HEARING OFFICER'S REPORT

TO: The Honorable Shawn M. Garvin
Cabinet Secretary, Department of Natural Resources and Environmental Control

FROM: Lisa A. Vest
Regulatory Specialist, Office of the Secretary
Department of Natural Resources and Environmental Control

RE: On-Site Wastewater Treatment and Disposal System Operations Permit Application for treated wastewater effluent disposal via spray irrigation by Artesian Wastewater Management, Inc., at Artesian Northern Sussex Regional Water Recharge Facility ("ANSRWRF") located in Milton, Delaware (Hearing Docket No. 2019-P-W-0016).

DATE: March 12, 2020

I. BACKGROUND AND PROCEDURAL HISTORY:

A public hearing was held on Wednesday, August 21, 2019, at 6:00 p.m. by the Department of Natural Resources and Environmental Control ("DNREC," "Department") at Mariner Middle School, located at 16391 Harbeson Road, Milton, Delaware, to receive comment on the On-Site Wastewater Treatment and Disposal Systems Operations Permit Application submitted to the Department by Artesian Wastewater Management, Inc. ("Artesian"), to receive treated wastewater effluent from the Allen Harim Harbeson Processing Facility's on-site wastewater treatment system for storage in a synthetically lined lagoon, and disposal via spray irrigation at the Artesian Northern Sussex Regional Water Recharge Facility ("ANSRWRF") in Milton, Delaware ("Application").

The Application submitted by Artesian is subject to various state and federal regulatory requirements, including, but not limited to, Delaware's *Regulations Governing the Design, Installation, and Operation of On-Site Wastewater Treatment and Disposal Systems*, as set forth in 7 DE Admin. Code 7101, and as provided for under Delaware law in 7 *Del.C.* Ch. 60.

It should be noted that the Artesian Application is very closely aligned with another permit application submitted to the Department by Allen Harim Foods, LLC. Although the Department processed both permit applications together for cost efficiency purposes, this Hearing Officer's Report ("Report") concerns only the Hearing Record ("Record") as it relates to the Artesian Application, as set forth above.

As noted above, Artesian has applied for a State of Delaware Operations Permit to receive treated wastewater effluent from the Allen Harim Harbeson Processing Facility's on-site wastewater treatment system for storage in a synthetically lined lagoon, and disposal via spray irrigation at ANSRWRF in Milton, Delaware. The Artesian facility will utilize treated wastewater effluent for irrigation of privately-owned agricultural land under a lease held in perpetuity by Artesian as the wastewater utility provider. The proposed irrigation sites, including current and future phases, total approximately 1,714 acres of land, which includes both wooded and agricultural areas. The proposed irrigation sites have been permanently placed in an Agricultural Preservation Easement by the Delaware Agricultural Lands Preservation Foundation. The treated wastewater effluent discharged via spray irrigation is required to comply with water quality limitations, along with operational, monitoring, and reporting requirements intended to protect public health and the environment.

The permit applications submitted by Artestian and Allen Harim were deemed technically complete by the Department on July 18, 2019, and July 24, 2019, respectively. Given the level of public interest on the Applicants' proposed activities as set forth above, the Department made the decision to go directly to a public hearing for both permit applications (instead of waiting to receive a meritorious request for a hearing from the public). Accordingly, the Department published legal notices in both the *Sunday News Journal* and the *Delaware State News* on July 31, 2019, advertising that a public hearing would be held, as referenced above. Thereafter, the Department held its public hearing concerning this matter on August 21, 2019.

Department staff, representatives of both Artesian and Allen Harim, and approximately one hundred members of the public attended the August 21, 2019 public hearing. Many of the hearing attendees provided comment on the Applications. Due to the high level of public interest in these Applications, and in response to requests made by the public at the time of the hearing for the Department to extend the public comment period, the Record remained open for receipt of comment through September 27, 2019. It should be noted that comments were received from the public not only at the time of the public hearing, but also during both the pre- and post-hearing phases of this permitting matter. Proper notice of the hearing was provided as required by law.

II. SUMMARY OF THE PUBLIC HEARING RECORD:

The Record consists of the following documents:

(1) The official verbatim Transcript of Proceedings from Wilcox & Fetzer, Ltd., generated from the public hearing of August 21, 2019;

(2) Five folders containing the Department's Exhibits concerning the Allen Harim Application, introduced by responsible Department staff at the aforementioned hearing, and marked accordingly by this Hearing Officer as "Dept. Exh. 1-5, Allen Harim Application";

(3) Five folders containing the Department's Exhibits concerning the Artesian Application, introduced by responsible Department staff at the aforementioned hearing, and marked accordingly by this Hearing Officer as "Dept. Exh. 1-5, Artesian Application";

(4) Copy of the Applicants' Joint PowerPoint presentation offered at the public hearing, marked accordingly by this Hearing Officer as "Applicants' Exh. 1";

(5) Written comment offered by Andrea G. Green at the public hearing, marked accordingly by this Hearing Officer as "Green Exh. 1";

(6) Written comment offered by Thomas DiOrio at the public hearing, marked accordingly by this Hearing Officer as "DiOrio Exh. 1";

(7) Written comment offered by Lou Colon at the public hearing, marked accordingly by this Hearing Officer as "Colon Exh. 1";

(8) Written comments offered by Anthony Scarpa at the public hearing, dated August 18, 2019, marked accordingly by this Hearing Officer as "Scarpa Exh. 1";

(9) Additional written comment offered by Anthony Scarpa at the public hearing, marked accordingly by this Hearing Officer as "Scarpa Exh. 2";

(10) Technical Response Memorandum ("TRM") from the Department's experts in the Division of Water, Groundwater Discharges Section, ("GWDS") including, but not limited to, John Rebar, Jr., Environmental Program Manager, dated December 31, 2019;

(11) Amended TRM from the Department's experts in the Division of Water, Groundwater Discharges Section, ("GWDS") including, but not limited to, John Rebar, Jr., Environmental Program Manager, dated March 9, 2020.

The Department's person primarily responsible for reviewing this application, Mr. Rebar, as referenced above, developed the Record with the relevant documents in the Department's files.

The Record generated in this matter indicates that numerous members of the public offered comments regarding these permit applications, both at the time of the public hearing on August 21, 2019, and during the time period when the Record remained open to receive public comment. The Department received well over 100 comments and questions concerning this proposed project, made by citizens concerned not only about the overall water quality in Sussex County, but also about the potential environmental and public health impacts of the proposed operations at both the Allen Harim Harbeson Processing Facility and ANSRWRF in Milton, Delaware.

At the request of this Hearing Officer, the technical experts in the Department's GWDS prepared a Technical Response Memorandum ("TRM") to (1) specifically address the concerns set forth in the public comments received by the Department; and (2) offer conclusions and recommendations with regard to these permit applications for the benefit of the Record generated in this matter. This TRM, dated December 31, 2019, provided a summary of the public comments received by the Department in this matter, and offered specific responses to the same.

Subsequent to the date of the TRM noted above, the Department's GWDS received additional information from Allen Harim regarding the proposed timelines for completion of various storage lagoon rehabilitation projects. Accordingly, an Amended TRM (dated March 9, 2020) was subsequently provided to this Hearing Officer. The Amended TRM updates the GWDS' previous responses to the public comments received in this matter, and reflects revisions made to the draft On-Site Wastewater Treatment and Disposal System Operational Permits ("Draft Permits") associated with these pending permit applications. The GWDS believes that the revised Draft Permits accompanying the Amended TRM address the technical and regulatory concerns of both the public and the permittees, while fulfilling the Department's mission to protect the public health and the environment.

The GWDS's Amended TRM provided updated responses to the public comments specifically associated with the permit applications pending before the Secretary at this time. It does not address, however, those comments that pertain to matters outside the permitting authority of the GWDS, nor is it responsive to any comments not specifically related to these Applications, which was the subject matter of the public hearing held by the Department on August 21, 2019.

I find that the GWDS's Amended TRM offers a thorough and detailed review of all aspects of the pending Application, addresses those concerns germane to the subject matter of the aforementioned public hearing, and responds to them in a balanced manner, accurately reflecting the information contained in the Record. Thus, the Amended TRM dated March 9, 2020, with attachments, is attached hereto as Appendix "A" and is expressly incorporated herein as such.

III. RECOMMENDED FINDINGS AND CONCLUSIONS:

Currently pending before the Department is the On-Site Wastewater Treatment and Disposal Systems Operations Permit Application submitted by Artesian Wastewater Management, Inc., for treated wastewater effluent disposal via spray irrigation at ANSRWRF in Milton, Delaware.

I find that the proposed project requires Artesian to obtain an Operations Permit, as noted above. I further find that the Applicant's proposed project is subject to various state and federal regulatory requirements, including, but not limited to, Delaware's *Regulations Governing the Design, Installation, and Operation of On-Site Wastewater Treatment and Disposal Systems*, as set forth in 7 DE Admin. Code 7101, and as provided for under Delaware law in 7 *Del.C.* Ch. 60.

In reviewing the applicable statutes and regulations, as well as weighing public benefits of this project against potential detriments, the Department's experts in the GWDS have concluded that Artesian's Application complies with all applicable federal and state laws and regulations. Should this Application be approved, the GWDS permit that would be issued by the Department would be reflective of the Application submitted, and would include water quality limitations, along with operational, monitoring, and reporting requirements intended to protect public health and the environment.

In response to the above referenced comments received from the public in this matter, the Department has sought to minimize the impacts to the surrounding communities. To that end, the Department's experts in GWDS have made the following determinations:

1. The storage lagoon at ANSRWRF is designed for 61 days of storage, providing sufficient assurance that spray disposal can be postponed or diverted during periods when conditions are unfavorable for approved uses, or when the quality requirements cannot be met.

2. ANSRWRF will be required to perform extensive water quality monitoring through spray effluent monitoring, the use of lysimeters (in-field), monitoring wells (in-field, up-gradient, and down-gradient), and surface water grab samples, allowing the GWDS to assess what impact the spray irrigation activities are having on the spray fields, groundwater, and surface waters within and adjacent to the spray fields.

3. In the event trends of increasing concentrations and/or impacts are observed, Artesian will be required to take all necessary actions to eliminate and correct any adverse impact on public health and/or the environment resulting from permit non-compliance, in accordance with Section 3.20 of 7 DE Admin. Code 7101, Delaware's *Regulations Governing the Design, Installation, and Operation of On-Site Wastewater Treatment and Disposal Systems*.

The Record developed in this matter indicates that the Department's GWDS experts have considered all statutes and regulations that govern projects such as the Applicant's above proposed activities and have recommended approval of the Operations Permit necessary for the same.

I find and conclude that the Applicant has adequately demonstrated compliance with all requirements of the statutes and regulations, as noted herein, and that the record supports approval of the Application as submitted by Artesian in this matter. In conclusion, I recommend the On-Site Wastewater Treatment and Disposal System Operations Permit for effluent disposal via spray irrigation by Artestian Wastewater Management, Inc., at ANSRWRF in Milton, Delaware, as set forth in the Application submitted by Artesian, be issued at this time by the Department in the customary form, consistent with the Record developed in this matter and with appropriate conditions; and

Further, I recommend the Secretary adopt the following findings and conclusions:

1. The Department has jurisdiction under 7 *Del. C.* §§6003, 6004, 6006(4), Delaware's *Regulations Governing the Design, Installation, and Operation of On-Site Wastewater Treatment and Disposal Systems* (7 DE Admin. Code 7101), and all other relevant statutory authority, to make a final determination on the Application after holding a public hearing, considering the public comments, and all information contained in the Record generated in this matter;

2. The Department provided proper public notice of the Applications submitted by both Allen Harim and Artesian, and of the public hearing held on August 21, 2019, and held said hearing to consider any public comment that may be offered on the Applications, in a manner required by the law and regulations;

3. The Department considered all timely and relevant public comments in the Record, as established in the TRMs provided by the Department's GWDS, which have now been expressly incorporated into the Record generated in this matter;

4. The Department has carefully considered the factors required to be weighed in issuing the permits required by the Application, and finds that the Record supports approval of the same;

5. The Department shall issue to Artesian the On-Site Wastewater Treatment and Disposal System Operations Permit for effluent disposal via spray irrigation by Artestian Wastewater Management, Inc., at ANSRWRF in Milton, Delaware, consistent with the Record developed in this matter. Furthermore, said permit shall include all conditions as set forth in the Department's Draft Permit for Artesian, to ensure that Delaware's environment and public health will be protected from harm;

6. The Department has an adequate Record for its decision, and no further public hearing is appropriate or necessary; and

7. The Department shall serve and publish its Order on its internet site, and shall provide legal notice of the Order in the same manner that the Department provided legal notice of the Applications.

LISA A. VEST
Regulatory Specialist

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Attachment A: Amended TRM (03/09/20)

APPENDIX "A"

EXHIBIT
Exh. #11 (LM)

RECEIVED
MAR 12 2020
DNREC
PUBLIC HEARING OFFICER

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES &
ENVIRONMENTAL CONTROL
DIVISION OF WATER
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

Groundwater Discharges Section

Telephone: (302) 739-9948

MEMORANDUM

TO: Lisa Vest, Hearing Officer, Office of the Secretary

THROUGH: Virgil Holmes, Director, Division of Water (DW) 3/12/2020
Jennifer Roushey, Environmental Program Administrator, DW

FROM: John Rebar Jr., Environmental Program Manager I, Groundwater Discharges Section (GWDS) JJR

RE: **Amended Technical Response Memorandum - Response to Comments Received during the Public Comment Period and the August 21, 2019 Public Hearing (Docket # 2019-P-W-0016) on the On-Site Wastewater Treatment and Disposal System Operations Permit Applications and Revisions to the proposed Draft Operations Permits for the Allen Harim Harbeson Processing Facility and the Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF)**

DATE: March 9, 2020

This Amended Technical Response Memorandum (TRM) was prepared at the request of the presiding hearing officer to revise an earlier TRM submitted on December 31, 2019. This amended TRM updates the GWDS's previous *response to comments* document to reflect revisions made to the draft On-Site Wastewater Treatment and Disposal System Operations Permits for on-site wastewater treatment by Allen Harim Foods, LLC in Harbeson, DE and treated wastewater effluent disposal via spray irrigation by Artesian Wastewater Management, Inc. at ANSRWRF in Milton, DE. These revisions are the result of public and permittee comments submitted on the proposed draft permits presented during a public hearing held on August 21, 2019 (Docket # 2019-P-W-0016) along with additional information submitted by Allen Harim Foods, LLC regarding timelines for completing various storage lagoon rehabilitation projects (Appendix I: Allen Harim Harbeson Old Anaerobic Lagoon Cleanout Plan). The GWDS believes that the revised draft permits accompanying this amended TRM address the technical and regulatory concerns of the public and permittees and fulfils GWDS's mission to protect public health and the environment.

The purpose of the amended TRM is to assist in the completion of the Hearing Officer's Report to the Secretary of the Delaware Department of Natural Resources and Environmental Control (the Department) and provide the information needed to help inform the final decision on the issuance of On-Site Wastewater Treatment and Disposal System Operations Permits for on-site wastewater treatment by Allen Harim Foods, LLC in Harbeson, DE and effluent disposal via spray irrigation by Artesian Wastewater Management, Inc. at ANSRWRF in Milton, DE.

Allen Harim Foods, LLC has applied for a State of Delaware operations permit to treat poultry processing wastewater at the Allen Harim Harbeson Processing Facility on-site treatment system. The majority of poultry processing water is generated on-site at the Harbeson facility with a minor amount discharged to the treatment system from the Allen Harim Pinnacle Processing Facility in Millsboro, DE and Allen Harim Hatchery in Dagsboro, DE. The Harbeson facility's wastewater treatment system consists of primary screening, dissolved air flotation (DAF) unit, two anoxic biological nutrient removal (BNR) basins, two complete mixed activated sludge (CMAS) aeration basins, flocculation tank, two clarifiers, and a chlorine contact tank. The treatment train also includes two aerobic digesters and screw press unit for sludge processing. The facility is capable of diverting non-compliant wastewater to on-site basins/lagoons followed by recirculating and retreating the wastewater. Treated wastewater effluent will be pumped via force main to ANSRWRF for storage in a synthetically lined lagoon and disposal via spray irrigation.

Artesian Wastewater Management, Inc. has applied for a State of Delaware operations permit to receive treated wastewater effluent from the Allen Harim Harbeson Processing Facility's on-site wastewater treatment system for storage in a synthetically lined lagoon and disposal via spray irrigation at ANSRWRF. The Artesian facility will utilize treated wastewater effluent for irrigation of privately-owned agricultural land under a lease held in perpetuity by Artesian as the wastewater utility provider. The proposed irrigation sites, including current and future phases, total approximately 1,714 acres of land which includes both wooded and agricultural areas. These sites have been permanently placed in an Agricultural Preservation Easement by the Delaware Agricultural Lands Preservation Foundation. Treated wastewater effluent discharged via spray irrigation is required to comply with water quality limitations along with operational, monitoring, and reporting requirements intended to protect public health and the environment.

A public hearing was held on the applications and proposed draft permits on Wednesday, August 21, 2019, 6:00 PM at Mariner Middle School, located at 16391 Harbeson Road, Milton, DE 19968. Approximately, 100 people attended the hearing, and many provided comments on the applications and proposed draft permits. Given the amount of interest in the applications/permits and two written requests for additional time to submit comments, the Hearing Officer left the hearing record open for an additional period of 30 days. Therefore, the comment period ended on September 27, 2019. The Department received 139 comments and questions from 35 individuals. In many cases, individuals provided comments and questions on the same issues, in others, the comments and questions are unrelated. During its review of the transcript and written comments to prepare the *response to comments* document, the GWDS paraphrased and grouped similar comments and questions together. This amended TRM updates the GWDS's original responses based on new information submitted by Allen Harim Foods, LLC and revisions to the draft permits necessitated by public and permittee comments. Comments and the GWDS's responses follow with the incorporation of revised permit language highlighted in blue.

1. **Public comments regarding the administrative and technical completeness of the Allen Harim and Artesian applications for operations permits.**

Comment 1a: During the hearing and in several documents several names are used for Artesian's spray irrigation facility. What is the name of Artesian's facility?

Response: The July 2019 application submitted by Artesian Wastewater Management, Inc., and on-file with the GWDS, bears the name Artesian Northern Sussex Regional Water Recharge Facility (abbreviated as ANSRWRF). The draft permit reflects that name.

Comment 1b: Artesian's application lacked a recent residential well survey.

Response: Staff hydrologists with the Division of Water's Groundwater Protection Branch performed a hydrological review of Artesian's amended Design Development Report (2017 DDR) and determined that the residential well survey included in the 2017 DDR was outdated. As a result, the GWDS required Artesian to perform a new survey to identify if any new homes were recently built within 1,000 feet of the proposed spray irrigation fields that are not serviced by a centralized water distribution system. The survey was required to include all applicable information regarding those homes including tax map parcel (TMP) numbers, well permit numbers, owner's name, and well locations. Artesian submitted an updated well survey on August 18, 2017 (Appendix II: ANSRWRF DDR Addendum 1).

Comment 1c: Artesian's application lacked required hydrologic studies needed to analyze the impact of ANSRWRF's spray irrigation operations on the aquifer.

Response: Artesian's original 2009 Design Development Report (2009 DDR) was submitted with a Hydrogeologic Investigation Report and preliminary groundwater mounding analysis. The Division of Water's Groundwater Protection Branch reviewed the hydrologic information and requested additional information on October 28, 2009. On March 3, 2010, Artesian submitted the requested hydrologic information with supporting documentation, which was subsequently reviewed by the Groundwater Protection Branch on March 25, 2010. Additional information was submitted by Artesian on April 22nd and April 26th and the GWDS accepted the revised hydrogeologic information on April 29, 2010 (Appendix III: Additional Hydrologic Information). This information was used in the final issuance of Artesian's Construction Permit on October 15, 2013.

Since, the site's suitability and disposal capacity were reviewed and approved during the construction permitting process the 2017 DDR only needed to account for changes in the anticipated influent flow characteristics and operations phasing. Therefore, no additional hydrologic studies were required to develop the draft permit.

Comment 1d: Is Artesian's application in accordance with the State's Agricultural Preservation Easement and Sussex County's Conditional Use Ordinance 1923 which requires that irrigation rates be determined by crop utilization and uptake limits rather than by wastewater disposal needs?

Response: Both the 2017 DDR-Appendix F and the 2019 O&M Plan-Appendix B include Artesian's *Vegetative and Nutrient Management Plan for the Spray Irrigation of Treated Wastewater* prepared by Keen Consulting (Appendix IV). The Vegetative and Nutrient Management Plan (VMP) is a document developed to ensure that wastewater discharged to both agricultural croplands and woodlands is performed in a responsible manner that is protective of the environment. It also provides information on wastewater handling and application rates, along with crop rotations and expected yields, nutrient management planning, maximum loading rates and other supporting information.

The VMP for ANSRWRF states (in part) that:

> "Wastewater applications will be limited to a maximum of 2.5 inches per week throughout the year. Applications will be timed whenever possible to times of greatest crop needs and limited in the winter and times of poor soil and weather conditions."
>
> "The operators should utilize as much storage capacity as possible during the winter months and periods of inclement weather (e.g. saturated/frozen ground) and/or low crop moisture demands."
>
> "Operators should spread wastewater application across all available land in a manner that best utilizes nutrients and supplied moisture to enhance crop growth. Coordination between the operators of the [facility] and the farming operations along with nutrient management planners concerning wastewater application frequencies, timing, and amounts are encouraged to maximize the agronomic benefits while minimizing any negative environmental impacts."

Please note that although the VMP references wastewater applications being limited to a maximum of 2.5 inches per week throughout the year, and, though the crops could assimilate 2.5 inches per week, the facility's design and proposed draft permit further limits the maximum application to 1.65 inches per week which will provided for even greater groundwater protection.

Further, Part III.A.3 of the proposed the draft permit outlines various operational conditions to ensure effective management of the spray irrigation system. These requirements include:

- Spray irrigation of wastewater shall only occur on fields being prepared for planting or already planted with a crop and shall not occur on fields with crops not actively growing or on voluntary vegetation.

- The spray fields shall be maintained in such a manner as to prevent wastewater pooling and/or discharge of wastewater to any surface waters. Should pooled areas become evident, spraying on those areas shall be prohibited until saturated conditions no longer exist.
- Erosion controls must be employed to prevent wastewater runoff from the spray irrigation fields. The Permittee must notify the Department immediately if any wastewater runoff occurs.
- The spray irrigation field's crops must be maintained in optimal condition, including any necessary weed management, reseeding, or other vegetative management practices.
- Effective vegetative management shall be provided such that crops harvested on the spray irrigation sites are removed from the sites.
- The wastewater must be applied in a manner such that the application is even and uniform over the irrigation area.
- Spray irrigation is prohibited when saturated or frozen soil conditions exist.
- The groundwater mound created by the added infiltration shall at no time reach within two feet of the ground surface in any section of the spray irrigation fields. Should the groundwater mound exceed this limit, the Permittee shall cease all irrigation of wastewater to the affected fields until the groundwater mound recedes to acceptable levels.

Therefore, the GWDS believes that Artesian's application is clearly meeting the State's Agricultural Preservation Easement and Sussex County's Conditional Use Ordinance 1923 by implementing the measures described above. In addition, the draft permit includes terms and conditions that require proper crop utilization including monitoring and reporting of discharge volumes, crop documentation, nitrogen balance calculations, and limitations on when it is appropriate to spray.

Comment 1e: Artesian's proposed spray operation is not consistent with Sussex County's Conditional Use of Land Approval (Ordinance No. 1922) which was granted for a community wastewater treatment facility for local communities and therefore does not authorize ANSRWRF to dispose of industrial poultry processing wastewater.

Response: On July 31, 2007, the Sussex County Council adopted Ordinance No. 1922 which granted the conditional use of land "for a sewage treatment plant [emphasis added] to be located on 74.61 acres lying on the east side of State Route 30, 6/10's of a mile south of County Road 231 (Reynolds Pond Road), in Broadkill Hundred, Sussex County, Delaware." The Ordinance envisions a more all-encompassing "sewage treatment plant" instead of a local "community wastewater treatment facility" as suggested by the comment. The Ordinance further states that the sewage treatment plant is "desirable for the general convenience and welfare of neighboring properties and the County [emphasis added]." Again, the Ordinance considered a wider scope than just local/neighboring communities, but a facility that can benefit the entire County. Artesian's and Allen Harim's facilities are in Sussex County and fit within the scope of this Ordinance.

In addition, "Sussex County Code § 110-1 Definitions; word usage; abbreviations" defines the term sewage "(used interchangeably with 'wastewater')" as the "liquid and water-carried industrial or domestic wastes from dwellings, commercial buildings, industrial facilities and institutions, whether treated or untreated, which are contributed into or permitted to enter the facility." (Appendix V) Therefore, ANSRWRF is authorized by Ordinance No. 1922 to receive treated wastewater effluent from the Harbeson facility's on-site treatment system for storage and disposal via spray irrigation (which is also authorized by Sussex County Ordinance No. 1923).

Ordinance No. 1922 also requires that the sewage treatment plant be "designed to minimize environmental impacts" and "not have any adverse impacts upon the County or its residents." Please note that the proposed draft permit includes terms and conditions that require influent and effluent monitoring, soil and groundwater monitoring, nitrogen loading calculations, data reporting, and inspections by State officials. The draft permit also includes operational requirements that place limitations on water quality, minimizes odors, noise, and mosquitos, and places wind restrictions on spray operations. Therefore, the GWDS believes that the ANSRWRF application and proposed draft permit derived from that application is in accordance with Ordinance No. 1922.

Comment 1f: Why is Field D included in the ANSRWRF operations permit when those fields have not yet received Sussex County conditional use approval?

Response: The GWDS is authorized by 7 Del. Admin. C. §7101, *Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems* (the Regulations) to permit the construction and operation of wastewater systems, provided specific requirements are met. In addition, §6.5.3.2.3 of the Regulations authorizes the GWDS to establish specific permit conditions necessary for the protection of the environment and public health. This authorization includes the establishment of conditions such as compliance schedules in permits.

Part I.F.1 of the proposed draft permit includes a compliance schedule that requires all application requirements outlined in the Regulations for the construction of a compliant spray irrigation system including: (a) Department application form, (b) Design Engineer Inspection Report(s) certifying the facility has been constructed in accordance with approved plans and specifications, (c) a set of "as-built" drawings of the facility bearing the seal and signature of a licensed Professional Engineer registered in the State of Delaware. The "as-built" drawings must include: (i) site map showing the location of all structures, piping and appurtenances, disposal areas and buffers, (ii) a full equipment list and technical specifications for all equipment used, if different than submitted in the permit application, (iii) the new topography elevations of the system, (iv) monitoring/observation well elevations at the top of the casing (TOC) and at the ground surface, GPS coordinates (State Plane), and local topography tied to a common benchmark, (v) the location and screen depth, length of stick up, and well ID's must be provided for each monitor well, (f) any necessary updates to the Operation and Maintenance (O&M) Plan, (g) Spreadsheet summary of groundwater monitoring well, lysimeter and pizometer information, (h) GPS

information, (j) a summary report detailing the analyses of the background groundwater quality sampling program that was conducted consisting of at least three samples one month apart and analyzed prior to the initiation of disposal activities, and an approved Conditional Use for Field D parcel (2-35-6-11.01). Please note that discharges are not authorized on Field D until conditional use is approved by Sussex County along with written approval from the GWDS authorizing use for disposal.

The GWDS included a compliance schedule for the construction of additional spray fields (Fields D and E) because the additional acreage will provide future operational flexibility during spray irrigation which will ultimately be more protective of the environment and public health.

Comment 1g: Why do the applications and draft permits indicate that the influent volumes at the Allen Harim Harbison facility are greater than the effluent volumes discharged at ANSRWRF? Can ANSRWRF handle the effluent sent from Allen Harim?

Response: The Allen Harim Harbeson Processing Facility's wastewater treatment system is designed to receive and treat a peak flow rate of 4.0 million gallons per day (MGD). This volume incorporates both process wastewater and stormwater collected from process areas of the facility including facility's current and former poultry truck live-holding areas. Allen Harim has requested approval to reduce the volume of stormwater entering the treatment system by reconfiguring the former live-hold drainage area to allow stormwater runoff to discharge via surface water outfalls authorized by NPDES Permit No. DE0000299.

The proposed reduction in stormwater flowing to the treatment system will allow Allen Harim to better maintain the average influent flow rate of 2.0 MGD and the average effluent flow rate of 1.5 MGD which are the influent and effluent flow limitations in the draft permit. In should also be noted that the treatment system consists of a flow equalization basin, DAF unit, two anoxic ponds for BNR, two complete mix activated sludge basins, a flocculation tank, two clarifiers, two sludge digesters, a chlorine contact chamber, and on-site lagoons. This combination of basins, tanks, and lagoons, along with piping allows flow to be equalized throughout the treatment process allowing more flow to enter the system than needs to leave the system.

The permitted average effluent flow from the Allen Harim wastewater treatment system is limited to 1.5 MGD averaged over a 7-day period with a peak daily flow of 2 MGD. This effluent limitation is duplicated in the ANSRWRF draft permit which has an influent limitation of a peak daily flow not to exceed 2.0 MGD. The facilities are specifically designed with the appropriate treatment/storage capacity to process the proposed influent and effluent flows and those flow limitations are incorporated in the Allen Harim and ANSRWRF draft permits. Therefore, the GWDS believes that the ANSRWRF lagoon can store and discharge all of the effluent it receives from Allen Harim's wastewater treatment system in a manner that is protective of the environment and public health.

Revised Draft Permit: In order to accommodate Allen Harim's request to disconnect some of the facility's stormwater drainage areas from the treatment system the revised draft permit includes the following Schedule of Compliance requirements.

The Permittee shall comply with the requirements herein as soon as possible, but in no event later than the dates set forth in the following schedule.

- *i. Within 30 days of the effective date of this Permit, the Permittee shall submit a conceptual plan (for Department review and approval) that details stormwater drainage areas of the plant where stormwater drainage will be disconnected from the wastewater treatment system. This plan shall include a detailed map showing drainage areas, overland flow pattern, and activities performed in the areas where disconnection from the wastewater treatment system is proposed.*
- *ii. Within 60 days of the Department's approval of the plan, the Permittee shall cease discharging stormwater to the wastewater treatment system from the approved drainage areas of the facility.*
  - *a. The Permittee is authorized to discharge stormwater from Outfalls 002 and 003 in accordance with NPDES Permit No. DE0000299.*
- *iii. Within 90 days of the effective date of this Permit, the Permittee shall submit a plan (for Department review and approval) to eliminate or reduce to the maximum extent practicable the concentration of enterococcus and sediment (i.e., total suspended solids) in stormwater to comply with Broadkill River TMDL requirements.*
  - *a. The plan shall include the identification of potential sources of enterococcus and sediment, additional "best management practices" (BMPs) to be implemented, and a monitoring and implementation schedule.*
- *iv. Within 180 days of the effective date of this Permit, the Permittee shall begin implementation of its plan of action with project completion no later than one (1) year from the effective date of this Permit.*

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 7: Schedule of Compliance Section (Appendix VI)

Comment 1h: The applications lack a "public health study" and/or an Environmental Impact Statement.

Response: 7 Del. Admin. C. §7101, *Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems* (Regulations) specifies the application requirements for construction and operations permits. The application requirements can vary depending on the size of the treatment and disposal system, the type of wastewater disposal (e.g., spray, rapid infiltration basins), and permit cycle (initial v. renewal) and can include "as-built" construction drawings, monitoring well and soil data, Design Engineer Report, Operation and Maintenance Plan, and Vegetative Management

Plan. The objective of this information is to provide the GWDS the information needed to prepare, technically and legally, defensible discharge permits that are protective of the environment and public health. However, the Regulations do not currently require a local or regional public health study or the preparation of a formal Environmental Impact Statement (EIS) as a component of the application package for groundwater construction and operations permits.

Notwithstanding this limitation, the GWDS believes that the applications provide all the essential information necessary to develop operations permits for the Allen Harim and Artesian facilities and to adequately protect the environment and human health. The applications provide information allowing the GWDS to determine if a facility can be operated in conformance with its design and if the design is adequate to protect the environment and public health, analyze the abilities of the soils and vegetative covers to treat wastewater without adversely impacting groundwater resources, utilize chemical, biological, physical, and volumetric characteristics of wastewater to develop limitations on flow, pollutant concentrations, and mass loadings, and require soil and monitoring well data to ensure protection of the environment and public health.

Comment 1i: The applications are incomplete or do not include all regulatory required information.

Response: 7 Del. Admin. C. §7101, *Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems* (Regulations) specifies the application requirements for construction and operations permits. The GWDS believes that Allen Harim and Artesian submitted applications with all the required information needed to understand the facilities operational capabilities and develop technically and legally defensible discharge permits that are protective of the environment and public health. Also, please note that the permitting process is not restricted to the application materials only, but the complete administrative record.

The GWDS recognizes that during the administrative and technical review of the Allen Harim and Artesian applications there was a significant amount of correspondence and re-submission of documents. As a result, the finalized applications consist of non-sequential documents which may be hard for the public to follow. In order to address the public's concerns, the GWDS added a "documentation section" to the draft permits that will outline specific documents used to develop the permits.

Revised Draft Permits: The following information was added to the draft permits.

The [Allen Harim] application consists of the materials submitted by the Permittee and materials contained in the administrative record prior to the issuance of this Permit. This includes (but not limited to) the following information.

1. *DNREC Application & Signature Form, received on August 4, 2018*

2. *Final Design Summary, dated November 23, 2015, Wastewater Treatment System Upgrades and Expansion for Allen Harim, LLC Harbeson, DE prepared by Reid Engineering Company, Inc.*
3. *Construction Plans, dated January 8, 2016, Wastewater Treatment System Upgrades and Expansion Phase One for Allen Harim, LLC Harbeson, DE prepared by Reid Engineering Company, Inc.*
4. *Record Drawing, dated March 13, 2019, Forcemain Piping Plan, Allen Harim, LLC Harbeson, DE prepared by Artesian Wastewater Management, Inc.*
5. *Wastewater Treatment System Operation and Maintenance Plan, received on July 24, 2019 and prepared by Allen Harim Foods, LLC.*

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 5: Documentation Section (Appendix VI)

The [Artesian] application consists of the materials submitted by the Permittee and materials contained in the administrative record prior to the issuance of this Permit. This includes (but not limited to) the following information.

1. *March 12, 2013 Secretary's Order No. 2012-W-0052.*
2. *May 5, 2017 Application Package for an Amended Construction Permit for the Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF) Phase 1 submitted by Artesian Wastewater Management, Inc. Application Package includes: Application Form, Amended Design Development Report (DDR), Drawings and Specifications.*
3. *August 18, 2017 Amended DDR Addendum 1 submitted by Artesian Wastewater Management, Inc. providing additional information requested.*
4. *June 12, 2018 Amended DDR Addendum 2 submitted by Artesian Wastewater Management, Inc. providing a revised drawing depicting several surface water monitoring locations*
5. *November 2, 2017 Secretary's Order No. 2017-W-0029.*
6. *August 17, 2018 Application for a Construction Permit Extension.*
7. *July 17, 2019 Spray Irrigation Permit Application.*
8. *July 17, 2019 Operation and Maintenance Plan.*

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 7: Documentation Section (Appendix VII)

Comment 1j: Aspects of the applications and operation and maintenance manuals are inconsistent with the proposed draft permits requirements. In addition, the permits should be linked together and the ANSRWRF and pipeline construction permit administrative record should be included in the record for the operations permits.

Response: The GWDS acknowledges that the frequent back-and-forth correspondence, meetings, and document re-submittals resulted in non-chronological application

packages and documents with minor inconsistences. However, the GWDS disagrees that any ambiguity identified in the applications or document submittals such as the operation and maintenance manuals will result in less environmentally protective operations.

The GWDS is not limited to only the current application but, utilizes an assortment of documents and information to develop operations permits, including previously submitted engineering reports, construction plans and specifications (including the pipeline construction documents), monitoring data, sampling plans, nutrient management plans, and operation and maintenance manuals. Any discrepancies between these documents are ultimately resolved through the issuance of the permit which is based on regulatory requirements, analytical data, and the permit writer's best professional judgement. The permittee is duly required to comply with those conditions regardless of the information in submitted documents (e.g. sampling procedures or contingencies). In addition, certain documents such as the nutrient management plans and operation and maintenance manuals are designed to be "living" documents with frequent changes based on treatment system and farming needs. These updates can also include changes required by the permit.

The Allen Harim and Artesian permits are two separate operations permits but, are very closely aligned because of the symbiotic relationship between Allen Harim's wastewater treatment system permit requirements and Artesian's permit requirements for discharging the treated wastewater effluent via spray irrigation. This is why the GWDS drafted, noticed, and held a hearing on the two permits together.

Prior to issuance the GWDS will review and ensure that both permits are internally consistent and complementary to each other. Additionally, in order to address the public's concerns, the GWDS added a "documentation section" to the draft permits that will outline specific documents used to develop the permits.

Revised Draft Permits: The following information was added to the draft permits.

The [Allen Harim] application consists of the materials submitted by the Permittee and materials contained in the administrative record prior to the issuance of this Permit. This includes (but not limited to) the following information.

1. *DNREC Application & Signature Form, received on August 4, 2018*
2. *Final Design Summary, dated November 23, 2015, Wastewater Treatment System Upgrades and Expansion for Allen Harim, LLC Harbeson, DE prepared by Reid Engineering Company, Inc.*
3. *Construction Plans, dated January 8, 2016, Wastewater Treatment System Upgrades and Expansion Phase One for Allen Harim, LLC Harbeson, DE prepared by Reid Engineering Company, Inc.*
4. *Record Drawing, dated March 13, 2019, Forcemain Piping Plan, Allen Harim, LLC Harbeson, DE prepared by Artesian Wastewater Management, Inc.*
5. *Wastewater Treatment System Operation and Maintenance Plan, received on July 24, 2019 and prepared by Allen Harim Foods, LLC.*

The [Artesian] application consists of the materials submitted by the Permittee and materials contained in the administrative record prior to the issuance of this Permit. This includes (but not limited to) the following information.

1. *March 12, 2013 Secretary's Order No. 2012-W-0052.*
2. *May 5, 2017 Application Package for an Amended Construction Permit for the Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF) Phase 1 submitted by Artesian Wastewater Management, Inc. Application Package includes: Application Form, Amended Design Development Report (DDR), Drawings and Specifications.*
3. *August 18, 2017 Amended DDR Addendum 1 submitted by Artesian Wastewater Management, Inc. providing additional information requested.*
4. *June 12, 2018 Amended DDR Addendum 2 submitted by Artesian Wastewater Management, Inc. providing a revised drawing depicting several surface water monitoring locations*
5. *November 2, 2017 Secretary's Order No. 2017-W-0029.*
6. *August 17, 2018 Application for a Construction Permit Extension.*
7. *July 17, 2019 Spray Irrigation Permit Application.*
8. *July 17, 2019 Operation and Maintenance Plan.*

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 7: Documentation Section (Appendix VII)

2. **Public comments expressed concerns about groundwater contamination. Most of the public comments raised concerns with groundwater contamination in general and the potential impact to individual well and drinking water.**

Response: Wastewater is composed of a range of physical, chemical, and biological constituents. The goal of wastewater treatment is the removal of specific constituents of concern for the protection of public health and the environment. The primary constituents of concern in wastewater include total suspended solids (TSS), pathogens, biodegradable organics, nutrients (i.e., nitrogen and phosphorus) and other dissolved inorganics, heavy metals, and priority pollutants (i.e., carcinogenic organic and inorganic compounds). Wastewater treatment systems are designed to remove specific constituents depending on the source of the wastewater (i.e., municipal, industrial, agricultural, etc.) and point of discharge (surface water, groundwater, public or agricultural reuse, etc.).

The GWDS is mandated by §3.13 of the Regulations to ensure that all permitted on-site wastewater treatment and disposal systems are "operated and maintained so as not to create a public health hazard or cause water pollution." In addition, the GWDS is required by §3.20 of the Regulations to ensure that a permittee takes "all necessary actions to eliminate and correct any adverse impact on public health or the environment resulting from permit non-compliance." In order to comply with these regulatory directives, the GWDS prepared draft On-Site Wastewater Treatment and Disposal System Operations Permits for on-site treatment by Allen Harim Foods, LLC in Harbeson, DE and disposal via spray irrigation

by Artesian Wastewater Management, Inc. at ANSRWRF in Milton, DE. The draft permits include effluent limitations along with operational, monitoring, and reporting conditions devised to protect public health and the environment.

The following information is found in the draft permit (No. 597261-01) for Allen Harim Harbeson Processing Facility.

The proposed draft permit requires treated effluent discharged from the Allen Harim on-site wastewater treatment system to meet unlimited public access criteria (Table 1) which is the State's highest level of treatment for spray facilities.

Table 1: Unlimited Public Access Criteria

Parameter	Daily Permissible Average Concentration
5-Day Biochemical Oxygen Demand	10 mg/L
Fecal Coliform	20 colonies/100 mL
Total Suspended Solids	10 mg/L
Turbidity	5 NTU

This level of treatment not only requires the removal of pathogens (bacteria, protozoans, and viruses) through disinfection, but also colloidal organic matter, color, and other substances that interfere with disinfection. In this case, the wastewater treatment system is utilizing chlorine to disinfect the wastewater and the draft permit includes a requirement to maintain a residual chlorine level to ensure this disinfection is occurring continuously.

Revised Draft Permit: In order to further address the public's concern regarding water quality, spray irrigation, and public health, the GWDS added new Fecal Coliform bacteria and turbidity diversion requirements to address public comments regarding the protection of public health. The new condition requires the Permittee to immediately cease transferring wastewater to ANSRWRF and divert non-compliant wastewater for on-site storage and re-treatment if confirmatory analytical results of treated wastewater effluent samples indicate an exceedance of any of the maximum limitations for fecal coliform bacteria or turbidity. The Permittee is also required to notify the GWDS, submit copies of the recent analytical results, examine operation and maintenance log for improper operational procedures and conduct a physical inspection of the treatment system to detect abnormalities. Any abnormalities discovered are required to be corrected. When the analytical results from samples of treated wastewater effluent no longer indicate an exceedance of any of the maximum limitations, the Permittee will notify the GWDS and may resume transferring treated wastewater effluent to ANSRWRF.

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 20: Fecal Coliform Bacteria and Turbidity Diversion Requirements (Appendix VI)

In order to ensure proper treatment, the proposed draft permit requires routine influent and effluent wastewater monitoring (Table 2).

Table 2: Influent and Effluent Monitoring Requirements

Parameter	Unit Measurement	Monitoring Frequency	Sample Type	
			Influent	Effluent
Flow	Gallons Per Day	Continuous	Recorded	Recorded
BOD5	mg/L	2 x Month	Grab	Composite
TSS	mg/L	2 x Month	Grab	Composite
Total Dissolved Solids	mg/L	Quarterly	NA	Grab
Fecal Coliform	Col/100 ml	Quarterly	NA	Grab
Total Nitrogen	mg/L	1 x Week	Grab	Composite
Ammonia Nitrogen	mg/L	Monthly	Grab	Composite
Nitrate/Nitrite as Nitrogen	mg/L	Monthly	Grab	Composite
pH	S.U.	3 x per week	Grab	Composite
Total Phosphorus	mg/L	Monthly	Grab	Composite
Chloride	mg/L	Quarterly	Grab	Composite
Turbidity	NTU	Continuous	N/A	Recorded
Total Residual Chlorine	mg/L	Continuous	N/A	Recorded
Potassium	mg/L	Quarterly	N/A	Composite
Sodium	mg/L	Quarterly	N/A	Composite

Revised Draft Permit: The GWDS removed the effluent limitations for Chloride and Sodium. These constituents are secondary drinking water standards established by the United States Environmental Protection Agency (US EPA) for aesthetic/cosmetic concerns but, are not considered by US EPA to present a risk to human health at low levels. Since, the GWDS does not currently have any data on file to determine if Chloride and Sodium concentration limits are appropriate for this discharge, the GWDS is removing the limits. However, the Permittee is still required to monitor the effluent concentrations of these constituents on a quarterly basis. If the monitoring data indicates a potential impact to public health or the environment, the GWDS can amend the permit to require Chloride or Sodium limits.

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 6: Effluent Limitations (Appendix VI)

The State of Delaware is dependent on groundwater for the bulk of its potable water supply. Therefore, the GWDS issues discharge permits that are designed to protect groundwater quality to the maximum extent practicable by including requirements to control the amount of nitrogen (i.e., nitrates as nitrogen) discharged in treated wastewater (effluent).

The proposed draft permit requires treated effluent discharged from the Allen Harim on-site wastewater treatment system to meet a daily average total nitrogen (the sum of nitrate, nitrite, ammonia, and organic nitrogen) concentration of 30 mg/L. This limitation is derived from the concentration of nitrogen that can be land applied by ANSRWRF without impacting groundwater resources based off of facility design (i.e. acreage, application rate, and crop type).

To ensure that only properly treated effluent is discharged to ANSRWRF the proposed draft permit includes a special condition requiring Allen Harim to field test wastewater daily for Nitrate as Nitrogen and Total Nitrogen. According to Allen Harim's Operation and Maintenance Manual if field tests indicate that either Nitrate as Nitrogen or Total Nitrogen concentrations exceed 25 mg/L than a series of operational adjustments to the denitrification process will begin. Additional laboratory testing will also begin.

If laboratory testing confirms that treated wastewater concentrations exceed 30 mg/L for either Nitrate as Nitrogen or Total Nitrogen than the Permittee shall notify the Department to determine if treated wastewater is required to be diverted on-site for retreatment. If required, the treated wastewater shall be immediately diverted for storage and retreatment.

If laboratory testing confirms that treated wastewater exceeds 45 mg/L for either Nitrate as Nitrogen or Total Nitrogen than the draft permit requires that the treated wastewater be diverted to on-site basins/lagoons for storage and retreatment.

Revised Draft Permit: The original draft permit required the Permittee to conduct process control testing to ensure that the wastewater treatment system was operating at peak efficiency and producing high quality treated wastewater effluent. In the event that the system failed to meet permit limits the Permittee was required to immediately cease transferring wastewater to ANSRWRF and divert wastewater flows for on-site storage and re-treatment.

The revised draft permit adds clarity to the nitrogen process control testing and diversion condition. The revised draft permit now requires the Permittee to notify the GWDS if laboratory testing confirms that treated wastewater concentrations exceed 30 mg/L for either Nitrate as Nitrogen or Total Nitrogen for determination if diversion is required. This change allows additional disposal flexibility for the Permittee because ANSRWRF incorporates enough land area to safely discharge wastewater with elevated nitrogen concentrations with appropriate operational adjustments (e.g. decrease application rate and increase in acreage where application occurs). By immediately contacting the

GWDS, the GWDS can effectively coordinate and monitor nitrogen management at the Allen Harim and Artesian facilities thereby proactively protecting groundwater resources. However, if laboratory testing confirms that treated wastewater concentrations exceed 45 mg/L for either Nitrate as Nitrogen or Total Nitrogen than the Permittee will immediately divert the treated wastewater for storage and retreatment.

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 19: Nitrogen Process Control Testing and Diversion Indicators (Appendix VI)

In addition, Allen Harim is in the process of rehabilitating an old anaerobic lagoon for the diversion, storage, and retreatment of non-compliant wastewater. This project will be required by the permit to be completed by July 1, 2021. Until the project is completed Allen Harim intends to divert the initial two million gallons of wastewater to the rehabilitated old stormwater lagoon and the next two million gallons of wastewater to the two anoxic basins.

However, new information submitted to the GWDS regarding Allen Harim's rehabilitation of the old stormwater lagoon indicates that the synthetic re-lining of the lagoon is required and will not be completed until April 2020. Since, §6.3.2.3.2.4 of the Regulations requires a treatment system to divert wastewater that fails to meet water quality requirements, the GWDS recommends that issuance of the Allen Harim Operations Permit is delayed until the former stormwater lagoon has been synthetically lined and is available for diversion purposes.

To ensure the liner integrity of the wastewater treatment system lagoons, the proposed draft permit also requires quarterly groundwater monitoring of four monitoring wells located around the system's lagoons (Table 3).

Table 3: Monitoring Well Sampling Requirements

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
pH	S.U.	Quarterly	Field Test
Temperature	°F	Quarterly	Field Test
Specific Conductance	µS/cm	Quarterly	Field Test
Dissolved Oxygen	mg/L	Quarterly	Field Test
Depth to Water Table	Hundredth of a foot	Quarterly	Field Test
Ammonia Nitrogen	mg/L	Quarterly	Grab
Nitrate + Nitrite Nitrogen	mg/L	Quarterly	Grab
Total Nitrogen	mg/L	Quarterly	Grab

Total Coliforms	Col/100 ml	Quarterly	Grab
Fecal Coliform	Col/100 ml	Quarterly	Grab
Total Phosphorus	mg/L	Quarterly	Grab
Sodium	mg/L	Quarterly	Grab
Chloride	mg/L	Quarterly	Grab
Total Dissolved Solids	mg/L	Quarterly	Grab

Conclusion

The GWDS believes that the permit requirements outlined in the proposed/revised draft permit for Allen Harim's on-site wastewater treatment system are protective of public health and the environment including the protection of local drinking water supplies. However, the GWDS also recommends delaying the issuance of operations permit until the old stormwater lagoon is synthetically lined and is available for diversion purposes.

The following information is found in the draft permit (No. 359288-02) for Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF).

The proposed draft permit includes extensive operational and monitoring requirements to ensure the protection of groundwater resources and public health. As discussed above, the treated effluent received from Allen Harim's on-site wastewater treatment system will meet the State's highest wastewater quality criteria for "unlimited public access." In addition, the revised draft permit includes bacteria and turbidity diversion requirements to ensure only high-quality treated wastewater effluent is used for irrigation.

The treated wastewater effluent will be required to meet a daily average total nitrogen concentration of 30 mg/L. The federal Maximum Contaminant Level (MCL) for Nitrate as Nitrogen in drinking water is 10 mg/L. The ANSRWRF application includes nitrogen balance calculations (prepared by a DE licensed Professional Engineer) verifying that ANSRWRF incorporates sufficient land to spray the maximum amount of effluent each month at a total nitrogen concentration of 30 mg/L and not exceed a percolate of <10 mg/L beneath the spray irrigation fields. Thereby, meeting the MCL for nitrate-nitrogen and not causing an impact to groundwater resources and local drinking water wells.

In order to verify that treated effluent discharged to the spray system from the synthetically lined lagoon is in compliance with all permit/regulatory requirements, the proposed draft permit requires routine effluent monitoring (Table 4).

Table 4: Effluent Monitoring Requirements

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
Flow	GPD per Field/Zone/Pivot	Continuous	Recorded
Ammonia Nitrogen	mg/L	Monthly	Composite
Nitrate/Nitrite as Nitrogen	mg/L	Monthly	Composite
Organic Nitrogen	mg/L	Monthly	Composite
Total Nitrogen	mg/L	2 x Month	Composite
Fecal Coliform	Col/100 ml	2 x Month	Grab
Cadmium	mg/L	Annually	Composite
Copper	mg/L	Annually	Composite
Lead	mg/L	Annually	Grab
Nickel	mg/L	Annually	Composite
Zinc	mg/L	Annually	Composite

Revised Draft Permit: Item 1 of the original draft permit included a table taken from the application's nitrogen balance which limited the annual average quantity of effluent discharged to the spray fields. The Permittee suggested that the table was too limiting because it did not take into account times when the nitrogen concentration was less than 30 mg/L. The GWDS agreed to revise the Item 1 so that the monthly quantity of effluent discharged to the spray fields will not exceed a volume that has been calculated each month by the Permittee to not cause the groundwater to exceed the drinking water standard (10 mg/L) for Nitrate at the percolate. The monthly quantity will be required to be calculated by utilizing the average of the laboratory verified effluent Total Nitrogen concentrations from the previous month and the calculations and assumptions provided in the design Nitrogen Balance excel spreadsheet. Once actual data is acquired for the mathematical assumptions, it will be utilized in lieu of the assumed data (i.e. crop nutrient uptake). Each month a spreadsheet will be submitted to the GWDS electronically (in Excel format with calculations maintained) and all changes to the spreadsheet calculations and assumptions will be approved by the GWDS prior to implementation.

The GWDS also added Item 2 to the revised draft permit which ensures that the monthly quantity of effluent discharged to the fields does not exceed hydraulic loading assimilative capabilities of each field. This ensures that the fields will receive only the appropriate volume of effluent at the appropriate time and help reduce the possibility of ponding and runoff.

The GWDS removed the effluent limitations for Chloride and Sodium. These constituents are secondary drinking water standards established by the United States Environmental Protection Agency (US EPA) for aesthetic/cosmetic concerns but, are not considered by US EPA to present a risk to human health at low levels. Since, the GWDS does not currently have any data on file to determine if Chloride and Sodium concentration limits are appropriate, the GWDS is removing the limits. However, the Permittee is still required to monitor the effluent concentrations of these constituents on a quarterly basis. If the monitoring data indicates a potential impact to public health or the environment, the GWDS can amend the permit to require Chloride or Sodium limits.

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 8: Sprayed Effluent Limitations (Appendix VII)

Revised Draft Permit: The GWDS also added the following monitoring and reporting requirements associated with the revised spray effluent limitations discussed above.

1. Total Effluent Flow to each Field/Zone/Pivot
2. Number of Days Sprayed During the Month to each Field/Zone/Pivots
3. Monthly and Cumulative Loading and Percolate Calculations (Nitrogen Balance) for each Field/Pivot

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 14: Sprayed Effluent Monitoring Requirements (Appendix VII)

Since, the State of Delaware is dependent on groundwater for the bulk of its potable water supply, spray irrigation permits require extensive groundwater monitoring. The proposed draft permit requires a groundwater monitoring well network (a total of 18 wells) to ensure that wastewater-related contaminants are detected, quantified, and analyzed regarding their impact to groundwater quality. The following parameters are required to be sampled in ANSRWRF's 18 monitoring wells (Table 5).

Table 5: Monitoring Well Sampling Requirements

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
pH	S.U.	Quarterly	Field Test
Temperature	°F	Quarterly	Field Test
Specific Conductance	µS/cm	Quarterly	Field Test
Dissolved Oxygen	mg/L	Quarterly	Field Test
Depth to Water Table	Hundredth of a foot	Quarterly	Field Test
Ammonia Nitrogen	mg/L	Quarterly	Grab

Nitrate + Nitrite Nitrogen	mg/L	Quarterly	Grab
Total Nitrogen	mg/L	Quarterly	Grab
Total Coliforms	Col/100 ml	Quarterly	Grab
Fecal Coliform	Col/100 ml	Quarterly	Grab
Total Phosphorus	mg/L	Quarterly	Grab
Sodium	mg/L	Quarterly	Grab
Chloride	mg/L	Quarterly	Grab
Total Dissolved Solids	mg/L	Quarterly	Grab

Revised Draft Permit: The GWDS added the following monitoring wells associated with the lagoon.

DNREC Well ID	Local ID	Northings (meters)	Eastings (meters)
254881	MW-1L	88993.83	206492.46
254882	MW-2L	89332.77	206846.20
254883	MW-3L	89038.74	207010.94
254884	MW-4L	88740.91	207018.88

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 16: Groundwater Monitoring Requirements (Appendix VII)

In addition, the proposed draft permit requires the use of eight piezometers or observation wells installed at ANSRWRF to measure the depth of the groundwater table on a monthly basis. Pursuant to §7101.6.5.3.2.1.4 of the Regulations, if the groundwater mound created by the added infiltration reaches within 2-ft of the ground surface than the spray irrigation operation must cease until the groundwater recedes to acceptable levels.

In order to verify that the spray irrigation system is producing a high-quality percolate of <10 mg/L beneath the spray irrigation fields and not causing a groundwater impact, the proposed draft permit requires the ANSRWRF's four lysimeters to be sampled for the following parameters on a monthly basis (Table 6).

Table 6: Lysimeter Monitoring Requirements

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
pH	S.U.	Monthly	Field Test
Temperature	°C	Monthly	Field Test

Specific Conductance	µS/cm	Monthly	Field Test
Total Nitrogen	mg/L	Monthly	Grab
Nitrate/Nitrite as Nitrogen	mg/L	Monthly	Grab
Ammonia Nitrogen	mg/L	Monthly	Grab
Total Phosphorus	mg/L	Monthly	Grab
Sodium	mg/L	Monthly	Grab
Chloride	mg/L	Monthly	Grab
Total Dissolved Solids	mg/L	Monthly	Grab

The proposed draft permit also requires the monitoring of six surface water locations in the Ingram Branch and Snowbridge Branch (east of Reynolds Pond). All samples must be taken on the same day, with downgradient locations sampled first, and with no sampling to occur within three days of a measurable rainfall event to ensure that the streams have returned to base flow (groundwater dominant conditions). The following parameters will be sampled on a quarterly basis (Table 7).

Table 7: Surface Water Sampling Requirements

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
pH	S.U.	Quarterly	Field Test
Temperature	°C	Quarterly	Field Test
Specific Conductance	µS/cm	Quarterly	Field Test
Dissolved Oxygen	mg/L	Quarterly	Field Test
Ammonia Nitrogen	mg/L	Quarterly	Grab
Nitrate + Nitrite Nitrogen	mg/L	Quarterly	Grab
Total Nitrogen	mg/L	Quarterly	Grab
Enterococcus	Col/100 ml	Quarterly	Grab
Fecal Coliform	Col/100 ml	Quarterly	Grab
Total Phosphorus	mg/L	Quarterly	Grab
Sodium	mg/L	Quarterly	Grab
Chloride	mg/L	Quarterly	Grab
BOD_5	mg/L	Quarterly	Grab
Total Suspended Solids	mg/L	Quarterly	Grab

Total Dissolved Solids	mg/L	Quarterly	Grab

Since, the hydraulic capacity of soils to accept, transmit, and treat water are controlled by the physical, chemical, and microbial properties of soils at ANSRWRF, the proposed draft permit requires soil monitoring. Composite soil samples representing each soil series within the wetted spray field shall be taken separately from both soil depths of 0–12 inches and 12–24 inches. A minimum of three composite sample for each mapped soil mapping unit are needed for each depth (0-12 inches and 12-24 inches) in accordance with the Regulations and the GWDS-approved Soil Sampling Plan. The following parameters will be sampled on an annual basis with metals sampled once every five years (Table 8).

Table 8: Soil Monitoring Requirements

Parameter	Unit Measurement	Measurement Frequency	Sample Type
pH	S.U.	Annually	Soil Composite
Organic Matter	%	Annually	Soil Composite
Phosphorus (as P_2O_5)	mg/kg	Annually	Soil Composite
Potassium	mg/kg	Annually	Soil Composite
Sodium Adsorption Ratio	meq/100g	Annually	Soil Composite
Cadmium	mg/kg	Once per 5 years	Soil Composite
Nickel	mg/kg	Once per 5 years	Soil Composite
Lead	mg/kg	Once per 5 years	Soil Composite
Zinc	mg/kg	Once per 5 years	Soil Composite
Copper	mg/kg	Once per 5 years	Soil Composite
Cation Exchange Capacity	meq/100g	*Only if soil pH changes significantly	Soil Composite

Phosphorus Adsorption (Mehlich 3 acceptable)	meq/100g	**Only if soil phosphorus levels become excessive for plant growth	Soil Composite
Percent Base Saturation	%	*Only if soil pH changes significantly	Soil Composite

Revised Draft Permit: The GWDS added the requirement for the Permittee to submit a Soil Sampling Plan for GWDS approval within 120 days from the effective date of the Permit. This condition was added to the revised draft permit because of the unusual distribution of the site's mapped soil units. In order to ensure that sampling is being performed efficiently and effectively, the GWDS has agreed to work closely with the Permittee to ensure proper soil sampling is performed. In addition, the soil sampling condition was revised to require a minimum of three (instead of one as proposed in the original draft permit) composite sample for each mapped soil mapping unit for each depth (0-12 inches and 12-24 inches). This requirement is in accordance with regulatory requirements.

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 19: Soil Monitoring Requirements (Appendix VII)

Revised Draft Permit: The GWDS received significant public comments expressing concerns about groundwater contamination during the public notice period and public hearing. The GWDS believes that the originally proposed draft permit included appropriate terms and conditions to ensure the protection of groundwater with multiple layers of monitoring to ascertain any increasing trends of wastewater constituents in groundwater. However, in order to further address the public's concerns, the GWDS included new terms and conditions to both revised draft permits. This includes a "Duty to Comply" condition reiterating the requirement for the Permittee to comply with all Permit requirements and outlining the authority under 7 Del. C. Chapter 60 for the GWDS to enforce permit requirements.

In addition, the GWDS added a "Groundwater Requirements" condition to both revised draft permits emphasizing that the "operation of the on-site wastewater treatment and disposal system shall not cause the quality of Delaware's groundwater resources to be in violation of applicable Federal or State Drinking Water Standards."

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 13: Duty to Comply and Groundwater Requirements (Appendix VI)

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 24: Duty to Comply and Groundwater Requirements (Appendix VII)

Conclusion

ANSRWRF's proposed/revised draft permit requires multiple layers of monitoring to ascertain any increasing trends of wastewater constituents in groundwater. Prior to the facility going into operation, three separate rounds of groundwater and surface water samples were obtained and tested through a certified laboratory to establish background levels for not only these constituents but a host of others. Once operational, sampling will be required by the facility through the following devices: lysimeters (in-field), monitoring wells (in-field, up-gradient, and down-gradient), and surface water grab samples. Using these three sets of data the GWDS will be able to assess what impact the spray irrigation activities are having on the spray fields, groundwater, and surface waters within and adjacent to the spray fields. Annual soil sampling is also required and once every five years heavy metals are required to be sampled. Again, background samples were obtained and tested during the soil investigation portion of the project. These data will be used to verify any impacts occurring as a result of the spray irrigation activities. In the event trends of increasing concentrations and/or impacts are observed, the permittee will be required take all necessary actions to eliminate and correct any adverse impact on public health or the environment resulting from permit non-compliance in accordance with §3.20 of the Regulations.

3. **Public comments raised concerns that ANSRWRF Field G soil and groundwater characteristics are not suitable for spray irrigation.**

Response: The 2008 SIR indicates that 80 borings and 11 test pits were examined for Field G. Current Regulation Exhibit W requires depth to the limiting zone (LZ) for a spray irrigation to be greater or equal to 24 inches. Out of the 80 soil borings and 11 test pits investigated in 2008, only 5 soil borings (G24, G32, G40, G133, and G137) had LZ less than 24 inches. Closed depressions in fields and woods and areas were addressed in the recommendation section of the GWDS's August 11, 2009 Soil Review Memorandum. The Memo states that "Area G - Zones I W-J, I W-2 and l-6 have small closed depressions within them and areas with limiting zones less than 24 inches so ponding and seasonal application is a potential here. Zones l W-4 through 1 W-6 have three closed depressions and a head of drain located within their area. These closed depressions could potentially pond while the head of drain goes further into the wooded area. Zone 1-l has closed depressions which could potentially pond. Zone I W- I 2 and 1-9 have a head of drain which could direct runoff further into the wooded area. A 10-foot-wide road bisects the entire area along the wood line, and another is located within a portion of the wooded area. Zone 1-4 should be fine." The Memo also recommended the following actions: "1) Ensure that during the first couple of years, during the wet season, careful monitoring of the spray fields is performed to ensure no ponding of wastewater occurs. Rates should be reduced if ponding or runoff occurs until the rates are appropriate. 2) This could be a labor-intensive

facility - Artesian should consider having a dedicated staff to operate and maintain this facility at all times plus work with the farmer during planting, harvesting and fertilizing of the fields in agricultural production. 3) Special attention should be taken also with the wooded portions of the areas being sprayed so as to maintain good stands and proper management."

Therefore, the GWDS believes that Field G is suitable for spray irrigation provided that fields G32, G40, and G133 are managed appropriately with careful monitoring to ensure no ponding of wastewater occurs. The draft permit includes operational conditions that require the Permittee to discharge the wastewater in a manner that ponding does not occur, and the agricultural and wooded fields are properly managed.

4. **Public comments raised concerns that the diversion plan to divert non-compliant wastewater at the Allen Harim Harbeson Processing Facility is not sufficient to protect public health and the environment.**

Response: As discussed above, Allen Harim's proposed/revised draft permit requires treated wastewater effluent discharged from the on-site wastewater treatment system to meet a daily average total nitrogen (the sum of nitrate, nitrite, ammonia, and organic nitrogen) concentration of 30 mg/L.

To ensure that only properly treated effluent is discharged to ANSRWRF the proposed draft permit includes a special condition requiring Allen Harim to field test wastewater daily for Nitrate as Nitrogen and Total Nitrogen. These field tests will be performed by on-site colorimetric or spectrophotometers instruments providing rapid results and allowing operators to make appropriate process control changes to ensure optimized treatment.

According to Allen Harim's Operation and Maintenance Manual if field tests indicate that either Nitrate as Nitrogen or Total Nitrogen concentrations exceed 25 mg/L than a series of operational adjustments to the denitrification process will begin. Additional laboratory testing will also begin. If laboratory testing confirms that treated wastewater concentrations exceed 30 mg/L for either Nitrate as Nitrogen or Total Nitrogen than the Permittee shall notify the Department to determine if treated wastewater is required to be diverted on-site for retreatment. If required, the treated wastewater shall be immediately diverted for storage and retreatment. If laboratory testing confirms that treated wastewater exceeds 45 mg/L for either Nitrate as Nitrogen or Total Nitrogen than the draft permit requires that the treated wastewater be immediately diverted on-site for retreatment.

In addition, Allen Harim is in the process of rehabilitating an old anaerobic lagoon for the diversion, storage, and retreatment of non-compliant wastewater. This project will be required by the permit to be completed by July 1, 2021. Until the project is completed Allen Harim intends to send the initial two million gallons of wastewater to the rehabilitated old stormwater lagoon and the next two million gallons of wastewater to

the two anoxic basins. Additional water conservation measures will also be employed until the diversion can be ended.

Revised Draft Permit: The original draft permit included a "Schedule of Compliance" section with milestones to address the clean-out, rehabilitation, and re-lining of the "old" anaerobic lagoon for use as a permanent emergency storage lagoon where wastewater can be diverted when water quality requirements cannot be met. The compliance schedule also included a deadline for ceasing stream discharge of process wastewater to Beaverdam Creek. The revised draft permit includes an updated "Schedule of Compliance" with adjusted milestones to address the clean-out, rehabilitation, and re-lining of the "old" anaerobic lagoon. However, the project completion date remains the same. The deadline to cease discharging to Beaverdam Creek is also updated.

1. *The Permittee shall cease discharging process wastewater to Beaverdam Creek by June 1, 2020*
2. *The Permittee shall complete clean-out operations, rehabilitate, and synthetically re-line the "old" anaerobic lagoon to be used as the permanent diversion option for non-compliant wastewater by January 1, 2021.*
    i. *The Permittee shall submit a copy of a signed and executed contract for "old" anaerobic lagoon clean-out operations including documentation from a disposal facility willing to accept the sludge by April 1, 2020.*
    ii. *The Permittee shall submit notification of mobilization and the start of clean-out activities by April 1, 2020.*
        a. *The Permittee shall maintain records documenting the volume of sludge removed from the "old" anaerobic lagoon and the location of final disposal and submit this information to the Department monthly until the lagoon clean-out is complete.*
    iii. *The Permittee shall complete "old" anaerobic lagoon clean-out operations by November 30, 2020.*
    iv. *The Permittee shall install a new synthetic liner in the "old" anaerobic lagoon by December 31, 2020.*

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Pages 7-8: Schedule of Compliance (Appendix VI)

Also, please note that in the event some non-compliant effluent does flow to ANSRWRF before diversion protocols are initiated at Allen Harim, ANSRWRF incorporates enough land area to safely discharge wastewater with elevated nitrogen concentrations with appropriate operational adjustments (e.g. decrease application rate and increase in

acreage where application occurs). Part I.C.10 of ANSRWRF's proposed draft permit limits the total amount of nitrogen that may be applied to each spray field (Table 9).

Table 9: Total Nitrogen Loading Limits

Crop Type	Nitrogen Loading Limit (lbs/acre-year)
Cover – Corn - Barley	334.5
Barley – Soybean – Cover	388.8
Woods (Loblolly Pines)	435.4

In the event that ANSRWRF is required to spray irrigate effluent with higher nitrogen concentrations these concentrations will be utilized in the facility's land application calculations and adjustments can be to spray or crop rotations to ensure that the total nitrogen loading limit in pounds per acre per year is not exceeded and a percolate of <10 mg/L beneath the spray irrigation fields is maintained. These calculations will be submitted to the GWDS on a monthly basis and an annual report.

To verify the annual nitrogen loading limits the proposed draft permit requires Artesian to submit to the GWDS the following spray field application data (Table 10).

Table 10: Spray Application Requirements

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
Total Effluent Flow to all Fields/Zones/Pivots combined	Gallons	Monthly	Data
Max Daily Effluent Flow to all Fields/Zones/Pivots combined	Gallons	Monthly	Data
Average Daily Effluent to all Fields/Zones/Pivots combined	MGD or GPD	Monthly	Calculation (Total Monthly Effluent Flow / Number of Days in Month)
Number of Days Sprayed during the Month to all Fields/Zones/Pivots combined	Days	Monthly	Data
Total Effluent Flow to each Field/Zone/Pivot	Gallons	Monthly	Data
Number of Days Sprayed During the Month to each Field/Zone/Pivots	Gallons	Monthly	Data

Nitrogen Loading Rate to each Field/Zone/Pivot	lbs/acre per Field/Zone/Pivot	Monthly	Calculation
Phosphorus Loading Rate to each Field/Zone/Pivot	lbs/acre per Field/Zone/Pivot	Monthly	Calculation
Monthly and Cumulative Loading and Percolate Calculations (Nitrogen Balance) for each Field/Pivot	lbs/acre mg/L	Monthly	Calculation

To verify crop nutrient uptake levels, the proposed draft permit requires Artesian to collect one composite sample of each crop harvested as submit to the GWDS the following vegetative monitoring data (Table 11).

Table 11: Vegetative Monitoring Requirements

Parameter	Unit Measurement	Measurement Frequency	Sample Type
Yield	Bushels/acre and lbs/acre	Per harvest	Vegetation Composite
Nitrogen	% and lbs/acre	Per harvest	Vegetation Composite
Phosphorus	% and lbs/acre	Per harvest	Vegetation Composite
% Moisture	%	Per harvest	Vegetation Composite

It should also be noted that Allen Harim's wastewater treatment system is routinely achieving total nitrogen concentrations of less than 30 mg/L. A review of Allen Harim's total nitrogen total nitrogen data from October 2015 to October 2019 (Table 12) documents that the average total nitrogen concentration was 20.86 mg/L. During that four-year time period, there were only three instances where effluent concentrations were slightly above 30 mg/L for total nitrogen. The concentrations were 30.3 mg/L, 30.7 mg/L and 32.4 mg/L as noted in Table 12 below. Any wastewater not immediately diverted at these concentrations would not significantly impact ANSRWRF's spray operations and would be accounted for in their monitoring data and nutrient management plan to ensure the annual total nitrogen loading limits were not exceeded and a percolate of <10 mg/L beneath the spray irrigation fields is maintained.

Table 12: Allen Harim Monitoring Data

Sampling Point	Period	Parameter	Maximum Concentration (mg/L)
Outfall 001	Oct-15	Total Nitrogen	26.00
Outfall 001	Nov-15	Total Nitrogen	21.30
Outfall 001	Dec-15	Total Nitrogen	21.60
Outfall 001	Jan-16	Total Nitrogen	25.40

	Outfall 001	Feb-16	Total Nitrogen	17.70	
	Outfall 001	Mar-16	Total Nitrogen	18.40	
	Outfall 001	Apr-16	Total Nitrogen	7.57	
	Outfall 001	May-16	Total Nitrogen	1.58	
	Outfall 001	Jun-16	Total Nitrogen	25.30	
	Outfall 001	Jul-16	Total Nitrogen	7.17	
	Outfall 001	Aug-16	Total Nitrogen	18.90	
	Outfall 001	Sep-16	Total Nitrogen	26.20	
	Outfall 001	Oct-16	Total Nitrogen	**32.40**	
	Outfall 001	Nov-16	Total Nitrogen	17.20	
	Outfall 001	Dec-16	Total Nitrogen	21.40	
	Outfall 001	Jan-17	Total Nitrogen	19.60	
	Outfall 001	Feb-17	Total Nitrogen	22.90	
	Outfall 001	Mar-17	Total Nitrogen	25.10	
	Outfall 001	Apr-17	Total Nitrogen	23.10	
	Outfall 001	May-17	Total Nitrogen	21.80	
	Outfall 001	Jun-17	Total Nitrogen	25.40	
	Outfall 001	Jul-17	Total Nitrogen	23.80	
	Outfall 001	Aug-17	Total Nitrogen	22.60	
	Outfall 001	Sep-17	Total Nitrogen	22.90	
	Outfall 001	Oct-17	Total Nitrogen	20.10	
	Outfall 001	Nov-17	Total Nitrogen	24.70	
	Outfall 001	Dec-17	Total Nitrogen	**30.70**	
	Outfall 001	Jan-18	Total Nitrogen	26.90	
	Outfall 001	Feb-18	Total Nitrogen	24.00	
	Outfall 001	Mar-18	Total Nitrogen	22.20	
	Outfall 001	Apr-18	Total Nitrogen	20.40	
	Outfall 001	May-18	Total Nitrogen	26.00	
	Outfall 001	Jun-18	Total Nitrogen	14.80	
	Outfall 001	Jul-18	Total Nitrogen	13.70	
	Outfall 001	Aug-18	Total Nitrogen	5.29	
	Outfall 001	Sep-18	Total Nitrogen	13.00	
	Outfall 001	Oct-18	Total Nitrogen	14.90	
	Outfall 001	Nov-18	Total Nitrogen	20.80	
	Outfall 001	Dec-18	Total Nitrogen	22.80	
	Outfall 001	Jan-19	Total Nitrogen	23.00	
	Outfall 001	Feb-19	Total Nitrogen	21.80	
	Outfall 001	Mar-19	Total Nitrogen	24.40	
	Outfall 001	Apr-19	Total Nitrogen	26.10	
	Outfall 001	May-19	Total Nitrogen	**30.30**	
	Outfall 001	Jun-19	Total Nitrogen	20.50	
	Outfall 001	Jul-19	Total Nitrogen	16.40	
	Outfall 001	Aug-19	Total Nitrogen	17.30	

Outfall 001	Sep-19	Total Nitrogen	25.20
Outfall 001	Oct-19	Total Nitrogen	21.50

The GWDS believes that the Allen Harim's proposed diversion plan as memorialized in the proposed draft discharge permit will be sufficient for ensuring the delivery of appropriate wastewater quality to ANSRWRF; that monitoring is sufficient for identifying potential denitrification issues; and that sufficient on-site capacity will be available if diversion is needed. Based on past data the need for diversion should be significantly low and any wastewater not immediately diverted and sent to ANSRWRF can be incorporated into the spray operation in a manner that will not result in the exceedance of their annual nitrogen loading rates verified by various monitoring requirements. Therefore, achieving the overall goal of protecting groundwater and public health. However, as discussed previously, the GWDS also recommends delaying the issuance of operations permit for Allen Harim until the old stormwater lagoon is synthetically lined and is available for diversion purposes.

5. **Does ANSRWRF intend to use chlorination equipment for algae control? If such equipment will be used, this needs to be discussed in the permit.**

Response: The use of chlorination for algae control is covered under ANSRWRF's proposed Operation and Maintenance Plan (O&M Plan) and the proposed draft permit requires the permittee to follow the O&M Plan. Specifically, Part III.A.15 of the draft permit requires the permittee to operate and maintain the land treatment system in accordance with the approved O&M Plan which includes the use of chlorination for both algae control and potential added disinfection.

Section 1.1.2.5 of the O&M Plan states that "supplemental chlorination may be injected into the effluent from the storage lagoon using sodium hypochlorite tanks. This is intended to be an optional tool for the operators to use as needed for algae control. The chlorination system is set up such that flow can be circulated back to the lagoon influent, so that mixing and additional disinfection can be provided as needed to address operational challenges.... final sizing of the permanent tanks and chemical feed pumps will be completed after startup and initial operations. In the interim, if chlorination is necessary, the two 350-gallon temporary tanks may be connected to the existing injection port with temporary pumps."

Section 2.3.4 of the O&M Plan also states that "sodium hypochlorite solution may be injected into the wastewater stream after the lagoon and cycled back to the lagoon to assist with algae control and odor control. To provide circulation, close the isolation valves leading to the spray irrigation sites and open the isolation valves leading to the inlet of the lagoon. Chlorine pumps may require priming. Trial and error testing will be required to determine chlorine dose necessary without over chlorination. The dosage will vary during the year."

6. **Public comments seeking assurances that the permit will include wind restrictions during spray irrigation operations.**

Response: ANSRWRF's proposed draft permit and submitted Operation and Maintenance Plan (O&M Plan) include requirements restricting spray irrigation during periods of high wind or if spray aerosols are observed to blow off-site.

Part III.A.4 of the draft permit (in part) requires that spray irrigation fields be managed to ensure that aerosols do not extend beyond the boundary of the spray irrigation site when treated wastewater is being applied. In addition, all action taken to limit aerosols will be reported to the Department in accordance with Part IV.A.4 of the draft permit.

In addition, Part III.A.15 of the draft permit requires Artesian to operate and maintain the irrigation system in accordance with the approved O&M Plan which must be on-site at all times. Section 2.5.6 of the O&M Plan states that "during periods of high wind, the active disposal areas will be restricted to avoid off-site impacts based on wind speed and direction. Winds are considered high if speed is greater than 15 mph at the spray fields or if aerosols are observed to blow off-site."

The GWDS believes that appropriate wind restrictions that are protective of public health and property are included in the proposed draft permit.

7. **Response to public comments raising concerns about possible odors derived from the treatment and storage lagoons and the spray irrigation system.**

Response: Odors are generally not associated with properly engineered and maintained wastewater storage lagoons. This is because the treated wastewater stored is generally of high quality with low suspended solids and fully disinfected. ANSRWRF's lagoon is receiving high quality wastewater and is also aerated and odors are not expected.

Wastewater treatment systems that utilize lagoons as a component of the treatment process may have slight earthy odors associated with them. However, these odors tend to occur on a seasonal basis when the weather changes (i.e., winter/spring and summer/fall) and should be short in duration. Consistently strong odors usually indicate that the wastewater treatment system is not being operated appropriately (e.g., down aerators or blowers). The GWDS routinely inspects wastewater treatment systems to ensure the systems are being properly operated and maintained. However, if the public were to notice any concerns, odors or otherwise, they may contact the DNREC 24-Hour Toll-Free Complaint Line at 800-662-8802 to have their concerns investigated.

8. **Response to public comments raising concerns that the lagoons will become a breeding ground for mosquitos.**

Response: Both the Allen Harim and ANSRWRF lagoons will be aerated which keeps the waters agitated and moving. Mosquitos breed and proliferate in shallow, stagnant pools of water. The lagoons are deep (~ 25 feet) and with aeration/agitation do not provide a good breeding ground for mosquitos. Other similar facilities do not have mosquito issues.

Both proposed draft permits include requirements to operate and maintain treatment and storage lagoons in such as manner as to limit the opportunity for mosquitos to proliferate.

Artesian also provided comments to the Department addressing their mitigation of potential mosquito concerns in a memorandum dated August 8, 2017. Their response follows:

> "Conditions most favorable to mosquitoes breeding are areas of shallow, stagnant water with fairly flat side slopes and vegetation along the banks. To minimize the emergence of mosquitoes, the storage lagoon has designed as a deep pond with steep side slopes. Surface aeration will be used to keep the surface of the lagoon from becoming stagnant and allow wave action on the bank to prevent mosquitoes from hatching. The lagoon liner will discourage vegetation growth, and operators will maintain the liner and banks to minimize weeds."
>
> "In a well-maintained pond system, mosquitoes usually are not a nuisance. According to studies by the U.S. Public Health Service, the density of the mosquito population is directly proportional to the extent of weed growth in a pond. Where weed growth in the ponds and along the water line of the dikes is negligible and where wind action on the pond is not unduly restricted, the likelihood of mosquitoes breeding is low." [U.S. EPA]

9. **Public comments raised concerns about the storage capacity of ANSRWRF's lagoon during times when it is inappropriate to spray because of poor water quality or when frozen or saturated ground conditions exist.**

Response: Part III.A.4 of ANSRWRF's draft permit includes operational requirements designed to properly manage spray operations. These requirements include the following:

- The spray fields shall be maintained in such a manner as to prevent wastewater pooling and/or discharge of wastewater to any surface waters. Should pooled areas become evident, spraying on those areas shall be prohibited until saturated conditions no longer exist.
- Erosion controls must be employed to prevent wastewater runoff from the spray irrigation fields. The Permittee must notify the Department immediately if any wastewater runoff occurs.

- The wastewater must be applied in a manner such that the application is even and uniform over the irrigation area.
- Spray irrigation is prohibited when saturated or frozen soil conditions exist.

In order to comply with these operational conditions, the Regulations require permittees to demonstrate (through monthly irrigation rate calculations) that that existing or proposed lagoon(s) have adequate storage for design flows while maintaining at least three feet of freeboard. The GWDS also recommends a minimum of 45 days of storage.

The storage lagoon at ANSRWRF is designed for 61 days of storage because the lagoon is designed with an additional three feet of freeboard and an extra 23 million gallons of extra capacity in order to accommodate future phases. In addition, Section 5.2 of ANSRWRF's Operation and Maintenance Plan (O&M Plan) states that the "standard operating procedure is to spray whenever weather, crop, soil, and land-limiting constituent conditions allow, so that the lagoon is kept to a minimum level at all times. This maximizes the available storage for addressing abnormal conditions such as excess precipitation or extended periods of subfreezing temperature."

In addition, as discussed above, the Allen Harim wastewater treatment system incorporates several on-site lagoons for storage and re-treatment of non-compliant wastewater. The process control sampling performed by Allen Harim operators should identify a significant treatment issue prior to the discharge of poorly treated wastewater to ANSRWRF. However, Section 3.5 of ANSRWRF's O&M Plan states that "in the unlikely event that some amount of effluent with concentrations exceeding a permit limit do arrive in the ANSRWRF lagoon, spray operations can be temporarily suspended. Additional monitoring will be performed at the lagoon, and if needed, additional chlorination or portable treatment used to bring effluent back to compliant condition prior to disposal." Additional fields are also available for additional spray capacity.

The GWDS believes that the storage capacity and flexibility of operations offered by the ANSRWRF design provides sufficient assurance that spray disposal can be postponed or diverted during periods when conditions are unfavorable for approved uses or when the quality requirements cannot be met.

Revised Draft Permit: The GWDS added the standard "Freeboard" condition requiring at least three feet of freeboard, measured vertically from the lowest point of the berm, for all storage ponds. The condition also requires the Permittee to notify the GWDS in writing prior to utilizing the freeboard in any lagoon or immediately upon unexpected encroachment into freeboard.

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 21: Lagoon Freeboard Requirements (Appendix VI)

10. Response to comments raising concerns about the possibility of pipeline and irrigation system failures (i.e., spills, leaks, accidents, etc.) and the potential for pipeline and irrigation system failures to impact groundwater and surface water resources.

Response: *7 Del. C.* Chapter 60 § 6028 states (in part) that any individual (i.e., permittee) who causes or contributes to an environmental release (i.e., spill) of a pollutant into surface water or groundwater or on land, must report such an incident to the Department as soon as possible and activate their emergency site plan. In addition, the following information is required to be reported to the Department.

1. The facility name and location of release;
2. The chemical name or identity of any substance involved in the release;
3. An indication of whether the substance is an extremely hazardous substance;
4. An estimate of the quantity of any such substance that was released into the environment;
5. The time and duration of the release;
6. The medium or media into which the release occurred;
7. Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals;
8. Proper precautions to take as a result of the release, including evacuation;
9. The names and telephone number of the person or persons to be contacted for further information; and
10. Such other information as the Department may require.

The pipeline connecting the Allen Harim wastewater treatment system to ANSRWRF is controlled by Artesian Wastewater Management, Inc. and was constructed pursuant to a State of Delaware issued construction permit. Part IV.A.4 of the draft permit includes the requirement for Artesian to report to the GWDS any spills, leaks, or accidents that result in a spill or the inability to transfer wastewater within 24-hrs of discovery. However, the GWDS acknowledges that the notification/reporting requirements are not as detailed as in *7 Del. C.* § 6028.

In order to clearly identify the information required to be reported to the GWDS additional language will be added to the draft permit.

Revised Draft Permits: The revised draft permits now include a condition requiring all spill notifications to include the information outlined in *7 Del. C.* § 6028 as discussed above.

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 15: Spill Reporting (Appendix VI)

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 29: Spill Reporting (Appendix VII)

Revised Draft Permit: The GWDS also included a condition requiring the installation of an influent flow meter (and monitoring) at ANSRWRF to complement the effluent flow metering at Allen Harim's wastewater treatment facility.

The Permittee shall install a flow meter to measure the volume of treated wastewater effluent discharged to the synthetically lined lagoon from Allen Harim. The meter shall be installed within one (1) year from the Permit effective date. Meter specifications shall be submitted to the Department within 30 days of installation.

See: Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02 Page 11: Schedule of Compliance (Appendix VII)

11. Public comments raised concerns about the transportation of wastewater from Allen Harim's Hatchery and the Pinnacle Processing Facility to the Harbeson Processing Facility for treatment.

Response: Allen Harim's wastewater treatment system is authorized by the proposed draft permit to receive and treat up to 40,000 gallons per day (GPD) of process wastewater from Allen Harim's Pinnacle Processing Facility and up to 40,000 GPD of process wastewater from Allen Harim's Dagsboro Hatchery. Please note that there is no sanitary component to the wastewater trucked in from these facilities. Sanitary wastewater at Allen Harim's Pinnacle Processing Facility is treated on-site and discharged to stream under an existing NPDES permit and sanitary at Allen Harim's Dagsboro Hatchery is disposed of via an on-site septic system. Therefore, the process wastewater received from these facilities is compositionally similar to Allen Harim Harbeson's processing wastewater which also does not include sanitary. Allen Harim Harbeson's sanitary wastewater is disposed of offsite via sewer and treated by a private utility.

All process wastewater from Allen Harim's Pinnacle Processing Facility and the Dagsboro Hatchery is transported in accordance with §5.3.32 of the Regulations which states that "no person shall haul, convey or transport any non-hazardous liquid waste in any container without a Class F liquid waste haulers license and a Non-Hazardous Liquid Waste Transporters Permit issued by the Department." These permits ensure that non-hazardous liquid waste is transported in a manner that is protective of human health and the environment. The permits include descriptions of disposal sites, prepare and keep on the trucks a plan for the prevention, control, and cleanup of accidental discharges, spill notification requirements, and operational requirements including:

- Every vehicle used for waste transporting purposes shall be equipped with a leak-proof tank or body and shall be maintained in a clean and sanitary condition. All pumps, hoses, and vehicle tanks or bodies shall be maintained so as to prevent leakage. Provisions shall be made to discharge all liquid waste through a leak-proof hose from the tank compartment of the vehicle; and

- All waste transporting truck pumping and discharge hoses shall be fitted with automatic shut-off valves at the tank compartment of the vehicle(s).

The GWDS believes that discharge of poultry process wastewater from various Allen Harim facilities to the Allen Harim wastewater treatment system which is also only treating poultry process wastewater is operationally sound. The wastewater treatment system has the treatment capacity to receive these flows and the offsite wastewater characteristics are in-line with the on-site wastewater. Additionally, the wastewater is transported to the wastewater treatment system in trucks with Non-Hazardous Liquid Waste Transporters Permit issued by the Department to ensure that the wastewater handled appropriately in transit. However, in consideration of public comment, the GWDS will require the permittee to record the volume of wastewater received daily from the Pinnacle Processing Facility and Dagsboro Hatchery.

Revised Draft Permit: The GWDS added a new a new condition requiring the Permittee to record the volume of wastewater received daily from Allen Harim Pinnacle Processing Facility and wash down water received from the Allen Harim Dagsboro Hatchery.

The Permittee shall record the volume of wastewater received from Allen Harim Pinnacle Processing Facility and wash down water received from the Allen Harim Dagsboro Hatchery daily. The daily and total volumes from each facility shall be submitted to the Department with the monthly effluent monitoring report submittals.

See: Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01 Page 20: Influent Flows from Allen Harim Pinnacle Processing Facility and Allen Harim Dagsboro Hatchery (Appendix VI)

12. Will Allen Harim continue to be authorized to discharge to Beaverdam Creek via a NPDES permit?

Response: Allen Harim Harbeson Poultry Processing Facility will cease discharging treated process wastewater effluent to Beaverdam Creek by June 1, 2020 in accordance with the proposed draft permit. Their current National Pollutant Discharge Elimination System (NPDES) Permit will be modified to allow stormwater discharges only. At that point no further discharges of treated process wastewater will be authorized to the creek.

13. Is monitoring data and other information available to the public electronically?

Response: Unfortunately, the GWDS does not currently have the ability to offer monitoring data or other information on its regulated facilities electronically. The GWDS is moving towards this capability, but it is not available yet. Until that time, the public can request information through the Department's Delaware Freedom of Information Act (FOIA) website: https://dnrec.alpha.delaware.gov/foia/.

14. Public comments requested information and status of past enforcement actions.

Response: The Department's Division of Water performs routine inspections and requires extensive monitoring for all surface water and groundwater dischargers. When violations are identified the Division utilizes a wide range of enforcement instruments to re-establish compliance with permit or regulatory requirements. This enforcement approach resulted in the issuance of a Notice of Violation followed by Penalty Assessment to Allen Harim Foods, LLC for failing to achieve effluent concentration and loading limits required by NPDES Permit No. DE0000299 for discharge to Beaver Dam Creek.

To offset a portion of the penalty, Allen Harim Foods chose to perform an Environmental Improvement Project (EIP) in conjunction with The Nature Conservancy related to improving water quality by eliminating agricultural runoff and groundwater transfer of nutrients in the Broadkill River Watershed. This proposal was memorialized in a Conciliation Order by Consent and Secretary's Order No. 2018-W-0057 signed on October 30, 2018.

Unfortunately, do to circumstances outside the control of Allen Harim Foods or The Nature Conservancy the proposed project could not be completed. An alternative EIP proposal was submitted to the Department in which Allen Harim Foods will fund a Delaware Center for the Inland Bays project to purchase high-value conservation property for reforestation and permanent protection. This proposal was accepted by the Department as an Addendum to the Conciliation Order by Consent Secretary's Order No. 2018-W-0057 signed on July 18, 2019. (Appendix VIII)

15. Miscellaneous Revisions to the Draft Operations Permits.

Allen Harim Harbeson Processing Facility, Revised Draft Permit, No. 597261-01

Page 5: Introduction

The GWDS added an "Introduction" section in response to public comments implying that the originally proposed draft permit was not protective of public health and the environment. While the GWDS disagrees with that assessment, the revised draft permit now includes an "Introduction" section that reiterates the Department's statutory authority to issue permits and that the purpose of the permit is to impose requirements for the protection of public health and the environment as required by 7 Del. Admin. C. §7101 *Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems* (the Regulations).

Page 5: General Description of Discharge

The GWDS removed "grit removal" from the description of the wastewater treatment system because the system does not utilize (nor is it required to utilize) grit removal technology.

Page 12: Facility Classification

The GWDS added a "Facility Classification" condition to the revised draft permit which classifies the Allen Harim Harbeson Processing Facility's wastewater treatment system as a Class IV facility and therefore requires a Class IV DE Licensed Operator in Direct Responsible Charge of the facility.

Page 15: Bypassing

The GWDS added a "Bypassing" condition to the revised draft permit which prohibits bypassing unless the bypass is unavoidable to prevent personal injury, loss of life, severe property damage, or materially adversely affect public health and/or the environment or if there is no alternatives readily available. The condition requires immediate notification of a pollutant release followed by a written report submitted within five days. The facility is required to be repaired and flow restored as soon as possible.

Artesian Northern Sussex Regional Water Recharge Facility, Revised Draft Permit, No. 359288-02

Page 3: Site Map

Added an up-to-date site map.

Groundwater Discharges Section Recommendation

Allen Harim's wastewater treatment system will be required to produce the State of Delaware's highest treatment level needed for unlimited public access which is the same level of treatment required on Delaware's golf courses and parks. The wastewater will also be disinfected and provide a residual chlorine content to ensure bacteria and viruses are killed to below acceptable levels. There will be nitrogen and phosphorus present in the wastewater; however, the concentrations of these constituents are accounted for in the nitrogen balance, vegetative management plan, and amount of acreage to be used for the spray irrigated wastewater at ANSRWRF. In addition, Allen Harim will have the ability to divert non-compliant wastewater on-site for retreatment if needed.

ANSRWRF's storage lagoon is designed for 61 days of storage providing sufficient assurance that spray disposal can be postponed or diverted during periods when conditions are unfavorable for approved uses or when the quality requirements cannot be met. In addition, ANSRWRF will be required to perform extensive water quality monitoring through spray effluent monitoring, the use of lysimeters (in-field), monitoring wells (in-field, up-gradient, and down-gradient), and surface water grab samples allowing the GWDS to assess what impact the spray irrigation activities are having on the spray fields, groundwater, and surface waters within and adjacent to the spray fields. In the event trends of increasing concentrations and/or impacts are observed, the permittee will be required take all necessary actions to eliminate and correct any adverse impact on public health or the environment resulting from permit non-compliance in accordance with §3.20 of the Regulations.

Given this, the GWDS has a high degree of confidence that the On-Site Wastewater Treatment and Disposal System Operations Permits for the Allen Harim Harbeson Processing Facility and the Artesian Northern Sussex Regional Water Recharge Facility will be protective of public health and the environment. As such, the GWDS recommends the approval of the On-Site Wastewater Treatment and Disposal System Operations Permits for the Allen Harim Harbeson Processing Facility and the Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF) near Milton, Delaware. However, GWDS recommends that issuance of the Allen Harim Operations Permit is delayed until the former stormwater pond has been synthetically lined and is available for diversion purposes.

Appendix I

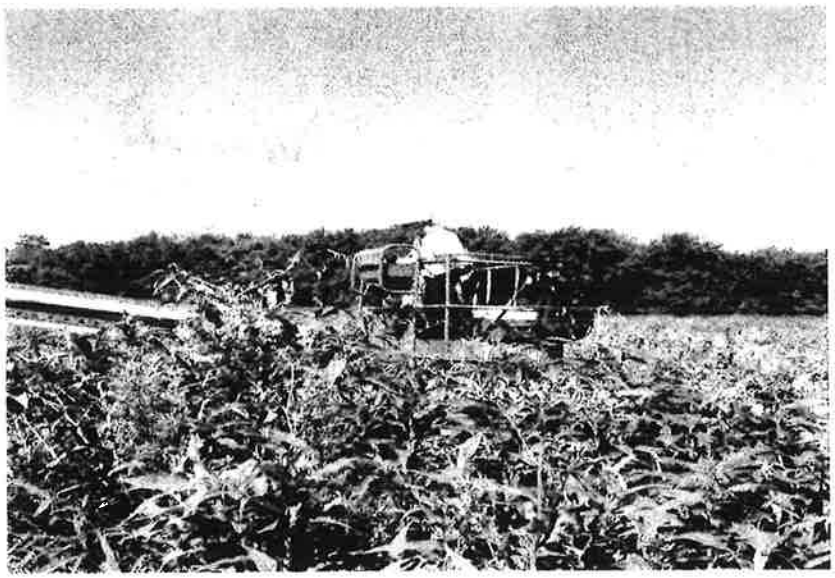
Received
Via Email
on 02/13/20

Allen Harim Harbeson
Old Anaerobic Lagoon Cleanout
Work Plan

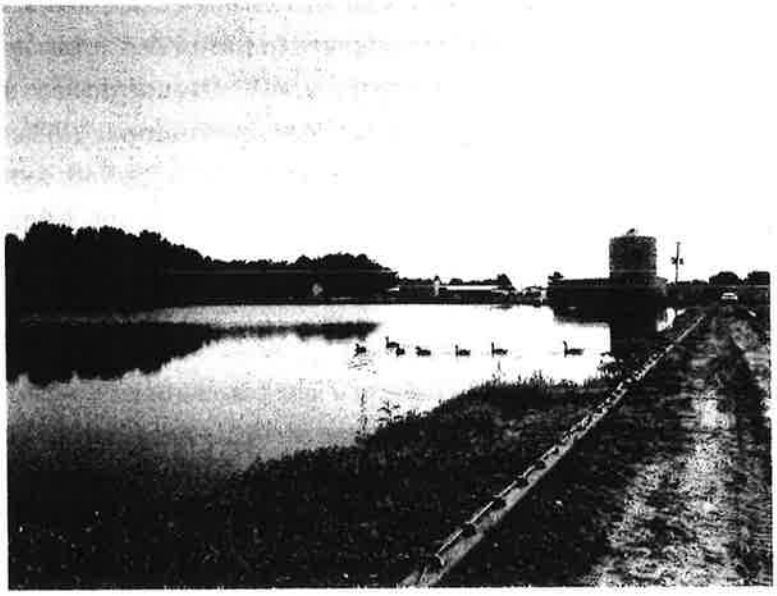
1. Background

Allen Harim owns a poultry processing plant in Harbeson, Del., with an on-site wastewater treatment plant (WWTP). The Harim Group bought the facility from Allen Family Foods, Inc. in 2011 and it was re-named Allen Harim Foods, LLC. Prior to 1998, an anaerobic lagoon was used to treat the waste from the process plant prior to biological treatment using a Complete Mix Activated Sludge (CMAS) system. There was also a small sanitary component to the influent waste to the WWTP. The anaerobic lagoon was abandoned in 1998 when the WWTP was upgraded to include anoxic ponds and additional CMAS capacity. The lagoon was not decommissioned. When the Harim Group bought the facility the lagoon was overgrown with vegetation, filled with sediment and the top liner was in place. The lagoon held a minimal amount of water primarily from rain events.

In the summer of 2013 Allen Harim Foods, LLC began planning the lagoon cleanout. A forklift with a basket was required to perform core sampling of the lagoon. Eight core samples were obtained and analyzed. The thought process was to land apply the material on the Allen Harim company farms, however, this never happened. In January of 2014, United Construction was hired to clean the lagoon of all vegetation and remove the top liner. With the approval of Glenn Davis, Program Manager of DNREC, the vegetation and sediment were disposed of on the field owned by Allen Harim adjacent to the Processing Plant in Harbeson, DE. The liner was hauled to the landfill for disposal. On an as need basis Allen Harim pumped the remaining storm water that accumulated in the lagoon to the on-site wastewater treatment plan



The top liner removal and partial lagoon cleaning was completed in the spring of 2014. Today the lagoon is a basin that holds storm water.



In 2016 it was decided not to pursue the Phase 2 construction of the expansion for the WWTP. The treated effluent will be sent to Artesian Resources for spray irrigation at the ANSWRF facility that is located near Milton, Delaware. A DNREC requirement for this was to convert the old anaerobic lagoon into a diversion lagoon that would accept non-compliant water in extremely unlikely event that water could not be sent to Artesian. The non-compliant water would be re-treated in the WWTP until compliance with spray irrigation requirements is achieved.

2. Lagoon Clean Out Planning

Planning for the final phase of cleaning the lagoon was initiated in early 2017. Allen Harim is developing a contingency plan for the unlikely event of non-compliant effluent. With the approval of the contingency plan, the date for the effluent to spray irrigation is November 2019.

Two methods of cleaning the lagoon were considered. One method was pumping of the sludge to Geo Tubes for dewatering. This method required a Temporary Sludge Holding Permit until the dewatered sediment could be disposed of off-site at an approved location. Because of the time required for the permitting process this method was not considered desirable. The second method that was considered was to dredge and/or pump the lagoon sediment to a belt filter press for dewatering. Hauling and disposal of the dewatered material would be at an approved location.

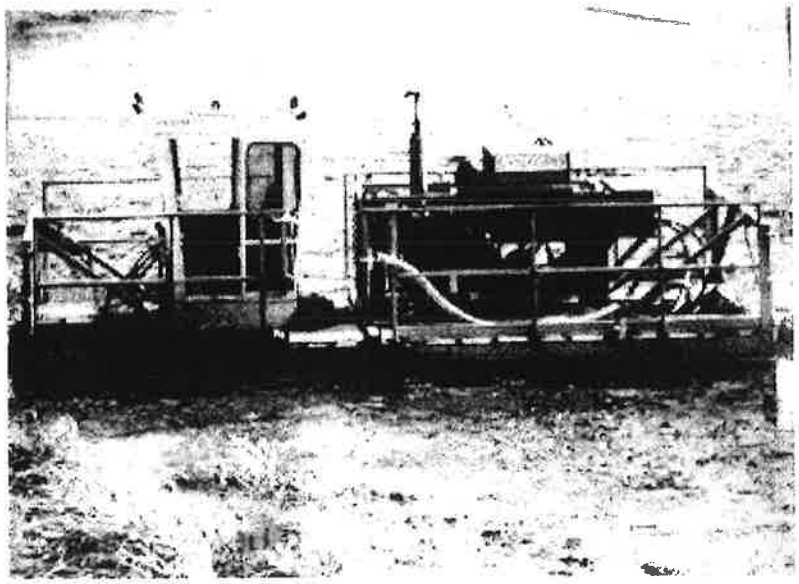
Two companies submitted proposals. Allen Harim has tentatively decided to contract with Synagro, a company headquartered in Baltimore that is a national leader in the sludge disposal and lagoon cleanout industry.

3. Sediment Removal – Old Storm Water Lagoon and Old Anaerobic Lagoon

The old storm water lagoon located on the northern side of the old anaerobic lagoon will be cleaned first. Once clean with the liner inspected, the old storm water lagoon will be used for diversion purposes followed by the anoxic ponds. This diversion strategy will prevent any diversion to the anaerobic lagoon during the cleanout process. The old storm water lagoon has a capacity of 2.0 MG and is filled with two to three feet of sediment. The plan is to dredge the sediment and discharge it to the old anaerobic lagoon before that cleaning begins.

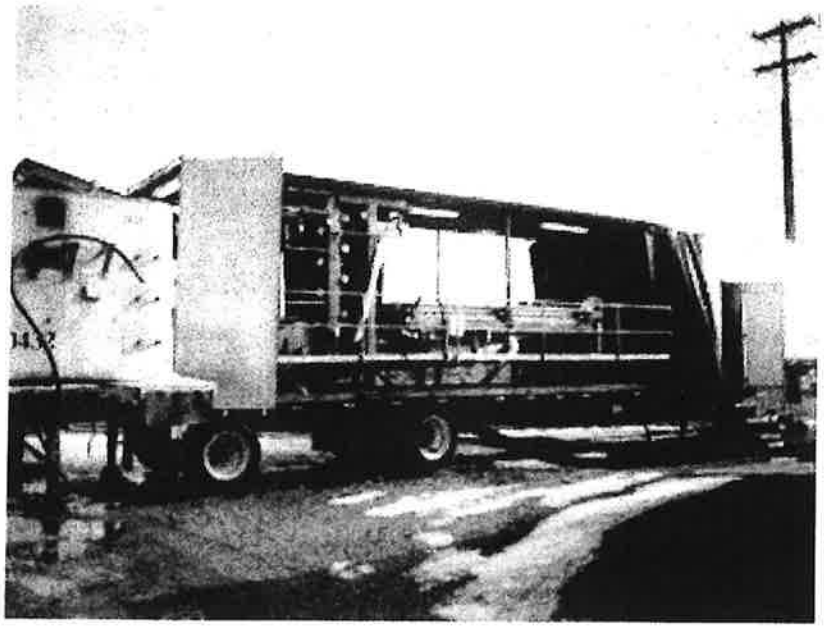
The sediment in the old anaerobic lagoon is on the average 5 to 7 feet in depth. That leaves approximately 3 feet of water on top of the sediment. A small cable driven dredge will be placed with a crane into the lagoon. The dredge will be equipped with a diesel engine and vegetable based biodegradable oil. The dredge will traverse along a cable that will be stretched across the lagoon and anchored using either temporary concrete blocks, or similar weighted wheeled machine; i.e. skid steer, telehandler. The cutter head on the dredge will be equipped with rubber tires that are adjustable for depth in order to preserve the integrity of the clay based liner and prevent damage to the existing structure. The dredge will remove the sediment down to approximately 6 inches. The remaining sediment will be finer particles that simply remain in suspension while operating the dredge. The dredge is expected to pump approximately 1000 gallons per minute (gpm) while operating. Floating pipe will be placed in the lagoon to allow the transfer of sediment to the bank of the lagoon where it will discharge into an 18,000 gallon mix tank. The float pipe will be 6 inches in diameter and will be secured with clamps to maintain integrity and prevent leaks. All fuel transfers to the dredge will occur with spill prevention practices in place and supplies for accidental spillages readily available onsite.

It is expected that 2 operators will be onsite for dredging operations in order to ensure safe work practices. One operator will be on the dredge while the other operator provides shoreline support and pipe line management. The proposed dredge is shown below:



4. Dewatering Operation

The sediment that is transferred from the dredge to the onshore mix tank will be dewatered with a belt filter press or a centrifuge. A second dewatering unit may be required. The mix tank will require 60 amps of 480 volt 3 phase electricity. The mix tank allows for consistent operation throughout the day for the belt filter presses. Each belt filter press will be 2 meters in width and be capable of processing 0.75 to 1.0 dry tons per hour. The belt filter presses are trailer mounted and fully equipped with sludge pumps, grinders, polymer makeup and injection systems, wash water booster pumps, drain basins and catch pans, and cake loadout conveyors. Each belt filter press will be equipped with electro-magnetic flow meters and totalizers. Electricity requirements for the belt filter presses are 100 amps of 480 volt, 3 phase electricity. The requirements for wash water will be 100 gallons per minute (gpm) at 40 psi. Each belt filter press will have an operator responsible for mixing polymer, maintenance and adjusting for optimal performance. It is expected that each belt filter press will operate 9 to 10 hours per day. The per cent solids on the dewatered sediment is expected to be 22%. Dewatered sediment will discharge from each press into an end dump trailer equipped with sealed tailgate and splash guards. Containment systems will be placed under each press prior to set up. Storm water and contained water will be pumped from the containments into the press filtrate or back into the mix tank for reprocessing. Filtrate water will be discharged to Anoxic Pond A for treatment in the Allen Harim Harbeson WWTP at a rate of 600 gallons per minute (gpm). The proposed belt filter press is shown below:



5. Transportation and Disposal of Dewatered Sediment

The dewatered sediment cake will be discharged from the belt filter presses or a centrifuge into end dump trailers equipped with seal tail gates and splash guards. All trailers will have current DOT inspection and be in good working order. Allen Harim has contracted with Synagro for hauling and disposal of dewatered sediment cake at a location in Virginia.

6. Alternate Disposal Options

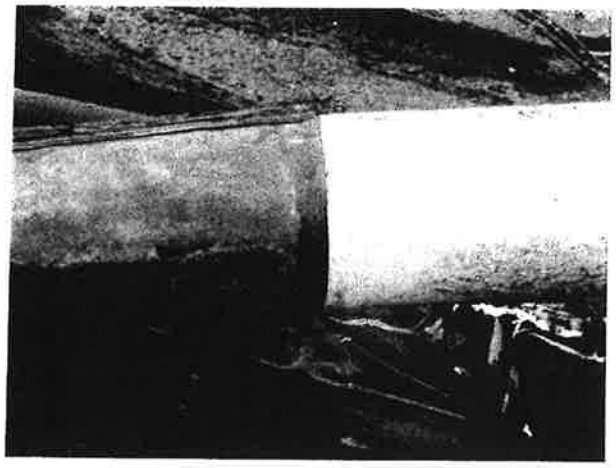
Allen Harim is also pursuing other disposal options for the dewatered sediment. Under consideration are electrolysis, bio-augmentation and composting. Allen Harim contracted with Synagro to perform a pilot test to dewater the sediment. The dewatered sediment from the pilot test will be shipped to Envirocorp for analytical that is needed for landfill disposal and/or disposal at a compost facility. Synagro has shared one set of results with the receiving location and have gained acceptance. We are currently pulling another sample to be sent for confirmation.

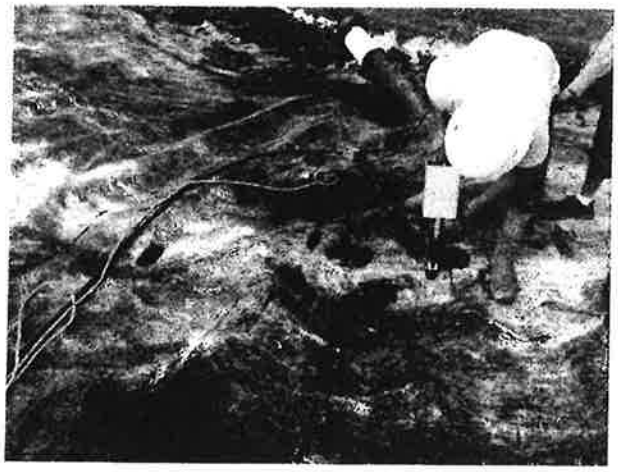
7. Groundwater Monitoring

Allen Harim installed 4 groundwater monitoring wells surrounding the anaerobic lagoon for the purpose of determining the integrity of the existing clay liner. Three sampling events on the 4 monitoring wells were conducted. The only issue that was found in the results from these events

was the presence of elevated ammonia levels in Monitoring Well 2 (MW2). Allen Harim tested the old anaerobic lagoon for ammonia and found the results to be in the range of 8 to 10 mg/L which was far less than the levels of ammonia reported in MW2 (38.7 mg/L average for the 3 sample events). Allen Harim does not believe the high levels of ammonia in MW2 are in any way related to the anaerobic lagoon, as the levels of ammonia in the lagoon are too low to cause elevations of ammonia in MW2 that we have reported. The most recent sampling of the Monitoring Wells was on 12-27-19. The ammonia level in MW2 for this date was 20.3 mg/L. This is a significant reduction from the average of 38.7 mg/L previously reported.

Even though there is no regulatory limit for ammonia in groundwater, Allen Harim decided to further investigate what may be the cause of the elevated ammonia levels in MW2. During the weekend of May 12th - May 13th, Allen Harim lowered Ponds A and B to a very low level that was approximately 3 feet below all pipe penetrations. On Monday, May 14th, the company inspected the pipes that penetrate the pond liner to ensure that the integrity of the seals on these pipes had not diminished to where leakage could occur. The soil in the area was also tested where the pipes penetrate the pond liner, but those reports showed no significant signs of ammonia. While the Ponds were at a low level, preventive maintenance was performed to reinforce all seals on the pipes that penetrate the lagoon. Please see the attached Anoxic Pond Liner report prepared by Hopkins Construction who performed the work. The pictures below show examples of the work that was performed.





Allen Harim contracted with Choptank Environmental, LLC to perform groundwater monitoring for the 1st quarter of 2019. The sampling was performed on March 19, 2019. The ammonia level in MW1 and MW 2 was 14.0 mg/L and 59.4 mg/L respectively. Because MW1 and MW2 have reported a high result for this sampling event, Allen Harim is continuing our investigation as to what may be the cause. Hopkins Construction was contracted to perform integrity testing on the DAF effluent pipe. This work was complete on June 3, 2019. Hopkins Construction was able to confirm that the DAF effluent pipe passed the integrity testing and is not the source of ammonia in the groundwater. As previously mentioned Choptank Environmental sampled the Monitoring Wells on December 27, 2019. The results for MW1 and MW2 were 13.2 mg/L and 20.3 mg/L respectively.

Once in the groundwater ammonia is persistent and can be long lasting. Appendix A contains a document prepared by Choptank Environmental, LLC that is "intended to demonstrate that a portion of the literature provides evidence, that in certain hydrogeochemical environments, Ammonium can persist long after more mobile wastewater constituents (e.g. Nitrate) are gone or the Nitrogen source has been abated."

Allen Harim has sampled and analyzed the surface water bodies of the old anaerobic lagoon, the old

Storm Water lagoon and the Storm Water 004 lagoon (see attached analytical reports). In addition, Allen Harim has sampled and analyzed the sediment of the old anaerobic lagoon. The ammonia levels (NH3-N) in the old anaerobic lagoon, old storm water lagoon and SW 004 lagoon were 1.12 mg/L, 0.31 mg/L and 1.11 mg/L respectively. Allen Harim believes the water contained in all three lagoons is consistent with storm water runoff and not the cause of elevated ammonia levels in two of the groundwater monitoring wells.

Allen Harim will install new synthetic liners in the Old Storm Water and Old Anaerobic lagoons that will meet all DNREC regulations.

8. Odor Control and Management

Synagro does not anticipate unacceptable odor to be generated from the dredging, dewatering and transportation activities. In the event that odor does become an issue, Synagro will deploy an odor control and management plan to include, but not limited to deodorizers, aerial odor reducer and carbon capture systems. Each method of managing odor will be dependent upon the application necessary to mitigate unacceptable conditions. Often it is necessary to employ multiple techniques in order to obtain satisfactory results to continue the operation. Synagro has extensive experience in managing these conditions and has committed to working with Allen Harim to resolve unacceptable odor conditions.

9. Off Spec Water - Sequence Diversion

If diversion is required due to the ongoing exceedance of any action limit, Allen Harim will divert in a sequential manner. The first 2.0 million gallons of diverted flow will be directed to the old storm water lagoon. The next 2.0 million gallons will be diverted to the anoxic ponds. Allen Harim has installed 10 inch Lay Flat hose to allow for discharge of the non-compliant water to the old storm water lagoon.

Old Storm Water Lagoon Cleanout

With the old storm water lagoon being used as the first lagoon for diversion It was necessary to clean the old storm water lagoon of sediment, fallen limbs, etc. Allen Harim contracted with Synagro to clean the old storm water lagoon. The cleanout started on November 21, 2019. The old storm water lagoon appeared to have a synthetic liner. During the cleanout process Synagro determined that the synthetic liner was for the sides only. The bottom of the old storm water lagoon is comprised of a clay liner. Synagro stopped the cleanout process since they did not want to disturb the clay liner. Allen Harim decided to finish the clean out and install a new synthetic liner that will cover the sides and bottom. This work is expected to be complete on or before April 1, 2020.

Lagoon Level Monitoring

During the lagoon cleanout period, Allen Harim will monitor the lagoon level on a daily basis using staph gauges. Allen Harim utilizes a staph gauge in the anoxic ponds. Two Staph Gauges have been installed in the old anaerobic lagoon the week of August 26th. The purpose of the staph gauges is to monitor the depth of water in the old anaerobic lagoon.

10. Time Line

Signed Contract to Clean Out the Old Storm Water Lagoon	November, 2019
Mobilization and Clean Out of the Old Storm Water Lagoon	November 21, 2019
Old Storm Water Lagoon Clean Out Complete	January, 2020
Signed Contract to Clean Out the old Anaerobic Lagoon.	December 19, 2020
Completion of Old Storm Water Lagoon Clean Out with Liner Installation	April, 2020
Mobilization and Clean Out of Old Anaerobic Lagoon	April, 2020
WWTP Effluent to Artesian for Spray Irrigation	April, 2020

Old Anaerobic Lagoon Cleaning Complete	November, 2020
Install New Liner in the Old Anaerobic Lagoon	December, 2020
10 MG Diversion Lagoon Ready for Use	January 2021

Appendix II

ARTESIAN RESOURCES™

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August 18, 2017

Mr. John G. Hayes
Department of Natural Resources and
Environmental Control
89 Kings Highway
Dover, DE 19901

RE: Artesian Northern Sussex Regional Wastewater Recharge Facility
Amended Design Development Report Addendum 1

Dear Mr. Hayes:

Enclosed is an addendum to the Amended Design Development Report for Phase 1 of the proposed Artesian Northern Sussex Regional Wastewater Recharge Facility (ANSRWRF) for your consideration. Please add the addendum to the binder that was submitted on May 5, 2017. This is in response to comments received from your office on July 17, 2017 and July 31, 2017, and includes the following items:

- Amended Design Development Report Addendum 1
  - Response to DNREC Comments for Submission 1
  - Summary of Comments for Submission 1
- Exhibit: Table 3:1: Revised Design Summary Table
- Exhibit: Surface Water Monitoring Plan
- Exhibit: Updated Well Search Map
- Exhibit: Updated Well Search Table
- Exhibit: Lease Agreement Affidavit
- Exhibit: DelDOT Entrance Permit
- Exhibit: Revised Site Plan Sheets

The Summary of Comments and Response to Comments have been cross-referenced for ease of review. If you have any questions, do not hesitate to contact me at (302) 453-7319.

Sincerely,

Daniel Konstanski, P.E.
Senior Engineer

Enclosures

664 Churchmans Road, Newark, Delaware 19702, P.O. Box 15004 Wilmington, Delaware 19850 Phone: (302) 453-6900 Fax: (302) 453-6957
14701 Coastal Highway, Milton, Delaware 19968 Phone: (302) 645-7751 Fax: (302) 645-8233
email: artesian@artesianwater.com Website: artesianwater.com

AMENDED
DESIGN DEVELOPMENT REPORT
ADDENDUM 1

Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF)

Phase 1

August 18, 2017

PREPARED FOR:

ARTESIAN WASTEWATER MANAGEMENT, INC.
664 Churchmans Road
Newark, DE 19702

PREPARED BY:

ARTESIAN RESOURCES CORP.
664 Churchmans Road
Newark, DE 19702

DANIEL W. KONSTANSKI
LICENSE
No. 18462
DELAWARE
PROFESSIONAL ENGINEER

8/18/2017

Daniel Konstanski, P.E.
Senior Engineer
Artesian Resources Corp.

Table of Contents

1. Response to DNREC Comments for Submission 1
2. Summary of DNREC Comments for Submission 1
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4. Exhibit: Surface Water Monitoring Plan
5. Exhibit: Updated Well Search Map
6. Exhibit: Updated Well Search Table
7. Exhibit: Lease Agreement Affidavit
8. Exhibit: DelDOT Entrance Permit
9. Exhibit: Revised Site Plan Sheets

Response to DNREC Comments for Submission 1

An application for an amended construction permit for the Artesian Northern Sussex Regional Wastewater Recharge Facility (ANSRWRF), including an Amended Design Development Report, was submitted to DNREC on 5/9/2017. Comments received from DNREC on 7/17/2017 and 7/31/2017 in the form of memos and e-mails have been summarized below in the section titled "Summary of DNREC Comments for Submission 1". The responses have been grouped according to related comments, with numbers in brackets referring to the applicable items in the Summary.

1. Applicable Regulations [1.a]
    a. The DDR states on page 5 that the project is governed by the 1999 *Guidance and Regulations Governing the Land Treatment of Wastes*. The 1999 Land Treatment Regulations were superseded by the 2014 amended State of Delaware, Department of Natural Resources and Environmental Control, Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems (Regulations). Therefore, the project is governed by the 2014 Regulations. The facility is considered an existing facility as per the definition of "New System" in the Regulations. Therefore, the facility must meet PSN2 requirements. These requirements can be met by "an average annual concentration of 10 mg/L beneath any permitted on-site wastewater treatment and disposal system as verified by in-field monitoring provided that the design percolate concentration does not exceed 10 mg/L on an average annual basis." The calculations in Appendix G demonstrate that the facility is designed to meet this standard.
    b. Regulatory sections in this addendum refer to the above described DNREC 2014 Regulations.
2. Chlorination [1.b, 5.a]
    a. As discussed in meetings subsequent to the application submittal, the proposed point of compliance for BOD5, TSS, and disinfection as described in Regulation 6.3.2.3.2 is at the proposed sampling station on the Allen Harim site. This meets the requirement of Regulation 6.3.2.3.2.2 for the point of compliance to be after treatment and prior to storage. Therefore, effluent will be sampled at this location to ensure a total chlorine residual between 0.5 and 4 mg/L is maintained as required by Regulation 6.3.2.3.3.2.3.1. A continuous on-line monitor of residual chlorine will be installed at the compliance monitoring point. See the revised Table 3-1 below.
    b. Equipment for re-chlorination at the lagoon as shown on Sheets 3, 5, and 6 is still included in the proposed design. This is intended as an optional tool for the operators to use as needed for algae control. Yard piping and valving is set up such that flow can be circulated through the lagoon effluent pumps and chlorine injection vault and routed back to the lagoon influent, so that mixing and additional disinfection can be provided as needed to address operational challenges.
3. Surface Water Monitoring Plan [1.c, 1.l.xii, 5.i]
    a. Surface water monitoring will be performed at the locations depicted in the attached Surface Water Monitoring Plan in accordance with Regulation 6.3.2.3.13.12. These represent the upgradient and downgradient locations for surface water bodies adjacent to the spray irrigation sites. Background monitoring as described in the Amended DDR Section 5.2.2 shall be performed, followed by quarterly samples for active spray sites,

including the parameters shown in Table 5-1. Note that these water bodies have low base flow and samples may not be possible when dry.

b. The water body shown adjacent to Field E in Figure 3-7 is the 100-year flood extents of Reynolds Pond. Under normal conditions the water body extents are not adjacent to the spray fields. Therefore no surface water monitoring is proposed.

c. Surface Water Monitoring locations for Fields A, B, and C will be proposed as necessary when these fields are incorporated into a future phase.

4. Agricultural Buildings [1.d.i, 5.b]
   a. The pump building has been designed to look like an agricultural well house, in accordance with the conditions in the Sussex County Conditional Use.
5. Mosquitos [1.d.ii]
   a. Conditions most favorable to mosquitoes breeding are areas of shallow, stagnant water with fairly flat sideslopes and vegetation along the banks. To minimize the emergence of mosquitoes, the storage lagoon has been designed as a deep pond with steep sideslopes. Surface aeration will be used to keep the surface of the lagoon from becoming stagnant, and allow wave action on the bank to prevent mosquitoes from hatching. The lagoon liner will discourage vegetation growth, and operators will maintain the liner and banks to minimize weeds.
   b. "In a well-maintained pond system, mosquitoes usually are not a nuisance. According to studies by the U.S. Public Health Service, the density of the mosquito population is directly proportional to the extent of weed growth in a pond. Where weed growth in the ponds and along the water line of the dikes is negligible and where wind action on the pond is not unduly restricted, the likelihood of mosquitoes breeding is low." [US EPA]

References:

US EPA. "Principles of Design and Operations of Wastewater Treatment Pond Systems for Plant Operators, Engineers, and Managers." 2011.

Lawler, Sharon P. and Gregory Lanzaro. "Managing Mosquitoes on the Farm." University of California, Division of Agriculture and Natural Resources. 2005.

Walton, William E. "Managing Mosquitoes in Surface-Flow Constructed Treatment Wetlands." University of California, Division of Agriculture and Natural Resources. 2003.

6. Buffer Zones [1.d.iii, 1.d.v, 1.k, 1.l.i, 1.l.v, 1.l.vi]
   a. Regulation 6.3.2.3.10.3 lists the required buffer zones for Unlimited Public Access spray sites operations. These include a 100 foot buffer from the edge of any perennial lake or stream or ephemeral drain, a 50 foot buffer from the edge of any channelized, intermittent watercourse, and a 50 foot buffer from the edge of any wetlands. As shown in Sheets 23-34, a 100 foot buffer has been applied to all perennial water bodies, watercourses (see the "WCB" buffer line), and a 50 foot buffer has been applied to all wetlands (see the and wetlands "WB" buffer line). Thus the design meets all requirements of 6.3.2.3.10.3. Note that the 8/11/2017 letter submitted by Artesian as part of the public comment period states that a 100 ft. buffer zone has been put in place to protect the natural resources surrounding the sites. This should be clarified to be a 100 foot buffer around watercourses, and a 50 foot buffer around wetlands.

b. Sheet 23 has been updated to show a small modification to existing spray patterns to meet the water course buffer requirements.
c. As described in Regulation 6.3.2.3.10, buffer zones around domestic and public water supply wells for unlimited public access spray sites are not normally required. As shown on Sheets 23-24, the proposed project includes buffer zones of at least 100 feet around all public and private domestic wells identified in the well search, exceeding the regulatory requirement. Additionally, in accordance with the DNREC Hydrogeologic review dated March 25, 2010 and as shown on Sheets 32 and 34, the buffer zone has been increased to 150 feet for downgradient domestic wells, specifically those occurring on TMPs 235-14.00-63.00, 235-14.00-66.00, and 235-13.00-6.06. Presumably the referenced well on parcel 235-13.00-6.06 is actually intended to mean the well on 235-13.00-6.00, as 13.00-6.06 is the spray field itself and has no supply wells.
d. The proposed project does not include construction of a pretreatment facility, thus Regulation 6.3.2.3.10.4 is not applicable.
e. In accordance with the Final Site Plan dated 3/22/2010 and approved by the Sussex County Planning and Zoning Commission on 4/26/2010 for the ANSRWRF site, a 30 foot forested buffer is proposed along the north and east property lines, as well as a 20 foot landscape buffer along Delaware State Route 30. The existing forested area along the southern property line will remain. Both the forested buffer and landscape buffer will be planted with trees.
f. In the DNREC Secretary's Order No. 2012-W-0052, DNREC recommends additional buffer zones around the Sylvan Acres development. This development is adjacent to Field A, which is not included in the current phase. This buffer zone will be addressed in a future phase.
g. Exhibit C: Minimum Isolation Distances is referenced in the regulations as part of the Standard Requirements for Large Systems (Regulation 6.3.1, 6.3.1.21). These requirements based around Limited Public Access, and are not applicable to wastewater treated for Unlimited Public Access, which is intended to allow reduced buffer zones for water treated to a high enough level to allow safe public access at all times (Regulation 6.3.2.3.3.2). Buffer requirements for Unlimited Public Access are defined in Regulation 6.3.2.3.10 and discussed above.

7. Conditional Use Ordinances [1.d.iv]
    a. The proposed design complies with the approved Sussex County Conditional Use for the treatment site and spray irrigation areas.
8. Observation Wells [1.d.vi, 1.d.vii, 6.a]
    a. A new Observation Well (Piezometer) PZ-8G has been added to the wet spot on Field G, at the 32' elevation contour. See the updated Sheet 33.
    b. Field C is not included in the current phase. The appropriate location of Observation Well PZ 2A on Field C will be adjusted as needed as part of a future amendment to the DDR.
9. DelDOT Approval [1.e, 5.e]
    a. See attached entrance permit.

10. Spray Area Topography [1.f, 1.l.iv]
    a. The maximum slope in the wetted crop areas for Fields D, E, F, and G is less than 7%, and the maximum slope for the wetted wooded areas is less than 30%. This is in accordance with the requirements in Regulation 6.3.2.3.7.3.
11. Well Search [1.g, 6.b]
    a. The original FOIA request was put in on 9/9/2008, and the response was received 9/15/2008.
    b. An updated FOIA request was put in on 7/31/2017, and the response was received 8/11/2017.
    c. A table of all additional wells found in the updated well search is attached. The attached map shows the location of all additional domestic wells, with their associated 100 ft buffer areas (or 150 ft for downgradient wells), as well as the buffer areas for wells found in the original 2008 search. Buffer zones for the additional wells have been added to the revised Site Plan Sheets, none of which encroach on proposed spray areas.
12. Vegetative Management Plan [1.h]
    a. The Vegetative Management Plan states that wastewater applications will be limited to a maximum of 2.5" per week, which is the general regulatory maximum. Specific permit conditions, such as the 1.65" per week limit based on groundwater modeling, may impose more restrictive operating constraints.
13. Solid Set Spray Height [1.i]
    a. The solid sets stand 5 feet above the ground surface, and the arc of the spray reaches approximately 10 feet above the ground surface.
14. Flow Meters and Pressure Valves [1.j, 1.l.xiii, 1.l.xiv, 1.l.xv, 1.l.xvi, 5.g]
    a. The Process Flow Diagram on Sheet 3 has been updated to indicate the flow meter locations for each pivot/zone as required by Regulation 6.3.2.3.13.16, including existing spray irrigation pivots. The wooded area solid sets are divided into zones, where each zone has a flow meter and pressure valve as shown on Sheet 3. These zones are further subdivided into sub-regions which are on a timed cycle, where each sub-region receives the same volume of water in a cycle. As discussed in meetings with DNREC, these sub-regions are considered part of the larger zone, and do not require individual metering. See also the details on Sheet 47.
    b. A flow meter is included in the sample station at the Allen Harim site. As this is the only customer for Phase 1, this meter represents the total volume of water entering into storage as required by Regulation 6.3.2.3.13.17. When additional customers are added in future phases, an additional flow meter will be added at the head of the storage lagoon to total all influent flow.
    c. The Process Flow Diagram on Sheet 3 has been updated to indicate the pressure valve locations for each pivot/zone. These valves will have automatic shutoff when either high pressure or low pressure is detected, in accordance with Regulations 6.3.2.3.13.18 and 6.3.2.3.13.19. See also the details on Sheet 47.
15. Automatic Flow Diversion [1.l.ii, 5.f]
    a. As discussed above, the point of compliance for monitoring wastewater effluent standards for Phase 1 through both grab samples and continuous monitoring will be at the Allen Harim site, which is after treatment and prior to storage as required by

Regulation 6.3.2.3.2.2. A 4 million gallon (2-day) storage lagoon will be provided by Allen Harim on-site so that non-conforming effluent can be diverted and retreated prior to being routed to the ANSRWRF facility in accordance with 6.3.2.3.2.4. The details regarding how diversion will be accomplished and which parameters will trigger automatic diversion will be addressed in the amended Allen Harim operations permit.

b. Sampling at Allen Harim includes both grab samples and continuous monitoring. The continuously monitored parameters including flowrate, oxidation/reduction potential, and turbidity serve as an early warning for most problems which could result in a significant exceedance on the grab samples. This allows problems to be recognized and addressed promptly even between grab samples without allowing a large volume of non-compliant effluent to be discharged to the lagoon.

16. Lagoon Height Above Groundwater [1.I.iii]
    a. As depicted on Sheet 7, there is at least 2 feet of separation from the proposed bottom of the lagoon and the seasonal high groundwater level, in accordance with Regulation 6.3.2.3.5.8.
17. Unlimited Public Access Advisory Signs [1.I.vii]
    a. In accordance with Regulation 6.3.2.3.13.2.2, each active spray field as well as the ANSRWRF treatment site will have advisory signs posted at all entry points that indicate the site is spray irrigated with treated wastewater, including the wording "RECYCLED WASTEWATER – DO NOT DRINK".
18. Fencing [1.I.viii]
    a. In accordance with 6.3.2.3.13.3, fencing has been proposed at the ANSRWRF site. See the legend on Sheet 2 as well as the site plan on Sheet 6.
19. Emergency Contingency Plan [1.I.ix, 1.I.x, 1.I.xi]
    a. Potential emergency conditions for a wastewater storage and disposal facility include excessive precipitation, extended periods of subfreezing temperature, loss of power, and the introduction of effluent into the lagoon with constituent concentrations that exceed design or permit levels.
    b. In the event that an emergency condition is encountered, operators will take immediate action as necessary, as well as notify DNREC and coordinate the gathering of additional information and the implementation of relief measures.
    c. The ANSRWRF facility has been designed with a range of available options to reduce, eliminate, and/or prevent non-compliant conditions, in accordance with Regulation 6.3.2.3.13.7. These options include the following items, which will be discussed in greater detail along with standard operating procedures in the O&M Plan.
        i. Standard operating procedure is to spray whenever weather, crop, soil, and land-limiting constituent conditions allow, so that the lagoon is kept to a minimum level at all times. This maximizes the available storage for addressing abnormal conditions such as excess precipitation or extended periods of subfreezing temperature.
        ii. The lagoon designed for Phase 1 includes approximately 23 million gallons of excess capacity intended for future increases in disposal volume. This excess capacity is available during Phase 1 to address any emergency conditions, and represents an extra 15 days of storage at Phase 1 flow rates. This may require

prior approval from DNREC including a plan for how to empty the excess volume in a timely fashion, likely by utilizing excess spray area on Field F.

iii. The lagoon design includes an additional 3 feet of freeboard in excess of the design volume, which represents additional storage that can be utilized in emergency conditions. This may require notification of DNREC and coordination of relief measures.

iv. An additional bypass lagoon with at least 2 days storage volume will be provided on-site by Allen Harim. In the event of a treatment upset at the Allen Harim plant leading to non-compliant wastewater, this wastewater will be diverted to the bypass lagoon so as not to contaminate the compliant effluent in the ANSRWRF storage lagoon. This non-compliant wastewater can directed back to the head of the plant for retreatment.

v. In the unlikely event that some amount of effluent with concentrations exceeding a permit limit do arrive in the ANSRWRF lagoon, spray operations can be temporarily suspended. Additional monitoring will be performed at the lagoon, and if needed additional chlorination or portable treatment used to bring effluent back to compliant condition prior to disposal.

vi. The Phase 1 construction permit includes more than the minimum required land for spray disposal. These additional fields are available to provide flexibility in operations. If challenging conditions arise, additional fields can be brought into operational use to address the issue.

vii. If necessary, the operators may seek temporary permission to exceed the design spray limit of 1.65 in/week, which is a permit condition based on groundwater models, rather than regulatory limits. Provided groundwater levels are not excessive, there is flexibility to provide a 50% increase in spray rates when authorized by DNREC without exceeding the regulatory limit. DNREC also considers temporary waivers to the 2.5 in/week limit in emergency situations.

20. Lease Agreement [1.l.xvii, 1.l.xviii, 1.l.xix, 1.l.xx, 1.l.xxi, 1.l.xxii, 1.l.xxiii, 1.l.xxiv, 1.l.xxv, 1.l.xxvi, 3.a, 3.a.i]

    a. The lease agreement contains confidential information. The attached affidavit confirms that Artesian has sufficient rights to use of the fields to achieve the design goals. This satisfies the intent of Sections 6.3.2.3.14.3.1, 6.3.2.3.14.3.2, 6.3.2.3.14.3.3, 6.3.2.3.14.3.4, 6.3.2.3.14.3.5, and 6.3.2.3.14.3.6.

21. Ponding and Runoff [2.a.i, 2.a.ii, 2.b.i, 2.b.ii, 2.b.iii]

    a. As noted in the comments from DNREC, there are a variety of depressions and slopes which could experience ponding or runoff if excessive spray is applied, and plowing some of these areas may lead to runoff and erosion during heavy rain events until the crops are established which would be compounded with spray application.

    b. For the first couple of years, during the wet season, careful monitoring of the spray fields will be performed to ensure no ponding of wastewater occurs. Rates will be reduced if ponding or runoff occurs. Once ponding or runoff has ceased and groundwater levels are observed and favorable, the application rate can be increased up to regular permit levels.

    c. Special attention will be paid to the wooded portions being sprayed so as to maintain good stands and proper management.

d. As discussed in the Amended DDR Section 5.2.4, depth to groundwater will be monitored at each observation well, and operators will discontinue spraying to the areas adjacent to observation wells while the depth to water is less than or equal to 2 feet.

22. Army Corps of Engineers and Wetlands and Subaqueous Lands Jurisdiction [4.a, 4.b, 5.c]
    a. The access road on Sheet 28 crosses inside the Water Course Buffer (WCB). This is not a regulated wetlands boundary, rather it is the 100-ft buffer from the edge of any perennial or intermittent watercourse where no spray irrigation will occur. Therefore this access road does not fall into the jurisdiction of the Army Corps of Engineers.
    b. As shown on sheets 23-34, no installation of utilities is proposed within State-regulated subaqueous lands.
23. FEMA Floodplains [5.d]
    a. The 100-Year Floodplains shown on the drawings are consistent with the latest revisions to the FEMA flood zones.
24. Nitrogen Balance Calculations [5.h]
    a. The Sussex County conditional use approval for the spray fields, Ordinance 1923, states that "irrigation rates shall be determined by crop utilization and uptake limits rather than by wastewater disposal needs". This is to ensure that excessive nitrogen is not applied without regard for the impacts to soil and groundwater, and is consistent with the intent of the more rigorously defined DNREC requirement that the design percolate nitrogen level be less than 10 mg/L and that "all nitrogen not lost to denitrification, ammonia volatilization, evapotranspiration or plant uptake must be assumed to leach into the groundwater as nitrate nitrogen." Detailed calculations have been provided in Appendix G demonstrating that design irrigation rates have been limited by crop utilization and related environmental factors rather than by wastewater disposal needs.
25. Miscellaneous Clarifications:
    a. As clarified in the revised Table 3-1, the design flow is 2 MGD for 5 days per week, with an average weekly flow of 1.5 MGD.
    b. Table 3-1 has been revised to clarify that 45 days storage is not required for non-municipal projects, but is still a recommended minimum.

Summary of DNREC Comments for Submission 1

The comments received from DNREC have been summarized and cross-referenced with numbers in brackets referring to the applicable response in the Response to Comments.

1. GWDS Engineering Review (Marlene Baust, 6/27/2017)
    a. Clarify that the facility is governed by the 2014 regulations and considered an existing facility required to meet PSN2 requirements. [Response 1]
    b. Reaffirm intent to re-chlorinate or amend application to omit the provisions to re-chlorinate if it is not a regulatory requirement. [Response 2]
    c. Submit a surface water monitoring plan that includes a map with both the water bodies and proposed monitoring points depicted and labeled. See the approximately six waterbodies/tributaries adjacent to spray irrigation fields in Figure 3-7 of the DDR. [Response 3]
    d. Note that requirements in the 2013 permit include:
        i. Design the treatment plant to look like an agricultural building and have landscaping to screen it from view from its neighbors. [Response 4]
        ii. Ensure that the storage ponds shall not become a breeding ground for mosquitos. [Response 5]
        iii. Maintain all required buffers for the spray fields as set by both the Department and Sussex County. [Response 6]
            1. Maintain a 100 ft buffer from the wetted field area to the north-west corner of the Sylvan Acres Development.
        iv. The permittee shall comply with all applicable Sussex county ordinances and conditional use requirements placed on this facility. [Response 7]
        v. In accordance with DNREC Hydrogeologic review dated March 25, 2010, all of the spray fields have to be located at least 150' from any off-site drinking water supply well. A 150' buffer zone must exist between the wetted field areas of field G and downgradient domestic wells located on TMPs 235-14.00-63.00, 235-14.00-66.00, and 235-13.00-6.06. [Response 6]
        vi. In accordance with DNREC Hydrogeologic review dated March 25, 2010, the Permittee shall install another permanent Observation Well (OW) in the area on field G between groundwater contours 31 – 32 in the location where the mounded average seasonal-high water table is predicted to lie as close as 0- 2' below the ground surface. When referring to the location for the additional OW, the Permittee should utilize Artesian's Consulting Engineers, Inc. large fold out map (Sheet No.1) of Artesian's March 3, 2010 document submitted to the DNREC Groundwater Protection Branch entitled, "ANSRWRF DDR Hydrogeological Appendix Response to Groundwater Protection Branch Memorandum March 3, 2010". [Response 8]
        vii. Observation well (PZ 2A) proposed for Field C and shown on Artesian's detailed topo map entitled "Field C Detailed Topographic Map and Proposed Monitoring Well and Piezometer Location Map" should be moved approximately 200' to the

southwest to an area where the projected mounded water table lies between 2 – 4"BGS. This aforementioned map is found in Artesian's hydrogeological report to the Department entitled: "ANSRWRF DDR Hydrogeological Appendix Response to Groundwater Protection Branch Memorandum March 3, 2010". [Response 8]

e. The DelDot approval referenced on page 22 and provided in Appendix D is expired. [Response 9]
f. The applicant should verify in the Topography Section 3.8 on Page 21 that all of the proposed spray irrigated areas meet the requirements of 6.3.2.3.7.3. The verbiage in the DDR speaks to averages and maximums only. [Response 10]
g. Section 3.10 of the DDR references a field survey and DNREC Well search. Applicant should provide the dates of both to indicate if they are recent and updated information since the 2009 DDR. [Response 11]
h. The Vegetative Management Plan provided in Appendix F on page 2 iterates that the wastewater is limited to an application of 2.5"/week and does not speak to the 1.65"/week limit established in the DDR. [Response 12]
i. The DDR indicates on page 29 of the Technical Specifications in Appendix H that the solid set irrigation system will provide a 166 feet wetted diameter. Applicant should also indicate height of irrigated treated wastewater. [Response 13]
j. Drawing 3 Process Flow Diagram should indicate flow meter locations for each field/zone. Process Flow Diagram should be updated if re-chlorination will not be occurring on site. [Response 14]
k. The Applicant should clearly delineate that minimum separation/buffer distances will be adhered to and should clearly delineate vegetated buffer areas [Section 6.3.2.3.10 of the Regulations] versus isolation distances [Appendix C of the Regulations]. [Response 6]
l. The applicant should demonstrate how the proposed ANSRWRF meets the intent of the following regulations. If any of the following are already demonstrated on the Drawings, applicant should also address the item within the verbiage of the DDR for verification and indicate on which Drawing the item may be found.
    i. 6.3.1.21 *[also see Section 6.3.2.3.10]* [Response 6]
    ii. 6.3.2.3.2.4 [Response 15]
    iii. 6.3.2.3.5.8 [Response 16]
    iv. 6.3.2.3.7.3 [Response 10]
    v. 6.3.2.3.10.3 [Response 6]
    vi. 6.3.2.3.10.4 [Response 6]
    vii. 6.3.2.3.13.2.2 [Response 17]
    viii. 6.3.2.3.13.3 [Response 18]
    ix. 6.3.2.3.13.7 [Response 19]
    x. 6.3.2.3.13.7.1 [Response 19]
    xi. 6.3.2.3.13.7.2 [Response 19]
    xii. 6.3.2.3.13.12 [Response 3]
    xiii. 6.3.2.3.13.16 [Response 14]
    xiv. 6.3.2.3.13.17 [Response 14]
    xv. 6.3.2.3.13.18 [Response 14]
    xvi. 6.3.2.3.13.19 [Response 14]

xvii. 6.3.2.3.14 [Response 20]
xviii. 6.3.2.3.14.1 [Response 20]
xix. 6.3.2.3.14.2 [Response 20]
xx. 6.3.2.3.14.3 [Response 20]
xxi. 6.3.2.3.14.3.1 [Response 20]
xxii. 6.3.2.3.14.3.2 [Response 20]
xxiii. 6.3.2.3.14.3.3 [Response 20]
xxiv. 6.3.2.3.14.3.4 [Response 20]
xxv. 6.3.2.3.14.3.5 [Response 20]
xxvi. 6.3.2.3.14.3.6 [Response 20]

2. Soils Review (Jack Hayes, 6/19/2017)
    a. Concerns:
        i. There are a variety of depressions and slopes which could experience ponding or runoff if excessive spray is applied. The spray fields must be carefully monitored to ensure ponding or runoff does not occur as a result of wastewater application. [Response 21]
        ii. Plowing some of these areas with slopes may lead to runoff and erosion during heavy rain events until the crop are established which would be compounded with spray application. [Response 21]
    b. Recommendations:
        i. For the first couple of years, during the wet season, careful monitoring of the spray fields must be performed to ensure no ponding of wastewater occurs. Rates should be reduced if ponding or runoff occurs until the rates are appropriate. If no ponding or runoff occurs and groundwater levels are observed and favorable, the application rate could be increased. [Response 21]
        ii. This could be a labor intensive facility – Artesian should consider having a dedicated staff to operate and maintain this facility of the fields in agricultural production. [Response 21]
        iii. Special attention should be paid to the wooded portions being sprayed so as to maintain good stands and proper management as mentioned in the forestland discussion. [Response 21]
3. Paralegal Review (Roy Heineman, 6/27/2017)
    a. Appendix C does not contain sufficient information. [Response 20]
        i. None of the underlying agreements were provided for the three Memoranda of Agreements. [Response 20]
4. Wetlands Review (Tyler Brown, 6/29/2017)
    a. Permits may be required from the Army Corps of Engineers if the temporary utility construction road for Field 28 [*may mean drawing 28*] is impacting regulated wetlands with fill. [Response 22]
    b. If the project includes the installation of utilities within State-regulated subaqueous lands a permit and review from WSLS (Wetlands and Subaqueous Lands Section) will be required for open cut trenching. If directional boring occurs below the stream bed, no permits are required in non-tidal features. [Response 22]
5. Compliance Review (Monica Boyer, 7/14/2017)

a. Add Total Chlorine Residual to the list of effluent parameters. See 6.3.2.3.3.3.1, 6.3.2.3.3.3.2, 6.8.2.3. Indicate ANSRWRF's effluent sampling responsibility to maintain compliance for total chlorine residual. [Response 2]
b. Confirm whether the facility shown in drawings 49-51 emulate agricultural designs as required by Sussex County Planning and Zoning. [Response 4]
c. Contact ACoE regarding their possible jurisdiction of wetlands or subaqueous lands in and around the ANSRWRF site, including the proposed installation of utilities in wetland areas. [Response 22]
d. Verify and revise any fields that have new FEMA Flood Zones since 2015 that are relevant to Phase 1. [Response 23]
e. Contact DELDOT regarding the expired entrance plan approval. [Response 9]
f. Consider how effluent that is tested only twice per month for restrictive parameters such as BOD and TSS should be handled if found to be out of compliance between the period of collection, testing, and reporting from the contracted laboratory. [Response 15]
g. Indicate all flow meter locations and revise Drawings 3 and 47. Discuss flow meter to be installed on existing center pivots and sprinklers. [Response 14]
h. Nitrogen balance calculations may be in conflict with Sussex County Planning and Zoning Ordinances 1922 and 1923. [Response 24]
i. To establish ambient water quality of the water bodies, submit a surface water monitoring plan. [Response 3]

6. Hydro Review (Blair Venables, 7/25/2017)
    a. Add an additional Observation Well to the wet spot of Field G at the 32' elevation contour approximately 320' east of the new center pivot on Sheet 33. [Response 8]
    b. If new homes have been built within 1000' of the proposed spray irrigation fields, the well search will need to be updated. [Response 11]

Exhibit: Table 3:1: Revised Design Summary Table

Table 3-1: Revised Design Summary Table

General Information		
Applicant	Artesian Wastewater Management, Inc.	
Facility Name	Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF)	
Facility Location	Sussex County, Delaware	
Responsible Official	Rodney Wyatt	
Activities (Phase 1)	Storage & disposal of treated wastewater	
Activities (Future Phases	Treatment, storage, and disposal	
Type of Waste (Phase 1)	Treated food processing	
Type of Waste (Future Phases)	Treated food processing and raw sanitary	
Disposal Method	Spray irrigation to woods and crops	
Type of Spray System	Pivot and Solid Set	
Public Access Level	Unlimited Public Access	
Nearest Weather Station	Georgetown 5 SW	
Watersheds	Broadkill River and Cedar Creek	
Tax Parcel	**Location**	**Area (Acres)**
235-6.00-28.09	ANSRWRF	74.62
230-22.00-1.00	Spray Field A	182.87
230-21.00-35.00	Spray Field B	77.93
230-21.00-35.01	Spray Field B	113.69
230-21.00-13.00	Spray Field B	221.14
235-7.00-27.00	Spray Field C	157.53
235-6.00-11.00	Spray Field D	56.78
235-6.00-11.01 [1]	Spray Field D	6.22
235-6.00-11.02	Spray Field D	10.46
235-7.00-164.00	Spray Field D	32.45
235-7.00-1.00	Spray Field D	19.23
235-6.00-21.00	Spray Field E	118.96
235-7.00-7.00	Spray Field F	126.51
235-13.00-6.05	Spray Field G	515.6
235-13.00-6.06	Spray Field G	74.9

1) See discussion in Section 4.3**Error! Reference source not found.**.

Table 3-1: Revised Design Summary Table (Continued)

Parameter	Value	Units
Influent to Lagoon[1]		
Daily Flow[2]	1.5	MGD
Peak Daily Flow[2]	2.0	MGD
BOD_5	10	mg/L
Total Suspended Solids	10	mg/L
Chlorine Residual	0.5 – 4	mg/L
Turbidity	5	NTU
Fecal Coliform	20	col/100 mL
Total Nitrogen (as N)	30	mg/L
Ammonia (as N)	0	mg/L
Nitrate/Nitrite (as N)	28	mg/L
Total Phosphorus	1.0	mg/L
Lead	0.001	mg/L
Zinc	0.039	mg/L
Copper	0.0072	mg/L
Nickel	0.005	mg/L
Cadmium	0.0005	mg/L
Aluminum	0.2	mg/L
pH	6.0 - 9.0	S.U.
Effluent to Spray		
No further treatment is proposed after the lagoons for Phase 1.		
Storage Volume		
Recommended Minimum Storage (45 day)	67.5	MG
Minimum Required Storage (storage calcs.)	69.0	MG
Phase 1 Available Storage (w/o freeboard)[2]	92	MG
Phase 1 Available Storage[2]	61	days
Surface Area (top of lagoon)	19.4	acres
Surface Area (high water level)	18.8	acres
Surface Area (low water level)	1.6	acres
Freeboard	3	ft
Top Elevation	46.0	ft
High Water Level	43.0	ft
Low Water Level	26.0	ft
Sidewall Slope	2.5:1	

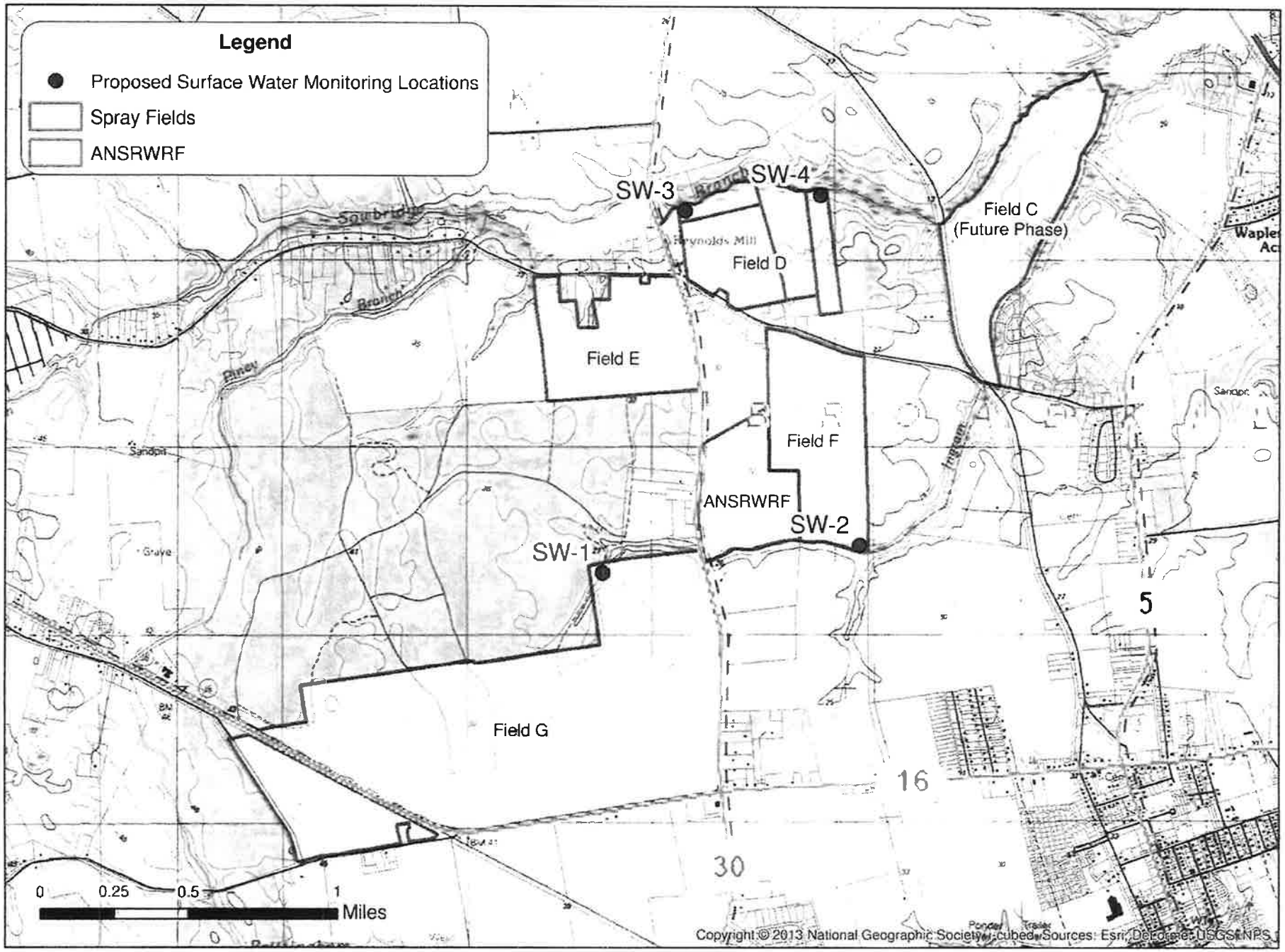
1) Influent values are average daily unless listed otherwise.
2) Design flow is 2 MGD 5 days per week, with an average weekly flow of 1.5 MGD.
3) See discussion in Section 4.7.

Table 3:1: Revised Design Summary Table (Continued)

Parameter	Value	Units
Spray Area		
Total Available Spray Area (gross acreage)	1,714	acres
Phase 1 Wetted Area (initial construction)[1]	471	acres
Phase 1 Wetted Area (total to be permitted)[1]	763	acres
Treatment Site Buffer Distance (property line)	30	ft
Treatment Site Buffer Distance (dwelling)	100	ft
Spray Buffer Distance (watercourse)	100	ft
Spray Buffer Distance (upgradient well)	100	ft
Spray Buffer Distance (downgradient well)	150	ft
Spray Irrigation Nitrogen Balance		
Design Percolate Total N	10	mg/L
Available Crop Area (initial construction)[1]	276	acres
Available Woods Area (initial construction)[1]	195	acres
Available Crop Area (total to be permitted)[1]	535	acres
Available Woods Area (total to be permitted)[1]	228	acres
Crop Plan	Corn-Wheat-Soybean-Cover	
Crop Plan (alternate option)	Corn-Barley-Soybean-Cover	
Corn Annual N Removal	155	lbs/acre/year
Wheat Annual N Removal	89	lbs/acre/year
Barley Annual N Removal	65	lbs/acre/year
Soybean Annual N Removal	189	lbs/acre/year
Cover Annual N Removal	0	lbs/acre/year
Loblolly Pine Annual N Removal	200	lbs/acre/year
Soybean Fixation	40%	% Annual Removal
Precipitation Deposition of N	5	lbs/acre/year
Ammonia Volatilization	5%	% Ammonia
Denitrification	15%	% Total Nitrogen
Max Hydraulic Loading	1.65	in/week
Phosphorus Loading		
Phosphorus Limited	Crop Areas of Fields D, F, and G	
Design Percolate Total Phosphorus	8.0	mg/L
Maximum Annual Spray Volume[2]	3.5	MG/acre-year
Maximum Phosphorus Loading[2]	29.5	lbs/acre-year
Average Annual Crop Removal	31.2	lbs/acre-year
Heavy Metals Loading		
Soil Cation Exchange	0 - 5	meq/100g
Soil Density	1.55	g/cc
Existing Lead in Soil	92.0	mg/kg
Existing Zinc in Soil	34.0	mg/kg
Existing Copper in Soil	13.0	mg/kg
Existing Nickel in Soil	13.0	mg/kg
Existing Cadmium in Soil	0.121	mg/kg
Land Limiting Constituent (LLC)	Zinc	
Site Life based on LLC	93	years

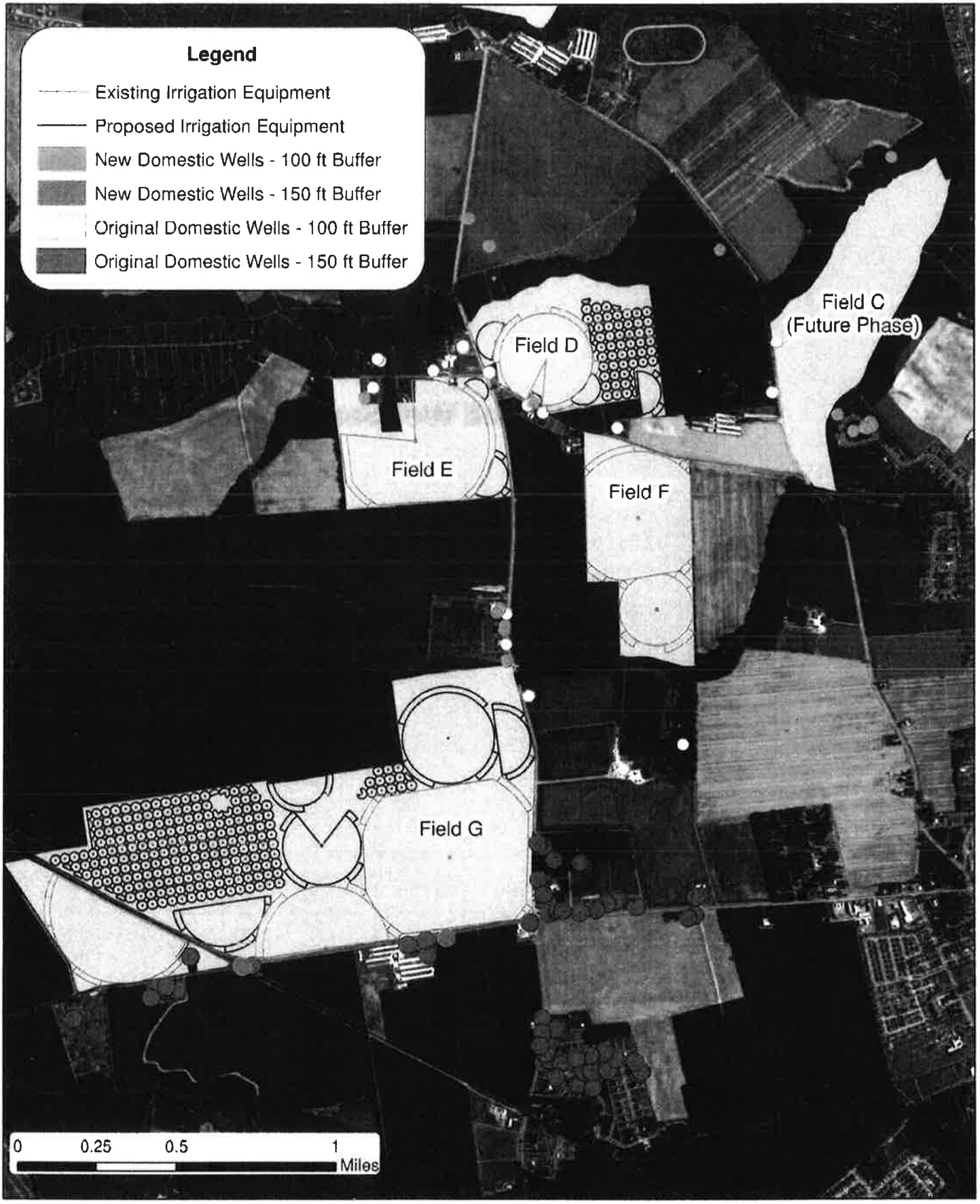
1) See discussion in Section 4.3.
2) This is a conservative estimate based on regulatory maximum spray rate of 2.5 in/wk.

Exhibit: Surface Water Monitoring Plan



ANSRWRF Phase 1
Surface Water Monitoring Plan

Exhibit: Updated Well Search Map



ANSRWRF Phase 1 Updated Well Search Map

Exhibit: Updated Well Search Table

ADDITIONAL WELLS WITHIN 2500 FT. OF THE PROPOSED DISPOSAL AREAS A, B, C, D, E, F, G, AND THE ANSRWRF SITE

As determined via information available from a State of Delaware Freedom of Information Act Request on 7/31/2017

These are in addition to the wells listed in Appendix E of the Amended Design Development Report

Well	Well Type	Potable	DNREC ID	Owner	TaxID	ModGrid	X	Y
1	Domestic - Standard	Yes	227938	Bestfields LLC	2-30-21.00-1231.00	154-136	206057	92548.6
2	Domestic - Standard	Yes	229723	Sunland Ranch LLC	2-35-07.00-0277.00	158-134	208281	89859.6
3	Domestic - Standard	Yes	232448	Bennett, Marion	2-30-21.00-0030.00	154-136	205875	92510.1
4	Domestic - Standard	Yes	232923	Pinto, John	2-35-07.00-0285.00	158-134	208196	89811.1
5	Domestic - Standard	Yes	236505	Route 30 LLC	2-30-21.00-1256.00	154-136	206089	92534.9
6	Domestic - Standard	Yes	238475	Comphert Homes LLC	2-30-21.00-1247.00	154-136	206161	92160.2
7	Domestic - Standard	Yes	239427	Martin, Philip & Jessica	2-35-07.00-0273.00	158-134	208115	89895.8
8	Domestic - Standard	Yes	239774	DJKH Properties LLC	2-30-21.00-1254.00	154-136	206152	92469
9	Domestic - Standard	Yes	240888	Wind Dancer Llc	2-30-21.00-1234.00	154-136	206057.24	92435.5
10	Domestic - Standard	Yes	241207	Kauder, Gary A	2-35-07.00-0278.00	158-134	208294.22	89837.81
11	Domestic - Standard	Yes	241733	Wind Dancer Llc	2-30-21.00-1235.00	154-136	206062.68	92384.71
12	Domestic - Standard	Yes	242268	Becker, Tyrone	2-30-21.00-1239.00	154-136	206073.9887	92208.79626
13	Domestic - Standard	Yes	242476	DJKH Properties	2-30-21.00-1240.00	154-136	206075.8221	92184.55361
14	Domestic - Standard	Yes	245046	DJKH Properties LLC	2-30-21.00-1253.00	154-136	206096.32	92419.7
15	Domestic - Standard	Yes	246281	Letizia Jr, Vincent	2-35-07.00-0284.00	158-134	208253.1238	89829.12725
16	Domestic - Standard	Yes	246732	Jefferson Crossroads LLC	2-30-21.00-0239.00	152-140	205491.25	92803.4
17	Domestic - Standard	Yes	247117	Marvel, Margaret Fay	2-30-21.00-1238.00	154-136	206069.73	92256.79
18	Domestic - Standard	Yes	248280	Balliet, Gary	2-35-06.00-0020.01	144-128	205731.11	89977.58
19	Domestic - Standard	Yes	248996	DJKH Properties LLC	2-30-21.00-1241.00	154-136	206069.22	92146.34
20	Domestic - Standard	Yes	249663	Ingram Branch Llc	2-35-06.00-0025.05	144-128	206461.34	88641.17
21	Domestic - Standard	Yes	250004	DJKH Properties LLC	2-30-21.00-1246.00	154-136	206102.37	92133.56
22	Domestic - Standard	Yes	250005	DJKH Properties LLC	2-30-21.00-1252.00	154-136	206105.18	92370.48
23	Domestic - Standard	Yes	250636	Smith, Aaron	2-35-06.00-0025.01	144-128	206445.06	88796.15
24	Domestic - Standard	Yes	251341	Porch, Kenneth	2-30-21.00-1248.00	154-136	206110.49	92196.15
25	Domestic - Standard	Yes	253123	DJKH Properties LLC	2-30-21.00-1249.00	154-136	206106.26	92238.27
26	Domestic - Standard	Yes	255453	DJKH Properties LLC	2-30-21.00-1250.00	154-136	206100.57	92291.89
27	Domestic - Standard	Yes	256318	Caras, Paul & Jennifer	2-35-07.00-0283.00	158-134	208264.8	89823.27
28	Domestic - Standard	Yes	258211	Carl Spangler Construction Inc	2-30-21.00-1233.00	154-136	206064.36	92472.73
29	Domestic - Standard	Yes	258486	Brooks, William	2-35-13.00-0028.00	144-124	206155.89	87227.1
30	Domestic - Standard	Yes	258651	Jefferson Crossroads LLC	2-30-21.00-0276.00	152-140	205615.95	92652.44
31	Domestic - Standard	Yes	258652	Jefferson Crossroads LLC	2-30-21.00-0252.00	152-140	205522.54	92838.17
32	Domestic - Standard	Yes	258700	Jefferson Crossroads LLC	2-30-21.00-0224.00	152-140	205652.95	92687.21
33	Domestic - Standard	Yes	258701	Jefferson Crossroads LLC	2-30-21.00-0225.00	152-140	205672.19	92689.29
34	Domestic - Standard	Yes	258703	DJKH Properties LLC	2-30-21.00-1251.00	154-136	206101.61	92352.33
35	Domestic - Standard	No	39703	USGS		144-124	205128.2658	87081.07967
36	Domestic - Standard	No	56741	Miller, Nicholas		158-134	208388.4	91204.51

ADDITIONAL WELLS WITHIN 2500 FT. OF THE PROPOSED DISPOSAL AREAS A, B, C, D, E, F, G, AND THE ANSRWRF SITE

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Well	Well Type	Potable	DNREC ID	Owner	TaxID	ModGrid	X	Y
37	Domestic - Standard	No	61023	Hicks, Elmer R		158-134	208388.4	91204.51
38	Domestic - Standard	No	61493	Sapp, Marie D		158-134	208388.4	91204.51
39	Domestic - Standard	No	61525	Reed, Clarence J		158-134	208388.4	91204.51
40	Domestic - Standard	No	61572	Horney, Donald		158-134	208388.4	91204.51
41	Domestic - Standard	No	62273	Roach, Marshall P		158-134	208388.4	91204.51
42	Domestic - Standard	No	63082	Bradley, Stan		158-134	208388.4	91204.51
43	Domestic - Standard	No	63214	Stout Jr, William F	2-35-06.00-0025.03	144-128	206422.9143	88904.99266
44	Domestic - Standard	No	64453	Smith & Brown, Richard &bonnie B		158-134	208388.4	91204.51
45	Domestic - Standard	No	65033	Rose, Robert		158-134	208388.4	91204.51
46	Domestic - Standard	No	65183	Lankford, Hilda I W		158-134	208388.4	91204.51
47	Domestic - Standard	No	65662	Oak-ingram,		158-134	208388.4	91204.51
48	Domestic - Standard	No	66065	Lankford, Hilda I W		158-134	208388.4	91204.51
49	Domestic - Standard	No	66346	Lankford, Hilda I W		158-134	208388.4	91204.51
50	Domestic - Standard	No	66691	Dodd, Laurence		158-134	208388.4	91204.51
51	Domestic - Standard	No	69177	Wilson, Carl W		158-134	208388.4	91204.51
52	Domestic - Standard	No	70576	Waples, Millsboro Assoc		158-134	208388.4	91204.51
53	Domestic - Standard	No	71201	Morosky, Peter		158-134	208388.4	91204.51
54	Domestic - Standard	No	71397	Hearn, Kevin J		158-134	208388.4	91204.51
55	Domestic - Standard	No	71687	Hearn, Kevin J		158-134	208388.4	91204.51
56	Domestic - Standard	No	72462	Smith, Aaron	2-35-06.00-0025.01	144-128	206448.3144	88818.63249
57	Domestic - Standard	No	73027	Crouch, William		158-134	208388.4	91204.51
58	Domestic - Standard	No	74183	Waples Mill Pond Associates		158-134	208388.4	91204.51
59	Domestic - Standard	No	74470	Huerta, Linda		158-134	208388.4	91204.51
60	Domestic - Standard	No	74834	Farlow, Lee Roy	2-35-06.00-0025.02	144-128	206408.053	88884.26572
61	Domestic - Standard	No	75918	Evans, Gene		158-134	208388.4	91204.51
62	Domestic - Standard	No	76362	Waples Mill Pond Associates		158-134	208388.4	91204.51
63	Domestic - Standard	No	76382	Cox, Mike		158-134	208388.4	91204.51
64	Domestic - Standard	No	77209	Lynch, Brian		158-134	208388.4	91204.51
65	Domestic - Standard	No	77612	Lankford, Thomas F		158-134	208388.4	91204.51
66	Domestic - Standard	No	78569	Rambo, Eric		158-134	208388.4	91204.51
67	Domestic - Standard	No	79158	Howard, Earl J		158-134	208388.4	91204.51
68	Domestic - Standard	No	79516	Barker, James		158-134	208388.4	91204.51
69	Domestic - Standard	No	80772	Palmer, Russell		158-134	208388.4	91204.51
70	Domestic - Standard	No	81843	Morris, Wesley		158-134	208388.4	91204.51
71	Domestic - Standard	No	81888	Ross, Robert		158-134	208388.4	91204.51
72	Domestic - Standard	No	83830	Scull, Richard		158-134	208388.4	91204.51

ADDITIONAL WELLS WITHIN 2500 FT. OF THE PROPOSED DISPOSAL AREAS A, B, C, D, E, F, G, AND THE ANSRWRF SITE

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Well	Well Type	Potable	DNREC ID	Owner	TaxID	ModGrid	X	Y
73	Domestic - Standard	No	84846	Fannin, Elsworth, Jr		158-134	208388.4	91204.51
74	Domestic - Standard	No	89125	Simpson, Richard		158-134	208388.4	91204.51
75	Domestic - Standard	No	89159	Collins, Paul		158-134	208388.4	91204.51
76	Domestic - Standard	No	89591	Sherman, Howard		158-134	208388.4	91204.51
77	Domestic - Standard	No	92032	Palmer, Russell R		158-134	208388.4	91204.51
78	Domestic - Standard	No	94975	Smith, Gary		158-134	208388.4	91204.51
79	Domestic - Standard	No	98758	Moore, Charles		158-134	208388.4	91204.51
80	Domestic - Standard	No	104433	Crouch, Nancy		158-134	208388.4	91204.51
81	Domestic - Standard	No	107340	Bailey, Richard		158-136	206584.2643	89959.4738
82	Domestic - Standard	No	108171	Morris, Ester		158-134	208388.4	91204.51
83	Domestic - Standard	No	108334	Beuilacqua, Edward		158-134	208388.4	91204.51
84	Domestic - Standard	No	157558	Rowan, Hugh		158-136	206258.29	90891.6
85	Domestic - Standard	No	188219	Rowan, Hugh		158-136	206363	90749.8
86	Domestic - Standard	No	192888	McDowell, Carol M		158-136	207526.543	90734.09779
87	Agricultural - Standard	No	63338	Milton Farm, P G		158-136	206951.93	90557.01
88	Agricultural - Standard	No	71529	Finning, Bob		158-136	206951.93	90557.01
89	Agricultural - Standard	No	79050	Fanning, Bob		158-136	206951.93	90557.01
90	Agricultural - Standard	No	103614	Isaccs, David		158-134	208388.4	91204.51
91	Agricultural - Standard	No	103615	Isaccs, David		158-134	208388.4	91204.51
92	Agricultural - Standard	No	234957	Coulbourne, William	2-35-06.00-0028.05	158-128	206598	89916.3
93	Agricultural - Standard	No	253401	Brooks, William	2-35-13.00-0028.00	144-124	205992.6236	87092.10596
94	Agricultural - Standard	No	253402	Brooks, William	2-35-13.00-0028.00	144-124	205976.8015	87095.01638
95	Dewater - Standard	No	211147	Delaware Department Of Transportation	2-30-00.00-0000.00	158-136	206283	91140.5
96	Geothermal - Closed Loop	No	66534	Moore, Herschel B		158-134	208388.4	91204.51
97	Geothermal - Recharge	No	66535	Moore, Herschel B		158-134	208388.4	91204.51
98	Geothermal - Recharge	No	227312	Isaacs III, Harry H	2-35-06.00-0021.02	144-128	205980.9204	89981.31969
99	Geothermal - Recharge	No	236872	Reid, Paul	2-35-07.00-0286.00	158-134	208192	89757.4
100	Geothermal - Recharge	No	241903	Kane, Philip M	2-35-07.00-0272.00	158-134	208082.8487	89832.40655
101	Geothermal - Recharge	No	253799	Park, David	2-35-07.00-0274.00	158-134	208145.27	89902.35
102	Geothermal - Supply	Yes	227311	Isaacs III, Harry H	2-35-06.00-0021.02	144-128	205980.9633	89972.72008
103	Geothermal - Supply	Yes	236873	Reid, Paul	2-35-07.00-0286.00	158-134	208190	89771.7
104	Geothermal - Supply	Yes	241902	Kane, Philip M	2-35-07.00-0272.00	158-134	208089.8337	89814.94402
105	Geothermal - Supply	Yes	253800	Park, David	2-35-07.00-0274.00	158-134	208149.24	89892.35
106	Geothermal - Supply	Yes	258775	Reid, Paul	2-35-07.00-0286.00	158-134	208222.61	89761.02
107	Irrigation - Standard	No	111005	Ockels Farms	2-30-28.00-0014.00	158-136	206219.0327	90674.74981
108	Irrigation - Standard	No	155064	Brooks, William & Diane		144-128	206145.5773	87607.98661

ADDITIONAL WELLS WITHIN 2500 FT. OF THE PROPOSED DISPOSAL AREAS A, B, C, D, E, F, G, AND THE ANSRWRF SITE

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109	Irrigation - Standard	No	208987	Reed, Clarence	2-35-07.00-0035.00	158-134	208774	90959.2
110	Irrigation - Standard	No	237736	Farm Boys, Llc	2-35-13.00-0006.06	144-126	204527.061	87369.227
111	Irrigation - Standard	No	237941	Farm Boys, Llc	2-35-13.00-0006.06	144-126	204527.061	87369.227
112	Irrigation - Standard	No	241271	Sapp, Richard L	2-35-07.00-0028.00	158-134	208677.8846	90031.05979
113	Irrigation - Standard	No	241409	Farm Boys, Llc	2-35-06.00-0011.00	158-136	206734.8348	90158.99924
114	Irrigation - Standard	No	241505	Sapp, Richard L	2-35-07.00-0028.00	158-134	208712.2805	90091.91408
115	Irrigation - Standard	No	241986	Farm Boys, Llc	2-35-06.00-0011.00	158-136	206666.043	90148.41589
116	Irrigation - Standard	No	242138	Clifton II, William Donald	2-30-22.00-0002.02	150-140	207947.8722	93544.64492
117	Irrigation - Standard	No	246127	Pepper Family Farms Limited Partnership	2-35-07.00-0008.00	158-128	207625.94	89553.18
118	Irrigation - Standard	No	246257	Pepper Family Farms Limited Partnership	2-35-07.00-0008.00	158-128	207456.61	89166.88
119	Irrigation - Standard	No	256280	Farm Boys, Llc	2-35-13.00-0006.05	144-128	205534.2367	87168.83737
120	Irrigation - Standard	No	256562	Farm Boys, Llc	2-35-13.00-0006.05	144-128	205546.2581	87171.69133
121	Monitor - Standard	No	216085	E L & M A Isaacs Farms Family LP	2-30-28.00-0012.00	144-134	205672	90612.4
122	Monitor - Standard	No	216086	E L & M A Isaacs Farms Family LP	2-30-28.00-0014.00	158-136	206577	91107.7
123	Monitor - Standard	No	216087	E L & M A Isaacs Farms Family LP	2-30-28.00-0014.00	158-136	206577	91107.7
124	Monitor - Standard	No	216088	E L & M A Isaacs Farms Family LP	2-30-28.00-0014.00	158-136	206577	91107.7
125	Monitor - Standard	No	242592	W & B Hudson Family Ltd Ptnr	2-35-14.00-0001.00	158-128	206599.38	88447.88
126	Monitor - Standard	No	242593	W & B Hudson Family Ltd Ptnr	2-35-14.00-0001.00	158-128	206599.38	88447.88
127	Monitor - Standard	No	242594	W & B Hudson Family Ltd Ptnr	2-35-14.00-0001.00	158-128	206599.38	88447.88
128	Monitor - Standard	No	254881	Artesian Water Company Inc	2-35-06.00-2809.00	158-128	206560.67	89250.19
129	Monitor - Standard	No	254882	Artesian Water Company Inc	2-35-06.00-2809.00	158-128	206560.67	89250.19
130	Monitor - Standard	No	254883	Artesian Water Company Inc	2-35-06.00-2809.00	158-128	206560.67	89250.19
131	Monitor - Standard	No	254884	Artesian Water Company Inc	2-35-06.00-2809.00	158-128	206560.67	89250.19
132	Monitor - Standard	No	258620	Farm Boys, Llc	2-35-13.00-0006.05	144-128	204498.2	87871.02
133	Monitor - Standard	No	258624	Farm Boys, Llc	2-35-13.00-0006.05	144-128	206193.65	87642.42
134	Monitor - Standard	No	258625	Farm Boys, Llc	2-35-13.00-0006.05	144-128	205869.8	87271.47
135	Monitor - Standard	No	258628	Farm Boys, Llc	2-35-13.00-0006.06	142-126	204313.96	86971.51
136	Monitor - Standard	No	258629	Farm Boys, Llc	2-35-13.00-0006.05	144-128	206492.1	88410.77
137	Monitor - Standard	No	258630	Farm Boys, Llc	2-35-13.00-0006.06	144-126	204830.96	87063.85
138	Monitor - Standard	No	258631	Farm Boys, Llc	2-35-13.00-0006.06	144-126	205026.75	87092.16
139	Monitor - Standard	No	258632	Farm Boys, Llc	2-35-07.00-0007.00	158-128	206895.58	89748.82
140	Monitor - Standard	No	258633	Farm Boys, Llc	2-35-07.00-0007.00	158-128	207336.59	89618.47
141	Monitor - Standard	No	258634	Farm Boys, Llc	2-35-07.00-0007.00	158-128	206881.43	89123.45
142	Monitor - Standard	No	258635	Farm Boys, Llc	2-35-07.00-0007.00	158-128	207384	88720.65
143	Monitor - Standard	No	258636	Farm Boys, Llc	2-35-07.00-0007.00	158-128	207111.48	89402.21
144	Monitor - Standard	No	258637	Farm Boys, Llc	2-35-06.00-0021.00	144-128	205669.67	89436.03

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145	Monitor - Standard	No	258638	Farm Boys, Llc	2-35-06.00-0021.00	144-128	205866.52	89789.25
146	Monitor - Standard	No	258639	Farm Boys, Llc	2-35-06.00-0021.00	144-128	205962.57	90071.56
147	Monitor - Standard	No	258640	Farm Boys, Llc	2-35-06.00-0021.00	144-128	206324.78	90064.41
148	Monitor - Standard	No	258641	Farm Boys, Llc	2-35-06.00-0021.00	144-128	206219.74	89688.44
149	Monitor - Standard	No	258642	Farm Boys, Llc	2-35-06.00-0011.00	158-136	206430.21	90074.96
150	Monitor - Standard	No	258643	Farm Boys, Llc	2-35-06.00-0011.00	158-136	206759.88	90206.2
151	Monitor - Standard	No	258644	Farm Boys, Llc	2-35-07.00-0001.00	158-136	207119.19	90468.15
152	Monitor - Standard	No	258645	Farm Boys, Llc	2-35-07.00-0001.00	158-136	207110.72	90127.11
153	Observation - Standard	No	71109	Delmarva Oil		158-134	208388.4	91204.51
154	Observation - Standard	No	71110	Delmarva Oil		158-134	208388.4	91204.51
155	Observation - Standard	No	71111	Delmarva Oil		158-134	208388.4	91204.51
156	Observation - Standard	No	71112	Delmarva Oil		158-134	208388.4	91204.51
157	Observation - Standard	No	71113	Delmarva Oil		158-134	208388.4	91204.51
158	Observation - Standard	No	71114	Delmarva Oil		158-134	208388.4	91204.51
159	Observation - Standard	No	234119	W & B Hudson Family Ltd Ptnr	2-35-14.00-0001.00	158-128	206969	88354.9
160	Observation - Standard	No	234120	W & B Hudson Family Ltd Ptnr	2-35-14.00-0001.00	158-128	206969	88354.9
161	Observation - Standard	No	234121	W & B Hudson Family Ltd Ptnr	2-35-14.00-0001.00	158-128	206969	88354.9
162	Observation - Standard	No	234122	W & B Hudson Family Ltd Ptnr	2-35-14.00-0001.00	158-128	206969	88354.9
163	Observation - Standard	No	234123	W & B Hudson Family Ltd Ptnr	2-35-14.00-0001.00	158-128	206969	88354.9

Exhibit: Lease Agreement Affidavit

AFFIDAVIT OF DANIEL W. KONSTANSKI

1. I, Daniel W. Konstanski, am employed as the Senior Engineer of Artesian Wastewater Management, Inc. ("Artesian"), and in that capacity I am authorized to submit this Affidavit on behalf of Artesian. I submit this affidavit in connection with Artesian's application for an amended Construction Permit for the Artesian Northern Sussex Regional Wastewater Recharge Facility ("ANSRWRF").

2. Artesian has a lease with the owner of the parcels upon which Artesian proposes to discharge treated wastewater. When Artesian first entered into that lease, Artesian's rights were subordinate to existing leases between the owner and certain farmers. Those leases subsequently lapsed, and Artesian's rights at the property now control.

3. Artesian's lease, as amended from time to time, has always provided Artesian can install, operate and maintain whatever equipment (such as spray rigs) is necessary for Artesian to accomplish its disposal activities at the parcels. The lease further provides that Artesian has the discretion to enter into agreements with farmers to use their equipment should Artesian wish to do so.

4. Artesian has the unrestricted right to use the full acreage of the woodlands and cultivated land on the properties.

5. Artesian has the unrestricted right to dispose up to a monthly average of three million gallons per day and 2.5 inches per week.

6. The cultivated portions of the parcels where Artesian will discharge treated wastewater are farmed pursuant to a Nutrient Management Plan between the farmers and the Delaware Department of Agriculture in accordance with the Department of Agriculture's regulations.

7. I declare that the foregoing is true and accurate to the best of my knowledge, information and belief.

Date: August 18, 2017

By: 8/18/17

Daniel W. Konstanski
Senior Engineer
Artesian Wastewater Management, Inc.

Sworn to and subscribed
before me this 18th day
of August, 2017

Cassandra Ann Cheserone
Notary Public

My Commission Expires: 5/30/19

CASSANDRA ANN CHESERONE
MY COMMISSION
EXPIRES
May 30, 2019
NOTARY PUBLIC
STATE OF DELAWARE

Exhibit: DelDOT Entrance Permit

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
23697 DUPONT BOULEVARD
GEORGETOWN, DE 19947

CAROLANN WICKS, P.E.
SECRETARY

July 15, 2010

Artesian Wastewater Management Inc
c/o John Thaeder, V.P.
664 Churchmans Road
Newark, DE 19702

Dear Mr. Thaeder:

Enclosed is the construction access permit for Artesian Wastewater Management Inc. located on Route 30. Please have the owner(s) sign their name at the bottom of the permit, **keep the yellow copy (Owner's Copy)**, return the original and the remaining duplicates.

If you have any questions, please feel free to contact me at (302) 853-1342.

Sincerely,

Gemez Norwood
South District Permit Supervisor

GN:sa
Enclosure

DelDOT

PERMIT FOR ENTRANCE CONSTRUCTION

STATE OF DELAWARE
DEPARTMENT OF
TRANSPORTATION

DIVISION OF HIGHWAY
OPERATIONS

23697 DUPONT BLVD
GEORGETOWN, DE 19947

DISTRICT: SOUTH AREA: 3 PERMIT NO.: C-25-10 DATE: 7-15-10

Type of Access: X Commercial Residential Farm Special

Maintenance Road No.: Route 30 Delaware Grid Coordinate:

Issue To: Artesian Wastewater Management Inc. c/o John Theeder (302) 750-6642 John Schneider Phone No.:

Address: 664 Churchmans Road Newark, DE 19702

Type of Security Furnished: Letter of Credit Amount: $ 57,946.50 (150% Costs)

Estimated Construction Cost: $ 38,631.00 Completion Date: 7/15/2011

DESCRIPTION OF CONSTRUCTION

Construction Access Permit

Permit to construct the entrance to the project known as, Artesian Wastewater Management Inc. (ANSWRF)

Permission is granted to construct 1-(one) construction entrance, to be located off Route 30, as per plans approved by Marc Coté, Subdivision Engineer on February 17, 2010 SSR8540. Tax Map # 2-35-6.00-28.09.

Bond in the amount of $ 57,946.50 has been posted and upon successful completion of work in conformance with approved plan the bond will be released. Letter of Credit number S907551 issued by Citizens Bank.

As a property owner granted a permit to construct a commercial entrance that accesses State right-of-way, it is your responsibility to construct that entrance according to your plans and State Specifications. To avoid problems and confrontations, the District requires that any changes in the plans have prior approval from the Section Supervisor. Prior notification must be given to the Section Supervisor when work will occur on permit. Failure to give adequate notification will result in loss of permit and possible legal ramifications. Please contact Gerner Norwood at (302) 853-1342 to give 72 hours notice prior to construction at the entrance.

A final inspection will be held when work on the permit is complete. Any corrections, additions, alterations, etc. will be done before the permit is accepted. These items in no way eliminate guarantees set forth by the permit. The owner/developer must obtain a Utility Construction Permit, separate from the entrance permit, for any utility work to be done within State right-of-way.

It is hereby agreed by the owner of the property affected, and all heirs, assigns and/or successors in interest, that all construction covered by this permit shall be performed in accordance with the approved construction plan and the current Standard Specifications published by the Department of Transportation. The plan and specifications are incorporated herein by reference, and made part of this permit. Work is to begin within 90 days of the date of this permit, and it is to be completed on or before the above completion date. Requests for an extension of this permit shall be submitted in writing to the Permit Section 30 days prior to expiration.

The owner agrees not to sell, lease, or change the use of the property to significantly alter the flow and/or volume of traffic and/or drainage as determined within the sole discretion of the Division, and/or transfer his/her interest in the property without obtaining a new permit from the Division of Highway Operations. Such failure automatically voids this permit.

The holder of this permit shall indemnify and save harmless the Division of Highway Operations and its officers, employees, and/or agents from suits and damages arising from, or on account of the above described construction herein permitted on State rights-of-way, or the Division's acceptance thereof consistent with Section 107.14 of the Standard Specifications and all amendments thereto, incorporated herein by reference.

Traffic control and utility alterations shall be in accordance with current The Division of Highway Operations "Traffic Controls for Streets and Highway Construction Manual" and the "Utilities Policy and Procedure Manual" incorporated herein by reference.

Permittee shall call the Division of Highway Operations Permit Section, (Canal District: 326-4679, Central District: 760-2473, South District: 853-1342) and Miss Utility (1-800-282-8555) prior to any construction on State rights-of-way.

The Division of Highway Operations may require revisions to the approved plans as required by field conditions.

The permittee shall request the Division of Highway Operations make final inspection of the construction when work is completed, and all work must be completed to the satisfaction of said Division of Highway Operations.

This permit shall be wholly conditional upon the satisfactory completion of all provisions set forth herein. If, upon expiration of this permit, work is incomplete or not performed according to the aforesaid plan and specifications, and no extension is applied for and issued, this permit shall become null and void for all legal purposes and the entrance shall be considered illegal with reference to 17 Del. C. §146.

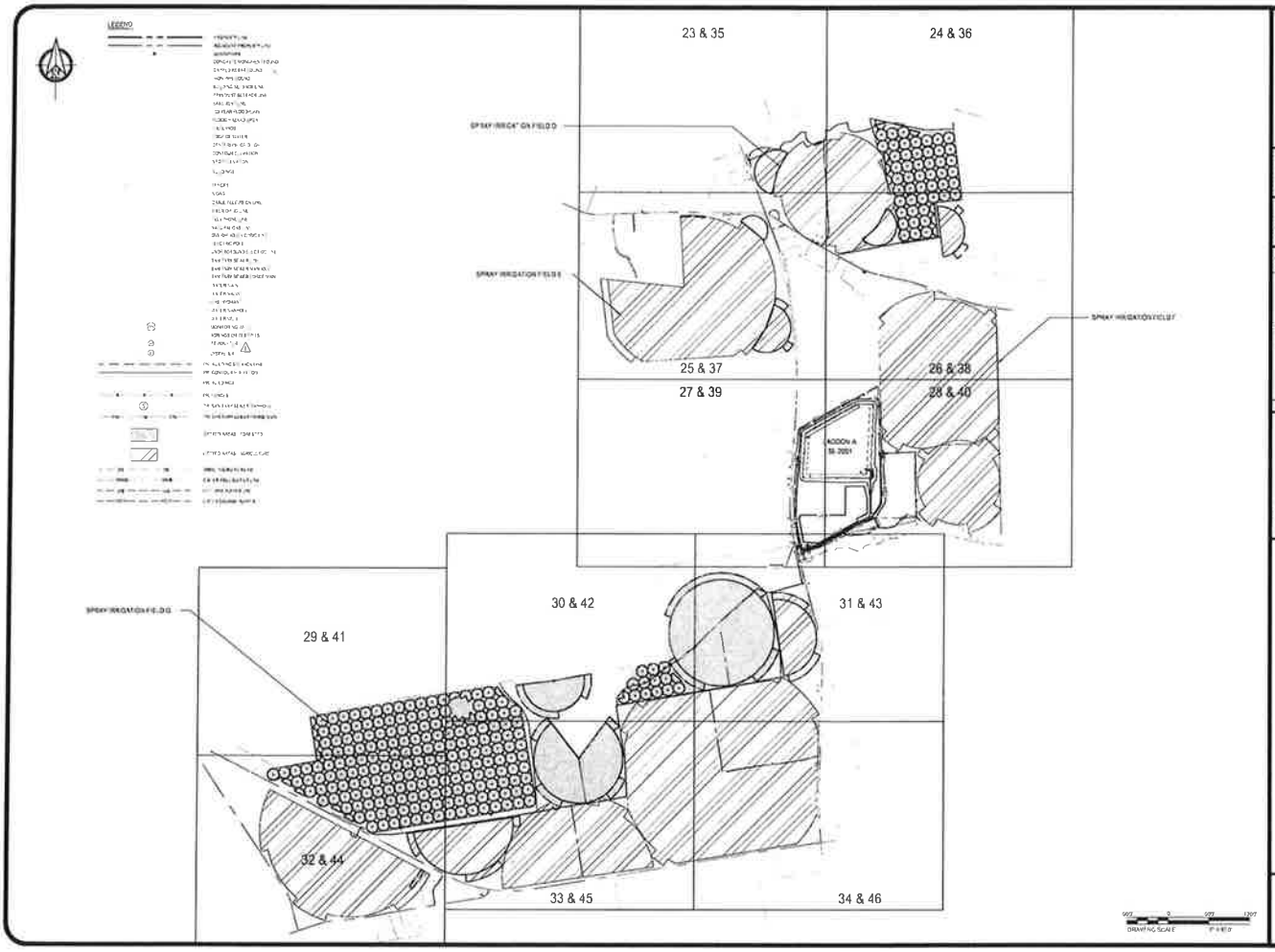
Authorized Representative of Division of Highway Operations

Property Owner

Property Owner Signature

PL-01 05/01 (owner's copy)

Document No.: 55 02 01 81 08 04



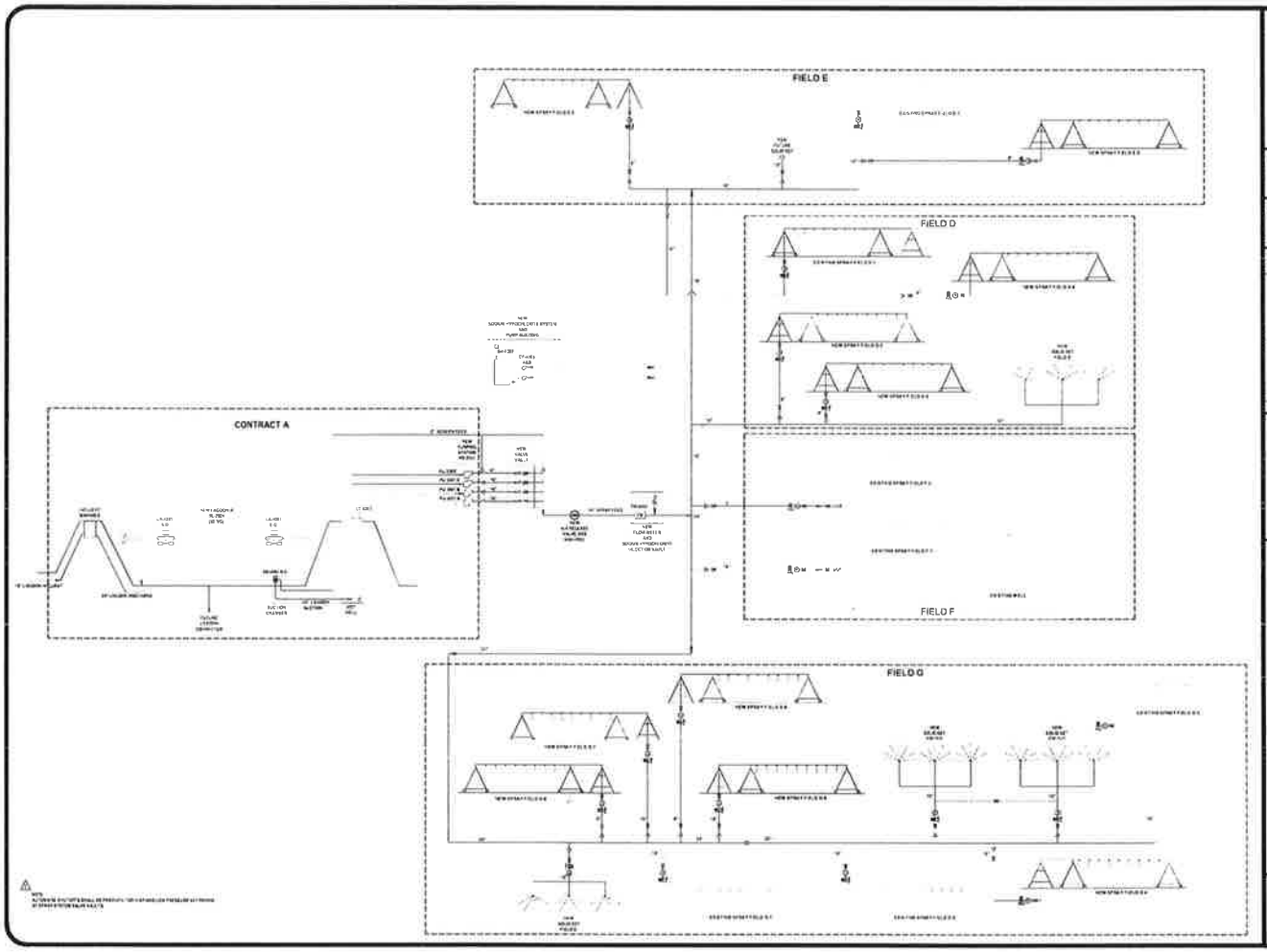
DUFFIELD ASSOCIATES

ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)

INDEX MAP

SUSSEX COUNTY - DELAWARE

DATE:	21 APRIL 2017
SCALE:	AS SHOWN
PROJECT NO	1127RBA
SHEET:	G-2



DUFFIELD ASSOCIATES

ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)

PROCESS FLOW DIAGRAM

SUSSEX COUNTY – DELAWARE

DATE: 17 MARCH 2017
SCALE: AS SHOWN
PROJECT NO: 11278 BA
SHEET: G-3

INDEX MAP
SHEET 23
SHEET 24
SHEET 25
SHEET 26
SHEET 27
SHEET 28
SHEET 29
SHEET 30
SHEET 31
SHEET 32
SHEET 33
SHEET 34
DRAWN @ SCALE

DUFFIELD ASSOCIATES
ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)
SPRAY IRRIGATION SYSTEM
SITE PLAN - FIELD D
SUSSEX COUNTY - DELAWARE
DATE: 21 APRIL 2017
SCALE: 1" = 120'
PROJECT NO: 11278 BA
SHEET: 23 OF 32

DUFFIELD ASSOCIATES

ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)

SPRAY IRRIGATION SYSTEM

SITE PLAN - FIELDS D & E

SUSSEX COUNTY - DELAWARE

DATE:	21 APRIL 2017
SCALE	1" = 120'
PROJECT NO	11276 BA
SHEET	15 OF 52

DUFFIELD ASSOCIATES

ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)

SPRAY IRRIGATION SYSTEM

SITE PLAN - FIELDS D & F

SUSSEX COUNTY - DELAWARE

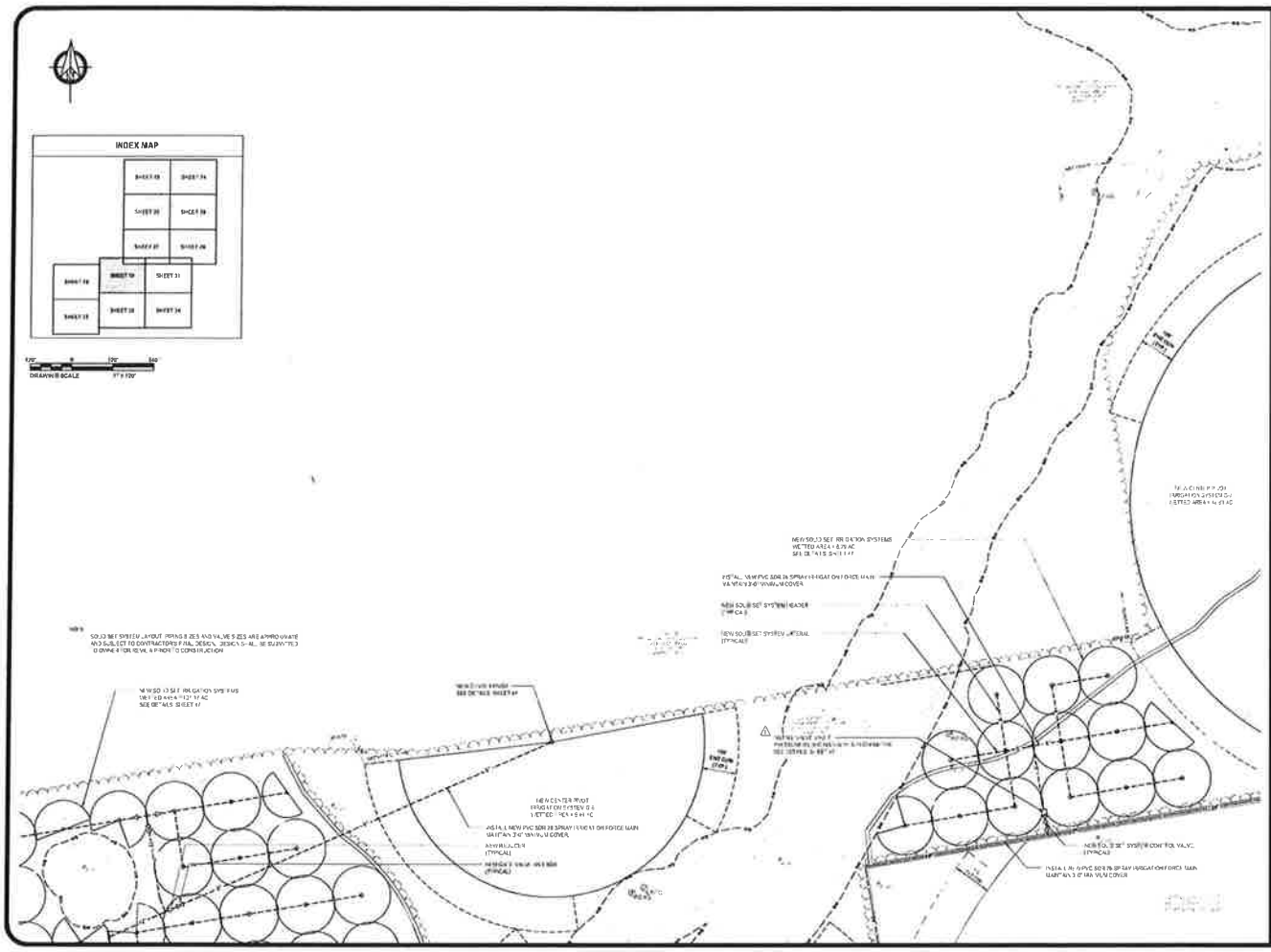
DATE: 21 APRIL 2017

SCALE: 1" = 120'

PROJECT NO: 11278.BA

SHEET: 26 OF 32

INDEX MAP
DUFFIELD ASSOCIATES
ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)
SPRAY IRRIGATION SYSTEM
SITE PLAN - FIELD G
SUSSEX COUNTY - DELAWARE
DATE 21 APRIL 2017
SCALE 1" = 120'
PROJECT NO 11278.BA
SHEET 27 OF 52


INDEX MAP
DRAWING SCALE
DUFFIELD ASSOCIATES
ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)
SPRAY IRRIGATION SYSTEM
SITE PLAN - FIELD G
SUSSEX COUNTY - DELAWARE
DATE: 21 APRIL 2017
SCALE: 1" = 120'
PROJECT NO: 11278.BA
SHEET: 10 OF 22

DUFFIELD ASSOCIATES

ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)

SPRAY IRRIGATION SYSTEM

SITE PLAN - FIELD G

SUSSEX COUNTY - DELAWARE

DATE	21 APRIL 2017
SCALE	1" = 120'
PROJECT NO	11278.B4
SHEET	31 OF 32

ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)

SPRAY IRRIGATION SYSTEM

SITE PLAN - FIELD G

SUSSEX COUNTY - DELAWARE

DATE: 21 APRIL 2017

SCALE: 1" = 120'

PROJECT NO: 11278 BA

SHEET: 33 OF 33

DUFFIELD ASSOCIATES

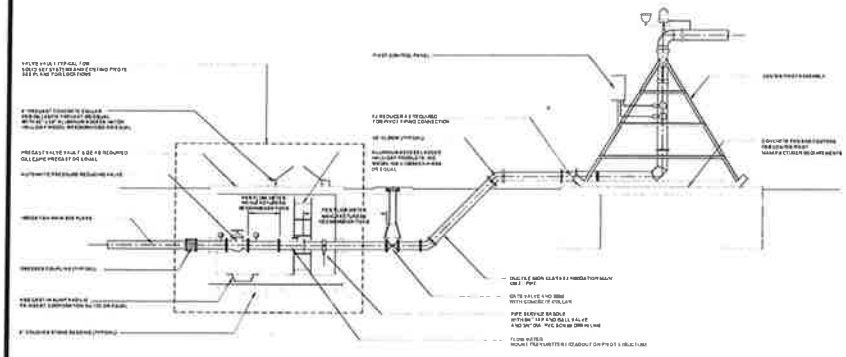
ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)

SPRAY IRRIGATION SYSTEM

SITE PLAN - FIELD G

SUSSEX COUNTY - DELAWARE

DATE	21 APRIL 2017
SCALE	1" = 120'
PROJECT NO	11278.B4
SHEET	34 OF 52



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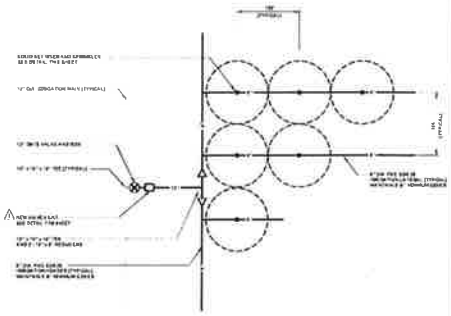
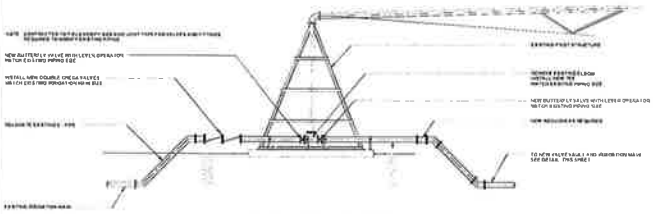
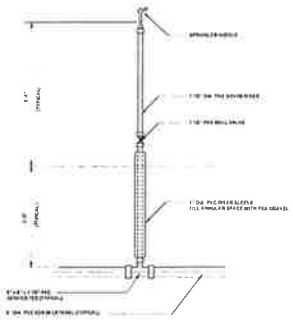
NO SCALE



TYPICAL SOLID SET IRRIGATION ZONE LAYOUT DETAIL
NO SCALE



NEW IRRIGATION MAIN TO EXISTING PIVOT DETAIL
NO SCALE



SOLID SET RISER AND SPRINKLER DETAIL
NO SCALE

DUFFIELD ASSOCIATES

ARTESIAN NORTHERN SUSSEX REGIONAL WATER RECHARGE FACILITY (ANSRWRF)

SPRAY IRRIGATION SYSTEM DETAILS

SUSSEX COUNTY – DELAWARE

DATE: 21 APRIL 2017
SCALE: AS SHOWN
PROJECT NO 11278.BA
SHEET: 47 OF 81

Appendix III

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES &
ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

April 29, 2010

Attn: Jessica D. Nichols, P.E.

Artesian Consulting Engineers, Inc.
25412 Broadkill Road
Milton DE 19968

Re: Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF)
Design Development Report

Dear Ms. Nichols,

The Ground Water Discharges Section has reviewed the Design Development Report for the Artesian Northern Sussex Regional Water Recharge Facility dated June 19, 2009 submitted by Artesian Consulting Engineers, Inc. The Ground Water Discharges Section has also reviewed the additional supporting documentation for the Artesian Northern Sussex Regional Water Recharge Facility subsequently submitted by Artesian Consulting Engineers, Inc.

The Design Development Report appears to meet the intent of the State of Delaware Department of Natural Resources and Environmental Control Guidance and Regulations Governing the Land Treatment of Wastes. Please proceed by submitting plans and specifications for the Artesian Northern Sussex Regional Water Recharge Facility.

Please note, the Department reserves the right to require additional information and/or documentation as it deems necessary.

If you have any questions or concerns, please feel free to contact me.

Sincerely,

Marlene M. Baust

Marlene M. Baust, P.E.
Environmental Engineer
Ground Water Discharges Section

cc: Brian Gulbaugh, Artesian

ARTESIAN RESOURCES

OVER 100 YEARS OF SUPERIOR SERVICE

Artesian Water Company ▲ Artesian Wastewater Management ▲ Artesian Utility Development ▲ Artesian Water Pennsylvania
Artesian Water Maryland ▲ Artesian Wastewater Maryland ▲ Artesian Consulting Engineers

RECEIVED
APR 29 2010
By

April 26, 2010

Marlene Baust, P.E.
Groundwater Discharges Section
Division of Water Resources
Department of Natural Resources and Environmental Control
89 Kings Highway
Dover, DE 19901

RE: ANSWRF DDR Hydrogeological Appendix
Groundwater Protection Branch Clarification Request

Dear Ms. Baust:

Artesian Wastewater Management, Inc. (AWMI) has prepared this response to a verbal request by Mr. Blair Venables, P.G for clarification on the timing of water level monitoring presented in our April 22 letter. Our letter was prepared in response to the March 25, 2010 Memorandum from the Department of Natural Resources and Environmental Control (DNREC) Groundwater Protection Branch (GPB) review of the hydrogeologic element of the Northern Sussex Regional Wastewater Recharge Facility (ANSRWRF) Design Development Report (DDR).

In the April 22 letter, we proposed to create a monitoring system that will allow for easy visual observation of water levels in the OWs. We proposed to use a float and dowel system in the observation wells to float on the water table. The dowel will then be color coated to indicate depth to water (DTW) with green being DTW greater than 3 feet below grade, yellow being DTW from 3 to 2 feet below grade, and red being depth to water less than 2 feet.

To clarify timing of measurements, we are proposing the following. The piezometers will be monitored weekly from December through April, inclusive, in fields where active spraying is occurring. Exact depth to water readings will be recorded monthly to within one one-hundredth of a foot in fields where active spraying in occurring through this period. If any area with active spraying has piezometers that indicate the yellow 2 to 3 foot depth to ground water from grade, those piezometers will be checked within 24 hours prior to any spraying in those fields to insure that water levels are not within the red zone.

664 Churchmans Road, Newark, Delaware 19702, P.O. Box 15004 Wilmington, Delaware 19850 Phone: (302) 453-6900 Fax: (302) 453-6957
P.O. Box 177 Harbeson, Delaware 19951 Phone: (302) 684-2527 Fax: (302) 684-5164
28322 Lewes-Georgetown Highway, Unit 4, Milton, Delaware 19968
email: artesian@artesianwater.com Website: artesianwater.com

If you have any questions on the information presented in this letter. Please do not hesitate to call.

RECEIVED
APR 29 2010
By

Very truly yours:

Peter M. Demicco, P.G.
Delaware Professional geologist S4-000406
Director of Ground-Water Resources

CC: Mr Brian Carbaugh, P.E.
Mr. John Hayes, DNREC
Mr. Blair Venables, P.G., DNREC

April 22, 2010

Marlene Baust, P.E.
Groundwater Discharges Section
Division of Water Resources
Department of Natural Resources and Environmental Control
89 Kings Highway
Dover, DE 19901

RE: ANSWRF DDR Hydrogeological Appendix
Response to March 25, 2010 Groundwater Protection Branch Memorandum

Dear Ms. Baust:

Artesian Wastewater Management, Inc. (AWMI) has prepared this response to the March 25, 2010 Memorandum from the Department of Natural Resources and Environmental Control (DNREC) Groundwater Protection Branch (GPB) review of the hydrogeologic content of the Northern Sussex Regional Wastewater Recharge Facility (ANSRWRF) Design Development Report (DDR). The GWP Memorandum was prepared in response to an AWMI submittal dated March 3, 2010. The AWMI submittal was predated by a February 3, 2010 meeting between representatives of AWMI and DNREC held in Dover to discuss this Memorandum, and an October 25, 2009 GPB Memorandum received by AWMI on December 19, 2006. The hydrogeological evaluation is for 7 preserved agricultural properties being proposed for wastewater spray irrigation. These fields have a combined acreage of 1,652 acres and are located north to northwest of the town of Milton. AWMI has proposed to use the fields as the spray irrigation area for a regional wastewater treatment facility.

In summary, the DNREC March 25, 2010 Memorandum states the following:

> *For the reasons listed above, the GPB generally approves of the DDR. We do not, however, recommend final approval until the owner of the proposed spray fields or his or her representatives:*
>
> - *Agrees to move proposed OW PZ 2A in field C approximately 200' southwest. (The consultants should work with the GPB to decide on the exact location for this well.)*
> - *Agrees to install another OW in the 0-2' DTW area in the center of field G between groundwater contours 31 and 32.*

- *Specifically states how often the OW's will be monitored to verify that the water table is greater than 3' BGS (below ground surface).*
- *Agrees to increase the buffer distance between the proposed wetted field area and all downgradient domestic wells to 150'. Specifically, the buffer distance between the spray fields and domestic wells must be increased to 150' for wells downgradient of field G and occurring on TMPs 235-14.00-63.00, 235-14.00-66.00, and 235-13.00-6.06.*

We agree to the conditions listed above, specifically on the well location move, the additional well on field G and the 150-foot buffer distances.

With respect to the water table monitoring system we are proposing to create a monitoring system that will allow for easy visual observation of water levels in the OW's. We are proposing to use a float and dowel system in the observation wells to float on the water table. The dowel will be inserted through the well cap into the float. The dowel will then be color coated to indicate depth to water (DTW) with green being DTW greater than 3 feet below grade, yellow being DTW from 3 to 2 feet below grade, and red being depth to water less than 2 feet. The OW's will be observed weekly during the wet season if yellow markers are observed and when spraying is being conducted. The operators will discontinue spraying if DTW reaches 2 feet (red observed).

If you have any questions on the information presented in this letter, please do not hesitate to call me at 302-453-5826.

Sincerely,

Peter M. Demicco /DJT

Peter M. Demicco, P.G.
Delaware Professional Geologist S4-000406
Director of Ground Water Resources

C: Mr Brian Carbaugh, P.E.
Mr. John Hayes, DNREC
Mr. Blair Venables, P.G., DNREC

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES &
ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HWY
DOVER, DELAWARE 19901

MEMORANDUM

TO: Marlene Bauer

THROUGH: Ron Graeber
John Barndt P.G.

FROM: Blair Venables P.G.

RE: **ANSRWRF 3/2/10 Post DDR Submittal**

DATE: March 25, 2010

PURPOSE&BACKGROUND

The Groundwater Protection Branch (GPB) has completed a hydrogeological evaluation of Artesian Resources' submittal captioned above. This submittal is in response to a request for additional information made by the GPB in a memorandum dated October 28, 2009 and entitled "ANSRWRF DDR". Artesian Resources met with the GPB on 2/3/10 to discuss the GPB's requirements found in the memo. At this meeting, the GPB reconsidered whether a denser observation well (OW) network and additional "wet water-table measurements were absolutely necessary to delineate wet areas of the proposed spray fields. The GPB decided that the wet areas could likely be sufficiently mapped without additional wells and new water table measurements and therefore, agreed to forego GPB requirements 1 through 3 found on page 10 of the memo.

In lieu of installing new wells and obtaining new water level measurements, the consultants agreed to use water levels from the existing OW network to develop a new groundwater model, generate new groundwater contours that account for long-term average high and mounded water-table conditions, delineate wet areas from maps created by subtracting the water-table contours from the sites' topography and provide groundwater mound height estimates. Performance of these tasks fulfills requirements 4 through 6 of the GPB's memo.

The consultants agreed to address the remaining requirements for the development of a new groundwater and vadose zone monitoring plan and the placement of additional monitor wells (MW's). Pertinent findings and information gathered during our review of the post DDR submittal follows.

DISCUSSION/FINDINGS

- To account for long-term average high water-table conditions, Artesian's Winflow model was rerun and the recharge rate was adjusted until water-table levels in the center of the proposed field areas increased by approximately 1.7' above the March 2009 water levels observed at the site. This adjusted model was run another time to account for additional spray irrigation recharge over the proposed wetted field areas. The additional spray irrigation recharge rate was set at the DDR design application rate of 1 to 3 inches per week. The resulting groundwater elevation contours generated for the 7 proposed spray field areas were than subtracted from the respective field's topography to derive DTW maps.

- The DTW maps indicate that the long-term average high water table is sufficiently deep over the large majority of the field areas to support spray irrigation. Each field does, however, have "wet spots" (areas where the water table lies within 2' below ground surface) in fringe areas of the fields generally adjacent to bounding streams. Some of these "wet spots" occur in topographically low undrained depressions.

  With the exception of field F, all of the spray fields have some portions of their proposed wetted field areas that lie within a "wet spot" area. However, only a very small percentage of the total wetted field area for any giving field lies within "wet areas". Field G has the greatest percentage of its total wetted field area that falls within "wet areas".

- The consultants have proposed placing "piezometers" in the "wet spot areas" that also lie within or near a proposed wetted field area. These OWs will be periodically monitored for DTW, and if the water table rises to within three feet of the land surface, they will be monitored weekly. If the water table rises to within 2' of the land surface, spray irrigation will cease in the "wet areas".

  The consultants have proposed a total of 18 piezometers to monitor water levels in the wet spots. With the exception for one needed OW location change and one needed additional OW, the OW location plan appears sound. The consultants will, however, have to better define the term "periodically" and must specifically state how often the OWs will be monitored to verify that the water table is greater than 3' BGS.

- A total of 41 MWs and 14 lysimeters are proposed to monitor groundwater and percolate water quality around and in the proposed 7 spray field areas. These wells and lysimeters are ideally located and should enable adequate monitoring of on-site and off-site groundwater impacts associated with spray irrigation.

- Information gathered during the GPB's original DDR review indicates that approximately 50 domestic wells lie within 1000' downgradient of the proposed spray irrigation fields. Most of these wells lie downgradient of field G's wetted field areas. A couple of these presumed unconfined wells lie within approximately 50' downgradient of field G's wetted field area.

CONCLUSIONS\REQUIREMENTS

The ANSRWRF facility's 7 fields are generally well suited to receive spray irrigated wastewater. "Wet areas" do, however, exist. The consultants appear to have adequately identified these potential "wet areas" in the proposed spray fields and have developed a logical plan for monitoring water levels in these areas. Spray in the "wet areas" will cease if and when the water-table levels rise above regulatory limits. In addition, the MW network is adequately designed to monitor on-site and off-site groundwater impacts which will be associated with spray irrigation. Some of these MWs will serve as sentinels for nearby downgradient domestic wells. Analytical results for water samples from these MWs will help the Department determine whether additional action is needed to protect downgradient drinking water supplies from spray irrigation.

For the reasons listed above, the GPB generally approves of the DDR. We do not, however, recommend final approval until the owner of the proposed spray fields or his or her representative:

- Agrees to move proposed OW PZ 2A in field C approximately 200' southwest. (The consultants should work with the GPB to decide on the exact location for this well.)

- Agrees to install another OW in the 0-2' DTW area in the center of field G between groundwater contours 31 and 32.

- Specifically states how often the OWs will be monitored to verify that the water table is greater than 2' BGS.

- Agrees to increase the buffer distance between the proposed wetted field area and all downgradient domestic wells to 150'. Specifically, the buffer distance between the spray fields and domestic wells must be increased to 150' for wells downgradient of field G and occurring on TMPs 235-14.00-63.00, 235-14.00-66.00, and 235-13.00-9.06.

Prior to receiving an operating permit for the site, the owner of the site or his or her representative must:

- Install all the MWs and OWs (with the exception of OW PZ 2A as referenced above) in the locations indicated on the detailed topographic maps which accompanied Artesian's March 3, 2010 post-DDR submittal. The screen settings and other well construction specifications should be in conformance with the attached Monitor Well Guidelines and with #4 off the attached, "Guidelines for Preparing Preliminary Ground-Water Impact Assessments (PGIA)'s for Large On-site Wastewater Treatment and Disposal Systems"

- Survey in the new MWs' and OWs' tops of castings (TOC) into a known bench mark. All survey measurements must be made to the closest 100th of a foot. The well caps must be removed prior to surveying in the wells and permanent reference marks must be etched on or attached to the wells to signify where the wells' elevations were taken. In addition, the GPS coordinates in state plane meters should be provided for each MW. (The GPS coordinates should be based on the North American Datum of 1983.)

- Sample all MWs for the following parameters: typical field parameters (specific conductance, temperature, and pH), fecal coliform, total dissolved solids, nitrate, ammonia, total phosphorus, sodium, chloride and DTW to the closest 100th of a foot. Water level measurements must also be obtained in all the observation wells during routine sampling rounds. A total of three background samples must be collected over at least a three month period prior to system startup. At least a two week period must separate consecutive background sampling rounds. Quarterly sampling rounds must be conducted after system startup.

- Submit well survey information including the MWs' and OWs' eastings and northings in state plane 1983 meters, TOC elevations and well stick-up heights. In addition, water-level readings, and ground-water analytical data from the sampling rounds must be submitted to the Department. All measurements must be to the closest 100th of a foot.

- Install lysimeters in the locations shown on the consultant's maps. Names or numbers must also be designated for the lysimeters. The consultants should work with the Department to help insure proper lysimeter design and construction and appropriate sampling protocol.

If ground-water analytical data indicates that a drinking-water standard is being violated in a drinking-water supply well or in off-site ground water as a result of spray irrigation, the owner of the system is responsible for either proving via a hydrogeological investigation that spray irrigation is not causing the contamination or mitigating the contamination. Mitigating the contamination may require one or more of the following: ceasing system operation, sufficiently reducing wastewater constituent concentrations via additional pretreatment, providing new wells to affected parties, and/or providing other acceptable water supplies to affected parties.

If you have any questions, concerns, or comments regarding this memo, feel free to meet with me or contact me at extension 9943.

ARTESIAN RESOURCES

100 YEARS OF SUPERIOR SERVICE

Artesian Water Company ▲ [illegible] ▲ Artesian Utility Development ▲ Artesian Water Maryland

March 3, 2010

Marlene M. Baust, P.E.
Ground Water Discharges Section
Division of Water Resources
Delaware Department of Natural Resources and Environmental Control
89 Kings Highway
Dover, DE 19901

RE: ANSRWRF DDR Hydrogeological Appendix
Response to Groundwater Protection Branch Memorandum

Dear Ms. Baust:

Artesian Wastewater Management, Inc. (AWMI) has prepared this response to the Groundwater Protection Branch (GPB) October 28, 2009 Memorandum that was received attached to an e-mail communication from the Department of Natural Resources and Environmental Control (DNREC) on December 18, 2009. The Memorandum presented the DNREC review of the hydrogeologic element of the Artesian Northern Sussex Regional Wastewater Recharge Facility (ANSRWRF) Design Development Report (DDR). In addition to the October GPB Memorandum, this letter reflects discussions from the February 3, 2010 meeting between representative of AWMI and DNREC held in Dover to discuss this Memorandum. The hydrogeological evaluation is for 7 preserved agricultural properties being proposed for wastewater spray irrigation. These fields have a combined acreage of 1,652 acres and are located north to northwest of the Town of Milton. AWMI has proposed to use the fields as the spray irrigation area for a regional wastewater treatment facility.

The discussion in the February 2010 meeting focused on possible areas where the seasonal high ground water plus 1.65 inches of spray irrigation may result in depths to water of less than two feet. These areas are largely along stream corridors near the ground-water discharge areas at each site. These areas have been identified, as presented below, by development of maps as requested in the October 28th Memorandum. In addition, shallow ground-water observation piezometers have been added to this Design Development Report (DDR) to be located in these areas. These wells will be used to monitor seasonal high ground-water and curtail operation of spray rigs when ground-water elevations reach preset depths. The operation of spray rigs located in the areas identified will be on a last on/first-off basis during winter months of operation.

This letter's primary focus is maps produced for each spray site where the Winflow model generated ground-water elevation contours are overlain by topographic contours

664 Churchmans Road, Newark, Delaware 19702, P.O. Box 15004, Wilmington, Delaware [illegible] Phone [illegible] Fax [illegible]
P.O. Box 172, Harbeson, Delaware [illegible] Phone (302) 684-8557 Fax [illegible]
28122 Lewes Georgetown Hwy, Unit 2, Milton, DE [illegible]
e-mail: artesian@artesianresources.com [illegible] www.artesianwater.com

for the field areas. These maps present the topographic elevation subtracted from the Winflow generated contours and present the result in two-foot depth to water intervals: 0 to 2 feet, 2 to 4 feet, 4 to 6 feet and over 6 feet. These maps illustrate the depths to water across the proposed spray field areas during irrigation under seasonal high ground-water conditions.

The Winflow models were also modified to reflect comments made by DNREC in the October 28th Memorandum. Specifically, the models were recalibrated with shallower depths to the base of the aquifer at slightly lower hydraulic conductivity values for ground-water conditions measured in March of 2009. From these March 2009 maps, the rainfall recharge was increased globally across the entire model until target points within the model reflected a 1.7 foot rise to seasonal high ground-water levels in the center parts of the fields. A final set of maps with the spray irrigation rate of 1.65 inches were developed to reflect seasonal high water table elevations under spray operations. It is important to note that the models are constructed for steady state conditions, with maximum spray volumes during wet season conditions and no water loss through evapotranspiration. Maximum use of spray irrigation fields typically is not conducted during the wet season unless system storage capacity is fully utilized. The models, by their nature, will be very conservative on the projections of water table elevations. These changes are discussed below in more detail.

Hydrogeology and Model Modifications

We agree with the GPB statement in the Memorandum that based on available Delaware Geological Survey information, the hydrogeology at the 7 field sites generally appears suitable for receiving spray irrigated wastewater. Lithologically, the bulk of the materials are fine to medium sands with varying admixtures of coarse sand and gravel. Small areas of perched to semi-perched water table conditions were also observed in the piezometers water level data due to dense, but not regionally extensive, clay layers. The high productivity of the aquifer was discussed in the original hydrogeologic report (Appendix 7 of the DDR) based on the high productivity and depths of irrigations wells identified around each spray field site.

The original DDR analysis (Appendix 7) and the GPB presented analysis of long-term hydrograph data for DGS well 11-37 which is located approximately 2,000 feet south of Field A. The GPB states that the water level measurements in the Appendix 7 report from March 2009 were approximately 1.7 feet below the long-term average seasonal high water table. The Winflow models have been adjusted to clearly illustrate the increase of 1.7 feet in the models prior to the operation of the spray irrigation rigs.

The Winflow models were modified to reflect DNREC comments. The base of the Columbia aquifer was raised 5 to 20 feet depending on site elevation and surrounding irrigation well depths. The hydraulic conductivity was typically decreased by minor amounts from 100 feet per day to values between 85 and 95 feet per day. Modifications at each site are noted below. Winflow uses line sinks to represent stream discharge points. Given the size of the model for each site, numerous stream line sinks had to be used to match the topographic changes in the streams. Most line sinks were raised along

the stream corridor in increments of 0.5 to 1 foot. The line sinks in the stream corridors are the primary hydrogeologic boundary of the model as outside edges of the models are no-flow boundaries. The line sinks were included throughout the modeled area, just not adjacent to the properties in the study. In general, the elevation assigned to each stream line sink reflects topographic data from the USGS topographic base map used for each model. The individual line sinks are shown on the attached maps. Each site is reviewed below and summary sheets for each model are attached. The summary sheets include three items as follows:

- Areas irrigated by each recharge zone on the sites. (This area matches the DDR irrigation area but Modflow can only use circular representations for recharge to the aquifer.)
- Piezometers installed at the site with calibration residuals, **and/or** additional calibration target wells within the model to evaluate seasonal high-water increases.
- Impact of 1.65 inches of recharge on the site piezometers and the additional calibration target wells.

Sites without wells were given calibration targets typically labeled for their location within the spray field including a central target for each site. Site with wells were also given an additional central calibration target. These additional calibration targets are needed to quantify maximum mound development on each site as requested in the Memorandum.

Ground-Water Monitoring Network

The GPB Memorandum specifically requests additional monitoring wells. As per the Memorandum, the following wells have been added:

- Infield Monitoring Wells at each of the 7 proposed spray field areas,
- An upgradient Monitoring Well for the storage lagoons,
- Lysimeters, once required, will be included to verify percolate nitrogen concentrations on fields and wooded areas,
- Additional wells for Sites B, E and F are included as per the maps attached to the GPB Memorandum, and
- Two additional wells are included at Site G as per the maps attached to the GPB Memorandum.

In addition, installation of piezometers to measure seasonal high-water levels is included in this plan. Each piezometer will be installed with screen set across the water table. Each well will be surveyed and a minimum depth to water will be developed for each piezometer. Water levels will be observed in these piezometers during the year when spraying is active. When water levels are within 1 foot of the predetermined minimum depth to water, water levels will be observed weekly when spraying is active. Irrigation in the spray field(s) adjacent to the piezometer will be terminated when depth to water reaches the preset minimum depth at each piezometer. The spray fields will be restarted

only after water levels have fallen below the preset minimum depth. Details on each site are provided below.

As discussed in the February 3rd meeting, the current depth to water in areas identified above could be evaluated this winter due to the current high water table conditions. The primary reason for doing this investigation now is the current field conditions. AWMI will conduct this investigation within the next 30 to 60 days based on weather conditions upon request of the GPB. However, the timing of the field work and study report from this soil boring investigation would not interfere with timing of the final approval of the DDR. The borings would be conducted at sites identified for piezometers.

The need to identify lysimeter locations for the DDR was also discussed at the February 3rd meeting. Lysimeters are requested to help verify percolate nitrate concentrations and one lysimeter will be installed on each of the 7 sites within the center of a selected wetted field. For sites with proposed wooded and open wetted field areas, one lysimeter is proposed in the center of one of the wooded wetted field areas and one lysimeter is proposed in the center of one of the open field areas. For Field F, only one lysimeter is proposed since no wooded areas exist for spray irrigation. The proposed lysimeters locations are shown on the proposed monitoring well location maps.

Site A

Site A had three observation well points, but only two of the three reflected the regional water table. Well 1 showed effects of perching with a water elevation 5 feet higher than the other two wells and a significant clay layer at the base of the well. Only two calibration points makes calculation of additional residual statistics nearly meaningless. However, the sum of the residuals was minimized to the greatest extent possible. The residual of the two observation well points for the March 2009 calibration run are 0.24 and -0.12 feet as highlighted on the Field A Analysis data sheet. The base elevation of the aquifer at Site A was raised 15 feet from the model presented in Appendix 7 of the DDR. The hydraulic conductivity was unchanged. However, thinning the aquifer effectively decreased the transmissivity at this site. Maps of the March 2009 calibration water elevation, 1.7 foot seasonal high water elevation and the seasonal high 1.65 inch spray irrigation runs are attached. The revised model has higher final water elevations, higher than the Appendix 7 maps, but with a steeper gradient reflecting the lower aquifer transmissivity.

A map presenting the difference of site elevation and the mounded water table elevation is attached. Areas where the 0 to 2 foot depth to water approaches the spray areas are illustrated on this map. Based on this map and GPB comments, a revised monitoring well and piezometer location map have been developed. The location of two seasonal high water table observation piezometers is included for Site A. An infield monitoring well (MW-5A) has been added to the site. Please note that the upgradient monitoring well for each site is labeled MW-1 followed by the site designation.

Site B

Site B did not have any observation wells. Four target points were added to the ground-water flow model to illustrate the effects of modeling the 1.7 foot seasonal change in water elevation and the 1.65 inches of irrigation from the spray rigs. The base elevation of the aquifer at Site B was raised 20 feet from the model presented in Appendix 7. The hydraulic conductivity was lowered from 100 to 95 feet per day. These changes effectively decrease the transmissivity of the aquifer at this site. Maps of the estimated March 2009 water elevation, 1.7 foot seasonal high water elevation and the seasonal high 1.65 inch spray irrigation runs are attached. The revised model has higher final water elevations, higher than the Appendix 7 maps, but with a steeper gradient reflecting the lower aquifer transmissivity.

A map presenting the difference of site elevation and the mounded water table elevation is attached. Areas where the 0 to 2 foot depth to water approaches the spray areas are illustrated on this map. Based on this map and GPB comments, a revised monitoring well and piezometer location map has been developed. The location of three seasonal high water table observation piezometers is included for Site B. An infield monitoring well (MW-6B) has been added to the site. In addition, a new upgradient well location as requested in the GPB Memorandum (MW-1B) has also been added to the site monitoring plan.

Site C

Site C did not have any observation wells. Four target points were added to the ground-water flow model to illustrate the effects of modeling the 1.7 foot seasonal change in water elevation and the 1.65 inches of irrigation from the spray rigs. The base elevation of the aquifer at Site C was raised 20 feet from the model in Appendix 7. The hydraulic conductivity was lowered from 100 to 90 feet per day. These changes effectively decrease the transmissivity of the aquifer at this site. Maps of the estimated March 2009 water elevation, 1.7 foot seasonal high water elevation and the seasonal high 1.65 inch spray irrigation runs are attached. The revised model has not changed dramatically from the Appendix 7 maps, probably due to the proximity of stream discharge areas around nearly the entire site.

A map presenting the difference of site elevation and the mounded water table elevation is attached. Areas where the 0 to 2 foot depth to water approaches the spray areas are illustrated on this map. Based on this map and GPB comments, a revised monitoring well and piezometer location map have been developed. The location of three seasonal high water table observation piezometers is included for Site C. An infield monitoring well (MW-4C) has been added to the site.

Sites D and F

Sites D and F were combined into one flow model due to their proximity. The combined sites had three observation well points. The residual of the three observation points for the March 2009 calibration run are 0.10, 0.57, and -0.11 feet as highlighted on the Fields D and F Analysis data sheet. The base elevation of the aquifer at Site A was raised 15 feet from the model presented in Appendix 7 of the DDR. The hydraulic conductivity was decreased to 90 feet per day. These changes effectively decrease the transmissivity of the aquifer at this site. Maps of the March 2009 calibration water elevation, 1.7 foot seasonal high water elevation and the seasonal high 1.65 inch spray irrigation runs are attached. The revised model has higher final water elevations, higher than the Appendix 7 maps, but with a steeper gradient reflecting the lower aquifer transmissivity.

A map presenting the difference of site elevation and the mounded water table elevation is attached. Areas where the 0 to 2 foot depth to water approaches the spray areas are illustrated on this map. Based on this map and GPB comments, a revised monitoring well and piezometer location map have been developed. The location of two seasonal high water table observation piezometers is included for Site D and one for Site F. Infield monitoring wells (MW-4D and MW-5F) have been added to the sites. In addition, a monitoring well has been added to the northwest corner of Area F (MW-2F) as requested by the GPB Memorandum as this was considered an area of potential off-site impact to domestic wells.

Site E

Site E had three observation wells installed across the site. The residual of the points for the calibration run are 0.02, 0.26 and -0.15 feet as highlighted on the Field E Analysis data sheet. The base of the aquifer elevation of the aquifer at Site E was raised 15 feet from the model presented in Appendix 7. The hydraulic conductivity was lowered from 100 to 90 feet per day. These changes effectively decrease the transmissivity of the aquifer at this site. Maps of the March 2009 calibration water elevation, 1.7 foot seasonal high water elevation and the seasonal high 1.65 inch spray irrigation runs are attached. The revised model has higher final water elevations, higher than the Appendix 7 maps, but with a steeper gradient reflecting the lower aquifer transmissivity.

A map presenting the difference of site elevation and the mounded water table elevation is attached. Areas where the 0 to 2 foot depth to water approaches the spray areas are illustrated on this map. Attached is a revised monitoring well and seasonal high observation piezometer location map for Site E. An infield monitoring well (MW-5E) has been added to the site as well as two seasonal high water table observation piezometers. An additional monitoring well has been added to the northwest corner of Area E (MW-2E) as requested by the GPB Memorandum. This well is to monitor ground water quality to the domestic residence immediately to the north of Area E.

Site G

Site G had four new observation wells installed across the site with two existing wells incorporated into the analysis. The sum of the residuals for these six wells is only -0.08 feet as shown on the attached Field G Analysis data sheet. The base of the aquifer elevation of the aquifer at Site G was raised 10 feet from the model in Appendix 7. The hydraulic conductivity was lowered from 100 to 95 feet per day. These changes effectively decrease the transmissivity of the aquifer at this site. Maps of the March 2009 calibration water elevation, 1.7 foot seasonal high water elevation and the seasonal high 1.65 inch spray irrigation runs are attached. The revised model has higher final water elevations, higher than the Appendix 7 maps, but with a steeper gradient reflecting the lower aquifer transmissivity.

A map presenting the difference of site elevation and the mounded water table elevation is attached. Areas where the 0 to 2 foot depth to water approaches the spray areas are illustrated on this map. Based on this map and GPB comments, a revised monitoring well and piezometer location map have been developed. An infield monitoring well (MW-9G) has been added to the site monitoring plan. Two other wells requested by the GPB that are located near potential down gradient receptors have also been added (MW-3G and MW-7G). A total of 7 seasonal high water table observation piezometers have been added to the site due to several undrained closed depressions that exist on the site as well as a large swale that extend far into the central wooded portion of Site G.

Conclusions and Recommendations

The GPB Memorandum presents 6 conclusions and recommendations that have been reviewed and discussed at the February 3, 2010 meeting.

Items 1, 2 and 3 request a plan for additional test borings and wells to enable further characterization of the depth to groundwater and direction of ground-water flow. As discussed in the meeting, this plan is not required. However, piezometers to monitor depth to seasonal high groundwater in areas of each site during spray operation are needed based on the results of Item 5 below.

Item 4 request that the Winflow models be rerun to estimate the amount of water table mounding that will occur as a result of spray irrigation. That information is included within this letter.

Items 5 and 6 request maps that readily enable depth to water levels be determined across all of the wetted fields. These maps have been provided. In addition, results from target well points in the Winflow models have been presented in a format that illustrates the development of the mound through the seasonally high ground-water time period and the 1.65 inch spray irrigation impacts.

In addition, the meeting on February 3, 2010 clarified the time frame for the property owners to install the monitoring wells and lysimeters (and newly proposed piezometers). The installation of these wells are not required for approval of the DDR, but must be installed prior to the startup of the spray fields as required by regulations.

If you have any questions on the information or maps presented in this report, please do not hesitate to call.

Very truly yours,

Peter M. Demicco, P.G.
Delaware Registered Geologist S-0000406
Director of Ground Water Resources

PMD/ljb
Attachments

cc: Mr. Brian Carbaugh, P.E.
Mr. John Hayes, DNREC
Mr. Blair Venables, P.G., DNREC

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES &
ENVIRONMENTAL CONTROL
DIVISION OF WATER RESOURCES
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

MEMORANDUM

TO: Marlene Baust

THROUGH: Ron Graeber RG
John Barndt P.G. JDB

FROM: Blair Venables P.G B.V.

RE: **ANSRWRF DDR**

DATE: October 28, 2009

PURPOSE\BACKGROUND

The Groundwater Protection Branch (GPB) has completed a hydrogeological evaluation for 7 agricultural fields slated for wastewater spray irrigation. These fields have a combined acreage of 1652 acres and are located north to northwest of the town of Milton. Artesian Wastewater Management Inc. (AWM Inc.) plans to use the fields as the disposal area for a regional wastewater treatment facility know as the Artesian Northern Sussex Regional Wastewater Recharge Facility (ANSRWRF).

Detailed design information for the facility and site characterization findings are provided in AWM Inc.'s Design Development Report (DDR). The GPB spent considerable time reviewing and assessing this report in order to (1) to determine whether the sites' hydrology has been adequately characterized, (2) assess the suitability of the sites for receiving wastewater, and (3) to estimate and if necessary, address the groundwater impacts which will be associated with spray irrigation.

Attached figure 1 shows the locations of the proposed spray field areas and surrounding surface water bodies. Aquifer specific capacity data and the locations for where proximal Delaware Geological Survey (DGS) gamma log information exists are also shown on the figure.

Pertinent design and other background information follows:

- Lands for the proposed ANSRWRF are leased to AWM Inc. and have been placed in an agricultural preservation easement. As a condition of being able to apply wastewater on lands with an agricultural preservation easement, applied wastewater must undergo a high level of treatment. This treatment must be sufficient to meet the "unlimited public access" designation applied to "superior" spray sites as found in the Department's "Guidance and Regulations Governing the Land Treatment of Waste".

- Wastewater received at the facility will be domestic in nature and will undergo at least secondary treatment. As mentioned above, this treatment must produce a high quality effluent capable of meeting the unlimited public access designation applied to "superior" spray sites. If needed, the pretreatment plant has the capability of producing tertiary effluent. Nitrate concentrations in the effluent are expected to range from 10 to 25 mg/L.

- According to the aforementioned land treatment regulations, buffer zones from the edge of the wetted field area are generally not required for unlimited public access spray sites. At ANSRWRF, however, 30' forested buffers from the spray fields to property boundaries, and 100' and 50' buffers from the wetted field areas to perennial and intermittent streams have been incorporated into the facility design, respectively.

- The proposed facility will serve the proposed 753 acre Elizabeth Town community and other existing communities.

- At full build out, the anticipated wastewater application rate is 1.65" per week. Applying wastewater at this rate over the proposed available wetted field area of 1326 acres equates to an average daily wastewater flow volume of 8.49 million gallon per day (MGD).

Attached figures 2A and 2B show the direction of groundwater flow based on the consultants Winflow model for the two northern spray fields and the five southern spray field areas, respectively. These figures also show the locations of the existing observation wells/test borings, the consultants proposed monitor wells (MW)s, required DNREC MWs, and unconfined water supply wells lying within 1000' downgradient of the proposed wetted field areas. The ranges in depths to the "wet" water table per wetted field area based on Andres and Martin (2005) are also shown on the figures.

FINDINGS\DISCUSSION

Consultants On-Site Investigation and Data Presentation

The hydrogeological consultants installed very few borings and observation wells (OW)s to characterize the sites' hydrogeology. The consultants advanced a total of only 13 borings for the 1652 acres comprising the 7 field areas. This equates to one test boring

per 127 acres of total field area. Each boring was drilled to a depth of 20' below ground surface (BGS) and was completed as a 2" OW.

In order to characterize the direction of groundwater flow and depth to water (DTW) over large land areas located between the borings and OWs, the hydrogeological consultants relied heavily upon output from the WinFlow groundwater model. Data from the model was not, however, adequately presented nor was it presented in a manner that enabled one to readily verify claims made in the report. For example, the consultants made claims about the DTW ranges in the various field areas but failed to provide adequate maps or data by which the claims could be readily substantiated. In order to determine the DTW across the spray field areas, the GPB had to develop new maps by scanning in maps provided in the report and then using ArcMap® to overlay these maps.

At a minimum the consultants should have provided maps in which the detailed topographic contours for the field areas overlay the Winflow generated groundwater elevation contours for each of the corresponding field areas Maps such as these would have enabled the GPB to readily determine the depths to water across the proposed spray field areas. Ideally, the consultants should have used software, e.g., Surfer®, to subtract the water-table elevation grid from the topographic elevation grid to derive a DTW grid. This DTW grid should have then been used to develop a DTW contour map for the field areas.

Hydrogeology

Based on available DGS information, the hydrogeology at the 7 field sites generally appears suitable for receiving spray irrigated wastewater. The Columbia (water-table) aquifer is generally thick and very transmissive which will help limit the amount of groundwater mounding that will occur at the sites as a result of spray irrigation. According to Andres and Klingbiel 2006, the transmissivity (T) and horizontal hydraulic conductivity (Kh) of the Columbia aquifer averages 6156 ft^2/d and 66 ft/d, respectively. Ramsey (2001) indicates that the base of the Columbia aquifer on average occurs at a depth of 106' below ground surface (BGS) which equates to an aquifer base elevation of approximately 64' below mean sea level (MSL). Assuming an average depth to the water table of 8' below ground surface, the Columbia aquifer's average saturated thickness is approximately 98'. The thickness of the Columbia aquifer is, however, vary variable in the area and can range from 33' to 159' (Andres and Klingbiel, 2006).

The dominant textures encountered while drilling the 13 boring for the hydrogeological investigation were fine and medium sands and medium to fine sands. Massive clay strata were, however, encountered in field A at borings A1 and A2 from depths of 15 – 20' and 18 – 20' BGS, respectively, in field D at boring D1 from 1- 4' BGS, and in field G at borings G1 and G4 from 19 – 20' and approximately 15 – 20' BGS, respectively. Due to the limited number of and shallow depths of the borings advanced during the hydrogeological investigation, predicting whether the clay strata in the Lynch Heights Fm. and the underlying Beaverdam Fm. are horizontally continuous is impossible by using the on-site data gathered to date.

Water-Table Depths Based on On-Site Field Data

The consultants performed only one water-level sampling round in the 13 OWs installed during the hydrgeological investigation. This sampling event occurred on March 5, 2009. Water-level readings obtained on this date are provided below in table 1.

Table 1
Water-level Readings Obtained from On-site Observation Wells

Field Areas	Acres	Number of Observation Wells Installed	Water-levels in Feet BGS
A	182	3	Range 14.1 – 18.2
B	395	0	?
C	157	0	?
D	118	1	11.5
E	136	3	Range 8.2 – 12.6
F	141	2	Range 12.7 – 14.5
G	523	4	Range 6.89 – 14.1

Long-Term Average High Water Table

Based on long-term hydrograph data for DGS well 11-37 which is located approximately 2000' south of field A, the water levels taken in the on-site OWs on March 5th, 2009 were approximately 1.7' below the long term average high water table that occurs in March. Therefore assuming that the water table at Ng 11-37 responds similarly to the water table at the proposed spray fields, the long-term average high water table levels at the proposed spray fields are approximately 1.7' higher than the levels recorded on March 9, 2009.

GPB's Depth to Water Analysis

To check the validity of AWM Inc.'s claims made in the DDR that the water table below the 7 field areas is greater than 8' BGS, the GPB utilized ArcMap to overlay the static groundwater elevation contour maps generated for each of the spray field areas by the consultants WinFlow model onto the corresponding topographic maps for the fields. The elevation of the water table could then be readily subtracted from the topographic elevations to derive the water-table depths across each of the proposed spray field areas. Table 2 provided below shows the results from this exercise. The results indicate that the water levels are not as deep as those indicated in the report and that in some areas of the spray site, water tables are as shallow as 2 to 4' BGS. If 1.7' were subtracted from these values to account for long term average high water table conditions discussed earlier, some portions of the proposed wetted field areas would likely not meet the required 2' isolation distance which must exists between the water table and the land surface in order for a site to be suitable for spray irrigation.

As another check to determine whether the water table is as deep as claimed by the consultants, the GPB utilized an ArcMap coverage of the depth to the "wet" water table generated by Andres and Martin (2005) to determine the ranges in the "wet" water table across the proposed spray field areas. Andres and Martin (2005) define the wet water table depth as the 25th percentile depth to water (DTW) value, i.e., the DTW value at which 25 percent of the DTW observations have lower DTW values. The results from this exercise are also provided below in Table 2 and they also indicate that in some areas of the proposed spray fields the water tables are much shallower than claimed by the consultants.

Table 2
Water-table Depths and Mound Heights
(DTW in feet BGS and mound rise in feet above the static water table)

Field	DTW Claimed by Consultant	DTW Ranges in the Spray Fields Based on the GPB's Analysis of Hydro Report Information	DTW Range from Andres "Wet" Water-Table Map	Mound Height Rise Claimed By Consultant	Mound Height Rise Range Based on the GPB's Analysis of Hydro Report Information
A	> 12	8.5 to 22.5	3 to 16	Max – 3	0.5 to 3
B	8 to 15	8 to 22	3 to 16	Max = 4	1 to 4
C	8 to 14	2 to 16	2 to 11	Max = 1	0.5
D	12 to 20	4 to 16	5 to 15	Max = 2	1 to 2

E	10 to 14	3 to 16	3 to 16	Max = 2	1 to 2
F	12 to 20	5 to 20	5 to 17	Max = 2	1 to 3
G	10 to 14	6 to 19	3 to 16	Max = 5	1 to 5

Based on on-site data from the soils investigation, water-level data obtained from a limited number of OWs installed during the hydrogeological investigation, DGS water level information, and groundwater elevation contours derived from the consultants Winflow model, water levels over most of the proposed wetted field areas appear deep enough to support spray irrigation. Most of the soils in the majority of the 7 field areas are well drained and very permeable with infiltration rates faster than 20 mpi. The limiting zones for these soils are generally greater than 60" BGS. In some fields, however, there are a number of locations within the proposed wetted field areas that have limiting zones that are less than 60" BGS and which are likely not suitable for receiving spray irrigation once groundwater mounding and long-term average high water tables are accounted for. Some of these locations occur in the south central and western portions of field G which have limiting zones ranging between 24 to 48" BGS. "Wet" water table information and DTW ranges based on the GPB's analysis, found in table 2, also show that some areas of fields A, B, C, D, and E may not be suitable for spray irrigation after mounding and the long-term average high water tables are considered.

Ground-Water Modeling and Groundwater Mounding Analysis

As mentioned in the previous section, the consultants primarily utilized a groundwater model based on limited on-site data to estimate the direction of ground-water flow, the DTW water, and the amount of groundwater mounding across the 7 field areas proposed for spray irrigation. The consultants chose Winflow, a calibratable, steady state, analytic element groundwater model to accomplish this. Model parameter values of 100 ft/d and 100' below mean sea level (MSL) for hydraulic conductivity (K) and aquifer base elevation were used in the model, respectively. These values equate to an aquifer transmissivity (T) of approximately 11,800 ft^2/d for the study area.

As mentioned previously in the "Hydrogeology" section of this memo, the GPB derived an average K value and average aquifer base elevation value of 66 ft/d and 64' below MSL, respectively. These values equate to an aquifer transmissivity of approximately 6468 ft^2/d for the study area and are likely more representative of average aquifer conditions. The consultants values are, however, not unfounded. Johnston (1977) and Johnston (1976) indicate that T values of 15,000 ft^2/d and 8000 ft^2/d are possible in the area. These values were based on a calibrated Modflow model and base flow recession curves, respectively.

Mound-height rises based on the WinFlow model are shown in Table 2 and range from a maximum of 1' in field C to a maximum of 5' in field G. The consultants used both

conservative and liberal parameter values in the groundwater mounding model. Aquifer base elevations and the hydraulic conductivity values used in the model are likely deeper and higher, respectively, than the actual average values for these parameters and thus are liberal values. Models utilizing higher K values and deeper base values will under predict mound heights (result in lower mound heights) than a similar model that uses lower K values and shallower base elevations. In contrast, the consultants utilized a wastewater application rate of 2.5" per week which is conservative in comparison to the actual maximum design application rate of 1.65"/week. The use of the 2.5" application rate in the mounding analysis will result in a higher mound than a similar model that uses the actual application rate of 1.65"/week. The use of these conservative and liberal model parameters likely largely negate one another.

Regardless of whether the conservative and liberal values used in the model negate one another, the model results in the table are currently the only available mound height values available for review, and some of the maximum mound height rises shown are substantial. If these mound heights develop they will cause many more spots in the wetted field areas to become unsuitable for spray irrigation.

The consultants failed to provide model calibration statistics, model boundaries, line sink locations and their corresponding surface water elevations. In addition, the consultants failed to indicate whether stream resistant values were used in the model and whether individual groundwater models were ran for each field area or whether one regional model was run to entail all of the field areas. This information is necessary to help evaluate whether the model is a "good" groundwater model.

Proximal Wells and Ground-Water Flow

Groundwater flow directions determined from the consultants Winflow Model are shown on figures 2A and 2B. In general groundwater flow for the 7 field areas is to the east and ranges from towards the northeast to towards the southeast depending on the specific field in question. Groundwater beneath fields A and B discharges to Slaughter Creek to the north and to North Prong to the South. Fields D and E's groundwater discharges to Sow Bridge Branch and Reynolds Pond. Groundwater beneath field C likely discharges to Sow Bridge Branch, Waples Pond, and Ingram Branch. Groundwater at field F discharges to Ingrams Branch which lies to the east and south. In the northern to middle portions of field G, groundwater at the site discharges to Ingram Branch. In the southern portion of field G, groundwater flows towards Brittingham Branch.

Approximately 52 domestic wells lie within 1000' in a downgradient direction from the proposed wetted field areas for the 7 farm fields (see figures 2A and 2B). The GPB has to assume that these wells are unconfined since screen setting depths and well completion reports were not submitted with the DDR. Six of the 52 wells are located on the opposite side of a local groundwater discharge area (a stream) and are likely not at a significant risk of being impacted by the spray irrigation process. The GPB does not consider these 6 wells as being downgradient and they will not be given further consideration. For each

of the 7 field sites, the number of downgradient domestic wells lying within 1000' of the wetted field areas and the distances from the wetted field area to the closest downgradient wells are provided below.

- Area A: Thirteen domestic wells lie within 1000' downgradient of the proposed wetted field areas. Most of these wells lie in the Sylvan Acres Subdivision located southeast of field A. The closest well lies approximately 350' downgradient of the southeastern most wetted field area of field A.

- Area B: No downgradient drinking water supply wells exist within 1000'.

- Area C: No downgradient drinking water supply wells exist within 1000'.

- Area D: No downgradient drinking water supply wells exist within 1000'.

- Area E: Approximately 11 domestic wells lie within 1000' downgradient of the proposed wetted field areas. The closest well lies approximately 132' northeast of the northeastern most wetted field area.

- Area F: Three domestic wells lie within 550' from and possibly downgradient of the proposed northwestern most wetted field area. The closest well lies approximately 250' downgradient from this proposed wetted field area.

- Area G: Twenty two downgradient domestic wells lie within 1000' downgradient from the proposed wetted field areas. One of the closest wells lies approximately 50' due east of the proposed large center pivot spray area located in the eastern portion of the site. The closest well lies approximately 41'east from Field G's southwestern most wetted field area.

Groundwater Monitoring Network

The consultants propose a total of 26 MWs to assess groundwater quality impacts associated with the 7 proposed spray fields. The proposed well locations are shown on figures 2A and 2B. Deficiencies in and needed additions to the groundwater monitoring network follow:

- Infield groundwater MWs are missing at each of the 7 proposed spray field areas and are required by the land treatment regulations.

- An upgradient MW is required for the storage lagoons.

- Lysimeters are needed to help verify percolate nitrate concentrations and must be installed within the center of some of the wetted field areas in each of the 7

fields. For fields with proposed wooded and open wetted field areas, one lysimeter must be installed in the center of one of the wooded wetted field areas and one lysimeter must be installed in the center of one of the open field areas (preferably the largest of the wetted field areas). For fields F, only one lysimeter must be installed since no wooded areas exist for spray irrigation.

- Provided the groundwater flow directions currently depicted on the attached maps remains valid after new groundwater flow information is provided, the following well location revisions and additions are needed:

    - Install an upgradient MW in field B in the location indicated on attached figure 2B.

    - Install an additional MW at field E to monitor groundwater flowing towards 1 off-site domestic well located to the north (see figure 2B for well location).

    - Install an additional MW at field F to monitor groundwater possibly flowing towards 3 off-site domestic wells located to the north (see figure 2B for well location).

    - Install two additional MWs at field G. One well is needed to monitor groundwater impacts moving towards 6 off-site domestic wells lying east of field G. Another well is needed to monitor the groundwater flowing towards 4 off-site domestic wells located south of the southwestern portion of field G (see figure 2B for well locations).

Conclusions and Requirements

Unlike the soil consultants that put in a large number of hand auger borings and test pits to adequately characterize soils at the 7 field sites, the hydrogeological consultants installed very few borings and OWs and did not adequately characterize the sites hydrogeology. The hydrogeological consultants relied heavily upon output from the WinFlow groundwater model to characterize the directions of flow and DTW at the sites. The GPB encourages the use of models to predict mound heights and to fill in data gaps between locations where field data exists but does not believe that data generated from these models should be used as a substitue for adequate on-site data. A sound on-site investigation is first needed to gather suffient field data. This field data should then be used in the model and in concert with the model output to help verify the accuracy of the model.

The GPB has shown through our own DTW analysis that the water table in the proposed wetted field areas is shallower than claimed by the consultants. More data and more

analyses are needed to verify whether more extensive areas of "shallow" groundwater exist in the proposed spray field areas. In order to better characterize the hydrogeology at the site, better assess the extent of groundwater mounding, and readily demonstrate scientific findings from additional hydrogeological investigation, the owner of the property and/or his or her representative must:

1. First develop a new test boring/OW plan which will enable the direction of groundwater flow and the DTW across the 7 field areas to be adequately characterized. This plan must be submitted to the Department for approval.

2. Upon OW plan approval, initiate the new on-site investigation phase and conduct at least three water level sampling rounds in the existing OWs and in the newly installed OWs. The sampling rounds must be conducted during the "wet" season, i.e., January through April.

3. Provide new groundwater flow maps based on the new water level measurements obtained from the three sampling rounds. Contouring software such as Surfer® should be used to generate the new flow maps.

4. Rerun the WinFlow model or another calibratable groundwater model to estimate the amount of water table mounding that will occur as a result of spray irrigation. Model calibration statistics, stream resistance values (if applied), model boundaries, line sink locations, and their corresponding surface water elevations must accompany the model results.

5. Provide maps that readily enable DTW levels to be determined across all of the wetted field areas for each of the 7 fields. A map with detailed topographic contours overlaying groundwater elevation contours is appropriate. Also acceptable is a DTW contour map from a software program which enables grid math such as Surfer®.

6. Provide maps that readily enable mound height rises to be determined across all of the wetted field areas for each of the 7 spray fields.

In order for the GPB to approve of the hydrogeological component of the DDR, the owner off the property and/or his or her representative must also:

- Install new MWs in the locations indicated on attached figures 2A and 2B provided that the new determinations of groundwater flow are similar to previous directions determined for the sites.

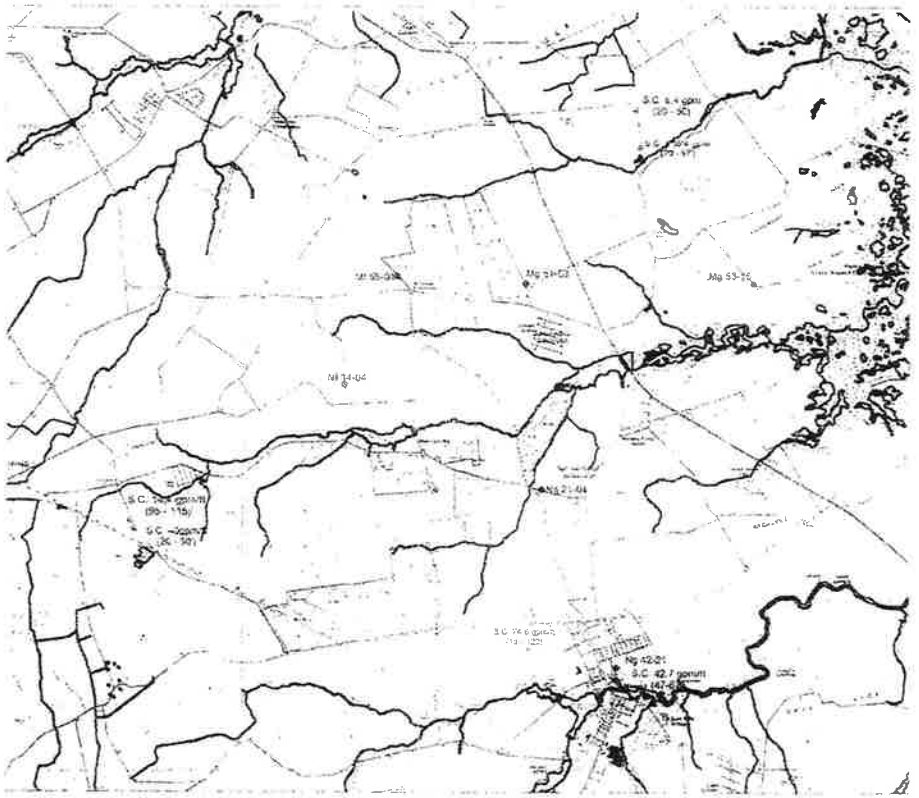
- Provide a MW plan for infield MWs that must be installed at each of the 7 proposed spray fields as required by the land treatment regulations. In addition, an upgradient MW must be sited for the wastewater storage lagoons. The locations for all the required MWs and all of the consultants proposed MWs must be shown on maps provided to the Department. Corresponding well labels must also be provided on the map. The Department must approve of the plan prior to MW installation.

- Provide a lysimeter monitoring plan to the Department for approval. For each of the 7 field areas, at least one lysimeter must be installed in the center of an open wetted field area and at least one must be installed in the center of a wooded wetted field area.

The GPB will provide further recommendations and requirements once the aforementioned investigation is completed and the required information is provided. If you have any questions, comments, or concerns, regarding this memo, feel free to contact me at extension 9945.

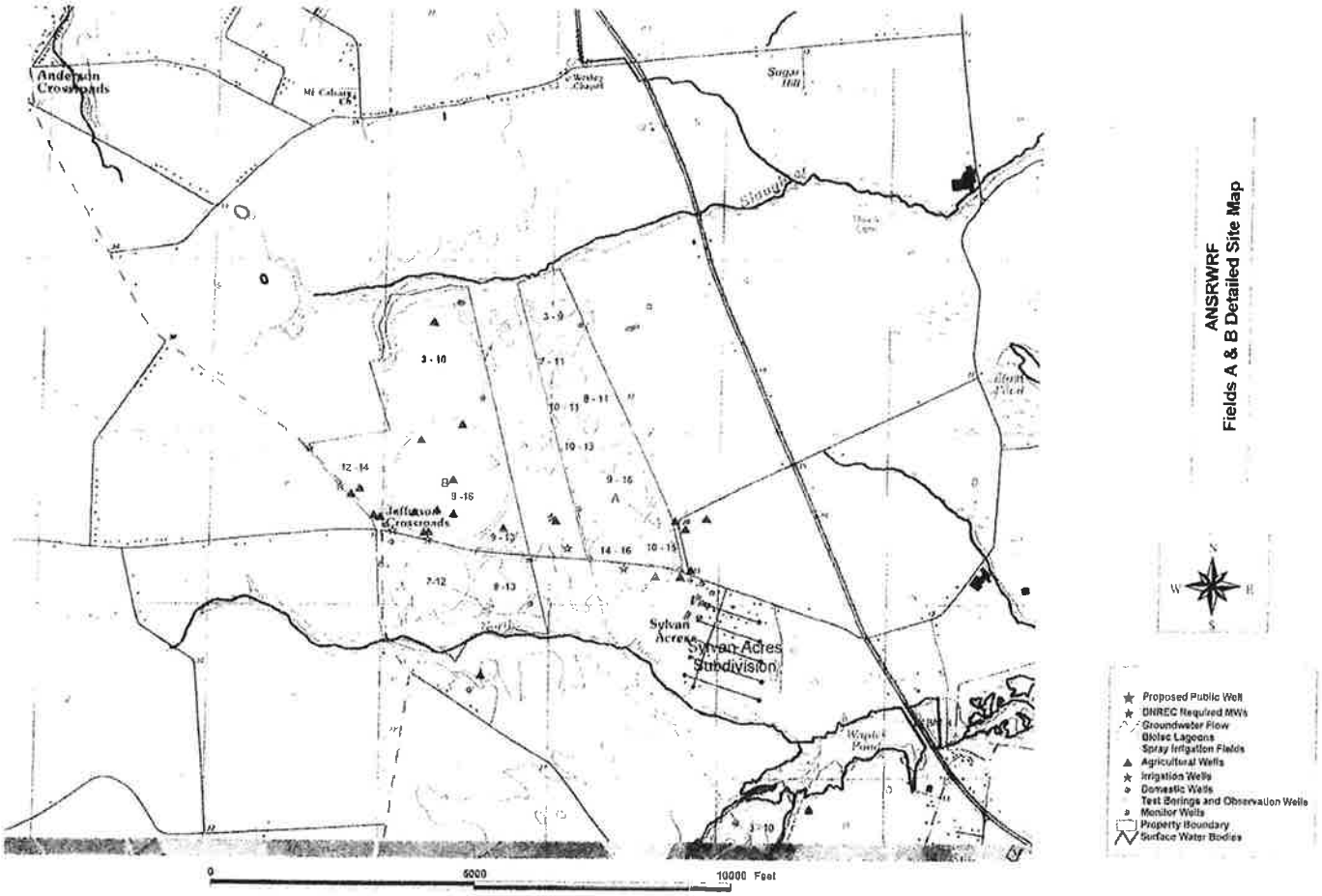
Enclosures: Figure 1, ANSRWRF General Site Map
Figure 2A, ANSRWRF Fields A & B Detailed Site Map
Figure 2B, ANSRWRF Fields C, D, E, F, & G Detailed Site Map

ANSRWRF General Site Map



2 0 2 Miles

- Aquifer Test Data
- DGS Gamma Logs
- Biolac Lagoons
- Spray Irrigation Fields
- Property Boundary
- Surface Water Bodies



ANSRWRF
Fields A & B Detailed Site Map

Figure 2A

ANSRWRF
Fields C,D,E,F,&G Detailed Site Map

Figure 2B

Appendix IV

Vegetative & Nutrient Management Plan For The Spray Irrigation Of Treated Wastewater

Prepared for

Artesian Northern Sussex Regional Wastewater Recharge Facility (ANSRWRF)

Prepared By

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Introduction

Artesian Wastewater Management, Inc. proposes to design, build and operate a wastewater treatment facility known as the Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF) on a 75 acre site located off Isaacs Road (Route 30) just north of the Milton Ellendale Highway (Route 16) in eastern Sussex County Delaware near the town of Milton. The facility is expected to process wastewater generated from various proposed and existing communities in the region.

Processed wastewater from the facility will be land applied via spray irrigation to various parcels of croplands and woodlands of Harry Isaacs, Jr. consisting of approximately 1,722 acres.

This Vegetative Management Plan (VPM) is a guidance document intended to account for the use of the wastewaters on both agricultural croplands and woodlands in an environmentally sound manner. It will provide guidance on wastewater handling and application rates along with crop rotations and expected yields, nutrient management planning, maximum loading rates and other supporting documentation.

Overview – Application Sites

All of the land for the application of effluent is owned by Harry Isaacs, Jr. Agricultural lands are currently leased out for the purposes of crop production. These lands are currently enrolled in Delaware s Agricultural Lands Preservation Program and therefore are required to remain in agricultural related activities. Any lessee s of the agricultural lands will be required to conform with the associated NM plans.

Soils are mostly very well drained sandy loams. Water holding capacities are generally low. Croplands are relatively high yielding soils used to grow small grains, corn, soybeans and hay. Woodlands are a mixture of various hardwoods, spruce and pines.

Spray Irrigation

Treated wastewater for land application will be applied via overhead center pivot irrigation to agricultural croplands and via fixed set sprinklers to woodlands. Wastewater will be directed throughout the network of application systems based upon available water and storage capacities, crop needs, weather, previous application history and hydraulic loading restrictions. Any applicable buffer requirements for wastewater applications will be maintained.

Application Restrictions

Wastewater applications will be limited to a maximum of 2.5 per week throughout the year. Applications will be timed whenever possible to times of greatest crop needs and limited in the winter and times of poor soil and weather conditions. Applications during times of frozen and/or saturated soils should only occur when absolutely necessary.

These applications cannot result in runoff to adjacent properties, tax ditches or water bodies.

The operators should utilize as much storage capacity as possible during the winter months and periods of inclement weather (saturated/frozen ground) and/or low crop moisture demands. Treatment processes should maximize nitrogen removal in treatment processes when not beneficial to crops. Operators should spread wastewater application across all available land in a manner that best utilizes nutrients and supplied moisture to enhance crop growth. Coordination between the operators of the plant and the farming operations along with nutrient management planners concerning wastewater application frequencies, timing and amounts are encouraged to maximize the agronomic benefits while minimizing any negative environmental impacts (runoff, drift, etc.).

Nutrient Management Planning (NMP)

The NMP is a constantly changing set of documents that is the heart of the VMP. The NMP will be updated annually and will comply with Delaware Nutrient Management Regulations. Nutrient recommendations will be based upon the latest data (soil tests, yield, crop rotations, etc.) with consideration given to economics and environmental impacts in order to ensure the long term sustainability of the operations. Nutrients from both wastewater and other organic and inorganic sources are to be addressed in the NMP. Other practices such as (but not limited to) available nitrogen testing and plant tissue testing may be utilized to better monitor crop performance and adjust the NMP and/or wastewater applications to improve crop performance and/or reduce negative environmental impacts. Yield goals based upon average historical yields along with nitrogen and phosphorous uptake rates for the various crops are provided as a general reference in Table 1 (page 6). Individual site specific yield goals are to be included as a component of the NMP.

Proper agronomic practices such as good pest control strategies, tillage, timely planting, harvesting, and applications, irrigation scheduling, etc. should be utilized to maximize crop performance.

General Cropping Information

The cropping sequence employed on the effluent treated land is a corn/small grain/soybean/small grain (cover crop) rotation. All crops are harvested and sold to be utilized as animal feed. Crops are maintained in all of the spray irrigation fields on a year round basis with the exception being during brief transition times between harvesting and the establishment of succeeding crops. Generally no-till and minimum-till methods (low soil disturbance) are employed. More intensive tillage is occasionally employed if environmental conditions necessitate. Supplemental fertilization is performed to account for nutrient needs not supplied via effluent applications. Liming of the soils is also performed in order to maintain a pH that is advantageous to proper crop growth. These activities are dictated by the NMP and utilize soil and plant tissue test

results as a basis for decision making. Generally speaking a relatively equal split in the cropping mix on an annual basis is desired.

Corn

Corn is planted after the termination of the winter cover crop (small grain). No-till or minimum-till planting methods are usually employed. Planting occurs in mid-April to mid-May. Supplemental fertilizer (starter, pre-plant, etc.) may be applied at this time to address any additional nutrient needs.

Approximately 4-6 weeks after crop emergence soil nitrate testing is performed to help gauge nitrogen available for crop growth. Test results along with previous and anticipated effluent contributions are then utilized for the purposes of a supplemental nitrogen fertilization recommendation being provided through the certified planner.

Corn is harvested in September to early October. Yields generally range in the 200-250 bu/acre range with a typical yield being 225 bu/acre. Corn stover is occasionally harvested and a yield of approximately 1.9 tons/acre would be expected when this occurs.

Small Grain

Small grain (barley and wheat) is planted in late September through late October. Both barley and wheat are utilized as cover or harvestable crops dependent upon the cropping rotation in a given field for a given year. Additions of lime and potassium fertilizers as dictated by soil test results are usually performed at this time.

For small grain being taken to grain harvest, a determination of anticipated supplemental crop nitrogen needs is made in early March. This is to be done in a collaborative fashion between the farmers, certified consultant and Artesian personnel. This recommendation is based upon many factors which include crop condition, yield expectations, climatic conditions and contributions from both applied and anticipated applications of effluent water.

Small grains are harvested from mid-June through early July. Barley yields range from 65-95 bu/acre with 85 bu/acre being a typical expected yield. Wheat yields range from 65-100 bu/acre with 85 bu/acre being typical On occasion wheat and barley straw may also be harvested. Straw yields would be expected to range from 2,400-3,000 lbs/acre. Soybeans are planted immediately following the small grain harvest utilizing the no-till method of farming practices.

Soybeans

Soybeans are normally planted as a double crop following small grain harvest. Occasionally due to environmental conditions a full season crop of soybeans may be utilized within the rotation. Full season soybeans would be planted in mid-May to early

June. Expected full season soybean yields would be 60-70 bu/acre. Double crop soybeans are planted in mid-June through early July with an expected yield of 50-60 bu/acre.

There is generally no supplemental fertilization of double crop soybeans beyond foliar applications of needed nutrients (minor elements) as dictated by soil and plant tissue test results and environmental conditions.

Reed Canarygrass

Reed canarygrass is not currently a part of the cropping sequence but may be employed should conditions dictate. If utilized it would be established in either the spring (April) or fall (September) and maintained as a perennial crop. Any necessary supplemental fertilization beyond anticipated effluent contributions would be performed in early spring (March/April) and fall (Sept/October). Expected annual yield would be 4 tons/acre.

Forestland

The associated woodlands are a mixture of hardwoods and pines that were harvested and reseeded in 2015. There is no fertilization of the forestlands beyond the contributions provided through the application of effluent. An expected harvest/planting cycle of 30 years is anticipated.

Crop Yields

Table 1 is provided below as a reference for the yields and nutrient removal rates of the various crops for the purposes of system design.

Table 1

Crop Yields Overview and Estimated Removal Rates (System Design)

Crop*	Yield	Moisture %	Units	Nitrogen Removal per Unit	Nitrogen Removal (lbs/acre @ Yield	Phosphorous Removal per Unit	Phosphorous Removal (lbs/acre @ Yield
Corn	225	15.5	bu/acre	0.69	155.25	0.40	90
Corn Stover	1.9		tons/acre	18.3	34.8	2.0	
Barley	85	14.0	bu/acre	0.76	64.6	0.23	19.6
Barley Straw	1.35		tons/acre	15.0	20.25	5.0	
Wheat	85	13.0	bu/acre	1.05	89.25	0.30	25.5
Wheat Straw	1.35		tons/acre	18.0	24.3	2.0	
Cover Crop	Not Harvested				40	N/A	
FS Soybeans	60	13.0	bu/acre	3.44	206.4	0.82	49.2
DC Soybeans	55	13.0	bu/acre	3.44	189.2	0.82	45.1
Reed Canarygrass	4	11.0	tons/acre	30.3	121.2	5.05	20.2
Forestland Pine/Hardwood Mix	N/A						

*Reed Canarygrass nutrient removal information provided by USDA/NRCS
*All other crop nutrient removal rates provided by University of Delaware

Summary

Nutrient management planning is performed on an on-going basis throughout the year. It is done as collaborative effort between the farmers, consultant and Artesian personnel to ensure permit compliance along with the goal of achieving a successful farming outcome. At a minimum, soils analyses are performed on an annual basis (fall season) along with any needed in-season testing deemed appropriate to the given situation. Historical data along with past and anticipated environmental conditions are also significant to the nutrient management planning and implementation process.

Appendix V

§ 110-1 Definitions; word usage; abbreviations.

A. Unless the context specifically indicates otherwise, the following terms and phrases, as used in this chapter, shall have the meanings hereinafter designated:

ACT or THE ACT

The Federal Water Pollution Control Act, also known as the "Clean Water Act," as amended, 33 U.S.C. 1251 et seq.

APPROVAL AUTHORITY

The Administrator of the EPA in an NPDES state without an approved state pretreatment program.

APPROVED

Accepted or acceptable under an applicable specification cited in this Code or accepted as suitable for the proposed use under procedures and powers of the County Engineer.

AUTHORIZED REPRESENTATIVE OF AN INDUSTRIAL USER

(1) A principal executive officer of at least the level of vice president, if the industrial user is a corporation.

(2) A general partner or proprietor, if the industrial user is a partnership or proprietorship, respectively.

(3) A duly authorized representative of the individual designated above, if such representative is responsible for the overall operation of the facilities from which the indirect discharge originates.

BACKFLOW

The flow of water or other liquids, mixtures or substances into the distribution pipes of a potable supply of water from any source or sources.

BACKFLOW PREVENTER

A device or means to prevent backflow.

BIOCHEMICAL OXYGEN DEMAND (BOD)

The quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure, five days at 20° C., expressed in terms of weight and concentration (milligrams per liter (mg/l).

BUILDING

A structure built, erected and framed of component structural parts designed for the housing, shelter, enclosure or support of persons, animals or property of any kind.

BUILDING DRAIN

That part of the lowest piping of a drainage system which receives the discharge from soil, waste and other drainage pipes inside the walls of the building and conveys it to a point directly outside of the building and to the building sewer.

BUILDING SEWER

That part of the drainage system which extends from the end of the building drain and conveys its discharge to a public sewer, private sewer, individual sewage disposal system or other point of disposal.

CATEGORICAL STANDARDS

National Categorical Pretreatment Standards or pretreatment standards.

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY (CPCN)

An approval granted to a private utility for a certain tax parcel by the Delaware Public Service Commission under a process defined in Title 26 of the Delaware Code.

CESSPOOL

A covered excavation in the ground which receives the discharge of domestic sewage or other organic wastes from a drainage system, so designed as to retain the organic matter and solids but permitting the liquids to seep through the bottom and sides.

CODE

When used alone, the Sussex County Code, subsequent amendments or any emergency rule or regulation which Sussex County Council may lawfully adopt.

CONTROL AUTHORITY

The approval authority, defined hereinabove, or, if the County has adopted an approved pretreatment program under the provisions of 40 CFR 403.11, the official designated therein.

COOLING WATER

The water discharged from any use, such as air conditioning, cooling or refrigeration, or to which the only pollutant added is heat.

CROSS-CONNECTION

Any connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other water of unknown or questionable safety, whereby water may flow from one system to the other.

CUSTOMER

Any person, firm, corporation or organization supplied with water or provided with sewer service by Sussex County.

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL (DNREC)

The agency responsible for monitoring all discharges to the surface- and groundwaters of the State of Delaware.

DIRECT DISCHARGE

The discharge of treated or untreated wastewater directly to the waters of the State of Delaware.

DRAINAGE SYSTEM

Includes all the piping within a public or private system conveying sewage or other liquid wastes by means of gravity.

DWELLING

A structure having walls and a roof designed and used for the housing, shelter, enclosure or support of persons, animals or property.

EASEMENT

A right acquired by public authority to use or control property for a designated use. An "easement" restricts but does not abridge the rights of the fee owner to the use and enjoyment of his land.

ENGINEER

The duly appointed County Engineer designated by the County pursuant to Title 9 of the Delaware Code, who is the person overseeing all aspects of the Sussex County Engineering Department charged with certain duties and responsibilities under this chapter of the Code or the authorized designee.

ENVIRONMENTAL PROTECTION AGENCY or EPA

The United States Environmental Protection Agency; or, where appropriate, the term may also be used as a designation for the Administrator or other duly authorized official.

EQUIVALENT DWELLING UNIT (EDU)

An arbitrary term used to express the load-producing effects on the water system and/or sewer system caused by one average-sized residential dwelling.

FACILITY

For the purposes of this chapter, the term "facility" means any of the County-owned and -operated regional wastewater facilities. This definition includes any sewers that convey wastewater to a facility. For the purposes of this chapter, "facility" shall also include any sewers that convey wastewaters to a facility from persons outside Sussex County who are, by contract or agreement with the County, users of the County's facility.

FALL

The slope of a line of pipe in reference to a horizontal plane. In drainage systems it is usually expressed as the "fall" in a fraction-of-an-inch-per-foot length of pipe.

FIXTURE UNIT (FU)

A quantity in terms of which the load-producing effects on the water system and/or sewer system of fixtures are expressed on a representative chosen scale.

FRONT FOOTAGE

Assessable parcel footage measurement as determined in this chapter and by the Official Sussex County Property Map.

GRAB SAMPLE

A sample which is taken from a waste stream on a one-time basis with no regard to the flow in the waste stream and without consideration of time.

HOLDING TANK WASTE

Any waste from holding tanks, such as vessels, chemical toilets, campers, manufactured homes, septic tanks and vacuum-pump tank trucks.

INDIRECT DISCHARGE

The discharge or the introduction of nondomestic pollutants from any source regulated under Section 307(b) or (c) of the Act (33 U.S.C. § 1317) into a County facility including holding tank waste discharged into the system.

INDUSTRIAL USER

A source of indirect discharge which does not constitute a discharge of pollutants under regulations issued pursuant to Section 402 of the Act (33 U.S.C. § 1342).

INDUSTRIAL WASTE

Waste that originates from a business or industry having a standard industrial classification (SIC) code or an expected classification, or having a reasonable potential, in the opinion of the Engineer, to adversely affect the facility (inhibition, pass-through of pollutants, sludge contamination or endangerment of staff).

INTERCEPTOR or SEPARATOR

A device designed and installed to separate and retain deleterious, hazardous or undesirable matter from normal waste streams while permitting the normal waste stream to discharge into the drainage system.

INTERFERENCE

The inhibition or disruption of the facility treatment processes or operations which contributes to a violation of any requirement of the NPDES permit. The term includes prevention of sewage sludge use or disposal in accordance with Section 405 of the Act (33 U.S.C. § 1345) or any criteria, guidelines or regulations developed pursuant to the Solid Waste Disposal Act (SWDA), the Clean Air Act, the Toxic Substances Control Act[1] or more stringent state criteria, including those contained in any state sludge management plan prepared pursuant to Title IV of SWDA), applicable to the method of disposal or use employed by the facility.

MULTIPLE LIVING UNIT

A condominium unit, townhouse unit, apartment unit, hotel or motel room, manufactured home site, campground site, travel trailer site and all other types of living units located on a single parcel.

NATIONAL CATEGORICAL PRETREATMENT STANDARD

Any regulation containing pollutant discharge limits promulgated by the EPA in accordance with Section 307(b) and (c) of the Act (33 U.S.C. § 1347) which applies to a specific category of industrial users.

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM OR NPDES PERMIT

A permit issued pursuant to Section 402 of the Act (33 U.S.C. § 1342).

NATIONAL PROHIBITIVE DISCHARGE STANDARD or PROHIBITIVE DISCHARGE STANDARD

Any regulation developed under the authority of Section 307(b) of the Act and 40 CFR 403.5.

NATURAL OUTLET

Any outlet into a watercourse, pond, ditch, lake or other body of surface- or groundwater.

NEW SOURCE

Any source, the construction of which is commenced after the publication of proposed regulations prescribing a Section 307(c) (33 U.S.C. § 1317) categorical pretreatment standard which will be applicable to such source, if such standard is thereafter promulgated within 120 days of proposal in the Federal Register. Where the standard is promulgated later than 120 days after proposal, a "new source" means any source, the construction of which is commenced after the date of promulgation of the standard.

PARCEL

An area of land measured, surveyed and plotted and set apart for separate use, ownership and occupancy possibly encompassing two previously recorded individual lots.

PERSON

Any individual, partnership, copartnership, firm, company, corporation, association, joint-stock company, trust, estate, governmental entity or any other legal entity or their legal representatives, agents or assigns. The masculine gender shall include the feminine, and the singular shall include the plural where indicated by the context.

PH

The logarithm (base 10) of the reciprocal of the concentration of hydrogen ions expressed in grams per liter of solution.

POLLUTANT

Any dredged spoil, solid waste, incinerator residue, garbage, sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discharged equipment, rock, sand, dirt and industrial, municipal and agricultural waste discharged into water.

POLLUTION

The man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of water.

POTABLE WATER

Water which is satisfactory for drinking, culinary and domestic purposes and meets the requirements of the primary and secondary standards of the Safe Drinking Water Act.[2]

PRETREATMENT or TREATMENT

The reduction of the amount of pollutants, the elimination of pollutants or the alteration of the nature of pollutant properties in wastewater to a less harmful state prior to or in lieu of discharging or otherwise introducing such pollutants into a facility. The reduction or alteration can be obtained by physical, chemical or biological processes or process changes by other means, except as prohibited by 40 CFR 403.6(d).

PRETREATMENT REQUIREMENTS

Any substantive or procedural requirement related to pretreatment, other than a national pretreatment standard imposed on an industrial user.

PRETREATMENT STANDARD

See definition of "National Categorical Pretreatment Standard" above.

PUBLICLY OWNED TREATMENT WORKS (POTW)

A treatment works as defined by Section 212 of the Act (33 U.S.C. § 1292), which is owned in this instance by Sussex County used in this chapter interchangeably with "facility."

RIGHT-OF-WAY

A legal right of passage over another person's ground acquired by public authority.

SANITARY SEWER

A sewer which carries sewage and to which storm-, surface- and groundwaters are not intentionally admitted.

SCATTERED PARCEL

Any single parcel of land abutted on at least two sides by developed property.

SEPTAGE

Liquid and solid materials pumped from a septic tank, cesspool or holding tank, excluding industrial waste.

SEPTAGE DISCHARGE FEE

A fee assessed to a user for each discharge made at the facility.

SEPTIC TANK

A watertight receptacle which receives the discharge of a drainage system and is designed and constructed to separate solids from the liquid, digest organic matter through a period of detention and allow the liquids to discharge into the soil outside of the tank through a system of open joint or perforated piping or disposal pit.

SEWAGE

Used interchangeably with "wastewater."

SEWER SYSTEM

All improvements utilized for collecting, transmitting, treating, process monitoring and disposing of sewage.

SEWER SYSTEM CONCEPT EVALUATION (SSCE)

A Sussex County Engineering Department fee-based service study identifying system connection point(s), service to off-site parcels, district status and necessity of any use of existing infrastructure agreement.

SIGNIFICANT INDUSTRIAL USER

Any industrial user of the County's wastewater disposal system who has a discharge flow of 10,000 gallons or more per average workday or has a flow greater than 5% of the flow in the County's wastewater treatment system or has, in his wastes, toxic pollutants as defined pursuant to Section 307 of the Act or is found by the County, Delaware DNREC or the United States Environmental Protection Agency to have significant impact, either singly or in combination with other contributing industries, on the wastewater treatment system, the quality of sludge, the system's effluent quality or air emissions generated by the system.

STANDARD INDUSTRIAL CLASSIFICATION (SIC)

A classification pursuant to the Standard Industrial Classification Manual issued by the Executive Office of the President, Office of Management and Budget, 1972.

STORMWATER

Any flow occurring during or following any form of natural precipitation and runoff resulting therefrom.

STREET

A public or private thoroughfare which affords the principal means of access to abutting property.

SUSPENDED SOLIDS

The total suspended matter that floats on the surface of or is suspended in water, wastewater or other liquids and which is removable by laboratory filtering.

TECHNICAL BULLETIN FOR BUILDING SEWER AND WATER SERVICE

A nonregulatory document outlining standards and details for the installation of private building sewers and water service lines. Modifications to this document based on the latest technology shall be posted on the Sussex County website 30 days prior to taking effect.

TOXIC POLLUTANT

Any pollutant or combination of pollutants listed as toxic in regulations promulgated by the Administrator of the Environmental Protection Agency under the provision of CWA 307(a)[3] or other acts.

TRAP

A fitting or device so designed and constructed as to provide, when properly vented, a liquid seal which will prevent the back passage of air without materially affecting the flow of sewage through it.

UNIFIED SANITARY SEWER DISTRICT

The Unified Sanitary Sewer District of Sussex County with boundaries as established and/or subsequently amended by Sussex County Council.

USER

Any person, partnership, corporation or an employee thereof that utilizes a facility for discharge of septage.

VACUUM BREAKER

A device which prevents backsiphon of water by admitting atmospheric pressure through ports to the discharge side of device.

VENT SYSTEM (VENTED)

A system of pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure.

WASTEWATER (used interchangeably with SEWAGE)

The liquid and water-carried industrial or domestic wastes from dwellings, commercial buildings, industrial facilities and institutions, whether treated or untreated, which are contributed into or permitted to enter the facility.

WATER MAIN

A water supply pipe for public use.

WATER SERVICE PIPE

The pipe from the connection point of the public water system to the structure.

WATER SYSTEM

All facilities for supplying, treating, storing, transmitting, distributing and measuring water.

WATERS OF THE STATE

All streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, aquifers, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through or border upon the state or any portion thereof.

[1] *Editor's Note: See 42 U.S.C. § 6901 et seq., 42 U.S.C. § 7401et seq., and 15 U.S.C. § 2605 et seq., respectively.*

[2] *Editor's Note: See 42 U.S.C § 300f et seq.*

[3] *Editor's Note: See 33 U.S.C. 1251 et seq.*

B. Word usage. "Shall" is mandatory; "may" is permissive.

C. Abbreviations. The following abbreviations shall have the designated meanings:

BOD — Biochemical oxygen demand.

CFR — Code of Federal Regulations.

COD — Chemical oxygen demand.

CPCN — Certificate of Public Convenience and Necessity.

DNREC — Delaware Department of Natural Resources and Environmental Control.

EDU — Equivalent dwelling unit.

FU — Fixture unit.

mg/l — Milligrams per liter.

NPDES — National Pollutant Discharge Elimination System.

SIC — Standard industrial classification.

SWDA — Solid Waste Disposal Act, 42 U.S.C. § 6901 et. seq.

TSS — Total suspended solids.

USC — United States Code.

Appendix VI

AUTHORIZATION TO OPERATE AND MAINTAIN
UNDER THE LAWS OF THE
STATE OF DELAWARE

1. **Pursuant to the provisions of 7 Del. C., 6003**

   Allen Harim Foods, LLC
   P.O. Box 1380
   Millsboro, DE 19966

   is herein authorized to operate and maintain an on-site wastewater treatment and disposal system to service:

   Allen Harim Harbeson Processing Facility

   Located (tax map #: 2-35-30.00-0097.00):

   18752 Harbeson Road, Harbeson, DE, Sussex County

   To receive and treat:

   Wastewater generated by poultry processing

   And to dispose of:

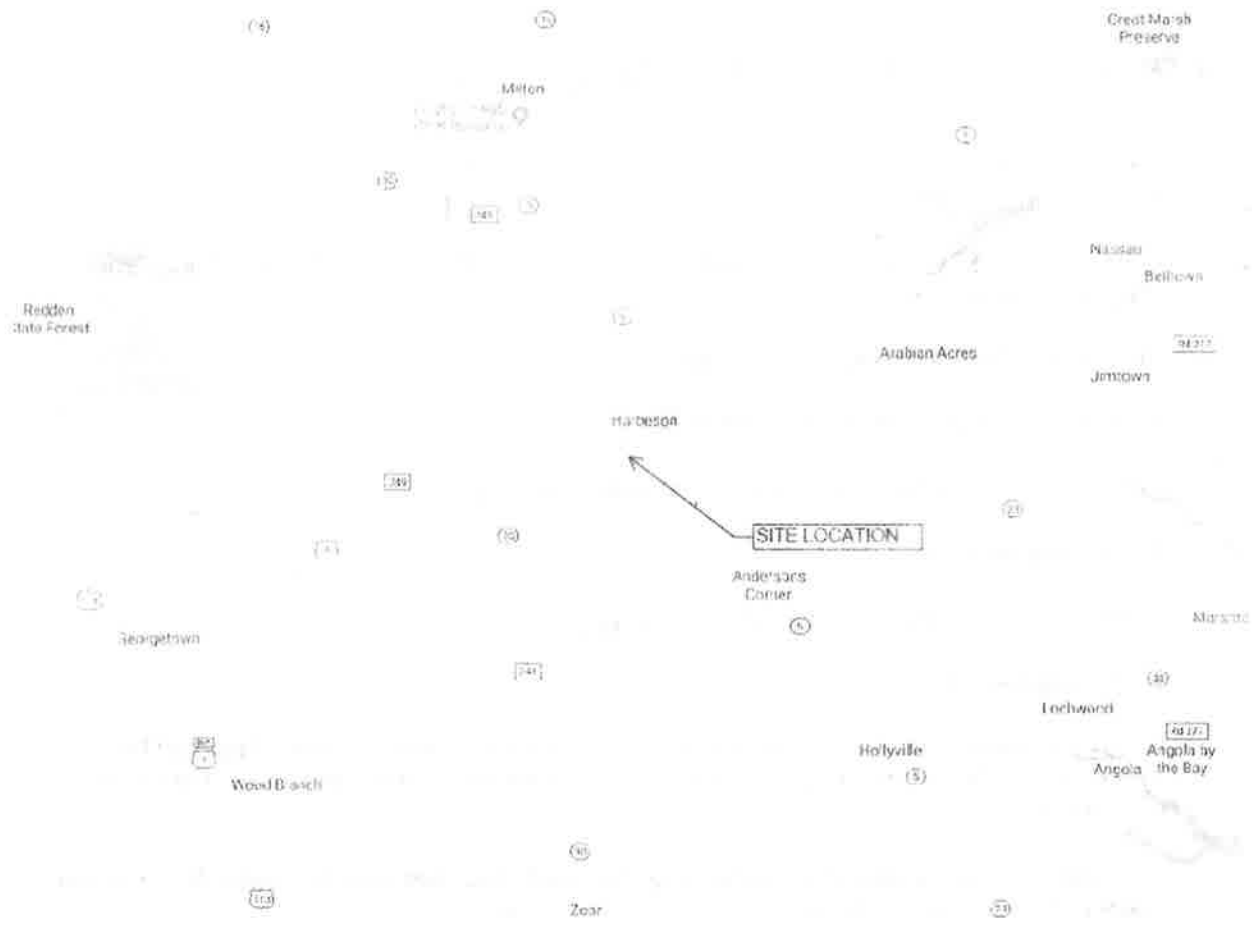
   Treated wastewater effluent via transfer to the Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF) for storage in a synthetically lined lagoon and final disposal via spray irrigation

2. **The effluent limitations, monitoring requirements and other permit conditions are set forth in Part I, II and III hereof.**

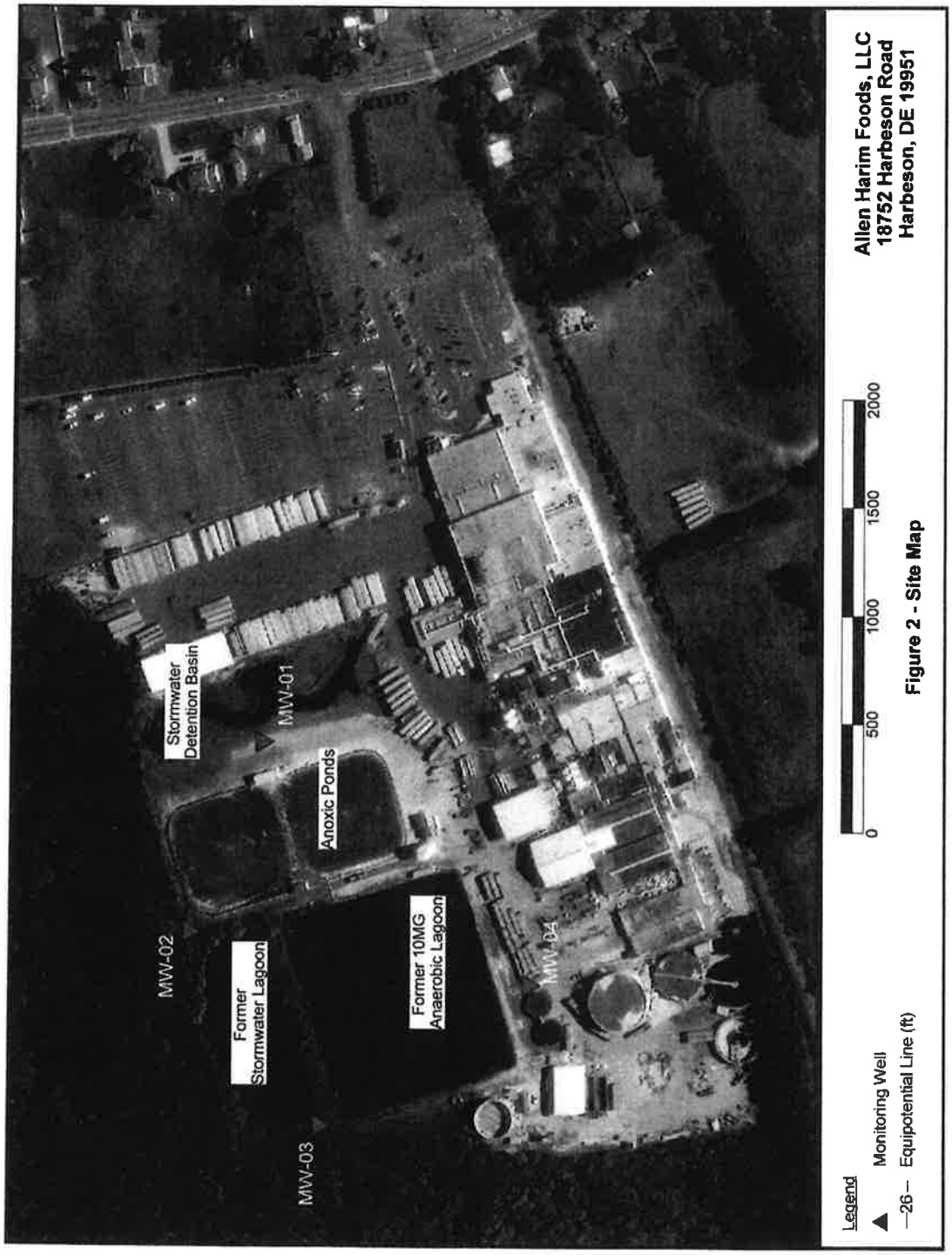
John J. Rebar Jr., Program Manager I
Ground Water Discharges Section
Department of Natural Resources &
Environmental Control

Date

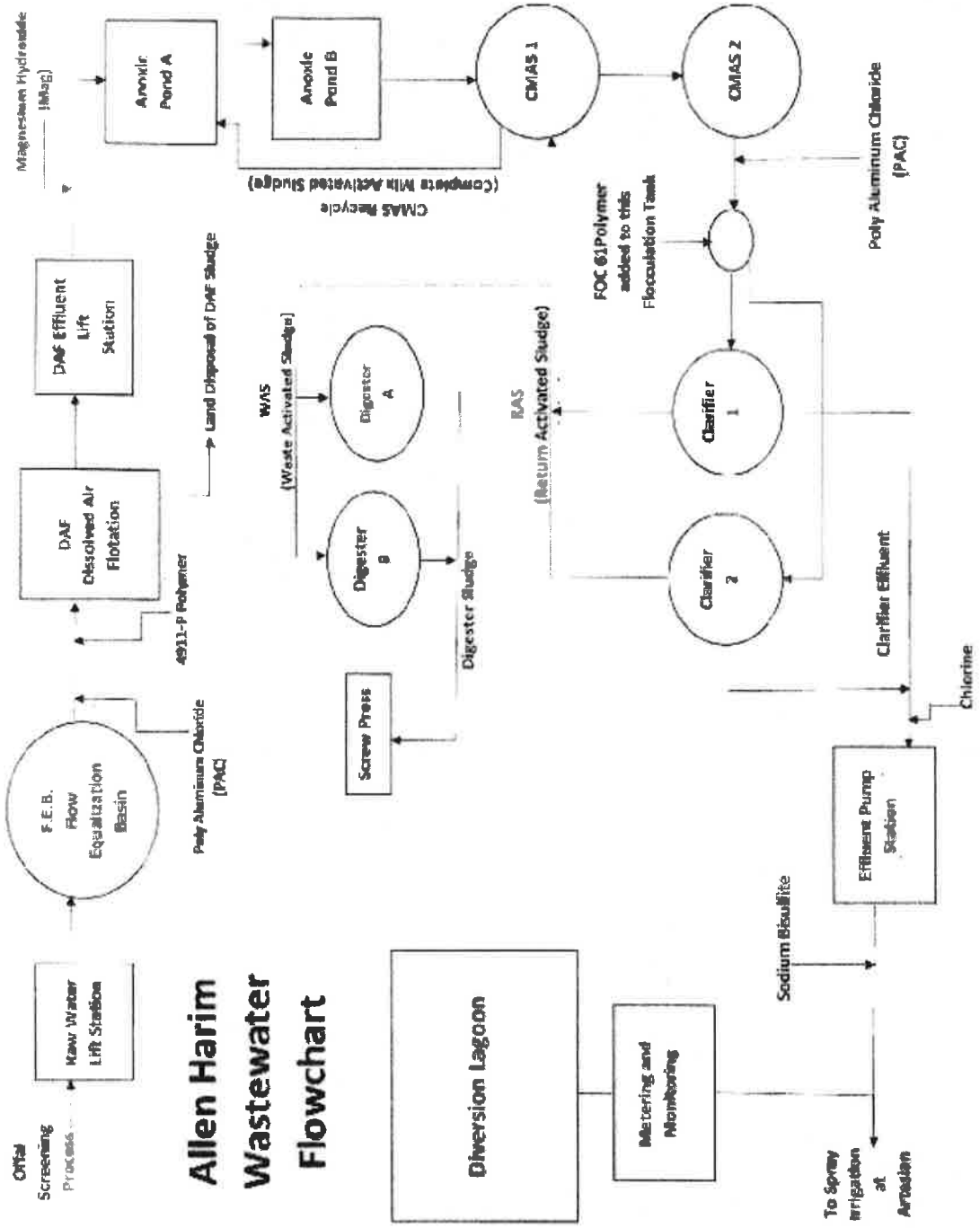
SITE LOCATION MAP



FACILITY SITE MAP



PROCESS DIAGRAM



Part I

A. Introduction

The Delaware Department of Natural Resources and Environmental Control, Division of Water, Groundwater Discharges Section (DNREC or the Department) issues this On-Site Wastewater Treatment and Disposal System Permit (State Permit No. 597261-01) to Allen Harim Foods, LLC (Permittee) pursuant to *7 Del. C.* § 6003. DNREC's purpose in issuing this Permit, and in imposing the requirements and conditions specified herein, is for the protection of the environment and the public health as required by 7 Del. Admin. C. §7101 *Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems* (the Regulations).

B. Documentation

The application consists of the materials submitted by the Permittee and materials contained in the administrative record prior to the issuance of this Permit. This includes (but not limited to) the following information.

1. DNREC Application & Signature Form, received on August 4, 2018
2. Final Design Summary, dated November 23, 2015, Wastewater Treatment System Upgrades and Expansion for Allen Harim, LLC Harbeson, DE prepared by Reid Engineering Company, Inc.
3. Construction Plans, dated January 8, 2016, Wastewater Treatment System Upgrades and Expansion Phase One for Allen Harim, LLC Harbeson, DE prepared by Reid Engineering Company, Inc.
4. Record Drawing, dated March 13, 2019, Forcemain Piping Plan, Allen Harim, LLC Harbeson, DE prepared by Artesian Wastewater Management, Inc.
5. Wastewater Treatment System Operation and Maintenance Plan, received on July 24, 2019 and prepared by Allen Harim Foods, LLC.

C. General Description of Discharge

The on-site wastewater treatment and disposal system is authorized to receive and treat poultry processing wastewater generated at the Allen Harim Harbeson Processing Facility; deboning process wastewater received from the Allen Harim Pinnacle Processing Facility and wash down water received from the Allen Harim Dagsboro Hatchery. The treatment system consists of primary screening, flow equalization basin, dissolved air floatation (DAF) unit, two (2) anoxic biological nutrient removal (BNR) basins, two (2) complete mix activated sludge (CMAS) basins, one (1) flocculation tank, two (2) clarifiers, and one (1) chlorine contact chamber. The treatment system also includes two (2) aerobic digesters and a screw press for sludge processing. The treatment system is also capable of diverting non-compliant wastewater to various on-site basins/lagoons followed by recirculation and re-treatment. Treated wastewater effluent is pumped via forcemain to the Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF) for storage in a synthetically lined lagoon and final disposal via spray irrigation in accordance with State Permit No. 359288-02.

D. Influent Limitations

Beginning on the effective date and lasting through the expiration date of this Permit, the Permittee is authorized to receive and treat the quantity of influent specified below.

1. The average influent flow from the Allen Harim Harbeson Processing Facility shall not exceed two (2) million gallons per day (MGD).

2. The maximum influent flow from the Allen Harim Pinnacle Processing Facility shall not exceed 40,000 gallons per day (GPD).

3. The maximum influent flow from the Allen Harim Dagsboro Hatchery shall not exceed 40,000 GPD.

E. Effluent Limitations

Beginning on the effective date and lasting through the expiration date of this Permit, the Permittee is authorized to discharge to ANSRWRF the quantity and quality of effluent specified below.

1. The average effluent flow from the Allen Harim Harbeson Facility transferred to ANSRWRF shall not exceed 1.5 MGD averaged over a 7-day period and shall not exceed a peak daily flow of 2.0 MGD.

2. 5-Day Biochemical Oxygen Demand (BOD_5) daily average concentration shall not exceed 10 mg/l.

3. Fecal coliform concentration shall not exceed 20 col/100 ml at any time.

4. Total Nitrogen (as N) concentration daily average shall not exceed 30 mg/l.

5. Total Nitrogen (as N) concentration daily maximum shall not exceed 45 mg/l.

6. Total Suspended Solids (TSS) daily average concentration shall not exceed 10 mg/l.

7. Turbidity concentration shall not exceed 5 NTU at any time.

8. The pH of the effluent shall not be less than 5.5 standard units nor greater than 9.0 standard units at any time.

9. The total residual chlorine concentration shall not be less than 1.0 mg/L nor more than 4.0 mg/L at any time.

F. Schedule of Compliance

1. The Permittee shall cease discharging treated process wastewater to Beaverdam Creek by June 1, 2020.

2. The Permittee shall comply with the requirements herein as soon as possible, but in no event later than the dates set forth in the following schedule.

   i. Within 30 days of the effective date of this Permit, the Permittee shall submit a conceptual plan (for Department review and approval) that details stormwater drainage areas of the plant where stormwater drainage will be disconnected from the wastewater treatment system. This plan shall include a detailed map showing drainage areas, overland flow pattern, and activities performed in the areas where disconnection from the wastewater treatment system is proposed.

   ii. Within 60 days of the Department's approval of the plan, the Permittee shall cease discharging stormwater to the wastewater treatment system from the approved drainage areas of the facility.
      a. The Permittee is authorized to discharge stormwater from Outfalls 002 and 003 in accordance with NPDES Permit No. DE0000299.

   iii. Within 90 days of the effective date of this Permit, the Permittee shall submit a plan (for Department review and approval) to eliminate or reduce to the maximum extent practicable the concentration of enterococcus and sediment (i.e., total suspended solids) in stormwater to comply with Broadkill River TMDL requirements.
      a. The plan shall include the identification of potential sources of enterococcus and sediment, additional "best management practices" (BMPs) to be implemented, and a monitoring and implementation schedule.

   iv. Within 180 days of the effective date of this Permit, the Permittee shall begin implementation of its plan of action with project completion no later than one (1) year from the effective date of this Permit.

3. The Permittee shall complete clean-out operations, rehabilitate, and synthetically re-line the "old" anaerobic lagoon to be used as the permanent diversion option for non-compliant wastewater by January 1, 2021.

   i. The Permittee shall submit a copy of a signed and executed contract for "old" anaerobic lagoon clean-out operations including documentation from a disposal facility willing to accept the sludge by April 1, 2020.

   ii. The Permittee shall submit notification of mobilization and the start of clean-out activities by April 1, 2020.
      a. The Permittee shall maintain records documenting the volume of sludge removed from the "old" anaerobic lagoon and the location of final disposal and submit this information to the Department monthly until the lagoon clean-out is complete.

iii. The Permittee shall complete "old" anaerobic lagoon clean-out operations by November 30, 2020.

iv. The Permittee shall install a new synthetic liner in the "old" anaerobic lagoon by December 31, 2020.

4. No later than 14 calendar days following a date identified in the above schedule of compliance, the Permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of the noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

G. Monitoring Requirements

During the period beginning on the effective date and lasting through the expiration date of this Permit, the Permittee shall perform the following monitoring as specified below.

For samples required to be taken 'monthly' and/or 'twice per month', the samples for each monitoring location (i.e. influent, effluent, well, etc.) shall be taken a minimum of 14 days apart.

Requests for monitoring modifications shall be submitted to the Department in writing. Such requests shall clearly state the reason for and nature of the proposed modification and, where applicable, shall contain supporting scientific information, analysis, and justification. Requests will be addressed by the Department on a case by case basis.

1. Influent and Effluent Samples

Wastewater treatment system influent and effluent shall be sampled for the following parameters. Effluent shall be sampled following final treatment at the effluent pump station.

Parameter	Unit Measurement	Monitoring Frequency	Sample Type	
			Influent	Effluent
Flow	Gallons Per Day	Continuous	Recorded	Recorded
BOD_5	mg/L	2 x Month	Grab	Composite
TSS	mg/L	2 x Month	Grab	Composite
Total Dissolved Solids	mg/L	Quarterly	NA	Grab
Fecal Coliform	Col/100 ml	Quarterly	NA	Grab
Total Nitrogen	mg/L	1 x Week	Grab	Composite
Ammonia Nitrogen	mg/L	Monthly	Grab	Composite
Nitrate/Nitrite as Nitrogen	mg/L	Monthly	Grab	Composite

pH	S.U.	3 x per week	Grab	Composite
Total Phosphorus	mg/L	Monthly	Grab	Composite
Chloride	mg/L	Quarterly	Grab	Composite
Turbidity	NTU	Continuous	N/A	Recorded
Total Residual Chlorine	mg/L	Continuous	N/A	Recorded
Potassium	mg/L	Quarterly	N/A	Composite
Sodium	mg/L	Quarterly	N/A	Composite

2. Monitoring Wells

The following monitoring wells

Local ID	DNREC ID
MW-01	260091
MW-02	260092
MW-03	260093
MW-04	260094

shall be sampled by the Permittee for the following parameters.

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
pH	S.U.	Quarterly	Field Test
Temperature	°F	Quarterly	Field Test
Specific Conductance	µS/cm	Quarterly	Field Test
Dissolved Oxygen	mg/L	Quarterly	Field Test
Depth to Water Table	Hundredth of a foot	Quarterly	Field Test
Ammonia Nitrogen	mg/L	Quarterly	Grab
Nitrate + Nitrite Nitrogen	mg/L	Quarterly	Grab
Total Nitrogen	mg/L	Quarterly	Grab
Total Coliforms	Col/100 ml	Quarterly	Grab
Fecal Coliform	Col/100 ml	Quarterly	Grab
Total Phosphorus	mg/L	Quarterly	Grab
Sodium	mg/L	Quarterly	Grab
Chloride	mg/L	Quarterly	Grab

Total Dissolved Solids	mg/L	Quarterly	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at each monitoring well and observation well in accordance with procedures approved by the Department and listed in the *State of Delaware Field Manual for Groundwater Sampling* (Custer, 1988).

Groundwater monitoring results for each monitoring well shall be reported using the State of Delaware Well Identification Tag Number that is required on all wells in accordance with Delaware's *Regulations Governing the Construction and Use of Wells*, Section 11.1.
All field sampling logs and laboratory results for samples obtained from a well shall be identified by the DNREC ID affixed to the well.

H. Monitoring Reporting

Annual Reporting Requirements

In accordance with Section 6.9 of the *Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems* (the Regulations), the Permittee shall submit to the Department an annual report summarizing operations, management, administration and maintenance of the facility for the calendar year. The annual report shall be submitted to the Department on or before February 28th of each year.

Monthly/Quarterly Requirements

Monitoring results obtained during the previous one month/quarter shall be summarized for each month/quarter and reported on an approved On-Site Effluent/Groundwater Monitoring Report Form postmarked no later than the 28th day of the month following the completed reporting period. Signed copies of these reports/forms, and all other reports or documentation (laboratory analytical results, sampling logs, and field data sheets, etc.) required herein shall be submitted to the Department at the following address:

Delaware Department of Natural Resources and Environmental Control
Ground Water Discharges Section
89 Kings Highway
Dover, DE 19901
Telephone: (302) 739-9948
Fax: (302) 739-7764

The Department may provide written requirements for the Permittee to submit monitoring data electronically. Upon notification from the Department, the Permittee shall transition (as directed) to the Department's electronic database system. The submission may need to be electronically signed.

I. Monitoring results reported as less than the detectible limit shall be reported with the less than symbol "<" before the detection limit. The full detection limit value shall be utilized in any necessary calculations. The less than symbol shall be carried through the calculation. The resulting value shall include any appropriate less than or greater than symbol resulting from the calculation.

J. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

K. Test Procedures

Test procedures for the analysis of pollutants shall conform to the applicable test procedures identified in 40 C.F. R. Part 136 or the most recently adopted copy of Standard Methods unless otherwise specified in this Permit.

L. Quality Assurance Practices

The Permittee is required to show the validity of all monitoring data by requiring its laboratory to adhere to quality assurance practices in accordance with Section 6.8.2.4 of the Regulations.

M. Recording of Results

i. For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:
   a. The exact place, date and time of sampling and/or measurement;
   b. The person(s) who performed the sampling and/or measurement;
   c. The date(s) the analyses were performed and the time the analyses were begun;
   d. The person(s) who performed the analyses; and
   e. The results of each analysis.

N. Additional Monitoring by Permittee

If the Permittee monitors any pollutant at the location(s) designated herein more frequently than required by this Permit, using approved analytical methods specified herein, then the results of such monitoring shall be included in the calculation and reporting of the values required in the appropriate On-Site Effluent/Groundwater Monitoring Report Form. Such increased frequency shall also be indicated.

O. Records Retention

All records and information resulting from the monitoring activities required by this Permit including all records of analyses performed and calibration and maintenance of instrumentation and recording from continuous monitoring instrumentation shall be retained for five (5) years. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or regarding control standards applicable to the Permittee, or as requested by the Department.

P. Facility Classification

A classification was performed on the permitted facility in accordance with *Regulations Licensing Operators of Wastewater Facilities.* The wastewater treatment system is designated as a Class IV Facility. The facility shall be under the direction of a Class IV Licensed Operator in Direct Responsible Charge for the facility who is available at all times. A licensed operator, operating under the direction of the licensed operator in Direct Responsible Charge for the facility, shall be available when the facility is in operation.

Part II

A. MANAGEMENT REQUIREMENTS

a. Duty to Comply

The Permittee shall comply with all the terms and conditions of this Permit.

The discharge of any pollutant more frequently than, or at a level in excess of that identified and authorized herein, shall constitute a violation of the terms and conditions of this Permit. The violation of any influent/effluent limitation or of any other condition specified in this Permit is a violation of 7 Del. C. Chapter 60 and is grounds for enforcement as provided in 7 Del. C., Chapter 60 "Enforcement; civil and administrative penalties; and expenses.", "Criminal Penalties." and "Cease and desist order." for Permit termination or loss of authorization to discharge pursuant to this Permit, for Permit revocation and reissuance, or Permit modification, or denial of a Permit renewal application. The Department may seek voluntary compliance by way of warning, notice or other educational means, pursuant to 7 Del. C., Chapter 60 "Voluntary compliance." or any other means authorized by Law. However, the Law does not require that such voluntary means be used before proceeding by way of compulsory enforcement.

b. Groundwater Requirements

Operation of the on-site wastewater treatment and disposal system shall not cause the quality of Delaware's groundwater resources to be in violation of applicable Federal or State Drinking Water Standards.

c. Facilities Operation

The Permittee shall at all times maintain in good working order and operate as efficiently as possible all collection and treatment facilities and systems (and related appurtenances) installed or used by the Permittee for water pollution control and abatement to achieve compliance with the terms and conditions of this Permit. Proper operation and maintenance include, but is not limited to, effective performance (based upon the facilities' design), adequate funding, effective management, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, when necessary, to achieve compliance with the terms and conditions of this Permit.

An operator log shall be kept on site at all times. All records and reports shall also be kept on site at all times. This log shall, at a minimum, include the following:

i. Time spent at the facility on any date;

ii. Details of the operation and maintenance performed on the system on any date;

iii. The volume of wastewater received and treated;

iv. A record of any deviations from the operation and maintenance manual or permit conditions;

v. A record of any deviations from the operation and maintenance manual or any condition that required effluent diversion;

vi. General daily weather conditions;

vii. A record of all actions taken to correct violations of this Permit and the Department's regulations;

viii. Record of all site management activities undertaken; and

ix. Record the date and volumes, and destination of biosolids removed from the system. When biosolids are removed or transported from the facility, a copy of the biosolids hauling receipts with amounts removed shall be kept on file at the site.

d. Change in Discharge

Any usage authorized herein shall be consistent with the terms and conditions of this Permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges shall be reported by submission of a written report to the Department with the following timelines:

i. Thirty (30) days before any planned physical alteration or addition to the permitted facility or activity if that alteration or addition would result in any change in information that was submitted to the Department.

ii. Thirty (30) days before any anticipated change which would result in noncompliance with any Permit condition or the Regulations.

iii. Immediately after the Permittee becomes aware of relevant facts not submitted or incorrect information submitted in a Permit application or any report to the Department. Those facts or the correct information shall be submitted as soon as possible and be included as part of the report.

e. Noncompliance Notification

If, for any reason, the Permittee does not comply with or will be unable to comply with any limitation(s) or condition(s) specified in this Permit, the Permittee shall contact the Ground Water Discharges Section at 739-9948, within 24 hours of noncompliance issue(s) occurring.

The Permittee shall also provide the Ground Water Discharges Section with the following information, in writing, within five (5) days of becoming aware of such condition:

i. A description of, and cause of noncompliance with any such limitation(s) or condition(s); and

ii. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue;

iii. Notification if diversion occurred and the volume of effluent diverted; and

iv. The steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance(s).

f. Spill Reporting

In the event of any environmental release of pollutants (i.e., spill), the Permittee shall call the Department's 24-hour Emergency Release Reporting Hotline at (800) 662-8802.

The Permittee shall also notify the GWDS regarding any environmental release of pollutants (i.e., spill) into surface water or groundwater or on land, within 24-hours from the time the Permittee becomes aware of the release and activate their emergency site plan. In addition, the following information shall be reported to the GWDS within five days.

1. The facility name and location of release;
2. The chemical name or identity of any substance involved in the release;
3. An indication of whether the substance is an extremely hazardous substance;
4. An estimate of the quantity of any such substance that was released into the environment;
5. The time and duration of the release;
6. The medium or media into which the release occurred;
7. Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals;
8. Proper precautions to take as a result of the release, including evacuation;
9. The names and telephone number of the person or persons to be contacted for further information; and
10. Such other information as the GWDS may require.

g. Bypassing

The diversion of flow from any portion of the treatment facility's process flow (including, but not limited to, pretreatment, storage, distribution and land application) necessary to maintain compliance with the terms and conditions of this Permit is prohibited unless:

a) The bypass is unavoidable to prevent personal injury, loss of life, severe property damage, or materially adversely affect public health and/or the environment; or
b) There are no alternatives readily available.

The Groundwater Discharges Section shall be orally notified within 24 hours after such bypass; and, a written submission regarding the bypass shall be submitted within five days of the Permittee's becoming aware of the bypass. Where the need for a bypass is known (or should have been known) in advance, this notification shall be submitted to the Groundwater Discharges Section for approval at least ten days prior, or as soon as possible, before the date of bypass.

The treatment facility shall be repaired and restored to the permitted design operations process flow.

h. Adverse Impact

The Permittee shall take all reasonable steps to eliminate or minimize any adverse impact to waters of the State resulting from operating under this Permit, including such accelerated or additional monitoring as necessary to determine the source, nature, and extent of the impact from a noncomplying discharge. In addition, at the direction of the Department, the Permittee shall submit a timely corrective action plan which will include a description of the proposed actions to mitigate or eliminate the source of the impact and an associated completion schedule. The plan shall be enacted as approved by the Department.

i. Removed Substances

Solids, sludge, filter backwash or other pollutants removed in the course of treatment or control of wastewater shall be disposed of in a manner such as to prevent any pollutant from entering the surface water or ground water and to comply with applicable federal or state laws and regulations.

j. Power Failures

An alternative power source, which is sufficient to operate the wastewater treatment and disposal facilities, shall be available. If such alternative power source is not available, the Permittee shall halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater facilities.

B. RESPONSIBILITIES

a. Reapplication for a Permit

At least 180 days prior to the expiration date of the Operation Permit, the Permittee shall submit an application for renewal or notify the Department of the intent to cease discharging by the expiration date. The application package for systems

with a design flow ≥ 100,000 GPD, shall include a five (5) year Compliance Monitoring Report (CMR) in accordance with Section 6.5.4.3 of the Regulations.

In the event that a timely and complete application has been submitted as determined by the Department, and the Department is unable, through no fault of the Permittee, to issue a new permit before the expiration date of this Permit, the terms and conditions of this Permit are automatically continued and remain fully effective and enforceable until a decision is made on the new application.

b. Right of Entry

The Permittee shall allow, at reasonable times, the Secretary of the Department of Natural Resources and Environmental Control, or his authorized representatives, upon the presentation of credentials and such other documents as may be required by law:

i. To enter upon the Permittee's premises where the on-site wastewater treatment and disposal system is located or where any records are required to be kept under the terms and conditions of this Permit;

ii. To have access to and copy any records required to be kept under the terms and conditions of this Permit;

iii. To inspect any facility, equipment, monitoring method, monitoring equipment, practice or operation permitted or required under this Permit; and

iv. To sample or monitor for the purpose of assuring Permit compliance with any condition of this Permit, the Regulations or 7 Del C., Chapter 60.

c. Transfer of Ownership and Control

No person shall transfer a Permit from one location to another or from one piece of equipment to another. No person shall transfer a Permit from one person to another unless thirty days written notice is given to the Department, indicating the transfer is agreeable to both persons, and approval of such transfer is obtained in writing from the Department, and any conditions of the transfer approved by the Department are complied with by the transferor and the transferee.

The notice to the Department shall contain a written agreement between the transferor and the transferee, indicating the specific date of proposed transfer of permit coverage and acknowledging responsibilities of current and new Permittees for compliance with and liability for the terms and conditions of this Permit. The notice shall be signed by both the transferor and the transferee.

d. Availability of Reports

All reports prepared in accordance with the terms of this Permit shall be available for public inspection at the offices of the Department of Natural Resources and Environmental Control. Monitoring data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in 7 Del. C., §6013.

e. Permit Revocation

The Department may revoke a Permit if, among other things, the Permittee violates any Permit condition, these regulations, fails to pay applicable Departmental fees, obtains the permit by misrepresentation or fails to fully disclose all relevant facts.

Except in cases of emergency, the Department shall issue a written notice of intent to revoke to the permittee prior to final revocation. Revocation shall become final within 20 days of receipt of the notice by the Permittee, unless within that time the permittee requests an administrative hearing in writing.

The Department shall notify the Permittee in writing of any revocation hearing at least 20 days prior to the date set for such hearing.

If the Department finds the public health, safety or welfare requires emergency action, the Department shall incorporate findings in support of such action in a written notice of emergency revocation issued to the permittee. Emergency revocation shall be effective upon receipt by the Permittee. Thereafter, if requested by the Permittee in writing, the Department shall provide the permittee a revocation hearing.

f. Permit Modifications/Amendments

In consultation with the Permittee, the Department may modify or amend an existing permit provided that the modifications would not result in an increased impact or risk to the environment or to public health.

g. State Laws

This Permit shall not be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation.

h. Property Rights

The issuance of this Permit does not convey any property rights of either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

i. Severability

The provisions of this Permit are severable. If any provision of this Permit, or the application of any provision of this Permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this Permit, shall not be affected thereby.

PART III

A. SPECIAL CONDITIONS

a. Nitrogen Process Control Testing and Diversion Indicators

The Permittee shall perform process control testing using various field tests (e.g., on-site colorimetric or spectrophotometers instruments). If field tests indicate that either Nitrate as Nitrogen or Total Nitrogen concentrations exceed 25 mg/L than the Permittee shall perform operational adjustments to the denitrification process and additional laboratory testing will also begin.

If laboratory testing confirms that treated wastewater concentrations exceed 30 mg/L for either Nitrate as Nitrogen or Total Nitrogen than the Permittee shall notify the Department to determine if treated wastewater is required to be diverted on-site for retreatment. If required, the treated wastewater shall be immediately diverted for storage and retreatment.

If laboratory testing confirms that treated wastewater concentrations exceed 45 mg/L for either Nitrate as Nitrogen or Total Nitrogen than the Permittee shall immediately diverted the treated wastewater for storage and retreatment.

The Permittee shall perform Nitrate as Nitrogen or Total Nitrogen laboratory testing daily until effluent limitations are achieved.

The Permittee shall sample the effluent for the following diversion parameters using field tests and other Department approved methods:

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
			Effluent
*BOD_5	mg/L	1 x Week	Grab
COD	mg/L	5 x Week	Grab
Nitrate	mg/L	Daily	Composite & Grab
Total Nitrogen	mg/L	Daily	Composite & Grab
Dissolved Oxygen	mg/L	5 x Week	Grab

* After 1 year the BOD_5 testing monitoring frequency shall be 2 times per month.

b. Fecal Coliform Bacteria and Turbidity Diversion Requirements

In the event that analytical results of treated wastewater effluent sample indicate an exceedance of any of the maximum limitations for fecal coliform bacteria or turbidity set by this Permit, the Permittee shall collect and analyze a second sample within 24-hours after becoming aware of the exceedance. In the event the second sample results indicate that any maximum limitation is continuing to be exceeded, the following contingency plan shall be enacted.

1) Notify the Department that the contingency plan is being enacted in accordance with Part II A(d) of this Permit;
2) Submit copies of the recent analytical results indicating an exceedance to the Department;
3) Immediately cease transferring wastewater to ANSRWRF and divert non-compliant wastewater for on-site storage and re-treatment;
4) Examine operation and maintenance log for improper operational procedures;
5) Conduct a physical inspection of the treatment system to detect abnormalities. Any abnormalities discovered shall be corrected.

When the analytical results from samples of treated wastewater effluent no longer indicate an exceedance of any of the maximum limitations, the Permittee shall notify the Department and may resume transferring treated wastewater effluent to ANSRWRF.

c. The Permittee shall record the volume of wastewater received from Allen Harim Pinnacle Processing Facility and wash down water received from the Allen Harim Dagsboro Hatchery daily. The daily and total volumes from each facility shall be submitted to the Department with the monthly effluent monitoring report submittals.

d. Connections or additions to the on-site wastewater treatment system other than those indicated on the approved plans will not be allowed without prior approval of the Department.

e. In the event that the permittee installs new monitoring wells or replaces any existing monitoring wells, the Permittee shall submit to the Department's Groundwater Discharges Section new elevation details relative to the common benchmark previously established. Additionally, the permittee shall conduct a groundwater quality sampling program prior to initiation of wastewater disposal activities on the area incorporating the well. The sampling program shall be sufficient to establish representative groundwater quality at each well prior to initiation of the wastewater disposal activities. A minimum of three samples shall be collected at least one month apart and analyzed. A summary report detailing all analyses shall be submitted to the Department's Groundwater Discharges Section prior to initiation of wastewater disposal activities. Analyses shall include the parameters iterated in Section 6.8.1 of the Regulations.

f. A valid sludge hauling contract shall be maintained for the life of the system. A copy of the waste manifest shall be made available to the Department during the annual compliance inspection or upon request. Any changes in the sludge haulers shall be reported to the Department immediately.

g. This permit does not relieve the permittee of complying with any other applicable Federal, State or local regulations.

h. The Department will conduct an annual compliance inspection with the facility's operator of the on-site wastewater treatment and disposal system. An inspection fee will be charged.

i. The Permittee shall calibrate all flow meters in accordance with the Manufacturer's recommendations. Calibration shall include, but not be limited to influent, effluent, continuous online turbidity and chlorine residual monitors. The calibration documentation shall be submitted to the Department with the annual report.

j. At least three feet of freeboard, measured vertically from the lowest point of the berm, is required for all storage ponds. The lowest point of the berm must be determined and marked.

   The Permittee must notify the Department's Groundwater Discharges Section in writing prior to utilizing the freeboard in any lagoon or immediately upon unexpected encroachment into freeboard. In the event of encroachment into freeboard, Permittee shall contact the Groundwater Discharges Section to coordinate relief measures. In the event of an emergency, Permittee may contact the Department at 302-739-9948; however, written notification must subsequently be provided within 5 days of encroachment.

k. The Permittee shall operate and maintain the on-site wastewater treatment and disposal system in accordance with the facility's design and the approved Operation and Maintenance Plan (O&M). A copy of the O&M shall be on-site at all times. The Permittee shall maintain the O&M's accuracy and applicability in accordance with both their Permit and the Regulations. In the event of a discrepancy between the O&M or the facility's and the Permit or Regulations, the requirements of the Permit and the Regulations would govern.

l. Additional Information

   The Permittee shall furnish to the Department within a specified period of time, any information including copies of records, which may be requested by the Department to determine whether cause exists for modifying, revoking, reissuing, or terminating the permit, or to determine compliance with the permit and the Regulations.

   A report shall be submitted to the Department within five (5) days of completion of the emergency repairs. The report shall summarize the nature of the emergency and the repairs performed. All violations shall also be reported in accordance with

Section 6.5.9 of the Regulations.

m. Emergency Repairs

Emergency repairs or the replacement of critical "like kind" components of the wastewater treatment facility necessary for the continued operation of the facility may be performed without first obtaining a construction permit from the Department.
A report shall be submitted to the Department within five (5) days of completion of the emergency repairs. The report shall summarize the nature of the emergency and the repairs performed. All violations shall also be reported in accordance with Section 6.5.9.

n. Wastewater Treatment System Closure/Abandonment

In the event the wastewater treatment facility, or a component of the facility, is proposed to be abandoned, the permittee shall submit a proposed closure and abandonment work plan with procedures on how the facility will be abandoned for review and approval by the Department. The work plan shall address remediation if monitoring data indicates impacts to the environment. Upon review and approval of the work plan and completion of all closure and abandonment actions the permittee must contact the Department for a final inspection of the site.

Appendix VII

AUTHORIZATION TO OPERATE AND MAINTAIN UNDER THE LAWS OF THE STATE OF DELAWARE

PERMITTEE: **Artesian Wastewater Management, Inc.**
664 Churchmans Road
Newark, DE 19702

FACILITY: **Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF)**

1. Pursuant to the provisions of 7 Del. C. §6003, **Artesian Wastewater Management, Inc.** is herein authorized to operate and maintain the facility known as **ANSRWRF** located in Sussex County, Delaware to receive and store treated poultry processing wastewater from Allen Harim Foods, LLC's Harbeson wastewater treatment system and to spray irrigate the treated effluent onto the spray fields consisting of approximately 1,714 acres located in Sussex County Delaware.

   Wastewater Treatment Plant Site: The ANSRWRF is located on Sussex County Tax Map/Parcel Number: 2-35 6.00 28.09 along Route 30 approximately 4,000' north of the intersection of Route 16 and Route 30.

   Spray Irrigation Sites: Sussex County Tax Map/Parcel Numbers listed in Part I.A of this Permit.

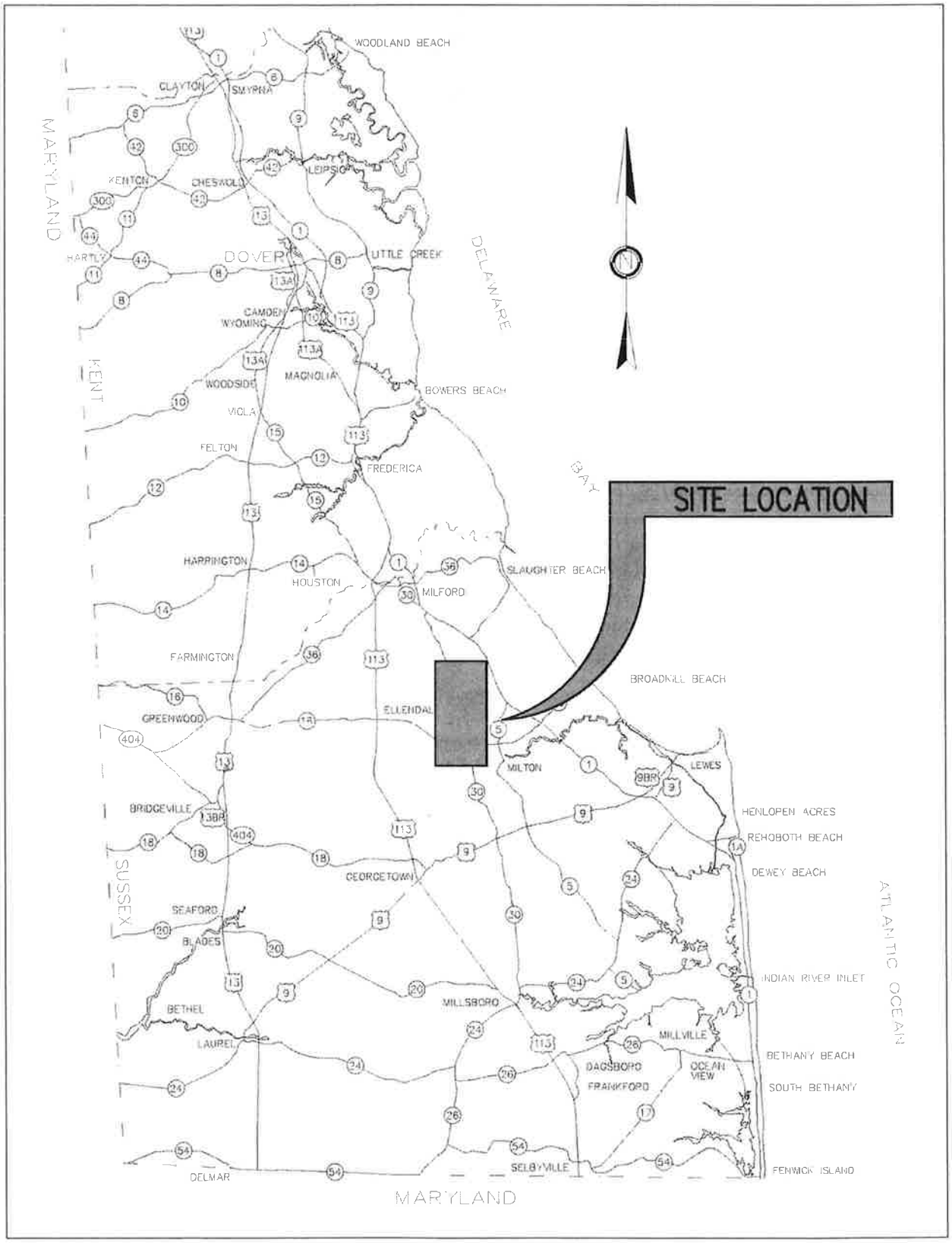
2. The Delaware Department of Natural Resources & Environmental Control's (the Department or DNREC) purpose in issuing this Permit, and in imposing the requirements and conditions specified herein, is for the protection of the environment and the public health as required by 7 Del. Admin. C. §7101 *Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems* (the Regulations). The effluent limitations, monitoring requirements and other Permit conditions are set forth herein.

John J. Rebar Jr.
Environmental Program Manager I
Groundwater Discharges Section
Division of Water
Delaware Department of Natural Resources

Date Signed

and Environmental Control

LOCATION MAP



ANSRWRF Spray Irrigation Facility

Legend

- Monitoring Wells
- Piezometers
- Lysimeters
- Surface Water Monitoring Locations

N
W E
S

0 550 1,100 2,200 3,300 4,400 Feet

SITE MAP

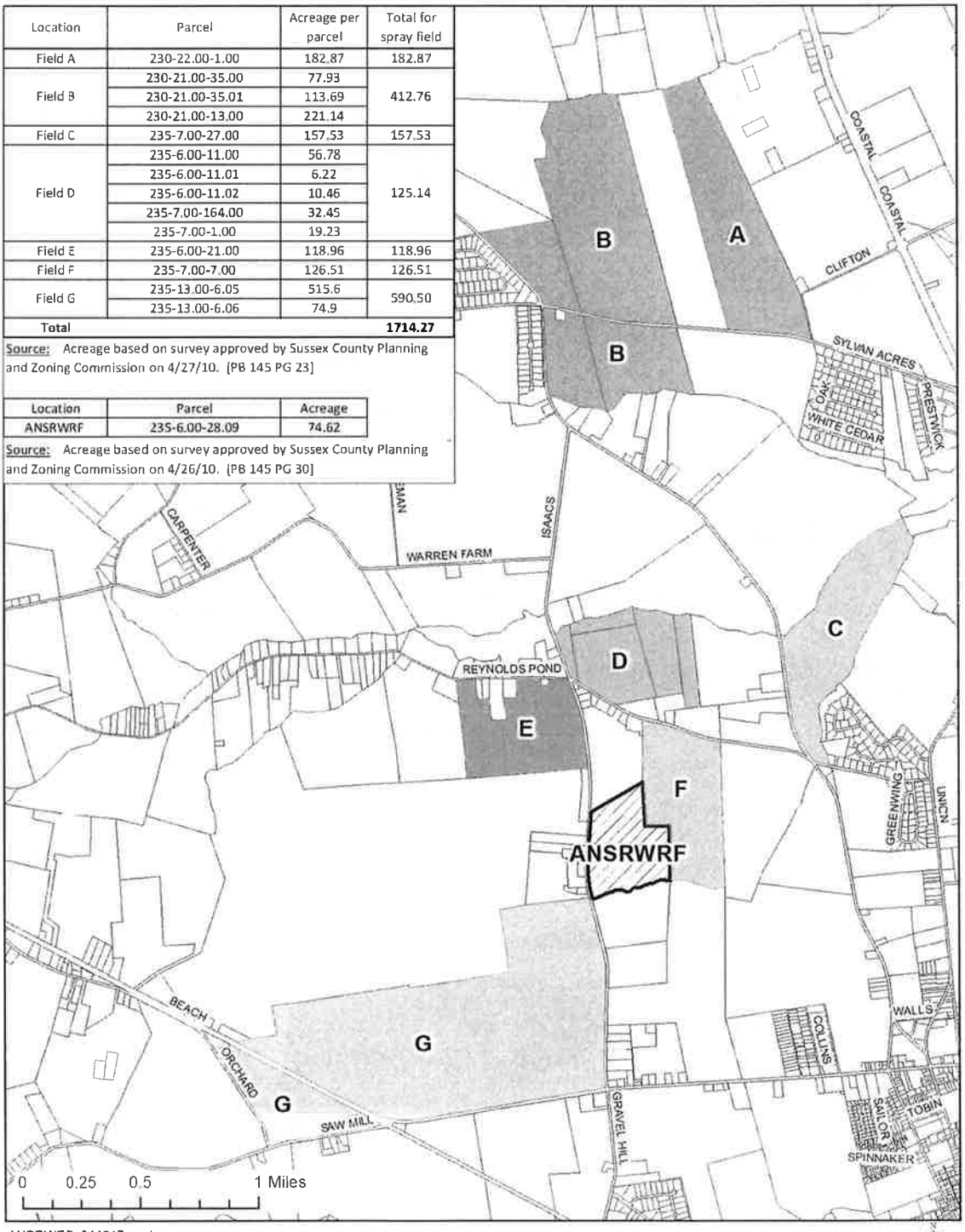
Figure 3-3: Spray Field Designations

Location	Parcel	Acreage per parcel	Total for spray field
Field A	230-22.00-1.00	182.87	182.87
Field B	230-21.00-35.00	77.93	412.76
	230-21.00-35.01	113.69	
	230-21.00-13.00	221.14	
Field C	235-7.00-27.00	157.53	157.53
Field D	235-6.00-11.00	56.78	125.14
	235-6.00-11.01	6.22	
	235-6.00-11.02	10.46	
	235-7.00-164.00	32.45	
	235-7.00-1.00	19.23	
Field E	235-6.00-21.00	118.96	118.96
Field F	235-7.00-7.00	126.51	126.51
Field G	235-13.00-6.05	515.6	590.50
	235-13.00-6.06	74.9	
Total			**1714.27**

Source: Acreage based on survey approved by Sussex County Planning and Zoning Commission on 4/27/10. [PB 145 PG 23]

Location	Parcel	Acreage
ANSRWRF	235-6.00-28.09	74.62

Source: Acreage based on survey approved by Sussex County Planning and Zoning Commission on 4/26/10. [PB 145 PG 30]

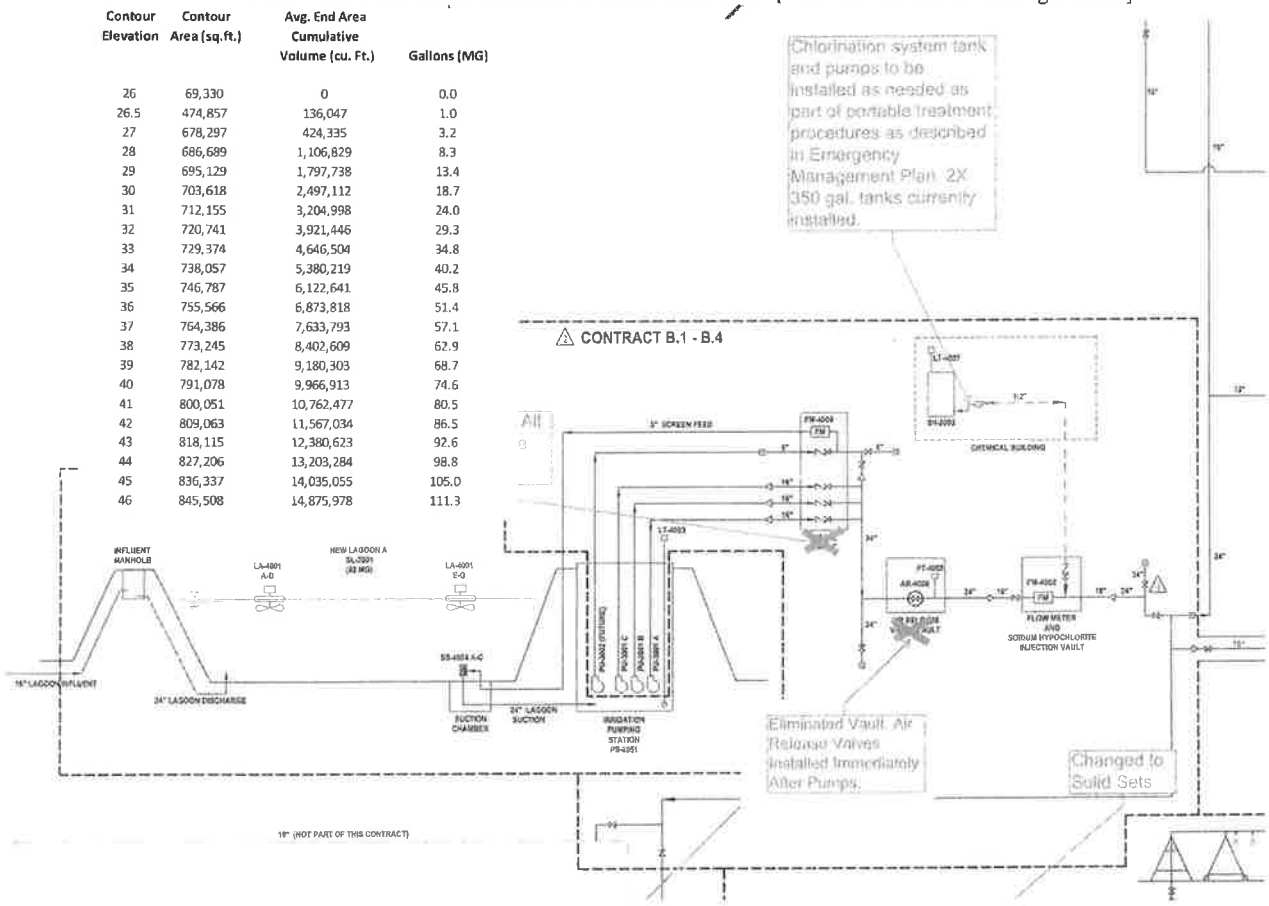


ANSRWRF_041017.mxd

ANSRWRF SPRAY FIELDS

PROCESS FLOW DIAGRAM & LAGOON VOLUMES [taken from 20190717 Drawings 3 and 4]

Contour Elevation	Contour Area (sq.ft.)	Avg. End Area Cumulative Volume (cu. Ft.)	Gallons (MG)
26	69,330	0	0.0
26.5	474,857	136,047	1.0
27	678,297	424,335	3.2
28	686,689	1,106,829	8.3
29	695,129	1,797,738	13.4
30	703,618	2,497,112	18.7
31	712,155	3,204,998	24.0
32	720,741	3,921,446	29.3
33	729,374	4,646,504	34.8
34	738,057	5,380,219	40.2
35	746,787	6,122,641	45.8
36	755,566	6,873,818	51.4
37	764,386	7,633,793	57.1
38	773,245	8,402,609	62.9
39	782,142	9,180,303	68.7
40	791,078	9,966,913	74.6
41	800,051	10,762,477	80.5
42	809,063	11,567,034	86.5
43	818,115	12,380,623	92.6
44	827,206	13,203,284	98.8
45	836,337	14,035,055	105.0
46	845,508	14,875,978	111.3



PART I

A. GENERAL DESCRIPTION OF OPERATION/DISCHARGES

Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF) will serve as a regional facility meeting existing and future wastewater needs within the Artesian Wastewater service territories in Sussex County, Delaware. The facility will be owned and operated by Artesian Wastewater Management, Inc.

The ANSRWRF has been constructed under the DNREC Construction Permit DEN Number 359288-01. The wastewater treatment facility is located on Sussex County Parcel Number: 2-35 6.00 28.09; on a 75 acre site south of Reynolds Pond Road, east of Route 30, north of Ingram Branch and Route 16, and west of Cedar Creek Road, Sussex County, Delaware.

The regional facility will be built in three phases. This Permit authorizes the operation of Phase I only. Phase I of the project consisted of the construction of a storage lagoon and disposal spray fields, and to accept treated wastewater effluent from Allen Harim Foods, LLC (Allen Harim). The design average daily flow is 1.5 MGD with a peak flow of 2.0 MGD. Phase I disposal fields include Fields D, E, F, and G; however, as of the date of this Permit, only Fields F and G have been constructed and only Fields F and G are permitted for use. Fields D and E will be permitted for use upon completion of the Schedule of Compliance requirements iterated in Part I.F.1 of this Permit and upon written approval from the Groundwater Discharges Section.

The effluent is to be utilized for spray irrigation of privately owned agricultural land, under a lease held in perpetuity by Artesian as the wastewater utility provider. These sites have been permanently placed in an Agricultural Preservation Easement by the Delaware Agricultural Lands Preservation Foundation. Irrigation Sites are listed below.

Phase I permitted Spray Irrigation Sites include Fields F and G [Taken from 20190717 Drawing 29]**:**

Field	Tax Map ID	Gross Area (acres)	Crop Spray Area (acres)	Woods Spray Area (acres)	Total Spray Area (acres)
A[1]	230-22.00-1.00	182.9	116.3	34.1	150.4
B[1]	230-21.00-13.00 230-21.00-35.00 230-21.00-35.01	412.8	214.1	86.3	300.4
C[1]	235-7.00-27.00	157.5	37.0	38.2	75.2
D[1]	235-6.00-11.00 235-6.00-11.01 235-6.00-11.02 235-7.00-1.00 235-7.00-164.00	125.1	58.0	32.7	90.7
E[2,4]	235-6.00-21.00	119.0	90.5	0	90.5
F	235-7.00-7.00	126.5	110.5	0	110.5
G	235-13.00-6.05 235-13.00-6.06	590.5	276.1	200.5	476.5
Total		1,714.27	902.5	391.8	1294.19

1) Spray areas based on preliminary design for Design Development Report dated June 19, 2009. These will be designed and permitted during a future phase.
2) Fields D and E have not yet been constructed.
3) One parcel from Field D (2-35-6-11.01) is not included in the current Conditional Use Ordinance 1923, adopted July 31, 2017. Spray will not commence on this parcel until it has been added to an approved Conditional Use.
4) There is a wooded region in Field E of approximately 10 acres which is not included in the existing design, but may be utilized in future phases.

B. DOCUMENTATION

The application consists of the materials submitted by the Permittee and materials contained in the administrative record prior to the issuance of this Permit. This includes (but not limited to) the following information.

1. March 12, 2013 Secretary's Order No. 2012-W-0052.

2. May 5, 2017 Application Package for an Amended Construction Permit for the Artesian Northern Sussex Regional Water Recharge Facility (ANSRWRF) Phase 1 submitted by Artesian Wastewater Management, Inc. Application Package includes: Application Form, Amended Design Development Report (DDR), Drawings and Specifications.

3. August 18, 2017 Amended DDR Addendum 1 submitted by Artesian Wastewater Management, Inc. providing additional information requested.

4. June 12, 2018 Amended DDR Addendum 2 submitted by Artesian Wastewater Management, Inc. providing a revised drawing depicting surface water monitoring locations.

5. November 2, 2017 Secretary's Order No. 2017-W-0029.

6. August 17, 2018 Application for a Construction Permit Extension.

7. July 17, 2019 Spray Irrigation Permit Application.

8. July 17, 2019 Operation and Maintenance Plan.

C. INFLUENT LIMITATIONS

1. The average daily influent received by ANSRWRF shall not exceed 1.5 million gallons per day in any calendar month or a peak daily flow of 2.0 million gallons per day. Only poultry processing wastewater from Allen Harim Foods, LLC (Allen Harim) shall be received by ANSRWRF. The connection of additional waste streams is prohibited without prior written approval from the Groundwater Discharges Section.

   Design Treatment Capacity: 1.5 MGD average daily flow
   [calculated as Total Monthly Volume divided by number of days in month]

   Peak daily flow not to exceed 2.0 MGD

D. SPRAYED EFFLUENT LIMITATIONS

During the period beginning on the effective date and lasting through the expiration date of this Permit, the Permittee is authorized to discharge to the spray irrigation **Fields F and G** as identified on page 3, in Part I.A, and depicted on pages 3 and 4 of this Permit the quantity and quality of effluent specified below and in accordance with the design documents listed in Part I.B of this Permit:

1. The monthly quantity of effluent discharged from the wastewater facility to the spray fields shall not exceed a volume that has been calculated each month by the Permittee to not cause the groundwater to exceed the drinking water standard for Nitrate at the percolate. The monthly quantity is to be calculated by utilizing the average of the lab verified effluent Total Nitrogen concentrations from the previous month and the calculations and assumptions provided in the design Nitrogen Balance excel spreadsheet. Once actual data is acquired for the mathematical assumptions, it shall be utilized in lieu of the assumed data (i.e. crop nutrient uptake). All changes to the spreadsheet calculations and assumptions shall be approved by the Groundwater Discharges Section prior to implementation. Each monthly spreadsheet shall be provided (electronically in Excel format with calculations maintained) to the Groundwater Discharges Section to be considered with the monthly Discharge Monitoring Report.

2. The monthly quantity of effluent discharged may not exceed hydraulic loading assimilative capabilities of the site.

3. The average weekly quantity of effluent discharged to any portion of the spray irrigation field shall not exceed 1.65 inches per acre averaged over a 7 day rolling period.

   If operations of the facility encounter emergency or extenuating circumstances that would require the weekly quantity of effluent discharged to exceed 1.65 inches per acre per 7 day period, and the system would be able to assimilate the additional Nitrogen Loading without exceeding the limitations set forth in Part I.D.11 below, please contact the Groundwater Discharges Section for written authorization in accordance with Section 6.3.2.3.13.8.1 of the Regulations.

4. The quantity of effluent discharged to any portion of the spray irrigation field shall not exceed 0.25 inch/acre/hour.

5. There must be a sufficient rest period between applications to prevent field saturation and runoff from occurring in any part of the field.

6. If the system has a partial circle center pivot, there shall be a minimum one hour rest period when the center pivot reaches any in-field end stops if the instantaneous application rate exceeds a rate of 0.125 inch/acre in any one hour.

7. The pH of the effluent shall not be less than 5.5 standard units nor greater than 9.0 standard units at any time. The point of compliance shall be at Allen Harim's effluent pump station.

8. The Total Residual Chlorine (TRC) concentration shall not be less than 1.0 mg/L nor more than 4.0 mg/L at any time. The point of compliance shall be at Allen Harim's effluent pump station.

9. Design Effluent Nitrogen Concentration:

   The facility has been designed for an effluent Total Nitrogen concentration of 30 mg/L [May 5, 2017 Amended Design Development Report ANSRWRF Phase 1].

   If the effluent Total Nitrogen concentration exceeds 37.5 mg/L [Design Value + 25%] in any calendar month, the Permittee shall resample the wastewater and submit the additional analyses to the Groundwater Discharges Section. If the effluent Total Nitrogen concentration exceeds 37.5 mg/L for over a three month period, the Permittee must have the system evaluated to determine the cause and submit a revised Design Engineer Report to the Groundwater Discharges Section. If the effluent exceeds 45.0 mg/L [Design Value +50%], the Department may invoke the provisions of Part V.A.1 of this Permit. Also reference Part II.B.1.

10. The total amount of nitrogen that may be applied to each spray field acre shall not exceed the following. This amount includes supplemental fertilizers, the nitrogen supplied from the effluent, and any other source. [Taken from 20190716 Active Spreadsheet Nitrogen Balance]

Crop Type	Nitrogen Loading Limit (lbs/acre-year)
Cover – Corn - Barley	334.5
Barley – Soybean – Cover	388.8
Woods (Loblolly Pines)	435.4

11. The total amount of Phosphorus that may be applied to each spray field acre per year shall not exceed crop uptake needs of 31.2 lbs/acre [March 2019 DDR Appendix C.3]. This amount includes supplemental fertilizers, the phosphorus supplied from the effluent, and any other source.

    Adjustments and reductions are ***not*** to be factored into the annual reporting of Total Phosphorus Loading for demonstration of compliance with this limit.

    If any crops are not removed from the spray irrigation fields, then the total phosphorus application rate for the field must be reduced by the amount of phosphorus that would be removed by harvesting the crop.

12. The discharge to the spray irrigation fields shall be free from material such as floating solids, sludge deposits, debris, scum, oil and grease.

13. The facility has been designed for Unlimited Public Access criteria.

    Unlimited Public Access
    The treated wastewater utilized for unlimited public access sites must meet the following daily permissible average concentrations. The daily average concentration shall be determined by the summation of all the measured daily concentrations obtained from composite samples divided by the number of days during the calendar month when the measurements were made. Reclaimed wastewater that fails to meet the effluent criteria shall not be discharged to the spray irrigation areas.

    The point of compliance for Fecal Coliform shall be at ANSRWRF's effluent pump station.

    The point of compliance for BOD_5, TSS, and turbidity shall be at Allen Harim's effluent pump station.

    a. Disinfection of wastewaters containing domestic waste is required to yield a discharge not to exceed 20 col/100 mL Fecal Coliform.
    b. The 5-day Biochemical Oxygen Demand (BOD_5) of the treated wastewater shall not exceed 10 mg/L.
    c. The treated wastewater shall not contain more than 10 mg/L Total Suspended Solids (TSS).
    d. The turbidity of the treated wastewater shall not exceed 5 NTU.

Parameter	Daily Permissible Average Concentration
BOD_5	10.0 mg/L
Fecal Coliform	20 colonies/100 mL
Total Suspended Solids	10.0 mg/L
Turbidity	5 NTU

E. FACILITY CLASSIFICATION

1. A classification was performed on the permitted facility in accordance with Regulations Licensing Operators of Wastewater Facilities. The wastewater treatment system is designated as a Class I Facility. The facility shall be under the direction of a Class I Licensed Operator in Direct Responsible Charge for the facility who is available at all times. A licensed operator, operating under the direction of the licensed operator in Direct Responsible Charge for the facility, shall be available when the spray irrigation system is in operation.

F. SCHEDULE OF COMPLIANCE

1. The Permittee shall submit the information necessary and/or complete the following requirements for proper compliant operation of the spray irrigation system:

   a. Prior to utilizing Fields D and E, Permittee shall complete the following:
      i. The Permittee shall notify the Department's Groundwater Discharges Section in writing of the intent to initiate construction activities for Fields D and E at least fifteen days prior to the commencement of construction. The written notification shall include a draft construction schedule. The Permittee shall provide updated construction schedules if the schedule changes as construction progresses;
      ii. Complete all construction relative to Fields D and E in accordance with State Permit DEN Number: 359288-01;
      iii. The Permittee shall notify the Department's Groundwater Discharges Section in writing upon completion of construction and request a Construction Completion Inspection to be performed by the Department's Groundwater Discharges Section staff. The Design Engineer, Class E.4 system contractor, licensed operator and the Permittee must be present during the inspection. During the inspection, all mechanical parts are to be tested.
      iv. Upon completion of construction, the Permittee shall submit to the Department's Groundwater Discharges Section the following applicable items. The items shall be combined in one package and must include an electronic copy of all items where possible. Failure to submit all required information constitutes grounds for denial of the authorization to utilize Fields D and E for disposal.
         (a) Design Engineer Inspection Report(s) certifying the facility has been constructed in accordance with approved plans and specifications.
         (b) Copies of any other applicable State/County inspection reports.
         (c) Contractor's Certificate of Completion.
         (d) A set of "as-built" drawings of the facility bearing the seal and signature of a licensed Professional Engineer registered in the State of Delaware.
         The "as-built" drawings must include:
            (i) Site map showing the location of all structures, piping and appurtenances, disposal areas and buffers.
            (ii) A full equipment list and technical specifications for all equipment used, if different than submitted in the permit application.
            (iii) The new topography elevations of the system.
            (iv) Monitoring/Observation well elevations at the top of the casing (TOC) and at the ground surface, GPS coordinates (State Plane), and local topography tied to a common benchmark.
            (v) The location and screen depth, length of stick up, and well ID's must be provided for each monitor well.
         (e) Any necessary updates to the Operation and Maintenance (O&M) Plan in accordance with Section 6.7 of the Regulations.

(f) Spreadsheet summary of groundwater monitoring well, lysimeter and pizometer information.
(g) GPS information detailing the northings and eastings; the local well ID number; and the DNREC Well ID/Well Permit Number. The GPS information shall be in either Delaware State Plane, North American Datum 1983 meters; or Latitude and Longitude decimal degrees.
(h) TOC elevations survey results for all monitoring wells to be utilized for groundwater monitoring. Provide the length of the well stickup and the well survey information to the closest 0.01 feet. Provide a permanent mark, etch, or fixture to be used to specify the survey point where the TOC elevations were read.
(i) A summary report detailing the analyses of the background groundwater quality sampling program that was conducted consisting of at least three (3) samples one (1) month apart and analyzed prior to the initiation of disposal activities (see Section 6.6.3.16 of the Regulations).
(j) An approved Conditional Use for Field D parcel (2-35-6-11.01).

v. Obtain written approval from the Groundwater Discharges Section authorizing disposal on Fields D and E.

b. The Permittee shall install flow meters to measure the volume of treated wastewater effluent applied to each spray irrigation zone on Field G solid sets in accordance with Section 6.3.2.3.13.16 of the Regulations. The meters shall be installed within one (1) year from the Permit effective date. Meter specifications shall be submitted to the Department within 30 days of installation.

2. The Permittee shall install a flow meter to measure the volume of treated wastewater effluent discharged to the synthetically lined lagoon from Allen Harim. The meter shall be installed within one (1) year from the Permit effective date. Meter specifications shall be submitted to the Department within 30 days of installation.

3. The Permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance by specified date. In the event of noncompliance, the notice shall include the cause of noncompliance, any remedial action taken, and the probability of meeting the next scheduled requirement.

G. BUFFER REQUIREMENTS

Buffer zones shall be maintained in accordance with Section 6.3.2.3.10 of the Regulations unless otherwise specified below. Also see buffer requirement set forth in Part I.1.c.

1. Buffer zones of at least 150 feet shall be maintained around all public and private domestic wells identified in the well search.

2. A buffer zone of 150 feet shall be maintained from all downgradient domestic wells occurring on parcels 235-14.00-63.00, 235-14.00-66.00, and 235-13.00-6.00 [Per DNREC Hydrogeologic review dated March 25, 2010 and the August 18, 2017 DDR Addendum].

3. In accordance with Secretary's Order No. 2012-W-0052 Issued and Effective March 12, 2013, Permittee shall:
   a. Maintain all required buffers for the spray fields as set by both the Department and Sussex County.
      i. Maintain a 100 foot buffer from the wetted field area to the north-west corner of the Sylvan Acres Development.

H. SLUDGE HANDLING REQUIREMENTS

N/A

I. FACILITY SPECIFIC CONDITIONS

1. In accordance with Secretary's Order No. 2012-W-0052 Issued and Effective March 12, 2013, the Permittee shall:
   a. Design the treatment plant to look like an agricultural building and have landscaping to screen it from view from its neighbors.
   b. Ensure that the storage ponds shall not become a breeding ground for mosquitos.
   c. Maintain all required buffers for the spray fields as set by both the Department and Sussex County.
      i. Maintain a 100 foot buffer from the wetted field area to the north-west corner of the Sylvan Acres Development.
2. The Permittee shall comply with all applicable Sussex county ordinances and conditional use requirements placed on this facility.
3. The Permittee shall maintain an updated copy of the spray irrigation land area Lease Agreement on file with the Groundwater Discharges Section.
4. Phase I is designed to require only 65.2 MG of the storage lagoon's 90 MG capacity. If storage volume exceeds 65.2 MG, the Permittee must notify the Groundwater Discharges Section in writing. The additional 23 MG storage capacity may not be utilized during Phase I unless under the written authorization of the GWDS or in response to an emergency situation outside the Permittee's control (Force Majeure). See lagoon volumes table on page 4 of this Permit.
5. Wastewater spray irrigation will not be permitted on Field D parcel (2-35-6-11.01) until it is added to an approved Conditional Use. Parcel 2-35-6-11.01is not included in the current Conditional Use Ordinance 1923, adopted July 31, 2007. Once this parcel has been added to an approved Conditional Use, the Permittee must provide a copy of the approved Conditional Use to the Groundwater Discharges Section for approval.

PART II

A. MONITORING REQUIREMENTS

During the period beginning on the effective date and lasting through the expiration date of this Permit, the Permittee is authorized to discharge to spray irrigation **Fields F and G** as identified on page 3, in Part I.A, and depicted on page 3 and 4 of this Permit. Such discharge shall be monitored by the Permittee as specified herein.

For samples required to be taken 'monthly' and/or 'twice per month', the samples for each monitoring location (i.e. influent, effluent, well, lysimeter, etc.) shall be taken a minimum of 14 days apart.

Requests for monitoring modifications must be submitted to the Department's Groundwater Discharges Section in writing. Such requests must clearly state the reason for and nature of the proposed modification and, where applicable, must contain supporting scientific information, analysis, and justification. Requests will be addressed by the Department on a case by case basis.

Permittee shall initiate periodic reporting required under Part II.B.2 upon initiation of irrigation activities for all of the following monitoring requirements.

1. INFLUENT MONITORING REQUIREMENTS

Samples taken in compliance with the sprayed influent monitoring requirements for all parameters specified may either be taken from a sampling port located and meter[1] prior to storage at ANSRWRF, or reported as sampled in accordance with Allen Harim LLC Permit DEN 597261-01 at their effluent pump station.

Parameter	Unit of Measurement	Monitoring Frequency	Sample Type
Flow - Total Influent Flow for Month to	Gallons	Continuous	Recorded
Flow - Max Daily Influent Flow to Facility	Gallons	Continuous	Recorded
Flow - Average Daily Influent Flow to Facility	Gallons/Day	Continuous	Calculation (Total Influent Flow for Month / Number of Days in Month)
BOD_5	mg/L	Monthly	Composite
TSS	mg/L	Monthly	Composite
Total Nitrogen	mg/L	Monthly	Composite
Ammonia Nitrogen	mg/L	Monthly	Composite
Nitrate/Nitrite as Nitrogen	mg/L	Monthly	Composite
pH	S.U.	Monthly	Composite
Total Phosphorus	mg/L	Monthly	Composite
Chloride	mg/L	Quarterly	Composite
Turbidity	NTU	Continuous	Recorded
Total Residual Chlorine	mg/L	Continuous	Recorded
Potassium	mg/L	Quarterly	Composite
Sodium	mg/L	Quarterly	Composite

[1] See Part I F.2

2. SPRAYED EFFLUENT MONITORING REQUIREMENTS

Samples taken in compliance with the sprayed effluent monitoring requirements for all parameters specified shall be taken from a sampling port located at the discharge side of the irrigation pumps.

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
Ammonia Nitrogen	mg/L	Monthly	Composite
Cadmium	mg/L	Annually	Composite
Copper	mg/L	Annually	Composite
Effluent Flow	Gal/day per Field/Zone/Pivot	Continuous	Recorded
Fecal Coliform	Col/100 ml	Twice per month	Grab
Lead	mg/L	Annually	Composite
Nickel	mg/L	Annually	Composite
Nitrate + Nitrite Nitrogen	mg/L	Monthly	Composite
Organic Nitrogen	mg/L	Monthly	Calculation
Total Nitrogen	mg/L	Twice per Month	Composite
Sodium[2]	mg/L	Monthly	Composite
Total Residual Chlorine[3]	mg/L	Monthly	Composite
Zinc	mg/L	Annually	Composite

Additionally, Permittee shall provide the following information:

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
Total Effluent Flow to all Fields/Zones/Pivots combined	Gallons	Monthly	Data
Max Daily Effluent Flow to all Fields/Zones/Pivots combined	Gallons	Monthly	Data
Average Daily Effluent to all Fields/Zones/Pivots combined	MGD or GPD	Monthly	Calculation (Total Monthly Effluent Flow / Number of Days in Month)
Number of Days Sprayed during the Month to all Fields/Zones/Pivots combined	Days	Monthly	Data
Total Effluent Flow to each Field/Zone/Pivot[4]	Gallons	Monthly	Data
Number of Days Sprayed During the Month to each Field/Zone/Pivots	Gallons	Monthly	Data

[2] Sodium shall only be sampled in the event of a disinfection event at ANSRWRF
[3] Total Residual Chlorine shall only be sampled in the event of a disinfection event at ANSRWRF
[4] Effluent flow to each zone of Field G solid sets shall be estimated until meter installation is completed

Nitrogen Loading Rate to each Field/Zone/Pivot	lbs/acre per Field/Zone/Pivot	Monthly	Calculation
Phosphorus Loading Rate to each Field/Zone/Pivot	lbs/acre per Field/Zone/Pivot	Monthly	Calculation
Monthly and Cumulative Loading and Percolate Calculations (Nitrogen Balance) for each Field/Pivot[5]	lbs/acre mg/L	Monthly	Calculation

[5] The Permittee shall submit to the GWDS monthly in Excel spreadsheet format

3. GROUNDWATER MONITORING REQUIREMENTS

Groundwater samples shall be taken from each monitoring well for the facility. Groundwater monitoring well locations are depicted on the Site Map found on Page 3 of this Permit.

Samples taken in compliance with the monitoring requirements specified shall be taken at each monitoring well in accordance with procedures approved by the Department and listed in the State of Delaware, Field Manual for Groundwater Sampling (Custer, 1988).

Groundwater monitoring results for each monitoring well shall be reported using the State of Delaware Well Identification Tag Number that is required on all wells in accordance with the Delaware Regulations Governing the Construction and Use of Wells, Section 11.1.

All field sampling logs and laboratory results for samples obtained from a well shall be identified by the DNREC ID affixed to the well.

Groundwater samples shall be tested from the following wells for the following parameters [Well info taken from 20190717 O&M p32]:

DNREC Well ID	Local ID	Northings (meters)	Eastings (meters)	Ground Elevations (ft)	Top of Outer Casing (ft)	Length of Stick Up (ft)	Casing Depth (ft)
254881	MW-1L	88993.83	206492.46	34.11	36.67	2.56	20
254882	MW-2L	89332.77	206846.20	33.21	35.67	2.46	20
254883	MW-3L	89038.74	207010.94	28.50	30.69	2.19	20
254884	MW-4L	88740.91	207018.88	34.11	36.67	2.56	20
258634	MW-1F	89056.08	206855.40	31.57	33.98	2.41	20
258632	MW-2F	89805.84	206844.26	31.53	33.93	2.4	20
258633	MW-3F	89653.61	207373.30	23.43	29.03	5.6	20
258635	MW-4F	88664.02	207398.01	18.48	20.98	2.5	20
258636	MW-5F	88901.57	207213.08	27.06	29.55	2.49	20
258620	MW-1G	87908.08	204453.82	39.08	41.88	2.8	20
258628	MW-2G	86961.64	204305.92	42.18	44.70	2.52	20
258630	MW-3G	87059.37	204894.01	38.48	40.82	2.34	20
258631	MW-4G	87083.99	205047.96	39.13	41.72	2.59	20
258625	MW-5G	87224.43	205871.48	35.28	38.11	2.83	20
258626	MW-6G	87338.98	206580.77	32.14	34.70	2.56	20
258627	MW-7G	87898.99	206585.64	33.23	35.64	2.41	20
258629	MW-8G	88466.82	206507.64	28.26	30.94	2.68	20
258624	MW-9G	87639.24	206170.14	33.67	36.15	2.48	20

1) Coordinates are in NAD 1983 Delaware State Plane 0700 Meters.
2) Monitoring Wells have been screened from a depth of 20-ft to 30-ft.

Parameter	Unit Measurement	Measurement Frequency	Sample Type
Ammonia as Nitrogen	mg/L	Quarterly	Grab
Chloride	mg/L	Quarterly	Grab
Depth to Water	hundredths of a foot	Monthly	Field Test
Dissolved Oxygen	mg/L	Quarterly	Field Test
Fecal Coliform	Col/100mL	Quarterly	Grab
Nitrate + Nitrite as Nitrogen	mg/L	Quarterly	Grab
pH	S.U.	Quarterly	Field Test
Sodium	mg/L	Quarterly	Grab
Specific Conductance	µS/cm	Quarterly	Field Test
Temperature	°C	Quarterly	Field Test
Total Dissolved Solids	mg/L	Quarterly	Grab
Total Nitrogen	mg/L	Quarterly	Grab
Total Phosphorus	mg/L	Quarterly	Grab

4. GROUNDWATER TABLE ELEVATION MONITORING REQUIREMENTS

Monthly water level measurements shall be taken at each piezometer and observation well listed below and depicted on Page 3 from December through April [Well info taken from 20190717 O&M p33].

DNREC Well ID	Local ID	Northings (meters)	Eastings (meters)	Ground Elevations (ft)	Top of Outer Casing (ft)	Length of Stick Up (ft)
265831	PZ-1F	88751.53	207166.42	22.53	25.53	25.41
265838	PZ-1G	87347.73	205271.49	35.45	38.86	37.92
265837	PZ-2G	87578.95	205093.80	37.31	41.29	40.00
265832	PZ-3G	87823.90	205250.09	32.78	43.00	41.81
265836	PZ-4G	87908.92	205455.69	32.64	36.24	32.23
265829	PZ-5G	88039.85	205768.25	32.67	35.97	35.23
265833	PZ-6G	88434.07	205949.66	31.58	34.63	33.21
265830	PZ-7G	88408.29	206450.31	25.91	29.58	29.92

Coordinates are in NAD 1983 Delaware State Plane 0700 Meters.

While performing the monitoring as required by Part II.A.3and Part II.A.4 of this Permit, if the 'Depth to Water' in any one of the monitoring wells has reached within 3 feet of the ground surface, the Permittee shall be required to collect additional weekly depth to water measurements from the monitoring wells within 3 feet of the ground surface. The additional monitoring is necessary to ensure that spray irrigation ceases on any areas of the spray fields where the groundwater may reach within 2 feet of the ground surface in accordance with Part III.A.5 of this Permit. The Permittee may discontinue the additional weekly sampling for depth to water in a well when the groundwater table elevation readings in the well exceeds a 3 foot separation between groundwater and ground surface. The additional groundwater table elevation measurements must be recorded in the operator's log and reported to the Groundwater Discharges Section in accordance with Part II.B.2 of this Permit.

5. LYSIMETER MONITORING REQUIREMENTS

Samples shall be taken monthly from each lysimeter for the facility. Lysimeter locations are depicted on the Site Map found on Page 3 of this Permit.

All field sampling logs and laboratory results for samples obtained from a well shall be identified by the DNREC ID affixed to the well.

Samples must be tested from the following wells for the following parameters. The constituents are listed below in highest priority first. In the event that sufficient sample volume may not be obtained to test for all parameters listed, the sample shall be tested for as many constituents possible in the following order [Well info taken from 20190717 O&M p35]:

DNREC Well ID	Local ID	Northings (meters)	Eastings (meters)	Ground Elevation (ft)	Outer Casing (ft)	Inner Casing (ft)
265827	LY-1F	89388.92	207110.93	33.13	35.73	35.23
265835	LY-1G	87984.44	205584.58	34.27	36.22	35.38
265834	LY-2G	87646.77	206139.14	33.80	36.10	35.82
265828	LY-3G	87205.37	204810.20	40.62	43.25	42.82

Coordinates are in NAD 1983 Delaware State Plane 0700 Meters.

Parameter	Unit Measurement	Measurement Frequency	Sample Type
Total Nitrogen	mg/L	Monthly	Grab
Total Phosphorus	mg/L	Monthly	Grab
Nitrate + Nitrite as Nitrogen	mg/L	Monthly	Grab
Ammonia as Nitrogen	mg/L	Monthly	Grab
Chloride	mg/L	Monthly	Grab
Sodium	mg/L	Monthly	Grab
Total Dissolved Solids	mg/L	Monthly	Grab
pH	S.U.	Monthly	Field Test
Specific Conductance	µS/cm	Monthly	Field Test
Temperature	°C	Monthly	Field Test

Lysimeter Rolling 12-Month Average

The Permittee shall maintain a rolling 12-month average of total nitrogen percolate concentrations in each lysimeter. The rolling 12-month average shall be calculated by adding the current month's total nitrogen concentration to the previous eleven (11) month's total nitrogen concentrations and dividing the sum by the number of samples obtained (i.e., 12 unless sample data was unattainable for any given month). The rolling 12-month average shall be reported to the Department monthly.

In the event that the rolling 12-month average exceeds the total nitrogen percolate concentration of 10 mg/L, the Permittee shall examine the facility's operation and maintenance log for improper operational procedures, conduct a physical inspection of the disposal system to detect abnormalities, and review monitoring data and other records to determine the cause/source of the total nitrogen exceedance. The Permittee shall report the finding to the Department with any proposed modifications to operational procedures or other corrective actions. The Permittee shall implement proposed actions upon approval by the Department.

6. SOIL MONITORING REQUIREMENTS

The Permittee shall submit a Soil Sampling Plan for GWDS approval within 120 days from the effective date of this Permit.

Composite soil samples representing each soil series within the wetted spray field shall be taken separately from both soil depths of 0–12 inches and 12–24 inches. A minimum of three composite sample for each mapped soil mapping unit are needed for each depth (0-12 inches and 12-24 inches) in accordance with the Regulations and the GWDS-approved Soil Sampling Plan. The composite soil sampling shall represent the average conditions in the sampled body of material. The discrete samples that are to be composited shall be collected from the same soil horizon and depth interval.

Soil sample locations shall be plotted on a scaled drawing and labeled consistent with the sample nomenclature. Each field shall also be identified so that sample results may be tracked and properly assessed for field life limiting factors.

Soil chemical testing should be in accordance with Methods of Soil Analysis published by the American Society of Agronomy, Madison, Wisconsin.

Testing for Cadmium, Nickel, Lead, Zinc and Copper shall be performed approximately one year prior to permit renewal so results may be utilized by the Permittee in the CMR and/or by Groundwater Discharges Section staff during renewal review. Reference Part IV.A.2 of the Permit and Section 6.5.4 of the Regulations regarding CMR requirements.

Parameter	Unit Measurement	Measurement Frequency	Sample Type
pH	S.U.	Annually	Soil Composite
Organic Matter	%	Annually	Soil Composite
Phosphorus (as P_2O_5)	mg/kg	Annually	Soil Composite
Potassium	mg/kg	Annually	Soil Composite
Sodium Adsorption Ratio	meq/100g	Annually	Soil Composite
Cadmium	mg/kg	Once per 5 years	Soil Composite
Nickel	mg/kg	Once per 5 years	Soil Composite
Lead	mg/kg	Once per 5 years	Soil Composite
Zinc	mg/kg	Once per 5 years	Soil Composite
Copper	mg/kg	Once per 5 years	Soil Composite
Cation Exchange Capacity	meq/100g	*Only if soil pH changes significantly	Soil Composite
Phosphorus Adsorption (Mehlich 3 acceptable)	meq/100g	**Only if soil phosphorus levels become excessive for plant growth	Soil Composite
Percent Base Saturation	%	*Only if soil pH changes significantly	Soil Composite

*A significant change in soil pH is defined as a change of one or more standard units from the original value established in the Design Development Report.

** Excessive levels of soil phosphorus are defined by the Delaware Nutrient Management Commission. Soil phosphorus levels must be tested in accordance with the University of Delaware soil testing methods (Gartley, 2002). If the soil phosphorus levels become excessive, the Permittee must perform a Phosphorus Site Index (PSI) study. The results must be submitted to the Groundwater Discharges Section within 30 days of completion. Based on these, the Groundwater Discharges Section may require the Permittee to submit a plan for detailing steps to reduce the phosphorus loading rates at the site.

7. VEGETATION MONITORING

In the year prior to permit expiration, a minimum of one composite sample for each field is required upon each harvest. If a crop rotation is utilized either in alternate years or in the same year, the aforementioned requirement must be duplicated for each crop type. If a Compliance Monitoring Report (CMR) is required for the facility, testing should be performed approximately one year prior to permit renewal so results may be utilized by the Permittee in the CMR. Reference Part IV.A.2 of the Permit and Section 6.5.4 of the Regulations regarding CMR requirements.

Parameter	Unit Measurement	Measurement Frequency	Sample Type
Yield	Bushels/acre and lbs/acre	Per harvest	Vegetation Composite
Nitrogen	% and lbs/acre	Per harvest	Vegetation Composite
Phosphorus	% and lbs/acre	Per harvest	Vegetation Composite
% Moisture	%	Per harvest	Vegetation Composite

8. OPERATIONS MONITORING REQUIREMENTS

a. Spray Field Applications

Parameter	Unit Measurement	Monitoring Frequency	Sample Type
Additional/Supplemental Irrigation Water (i.e. groundwater)	Total Gallons per field/zone/pivot	Monthly	Recorded/Calculated
Additional/Supplemental Irrigation Water (i.e. groundwater)	Inches/acre per field/zone/pivot	Monthly	Recorded/Calculated
Fertilizer Nitrogen	lbs/acre per field/zone/pivot	Monthly	Reported
Fertilizer Phosphorus	lbs/acre per field/zone/pivot	Monthly	Reported

b. Lagoons

Parameter	Sample Location	Unit Measurement	Monitoring Frequency	Sample Type
Lagoon Levels	Lagoons	Feet and Gallons	Weekly	Field Test

9. SURFACE WATER MONITORING REQUIREMENTS

Surface Water samples shall be obtained from the six locations as approximately depicted on the Site Map found on Page 3 of this Permit. The surface water sampling locations include Ingram Branch and Sowbridge Branch (East of Reynolds Pond).

The geographic coordinates of the surface water sampling locations were determined and are as follows [Location info taken from 20190717 O&M p34].

Local ID	Northings	Eastings
SW-1	88368.84	205871.47
SW-2	88557.43	206493.46
SW-3	88638.01	207393.63
SW-4	90245.11	205198.77
SW-5	90372.08	206230.09
SW-6	90363.90	207758.40

Coordinates are in NAD 1983 Delaware State Plane 0700 Meters.

Surface Water Monitoring results for each monitoring point shall be reported using the established geographic coordinates.

A down gradient sample for a surface water body should be taken first, immediately followed by the up gradient location for the same surface water body. Followed by, the down gradient sample for the next surface water body being taken third, immediately followed by sampling of the up gradient location for this same surface water body. All samples should be taken on the same day.

Surface Water sampling should not occur within 3 days of a measurable rainfall event to ensure that the streams have returned to base flow, groundwater dominant, conditions.

Parameter	Unit Measurement	Measurement Frequency	Sample Type
Ammonia as Nitrogen	mg/L	Quarterly	Grab
BOD_5	mg/L	Quarterly	Grab
Chloride	mg/L	Quarterly	Grab
Dissolved Oxygen	mg/L	Quarterly	Field Test
Enterococcus	Col/100mL	Quarterly	Grab
Fecal Coliform	Col/100 ml	Quarterly	Grab
Nitrate + Nitrite as Nitrogen	mg/L	Quarterly	Grab
pH	S.U.	Quarterly	Field Test
Sodium	mg/L	Quarterly	Grab
Specific Conductance	µS/cm	Quarterly	Field Test
Temperature	°C	Quarterly	Field Test
Total Dissolved Solids	mg/L	Quarterly	Grab
Total Nitrogen	mg/L	Quarterly	Grab
Total Phosphorus	mg/L	Quarterly	Grab
Total Suspended Solids	mg/L	Quarterly	Grab

B. MONITORING SPECIFICATIONS AND REPORTING REQUIREMENTS

1. Representative Sampling

Samples and measurements taken as required in the operation permit shall be representative of the volume and nature of the monitored discharge. If there has been significant increase (> 25%) in the characterization of any one parameter of the effluent wastewater as established in the Design Engineer Report, the permittee shall resample the wastewater and submit the additional analyses to the Department. The permittee shall re-characterize the wastewater to determine if a change in treatment is required and/or if the land limiting constituent has changed. If a change in treatment is required and/or if the land limiting constituent has changed, a revised Design Engineer Report shall be submitted to the Department. After a review of these results, the Department may invoke the provisions of Part V.A.1 of this Permit.

2. Reporting

Monitoring results obtained during the previous one month/quarter shall be summarized and reported on an approved monitoring report form(s) postmarked no later than the 28th day of the month following the completed reporting period. Laboratory analytical results and sampling logs must be submitted with the corresponding month's monitoring report. Signed reports/forms, laboratory analytical results, laboratory sampling logs and field data sheets shall be submitted in one complete package to the Department at the following address:

Groundwater Discharges Section
Division of Water
Department of Natural Resources and Environmental Control
89 Kings Hwy
Dover, DE 19901
(302) 739-9948 Office

The Department may provide written requirements for the permittee to submit monitoring data electronically. Upon notification from the Department, the Permittee shall transition (as directed) to the Department's electronic database system. The submission may need to be electronically signed.

3. Monitoring results reported as less than the detectible limit should be reported with the less than symbol "<" before the detection limit. The full detection limit value must be utilized in any necessary calculations. The less than symbol must be carried through the calculation. The resulting value must include any appropriate less than or greater than symbol resulting from the calculation.

4. Additional Monitoring by Permittee

If the Permittee monitors any parameter at the location(s) designated herein more frequently than required, using approved analytical methods, the results shall be reported to the Department on an approved monitoring report form. Such increased frequency shall also be indicated.

5. Annual Report

The Permittee shall submit to the Department's Groundwater Discharges an Annual Report summarizing the operations, management, administration and maintenance of the facility for the calendar year. The Annual Report must be submitted to the Department's Groundwater Discharges on or before February 28th of each year. The Annual Report must include all applicable items found in Section 6.8.2.4.1.3 and Section 6.9 of the Regulations.

6. Test Procedures

Test procedures for analysis of pollutants shall conform to the applicable test procedures identified in 40 CFR, Part 136 or the most recently adopted copy of Standard Methods unless otherwise specified in this permit.

7. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the Permittee shall record the following information:

a. The exact place, date and time of sampling and/or measurement;

b. The person(s) who performed the sampling and/or measurement;

c. The date(s) the analyses were performed and the time the analyses were begun;

d. The person(s) who performed the analyses; and

e. The results of each analysis.

8. Records Retention

All records and information resulting from the monitoring activities required by this permit or the Regulations including all records of performed analyses, calibration and maintenance of instrumentation and recording from continuous monitoring instrumentation shall be retained for five years. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or regarding control standards applicable to the Permittee or as requested by the Department.

9. Availability of Reports

All reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department of Natural Resources and Environmental Control. Monitoring data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in 7 Del. C., §6013.

10. Operator Log

An operator log must be kept on site at all times. Each spray system section shall be numbered and referred to by number in the operator log. All records and reports shall also be kept in a bound log book on site at all times and must be made available upon request for review by the Department. This log shall, at a minimum, include the applicable items listed in Section 6.7.3 of the Regulations.

11. Quality Assurance Practices

The Permittee is required to show the validity of all monitoring data by requiring its laboratory to adhere to quality assurance practices in accordance with Section 6.8.2.4 of the Regulations.

PART III

A. OPERATIONAL REQUIREMENTS

1. Duty to Comply

The Permittee shall comply with all the terms and conditions of this Permit.

The discharge of any pollutant more frequently than, or at a level in excess of that identified and authorized herein, shall constitute a violation of the terms and conditions of this Permit. The violation of any influent/effluent limitation or of any other condition specified in this Permit is a violation of 7 Del. C. Chapter 60 and is grounds for enforcement as provided in 7 Del. C., Chapter 60 "Enforcement; civil and administrative penalties; and expenses.", "Criminal Penalties." and "Cease and desist order." for Permit termination or loss of authorization to discharge pursuant to this Permit, for Permit revocation and reissuance, or Permit modification, or denial of a Permit renewal application. The Department may seek voluntary compliance by way of warning, notice or other educational means, pursuant to 7 Del. C., Chapter 60 "Voluntary compliance." or any other means authorized by Law. However, the Law does not require that such voluntary means be used before proceeding by way of compulsory enforcement.

2. Groundwater Requirements

Operation of the wastewater treatment facility and spray irrigation system shall not cause the quality of Delaware's groundwater resources to be in violation of applicable Federal or State Drinking Water Standards.

3. Facilities Operation

The Permittee must properly maintain and operate all structures, pipelines, systems and equipment for collection, treatment control and monitoring which are used by the permittee to achieve compliance with the terms and conditions of the permit. Proper operation and maintenance includes, but is not limited to, effective performance based on designed facility removals, adequate funding, effective management, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures.

4. The spray irrigation fields shall be managed to assure at a minimum that:

   a. Spray irrigation of wastewater shall only occur on fields being prepared for planting or already planted with a crop and shall not occur on fields with crops not actively growing or on voluntary vegetation.

   b. The spray fields shall be maintained in such a manner as to prevent wastewater pooling and/or discharge of wastewater to any surface waters. Should pooled areas become evident, spraying on those areas shall be prohibited until saturated conditions no longer exist.

   c. Aerosols or nuisance odors shall not extend beyond the boundary of the spray irrigation site when treated wastewater is being applied. If odors are produced that are considered to be a public nuisance, the Permittee shall take the necessary steps to eliminate such odors. All action taken shall be reported to the Department in accordance with Part IV.A.4 of this Permit.

   d. Erosion controls must be employed to prevent wastewater runoff from the spray irrigation fields. The Permittee must notify the Department immediately if any wastewater runoff occurs.

   e. The spray irrigation field's crops must be maintained in optimal condition, including any necessary weed management, reseeding, or other vegetative management practices.

   f. Effective vegetative management shall be provided such that crops harvested on the spray irrigation sites are removed from the sites.

g. Forage crops must be harvested and removed from the irrigation field(s) at least twice a year. Crops harvested must be removed from the irrigation site within six (6) months of harvest.

h. The wastewater must be applied in a manner such that the application is even and uniform over the irrigation area.

5. Spray irrigation is prohibited when saturated or frozen soil conditions exist.

6. The groundwater mound created by the added infiltration shall at no time reach within two feet of the ground surface in any section of the spray irrigation fields. Should the groundwater mound exceed this limit, the Permittee shall cease all irrigation of wastewater to the affected fields until the groundwater mound recedes to acceptable levels.

7. Connections or additions to the spray irrigation system other than those indicated on the approved plans are prohibited without prior approval from the Department's Groundwater Discharges Section.

8. The Permittee shall take appropriate measures to protect the spray irrigation system from damage due to sub-freezing conditions.

9. Any leaks shall be reported to the Department and repaired immediately.

10. Signs

    Unlimited Public Access: Unlimited public access sites must have advisory signs posted at all entry points that indicate the site is spray irrigated with treated wastewater. Verbiage should include the following wording: "RECYCLED WASTEWATER – DO NOT DRINK". Alternate verbiage may be used if approved in writing by the Department.

11. Potable ground or surface water may be used for distribution system testing and irrigation to establish vegetation when sufficient treated effluent is not available.

12. Phased Systems

    a. Once an operation permit has been issued and the wastewater flow reaches 80% of the permitted treatment capacity for the constructed phase based on a period of seven (7) consecutive days, the Permittee must submit written notification to the Department. The written notification must include a work plan for construction of the next permitted phase. The Permittee must submit a construction permit application, plans and specifications and Design Engineer Report with applicable fees if the next phase has not yet been permitted or if there are changes to the previously permitted design.

    b. Any flow above the permitted flow for a phase shall not be allowed to be discharged to the system until construction is completed on the following phase and an operating permit has been issued or amended by the Department for the next phase.

    c. Required documents for connecting subdivisions may be found in Section 6.5.10.3.1 of the Regulations.

13. In the event that the permittee installs new monitoring wells or replaces any existing monitoring wells, the Permittee shall submit to the Department's Groundwater Discharges Section new elevation details relative to the common benchmark previously established. Additionally, the permittee shall conduct a groundwater quality sampling program prior to initiation of wastewater disposal activities on the area incorporating the well. The sampling program shall be sufficient to establish representative groundwater quality at each well prior to initiation of the wastewater disposal activities. A minimum of three samples shall be collected at least one month apart and analyzed. A summary report detailing all analyses shall be submitted to the Department's Groundwater Discharges Section prior to initiation of wastewater disposal activities. Analyses shall include the parameters iterated in Section 6.8.1 of the Regulations.

14. The Permittee shall calibrate all flow meters in accordance with the Manufacturer's recommendations. Calibration shall include, but not be limited to influent, effluent, continuous online turbidity and chlorine residual monitors. The calibration documentation must be submitted with the Annual Report in accordance with Part II.B.5.

15. The Permittee shall operate and maintain the land treatment system in accordance with the facility's design and the approved Operation and Maintenance Plan (O&M). A copy of the O&M must be on site at all times. The Permittee must maintain the O&M's accuracy and applicability in accordance with both their Permit and the Regulations. In the event of a discrepancy between the O&M and the Permit or Regulations, the requirements of the Permit and the Regulations would govern.

16. At least three feet of freeboard, measured vertically from the lowest point of the berm, is required for all ponds. The lowest point of the berm must be determined and marked.

17. The Permittee must notify the Department's Groundwater Discharges Section in writing prior to utilizing the freeboard in any lagoon or immediately upon unexpected encroachment into freeboard. In the event of encroachment into freeboard, Permittee shall contact the Groundwater Discharges Section to coordinate relief measures. In the event of an emergency, Permittee may contact the Department at the telephone numbers cited in Part II.B.2 of this Permit; however, written notification must subsequently be provided within 5 days of encroachment.

18. If the facility does not treat sewage and has a storage tank that requires cleanout, and if the Permittee intends to land apply material collected from the cleanout onto the spray irrigation field, the Permittee must analyze the material for nutrients and any other applicable parameters of concern as determined by the Groundwater Discharges Section Prior to tank cleanout being performed. Permittee must submit to the Groundwater Discharges Section a report including the results, the frequency and estimated volume of material to be applied, and how and where it will be applied. The report must include a mathematical analysis determining any nitrogen loading from the tank cleaning combined with nitrogen loading from wastewater application will not exceed the allowable nitrogen load.

19. Fencing is required at treatment facilities, pump stations and storage/treatment ponds. Fencing of spray fields is not required.

20. The collection and channelization of irrigated wastewater for purposes other than retreatment is prohibited.

21. Direct application of treated wastewater to drainage ditches, any water bodies, and wetlands is prohibited.

22. Emergency Repairs

    Emergency repairs or the replacement of critical "like kind" components of the wastewater treatment facility necessary for the continued operation of the facility may be performed without first obtaining a construction permit from the Department.

    A report must be submitted to the Department within five (5) days of completion of the emergency repairs. The report must summarize the nature of the emergency and the repairs performed. All violations must also be reported in accordance with Section 6.5.9.

23. Adverse Impact

    The Permittee shall take all reasonable steps to eliminate or minimize any adverse impact to waters of the State resulting from this Permit, including such accelerated or additional monitoring as necessary to determine the source, nature, and extent of the impact from a noncomplying discharge. In addition, at the direction of the Department, the Permittee shall submit a corrective action plan which will include a description of the proposed actions to mitigate or eliminate the source of the impact and an associated completion schedule. The plan shall be enacted as approved by the Department.

24. Bypassing

The diversion of flow from any portion of the treatment facility's process flow (including, but not limited to, pretreatment, storage, distribution and land application) necessary to maintain compliance with the terms and conditions of this permit is prohibited unless:

a. The bypass is unavoidable to prevent personal injury, loss of life, severe property damage, or materially adversely affect public health and/or the environment; or

b. There are no alternatives readily available.

The Groundwater Discharges Section must be orally notified within 24 hours after such bypass; and, a written submission regarding the bypass must be submitted within five days of the Permittee's becoming aware of the bypass. Where the need for a bypass is known (or should have been known) in advance, this notification must be submitted to the Groundwater Discharges Section for approval at least ten days prior, or as soon as possible, before the date of bypass.

The treatment facility must be repaired and restored to the permitted design operations process flow.

25. Removed Substances

Solids, sludges, filter backwash or other pollutants removed in the collection, conveyance, or treatment of wastewater shall be disposed of in a manner such as to prevent any pollutant from entering the surface water or groundwater and to comply with applicable federal or state laws and regulations.

26. Power Failures

An alternative power source, which is sufficient to operate the wastewater treatment and disposal facilities, shall be available. If such alternative power source is not available, the Permittee shall halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater facilities.

PART IV

A. MANAGEMENT REQUIREMENTS AND RESPONSIBILITIES

1. Initiation of Facility Operations Notification

   If this Permit is for initial operations following construction, the Permittee shall notify the Department in writing within 24 hours of the initiation of operations.

2. Operation Permit Re-Issuance

   At least 180 days before the expiration date of this Permit, the Permittee must submit an application for renewal or notify the Department of the intent to cease discharging by the expiration date. The application package for systems with a design flow ≥ 100,000 GPD, must include a five (5) year Compliance Monitoring Report (CMR). The CMR must be in accordance with Section 6.5.4.3 of Regulations. In the event that a timely and complete application has been submitted as determined by the Department, and the Department is unable, through no fault of the Permittee, to issue a new Permit before the expiration date of this Permit, the terms and conditions of this Permit are automatically continued and remain fully effective and enforceable until a decision is made on the new application.

3. Change in Discharge

   All discharges authorized herein shall be consistent with the terms and conditions of this Permit. The discharge of any pollutant identified in this Permit more frequently than or at a level in excess of that authorized shall constitute a violation of the Permit.

   Any anticipated facility expansions, production increases, or process modifications that will result in new, different, or increased discharges of pollutants must be reported in writing to the Department's Groundwater Discharges Section for approval. A new Permit may be required.

   Any other activity which would constitute cause for modification or revocation and reissuance of this Permit as described in Part V.A.1 of this Permit shall be reported to the Groundwater Discharges Section. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

4. Non-compliance Notification

   The Permittee shall report to the Groundwater Discharges Section orally within 24 hours from the time the Permittee became aware of any noncompliance that may endanger the public health or the environment by contacting the Groundwater Discharges Section at the telephone numbers cited in Part II.B.2 of this Permit.

   If for any reason the Permittee does not comply with, or will be unable to comply with, any effluent limitations or other conditions specified in this permit, the Permittee shall provide the Department with the following information in writing within five days of becoming aware of any actual or potential noncompliance:

   a. A description and cause of the non-compliance with any limitation or condition;

   b. The period of non-compliance including exact dates and times; or, if not yet corrected, the anticipated time the non-compliance is expected to continue; and

   c. The steps being taken or planned to reduce, eliminate and/or prevent recurrence of the non-compliant condition.

5. Spill Reporting

In the event of any environmental release of pollutants (i.e., spill), the Permittee shall call the Department's 24-hour Emergency Release Reporting Hotline at (800) 662-8802.

The Permittee shall also notify the GWDS regarding any environmental release of pollutants (i.e., spill) into surface water or groundwater or on land, within 24-hours from the time the Permittee becomes aware of the release and activate their emergency site plan. In addition the following information shall be reported to the GWDS within five days.

1) The facility name and location of release;
2) The chemical name or identity of any substance involved in the release;
3) An indication of whether the substance is an extremely hazardous substance;
4) An estimate of the quantity of any such substance that was released into the environment;
5) The time and duration of the release;
6) The medium or media into which the release occurred;
7) Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals;
8) Proper precautions to take as a result of the release, including evacuation;
9) The names and telephone number of the person or persons to be contacted for further information; and
10) Such other information as the GWDS may require.

6. Facility and Construction Changes

The Permittee shall submit a written report to the Department for review and approval, of any changes to the facility or construction of the system within the following time periods:

a. Thirty days before any planned activity, physical alteration to the permitted facility or addition to the permitted facility if that activity, alteration or addition would result in a change in information that was previously submitted to the Department;

b. Thirty days before any anticipated change which would result in noncompliance with any permit condition or the regulations; or

b. Immediately after the Permittee becomes aware of relevant facts omitted from, or incorrect information submitted in, a permit application or report to the Department.

7. Right of Entry

The permittee shall allow the Department entry and access, consistent with 7 Del.C. Ch. 60, to:

a. Enter the permitted facility.

b. Inspect any records that must be kept under the conditions of the Permit.

c. Inspect any facility, equipment, practice, or operation permitted or required by the Permit.

d. Sample or monitor for the purpose of assuring Permit compliance of any substance or any parameter at the facility.

8. Permit Transferability

Permits may be transferred to a new owner or operator. The Permittee must notify the Department by requesting a change of ownership of the permit before the date of transfer. The transfer must be consistent with any notarized legal documents and/or CPCN required by the Regulations. The legal documentation must be provided with the application. The application must be received 30 days before the transfer.

a. No person shall transfer a permit from one (1) person to another unless 30 days written notice is given to the Department, indicating the transfer is agreeable to both persons, and approval of such transfer is obtained in writing from the Department, and any conditions of the approval of such transfer is obtained in writing from the Department, and any conditions of the transfer approved by the Department are complied with by the transferor and the transferee.

b. The notice to the Department shall contain a written agreement between the transferor and the transferee, indicating the specific date of proposed transfer of Permit coverage and acknowledging responsibilities of current and new permittees for compliance with and liability for the terms and conditions of this permit. The notice shall be signed by both the transferor and the transferee.

PART V

A. PROVISIONS

1. Permit Revocation

   The Department may revoke a Permit if, among other things, the Permittee violates any Permit condition, these regulations, fails to pay applicable Departmental fees, obtains the permit by misrepresentation or fails to fully disclose all relevant facts.

   Except in cases of emergency, the Department shall issue a written notice of intent to revoke to the permittee prior to final revocation. Revocation shall become final within 20 days of receipt of the notice by the Permittee, unless within that time the permittee requests an administrative hearing in writing.

   The Department shall notify the Permittee in writing of any revocation hearing at least 20 days prior to the date set for such hearing.

   If the Department finds the public health, safety or welfare requires emergency action, the Department shall incorporate findings in support of such action in a written notice of emergency revocation issued to the permittee. Emergency revocation shall be effective upon receipt by the Permittee. Thereafter, if requested by the Permittee in writing, the Department shall provide the permittee a revocation hearing.

2. Permit Modifications/Amendments

   In consultation with the Permittee, the Department may modify or amend an existing permit provided that the modifications would not result in an increased impact or risk to the environment or to public health.

3. State Laws

   This Permit shall not be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation.

4. Property Rights

   The issuance of this Permit does not convey any property rights of either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

5. Severability

   The provisions of this Permit are severable. If any provision of this Permit, or the application of any provision of this Permit, to any circumstances is held invalid; the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

6. This Permit does not relieve the Permittee of complying with any applicable Federal, State or local regulations.

7. Additional Information

   The Permittee shall furnish to the Department within a specified period of time, any information including copies of records, which may be requested by the Department to determine whether cause exists for modifying, revoking, reissuing, or terminating the permit, or to determine compliance with the permit and the Regulations.

8. Wastewater Treatment Facility Closure/Abandonment

   In the event the wastewater treatment facility, or a component of the facility, is proposed to be abandoned, the permittee shall submit a proposed closure and abandonment work plan with procedures on how the facility will be abandoned for review and approval by the Department. The work plan shall address remediation if monitoring data indicates impacts to the environment. Upon review and approval of the work plan and completion of all closure and abandonment actions the permittee must contact the Department for a final inspection of the site.

9. In the event that the *Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems* or applicable federal regulations are revised, this Permit may be opened and modified accordingly after notice and opportunity for a public hearing.

10. This Permit supersedes all previous spray irrigation operation permits issued to the Permittee for this facility.

Appendix VIII

ADDENDUM TO THE CONCILIATION ORDER BY CONSENT

SECRETARY'S ORDER No. 2018-W-0057

Issued Pursuant to 7 Del. C. §6005(b)(2)

Issued to: Dr. Key U. Lee President & CEO
Allen Harim, LLC
29984 Pinnacle Way
Millsboro, DE 19966

Dear Dr. Lee:

This Addendum to the Conciliation Order by Consent and Secretary's Order ("Order") reflects the mutual effort by Allen Harim, LLC ("Allen Harim") and the Secretary of the Department of Natural Resources and Environmental Control ("Secretary or DNREC") (collectively the "Parties") to attain compliance with *7 Del. C.* Chapter 60 by Conciliation pursuant to *7 Del. C.* §6005(b)(2) in light of proposed changes to the Environmental Improvement Project as further detailed below.

SECTION I: BACKGROUND

WHEREAS, Allen Harim and DNREC jointly executed the Order on October 30, 2018, to resolve and comprehensively address compliance issues contained in Secretary's Order 2018-W-0014, 5-day, and non-compliance letters, and other permitting issues at both the Harbeseon Facility and Dagsboro Hatchery; and

WHEREAS, Allen Harim had originally proposed funding a Nature Conservancy project. That project, however, is not going to proceed; and

WHEREAS, Allen Harim has presented DNREC with an alternative Environmental Improvement Project in conjunction with the Delaware Center for the Inland Bays, and DNREC has determined that this alternative is acceptable in theory; and

WHEREAS, the Order must be modified to reflect this alternative project.

SECTION II: CONCILIATION

NOW THEREFORE, this Addendum to the Order is hereby jointly executed to effectuate the purposes and actions delineated herein, and pursuant to *7 Del. C.* §6005(b)(2), it is Ordered and Agreed as follows:

1. Paragraph 2 of Section II of the Order is hereby replaced with Paragraph 2 of this Section.

2. In lieu of paying the administrative penalty, Allen Harim has proposed to offset said administrative penalty by undertaking an Environmental Improvement Project ("EIP"). At the time of the Order signing, Allen Harim had not yet submitted a proposed EIP for DNREC's approval. Due to the November 13, 2018 EAB Hearing, the parties agreed that executing the Order was in their best interests. Allen Harim informed DNREC that it would be unable to comply with the original deadlines of the Order and DNREC has agreed to modify the terms as follows:

    a. Allen Harim expects that the EIP will fund a Delaware Center for the Inland Bays ("CIB") project to purchase high-value conservation property for reforestation and permanent protection.
    b. The EIP will be memorialized by written agreement ("Agreement") between Allen Harim and any third parties, including but not limited to CIB, performing and/or directing the work, to be accepted and approved by DNREC, which will expressly stipulate the roles, responsibilities and accountabilities of both parties. Specifically, the Agreement must detail the environmental benefit, expenses to be incurred in the development and implementation of the project, and a timeline for project completion in order to be approved by DNREC.
    c. Allen Harim shall remain in regular contact with DNREC. At a minimum, Allen Harim shall update DNREC every ninety (90) days with an explanation of the work completed since the previous update and disclosure of any delays or issues reasonably anticipated to affect the timeline.
    d. The Agreement must be finalized within sixty (60) calendar days from the effective date of this Addendum to the Order. Further, the project must be completed, including final report submission, no later than December 31, 2020.
    e. The successful completion of the EIP, subject to DNREC approval thereof, will result in the direct offset not to exceed **50%** of the Administrative Penalty Assessment (an amount not to exceed **$150,000**), leaving a remaining balance of not less than **$150,000**, plus DNREC abatement expenses in the amount of **$7,888**.
    f. It is anticipated by the Parties that Allen Harim will utilize the maximum direct offset amount to fund the EIP. Accordingly, Allen Harim previously remitted the minimum $150,000 administrative penalty, plus DNREC abatement expenses in the amount of $7,888.

g. In the event that any of the above deadlines are not met, the outstanding **$150,000** administrative penalty will shall become immediately due and payable.

3. All other provisions of the Order remain in full force and effect and are not modified by this Addendum.

4. This Addendum becomes effective on the date of execution by the Secretary of DNREC.

Date: 7/18/19

Shawn M. Garvin, Secretary
Department of Natural Resources
and Environmental Control

Agreed and Accepted:

Date: 7/1/2019

Allen Harim, LLC

By:
Name: DR. KEY U. LEE
Title: CEO