



# PILOT PROJECT DESIGN AND SAMPLING PLAN

## Sampling Domestic Wells, Located Downgradient of the Clean Delaware Class B Biosolids Application Sites, for PFAS

Department of Natural Resources and Environmental Control

Division of Water

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## 1.0 INTRODUCTION

The initial Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Water (Water) Project Design and Sampling Plan for PFAS in Biosolids was prepared in October 2022 (DNREC, 2022), field sampling was completed in April 2024, and a data summary report is available at <https://dnrec.delaware.gov/waste-hazardous/remediation/pfas/and-wastewater/>. The initial study looked at the concentration of PFAS in biosolids from 5 different wastewater treatment facilities and the concentration of PFAS in soil and groundwater at one long term biosolids land application site. A second DNREC Water Project Design and Sampling Plan was developed to further study groundwater impacts at 5 additional biosolids land application sites (DNREC, 2024). This plan was finalized in August 2024 and sampling activities began in November 2024. The second biosolids PFAS study data summary report was published in May 2025 and is available at <https://dnrec.delaware.gov/waste-hazardous/remediation/pfas/and-wastewater/>. The sites that were selected for the second study are shown in Table 1.

Site Name	Approximate Application Acres	Approximate Number of Private Wells < 0.5 Miles Downgradient	Approximate Years of Biosolids Application
Clean Delaware Milton Site	170	70	30
Clean Delaware New Market Site <sup>1</sup>	34	10	30
Clean Delaware Harbeson Site	24	10	30
Sussex County Hettie Lingo <sup>2,3</sup> and Tower Site	125	15	20 <sup>2</sup>
Synagro / Town of Georgetown Application Site Fields 22 and 24 <sup>4, 5</sup>	306	40	20 <sup>4</sup>

Table 1 - Biosolids sites associated with PFAS in water and drinking water study

<sup>1</sup> Application of biosolids and residuals ceased in 2013. Traditional agricultural practices continue at this site.

<sup>2</sup> Beginning in 1993 through the mid 2000’s, Mountaire was permitted to land apply Class B biosolids at this site. Sussex County applied biosolids beginning in the mid 2000’s and ceased application in 2012.

<sup>3</sup> Spray irrigation activities began in 2012 on the north end of the field and by 2017 the entire field was dedicated to spray irrigation.

<sup>4</sup> Fields 22 and 24 were formerly known as field 7. Currently under the spray irrigation program, field 22 is known as fields 2 and 3 and field 24 is known as field 4.

<sup>5</sup> Spray irrigation activities began in 2009 and continue to date. Class B biosolids application began in 1993 and ceased in 2016.

Laboratory analytical results of samples collected during the aforementioned biosolids land application studies show that PFAS compounds are not only present in biosolids, but also in soils that received biosolids application and in groundwater sampled from monitoring wells at biosolids land application sites. This document outlines the next phase PFAS study and will address the potential presence of PFAS in drinking water, sampled from domestic wells located downgradient of the Clean Delaware Milton biosolids application site, that are installed in the unconfined aquifer (hereafter, the biosolids “domestic well pilot study”). Domestic wells identified downgradient and nearby the Clean Delaware New Market and Clean Delaware Harbeson sites, and the Sussex County Inland Bays site and the Synagro / Town of Georgetown application site will be evaluated in the future during the next phase of DNREC’s domestic well sampling project that is associated with biosolids application sites.

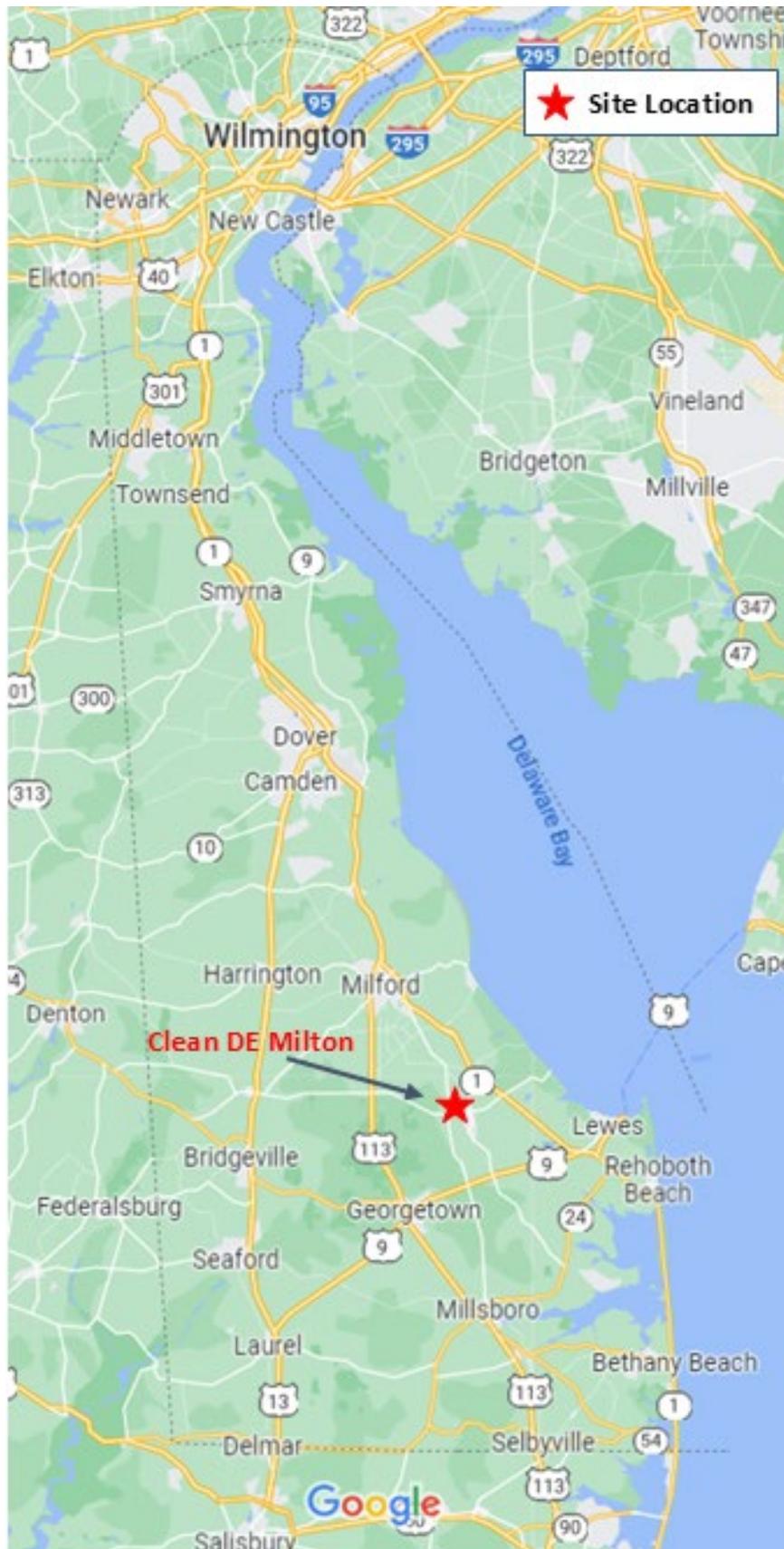


Figure 1. Site Location Map of the Biosolids Domestic Well Pilot Study



As more research and understanding of the impacts of PFAS occurs, Drinking Water Standards are likely to be modified. The most current drinking water standards from USEPA can be found at <https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas>. As of February 2026, EPA’s standards are as shown in Table 2.

Compound	Final MCLG	Final MCL (enforceable levels)
PFOA	Zero	4.0 parts per trillion (ppt) (also expressed as ng/L)
PFOS	Zero	4.0 ppt
PFHxS	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
HFPO-DA (commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1 (unitless) Hazard Index	1 (unitless) Hazard Index

Table 2. USEPA PFAS Drinking Water MCLs (MCLG = maximum contaminate level goal)

Maximum Contaminant Levels (MCLs) for drinking water are established under the USEPA National Primary Drinking Water Regulations (USEPA, 2009). MCLs for several PFAS compounds were set by the USEPA in April 2024 (USEPA, 2024a). These criteria are applicable to treated drinking water in regulated public drinking water systems, and not to “raw” water samples collected from a surface water body or from groundwater. In addition to the MCLs for PFNA, PFHxS, PFBS and/or HFPO-DA, these compounds are to be combined and used in the calculation of a Hazard Index MCL, as noted on USEPA’s website (USEPA, 2024b), to determine if an exceedance of the Hazard Index criterion has occurred. Currently, when PFAS compounds are detected in private drinking water in Delaware at concentrations above the USEPA’s established MCLs for public water systems for PFAS compounds listed in Table 2, DNREC implements a response plan. The response plan may include mitigation, monitoring and studies to determine alternate sources of drinking water, and/or water treatment to ensure that water supplies are safe to consume. USEPA’s MCL’s are used as threshold concentrations to characterize the downgradient areas for mitigation and have been used by DNREC as threshold concentrations since the values were proposed by EPA in March 2023.

USEPA’s MCL’s were used to evaluate the levels of PFAS in groundwater sampled from on-site monitoring wells and will also be used to evaluate the potential existence of PFAS in downgradient domestic wells above these standards. The Project Design and Sampling Plan (DNREC, 2024) indicated that 4 groundwater samples would be collected from each selected on-site monitoring well to detect possible seasonal change and to raise statistical confidence level of the data. However, upon reviewing the first 2 sampling events of these monitoring well data, it was determined that all 5 study sites had PFAS levels greater than the MCLs for at least one PFAS compound. At that time, a determination was made that more than 2 samples were unnecessary and that downgradient domestic wells require sampling for PFAS. This pilot study will look at domestic wells downgradient of the Clean Delaware Milton biosolids land application site in accordance with this Pilot Project Design and Sampling Plan.



Hydrogeological reports prepared by the wastewater treatment facilities, as well as by DNREC Water staff, were reviewed to evaluate the groundwater flow direction in the land application areas. A Geographic Information System (GIS) was used to identify downgradient domestic wells within 0.5 mile from the site boundaries and to compile well depth information when complete records were available. Domestic wells selected for sampling in this study were based on proximity to the Clean Delaware Milton Farm biosolids application site and well depth. A statistically sufficient number of wells listed at depths of under <60 feet (shallow = S), 60-70 feet (medium = M), 71-90 feet (deep = D), >90 feet (very deep = VD), unknown = U, were selected to characterize groundwater, primarily in the unconfined aquifer. Additionally, secondary wells were identified as alternatives should DNREC be unable to sample the primary wells.

If PFAS levels are detected above the MCL in any domestic wells sampled as part of this study, drinking water treatment will be offered to the affected property owners. Nearby (e.g., within 500 feet) domestic wells, at similar depth groups, will be presumed to be impacted and drinking water treatment will be offered as appropriate. The majority of wells selected for sampling in this pilot study are known or believed to be screened in the unconfined aquifer (*shallow wells*); however, a limited number may be screened in uppermost confined aquifer.

## 2.0 CLEAN DELAWARE MILTON FARM BIOSOLIDS APPLICATION site

### 2.1 Background Information

The Clean Delaware Milton Farm Class B biosolids application site is permitted and currently actively utilized for the land application of several different materials. Sludge (biosolids) from wastewater treatment plants is required to be treated to Class B pathogen reduction requirements, prior to being accepted by Clean Delaware for land application. Septic tank pump-outs are treated on-site by lime stabilization (pH is increased to a pH of 12 for at least 2 hours) and stored in a 200,000 gallon above ground storage tank (AST) prior to application onto designated application fields. Additional materials applied to the land include brewery wastewater and grease trap waste. The site was originally permitted in 1992 and consists of approximately 170 acres of land suitable for application. The 2024 Project Design and Sampling Plan (DNREC, 2024) contains detailed descriptions of site operations, layout, and the locations of PFAS sampling from on-site and nearby groundwater monitoring wells.

In general, groundwater flows from west to east beneath the application area. Five groundwater monitoring wells were selected for the PFAS in the 2024 Biosolids Study, 3 on-site and 2 off-site. Three monitoring wells are located upgradient and 2 monitoring wells are downgradient. Due to an unusually low water table during sampling activities, it was only possible to collect 1 sample from the 2 downgradient monitoring wells. The results of the 1 downgradient well sample was above USEPA's MCLs for PFOA and PFHxS. Sampling of downgradient domestic shallow wells has, therefore, been prioritized.

### 2.2 Domestic Well Sampling

A total of 43 domestic wells surrounding the Clean Delaware Milton site were selected for sampling in this study, which includes 26 primary and 17 secondary wells. If primary wells are not available for sampling, secondary wells will be selected for sampling. Table 3 provides basic information about the selected wells and Figure 2 shows the location of the wells relative to the site.



Table ID	Local ID	Choice	Depth (ft)	Table ID	Local ID	Choice	Depth (ft)
1	MLT-DOM01Sp	Primary	35	23	MLT-DOM13Dp	Primary	87
2	MLT-DOM02Sp	Primary	50	24	MLT-DOM14Dp	Primary	90
3	MLT-DOM02Ss	Secondary	50	25	MLT-DOM15VDp	Primary	120
4	MLT-DOM03Sp	Primary	50	26	MLT-DOM15VDs	Secondary	120
5	MLT-DOM03Ss	Secondary	55	27	MLT-DOM16VDp	Primary	150
6	MLT-DOM04Sp	Primary	50	28	MLT-DOM16VDs	Secondary	150
7	MLT-DOM05Sp	Primary	55	29	MLT-DOM17VDp	Primary	150
8	MLT-DOM05Ss	Secondary	55	30	MLT-DOM18VDp	Primary	102
9	MLT-DOM06Mp	Primary	70	31	MLT-DOM19Sp	Primary	50
10	MLT-DOM06Ms	Secondary	70	32	MLT-DOM19Ss	Secondary	55
11	MLT-DOM07Mp	Primary	66	33	MLT-DOM20Sp	Primary	50
12	MLT-DOM07Ms	Secondary	60	34	MLT-DOM20Ss	Secondary	50
13	MLT-DOM08Mp	Primary	60	35	MLT-DOM21Mp	Primary	65
14	MLT-DOM08Ms	Secondary	60	36	MLT-DOM21Ms	Secondary	72
15	MLT-DOM09Mp	Primary	60	37	MLT-DOM22Dp	Primary	90
16	MLT-DOM09Ms	Secondary	60	38	MLT-DOM22Ds	Secondary	100
17	MLT-DOM10Mp	Primary	60	39	MLT-DOM23Dp	Primary	90
18	MLT-DOM10Ms	Secondary	60	40	MLT-DOM23Ds	Secondary	90
19	MLT-DOM11Dp	Primary	76	41	MLT-DOM24Up	Primary	Unknown
20	MLT-DOM12Dp	Primary	75	42	MLT-DOM25Up	Primary	Unknown
21	MLT-DOM12Ds	Secondary	75	43	MLT-DOM26Up	Primary	Unknown
22	MLT-DOM13Ds /14Ds	Secondary	90				

\* See Section 3.0 for a narrative description of the local ID labeling format.

Table 3. Primary and secondary choice domestic wells to be sampled adjacent to the Clean DE Milton Farm biosolids application site.

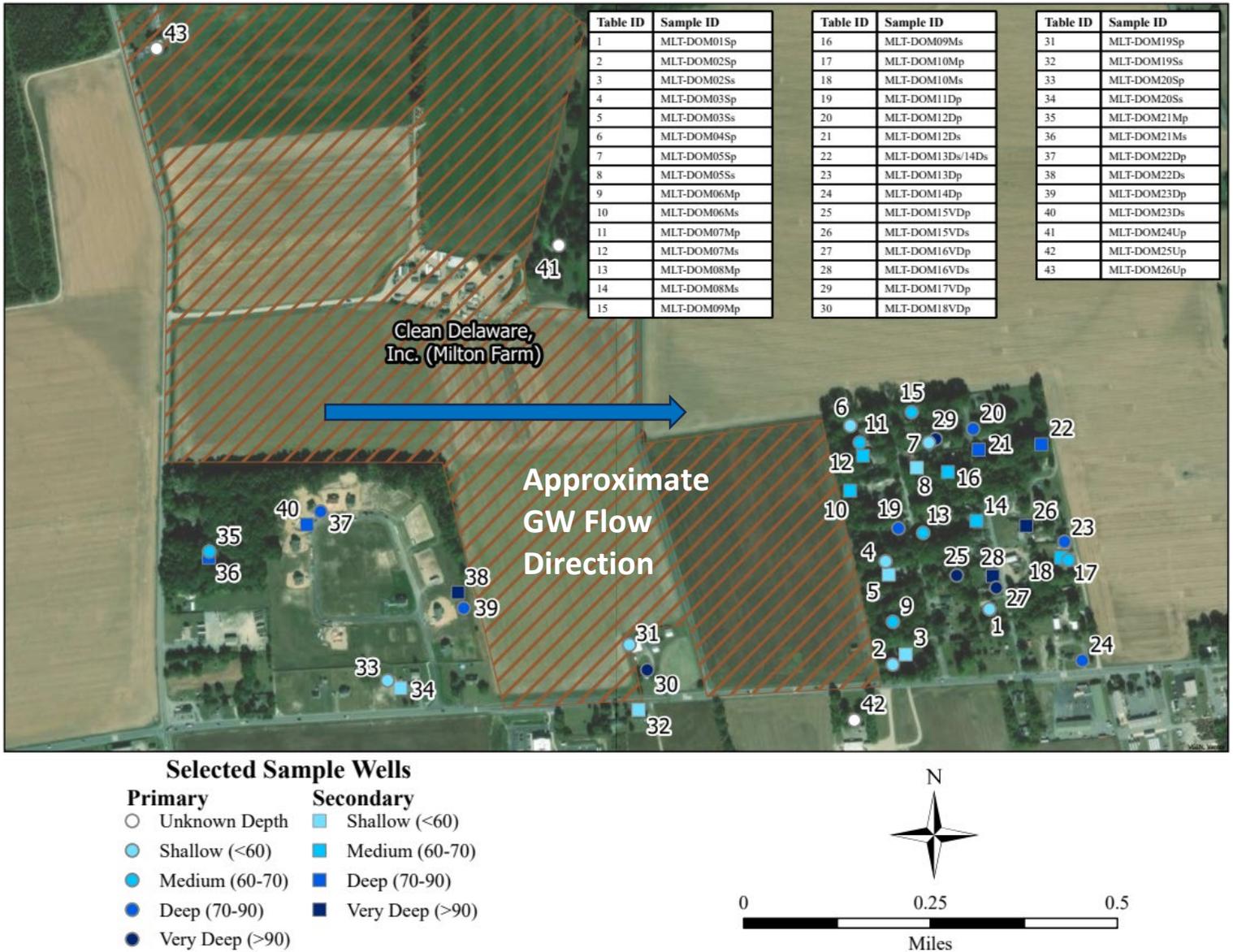


Figure 2. Sampling Location Map – Domestic wells adjacent to Clean Delaware Milton Farm biosolids application site



### 3.0 SAMPLE IDENTIFICATION AND LABELING

Samples collected from domestic wells for this study will be identified using the following labeling format:

Site Code+DOM+SampleID+Depth Group+Priority, where Site Code is defined as MLT = Clean Delaware Milton Farm; DOM = domestic well; Sample ID = number 1 through 26 corresponding to the sample location, Depth Group = under <60 feet (shallow = S), 60-70 feet (medium = M), 71-90 feet (deep = D), >90 feet (very deep = VD), unknown = U, and Priority (primary selection = p and secondary selection = s). For example, **MLT-DOM02Ss** will be the sample collected adjacent to the Clean Delaware Milton Farm site, from a shallow secondary selected domestic well.

For this study, effort will be made to collect a groundwater sample prior to any reverse osmosis or activated carbon treatment system at each residence. If it is not possible to collect a pre-treatment sample, a post-treatment sample will be collected. “-POST” will be added to the sample ID if a sample is collected post treatment and the type of treatment will be noted in the field sampling log. If at a residence where a treatment system is (or multiple treatment systems are) in operation, and it is possible to collect samples from inflow and outflow, two samples: one pre-treatment and one post-treatment will be collected. “-POST” will be added to the sample ID of the post-treatment sample. The type of treatment (i.e., reverse osmosis, activated carbon), treatment location (i.e., point of use, or point of entry), and the date of last maintenance (such as filter/membrane replacement) will be noted in the field sampling log. For PFAS analysis, sediment or ceramic filtration, ultraviolet purification and water softener systems will not be considered a “treatment system” in this study, and there is no need to collect a “-POST” sample. For the analysis of Division of Public Health (DPH) parameters (DHSS, 2024), however, pre-treatment and post-treatment samples will be collected for any well with treatment system(s) installed at the residence. In this case, “DPH Post” will be included in the sample ID.

### 4.0 QUALITY ASSURANCE AND QUALITY CONTROL

A Quality Assurance Project Plan (QAPP) will be developed for this study before the start of sampling. DNREC Water will select qualified contractors and laboratories to perform sample collection and analysis. These contractors will be required to submit Standard Operating Procedures (SOPs) and Quality Assurance and Quality Control Plans (QA/QC) to DNREC for approval prior to sampling. All samples will be analyzed using DNREC modified USEPA Method (1633M). Appendix I presents the analyte list of Method 1633M.

### 5.0 SAMPLING FREQUENCY AND PROJECT SCHEDULE

One-time sampling will be conducted from selected wells as specified in Sections 2.0 through Section 4.0 for this study. USEPA MCLs (EPA, 2024a) will be used as threshold concentrations to characterize the downgradient areas for mitigation. If detections from domestic wells exceed PFAS threshold concentrations, treatment options will be made available to homeowners of impacted domestic wells and unsampled proximate domestic wells as appropriate (free of charge). Additional sampling may be conducted when deemed necessary.

This project design and sampling plan was finalized in February 2026 and it is anticipated that field sampling will first occur in the second quarter of 2026. Sampling will be coordinated with



the DPH, who has indicated the desire to collect samples with DNREC for analysis of general drinking water parameters (DHSS, 2024).

## 6.0 SUMMARY

DNREC Water intends to conduct follow-up studies on the impacts of the land application of Class B biosolids to groundwater by sampling domestic wells downgradient of biosolids application sites where groundwater from onsite monitoring wells was found to contain PFAS. For this Pilot Study, a total of 26 domestic wells, downgradient of Clean Delaware Milton Farm Class B biosolids land application sites, will be sampled. A potential total number of approximately 52 groundwater samples will be collected (assuming pre- and post- treatment samples need to be collected from 26 residences). Additional QA/QC samples will be collected in accordance with the QAPP. This estimated total number of samples does not include the QA/QC samples collected by the field team. Field sampling for this pilot study is expected to start in May 2026. The full scale downgradient domestic well study for the other selected Class B biosolids application facilities is anticipated to commence later in 2026.

## REFERENCES

DHSS, 2024: Private Well Owners (<https://dhss.delaware.gov/dph/lab/privdw.html>)

DNREC, 2022: PROJECT DESIGN AND SAMPLING PLAN- PFAS -PFAS in Biosolids: Characterization and Fate (<https://documents.dnrec.delaware.gov/dwhs/remediation/watar/PFAS-Project-Design-and-Sampling-Plan-Biosolids.pdf>)

DNREC, 2024: PROJECT DESIGN AND SAMPLING PLAN – PFAS in Groundwater Associated with Class B Biosolids Land Application Sites (<https://documents.dnrec.delaware.gov/dwhs/remediation/watar/PFAS-Project-Design-and-Sampling-Plan-Biosolids-Monitor-Wells.pdf>)

USEPA, 2009. National Primary Drinking Water Regulations: <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>

USEPA, 2021. Method 1633: Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS: [https://www.epa.gov/system/files/documents/2021-09/method\\_1633\\_draft\\_aug-2021.pdf](https://www.epa.gov/system/files/documents/2021-09/method_1633_draft_aug-2021.pdf)

USEPA, 2024a: EPA’s Final PFAS National Primary Drinking Water Regulation: Monitoring and Reporting ([https://www.epa.gov/system/files/documents/2024-04/pfas-npdwr\\_fact-sheet\\_monitoring\\_4.8.24\\_0.pdf](https://www.epa.gov/system/files/documents/2024-04/pfas-npdwr_fact-sheet_monitoring_4.8.24_0.pdf))

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