St. Mary's River Pilot Study of PFAS Occurrence in Surface Water and Oysters
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Maryland Department of the Environment
Water and Sciences Administration

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ACRONYM LIST

COC	Chain of Custody
DNR	Maryland Department of Natural Resources
EPA	United States Environmental Protection Agency
ESI	Expanded Site Inspection
LRP	Land Restoration Program
MDE	Maryland Department of the Environment
M	Meter(s)
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MPH	miles per hour
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
ng/L	nanograms per liter
NIST	National Institute of Standards and Technology
pps	practical salinity
ppt	parts per trillion
PFAS	Per- and polyfluoroalkyl substances
RI	Remedial Investigation
µg/kg	micrograms per kilogram
uS/cm	microSiemens
USGS	United States Geological Survey
WSA	Water and Sciences Administration
°C	degrees Celsius

EXECUTIVE SUMMARY

Per- and Polyfluoroalkyl Substances (PFAS) are a family of thousands of human-made chemicals that are found in a wide range of products used by consumers and industry since the 1940's. PFAS have been used in a variety of applications including in stain- and water-resistant fabrics and carpeting, cleaning products, paints, and fire-fighting foams due to their resistance to grease, oil, water and heat. Many PFAS are persistent in the environment and can bioaccumulate. The widespread use of PFAS and their ability to remain intact in the environment means that over time PFAS levels from past and current uses can result in increasing levels of environmental contamination which may bioaccumulate throughout the food chain. Understanding the occurrence of PFAS compounds in various environmental compartments (e.g., air, surface water, groundwater, and land) and the routes of human exposure (e.g., in drinking water or in foods such as seafood) is a growing area of science, as environmental and public health professionals seek to better understand the risks to human health posed by PFAS.

In late 2019 and early 2020, the Maryland Department of the Environment (MDE) increased its efforts to better understand, communicate and manage PFAS risks in Maryland and initiated two new studies: (1) a pilot study of the occurrence of PFAS compounds in surface water and oysters (the St. Mary's River Study) and (2) a study of the occurrence of PFAS in a subset of public drinking water treatment systems across the State. The focus of this Report is on presenting and interpreting the results of the St. Mary's River Study of the occurrence of PFAS in surface water and oysters.

The St. Mary's River Study piloted an approach for determining the presence of PFAS in surface waters and oysters in the vicinity of Webster Field Annex and the Patuxent River Naval Air Station, where potential sources of PFAS may be present due to the use of fire-fighting foam which contains PFAS. The study included monitoring for PFAS in surface waters and oysters in the St. Mary's River, St. Inigoes Creek, Smith Creek, the Patuxent River, and Fishing Bay (a reference station located on Maryland's eastern shore).

A pre-sampling field exercise was conducted in June 2020 to validate quality control procedures utilized during surface water and oyster sample collection. PFAS compounds were not detected in any of the quality control samples indicating procedural integrity for the scheduled surface water and oyster field sampling event. Study area oyster and surface water samples were collected during July and August 2020. The Department contracted the services of Alpha Analytical Mansfield Laboratory, 320 Forbes Boulevard, Mansfield, MA 02048 for sample analysis.

Results of the PFAS public health risk evaluation for recreational surface water exposure and oyster consumption were very low and were significantly below MDE site-specific risk-based screening criteria throughout the entirety of the study area. The evaluation of the surface water samples, and oyster tissue consumption included a comparison to PFAS concentrations from a control site located in Fishing Bay on the Eastern Shore. Risk-based surface water and oyster tissue screening criteria were developed for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS) which both have toxicity values.

Surface water concentrations of PFAS ranged from 2.3 to 13.5 ng/L, suggesting recreational health risks from potential exposure to PFAS in surface water are very low. Concentrations of PFAS were below site-specific risk based PFAS recreational surface water incidental ingestion screening concentrations and the EPA PFAS drinking water lifetime health advisory level. Surface water analysis in the area of concern indicated that total PFAS concentrations are similar to those found at the control site and PFAS compounds, PFOA and PFOS were only intermittently detected at or near the analytical detection limits throughout the study area and control site. While the EPA lifetime health advisory level for treated drinking water of 70 ng/l is not an appropriate health-based screening criterion for recreational use, within the study area all water sample concentrations of PFOA, PFOS and PFAS compounds were well below the drinking water lifetime health advisory level.

The evaluation of the oyster tissue samples includes a comparison to PFAS oyster tissue concentrations at the control site and comparisons to a range of risk-based oyster consumption screening concentrations that were derived for PFOA and PFOS assuming all oysters were consumed from the same harvesting location. Oyster tissue concentrations were non-detect throughout the study area and the only reported detection of PFAS was in the Fishing Bay control site location at 1.57 ug/kg, which approached the method detection limits. Results of the oyster tissue consumption evaluation for PFOA plus PFOS indicated consumption of oysters within the study area and at the control site are well below the MDE site-specific oyster consumption screening criteria derived to be protective of public health.

The study concludes PFAS is present in tidal waters of the St. Mary's River, the Patuxent River, and the Fishing Bay reference station at concentrations significantly below risk based recreational use screening criteria and oyster consumption site-specific screening criteria. The results and conclusions from this study will assist MDE in forming future PFAS monitoring efforts in other watersheds.

1.0 INTRODUCTION

The Maryland Department of the Environment's (MDE) Water and Sciences Administration (WSA) conducted this monitoring effort to assess the occurrence of Per- and Polyfluoroalkyl Substances (PFAS) in surface water and oysters in and around St. Inigoes Creek, the St. Mary's River and the mouth of the Patuxent River to pilot a monitoring approach for PFAS which may be utilized in other locations in the State. The Department collected samples along transects and discrete locations within St. Inigoes Creek and the St. Mary's River as well as locations at the mouth of the Patuxent River. Sampling locations were targeted to focus on potential source areas and potential areas of concern (AOC) associated with Patuxent River Naval Air Station (NAS) Webster Field Annex. Results and evaluations of the sample data collected during this investigation were compared to applicable state and federal risk-based concentration levels or site and media specific risk-based screening levels derived for the protection of human health are presented below.

2.0 STUDY AREA AND BACKGROUND

The study centers on the St. Mary's River and the tidal waters and tributaries in and around the Patuxent River Naval Air Station and Webster Field Annex, an auxiliary airfield operated by the NAS, Figure 1. The St. Mary's River is located in Saint Mary's County, and is a tidal tributary of the Potomac River. The area is rural with a mix of agricultural fields and waterfront communities and includes a thriving estuarine habitat. In addition to characterization sampling in the St. Mary's River samples were collected within St. Inigoes Creek (north of Webster Field), Smith Creek (a small tributary located due south of Webster Field), at the mouth of the Patuxent River and a reference station within Fishing Bay.

On March 3, 2020, the Navy sponsored a public information meeting for residents in the vicinity of Patuxent River NAS to learn about the Navy's assessment program to determine the occurrence of certain PFAS on and in the vicinity of Navy installations that have known or potential releases of these compounds into the environment from the use of firefighting foam containing PFAS. Concerns were raised at this public meeting about potential PFAS compounds reaching surface waters through runoff or groundwater at the Webster Field Annex. The widespread use of PFAS and their ability to remain intact in the environment means that over time PFAS levels from past and current uses can result in increasing levels of environmental contamination.

In furtherance of the Department's overall mission to protect and restore the environment for the health and well-being of all Marylanders, the Department initiated this pilot study to assess whether surface water and potentially oysters in the vicinity of Webster Field Annex have elevated levels of PFAS. In addition, the Department tested water and oysters near Hog Point and across the mouth of the Patuxent River near Drum Point. This decision centered on data from 1997 in a Journal Article (https://www.researchgate.net/publication/11454831_Perfluorooctane_Sulfonate_in_Oysters_*Crassostrea_virginica*_from_the_Gulf_of_Mexico_and_the_Chesapeake_Bay_USA). The studyhad six sites in Maryland where five of the six sites were non-detect for PFOS in oysters and one site, Hog Point, had the second highest level of PFOS found during the study. For this

study, Fishing Bay was chosen as a reference site or control. The reference station in Fishing Bay (Figure 2) constitutes an area which MDE believes has minimal anthropogenic influences and will be utilized for comparative purposes as a background location with potentially less anthropogenic sources of PFAS.

In addition to surface water and oyster sampling, MDE field staff also had the opportunity to obtain a grab sample of effluent from the Webster Field WWTP. Although not the focus of this Report--which is determining the occurrence of PFAS in ambient surface water and oyster tissue---MDE recognizes that this information may be of interest to the Navy and will be sharing this information with them. Environmental investigations by the Navy at the Patuxent River NAS are ongoing and may be found at https://www.navfac.navy.mil/products_and_services/ev/products_and_services/env_restoration/installation_map/navfac_atlantic/washington/nas_patuxent_river/outreach.html.

3.0 PFAS BASIC INFORMATION AND STUDY TARGET ANALYTE LIST

PFAS refers to a large group of human-made chemicals that for decades were used in a range of products, including stain- and water-resistant fabrics and carpeting, cleaning products, paints, cookware, food packaging and fire-fighting foams. Some PFAS can last a long time in the natural environment and can potentially accumulate in the food chain. Some scientific studies even suggest that certain PFAS may affect systems in the human body. Accumulation of certain PFAS has also been shown to potentially occur throughout the food chain. Measuring PFAS concentrations in food, estimating dietary exposure and determining the associated health effects is an emerging area of science. For additional information on PFAS reference the corresponding fact sheets provided by the Agency for Toxic Substances and Disease Registry (ATSDR) and the Food and Drug Administration (FDA).

- https://www.atsdr.cdc.gov/pfas/docs/pfas_fact_sheet.pdf
- https://www.fda.gov/food/chemicals/questions-and-answers-and-polyfluoroalkyl-substances-pfas-food

MDE is putting a priority on better understanding, communicating, and reducing unacceptable risks to human health related to PFAS. This includes identifying and investigating PFAS occurrence in areas with the potential for the highest relative risk such as public drinking water treatment facilities that may be more vulnerable to contamination, in locations where there may be more than one source of PFAS releases. The focus of this pilot study is to quantify and assess the presence of PFAS in surface water and oysters throughout the study area. The Target Analyte List (TAL) of PFAS compounds utilized in this study comprises 2 suites of PFAS compounds. The 2 TAL suites consist of 14 PFAS and 36 PFAS analytes (Table 1). The 36 PFAS suite contains all the 14 PFAS compounds in the abbreviated list as well as 22 additional PFAS compounds.

4.0 SAMPLING PROCEDURE AND ANALYTICAL METHODOLOGY

4.1 Surface Water Sample Collection

4.1.1 Pre-sampling Procedure Validation

A pre-sampling field trial was conducted to validate quality control procedures that would be utilized during surface water and oyster sample collection. The quality control pre-sampling field exercise was performed to assess the efficacy of sampling procedures designed to minimize potential cross contamination issues when sampling for PFAS. PFAS have the potential to become airborne and are present in many products such as fire suppressant foams, fabric softeners, water-resistant synthetics and some sunscreens that could be on the sampling vessel or worn by the sampling team and could result in cross contamination during field sampling activities.

On June 4, 2020 staff from MDE's, Water and Science Administration, Compliance Monitoring Division initiated the pre-sampling field exercise. Four monitoring teams were given an empty sample bottle and a bottle of PFAS free water supplied by Alpha Analytical laboratory. Transects T5-W1 to T5-W3, T3-W1 to T3-W4 and T4-W1 to T4-W3 were the selected transect lines (along with the single control site station in Fishing Bay, FB-W1) to test for the potential of cross contamination and performed as a quality control implementation measure (Figure 1 and Figure 2). Transects were run beginning from the station of least contamination potential to the highest potential.

Upon reaching the first sampling station each of the three teams running a transect line and the team with the single monitoring site in Fishing Bay transferred the contents of the bottle containing PFAS free water to the empty bottle and capped. Once reaching the next monitoring station along the transect the bottle containing the PFAS free water was opened and exposed to the atmosphere for approximately 10 seconds then re-capped. This continued until each monitoring station along the transect was visited. Samples were then bagged and placed on ice in their designated cooler. Environmental conditions were noted, and water quality parameters were collected and recorded on field data sheets from pre-selected stations (Appendix 1). A chain of custody form was filled out by field staff and signed off on by the courier from Alpha Analytical who collected the coolers containing the samples from MDE's Annapolis Field Office for transfer to the laboratory for PFAS analysis.

A NIST traceable calibration was provided as an assurance that all equipment used in the laboratory were properly calibrated to match the measurement standards of the National Institute of Standards and Technology (NIST).

The quality control samples for pre-sampling were received from Alpha Analytical on June 19, 2020 and the field and trip blanks as well as the NIST PFOS tissue standard samples were received on August 10, 2020. Results are detailed in Appendix 2 and are summarized in Tables 2 and 3. Quality control pre-sampling procedure results and field and trip blanks samples collected during the surface water and oyster tissue sampling were non-detect for PFAS. Results of the quality control procedures utilized during the sampling process were of sufficient integrity to

ensure data certainty during the surface water and oyster field sampling activities. The NIST PFOS tissue sample identified PFOS within the sample indicating method integrity.

4.1.2 Surface Water Sampling- St. Mary's River, St. Inigoes Creek, Smith Creek and Fishing Bay

Surface water samples were collected on July 7, 2020 in and around St. Inigoes Creek, the St. Mary's River, Smith Creek and a reference site in Fishing Bay on the Eastern Shore. Figures 1 through 7 show the sampling locations for surface water sample stations in the St. Inigoes Creek, St. Mary's River, Smith Creek and one site in Fishing Bay. The Fishing Bay site was used as a reference site or control throughout the study.

Each of four teams was provided with a trip blank that was stored in their vehicle in a cooler on ice the day of sampling. Trip blanks were inserted in the cooler at the beginning of the day and traveled to the boat launch location and back to the Annapolis Field Office for courier pickup. A total of 10 field blanks containing PFAS-free water supplied by the contract laboratory were utilized during sampling using the same methodology detailed in the pre-sampling exercise. Replicate samples were collected at designated locations. The number of samples, sample locations and quality control samples are detailed in Table 4. The samples were shipped to the laboratory following approved sample handling and storage methods. Environmental conditions were recorded at each station along with water quality parameters at preselected stations (Appendix 1). Chain of custody forms were utilized to properly track sample handling, requested analytical tests and sample transfer (Appendix 3).

4.1.3 Surface Water Sampling- Patuxent River-Drum Point, Hog Point and Fishing Bay

On August 11, 2020 the surface water monitoring for PFAS compounds were conducted in the vicinity of Drum Point, Hog Point and at the control site in Fishing Bay (Figure 8). Each of the two teams were provided a trip blank and field blanks that were utilized at each of three sampling locations. Protocol for collection of samples, use of trip and field blanks, storage, transport and chain of custody remained the same as utilized previously in the St. Mary's River and the surrounding area. Environmental field conditions were recorded, and water quality parameters were collected at select stations. These in-situ results can be viewed in Appendix 1.

4.2 Oyster Sample Collection- St. Mary's and Patuxent River's and Fishing Bay

The Department collected oyster samples at six locations in the St. Mary's River: main stem of the River upstream of St. Inigoes Creek, two locations in St. Inigoes Creek (adjacent to and upstream of Webster Field), mainstem near Webster Field, one in Smith Creek and one near the mouth of the River (Figure 1). Additionally, oyster samples were collected from two locations at the mouth of the Patuxent River (Figure 8) and one reference location in Fishing Bay (Figure 2). All samples collected were submitted for analysis of PFAS. The Department contracted the services of Alpha Analytical Mansfield Laboratory, 320 Forbes Boulevard, Mansfield, MA 02048 for sample analysis. Corresponding analytical methodologies and quality control procedures are detailed and provided in Appendix 4.

On August 10, 2020 the Department collected oyster shellstock samples at six sampling locations in the St. Mary's River: main stem of the River upstream of St. Inigoes Creek, two locations in St. Inigoes Creek (adjacent to and upstream of Webster Field), mainstem near Webster Field, one in Smith Creek (Figure 1) and one at the reference site in Fishing Bay (Figure 2). Oysters were collected by four teams using a traditional oyster scrape towed behind MDE research vessels. Oyster knives used for shucking were rinsed with PFAS free water each time before shucking the next sample. This methodology was utilized as teams moved from each sample site and in future oyster collections.

At each oyster collection site two oysters sample composites of twelve market size oysters were collected and shucked on the boat. One composite of twelve oysters included the oyster meats and liquor and the other composite included the oyster meat only. Samples were shucked directly in the laboratory supplied containers, bagged and placed on ice. Each of the four teams was provided a trip blank by the laboratory containing PFAS free water and a field blank for each of the seven oyster shellstock collection sites. Methodology and rationale behind the use of trip and field blanks was the same as mentioned previously. Once complete, all trip and field blanks were bagged and placed in their designated cooler for shipment and analysis by Alpha Analytical Laboratory. Oyster tissue samples were transported and homogenized at the laboratory. At each station, environmental conditions and water quality parameters were collected and recorded and field data sheets. Data for this event can be found in Appendix 1 and Table 5.

On August 11, 2020 oyster shellstock collections were initiated in the vicinity of Hog Neck Point and Drum Point near the mouth of the Patuxent River. During the sampling protocols put in place from previous PFAS oyster tissue collections were implemented. Oysters were collected from the area adjacent to Hog Neck Point and Fishing Bay, processed, placed in laboratory supplied containers and iced for courier pick-up and transport to Alpha Analytical Laboratory for analysis.

Due to a lack of oysters in the vicinity of Drum Point an alternative site was selected and later sampled on August 18, 2020 which did not include Fishing Bay, due to sufficient data collected previously at the control site. Twenty-four oysters were collected which included twelve oysters with meat and liquor and twelve with just meat. These oysters were processed on the boat and shucked directly into containers provided by the lab conducting the analysis. Environmental conditions and water quality were recorded for both sampling events and can be located in Appendix 1 and Table 5.

4.3 Analytical Methodology

The 2 TAL suites consist of 14 PFAS and 36 PFAS analytes (See table 3 identifying the PFAS TALs and Appendix 1 for approximate method detection limits for water and oysters). The 36 PFAS suite contains all the 14 PFAS compounds in the abbreviated list as well as 22 additional PFAS compounds. A brief narrative of the sample preparation and analytical methodology for both surface water and oyster tissue analysis is presented in Appendix 4. Given the lack of standardized, published analytical methods for non-drinking water sample media, and the fact that EPA 500 series methods are not allowed to be modified, an alternative method based on principles detailed in the EPA 500 series method was utilized by the contract laboratory. The Alpha Analytical method was a liquid chromatography tandem mass spectrometry method

(LC/MS/MS) with solid phase extraction and it is most similar to Method 533 in that it utilizes the weak anion exchange (WAX) SPE cartridge and the method calibration employs the isotope dilution technique. This method incorporates the maximum number of commercially available extracted internal standards, consisting of (18) 13C-enriched and (2) 2H-enriched compounds. Up to 36 PFAS compounds, or any subset, can be quantified using this approach. The method can analyze a wide range of sample matrices in addition to aqueous samples including soils/sediments, biosolids, and tissues. Although similar methods are used, there is currently no standard analytical method, from EPA or any voluntary consensus standard body, for PFAS analysis in shellfish tissue. Few laboratories advertise shellfish tissue analysis for PFAS.

5.0 PFAS TOXICITY VALUES AND UNCERTAINTY ANALYSIS

Health-based guidance values in specific environmental media for some PFAS have been developed by federal, state, and international agencies using a variety of critical studies, endpoints, and methods. This pilot study focuses on PFAS in surface water and oyster tissue and utilizes peer reviewed reference doses (RfDs), an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime with uncertainty factors generally applied to reflect limitations of the data used. RfDs are generally used in noncancer health assessments and the RfDs utilized in this assessment are approved by EPA and detailed within the Regional Screening Level User's Guide, (May, 2020), https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide. These guidance values are estimates of a daily exposure dose that is not expected to lead to a non-cancer health risk over a set period of time. These guidance values are used to identify exposures that could potentially be hazardous to human health. However, exposure above a guidance value does not mean that health problems will occur. The quantitative assessment addressed Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS), two of the most studied PFAS which both have RfDs.

The MDE risk threshold for noncarcinogens is set at a hazard quotient of 1 which is the ratio of the potential exposure to a substance and the level at which no adverse effects are expected (calculated as the exposure divided by the appropriate chronic or acute value)which means adverse noncancer effects are unlikely, and thus can be considered to have negligible hazard. For hazard quotients greater than 1, the potential for adverse effects increases, but we do not know by how much. For toxics that affect the same target organ or organ systems that can cause similar adverse health effects, combining hazard quotients from different toxics is often appropriate. The sum of hazard quotients is a hazard index (HI) which was utilized in this evaluation. An HI of 1 or lower means toxics are unlikely to cause adverse noncancer health effects over a lifetime of exposure. However, an HI greater than 1 doesn't necessarily mean adverse effects are likely.

As stated previously PFAS compounds have been in use since the 1940s and PFAS are found in a wide array of consumer and industrial products. A significant number of PFAS compounds exist in the marketplace with little to no known human health toxicity information or RfDs. As greater knowledge of PFAS compounds with minimal human and environmental health toxicity data are advanced these factors and their potential impacts on human health and the environment will be considered by MDE. Currently, the MDE, EPA and other organizations are collaborating

to generate and review research and consider new scientific information as it becomes available on the bioaccumulation potential and toxicity of other additional PFAS. Developing toxicity values or oral reference doses, RfDs, for GenX chemicals and perfluorobutane sulfonic acid (PFBS) are a priority for EPA and will be considered by MDE as the research becomes available. Accordingly, the uncertainty associated with other PFAS detected in this study will be discussed qualitatively and will be considered as MDE continues its efforts to understand, communicate and manage PFAS risks to human health.

6.0 RESULTS

6.1 Surface Water Data

Surface water sample results are presented in Table 6 and corresponding sample locations are identified in Figures 1 through 8. Surface water results ranged from 2.03 ng/L to 13.5 ng/L total PFAS across the entirety of the study area. The surface water PFAS concentration from the reference station location in Fishing Bay (Figure 2) was 12.4 ng/L. The results exhibited no specific pattern relative to potential sources and were generally similar to or less than the reference station in Fishing Bay. PFAS was detected at low concentrations throughout the study area and concentrations were reported at or near the method detection limits. Many of the PFAS compounds within both TALs were reported as non-detect.

6.1.1 Recreational Surface Water Screening Evaluation

Recreator surface water potential exposure routes to PFAS were evaluated for PFOA and PFOS which both have supporting toxicity values. Recreator surface water exposure supporting calculations, equations and exposure variables are presented in detail in Appendix 6. Surface water exposure was evaluated for all potential populations including children at all stages of development from birth on. Recreational use surface water exposures were evaluated using a conservative range of exposure times within the study area as presented in the Table 1 below.

Site-specific Surface Water Exposure Variables

Recreational Scenario	Exposure duration (yrs.)	Exposure frequency (days/yr.)	Exposure time (hrs. day)
Surface water moderate	26	26 (2 days a week 13 weeks)	2
Surface water intensive	26	78 (3 days a week 26 weeks)	2

The evaluation involved incidental ingestion while swimming, wading or recreating in surface water. Dermal contact with surface water was not quantitatively evaluated for surface water exposure due to the low dermal permeability of PFAS. Dermal exposure is not considered to be a significant PFAS exposure pathway due to the fact that PFOA and PFOS are not estimated to be within the effective predictive domain for dermal permeability. Inhalation was not considered due to mixing with outdoor air.

Surface water concentrations of PFAS are presented in Table 6. Comparisons to site-specific surface water risk-based screening values are presented in Appendix 5. Risk-based surface water screening concentrations are greater than EPA recommended health advisory levels for PFAS in drinking water because people accidently ingest much less water per day while swimming or recreating as compared to the amount of water people purposefully ingest throughout the day. Comparisons of surface water concentrations to the EPA recommended Health Advisory Level (or any other drinking water criteria) are not appropriate and applicable in brackish tidal waters or non-potable surface waters. As presented in Table 9 the mean and maximum detected surface water concentrations were significantly below the risk-based screening concentrations for the sum of PFOA and PFOS in surface waters throughout the study area. The mean surface water PFOA + PFOS concentration in the St. Mary's River and its tributaries and the mouth of the Patuxent River were 4.09 and 3.97 ng/L, respectively. The maximum detected surface water PFOA + PFOS concentrations in the St. Mary's River and its tributaries and the mouth of the Patuxent River were 8.76 and 4.13 ng/L. The PFOA + PFOS Fishing Bay concentration was 6.27 ng/L which similar to the PFOA + PFOS results throughout the study area. PFAS compounds, PFOA and PFOS were only intermittently detected at or near the analytical detection limits throughout the study area and the reference location in Fishing Bay.

Although comparisons to the EPA drinking water PFOA and PFOS lifetime exposure concentration of 70 ng/L is not an appropriate health based screening criteria, within the study area all concentrations of PFOA, PFOS and PFAS compounds in surface water were significantly less than the EPA lifetime drinking water health advisory concentration. Based upon the results of the surface water recreational exposure evaluation within the pilot study area, surface water recreational exposure risk estimates were significantly below MDE site-specific surface water recreational use screening criteria.

6.2 Oyster Tissue Data

Oyster tissue results are presented in Tables 7 and 8 and corresponding sample locations are identified in Figures 1 through 8. Oyster tissue was analyzed and processed following 2 protocols per sampling location, oyster meat (Table 7) and oyster meat plus liquor (liquid within the oyster) (Table 8). PFAS + PFOA concentrations as well as all other PFAS compounds were not detected at the reported detection limits throughout the entirety of the study area with the exception of an oyster meat plus liquor sample from the Fishing Bay reference Station location. 1H,1H,2H,2H- Perfluorooctanesulfonic Acid (6:2FTS) was detected at a concentration of 1.57 ug/kg in the Fishing Bay oyster meat plus liquor sample. This detection approached the analytical detection limits of the methodology which was approximately 1 ug/kg for PFAS compounds in the study.

6.3 Oyster Consumption Screening Evaluation

The oyster consumption potential exposure routes to PFAS were evaluated for PFOA and PFOS which both have supporting toxicity values. Oyster consumption supporting calculations, equations and exposure variables are presented in detail in Appendix 6. Oyster consumption was quantitatively evaluated using EPA fish consumption population exposure variables. The oyster site-specific consumption variables utilized a range of oyster meals per year and meal sizes as

well as consuming both oyster meat and oyster meat and liquor. The assessment quantitatively evaluated exposure assuming oysters consumed were all from the same location which may potentially over or under-estimate potential health risk. Risks were assessed using maximum detected concentrations which will potentially result in over-estimating potential health risks.

Although children and youth consumption of shellfish is not presented as an exposure pathway that is typically quantitatively evaluated, MDE included derivation of a child/youth oyster consumption scenario utilizing the 10 large meal exposure variables for conservative comparative purposes. The screening criteria are site-specific and should not be considered as screening criteria for commercially harvested shellfish. Commercially available shellfish often come from a range of locations and suppliers and this pilot study was not intended to specifically provide guidance on commercially harvested shellfish. The results of the study may be utilized with other guidance on shellfish harvesting located on the MDE website to assess potential health hazards associate with commercially harvested shellfish https://mde.maryland.gov/programs/Water/FishandShellfish/Pages/index.aspx.

Site-Specific Oyster Consumption Exposure Variables

Oyster Consumption Scenario	Exposure duration (yrs.)	Meals Per Year	Average Meal Size (mg/meal)	Large Meal Size (mg/meal)	Average Meal Ingestion Rate (mg/day)	Large Meal Ingestion Rate (mg/day)
Surface water moderate	26	2	17000	227000	932	1244
Surface water intensive	26	10	17000	227000	4658	6214

Comparisons to site-specific oyster tissue risk-based screening values for oyster meat and oyster meat plus liquor are presented in Appendix 5. As presented in Tables 10 and 11 PFAS was not detected in oyster meat or oyster meat plus liquor and the comparisons to the risk based screening criteria at the reported detection limits for PFOA and PFAS were significantly below the risk-based oyster consumption screening concentrations for the sum of PFOA and PFOS for all potential exposure scenarios throughout the study area. Additionally, for comparative purposes child/youth risk estimates were quantified and were also below MDE lifetime noncarcinogenic health-based concentrations at the reported detection limits for PFOA and PFOS. One PFAS compound, 1H,1H,2H,2H- Perfluorooctanesulfonic Acid (6:2FTS), was detected at the Fishing Bay reference station at a concentration approaching the analytical detection limit. Based upon the results of the PFAS oyster tissue analysis, consumption of oysters within the pilot study area were below significantly below MDE site-specific health-based consumption screening criteria for PFOA and PFOS.

6.4 Ecological Screening Evaluation

The primary objectives of this pilot study were to evaluate the potential presence of PFAS in surface waters and oysters and potential human health impacts in and around Patuxent NAS. Limited promulgated PFAS, PFOA and PFOS ecological water quality standards currently exist throughout the US, however, efforts are underway to evaluate and develop such standards as necessary. In this study total PFAS concentrations ranged from 2.04 to 13.5 ng/L which is significantly below the limited published ecological aquatic life screening criteria. The ability of certain PFAS compounds to accumulate up the food chain is an important factor that is being assessed as aquatic life water quality standards are being developed. The state of Michigan currently has published water quality standards that are significantly greater than the concentrations of PFAS detected in the MDE pilot study (https://www.michigan.gov/documents/mdhhs/PFAS_-_Overview_of_Michigan_Values_FINAL_675761_7.pdf). As MDE continues to assess and evaluate potential impacts of PFAS to waters with our state and federal partners, updates to water quality standards will be communicated to stakeholders.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The MDE WSA in cooperation with Maryland's DNR conducted this pilot study to assess the occurrence of Per- and Polyfluoroalkyl Substances (PFAS) in surface water and oysters in and around St. Inigoes Creek, the St. Mary's River, the mouth of the Patuxent River and a reference station in Fishing Bay. Sampling locations were targeted to focus on potential source areas and potential areas of concern associated with Webster Field Annex and the Patuxent River NAS.

Results of the PFAS public health risk evaluation for recreational surface water exposure and oyster consumption were very low and were significantly below MDE site-specific risk-based screening criteria throughout the entirety of the study area. The evaluation of the surface water samples and oyster tissue concentration comparisons to PFAS concentrations from the reference station in Fishing Bay were similar. Risk-based surface water and oyster tissue screening criteria were developed for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS) which both have toxicity values.

Surface water concentrations of PFAS ranged from 2.3 to 13.5 ng/L, suggesting recreational health risks from potential exposure to PFAS in surface water are very low. Concentrations of PFAS were below site-specific risk-based PFAS recreational surface water incidental ingestion screening concentrations and the EPA PFAS drinking water lifetime health advisory level. Surface water analysis in the area of concern indicated that total PFAS concentrations are similar to those found at the control site and PFAS compounds, PFOA and PFOS were only intermittently detected at or near the analytical detection limits throughout the study area and control site. While the EPA lifetime health advisory level for treated drinking water of 70 ng/l is not an appropriate health-based screening criterion for recreational use, within the study area all water sample concentrations of PFOA, PFOS and PFAS compounds were well below the drinking water lifetime health advisory level.

Oyster tissue samples were compared to PFAS oyster tissue concentrations at the control site and to a range of risk-based oyster consumption screening concentrations that were derived for PFOA and PFOS assuming all oysters were consumed from the same harvesting location. Oyster tissue concentrations were non-detect throughout the study area and the only reported detection of PFAS was in the Fishing Bay control site location at 1.57 ug/kg, which approached the method detection limits. Results of the oyster tissue consumption evaluation for PFOA plus PFOS indicated consumption of oysters within the study area and at the control site are well below the MDE site-specific oyster consumption screening criteria derived to be protective of public health.

Given the use of PFAS compounds throughout the marketplace, their bioaccumlative properties and the uncertainty associated with their potential presence in environmental media throughout Maryland, MDE efforts regarding PFAS compounds impacts to human health and the environment are ongoing and evolving rapidly. Actions are underway at both the federal level (EPA, DOD, USGS) and the state level to better understand PFAS risk and exposure pathways and to reduce as needed the presence and potential exposure to PFAS compounds both environmentally and within the marketplace. Investigative efforts at Department of Defense Facilities, including Patuxent River NAS, as well as other public and private potential sources of interest are ongoing throughout Maryland. As additional environmental and human health assessment information is derived regarding PFAS compounds, MDE will pursue updates to its strategy and action plan to ensure protection of public health and natural resources in Maryland.

8.0 REFERENCES

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9.0 TABLES AND FIGURES

Table 1: Target Analyte List

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1

Table 2: PFASs measured in pre-sampling surface water (ng/l)

Lab Sample ID	L2023415-01	L2023415-02	L2023415-03	L2023415-04
Sample Station	T4	T-5	T3	Fishing Bay
Collection Date/Time	6/4/2020 9:02 AM	6/4/2020 9:10 AM	6/4/2020 9:00 AM	6/4/2020 10:10 AM
Site Description	LWR St. Marys River - East Mouth	St. Inigoes Creek	Mid St. Mary's River	Fishing Bay
Units	ng/l	ng/l	ng/l	ng/l
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA) [1]	•	•	•	•
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA) [1]	•	•	•	•
Perfluorobutanoic Acid (PFBA) [1]	•	•	•	•
Perfluoropenlanoic Acid (PFPeA) [1]	•	•	•	•
Perfluorobutanesulfonic Acid (PFBS) [2]	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorohexanesulfonic Acid (4:2FTS) [1]	•	•	•	•
Perfluorohexanoic Acid (PFHx A) [2]	ND	ND	ND	ND
Perfluoropentanesulfonic Acid (PFPeS) [1]	•	•	•	•
Perfluoroheptanoic Acid (PFHpA) [2]	ND	ND	ND	ND
Perfluorohexanesulfonic Acid (PFHxS) [2]	ND	ND	ND	ND
Perfluorooctanoic Acid (PFOA) [2]	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorooctanesulfonic Acid (6:2FTS) [1]	•	•	•	•
Perfluoroheptanesulfonic Acid (PFHpS) [1]	•	•	•	•
Perfluorononanoic Acid (PFNA) [2]	ND	ND	ND	ND
Perfluorooctanesulfonic Acid (PFOS) [2]	ND	ND	ND	ND
Perfluorodecanoic Acid (PFDA) [2]	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS) [1]	•	•	•	•
Perfluorononanesulfonic Acid (PFNS) [1]	•	•	•	•
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA) [2]	ND	ND	ND	ND
PerfluorouND1ecanoic Acid (PFUnA) [2]	ND	ND	ND	ND
Perfluorodecanesulfonic Acid (PFDS) [1]	•	•	•	•
Perfluorooctanesulfonamide (FOSA) [1]	•	•	•	•
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA) [2]	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA) [2]	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA) [2]	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTA) [2]	ND	ND	ND	ND
2,3,3,3-TelralIuoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA) [3]	•	•	•	•
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA) [1]	•	•	•	•
Perfluorohexadecanoic Acid (PFH xDA) [4]	•	•	•	•
Perfluorooctadecanoic Acid (PFODA) [5]	•	•	•	•
Perfluorododecane Sulfonic Acid (PFDoDS) [1]	•	•	•	•
1H,1H,2H,2H-PerfluorododecanesuIfonic Acid (10:2FTS) [6]	•	•	•	•
9-ChIorohexadecafIuoro-3-Oxanone-1-SuIIonic Acid (9CI-PF3ONS) [1]	•	•	•	•
11-ChIoroeicosaIIuoro-3-OxauND1ecane-1-SuIfonic Acid (11CI-PF3OUdS) [1]	•	•	•	•
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE) [7]	•	•	•	•
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE) [7]	•	•	•	•
Total PFAS	0.00	0.00	0.00	0.00

ND - Non Detect

• - Not Analyzed

[1] - Reporting limits ranging from lowest 1.76 to highest 2.00

[2] - Reporting limits ranging from lowest 1.74 to highest 2.08

[3] - Reporting limits ranging from lowest 44.1 to highest 49.6

[4] - Reporting limits ranging from lowest 3.51 to highest 4.00

[5] - Reporting limits ranging from lowest 1.76 to highest 4.00

[6] - Reporting limits ranging from lowest 1.76 to highest 5.00

[7] - Reporting limits ranging from lowest 17.6 to highest 50.0

Table 3: PFASs measured in Field Blanks and Trip Blanks (ng/l)

Lab Sample ID	L2028498-01	L2028496-05	L2028498-06	L2028494-05	L2028496-01	L2028494-02	L2028495-02	L2032501-05	L2028496-09	L2028498-13	L2028494-10	L2032501-09	L2032501-11	L2028496-12	L2028495-03	L2028498-10	L2028494-01	L2032501-06	L2032501-04	L2032321-22
Sample Station	FB-1A	FB-2A	FB-3A	FB-4A	FB-5A	FB-6A	FB-7A	FB-7A	FB-08	FB-8A	FB-8C	FB-9A	FB-9B	TB-001	TB002	TB003	T004	TB-200	TB-201	SRM
Collection Date/Time	7/7/2020 9:02	7/7/2020 9:31	7/7/2020 9:43	7/7/2020 8:44 AM	7/7/2020 9:00	7/7/2020 8:22 AM	7/7/2020 10:02 AM	8/11/20 9:36 AM	7/7/2020 9:52	7/7/2020 10:19	7/7/2020 9:14 AM	8/11/20 10:00 AM	8/11/20 9:00 AM	7/7/20 6:00 AM	7/7/20 6:57 AM	7/7/20 6:00 AM	7/7/2020 6:05 AM	8/11/20 6:00 AM	8/11/20 6:30 AM	8/10/20 9:45 AM
Site Description	Upper St. Mary's River - Field Blank	Mouth of St. Inigoes Creek - Field Blank	Mid St. Mary's River - Middle of Transect - Field Blank	LWR St. Marys River & Mouth - Field Blank	St. Inigoes Creek - Field Blank	Smith Creek - Field Blank	Fishing Bay - Field Blank	Fishing Bay - Field Blank Water	Webster Field Discrete Sample - Field Blank	Webster Field Discrete Sample - Field Blank	Webster Field Discrete - Field Blank	Patuxent River - Hog Point - Field Blank	Patuxent River - Drum Point - Field Blank	Trip Blank - Team 1	Trip Blank - Team 2	Trip Blank - Team 3	Trip Blank - Team 4	Trip Blank - Team 1 (Hog Point)	Trip Blank - Team 2 (Fishing Bay)	NIST Sample - Tissue [13]
Units	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ug/kg
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorobutanoic Acid (PFBA) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluoropenlanoic Acid (PFPeA) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorobutanesulfonic Acid (PFBS) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorohexanesulfonic Acid (4:2FTS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorohexanoic Acid (PFHx A) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoropentanesulfonic Acid (PFPeS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluoroheptanoic Acid (PFHpA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanesulfonic Acid (PFHxS) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanoic Acid (PFOA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorooctanesulfonic Acid (6:2FTS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluoroheptanesulfonic Acid (PFHpS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorononanoic Acid (PFNA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanesulfonic Acid (PFOS) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.81
Perfluorodecanoic Acid (PFDA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorononanesulfonic Acid (PFNS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PerfluorouND1ecanoic Acid (PFUnA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanesulfonic Acid (PFDS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorooctanesulfonamide (FOSA) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA) [3]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorohexadecanoic Acid (PFH xDA) [4]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorooctadecanoic Acid (PFODA) [5]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Perfluorododecane Sulfonic Acid (PFDoDS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS) [6]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
11-Chloroeicosafluoro-3-OxauND1ecane-1-Sulfonic Acid (11Cl-PF3OUdS) [1]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE) [7]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE) [7]	•	ND	ND	•	•	•	ND	ND	•	•	•	ND	•	•	•	•	•	•	•	•
Total PFAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.81

ND - Non Detect

• - Not Analyzed

[1] - Reporting limits ranging from lowest 1.76 to highest 2.00

[2] - Reporting limits ranging from lowest 1.74 to highest 2.08

[3] - Reporting limits ranging from lowest 44.1 to highest 49.6

[4] - Reporting limits ranging from lowest 3.51 to highest 4.00

[5] - Reporting limits ranging from lowest 1.76 to highest 4.00

[6] - Reporting limits ranging from lowest 1.76 to highest 5.00

[7] - Reporting limits ranging from lowest 17.6 to highest 50.0

[13] Quality Control standard used to evaluate the procedural integrity of the tissue analysis.

Table 4: Sample Location Summary Table

Sample Station	Sample Type	QA/QC			Analytes	Site Description	North Latitude	West Longitude
		Field Blank	Trip Blank	Replicate				
FB-W1	Water	FB-7A	TB002 & TB-201		14	Fishing Bay	38° 25' 08.4"	76° 01' 10.8"
T1-W3	Water	FB-1A	TB-003		14	Upper St. Mary's River	38° 11' 18.0"	76° 26' 38.0"
T1-W2	Water	FB-1A	TB-003	T1-W2R	14	Upper St. Mary's River	38° 11' 18.0"	76° 26' 27.0"
T1-W1	Water	FB-1A	TB-003		14	Upper St. Mary's River	38° 11' 17.0"	76° 26' 16.0"
T3-W4	Water	FB-3A	TB-003	T3-W4R	14	Middle St. Mary's River	38° 08' 19.0"	76° 27' 32.0"
T3-W3	Water	FB-3A	TB-003		14	Middle St. Mary's River	38° 08' 40.0"	76° 26' 59.0"
T3-W2	Water	FB-3A	TB-003		14	Middle St. Mary's River	38° 08' 45.0"	76° 26' 42.0"
T3-W1	Water	FB-3A	TB-003		36	Middle St. Mary's River	38° 08' 50.0"	76° 26' 28.0"
WFDS-W6	Water	FB-08, FB-8A, FB-8C	T004		14	Webster Field Discrete	38° 07' 47.3"	76° 26' 22.4"
WFDS-W5	Water	FB-08, FB-8A, FB-8C	T004		14	Webster Field Discrete	38° 07' 52.5"	76° 26' 11.3"
WFDS-W4	Water	FB-08, FB-8A, FB-8C	TB-003		14	Webster Field Discrete	38° 08' 33.0"	76° 26' 33.0"
WFDS-W3	Water	FB-08, FB-8A, FB-8C	TB-003		14	Webster Field Discrete	38° 08' 34.0"	76° 26' 15.0"
WFDS-W2	Water	FB-08, FB-8A, FB-8C	TB-001		14	Webster Field Discrete	38° 09' 20.0"	76° 26' 22.0"
WFDS-W1	Water	FB-08, FB-8A, FB-8C	TB-001		14	Webster Field Discrete	38° 09' 14.0"	76° 26' 17.2"
T2-W3	Water	FB-2A	TB-001		14	Mouth of St. Inigoes	38° 09' 33.1"	76° 26' 06.3"
T2-W2	Water	FB-2A	TB-001		36	Mouth of St. Inigoes	38° 09' 27.0"	76° 26' 06.2"
T2-W1	Water	FB-2A	TB-001		14	Mouth of St. Inigoes	38° 09' 19.1"	76° 26' 06.1"
T5-W3	Water	FB-5A	TB-001		14	St. Inigoes-Mid Creek	38° 09' 59.2"	76° 25' 19.1"
T5-W2	Water	FB-5A	TB-001		14	St. Inigoes-Mid Creek	38° 09' 55.0"	76° 25' 18.1"
T5-W1	Water	FB-5A	TB-001		14	St. Inigoes-Mid Creek	38° 09' 51.3"	76° 25' 16.4"
T4-W3	Water	FB-4A	T004		14	LWR St. Marys River - Western Shore	38° 06' 38.5"	76° 27' 43.4"
T4-W2	Water	FB-4A	T004		14	LWR St. Marys River - Middle	38° 06' 28.5"	76° 26' 33.0"
CC-W1	Water	FB-4A	T004		14	LWR St. Marys River - Mouth	38° 06' 34.9"	76° 25' 44.9"
T4-W1	Water	FB-4A	T004		14	LWR St. Marys River - East Mouth	38° 06' 22.9"	76° 25' 27.3"
SC-W1	Water	FB-6A	T004	SC-W1R	14	Smith Creek	38° 07' 31.4"	76° 24' 44.9"
WWTP-EFF	Water	FB-WWEFF	T004		14	Webster Field WWTP Effluent	38° 08' 57.8"	76° 26' 22.1"
HP-W1	Water	FB-9A	TB-200		36	Patuxent River - Hog Point	38° 18' 05.7"	76° 22' 25.2"
DP-W1	Water	FB-9B	TB-200		14	Patuxent River - Drum Point	38° 20' 00.0"	76° 24' 27.2"

Table 5: Field Water Quality Parameters

Sample Station	QA/QC			Site Description	Date	Time	Air Temp (°C)	Weather	Wind Direction	Wind Velocity (MPH)	Tide	Depth (M)	Water Temp °C	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	pH	Salinity (pss)
	Field Blank	Trip Blank	Replicate														
T -3 [1]				St. Mary's River	6/4/2020	9:00 AM	25	Partly Cloudy	Southeast	3	Flood	1	22.6		8.2	8.3	10.7
				Transect 3								4	21.6		9.2	8.4	10.8
T - 4 [1]				St. Mary's River	6/4/2020	9:02 AM	26	Partly Cloudy	Northwest	1	Flood	1	21.2	17700	9.1	8.4	10.5
				Transect 4								20	19.1	19900	5	7.9	11.9
T - 5 [1]				St. Inigoes Creek	6/4/2020	9:10 AM	25	Partly Cloudy	Southwest	1	Flood	1	22.5	18600	9.8	8.4	11
				Transect 5								13	22.9	19200	9.2	8.2	11.5
Fishing Bay [1]				Fishing Bay	6/4/2020	10:10 AM	29	Partly Cloudy	South	1	Slack after Ebb	1	23.3	22190	8.6	8.1	13.3
												9	22.3	22400	8.4	8.1	13.5
T1-W1	FB-1A	TB-003		Upper St. Mary's River	7/7/2020	9:02 AM	28	Partly Cloudy	South	5	Ebb	1	28.6	18560	6.7	8.4	10.9
												20	28.5	18910	6.2	8.3	11.2
T1-W2	FB-1A	TB-003	T1 - W2R	Upper St. Mary's River	7/7/2020	9:17 AM	28	Partly Cloudy	South	5	Ebb						
T1-W3	FB-1A	TB-003		Upper St. Mary's River	7/7/2020	9:27 AM	28	Partly Cloudy	South	5	Ebb						
T2-W1	FB-2A	TB-001		Mouth of St. Inigoes	7/7/2020	9:44 AM	34	Partly Cloudy	South	5	Ebb						
T2-W2	FB-2A	TB-001		Mouth of St. Inigoes	7/7/2020	9:38 AM	34	Partly Cloudy	South	5	Ebb						
T2-W3	FB-2A	TB-001		Mouth of St. Inigoes	7/7/2020	9:31 AM	33	Partly Cloudy	South	5	Ebb						
T3-W1	FB-3A	TB-003		Middle St. Mary's River	7/7/2020	10:13 AM	28	Partly Cloudy	South	5	Ebb						
T3-W2	FB-3A	TB-003		Middle St. Mary's River	7/7/2020	10:07 AM	28	Partly Cloudy	South	5	Ebb						
T3-W3	FB-3A	TB-003		Middle St. Mary's River	7/7/2020	10:02 AM	28	Partly Cloudy	South	5	Ebb						
T3-W4	FB-3A	TB-003	T3-W4R	Middle St. Mary's River	7/7/2020	9:43 AM	28	Partly Cloudy	South	5	Ebb						
T4-W1	FB-4A	T004		LWR St. Marys River - East Mouth	7/7/2020	8:59 AM	26	Partly Cloudy	South	6	Ebb						
T4-W2	FB-4A	T004		LWR St. Marys River - Middle	7/7/2020	8:52 AM	26	Partly Cloudy	South	6	Ebb						
T4-W3	FB-4A	T004		LWR St. Marys River - Western Shore	7/7/2020	8:44 AM	26	Partly Cloudy	South	6	Ebb						
T5-W1	FB-5A	TB-001		St. Inigoes-Mid Creek	7/7/2020	9:18 AM	31	Partly Cloudy	South	5	Ebb						
T5-W2	FB-5A	TB-001		St. Inigoes-Mid Creek	7/7/2020	9:10 AM	31	Partly Cloudy	South	5	Ebb	1	29.2	18230	6.7	8.2	10.7
												12	29.4	19060	6.8	7.9	11.2
T5-W3	FB-5A	TB-001		St. Inigoes-Mid Creek	7/7/2020	9:00 AM	31	Partly Cloudy	South	5	Ebb						
CC-W1	FB-4A	T004		LWR St. Marys River - Mouth	7/7/2020	9:04 AM	26	Partly Cloudy	South	6	Ebb	1	28	17800	7.3	8.4	10.4
												13	28	17800	7.1	8.4	10.4
WFDS-W6	FB-8C	T004		Webster Field Discrete	7/7/2020	9:14 AM	26	Partly Cloudy	South	6	Ebb						
WFDS-W5	FB-8C	T004		Webster Field Discrete	7/7/2020	9:20 AM	26	Partly Cloudy	South	6	Ebb						
WFDS-W4	FB-8A	TB-003		Webster Field Discrete	7/7/2020	10:19 AM	28	Partly Cloudy	South	5	Ebb						
WFDS-W3	FB-8A	TB-003		Webster Field Discrete	7/7/2020	10:25 AM	28	Partly Cloudy	South	5	Ebb						
WFDS-W2	FB-8B	TB-001		Webster Field Discrete	7/7/2020	9:52 AM	34	Partly Cloudy	South	5	Ebb						
WFDS-W1	FB-8B	TB-001		Webster Field Discrete	7/7/2020	9:59 AM	34	Partly Cloudy	South	5	Ebb						
SC-W1	FB-6A	T004	SC-W1R	Smith Creek	7/7/2020	8:22 AM	26	Partly Cloudy	South	6	Ebb	1	29.5	18300	6.8	8.4	10.7
												12	29.5	18200	6.7	8.4	10.7
FB- W1	FB - 7A	TB - 201		Fishing Bay	8/11/2020	9:36 AM	29	Partly Cloudy	South	10	Flood	1	29.5	23440	7.4	7.9	14.1
												8	29.2	23540	7.1	7.8	14.2
HP - W1	FB - 9A	TB - 200		Patuxent River - Hog Point	8/11/2020	10:00 AM	29	Partly Cloudy	Southeast	6	Ebb	1	28.7	22100	6.6	7.9	13.2
												10	28.2	23850	3	7.5	14.4
DP - W1	FB - 9B	TB - 200		Patuxent River - Drum Point	8/11/2020	9:00 AM	26	Partly Cloudy	Southeast	6	Ebb	1	28.8	22480	6.7	8	13.5
												7	28.5	23210	4.4	7.7	14
WWTP-EFF	FB-WWEFF	T004		Webster Field WWTP Effluent	7/7/2020	10:38 AM	26	Partly Cloudy	South	6	Ebb						
FB - W1	FB - 7A	TB - 02		Fishing Bay	7/7/2020	10:02 AM	27	Partly Cloudy	South	12	Ebb	1	28.3	23200	7	7.9	14
												8	28.2	23210	6.8	7.8	14
SC - 01 [2]	SC - 01FB	TB 102		Smith Creek	8/10/2020	9:00 AM	28	Partly Cloudy	South	3	Ebb	1	29.8	21530	8	8.3	12.8
												12	28.9	22500	3.4	7.7	13.5
SC - 01L [2]	SC - 01FB	TB 102		Smith Creek	8/10/2020	9:00 AM	28	Partly Cloudy	South	3	Ebb	1	29.8	21530	8	8.3	12.8
												12	28.9	22500	3.4	7.7	13.5
CC- 01 [2]	CC- 01FB	TB 102		St. Mary's River	8/10/2020	9:45 AM	30	Partly Cloudy	South	3	Ebb	1	29	21900	8.8	8.3	13.1
												19	28.4	23540	3	7.5	14.2
CC- 01L [2]	CC- 01FB	TB 102		St. Mary's River	8/10/2020	9:45 AM	30	Partly Cloudy	South	3	Ebb	1	29	21900	8.8	8.3	13.1
												19	28.4	23540	3	7.5	14.2
WFWWTP - 01 [2]	WFWWTP - 01FB	TB 102		St. Mary's River	8/10/2020	10:15 AM	30	Partly Cloudy	South	3	Ebb	1	29.5	20700	8.1	8.3	12.3
												9	28.8	22340	7	8.1	13.4
WFWWTP - 01L [2]	WFWWTP - 01FB	TB 102		St. Mary's River	8/10/2020	10:15 AM	30	Partly Cloudy	South	3	Ebb	1	29.5	20700	8.1	8.3	12.3
												9	28.8	22340	7	8.1	13.4
FB - 01 [2]	FB - 01FB	TB 103		Fishing Bay	8/10/2020	10:20 AM	30	Fog/Haze	Southeast	5	Ebb	1	29.4	23450	7.9	7.9	14.1
												9	28.3	24200	7.2	7.8	14.7
FB - 01L [2]	FB - 01FB	TB 103		Fishing Bay	8/10/2020	10:20 AM	30	Fog/Haze	Southeast	5	Ebb	1	29.4	23450	7.9	7.9	14.1
												9	28.3	24200	7.2	7.8	14.7
T1 - 01 [2]	T1 - 01FB	TB 101		St. Mary's River	8/10/2020	9:45 AM	30	Partly Cloudy	Southwest	2	Ebb	1	29.8	16070	7.9	8.9	9.2
												16	28.5	22060	0.5	7.4	13.2
T1 - 01L [2]	T1 - 01FB	TB 101		St. Mary's River	8/10/2020	9:00 AM	30	Partly Cloudy	Southwest	2	Ebb	1	29.8	16070	7.9	8.9	9.2
												16	28.5	22060	0.5	7.4	13.2
T5 - 01 [2]	T5 - 01FB	TB 100		St. Inigoes	8/10/2020	9:05 AM	31	Partly Cloudy	Southwest	5	Ebb	1	29.5	18450	7.8	7.9	10.8
												13	28.9	21400	5.6	7.7	12.8
T5 - 01L [2]	T5 - 01FB	TB 100		St. Inigoes	8/10/2020	9:05 AM	31	Partly Cloudy	Southwest	5	Ebb	1	29.5	18450	7.8	7.9	10.8
												13	28.9	21400	5.6	7.7	12.8
T2 - 01 [2]	T2- 01FB	TB 100		St. Inigoes	8/10/2020	9:30 AM	34	Partly Cloudy	Southwest	5	Ebb						
T2 - 01L [2]	T2- 01FB	TB 100		St. Inigoes	8/10/2020	9:30 AM	34	Partly Cloudy	Southwest	5	Ebb						
FB- 01 [2]	FB - 7A	TB - 201		Fishing Bay	8/11/2020	9:36 AM	29	Partly Cloudy	South	10	Flood	1	29.5	23440	7.4	7.9	14.1
												8	29.2	23540	7.1	7.8	14.2
FB- 01L [2]	FB - 7A	TB - 201		Fishing Bay	8/11/2020	9:36 AM	29	Partly Cloudy	South	10	Flood	1	29.5	23440	7.4	7.9	14.1
												8	29.2	23540	7.1	7.8	14.2
HP - 01 [2]	FB - 9A	TB - 200		Patuxent River - Hog Point	8/11/2020	10:00 AM	27	Partly Cloudy	Southeast	6	Ebb	1	28.7	22100	6.6	7.9	13.2
												10	28.2	23850	3	7.5	14.4
HP - 01L [2]	FB - 9A	TB - 200		Patuxent River - Hog Point	8/11/2020	10:00 AM	27	Partly Cloudy	Southeast	6	Ebb	1	28.7	22100	6.6	7.9	13.2
												10	28.2	23850	3	7.5	14.4
DP - 01 [2]	FB - 9B	TB - 203		Patuxent River - Drum Point	8/18/2020	10:40 AM	26	Partly Cloudy	Northwest	2	flood	1	27.5	20700	6.8	7.8	12.3
												13	27.3	21400	5.3	7.7	12.8
DP - 01L [2]	FB - 9B	TB - 203		Patuxent River - Drum Point	8/18/2020	10:40 AM	26	Partly Cloudy	Northwest	2	flood	1	27.5	20700	6.8	7.8	12.3
												13	27.3	21400	5.3	7.7	12.8

Table 6: PFASs measured in surface water (ng/l)

Lab Sample ID	L2028498-02	L2028498-03	L2028498-04	L2028498-05	L2028498-06	L2028498-07	L2028496-06	L2028498-12	L2028498-11	L2028498-09	L2028498-08	L2028498-07	L2028494-09	L2028494-07	L2028494-06	L2028496-04	L2028496-03	L2028496-02	L2028494-08	L2028494-03	L2028494-04	L2028496-11	L2028496-10	L2028498-15	L2028498-14	L2028494-12	L2028494-11	L2032501-01	L2032501-10	L2032501-12
Sample Station	T1-W1	T1-W2	T1-W2R	T1-W3	T2-W1	T2-W2	T2-W3	T3-W1	T3-W2	T3-W3	T3-W4R	T3-W4	T4-W1	T4-W2	T4-W3	T5-W1	T5-W2	T5-W3	CC-W1	SC-W1	SC-W1R	WFDS-W1	WFDS-W2	WFDS-W3	WFDS-W4	WFDS-W5	WFDS-W6	FB-W1	FB-W1	HP-W1	DP-W1
Collection Date/Time	7/7/20 9:02 AM	7/7/20 9:14 AM	7/7/20 9:21 AM	7/7/20 9:27 AM	7/7/20 9:44 AM	7/7/20 9:38 AM	7/7/20 9:31 AM	7/7/20 10:07 AM	7/7/20 10:07 AM	7/7/20 10:02 AM	7/7/20 9:57 AM	7/7/20 9:43 AM	7/7/2020 8:59 AM	7/7/2020 8:52 AM	7/7/2020 8:44 AM	7/7/20 9:18 AM	7/7/20 9:10 AM	7/7/20 9:00 AM	7/7/2020 9:04 AM	7/7/20 8:22 AM	7/7/20 8:27 AM	7/7/20 9:58 AM	7/7/20 9:52 AM	7/7/20 10:25 AM	7/7/20 10:19 AM	7/7/2020 9:20 AM	7/7/2020 9:14 AM	7/7/2020 10:02 AM	8/11/20 9:36 AM	8/11/20 10:00 AM	8/11/20 9:00 AM
Site Description	Upper St. Mary's River - Eastern Shore	Upper St. Mary's River - Middle of Transect	Upper St. Mary's River - Middle of Transect - Replicate	Upper St. Mary's River - Western Shore	Mouth of St. Inigoes Creek - Kennedy Bar - North Shore	Mouth of St. Inigoes Creek - Middle of Transect	Mouth of St. Inigoes Creek - Kennedy Bar - South Shore	Mid St. Mary's River - Eastern Shore Near WWTP	Mid St. Mary's River - Middle of Transect	Mid St. Mary's River - Western Shore Near Cedar Lane	Mid St. Mary's River - Western Shore Near Cedar Lane - Replicate	Mid St. Mary's River - Western Shore Near Cedar Lane	LWR St. Marys River - East Mouth	LWR St. Marys River - Middle	LWR St. Marys River - Western Shore	St. Inigoes Creek - Mid Creek - North Shore	St. Inigoes Creek - Mid Creek - Middle of Transect	St. Inigoes Creek - Mid Creek - South Shore	LWR St. Marys River - Mouth	Smith Creek	Smith Creek - Replicate	Webster Field Discrete Sample	Webster Field Discrete Sample	Webster Field Discrete Sample	Webster Field Discrete Sample	Webster Field Discrete Sample	Webster Field Discrete Sample	Webster Field Discrete Sample	Fishing Bay	Fishing Bay	Patuxent River - Hog Point	Patuxent River - Drum Point
Units	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluorobutanoic Acid (PFBA) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2.12	ND	ND	•
Perfluoropentanoic Acid (PFPeA) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	3.61	2.38	•
Perfluorobutanesulfonic Acid (PFBS) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorohexanesulfonic Acid (4:2FTS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluorohexanoic Acid (PFHx A) [2]	2.37	2.48	2.36	2.41	2.23	2.09	2.18	1.99	2.59	2.46	2.58	2.47	2.02	ND	2.03	2.28	2.10	2.33	2.01	2.03	2.20	2.33	2.11	2.98	2.40	2.03	ND	1.90	2.52	2.14	2.06
Perfluoropentanesulfonic Acid (PFPeS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluoroheptanoic Acid (PFHpA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanesulfonic Acid (PFHxS) [2]	ND	ND	ND	ND	ND	ND	ND	ND	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.26	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanoic Acid (PFOA) [2]	2.21	2.10	2.00	1.94	2.10	2.20	1.91	ND	2.04	1.83	2.03	2.01	ND	2.07	ND	2.19	2.12	2.12	ND	1.94	1.93	ND	2.07	2.51	2.03	ND	2.02	2.67	3.07	2.10	ND
1H,1H,2H,2H- Perfluorooctanesulfonic Acid (6:2FTS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluoroheptanesulfonic Acid (PFHpS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluorononanoic Acid (PFNA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanesulfonic Acid (PFOS) [2]	5.17	2.17	1.94	1.93	ND	ND	2.17	2.43	6.72	2.91	3.67	2.50	1.98	2.05	ND	2.10	1.99	ND	5.26	2.28	2.12	2.34	ND	5.42	3.23	1.95	2.11	ND	3.20	2.03	3.81
Perfluorodecanoic Acid (PFDA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluorononanesulfonic Acid (PFNS)	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PerfluorononDIecanoic Acid (PFUnA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanesulfonic Acid (PFDS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluorooctanesulfonamide (FOSA) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTA) [2]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,3,3- Tetrafluoro-2-(1,1,2,2,3,3,3-Heptafluoropropoxyl-Propnanoic Acid (HFPO-DA) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluorohexadecanoic Acid (PFH xDA) [4]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluorooctadecanoic Acid (PFODA) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Perfluorododecane Sulfonic Acid (PFDoDS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS) [4]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
11-Chloroeicosafluoro-3-OxaND1ecane-1-Sulfonic Acid (11Cl-PF3OUdS) [1]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE) [3]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE) [3]	•	•	•	•	•	ND	•	ND	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	ND	ND	ND	•
Total PFAS	9.75	6.75	6.30	6.28	4.33	4.29	6.26	4.42	13.45	7.20	8.28	6.98	4.00	4.12	2.03	6.57	6.21	4.45	7.27	6.25	6.25	4.67	4.18	13.17	7.66	3.98	4.13	6.69	12.40	8.65	5.87
Perfluorooctanoic Acid (PFOA) [2] + Perfluorooctanesulfonic Acid (PFOS) [2]	7.38	4.27	3.94	3.87	2.10	2.20	4.08	2.43	8.76	4.74	5.70	4.51	1.98	4.12	0.00	4.29	4.11	2.12	5.26	4.22	4.05	2.34	2.07	7.93	5.26	1.95	4.13	2.67	6.27	4.13	3.81

Summary Water Results	
PFOA[2] + PFOS[2] St. Marys Average Detections (ng/l)	4.09
PFOA[2] + PFOS[2] Patuxent Average Detections (ng/l)	3.97
PFOA[2] + PFOS[2] Fishing Bay Maximum Detections (ng/l)	6.27

ND - Non Detect
• - Not Analyzed
- Reporting limits ranging from lowest 1.76 to highest 2.00
- Reporting limits ranging from lowest 1.74 to highest 2.08
- Reporting limits ranging from lowest 44.1 to highest 49.6
- Reporting limits ranging from lowest 3.51 to highest 4.00
- Reporting limits ranging from lowest 1.76 to highest 4.00
- Reporting limits ranging from lowest 1.76 to highest 5.00
- Reporting limits ranging from lowest 17.6 to highest 50.0

Table 7: PFASs measured in oyster tissue (ug/kg)

Lab Sample ID	L2032321-3	L2032321-14	L2032321-12	L2032321-20	L2032321-18	L2032321-16	L2032321-5	L2032501-02	L2032501-08	L2033550-04
Sample Station	T1-01	T2-01	T5-01	CC-01	WFWWTP-01	SC-01	FB-01	FB-01	HP-01	DP-01
Collection Date/Time	8/10/20 9:45 AM	8/10/20 9:30 AM	8/10/20 9:05 AM	8/10/20 9:45 AM	8/10/20 10:15 AM	8/10/20 9:00 AM	8/10/20 10:20 AM	8/11/20 9:36 AM	8/11/20 10:00 AM	8/18/20 10:40 AM
Site Description	Upper St. Mary's - Transect 1 - Oyster Tissue	Mouth of St. Inigoes - Transect 2 - Oyster Tissue	St. Inigoes Creek - Transect 5 - Oyster Tissue	LWR St. Marys River - Mouth - Oyster Tissue	Upper St. Mary's River - Middle of Transect - Oyster Tissue	Smith Creek - Oyster Tissue	Fishing Bay - Oyster Tissue	Fishing Bay - Oyster Tissue	Hog Point - Oyster Tissue	Drum Point - Oyster Tissue
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorobutanoic Acid (PFBA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluoropenlanoic Acid (PFPeA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorobutanesulfonic Acid (PFBS) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorohexanesulfonic Acid (4:2FTS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorohexanoic Acid (PFHx A) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoropentanesulfonic Acid (PFPeS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluoroheptanoic Acid (PFHpA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanesulfonic Acid (PFHxS) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanoic Acid (PFOA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorooctanesulfonic Acid (6:2FTS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluoroheptanesulfonic Acid (PFHpS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorononanoic Acid (PFNA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanesulfonic Acid (PFOS) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanoic Acid (PFDA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorononanesulfonic Acid (PFNS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroundecanoic Acid (PFUnA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanesulfonic Acid (PFDS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorooctanesulfonamide (FOSA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,3,3-Telralluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA) [10]	•	•	ND	•	•	•	ND	ND	ND	•
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA) [11]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorohexadecanoic Acid (PFH xDA) [12]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorooctadecanoic Acid (PFODA) [12]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorododecane Sulfonic Acid (PFDoDS) [11]	•	•	ND	•	•	•	ND	ND	ND	•
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS) [11]	•	•	ND	•	•	•	ND	ND	ND	•
9-Chlorohexadecafluoro-3-Oxanone-1-Sullonic Acid (9Cl-PF3ONS) [11]	•	•	ND	•	•	•	ND	ND	ND	•
11-Chloroeicosalluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS) [11]	•	•	ND	•	•	•	ND	ND	ND	•
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE) [12]	•	•	ND	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE) [12]	•	•	ND	•	•	•	ND	ND	ND	•
Total PFAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ND - Non Detect

• - Not Analyzed

[8] - Reporting limits ranging from lowest 0.924 to highest 1.00

[9] - Reporting limits ranging from lowest 0.887 to highest 1.00

[10] - Reporting limits ranging from lowest 9.01 to highest 10.00

[11] - Reporting limits ranging from lowest 0.901 to highest 1.000

[12] - Reporting limits ranging from lowest 1.8 to highest 2.0

Table 8: PFASs measured in Oyster Tissue and Liquor (ug/kg)

Lab Sample ID	L2032321-4	L2032321-15	L2032321-11	L2032321-21	L2032321-17	L2032321-19	L2032321-6	L2032501-03	L2032501-07	L2033550-03
Sample Station	T1-01L	T2-01L	T5-01L	CC-01L	SC-01L	WFWWTP-01L	FB-01L	FB-01L	HP-01L	DP-01L
Collection Date/Time	8/10/20 9:00 AM	8/10/20 9:30 AM	8/10/20 9:05 AM	8/10/20 9:45 AM	8/10/20 9:30 AM	8/10/20 10:15 AM	8/10/20 10:20 AM	8/11/20 9:36 AM	8/11/20 10:00 AM	8/18/20 10:40 AM
Site Description	Upper St. Mary's - Transect 1 - Oyster Tissue & Liquor	Mouth of St. Inigoes - Transect 2 - Oyster Tissue & Liquor	St. Inigoes Creek - Transect 5 - Oyster Tissue & Liquor	LWR St. Marys River - Mouth - Oyster Tissue & Liquor	Smith Creek - Oyster Tissue & Liquor	Upper St. Mary's River - Middle of Transect - Oyster Tissue & Liquor	Fishing Bay - Oyster Tissue & Liquor	Fishing Bay - Oyster Tissue & Liquor	Hog Point -Oyster Tissue & Liquor	Drum Point -Oyster Tissue & Liquor
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorobutanoic Acid (PFBA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluoropenlanoic Acid (PFPeA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorobutanesulfonic Acid (PFBS) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorohexanesulfonic Acid (4:2FTS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorohexanoic Acid (PFHx A) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoropentanesulfonic Acid (PFPeS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluoroheptanoic Acid (PFHpA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorohexanesulfonic Acid (PFHxS) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanoic Acid (PFOA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H- Perfluorooctanesulfonic Acid (6:2FTS) [8]	•	•	ND	•	•	•	ND	1.57	ND	•
Perfluoroheptanesulfonic Acid (PFHpS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorononanoic Acid (PFNA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorooctanesulfonic Acid (PFOS) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanoic Acid (PFDA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorononanesulfonic Acid (PFNS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluoroundecanoic Acid (PFUnA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorodecanesulfonic Acid (PFDS) [8]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorooctanesulfonamide (FOSA) [8]	•	•	ND	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTA) [9]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,3,3-Telralluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA) [10]	•	•	ND	•	•	•	ND	ND	ND	•
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA) [11]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorohexadecanoic Acid (PFH xDA) [12]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorooctadecanoic Acid (PFODA) [12]	•	•	ND	•	•	•	ND	ND	ND	•
Perfluorododecane Sulfonic Acid (PFDoDS) [11]	•	•	ND	•	•	•	ND	ND	ND	•
1H,1H,2H,2H-Perfluorododecanesulfonic Acid (10:2FTS) [11]	•	•	ND	•	•	•	ND	ND	ND	•
9-Chlorohexadecafluoro-3-Oxanone-1-Sullonic Acid (9CI-PF3ONS) [11]	•	•	ND	•	•	•	ND	ND	ND	•
11-Chloroeicosalluoro-3-Oxaundecane-1-Sulfonic Acid (11CI-PF3OUdS) [11]	•	•	ND	•	•	•	ND	ND	ND	•
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE) [12]	•	•	ND	•	•	•	ND	ND	ND	•
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE) [12]	•	•	ND	•	•	•	ND	ND	ND	•
Total PFAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.57	0.00	0.00

ND - Non Detect

• - Not Analyzed

[8] - Reporting limits ranging from lowest 0.924 to highest 1.00

[9] - Reporting limits ranging from lowest 0.887 to highest 1.00

[10] - Reporting limits ranging from lowest 9.01 to highest 10.00

[11] - Reporting limits ranging from lowest 0.901 to highest 1.000

[12] - Reporting limits ranging from lowest 1.8 to highest 2.0

Table 9: Surface Water PFOA + PFOS Screening Concentrations

Sampling Location	Surface Water PFOA+PFOS[1] (ng/L)	Moderate Use Screening Concentration (ng/L)	Intensive Use Screening Concentration (ng/L)	Moderate Use Risk Ratio[2]	Intensive Use Risk Ratio[2]
St. Mary's (mean)	4.09	17500	5850	0.00023	0.00070
St. Mary's (maximum)	8.76	17500	5850	0.00050	0.0015
Patuxent (mean)	3.97	17500	5850	0.00023	0.00068
Patuxent (maximum)	4.13	17500	5850	0.00024	0.00071
Fishing Bay[3]	6.27	17500	5850	0.00036	0.0011

[1]Surface water concentration represents the sum of PFOA and PFOS. PFOA and PFOS have supporting reference doses utilized to derive surface water screening concentrations.

[2]A risk ratio less than 1 for lifetime exposure to PFOA+PFOS in surface water indicates the level of exposure at which no adverse effects are expected.

[3]Fishing Bay surface water sample represents a location with minor anthropogenic influences and represents a conservative reference station.

Table 10: Oyster Tissue Meat Only Screening Concentrations

Exposure Pathway Oyster Tissue	Oyster Meat PFOA+PFOS[1] (ug/kg)	Moderate Use Screening Concentration (ug/kg) 2 Meals a Year		Intensive Use Screening Concentration (ug/kg) 10 Meals a Year		Moderate Use Risk Ratio		Intensive Use Risk Ratio[2,3]	
		Average Meal	Large Meal	Average Meal	Large Meal	Average Meal	Large Meal	Average Meal	Large Meal
St. Mary's (mean)	**ND**	**1790**	**1340**	**358**	**269**	**<0.0011**	**<0.0015**	**<0.0056**	**<0.074**
St. Mary's (maximum)	**ND**	**1790**	**1340**	**358**	**269**	**<0.0011**	**<0.0015**	**<0.0056**	**<0.074**
Patuxent (mean)	**ND**	**1790**	**1340**	**358**	**269**	**<0.0011**	**<0.0015**	**<0.0056**	**<0.074**
Patuxent (maximum)	**ND**	**1790**	**1340**	**358**	**269**	**<0.0011**	**<0.0015**	**<0.0056**	**<0.074**
Fishing Bay[4]	**ND**	**1790**	**1340**	**358**	**269**	**<0.0011**	**<0.0015**	**<0.0056**	**<0.074**

ND = non detect at a PFOA + PFOS reported summation detection limit of ~ 2 ug/kg.

[1]Oyster tissue concentration represents the sum of PFOA and PFOS. PFOA and PFOS have supporting reference doses utilized to derive oyster tissue screening concentrations.

[2]A risk ratio less than 1 for lifetime exposure to PFOA+PFOS in oyster tissue indicates the level of exposure at which no adverse effects are expected.

[3]Although child/youth consumption of oysters is not expected to be a primary childhood route of exposure risk estimates were calculated for a child/youth oyster consumption scenario utilizing the intensive use large meal scenario for comparative purposes. The risk ratio for the child youth scenario was less than 1 for lifetime exposure to PFOA+PFOS in oyster tissue.

[4]Fishing Bay surface water sample represents a location with minor anthropogenic influences and represents a conservative reference station.

ND at a PFOA + PFOS reported summation detection limit of ~ 2 ug/kg.

Table 11: Oyster Tissue Meat and Liquor Screening Concentrations

Exposure Pathway Oyster Tissue	Oyster Meat and Liquor PFOA+PFOS[1] (ug/kg)	Moderate Use Screening Concentration (ug/kg) [2] Meals a Year		Intensive Use Screening Concentration (ug/kg) 10 Meals a Year		Moderate Use Risk Ratio		Intensive Use Risk Ratio[2,3]	
		Average Meal	Large Meal	Average Meal	Large Meal	Average Meal	Large Meal	Average Meal	Large Meal
St. Mary's (mean)	ND	1790	1340	358	269	<0.0011	<0.0015	<0.0056	<0.074
St. Mary's (maximum)	ND	1790	1340	358	269	<0.0011	<0.0015	<0.0056	<0.074
Patuxent (mean)	ND	1790	1340	358	269	<0.0011	<0.0015	<0.0056	<0.074
Patuxent (maximum)	ND	1790	1340	358	269	<0.0011	<0.0015	<0.0056	<0.074
Fishing Bay[4]	ND	1790	1340	358	269	<0.0011	<0.0015	<0.0056	<0.074

ND = non detect at a PFOA + PFOS reported summation detection limit of ~ 2 ug/kg.

[1]Oyster tissue concentration represents the sum of PFOA and PFOS. PFOA and PFOS have supporting reference doses utilized to derive oyster tissue screening concentrations.

[2]A risk ratio less than 1 for lifetime exposure to PFOA+PFOS in oyster tissue indicates the level of exposure at which no adverse effects are expected.

[3]Although child/youth consumption of oysters is not expected to be a primary childhood route of exposure risk estimates were calculated for a child/youth oyster consumption scenario utilizing the intensive use large meal scenario for comparative purposes. The risk ratio for the child youth scenario was less than 1 for lifetime exposure to PFOA+PFOS in oyster tissue.

[4]Fishing Bay surface water sample represents a location with minor anthropogenic influences and represents a conservative reference station.

Figure 1: Site Map - St. Mary's River Overview

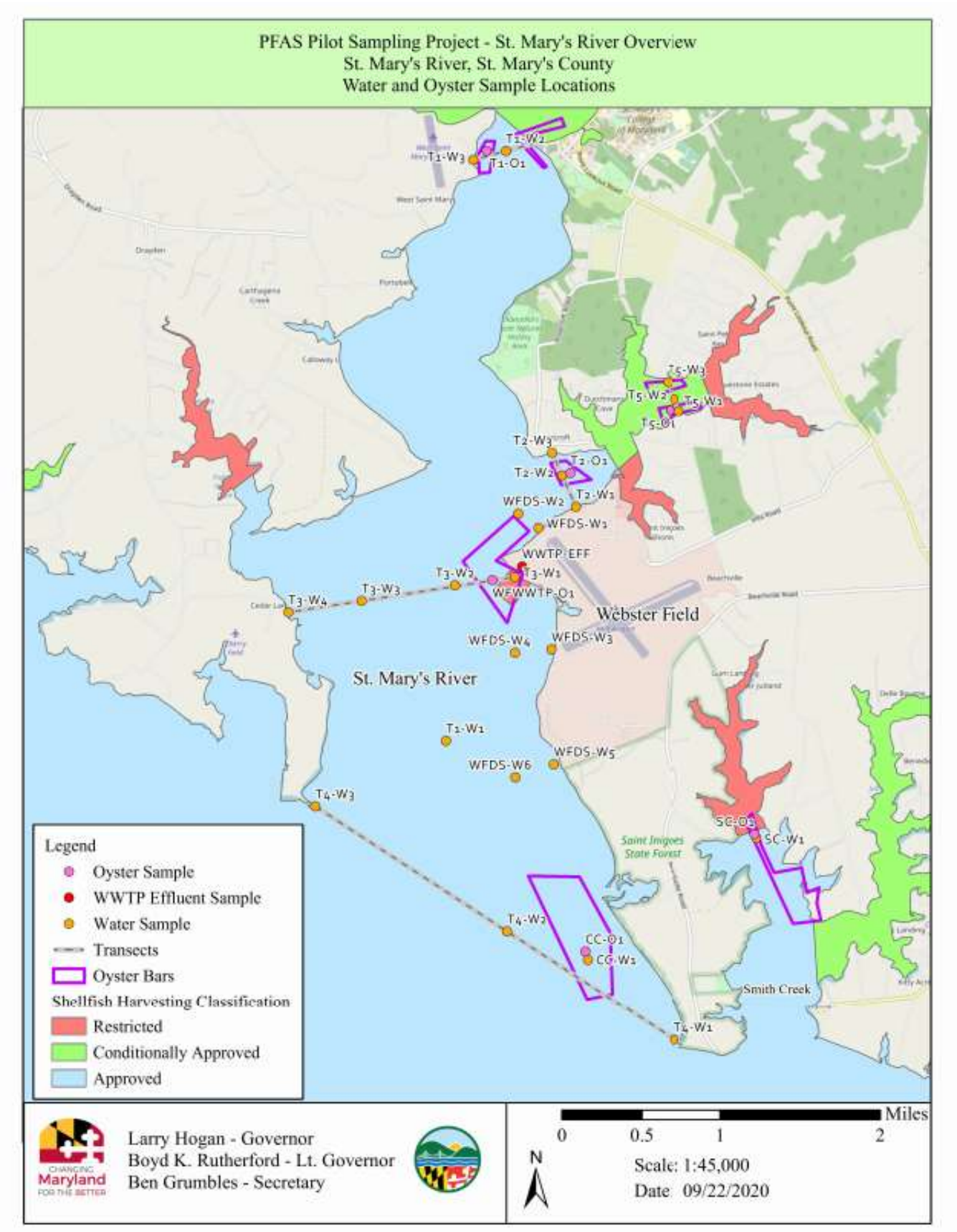

Figure 2: Site Map – Fishing Bay

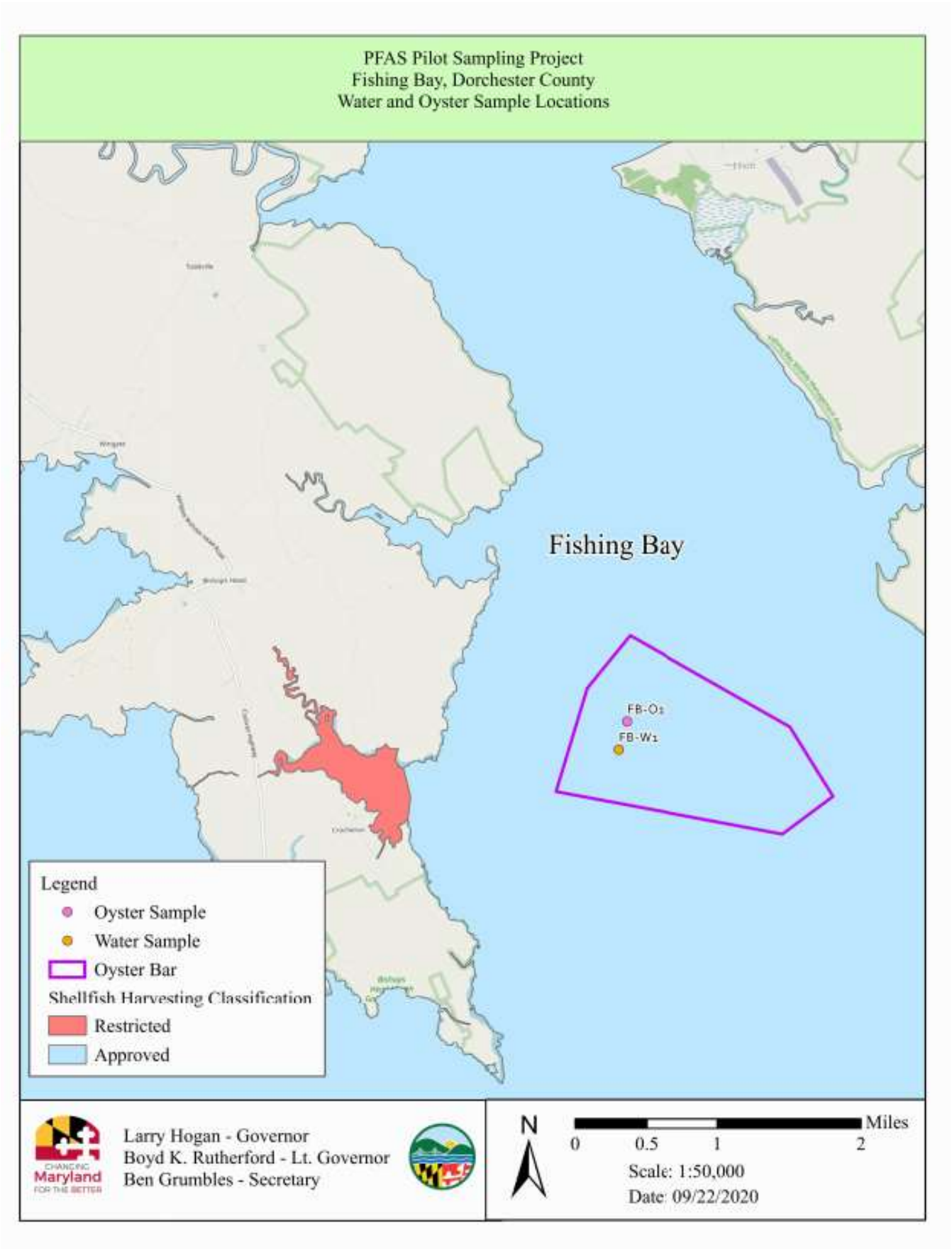

Figure 3: Site Map – St. Inigoes Creek, St. Mary's River

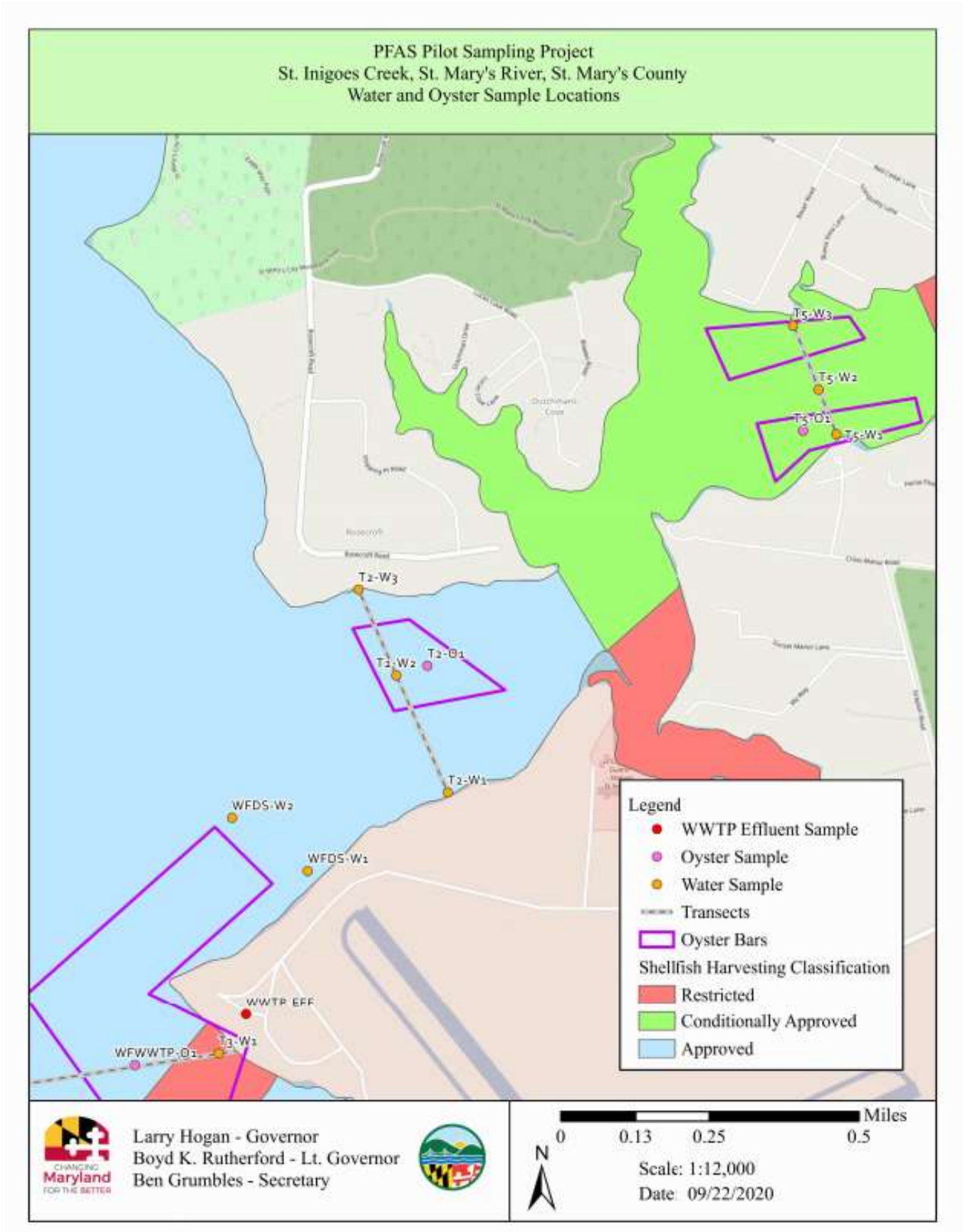

Figure 4: Site Map - Upper St. Mary's River

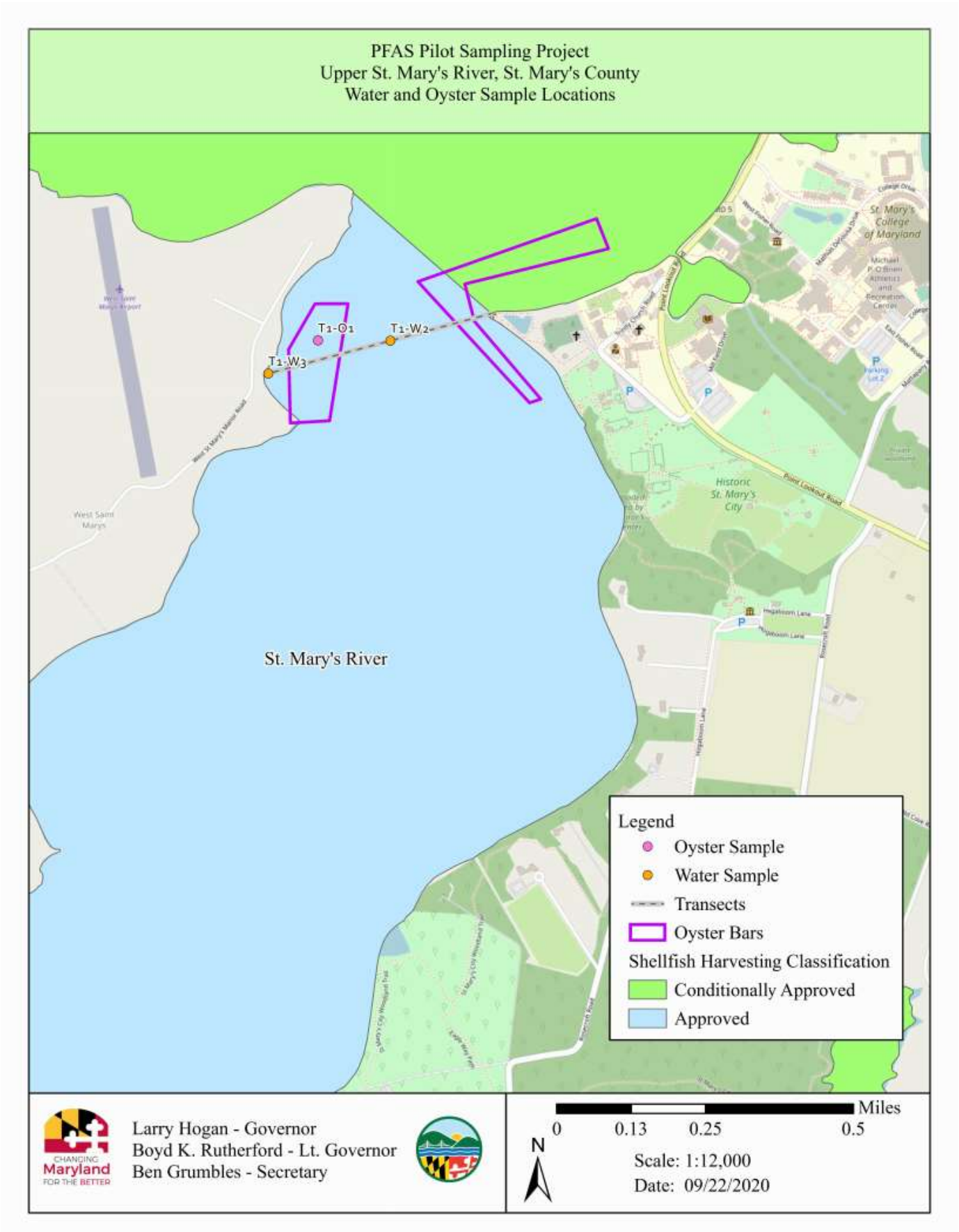

Figure 5: Site Map - Middle St. Mary's River

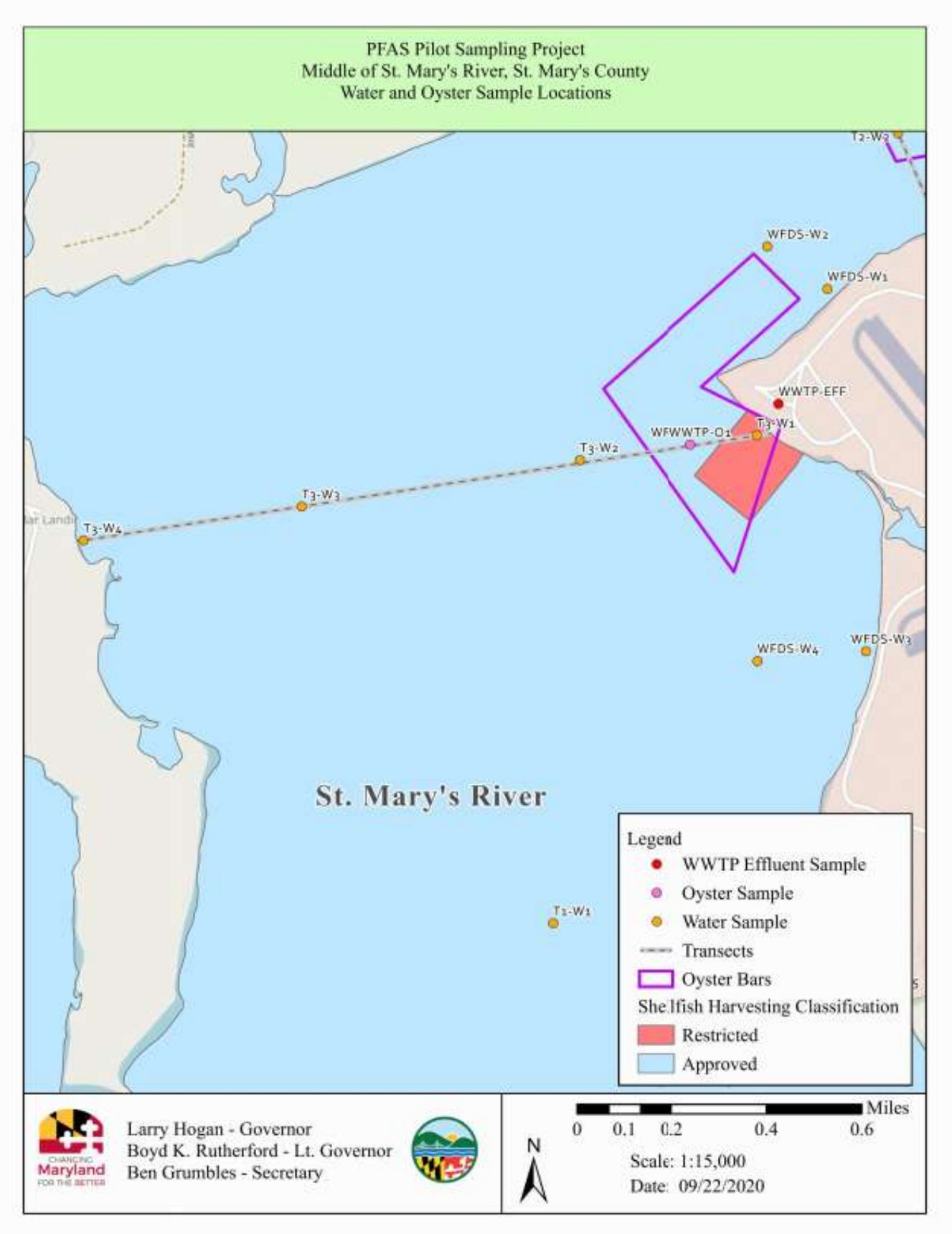

Figure 6: Site Map - Lower St. Mary's River

Figure 7: Site Map- Smith Creek, St. Mary's River

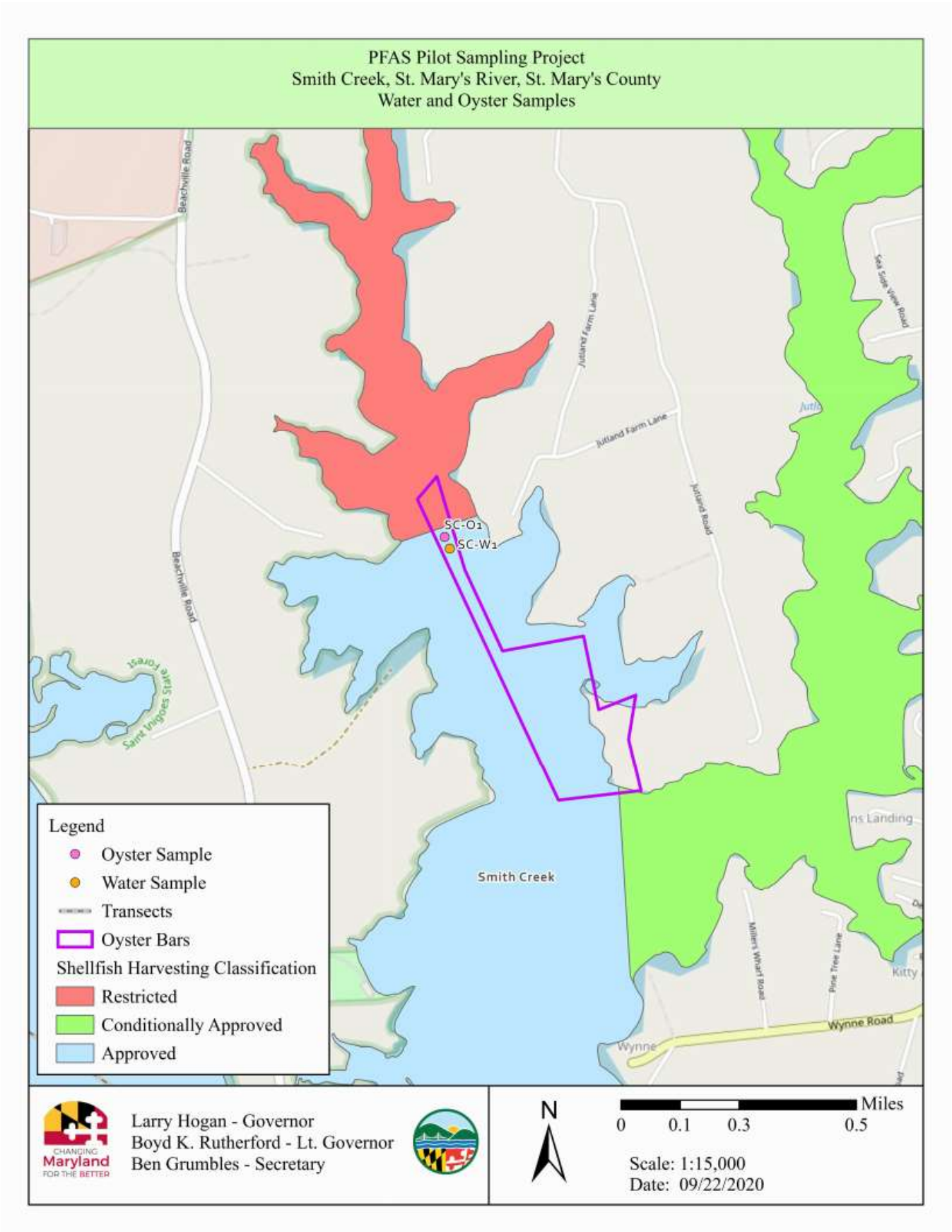

Figure 8: Site Map - Patuxent River, Hog Point and Drum Point