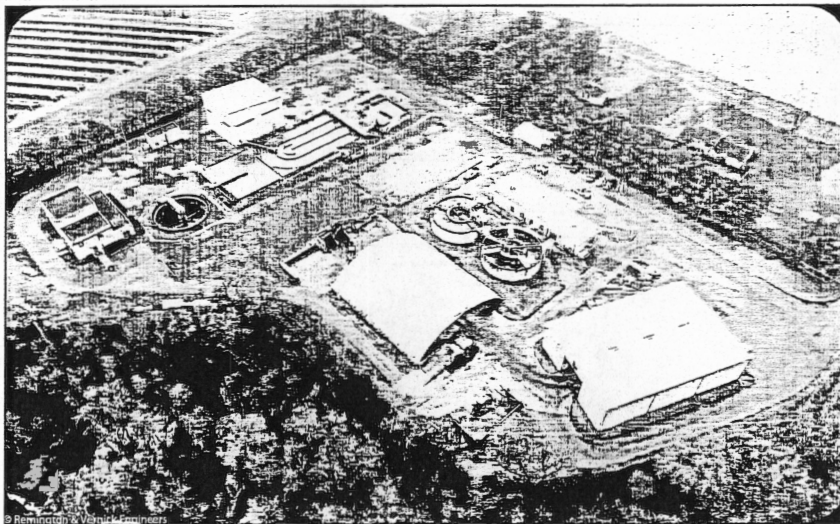
1. Equalization
2. Screening
3. Anaerobic Zone
4. 1st Anoxic Zone
5. Aerobic Zone with Recycle to 1st Anoxic
6. 2nd Anoxic Zone
7. Alum addition in Reaeration Zone
8. Clarification
9. Sand Filtration
10. UV Disinfection
11. Effluent Discharge to Deep Run



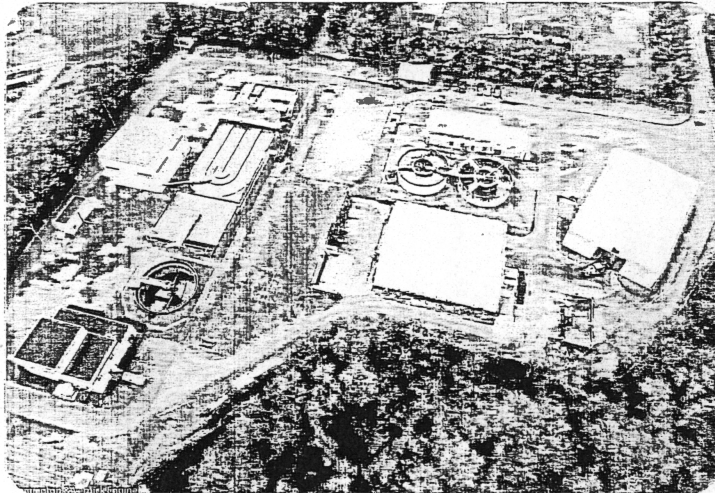
Aerial Drone Photos of the Plant



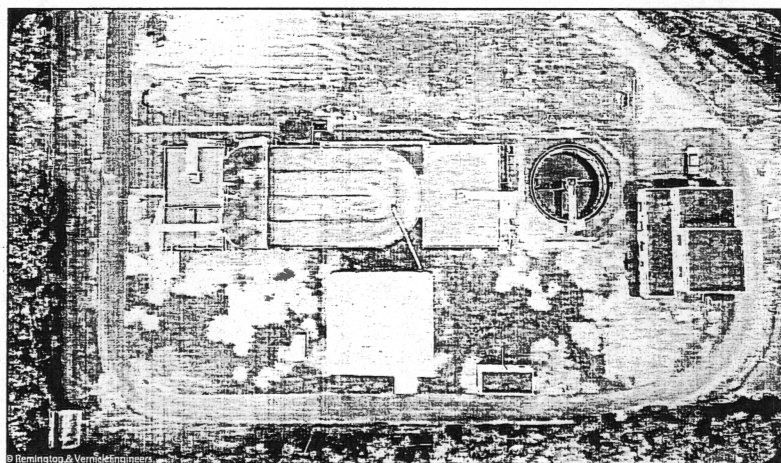
Aerial Drone Photos of the Plant



Aerial Drone Photos of the Plant

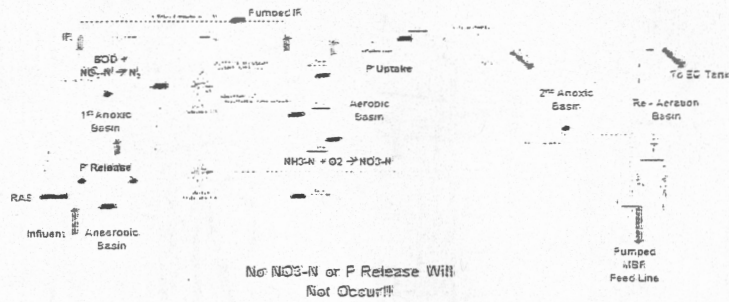


Aerial Drone Photos of the Plant



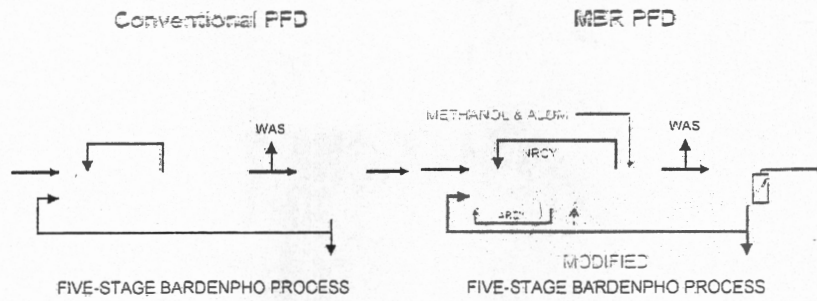
Design Criteria

Parameter	Value
Q	0.6 MGD
BOD ₅	250 mg/L
TSS	250 mg/L
TKN	40 mg/L
TPO	0.6 mg/L
BOD ₅ /TSS	5 mg/L
TPO/TSS	2 mg/L
TPO	0.6 mg/L
SRT	2.6 days
MLSS	3,000 mg/L
BOD ₅ lag	330 minutes

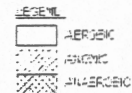


2013 MBR Upgrade

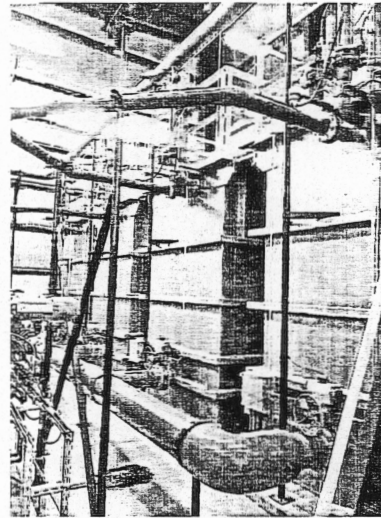
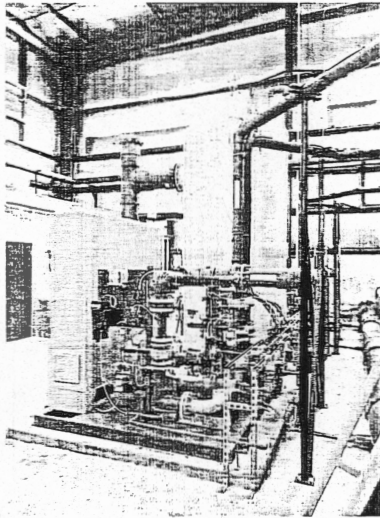
Biological Design



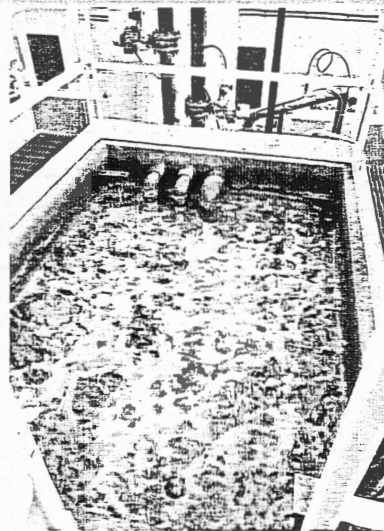
- Added fine screen at headworks.
- Modified recycle pumping.
- Installed improved aerators for better mixing & energy efficiencies.
- Replaced clarifier, filters and disinfection with MBR process.
- Added carbon feed source.



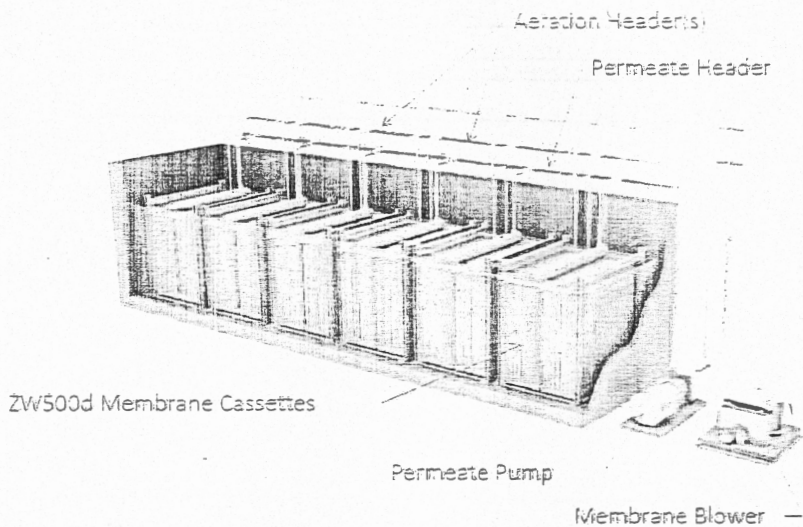
Images



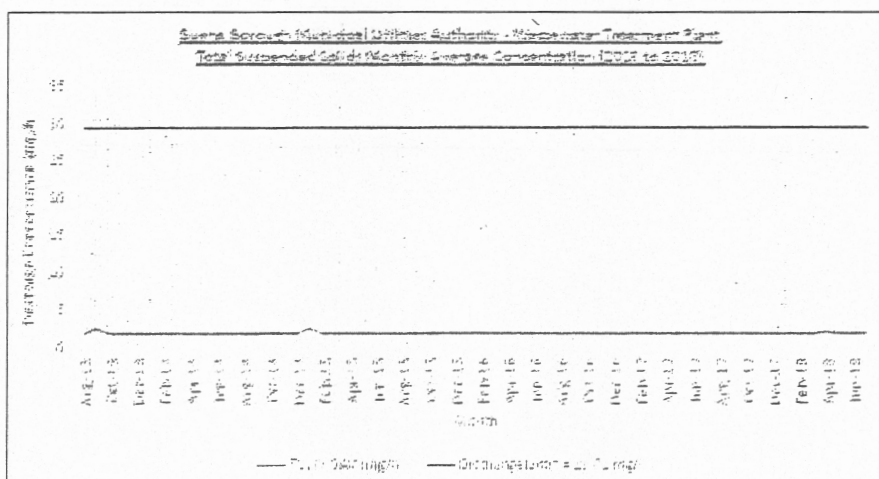
Images continued



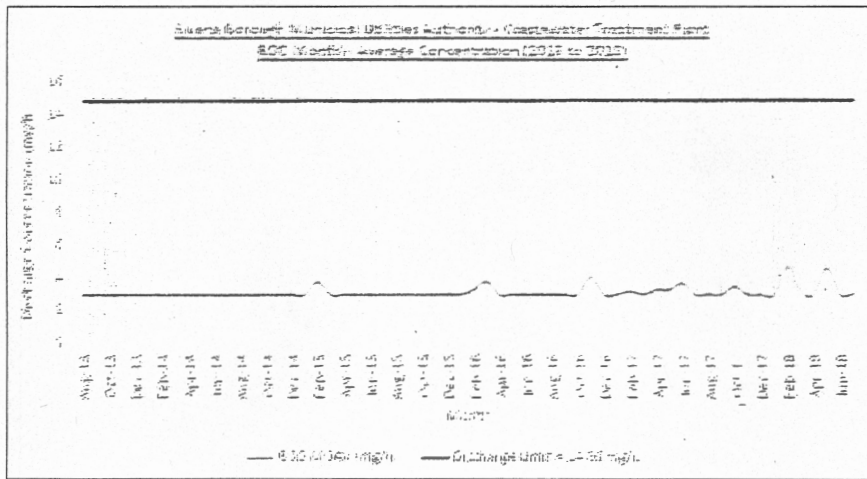
Typical MBR Configuration



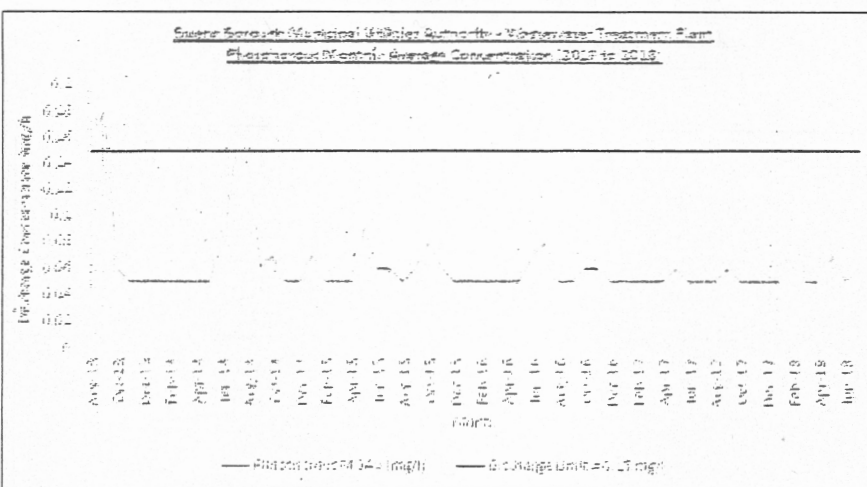
Total Suspended Solids Monthly Average Concentration



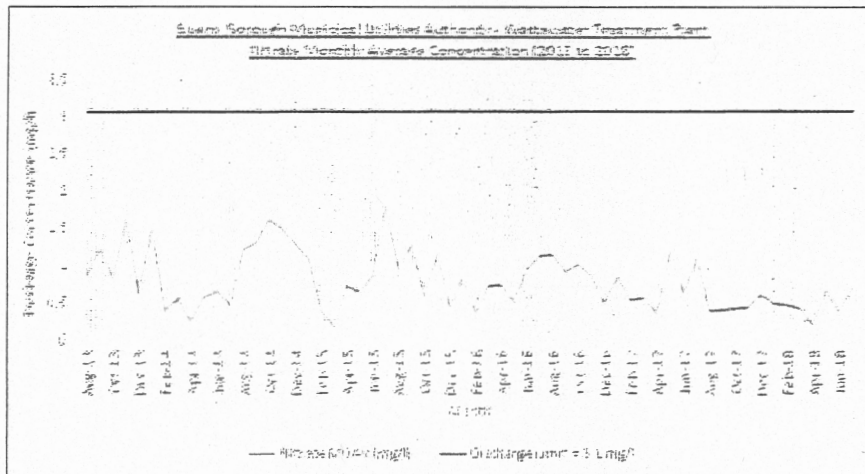
BOD Monthly Average Concentration



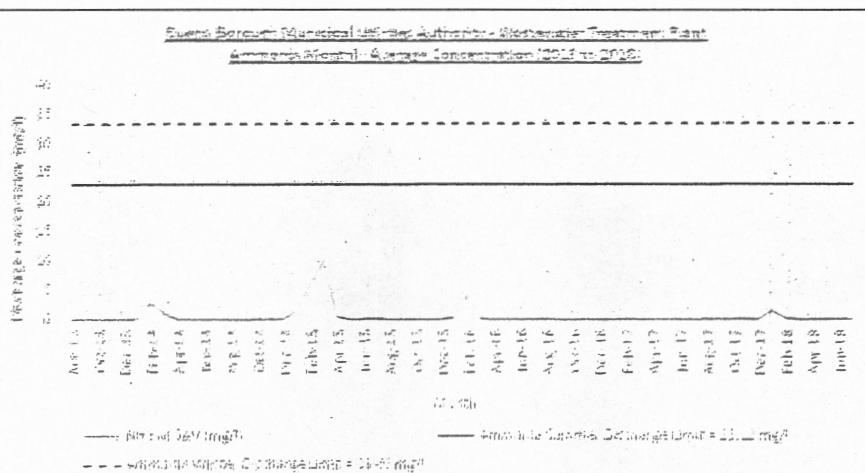
Phosphorous Monthly Average Concentration



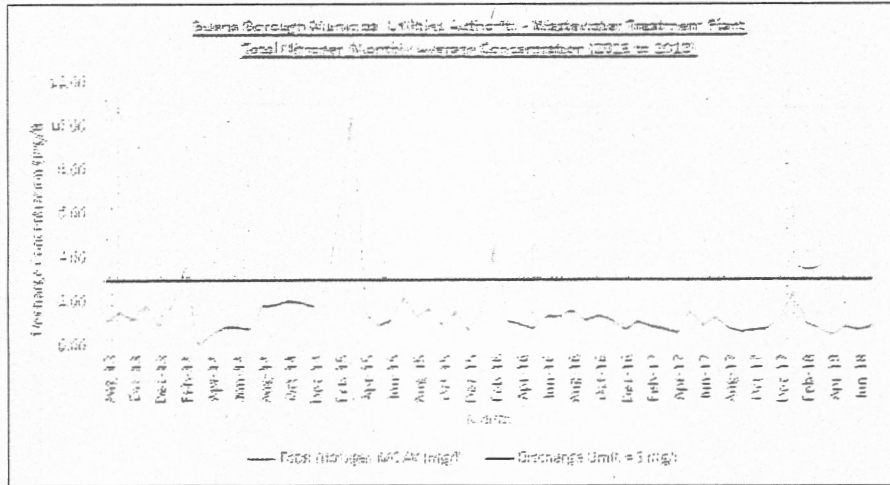
Nitrate Monthly Average Concentration



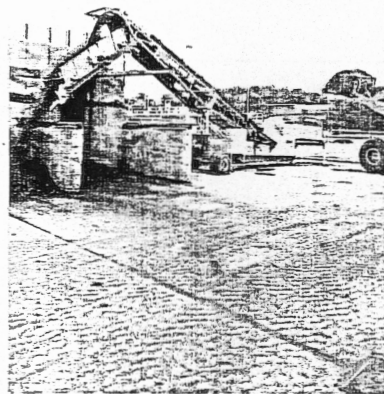
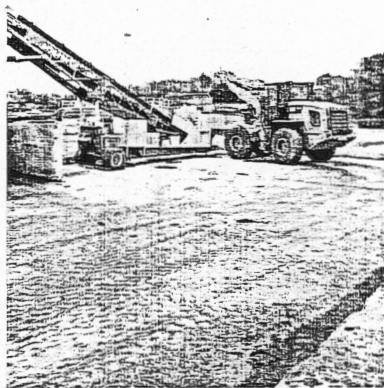
Ammonia Monthly Average Concentration



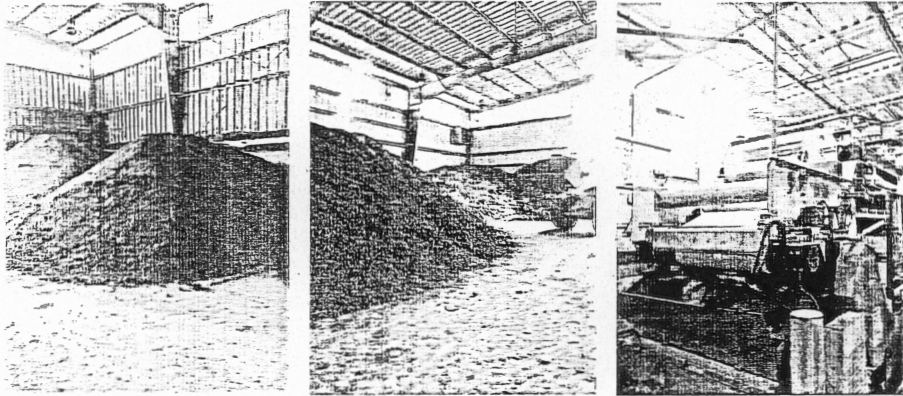
Total Nitrogen Monthly Average Concentration



Bio-Solids Process-Composting



Bio-Solids Process-Composting





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*.

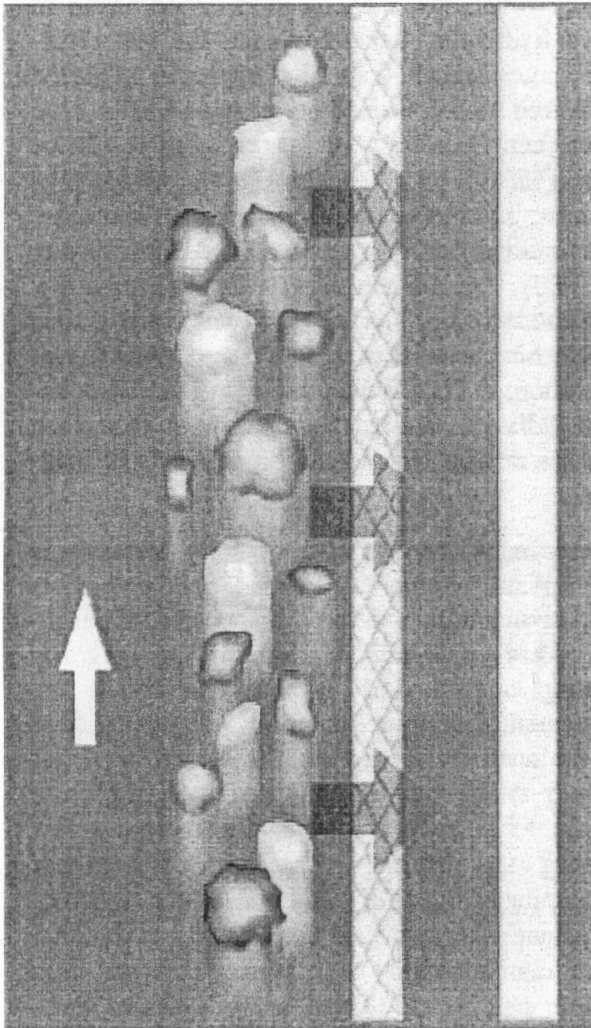


Figure 1. Membrane filtration process (Image from Siemens/U.S. Filter)

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.

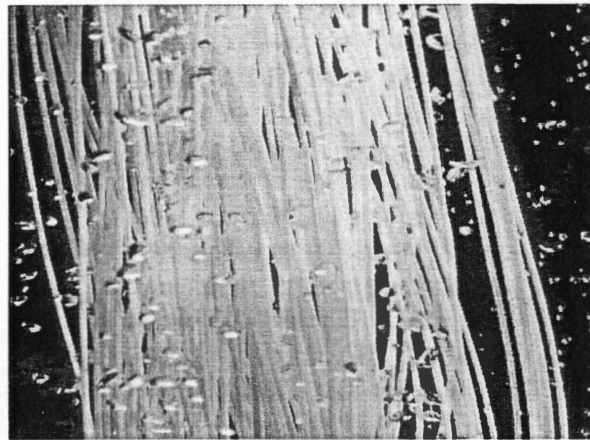


Figure 2. Hollow-fiber membranes (Image from GE/Zenon)

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-

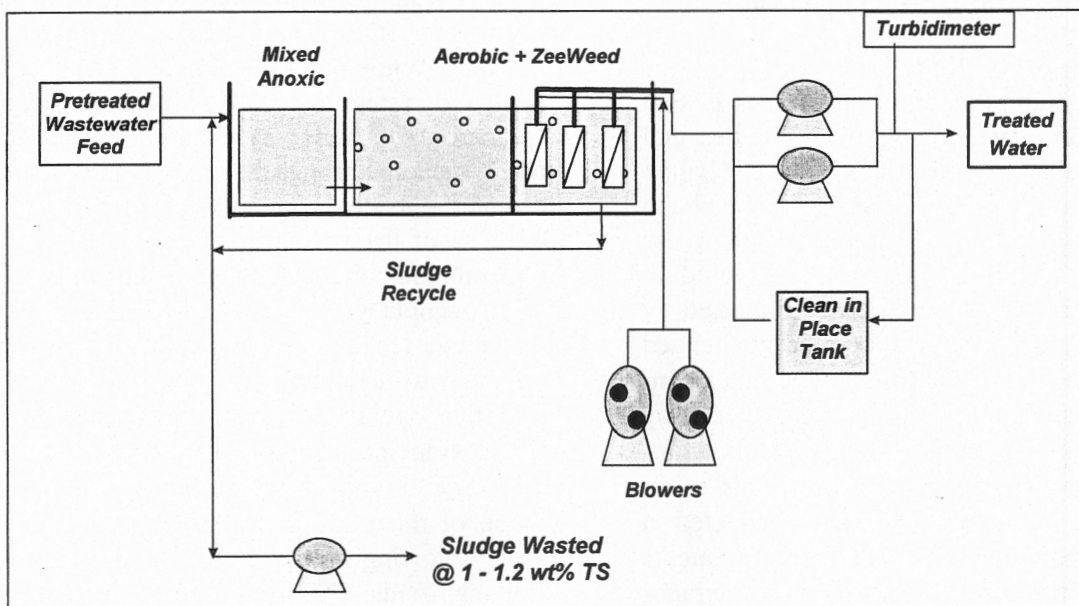


Figure 3. Immersed membrane system configuration (Image from GE/Zenon)

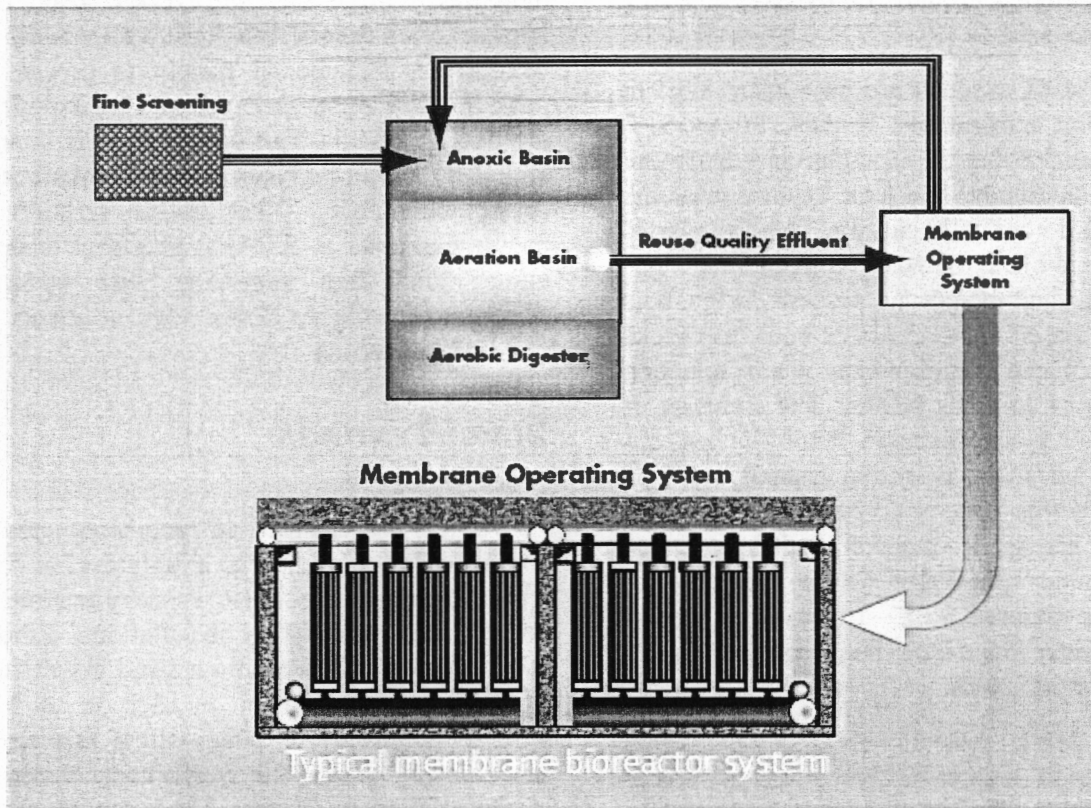


Figure 4. External membrane system configuration (Image from Siemens/U.S. Filter)

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

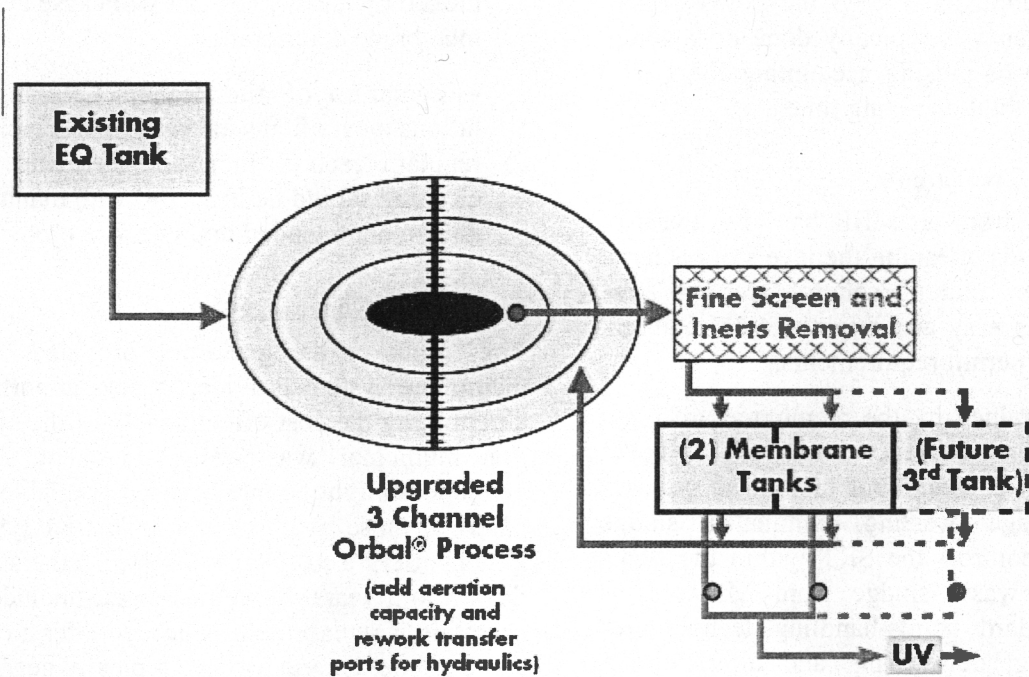


Figure 5. Calls Creek flow diagram (courtesy of Siemens/U.S. Filter)

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 param-

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/Siemen'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

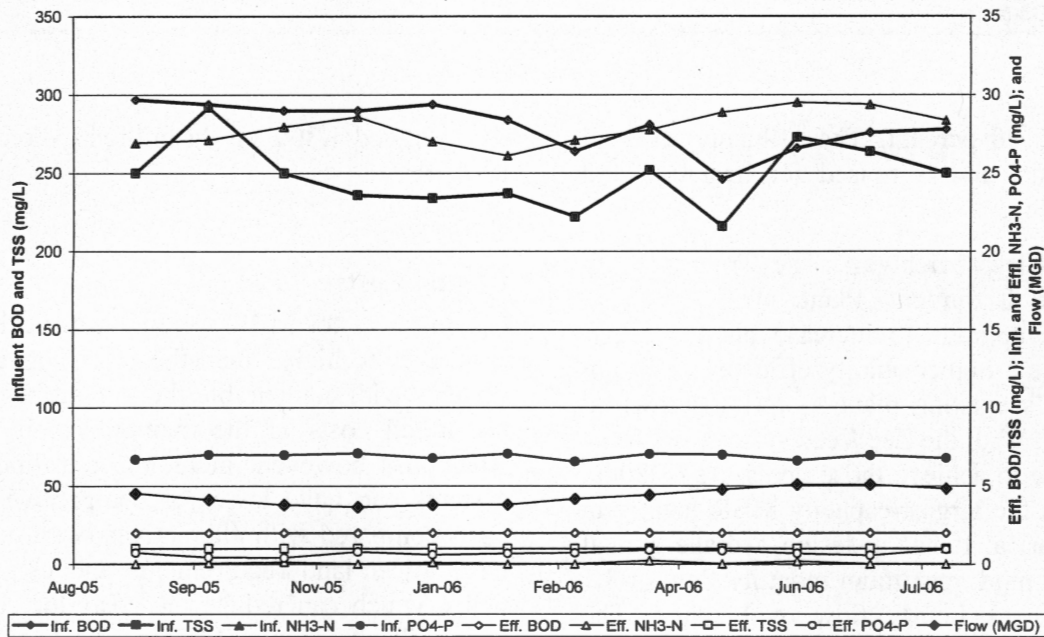


Figure 6. Performance of the Traverse City plant

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.

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