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Evaluation of Lapeer WWTP Biosolids Sites 08n11e16-TG01 and 08n11e16-TG02

Lapeer County, MI

Project number: 60570635

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1. Introduction

This technical memorandum summarizes and reports the findings at the privately owned sites 08n11e16-TG01 and 08n11e16-TG02 (Site) (**Figure 1**). The purpose of the investigation was to determine the impact, if any, from the potential land application of Per- and Polyfluroalkyl Substances (PFAS)-impacted biosolids from the City of Lapeer Wastewater Treatment Plant (WWTP) in the soil, groundwater and adjacent surface water bodies.

The field investigation activities were designed to characterize conditions in soil, groundwater and surface water, and to collect data to evaluate risk to human health and the environment from the application of potential PFAS-impacted biosolids. A review of existing data was used to guide the scope of this investigation. Field investigation activities at the site included soil, groundwater and surface water sampling activities.

2. Background

The Site (**Figure 1**) is an actively farmed field where soy beans were planted for the 2018 growing season. As a result of the farming activities, all soil sampling and well installation was completed prior to spring planting at the request of the owner. The investigation was conducted by AECOM on behalf of the Michigan Department of Environmental Quality (MDEQ) and was performed in accordance with applicable AECOM, MDEQ, and US Environmental Protection Agency (USEPA) guidance documents, including the site-specific Sampling and Analysis Plan (SAP) and the Quality Assurance Project Plan (QAPP).

PFAS have been classified by the USEPA as an emerging contaminant, that are regulated by the MDEQ under Part 201 of the Natural Resources and Environmental Protection Act, Act 451 of 1994, as amended and Rule 323.1057 (Rule 57) (Toxic Substances) of the Michigan Administrative Code. PFAS are a complex family of more than 3,000 man-made fluorinated organic chemicals. Due to their unique chemical properties, PFAS have been used in many industries and consumer products since the late 1950's. The Interstate Technology Regulatory Council (ITRC) has identified four major sources of PFAS: fire training/fire response sites, industrial sites, landfills, and wastewater treatment plants/biosolids.

Preliminary surface water and fish tissue sampling performed by the MDEQ in 2013 and 2014 on the Flint River found concentrations of perfluorooctane sulfonic acid (PFOS) above Michigan's Part 31 Water Quality Standard and Michigan Department of Health and Human Services (MDHHS) screening values for fish tissue. As a result, in 2015, MDHHS released an updated "Eat Safe Fish" guidance where PFOS was the driver for the fish consumption advisory for several species on the Flint River downstream of Mott Dam. Subsequent surface water and fish collection was conducted in 2016 to investigate the potential sources of PFAS to the river the results of which indicated that there was a PFAS source located upstream of Holloway Dam. In 2017, additional monitoring was conducted upstream of Holloway Dam, of major tributaries of the Flint River, and of the three major wastewater treatment plants which discharge to the Flint River within the area of concern. Analysis of the City of Lapeer's WWTP effluent identified the WWTP as a significant source of PFOS to the Flint River in May of 2017. Subsequently, an industrial user to the WWTP was identified as contributing significant amounts of PFOS to the City's sewer system.

The City of Lapeer was authorized to land-apply biosolids from the Lapeer WWTP in accordance with a Residuals Management Program approved by the MDEQ on October 17, 2000. During land application, biosolids are injected below the surface to a maximum depth of 12 inches. Due to the elevated levels of PFAS identified in the effluent from the WWTP and concerns regarding the potential for PFAS-impacted biosolids being land applied, the MDEQ requested the City of Lapeer analyze their biosolids for PFAS on August 24, 2017. Results indicated that PFAS was present in biosolids at elevated concentrations. The

concentration of PFOS was found to be the highest at 2,100 nanograms per gram (ng/g) or parts per billion (ppb). In order to evaluate the potential impact of PFAS-contaminated biosolids in fields where they were land applied by the City of Lapeer, the MDEQ conducted a file review and identified 38 fields used by the City of Lapeer for land application of biosolids since 1997. Access to records of land application prior to 1997 is limited.

The MDEQ conducted an initial, limited investigation in December 2017 at the Site owned by the City of Lapeer (8n10e33-CL01) that included three surface soil samples and one surface water sample. The results of the initial MDEQ investigation indicated the highest PFAS concentration was PFOS, with an average soil concentration of 500 ppb. In addition, PFOS levels in the pond located on the northeast side of the City owned field were reported at 2,000 nanograms per liter (ng/L) or parts per trillion (ppt) which is above the Part 31 water quality value of 12 ppt. The presence of elevated levels of PFOS in the soils and pond water indicated the potential for PFOS to be present in adjacent groundwater and/or surface waters. The MDEQ's drinking water cleanup criterion under Part 201 is 70 ng/L for PFOS, perfluorooctanoic acid (PFOA), or the sum of both compounds.

Based on the data results from the parcel owned by the City of Lapeer (8n10e33-CL01), the MDEQ determined that additional monitoring was necessary to evaluate potential, if any, impacts to resources and chose additional fields for investigation.

Two of those Sites were 08n11e16-TG01 and 08n11e16-TG02 (**Figure 1**). The MDEQ prioritized this site for monitoring based on several factors. The site had received a moderate number (4) of applications of biosolids from the City of Lapeer during a period of time when it is suspected that PFOS concentrations levels in biosolids may have been higher than what was measured in 2017 due to a PFOS-based fume suppressant being used at the industrial user as part of their process. Approximately 548 dry tons of biosolids were applied to this field since 2014 with the last application occurring in 2017. However, based on conversations with the landowner, as shown in **Figure 2**, biosolids from the Lapeer WWTP were only applied to the eastern portion of parcel 08n11e16-TG01 and all of 8n11e16-TG02. Biosolids from the Imlay City WWTP were applied to the western portion of parcel 08n11e16-TG01. **Table 1** summarizes the application data based on a summary of the biosolids applications report provided by the MDEQ. In addition, the Site offered a contrast of soil types to those at the City of Lapeer site.

From April 26, 2018 through May 02, 2018, AECOM conducted a field investigation to determine the impact, if any, from the land application of potential PFAS-impacted biosolids from the WWTP in the soil, groundwater and adjacent surface water bodies at the Sites. In addition, the MDEQ is sampling all of the State's public water supplies, including Lapeer County, for PFAS.

3. Hydrogeology/Geology

The geology and topography of the site is the result of glacial activity. The glacial aquifers consist of sand and gravel that are part of a thick sequence of Pleistocene glacial deposits. The area is composed of end moraines of coarse-textured till. Soil borings installed during the investigation generally encountered surficial sand and gravel, underlain by sand or silty sand. Boring logs are provided in **Appendix A**.

The Lapeer County Soil Survey identified one primary type of surface soil in the three Decision Units (DUs) in which surface soil samples were collected. The soil type is identified by the U.S. Department of Agriculture as the Boyer loamy sand (BrA and BrC). BrA soil is located on outwash plains and can contain fine gravel. These soils dry out slowly in spring and after rain. Permeability of this Boyer soil is moderately rapid. BrC soil is located on moraines, and similar to BrA soil, their permeability is moderately rapid. The Site soils identified in the Lapeer County Soil Survey are shown on **Figure 2** and are described in **Appendix B**.

Regional groundwater flow is expected to generally be towards surface water bodies such as lakes and streams. The general groundwater elevation map, based on MDEQ-provided shallow groundwater elevation data, is provided in **Figure 3** and indicates groundwater flows northwest, towards Elk Lake.

4. Scope of Work

Soil, groundwater and surface water samples were collected from the Sites to further characterize PFAS. Three surface soil samples were collected from each of the three DUs using Incremental Sampling Methodology (ISM). A total of nine soil samples were sent for laboratory analysis. Groundwater was collected from one temporary monitoring well. Five saturated soil samples were collected across the Sites. Three surface water samples were also collected.

The soil, groundwater, and surface water samples were submitted to Vista Analytical Laboratories and analyzed using the isotope dilution method for a list of 24 PFAS which included:

- PFBA = Perfluorobutanoic acid
- PFPeA = Perfluoropentanoic acid
- PFHxA = Perfluorohexaonic acid
- PFHpA = Perfluoroheptanoic acid
- PFOA = Perfluorooctanoic acid
- PFNA = Perfluorononanoic acid
- PFDA = Perfluorodecanoic acid
- PFUnDA = Perfluoroundecanoic acid
- PFDoDA = perfluorododecanoic acid
- PFTeDA = Perfluorotetradecanoic acid
- PFTrDA = Perfluorotridecanoic acid
- PFBS = Perfluorobutane sulfonic acid
- PFPeS = Perfluoropentane sulfonic acid
- PFHxS = Perfluorohexane sulfonic acid
- PFHpS = Perfluoroheptane sulfonic acid
- PFOS = Perfluorooctane sulfonic acid
- PFNS = Perfluorononane sulfonic acid
- PFDS = Perfluorodecane sulfonic acid
- 4:2 FTS = 4:2 fluorotelomer sulfonate
- 6:2 FTS = 6:2 fluorotelomer sulfonate
- 8:2 FTS = 8:2 fluorotelomer suflonate
- PFOSA = Perfluorooctane sulfonamide
- EtFOSAA = N-Ethyl perfluorooctane sulfonamide
- MeFOSAA = N-methylperfluoro-1-octane sulfonamide

The nine soil samples were also submitted to Test America Laboratories for total organic carbon (TOC) analysis using the Lloyd Kahn Method.

5. Surface Soil

Surface soil samples were collected on April 26-27, 2018 according to the MDEQ's Incremental Sampling Methodology and Applications guidance document. This document is based on the ITRC 2012 Incremental Sampling Methodology. The spreading of the biosolids was assumed to have been applied consistently at a depth of 8 inches across the Site based on information provided by the MDEQ. The various soil types identified in the soil survey could influence the adsorption of PFAS. In order for the sampling to be representative of the entire site, the soil samples were taken from areas with various soil types as described in *Section 3* that covered at least 50% of the entire Site. A total of three DU areas of one acre each was selected, and a total of three soil samples were collected from each DU in accordance with the MDEQ's Incremental Sampling Methodology and Applications guidance document (**Figure 2**). A total of 50 incremental sampling points were collected for each soil sample (approximately 24 grams each), resulting in a total sample mass of approximately 1,200 grams.

A one-inch diameter soil coring tool was used and was advanced to 8 inches below the ground surface (bgs), with the bottom two inches collected for composite sampling.

The PFAS data are summarized in the table below and attached **Table 2, Figure 4** and **Figure 5**. Laboratory reports are provided in **Appendix C**.

Soil Sample IDs	Total PFAS Mean Value (ng/g)	PFOS Mean Value (ng/g)	PFOA Mean Value (ng/g)
TG1-DU1	10.1	9.3	ND
TG1-DU2	12.9	7.1	ND
TG1-DU3	10.2	6.0	ND

All nine soil samples collected from the three DUs exceeded the Part 201 Groundwater Surface Water Interface (GSI) Protection Criterion (GSIPC) and proposed Drinking Water Protection Criterion (DWPC) for PFOS

All three areas sampled showed similar soil impact. These DUs are associated with the Boyer loamy sand (BrA and BrC). BrA and BrC have different slope values of 0 to 2 percent and 6 to 12 percent, respectively. However, the surficial soil that was sampled is tilled annually and had no field observable differences in classification.

The TOC analytical results ranged from 7,000 to 11,000 milligrams per kilogram (mg/Kg) or parts per million (ppm) with average TOC values for DU1, DU2 and DU3 of 10,133 mg/Kg, 8,100 mg/Kg and 7,800 mg/Kg, respectively. The maximum TOC values are associated with DU1 and the Boyer loamy sand (BrA). **Table 3** summarizes the TOC data by DU sample and compares it to total PFAS concentration, soil survey classification and the soil lithology logged in the soil borings within the DUs. The soils observed in the soil borings at each of the DUs were generally sand with gravel. These coarse-grained soils resulted in lower TOC values compared to the City owned Site where the TOC values ranged from 13,000 to 23,000 mg/Kg and the soils were generally more fine grained.

6. Groundwater

Between May 01, 2018 and May 02, 2018, AECOM and Job Site Services (JSS) installed six temporary monitoring wells (TMW1, TMW2, TMW3, TMW4, TMW5 and TMW6) (**Figure 3; Table 4)**. The scope of work proposed six locations located within the active farming field for the purpose of collecting groundwater samples; however, groundwater could only be collected from one location (TMW3) due to insufficient water. Saturated soil samples were collected as a substitute for the groundwater samples from the five remaining locations (TMW1, TMW2, TMW4, TMW5 and TMW6). Since groundwater elevation data could not be collected, the groundwater flow is based on MDEQ-provided shallow groundwater elevation data (**Figure 3**) and is assumed to flow in a northwesterly direction towards Elk Lake.

The proposed wells were initially to be installed as permanent monitoring wells; however, since the proposed six locations were located within the active farming field, the owner requested that only temporary wells be installed. Temporary monitoring wells TMW1, TMW2, and TMW6 were collocated with decision units DU1, DU2 and DU3, respectively, to evaluate potential impacts to the groundwater from the surface soils. Temporary monitoring well TMW3 was installed to evaluate potential impacts to groundwater from the pond on the western Site. Temporary monitoring well TMW4 was selected as an upgradient boundary point and temporary monitoring well TMW5 was selected as a downgradient point. All locations were originally chosen as groundwater elevation points to confirm groundwater flow direction. However, as previously discussed, only the TMW3 location provided sufficient groundwater for a groundwater sample to be collected. Saturated soil samples were collected from the remaining five locations.

Locations TMW3, TMW4, and TMW5 were located on the portion of parcel 08n11e16-TG01 where biosolids from the Imlay City WWTP were applied.

Prior to any intrusive work being performed, a utility clearance was conducted by MISS DIG, Michigan's one-call utility locating service. In addition, a third party, Underground Detectives of Toledo, OH, conducted a sub-surface investigation. All boring site locations were marked by AECOM and cleared by Underground Detective. No anomalies were encountered at the Site resulting in no sampling locations needing to be relocated.

Temporary Monitoring Well

JSS completed the soil borings by hand augering the first 5 feet bgs and then using a Geoprobe 7720DT. Both hand augering and 3-inch dual tube system were used to continuously core soils. Cored soils were logged from the surface to the total depth of each boring (**Appendix A**). When water was encountered, a final dual tube sample was collected approximately 5 feet past the vadose zone to confirm groundwater. Once the borehole was at total depth, the dual tube system was removed. After the driller confirmed that the borehole did not collapse, a 1-inch diameter, Schedule 40, polyvinyl chloride well casing and a 5-foot, 10 slotted well screen was installed. TMW3 was the only location that encountered sufficient water to sample. The well screen in TMW3 was installed in poorly graded sand with silt at a depth of approximately 13.5 feet bgs (**Table 4**).

Prior to the collection of the groundwater sample, an electronic water tape was used to confirm the amount of water in the well and to collect a static water level measurement.

Groundwater Sampling

One groundwater sample was collected from the Site from temporary monitoring well TMW-3. The location is shown on **Figure 3**. The monitoring well was located in the south west corner of TG01, southeast of the pond. The proximity to the pond may account for the quantity of groundwater available for pumping. The well was purged and a groundwater sample was collected for PFAS analysis in laboratory supplied containers. An attempt was made to collect water quality parameters (temperature,

specific conductance, pH, dissolved solids, oxidation-reduction potential, and turbidity) following AECOM groundwater Standard Operating Procedures. However, the well continued to purge dry not allowing enough water to flow through the water quality meter.

The data is summarized in the table below and attached **Table 5, Figure 6** and **Figure 7**.

Well Sample IDs	Screen Interval (ft bgs)	Total PFAS (ng/L)	PFOS (ng/L)	PFOA (ng/L)
TG1-2-TMW3	8.5-13.5	5.3	1.4	1.8

There were no criteria exceedances at this location.

Saturated Soil Sampling

Five saturated soil samples were collected from the Site at temporary monitoring well locations TMW1, TMW2, TMW4, TMW5 and TMW6 (**Figure 3**). During the drilling process, well screens were set in the soils where first water was encountered. However, the formations at these five locations would not allow water pumping to occur. A phone discussion between the MDEQ and AECOM concluded that field staff would collect saturated soils for laboratory analysis from each location. While it was understood that the data would not be valid as either a soil or water sample, it was decided that the results could be useful if future investigations were required. A step-out of approximately 2 feet at each previously drilled location was performed and a second hole was cored to the first water interval identified in the original borehole. Saturated soils were collected in 250 milliliter, high-density polyethylene containers.

The data is summarized in the table below and attached **Table 6, Figure 8** and **Figure 9**.

Saturated Soil Sample IDs	Sample Depth (ft)	Total PFAS (ng/g)	PFOS (ng/g)	PFOA (ng/g)
TG1-2-TMW1	10	ND	ND	ND
TG1-2-TMW2	10	ND	ND	ND
TG1-2-TMW4	9	ND	ND	ND
TG1-2-TMW5	13	ND	ND	ND
TG1-2-TMW6	8	ND	ND	ND

All samples were nondetect for all PFAS parameters and there were no criteria exceedances.

7. Surface Water

Surface water samples were collected from three surface water bodies located downgradient of the Site. The analytical results are summarized in the table below and attached **Table 7, Figure 10** and **Figure 11**.

Surface Water Sample IDs	Total PFAS (ng/L)	PFOS (ng/L)	PFOA (ng/L)
TG1-2-SW1	6.8	1.6	0.7
TG1-2-SW2	9.3	ND	1.5
TG1-2-SW3	14.9	ND	0.5

The surface water sampling locations are described below.

SW1 was collected from the small pond along the Site's western property boundary.

SW2 was located at the southeast corner of Elk Lake, approximately 100 feet northwest (downgradient) of the Site.

SW3 was located in a small pond approximately 300 feet north (downgradient) of the TG02 parcel.

The highest total PFAS concentration (14.9 ng/L) was detected in SW3, which is located downgradient of the field that was used for biosolids application. However, there were no criteria exceedances at the three surface water locations.

8. QA/QC Results

Laboratory reports 1800898 and 1800937 (**Appendix D**) were subjected to data validation per the Lapeer WWTP Biosolids Sites QAPP. The reports were evaluated for data completeness, holding times and sample preservation, initial and continuing calibration, method and field blanks, ongoing precision and recovery, field duplicate precision, extracted internal standard recoveries, and reporting issues. All quality control acceptance limits and criteria specified in the QAPP were met or qualification of the data was not required, with the exception of some exceedances for extracted internal standard recovery which were qualified as estimated.

All results in other PFAS laboratory reports were evaluated to determine if any result values should be rejected based on major quality control problems. No results were rejected based on this evaluation.

Data validation memos are presented in **Appendix D**.

9. Investigation-Derived Waste (IDW)

Investigation-derived waste (IDW) generated during the investigation included the following:

- Disposable material such as Geoprobe®/Vibracore™ liners, personal protective equipment (PPE), plastic sheeting, etc.
- Drill cuttings;
- Excess soil leftover from sampling activities
- Well development water;
- Purge water, and
- Decontamination water.

Minimally-contaminated disposable sampling materials and PPE were containerized and disposed of as ordinary solid waste. Drill cuttings, excess soil from sampling, well development water, purge water and decontamination water was discharged to the ground surface adjacent to where the material was generated.

10. Pathway and Receptors Evaluation

An exposure pathway includes five components: source of contamination; environmental media and transport mechanism; point of exposure; route of exposure; and receptor population. A pathway is considered potentially complete if all five components are present and one or more hazardous substances are detected. The human health risk associated with a potentially complete exposure

pathway is acceptable if concentrations do not exceed the applicable criteria and background concentrations (Rule 299.1013(3). Ecological risks are acceptable if concentrations do not exceed water quality values or soil screening values.

Potentially complete groundwater exposure pathways associated with the Site and corresponding Part 201 cleanup criteria are:

- Drinking Water criteria (DWC) (PFOA and PFOS 70 ppt), and
- Groundwater surface water interface (GSI; Part 31 Water Quality Values) (PFOA 12 ppb and PFOS 12 ppt).

Potentially complete surface water exposure pathways associated with the Site and corresponding Part 31 Water Quality Values are:

- Ingestion of surface water incidental to recreational activities (human cancer values and non-cancer values for non-drinking water sources) (PFOA 12 ppb and PFOS 12 ppt),
- Ingestion of fish (human cancer values and non-cancer values for non-drinking water sources) (PFOA 12 ppb and PFOS 12 ppt), and
- Aquatic life exposures (aquatic chronic values (PFOA 880 ppb and PFOS 140 ppb) and final acute values (PFOA 15,000 ppb and PFOS 1,600 ppb).

Potentially complete soil exposure pathways associated with the Site and corresponding Part 201 cleanup criteria (if available) are:

- Direct Contact Criteria (DCC; criteria not available);
- Particulate Soil Inhalation Criteria (PSIC; criteria not available),
- Soil protection of groundwater for drinking water (DWPC; proposed criteria PFOS 1.4 ppb and PFOA 59 ppb);
- Soil protection for the groundwater surface water interface (GSIPC; PFOA 10,000 ppb and PFOS 240 ppt), and
- Human exposure by consuming impacted vegetation (gardening, farming; screening levels not available).

Potential receptors associated with groundwater are:

- People who use impacted groundwater for drinking water.

Potential receptors associated with surface water are:

- People using impacted surface waters for recreation and fishing, and
- Fish and other aquatic life.

Potential receptors associated with soil are:

- Residents living at or near impacted soil areas, and
- Non-residential use of impacted soil areas, such as farming and commercial use.

Groundwater Evaluation

Groundwater receptors from WWTP biosolids include at least 7 private/household wells as identified within a ½-mile radius (**Figure 12**) using the MDEQ Wellogic data base. The MDEQ Wellogic database does not include all of the well records; however, a review of additional scanned well logs was also

performed. An additional two unverified wells were identified as was a historical, shallow well. Six of the seven identified Wellogic residential wells near the Site were found to be upgradient, with the seventh approximately ¼-mile downgradient on the northeast side of Elk Lake. Based upon the results of this investigation, there is no unacceptable risk to groundwater since all groundwater, surface water and saturated soil samples are below criteria. In addition, groundwater samples collected as part of the MDEQ's Statewide Public Water Supply Sampling Program from community water supplies and public schools identified near the biosolid application sites were nondetect for PFAS.

Surface Water Evaluation

PFAS concentrations were detected in the surface water samples with no locations exceeding the Part 31 Water Quality Value for PFOS. Additionally, no exceedances of the Part 31 final chronic (FCV) and final acute values (FAV) were detected. Based upon the results of this investigation there is no unacceptable risk for exposure to PFAS from ingestion of PFAS-impacted fish due to bioaccumulation of PFOS in fish tissue.

Surface Soil Evaluation

On-site farm workers may encounter surface soil impacted with PFAS; however no Part 201 direct contact criteria has been established for PFOS and PFOA. All of the surface soil samples exceeded the Part 201 GSI protection criterion and the proposed Part 201 DWPC for PFOS, indicating a potential for PFOS concentrations to leach into groundwater at levels that exceed the Part 31 Water Quality Values and the Part 201 Drinking Water Criterion; however, based upon the results of this investigation there is no unacceptable risk since all groundwater, surface water and saturated soil sample results are below criteria.

PFAS has been documented to transfer to various plants. Depending on the plant type and individual PFAS, the accumulation of PFAS is not evenly distributed throughout the major components of the plant. Some of the PFAS will accumulate more in the roots while others will accumulate in the leaves and fruit. However, there is the possibility of exposure to PFAS via plant uptake through direct or indirect ingestion of PFAS-impacted plants. Currently there are no PFAS criteria for plants; however, a consumption advisory could be developed in the future similar to those for fish.

11. Summary and Discussion

PFAS was detected in all three surface soil samples in each of the three DUs (**Figure 4** and **Figure 5**), the groundwater sample (**Figure 6** and **Figure 7**), and all three surface water locations (**Figure 10** and **Figure 11**). The following Part 201 criteria were exceeded:

- GSI protection criterion for PFOS for each of the nine soil samples;
- Proposed residential drinking water protection criterion for PFOS for each of the nine soil samples.

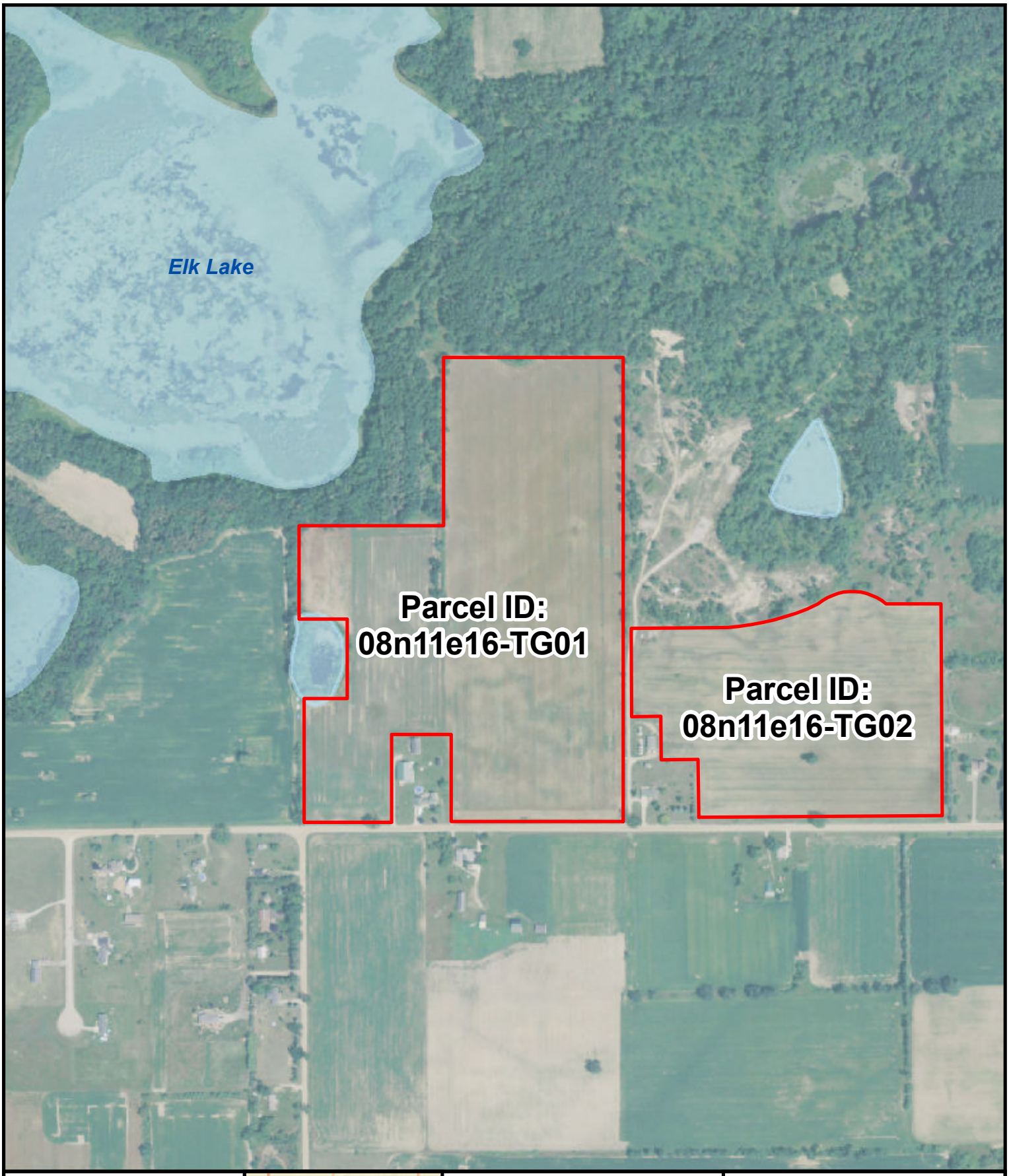
The total PFAS concentration detected in groundwater at temporary monitoring well TMW3 was 5.31 ppt, composed of 3.2 ppt PFOA and PFOS. TMW3 is located on the western boundary of the Site adjacent to a pond. The five saturated soil samples were all nondetect for PFAS. The low PFAS concentrations detected in the surface soil samples are likely related to the lithology at the Site, generally sand. PFAS are known to adsorb more strongly to fine particles such as silt and clay. There is no obvious correlation between PFAS and TOC concentrations; however the PFAS and TOC conentrations are relatively low which correcsponds to the observed sand lithology. These observations suggest that if additional groundwater samples were collected, PFAS groundwater concentrations would be low (i.e. below Part 201 criteria) due to the primarily sand lithology at the Site.

Based on the review of well records near the Site, six of the seven Wellogic residential wells are located immediately upgradient of the Site and the seventh is ¼-mile away on the northeast side of Elk Lake. The residential wells are screened at depths between 215 and 300 feet below ground surface, into bedrock, with clay thickness generally in excess of 70 feet overlying the well screens. Given that the residential well locations are upgradient of the Site, the well screens are deep in the aquifer with significant overlying clay, and current groundwater sample results, there is no indication that the residential wells near the Site would be at risk of PFAS contamination. In addition, groundwater samples collected from community water supplies and public schools near the biosolids application sites were nondetect for PFAS.

Low PFAS surface water concentrations are likely related to a combination of surface runoff and discharge of shallow groundwater into the surface water bodies. A potential for ingestion of PFAS-impacted fish near the Site was identified, but does not pose an unacceptable risk. In addition, the PFAS surface water concentrations did not exceed the Part 31 FAV and FCV, and as a result ecological impacts are not likely.

A direct contact exposure risk was not identified at the Site. However, the surface water and groundwater was found to be impacted due to PFAS leaching from the surface soils. Uptake of PFAS to various crops is also possible, but an ingestion criteria for plants has not been established. Ecological screening levels are not available for soil or sediments.

Figures



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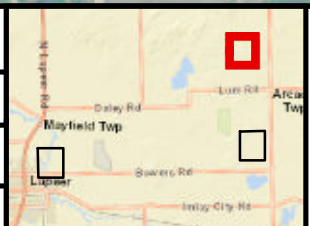

Legend

Site Location

Surface Water

0 250 500 Feet

N

FIGURE 1
08n11e16-TG01 and TG02
SITE LOCATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

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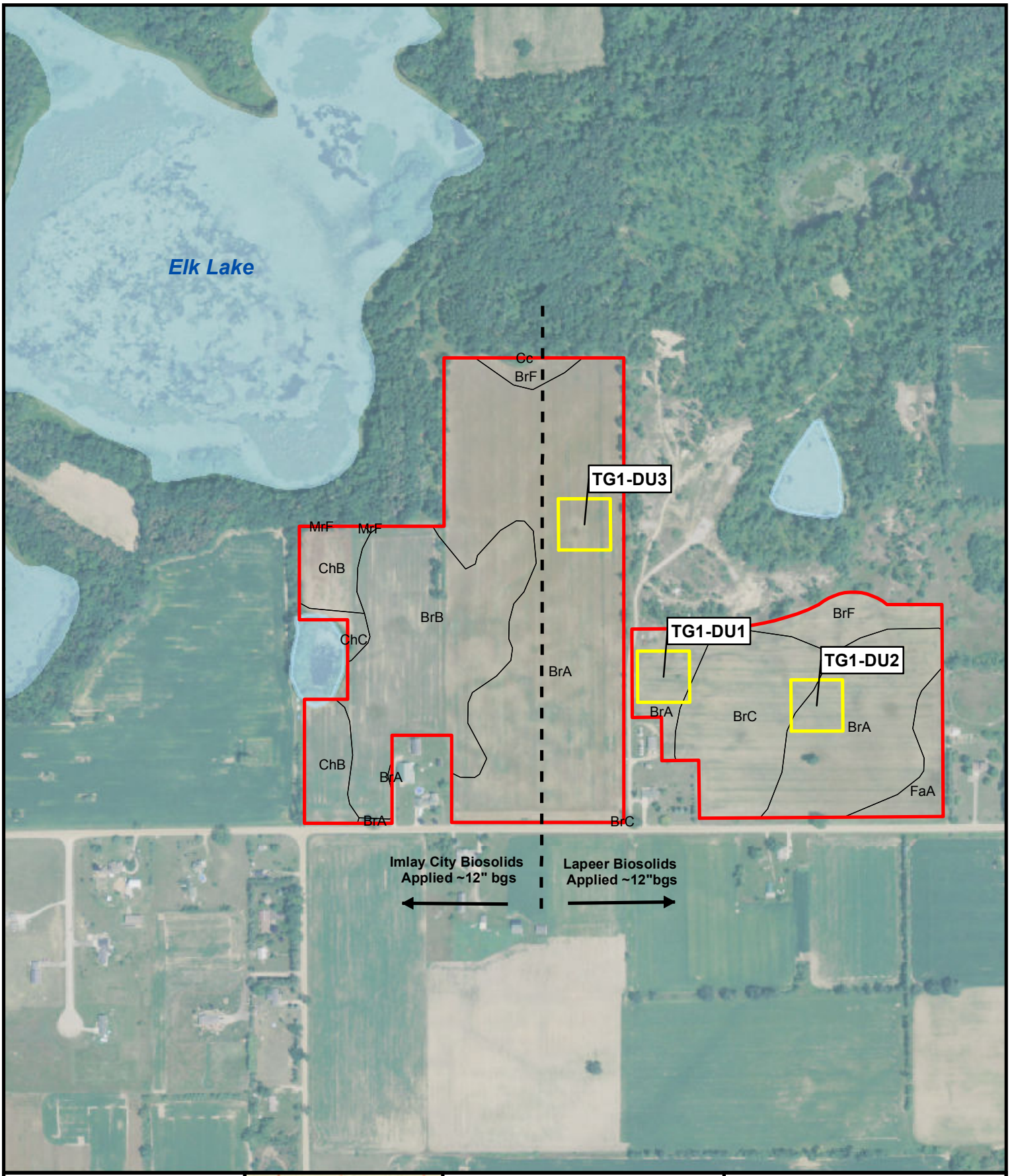

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Legend

- Site Location
- Incremental Soil Sample Area
- Soil Series
- Surface Water

0 250 500 Feet

N

FIGURE 2
08n11e16-TG01 and TG02
INCREMENTAL SOIL
SAMPLING LOCATIONS

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

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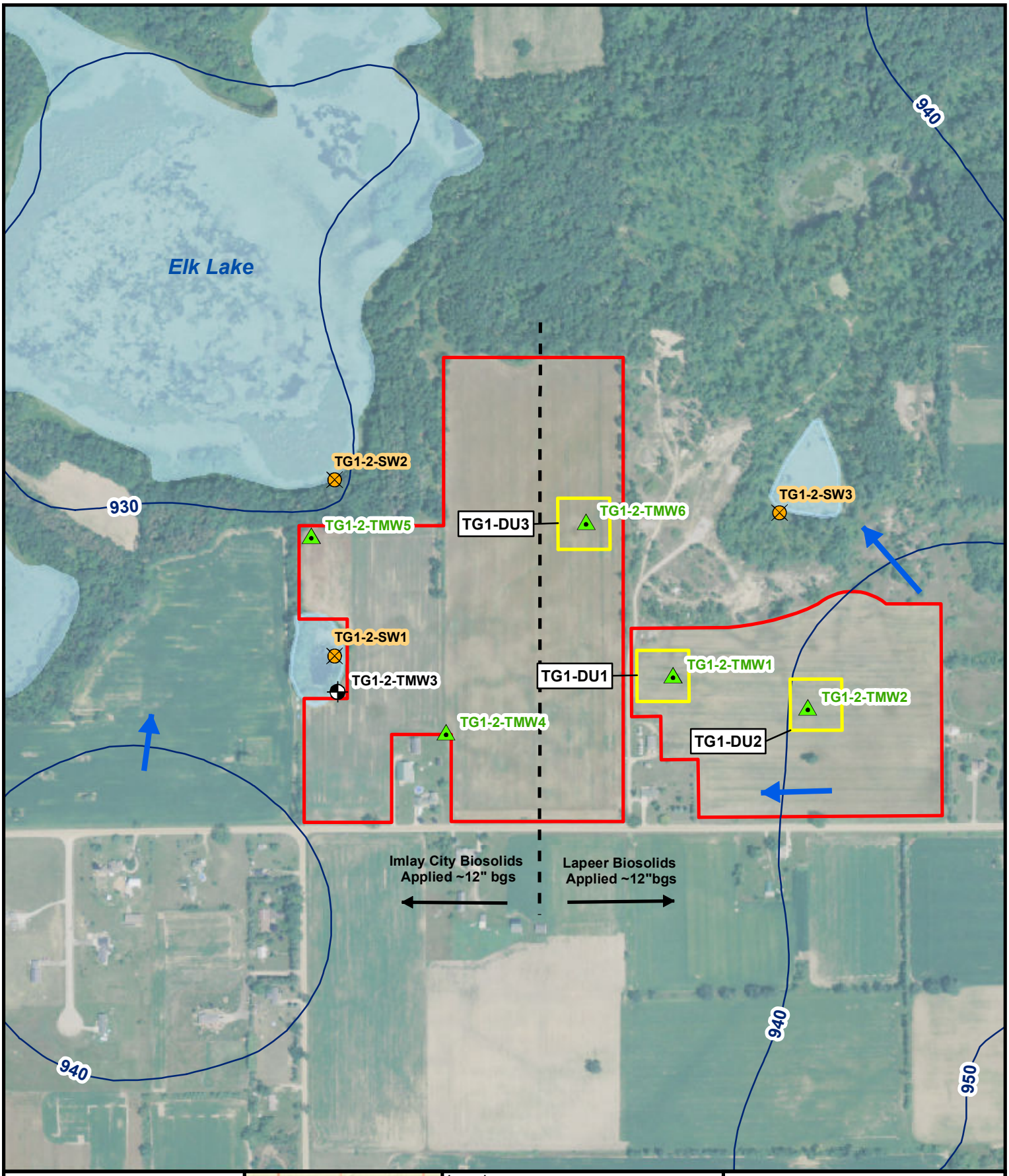

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Legend

- Surface Water Sample
- Saturated Soil Sample Location
- Temporary Monitoring Well Location
- Groundwater Contour Source: MDEQ
- Site Location
- Incremental Soil Sample Area
- Surface Water
- Groundwater Flow Direction
- 940 GW Elevation (ft above mean sea level)

0 250 500 Feet

N

FIGURE 3
08n11e16-TG01 and TG02
GROUNDWATER, SATURATED SOIL AND SURFACE WATER SAMPLING LOCATIONS

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

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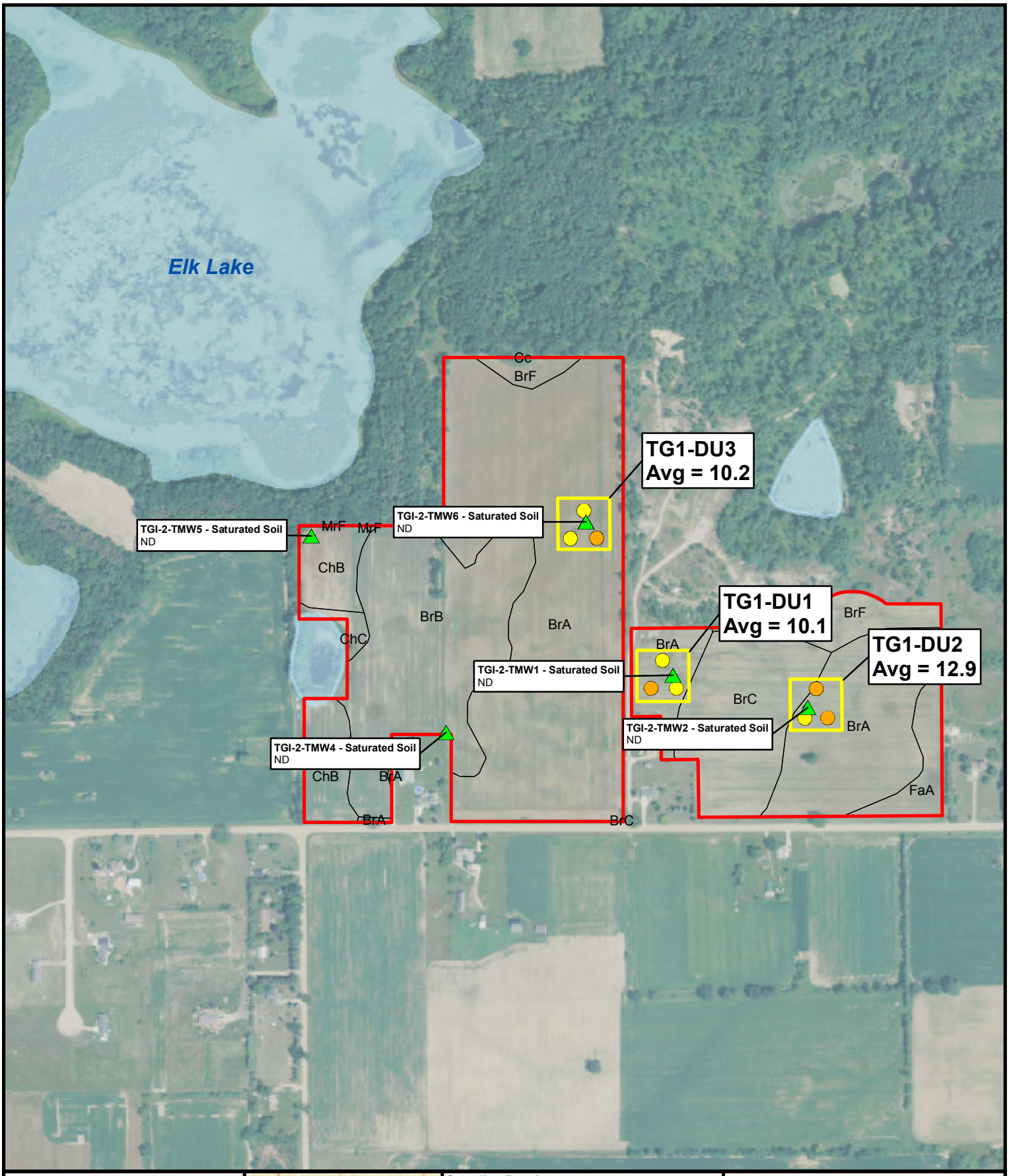

AECOM

Drawn:	Date: 7/17/2018
Approved:	Date: 7/17/2018
Project #:	60570635

Sampling Results

Total PFAS (ng/g or parts per billion - ppb)

Incremental Soil Sample

- ND
- >0 - 10
- >10 - 100
- >100 - 2100
- >2100

Saturated Soil Sample

Site Location

Incremental Soil Sample Area (Average Total PFAS Concentration)

Soil Series

0 250 500 Feet

N

FIGURE 4
08n11e16-TG01 and TG02
INCREMENTAL SOIL SAMPLING
TOTAL PFAS CONCENTRATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

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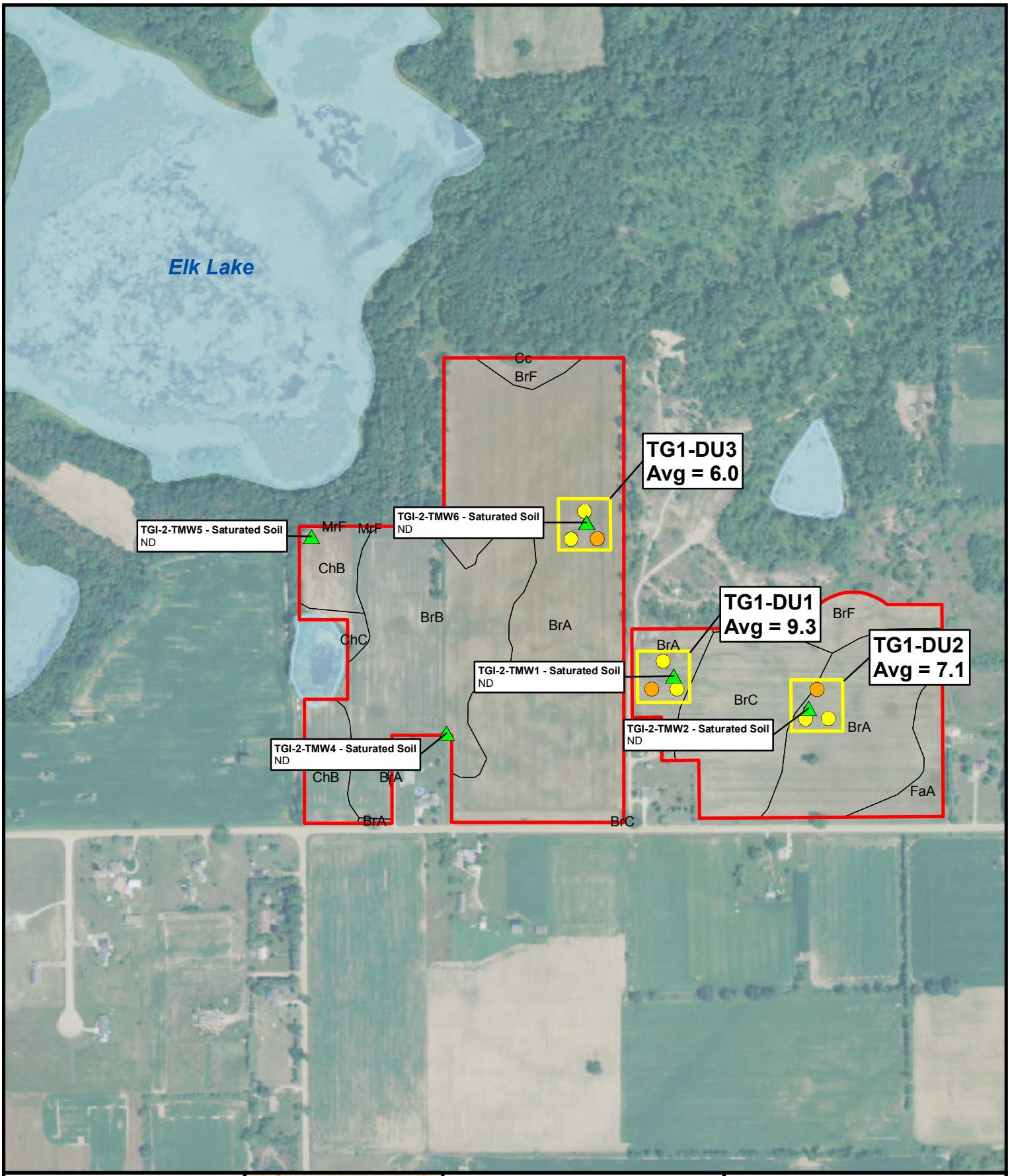

AECOM

Drawn:	Date: 7/17/2018
Approved:	Date: 7/17/2018
Project #:	60570635

Sampling Results
PFOS (ng/g or parts per billion - ppb)
Incremental Soil Sample
- ND
- >0 - 10
- >10 - 100
- >100 - 2100
- >2100

Saturated Soil Sample
Site Location
Incremental Soil Sample Area (Average PFOS Concentration)
Soil Series

0 260 520 Feet

N

FIGURE 5
08n11e16-TG01 and TG02
INCREMENTAL SOIL SAMPLING
PFOS CONCENTRATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

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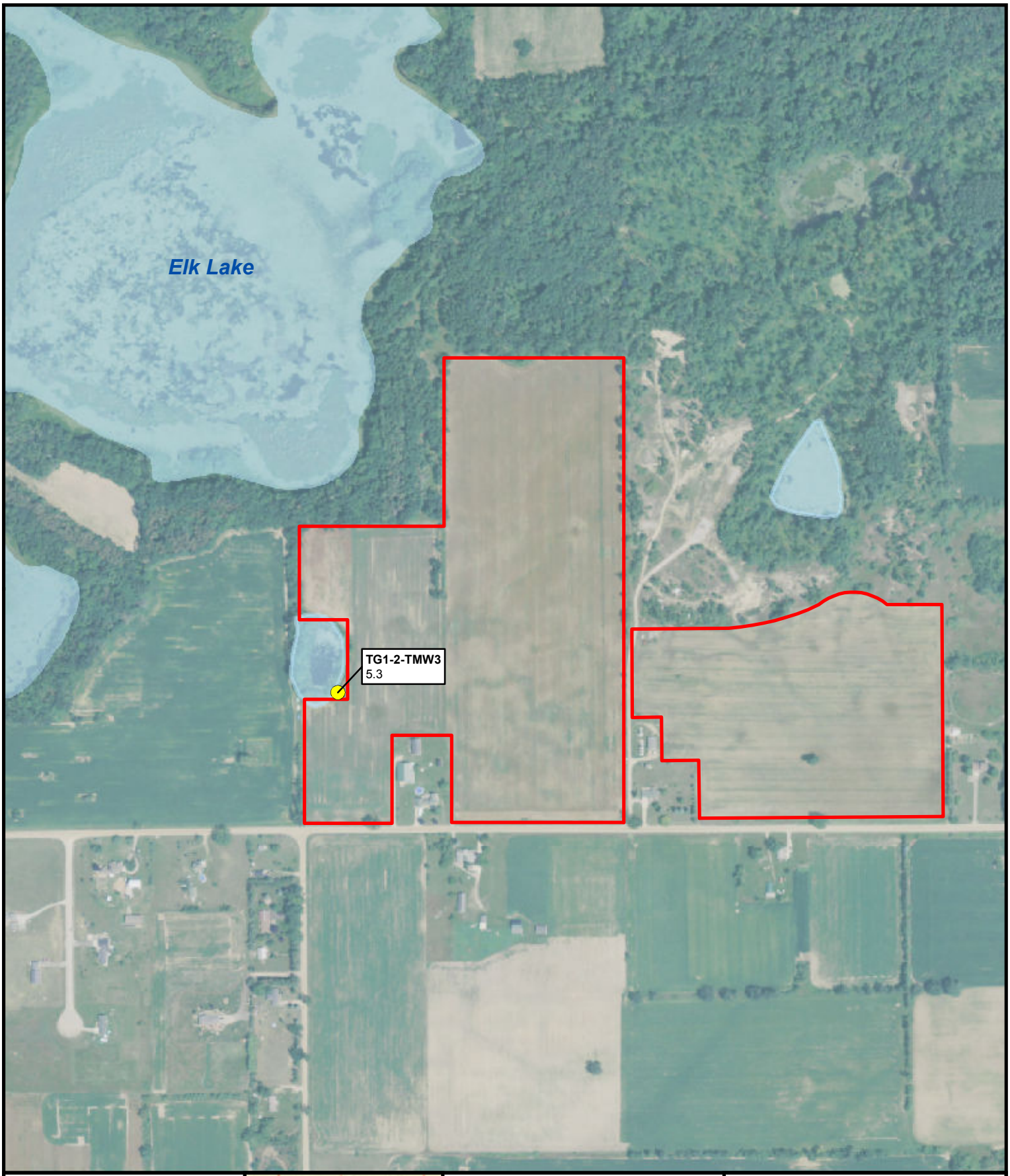


AECOM

Drawn:	Date: 7/17/2018
Approved:	Date: 7/17/2018
Project #:	60570635

Sampling Results
Total PFAS (ng/L or ppt)

- ND
- >0 - 10
- >10 - 70
- >70 - 1000
- >1000

Sample Name
Total PFAS

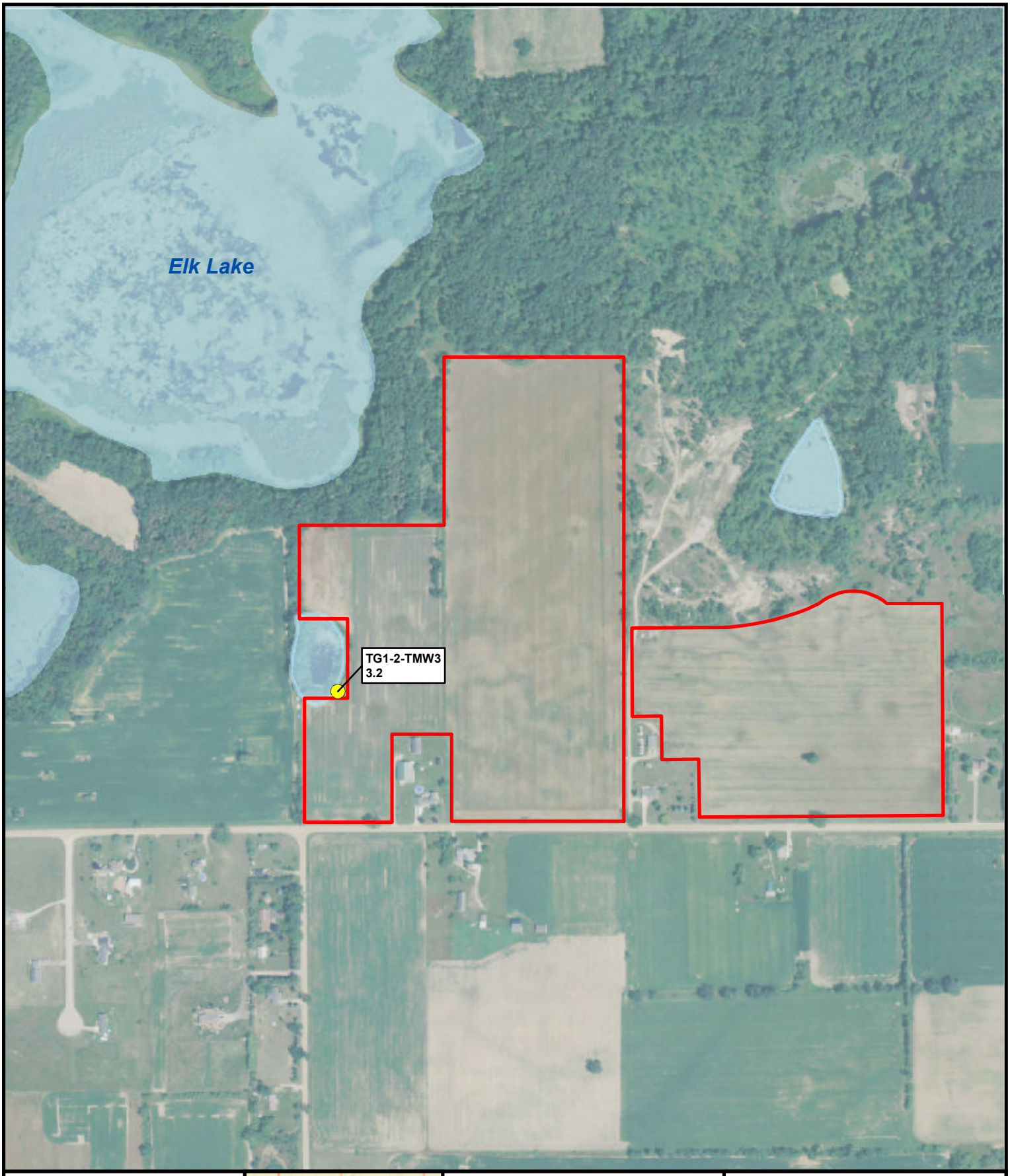
0 250 500 Feet

N

FIGURE 6
08n11e16-TG01 and TG02
GROUNDWATER TOTAL PFAS CONCENTRATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

Document Path: G:\GrandRapids\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Lapeer_LPP\MXDs\8.5x11\Heatmaps\GW\TG01_02_groundwater_totalPFAS_heatmap.mxd



AECOM

Drawn:	Date: 7/17/2018
Approved:	Date: 7/17/2018
Project #:	60570635

Sampling Results
PFOA + PFOS (ng/L or ppt)

- ND
- >0 - 10
- >10 - 70
- >70 - 1000
- >1000

Sample Name
PFOA+PFOS

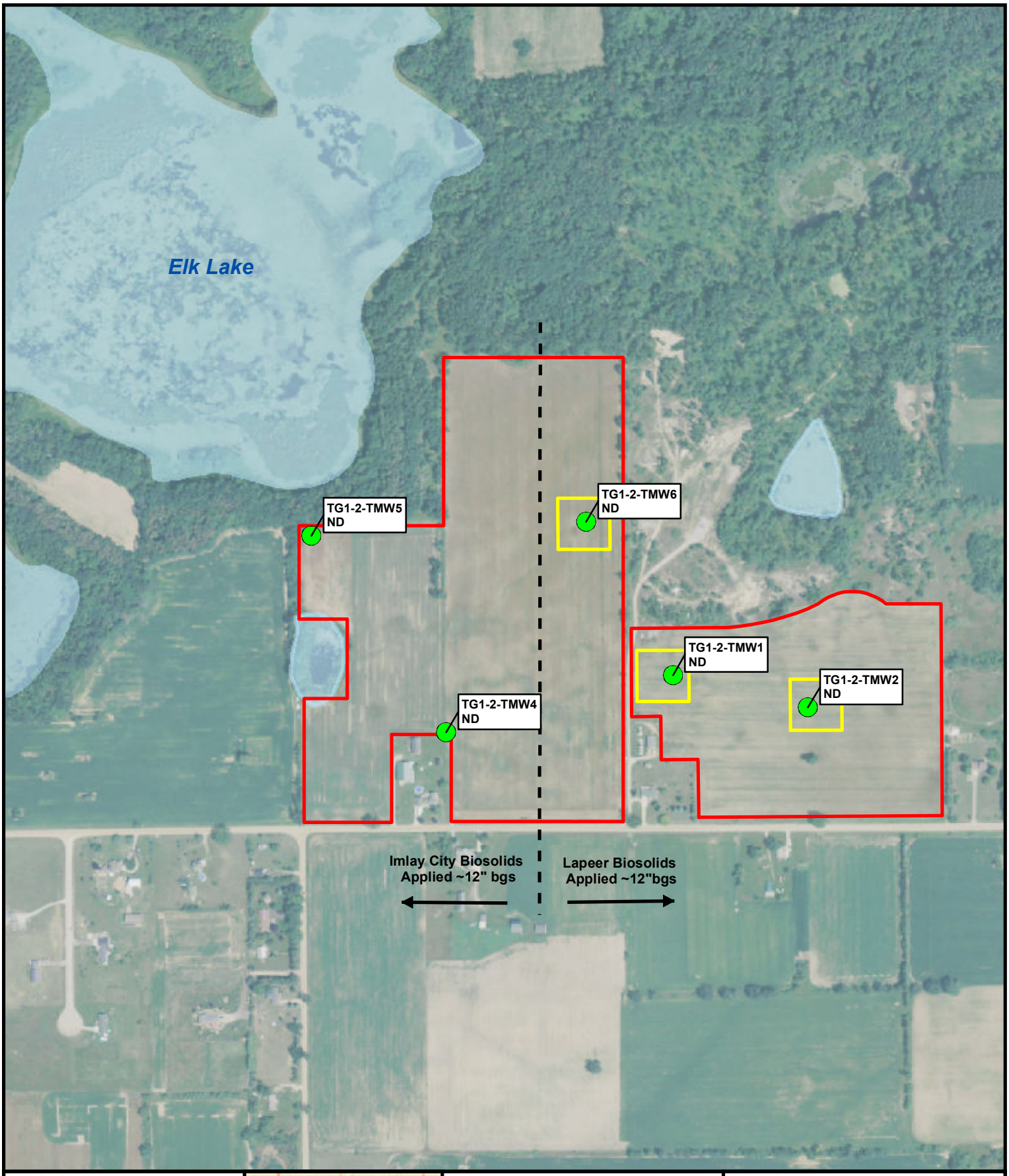
0 250 500 Feet

N

FIGURE 7
08n11e16-TG01 and TG02
GROUNDWATER PFOA + PFOS
CONCENTRATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

Document Path: G:\GrandRapids\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Lapeer_LPP\MXDs\8.5x11\Heatmaps\GW\TG01_02_groundwater_PFOA_PFOS_heatmap.mxd



AECOM	
Drawn:	Date: 9/27/2018
Approved:	Date: 9/27/2018
Project #:	60570635

Sampling Resultes
Total PFAS (ng/L or ppt)

- ND
- >0 -10
- >10 - 70
- >70 -1000
- >1000

Sample Name
Total PFAS

0 250 500 Feet

N

FIGURE 8
08n11e16-TG01 and TG02
SATURATED SOIL
TOTAL PFAS CONCENTRATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

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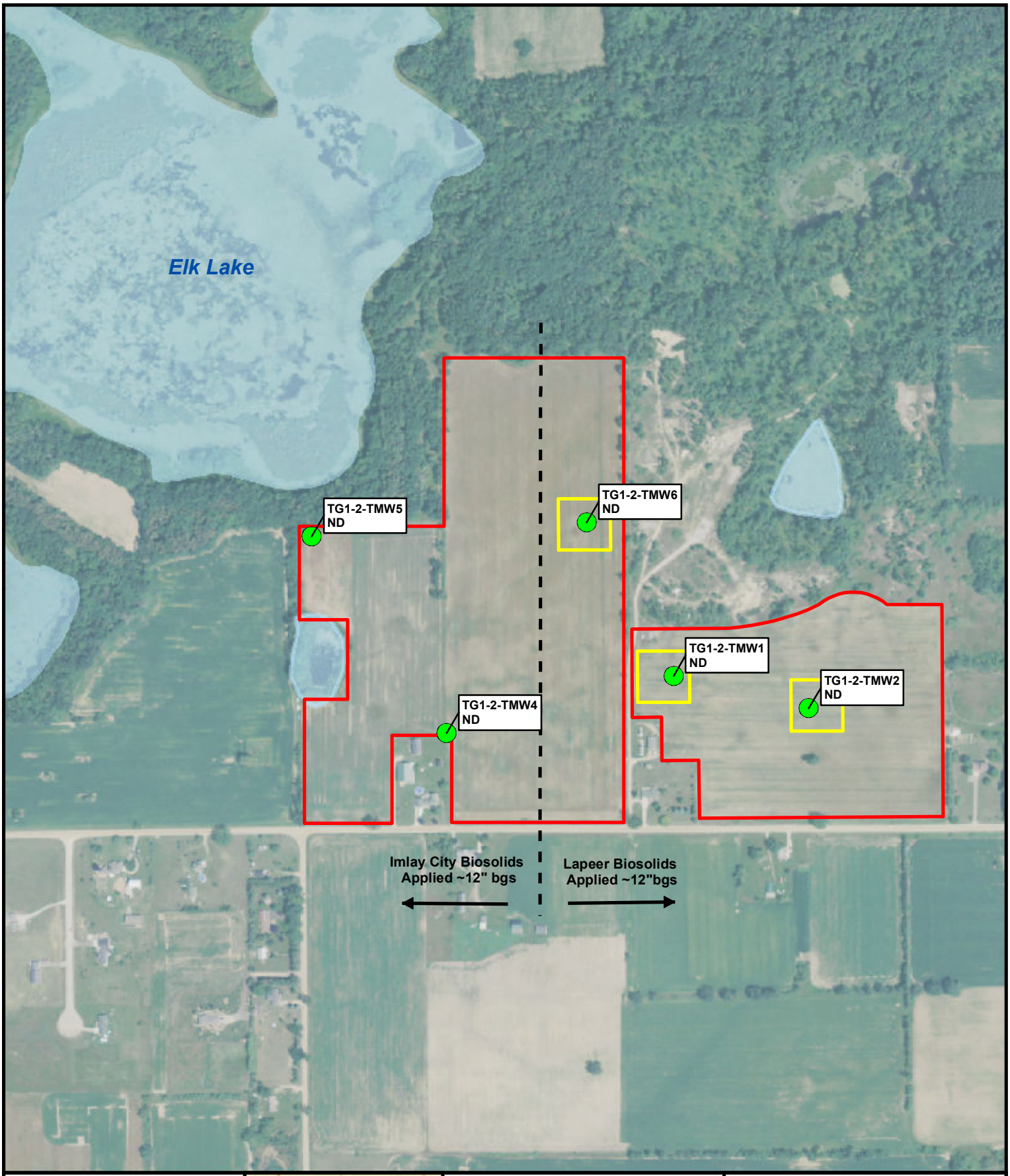


AECOM

Drawn:	Date: 9/27/2018
Approved:	Date: 9/27/2018
Project #:	60570635

Sampling Resultes
PFOA + PFOS (ng/L or ppt)

- ND
- >0 -10
- >10 - 70
- >70 -1000
- >1000

Sample Name
PFOA + PFOS

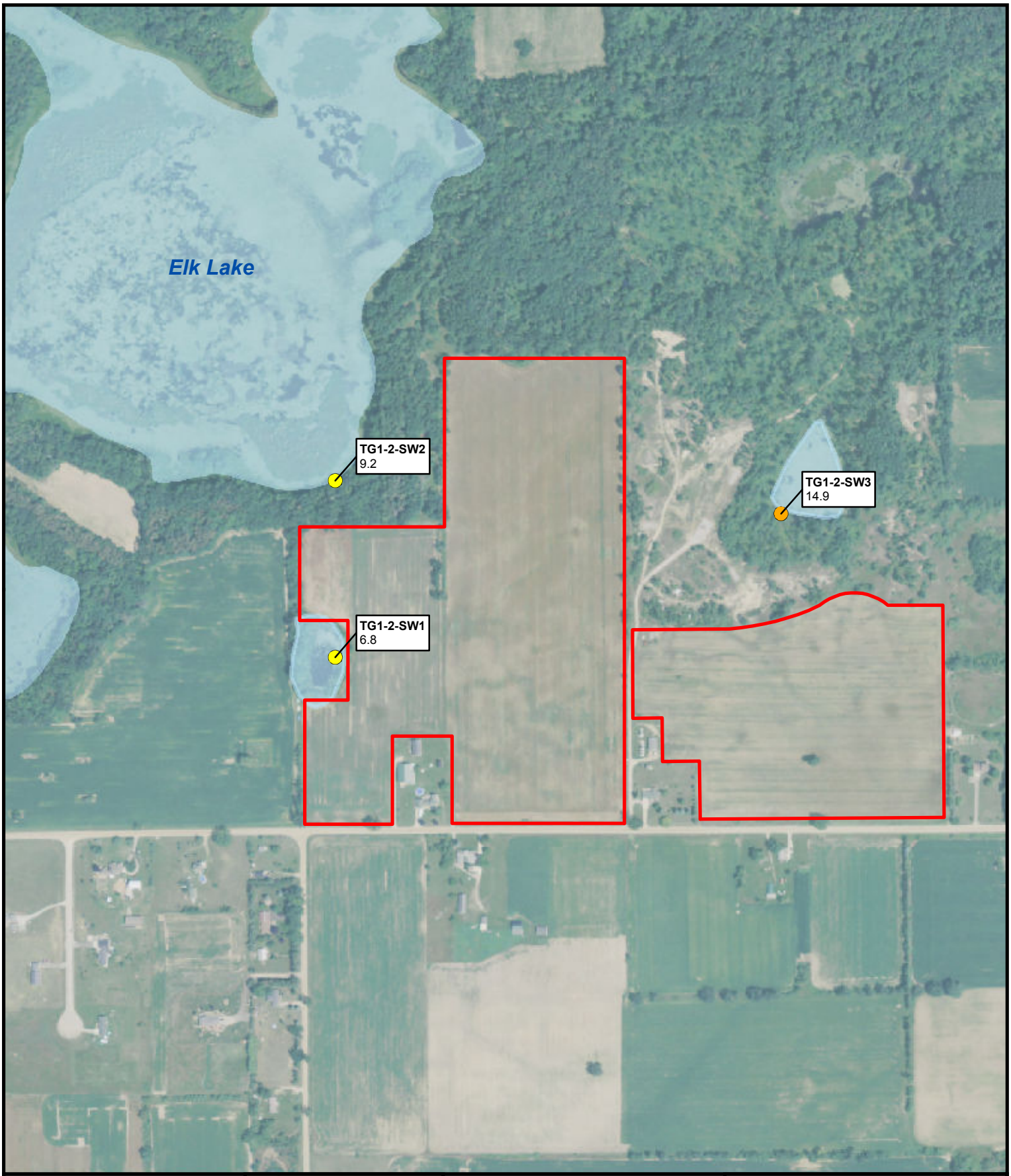
0 250 500 Feet

N

FIGURE 9
08n11e16-TG01 and TG02
SATURATED SOIL
PFOA + PFOS CONCENTRATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

Document Path: G:\GrandRapids\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Lapeer_LPP\MXDs\8.5x11\Heatmaps\Soil\TG01_02_Saturated_soil_PFOA_PFOS_heatmap.mxd



AECOM

Drawn:	Date: 7/17/2018
Approved:	Date: 7/17/2018
Project #:	60570635

Sampling Results
Total PFAS (ng/L or ppt)

- ND
- >0 - 12
- >12 - 70
- >70 - 1000
- >1000

Sample Name
Total PFAS

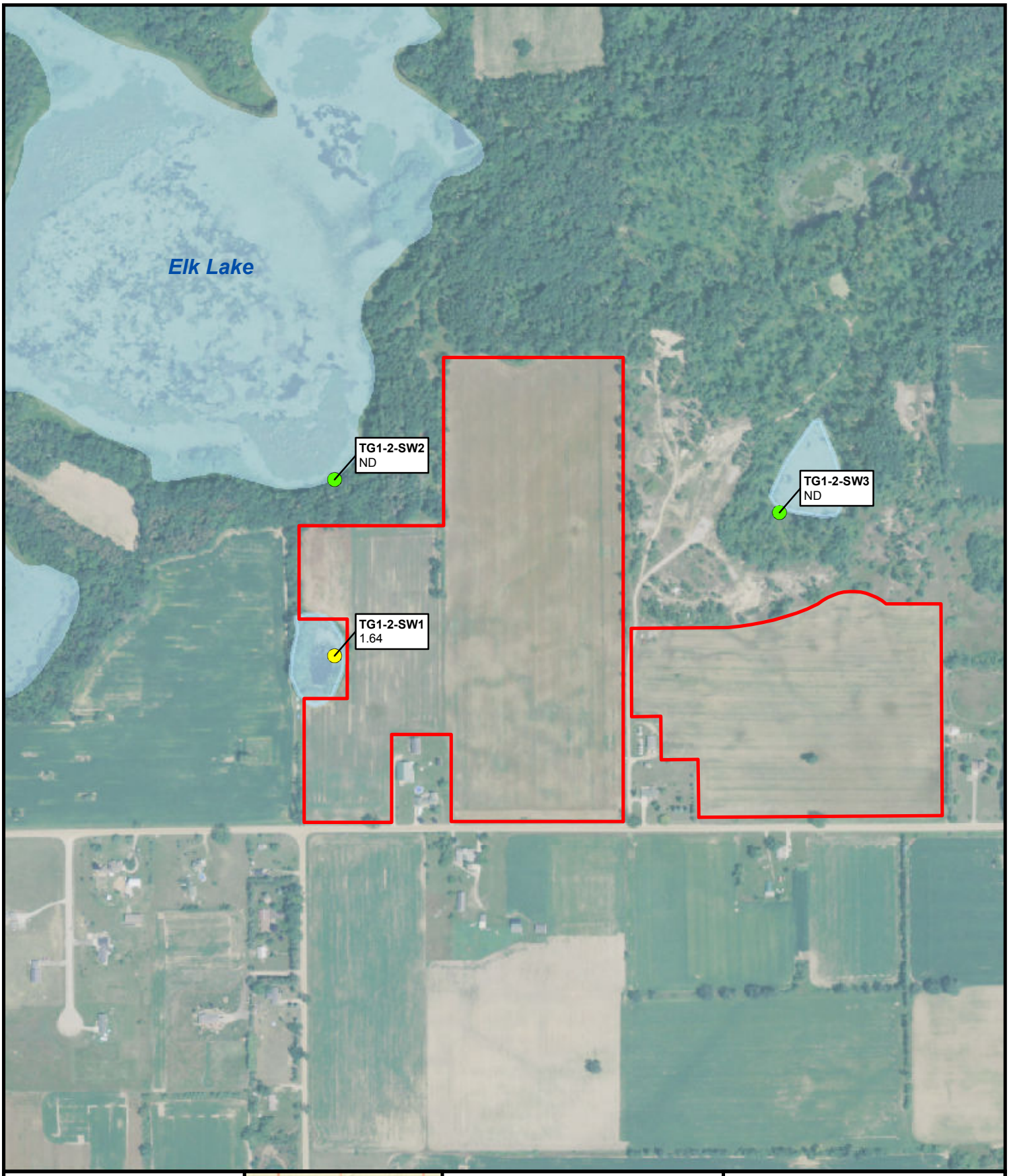
0 240 480 Feet

N

FIGURE 10
08n11e16-TG01 and TG02
SURFACE WATER
TOTAL PFAS CONCENTRATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

Document Path: G:\GrandRapids\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Lapeer_LPP\MXDs\8.5x11\Heatmaps\SW\TG01_02_surface_water_totalPFAS_heatmap.mxd



AECOM

Drawn:	Date: 7/17/2018
Approved:	Date: 7/17/2018
Project #:	60570635

Sampling Results
PFOS (ng/L or ppt)

- ND
- >0 - 12
- >12 - 70
- >70 - 1000
- >1000

Sample Name
PFOS

0 240 480 Feet

N

FIGURE 11
08n11e16-TG01 and TG02
SURFACE WATER
PFOS CONCENTRATION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

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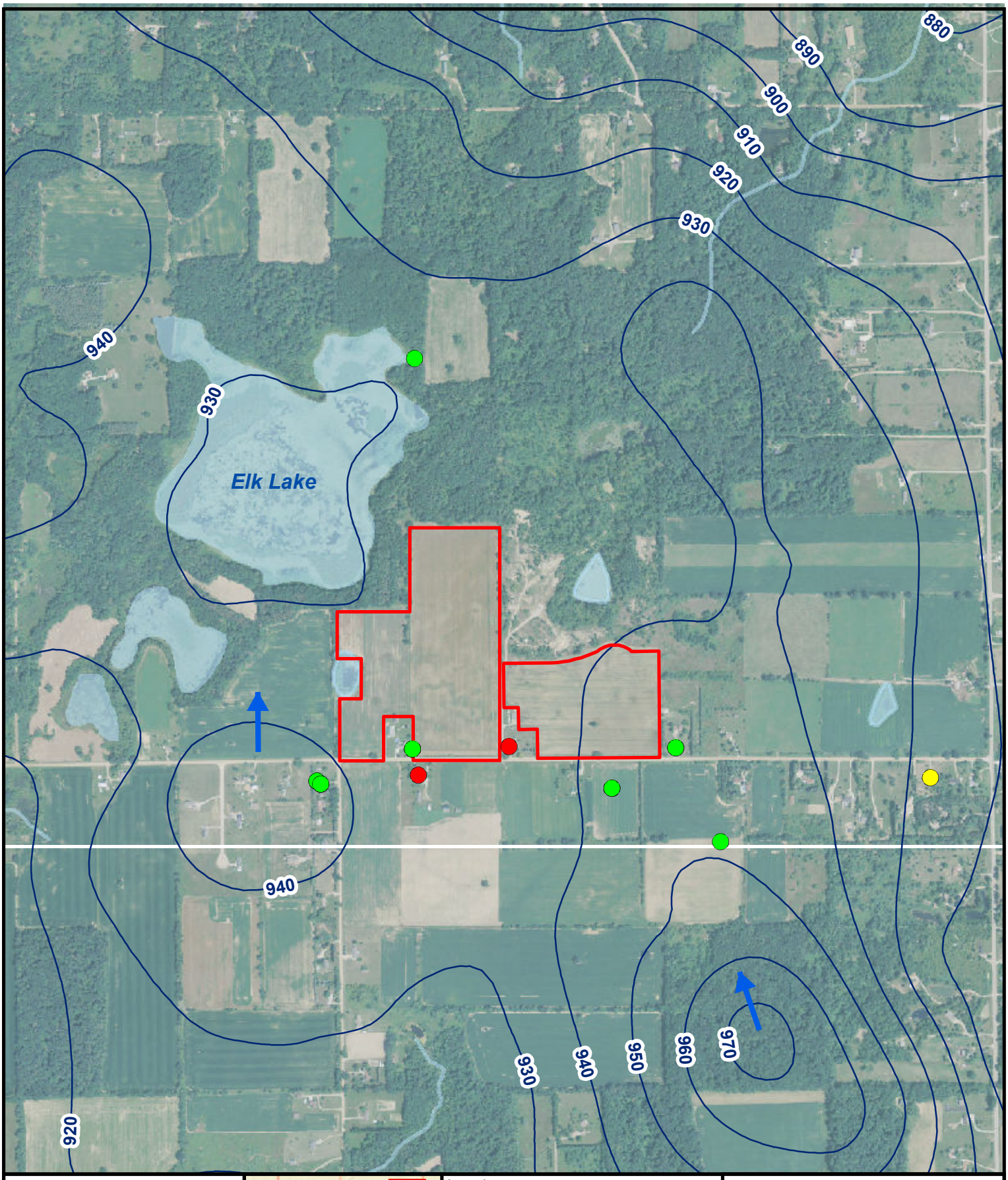
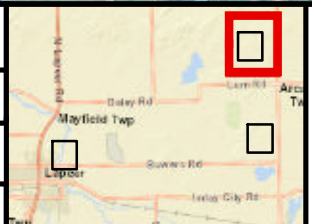


AECOM	
Drawn:	Date: 7/17/2018
Approved:	Date: 7/17/2018
Project #:	60570635



Legend

- Wellogic Well
- Historical Shallow Well
- Unverified Well
- Groundwater Contour Source: MDEQ
- Site Location
- Surface Water
- Groundwater Flow Direction
- 940 GW Elevation (ft above mean sea level)

0 500 1,000 Feet

N

FIGURE 12
08n11e16-TG01 and TG02
WELLOGIC WELLS & REGIONAL GW FLOW DIRECTION

LAPEER BIOSOLIDS ANALYSIS
LAPEER COUNTY, MI

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Tables

Table 1
08n11e16-TG01 and TG02
Biosolids Application Data

Annual Report Year	Site ID Number	dT Land Applied	dT/Acre	Acres Used	Acres Approved	Dates of Land Application
2017	08n11e16-TG01	111.73	1.93	61	70	10/5/16, 10/7/16, 10/10/16, 11/3-11/5/16
2016	08n11e16-TG01	89.5	1.79	50	70	5/4/16 - 5/6/16
2016	08n11e16-TG02	79.2	3.3	24	24	5/7/16, 5/9/16, 5/10/16
2015	08n11e16-TG01	NR	NR	27	70	NR
2015	08n11e16-TG02	NR	NR	24	24	NR
2014	08n11e16-TG01	267.4	7.64	35	70	NR
	Total dT Applied:	**547.83**				

Notes:
dT = dry tons
NR = not reported

Table 2
08n11e16-TG01 and TG02
PFAS Soil Analytical Results Summary

Soil Sample	Sample Date	Depth (ft)	Total PFASs	PFOA + PFOS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFNS	PFOS	PFDS	4:2 FTS	6:2 FTS	8:2 FTS	PFOSA	EtFOSAA	MeFOSAA
TG1DU10100180426N	**4/27/2018**	**8"**	**5.96**	**5.45**	**0.28**	**0.24**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**5.45**	ND	ND	ND	ND	ND	ND	ND
TG1DU10200180427N	**4/27/2018**	**8"**	**9.57**	**8.96**	**0.32**	**0.28**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**8.96**	ND	ND	ND	ND	ND	ND	ND
TG1DU10300180427N	**4/27/2018**	**8"**	**14.71**	**13.60**	**0.39**	**0.30**	**0.42**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**13.60**	ND	ND	ND	ND	ND	ND	ND
TG1DU20100180430N	**4/30/2018**	**8"**	**22.22**	**13.60**	**0.29**	**0.25**	**0.40**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**13.60**	ND	ND	**7.67**	ND	ND	ND	ND
TG1DU20200180430N	**4/30/2018**	**8"**	**13.18**	**4.71**	**0.20**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**4.71**	ND	ND	**7.95**	ND	**0.32**	ND	ND
TG1DU20300180430N	**4/30/2018**	**8"**	**3.30**	**3.12**	**0.18**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3.12**	ND	ND	ND	ND	ND	ND	ND
TG1DU30100180426N	**4/26/2018**	**8"**	**3.61**	**3.39**	**0.22**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3.39**	ND	ND	ND	ND	ND	ND	ND
TG1DU30200180426N	**4/26/2018**	**8"**	**18.33**	**12.30**	**0.33**	**0.24**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**12.30**	ND	ND	**5.05**	ND	**0.41**	ND	ND
TG1DU30300180426N	**4/26/2018**	**8"**	**8.69**	**2.31**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2.31**	ND	ND	**6.38**	ND	ND	ND	ND

ND = Non Detect
Concentrations are reported as ng/g or ppb
FB = Field Blank

Bolded values indicate detection

PFBA = Perfluorobutanoic acid
PFPeA = Perfluoropentanoic acid
PFPeS = Perfluoropentane sulfonic acid
PFHxA = Perfluorohexanoic acid
PFHpA = Perfluoroheptanoic acid
PFOA = Perfluorooctanoic acid
PFNA = Perfluorononanoic acid
PFDA = Perfluorodecanoic acid

PFUnDA = Perfluoroundecanoic acid
PFDoDA = Perfluorododecanoic acid
PFTrDA = Perfluorotridecanoic acid
PFTeDA = Perfluorotetradecanoic acid
PFBS = Perfluorobutane sulfonic acid
PFHxS = Perfluorohexane sulfonic acid
PFHpS = Perfluoroheptane sulfonic acid
PFNS = Pefluorononane sulfonic acid

PFOS = Perfluorooctane sulfonic acid
PFDS = Perfluorodecane sulfonic acid
4:2 FTSA = 4:2 Fluorotelomer sulfonic acid
6:2 FTSA = 6:2 Fluorotelomer sulfonic acid
8:2 FTSA = 8:2 Fluorotelomer sulfonic acid
POSA = Perfluorooctane sulfonamide
EtFOSAA - N-Ethyl Perfluorooctane sulfonamindoacetic acid
MeFOSAA = N-Methyl Perfluorooctane sulfonamide

Soil Criteria (ng/g or ppb):	PFOS	PFOA
Part 201 Generic Residential Groundwater Surface Water Interface Protection Criteria (for soils) (GSIPC)	0.24	10,000
Proposed Drinking Water Protection Criteria (DWPC)	1.4	59

Soil Criteria Exceedances:
Yellow indicates PFAS exceeded GSIPC
Blue indicates PFAS exceeded DWPC
Green indicates PFAS exceeded both DWPC and GSIPC

Table 3
08n11e16-TG01 and TG02
PFAS and TOC Detection Summary

Soil Sample	Sample Date	Depth (ft)	Total PFAS	Total TOC	Soil Survey	Soil Boring
TG1DU10100180426N	4/27/2018	8"	5.96	11,000	BrA	Sand with Gravel
TG1DU10200180427N	4/27/2018	8"	9.57	10,000	BrA	Sand with Gravel
TG1DU10300180427N	4/27/2018	8"	14.71	9,400	BrA	Sand with Gravel
TG1DU20100180430N	4/30/2018	8"	22.22	8,600	BrA/BrC	Sand with Gravel
TG1DU20200180430N	4/30/2018	8"	13.18	7,300	BrA/BrC	Sand with Gravel
TG1DU20300180430N	4/30/2018	8"	3.30	8,400	BrA/BrC	Sand with Gravel
TG1DU30100180426N	4/26/2018	8"	3.61	8,800	BrA	Sand
TG1DU30200180426N	4/26/2018	8"	18.33	7,600	BrA	Sand
TG1DU30300180426N	4/26/2018	8"	8.69	7,000	BrA	Sand

ND = Non Detect
PFAS concentrations are reported as ng/g or ppb
TOC concentrations are reported as mg/Kg or ppb
BrA/BrC - Boyer loamy sand

Table 4
08n11e16-TG01 and TG02
Temporary Well and Monitoring Well Construction

WELL ID	Well size / Material	Depth to Water ft BGS	Screen Interval ft BGS
TMW1	Dry - No well set		
TMW2	1" pvc	Dry	1-6
TMW3	1" pvc	12.05	8.5-13.5
TMW4	1" pvc	Dry	4-9
TMW5	1" pvc	Dry	8-13
TMW6	1" pvc	Dry	3.5-8.5

Footnotes:
BGS = below ground surface
ft = feet
pvc = polyvinyl chloride

Table 5
08n11e16-TG01 and TG02
PFAS Groundwater Analytical Results Summary

Groundwater Sample	Sample Date	Depth (ft)	Total PFASs	PFOA + PFOS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFNS	PFOS	PFDS	4:2 FTS	6:2 FTS	8:2 FTS	PFOSA	EtFOSAA	MeFOSAA
TG1TMW318180502N	**5/2/2018**	**13.5'**	**5.31**	**3.19**	**2.12**	ND	ND	ND	**1.80**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.39**	ND	ND	ND	ND	ND	ND	ND

ND = Non Detect
Concentrations are reported as ng/L or ppt
FB = Field Blank

Bolded values indicate detection

PFBA = Perfluorobutanoic acid
PFPeA = Perfluoropentanoic acid
PFPeS = Perfluoropentane sulfonic acid
PFHxA = Perfluorohexanoic acid
PFHpA = Perfluoroheptanoic acid
PFOA = Perfluorooctanoic acid
PFNA = Perfluorononanoic acid
PFDA = Perfluorodecanoic acid

PFUnDA = Perfluoroundecanoic acid
PFDoDA = Perfluorododecanoic acid
PFTrDA = Perfluorotridecanoic acid
PFTeDA = Perfluorotetradecanoic acid
PFBS = Perfluorobutane sulfonic acid
PFHxS = Perfluorohexane sulfonic acid
PFHpS = Perfluoroheptane sulfonic acid
PFNS = Pefluorononane sulfonic acid

PFOS = Perfluorooctane sulfonic acid
PFDS = Perfluorodecane sulfonic acid
4:2 FTSA = 4:2 Fluorotelomer sulfonic acid
6:2 FTSA = 6:2 Fluorotelomer sulfonic acid
8:2 FTSA = 8:2 Fluorotelomer sulfonic acid
POSA = Perfluorooctane sulfonamide
EtFOSAA - N-Ethyl Perfluorooctane sulfonamindoacetic acid
MeFOSAA = N-Methyl Perfluorooctane sulfonamide

Aqueous Criteria (ng/L or ppt):	PFOS	PFOA
Part 201 Generic Residential Drinking Water Criteria (DWC)	70	70
Part 31 Water Quality Value (non-drinking source) (GSIC)	12	12,000
Part 31 Final Chronic Value (FCV)	140,000	880,000
Part 31 Final Acute Value (FAV)	1,600,000	15,000,000

Aqueous Criteria Exceedances:
Yellow indicates PFAS exceeded DWC
Blue indicates PFAS exceeded GSIC
Green indicates PFAS exceeded both DWC and GSIC
Orange indicates PFAS exceeded FCV
Red indicates PFAS exceeded both FCV and FAV

Table 6
08n11e16-TG01 and TG02
PFAS Saturated Soil Analytical Results Summary

Soil Sample	Sample Date	Depth (ft)	Total PFASs	PFOA + PFOS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFNS	PFOS	PFDS	4:2 FTS	6:2 FTS	8:2 FTS	PFOSA	EtFOSAA	MeFOSAA
TG1-2-TMW1	**5/2/2018**	**10'**	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
TG1-2-TMW2	**5/2/2018**	**10'**	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
TG1-2-TMW4	**5/2/2018**	**9'**	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
TG1-2-TMW5	**5/2/2018**	**13'**	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
TG1-2-TMW6	**5/2/2018**	**8'**	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 = Non Detect
Concentrations are reported as ng/g or ppb
FB = Field Blank

Bolded values indicate detection

PFBA = Perfluorobutanoic acid
PFPeA = Perfluoropentanoic acid
PFPeS = Perfluoropentane sulfonic acid
PFHxA = Perfluorohexanoic acid
PFHpA = Perfluoroheptanoic acid
PFOA = Perfluorooctanoic acid
PFNA = Perfluorononanoic acid
PFDA = Perfluorodecanoic acid
PFUnDA = Perfluoroundecanoic acid
PFDoDA = Perfluorododecanoic acid
PFTrDA = Perfluorotridecanoic acid
PFTeDA = Perfluorotetradecanoic acid
PFBS = Perfluorobutane sulfonic acid
PFHxS = Perfluorohexane sulfonic acid
PFHpS = Perfluoroheptane sulfonic acid
PFNS = Pefluorononane sulfonic acid
PFOS = Perfluorooctane sulfonic acid
PFDS = Perfluorodecane sulfonic acid
4:2 FTSA = 4:2 Fluorotelomer sulfonic acid
6:2 FTSA = 6:2 Fluorotelomer sulfonic acid
8:2 FTSA = 8:2 Fluorotelomer sulfonic acid
POSA = Perfluorooctane sulfonamide
EtFOSAA - N-Ethyl Perfluorooctane sulfonamindoacetic acid
MeFOSAA = N-Methyl Perfluorooctane sulfonamide

Soil Criteria (ug/kg or ppb):	PFOS	PFOA
Part 201 Generic Residential Groundwater Surface Water Interface Protection Criteria (for soils) (GSIPC)	0.24	10,000
Proposed Drinking Water Protection Criteria (DWPC)	1.4	59

Soil Criteria Exceedances:
Yellow indicates PFAS exceeded GSIPC
Blue indicates PFAS exceeded DWPC
Green indicates PFAS exceeded both DWPC and GSIPC

Aqueous Criteria (ng/L or ppt):	PFOS	PFOA
Part 201 Generic Residential Drinking Water Criteria (DWC)	70	70
Part 31 Generic Residential Groundwater Surface Water Interface Criteria	12	12,000
Part 31 Final Chronic Value (FCV)	140,000	880,000
Part 31 Final Acute Value (FAV)	1,600,000	15,000,000

Aqueous Criteria Exceedances:
Yellow indicates PFAS exceeded DWC
Blue indicates PFAS exceeded GSIC
Green indicates PFAS exceeded both DWC and GSIC
Orange indicates PFAS exceeded FCV
Red indicates PFAS exceeded both FCV and FAV

Table 7
08n11e16-TG01 and TG02
PFAS Surface Water Analytical Results Summary

Surface Water/Drain Tile Sample	Sample Date	Depth (ft)	Total PFASs	PFOA + PFOS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFNS	PFOS	PFDS	4:2 FTS	6:2 FTS	8:2 FTS	PFOSA	EtFOSAA	MeFOSAA
TG1SW0100180509N	**5/9/2018**	**surface**	**6.82**	**2.37**	**3.25**	ND	ND	**1.20**	**0.73**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.64**	ND	ND	ND	ND	ND	ND	ND
TG1SW0200180509N	**5/9/2018**	**surface**	**9.25**	**1.52**	**4.17**	**1.00**	ND	**1.91**	**1.52**	**0.65**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TG1SW0300180509N	**5/9/2018**	**surface**	**14.93**	**0.53**	**2.55**	ND	ND	**1.37**	**0.53**	**0.58**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**9.90**	ND	ND	ND	ND

ND = Non Detect
Concentrations are reported as ng/L or ppt
FB = Field Blank

Bolded values indicates detection

PFBA = Perfluorobutanoic acid
PFPeA = Perfluoropentanoic acid
PFPeS = Perfluoropentane sulfonic acid
PFHxA = Perfluorohexanoic acid
PFHpA = Perfluoroheptanoic acid
PFOA = Perfluorooctanoic acid
PFNA = Perfluorononanoic acid
PFDA = Perfluorodecanoic acid

PFUnDA = Perfluoroundecanoic acid
PFDoDA = Perfluorododecanoic acid
PFTrDA = Perfluorotridecanoic acid
PFTeDA = Perfluorotetradecanoic acid
PFBS = Perfluorobutane sulfonic acid
PFHxS = Perfluorohexane sulfonic acid
PFHpS = Perfluoroheptane sulfonic acid
PFNS = Pefluorononane sulfonic acid

PFOS = Perfluorooctane sulfonic acid
PFDS = Perfluorodecane sulfonic acid
4:2 FTSA = 4:2 Fluorotelomer sulfonic acid
6:2 FTSA = 6:2 Fluorotelomer sulfonic acid
8:2 FTSA = 8:2 Fluorotelomer sulfonic acid
POSA = Perfluorooctane sulfonamide
EtFOSAA - N-Ethyl Perfluorooctane sulfonamindoacetic acid
MeFOSAA = N-Methyl Perfluorooctane sulfonamide

Aqueous Criteria (ng/L or ppt):	PFOS	PFOA
Part 201 Generic Residential Drinking Water Criteria (DWC)	70	70
Part 31 Water Quality Value (non-drinking source) (GSIC)	12	12,000
Part 31 Final Chronic Value (FCV)	140,000	880,000
Part 31 Final Acute Value (FAV)	1,600,000	15,000,000

Aqueous Criteria Exceedances:
Yellow indicates PFAS exceeded DWC
Blue indicates PFAS exceeded GSIC
Green indicates PFAS exceeded both DWC and GSIC
Orange indicates PFAS exceeded FCV
Red indicates PFAS exceeded both FCV and FAV

Appendix A

FIELD BOREHOLE LOG

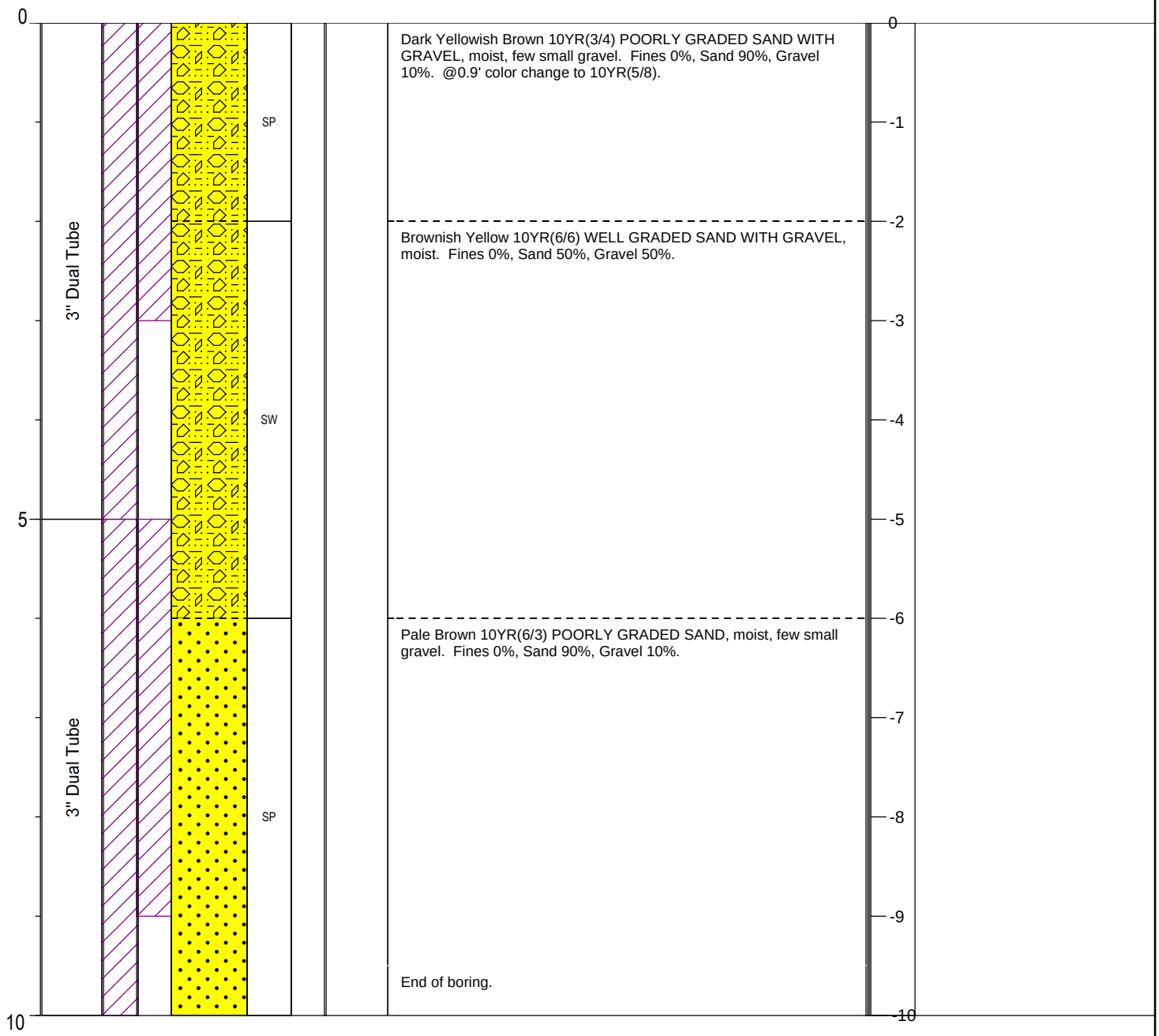
BOREHOLE NO: **TG1-2-TMW1**
TOTAL DEPTH: **10'**

PROJECT INFORMATION

PROJECT:	**Lapeer Plating**
SITE LOCATION:	**Lapeer, MI**
PROJECT NO.:	**60570635**
PROJECT MANAGER:	**John Cuthbertson**
LOGGED BY:	**Stan Krenz**
CREATED BY:	**Stan Krenz**

DRILLING INFORMATION

CONTRACTOR:	**Job Site Services**
CREW CHIEF:	**Dave Mokma**
DRILL RIG TYPE:	**Geoprobe 7720DT**
DRILLING METHOD:	**3" Dual Tube**
HOLE DIAMETER:	**3.25"**
DATE START:	**5/2/18 0950**
DATE END:	**5/2/18 1545**



NOTES:

Water level during drilling Water level in completed well

FIELD BOREHOLE LOG

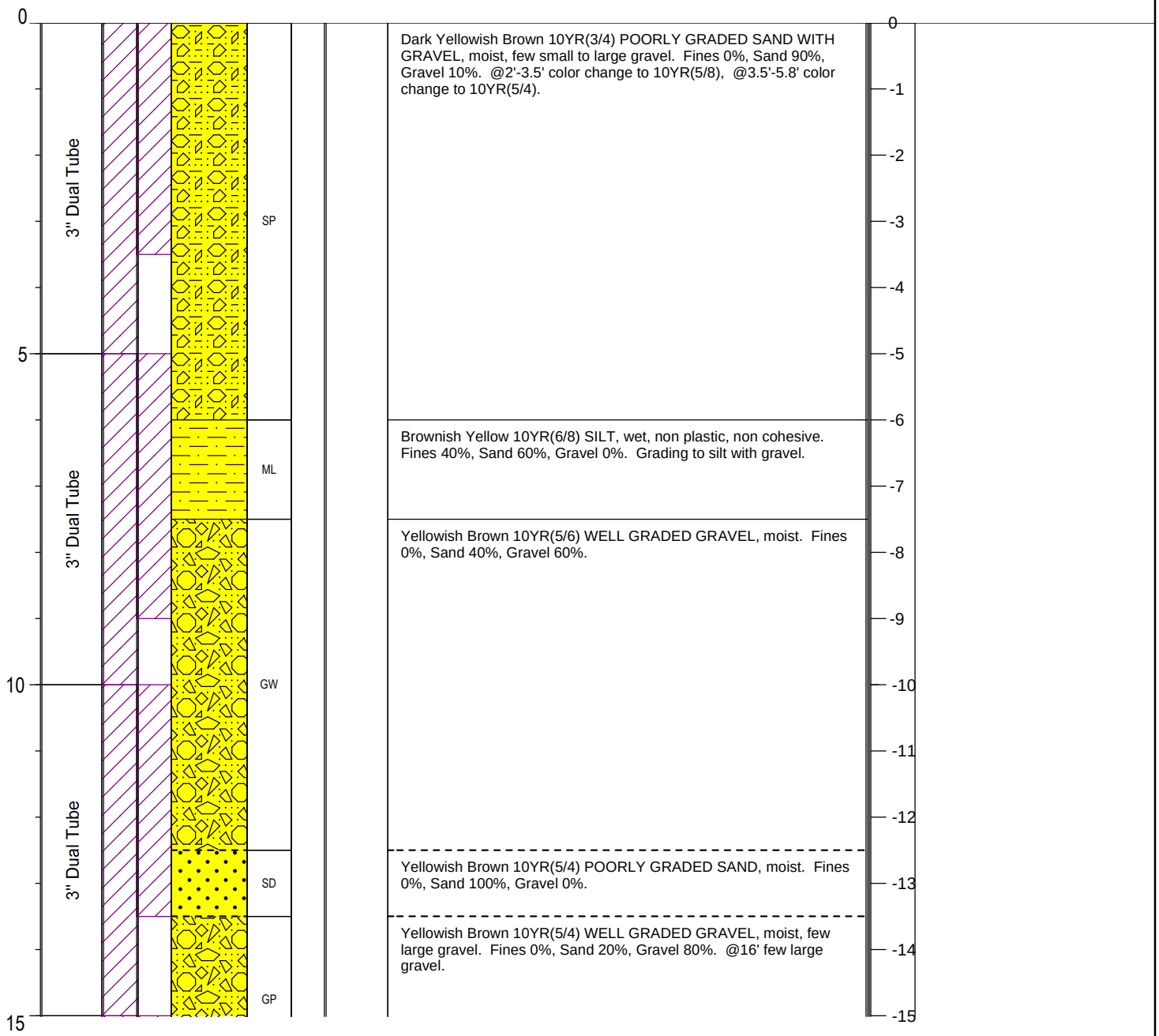
BOREHOLE NO: **TG1-2-TMW2**
TOTAL DEPTH: **30'**

PROJECT INFORMATION

PROJECT:	**Lapeer Plating**
SITE LOCATION:	**Lapeer, MI**
PROJECT NO.:	**60570635**
PROJECT MANAGER:	**John Cuthbertson**
LOGGED BY:	**Stan Krenz**
CREATED BY:	**Stan Krenz**

DRILLING INFORMATION

CONTRACTOR:	**Job Site Services**
CREW CHIEF:	**Dave Mokma**
DRILL RIG TYPE:	**Geoprobe 7720DT**
DRILLING METHOD:	**3" Dual Tube**
HOLE DIAMETER:	**3.25"**
DATE START:	**5/1/18 1630**
DATE END:	**5/2/18 1605**



NOTES:

▽ Water level during drilling ▼ Water level in completed well

FIELD BOREHOLE LOG

BOREHOLE NO: **TG1-2-TMW2**
TOTAL DEPTH: **30'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Lapeer Plating**	CONTRACTOR:	**Job Site Services**
SITE LOCATION:	**Lapeer, MI**	CREW CHIEF:	**Dave Mokma**
PROJECT NO.:	**60570635**	DRILL RIG TYPE:	**Geoprobe 7720DT**
PROJECT MANAGER:	**John Cuthbertson**	DRILLING METHOD:	**3" Dual Tube**
LOGGED BY:	**Stan Krenz**	HOLE DIAMETER:	**3.25"**
CREATED BY:	**Stan Krenz**	DATE START:	**5/1/18 1630**
		DATE END:	**5/2/18 1605**

DEPTH	SAMPLE TYPE	ATTEMPT / RECOVERY	SOIL SYMBOLS	USCS	PID (ppm)	SOIL DESCRIPTION	WELL CONSTRUCTION
15	3" Dual Tube			SP		Pale Brown 10YR(6/3) POORLY GRADED SAND, moist, trace small gravel. Fines 0%, Sand 100%, Gravel trace. @20.8'-21.8' color change to Dark Yellowish Brown 10YR(4/4). @21.8' color change back to 10YR(6/3). Wet @ 25-30'.	
20	3" Dual Tube						
25	3" Dual Tube						
30						End of boring.	

NOTES:

Water level during drilling Water level in completed well

FIELD BOREHOLE LOG

BOREHOLE NO: **TG1-2-TMW3**
TOTAL DEPTH: **15'**

PROJECT INFORMATION

PROJECT:	**Lapeer Plating**
SITE LOCATION:	**Lapeer, MI**
PROJECT NO.:	**60570635**
PROJECT MANAGER:	**John Cuthbertson**
LOGGED BY:	**Stan Krenz**
CREATED BY:	**Stan Krenz**

DRILLING INFORMATION

CONTRACTOR:	**Job Site Services**
CREW CHIEF:	**Dave Mokma**
DRILL RIG TYPE:	**Geoprobe 7720DT**
DRILLING METHOD:	**3" Dual Tube**
HOLE DIAMETER:	**3.25"**
DATE START:	**5/2/18 1245**
DATE END:	**5/2/18 1335**

DEPTH	SAMPLE TYPE	ATTEMPT / RECOVERY	SOIL SYMBOLS	USCS	PID (ppm)	SOIL DESCRIPTION	WELL CONSTRUCTION
0–5	3" Dual Tube			SP		Dark Yellowish Brown 10YR(3/4) POORLY GRADED SAND, moist, trace small gravel. Fines 0%, Sand 95%, Gravel <5%. @2.2' color change to 10YR(5/8).	1" PVC
5–10	3" Dual Tube			SM		Yellowish Brown 10YR(5/6) SILTY SAND, wet. Fines 80%, Sand 20%, Gravel 0%.	
10–15	3" Dual Tube			SP-SM		Yellowish Brown 10YR(5/6) POORLY GRADED SAND WITH SILT, wet, few fines, trace gravel. Fines 20%, Sand 80%, Gravel trace. End of boring.	1" Screen

NOTES:

Water level during drilling ▽ Water level in completed well ▼

FIELD BOREHOLE LOG

BOREHOLE NO: **TG1-2-TMW4**
TOTAL DEPTH: **10'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Lapeer Plating**	CONTRACTOR:	**Job Site Services**
SITE LOCATION:	**Lapeer, MI**	CREW CHIEF:	**Dave Mokma**
PROJECT NO.:	**60570635**	DRILL RIG TYPE:	**Geoprobe 7720DT**
PROJECT MANAGER:	**John Cuthbertson**	DRILLING METHOD:	**3" Dual Tube**
LOGGED BY:	**Stan Krenz**	HOLE DIAMETER:	**3.25"**
CREATED BY:	**Stan Krenz**	DATE START:	**5/2/18 1355**
		DATE END:	**5/2/18 1445**

DEPTH	SAMPLE TYPE	ATTEMPT / RECOVERY	SOIL SYMBOLS	USCS	PID (ppm)	SOIL DESCRIPTION	WELL CONSTRUCTION
0–5	3" Dual Tube			SP		Dark Yellowish Brown 10YR(3/4) POORLY GRADED SAND, moist. Fines 0%, Sand 100%, Gravel 0%. @1' color change to 10YR(5/8). Wet at 6.5', few fines. @6.5'-7.5' mottling of 10YR(5/8) and 10YR(6/3).	0 to -2: 1" PVC
5–10	3" Dual Tube					Pale Brown 10YR(6/3) POORLY GRADED SAND, moist. Fines 0%, Sand 100%, Gravel 0%. End of boring.	-5 to -9: 1" Screen

NOTES:

▽ Water level during drilling ▼ Water level in completed well

FIELD BOREHOLE LOG

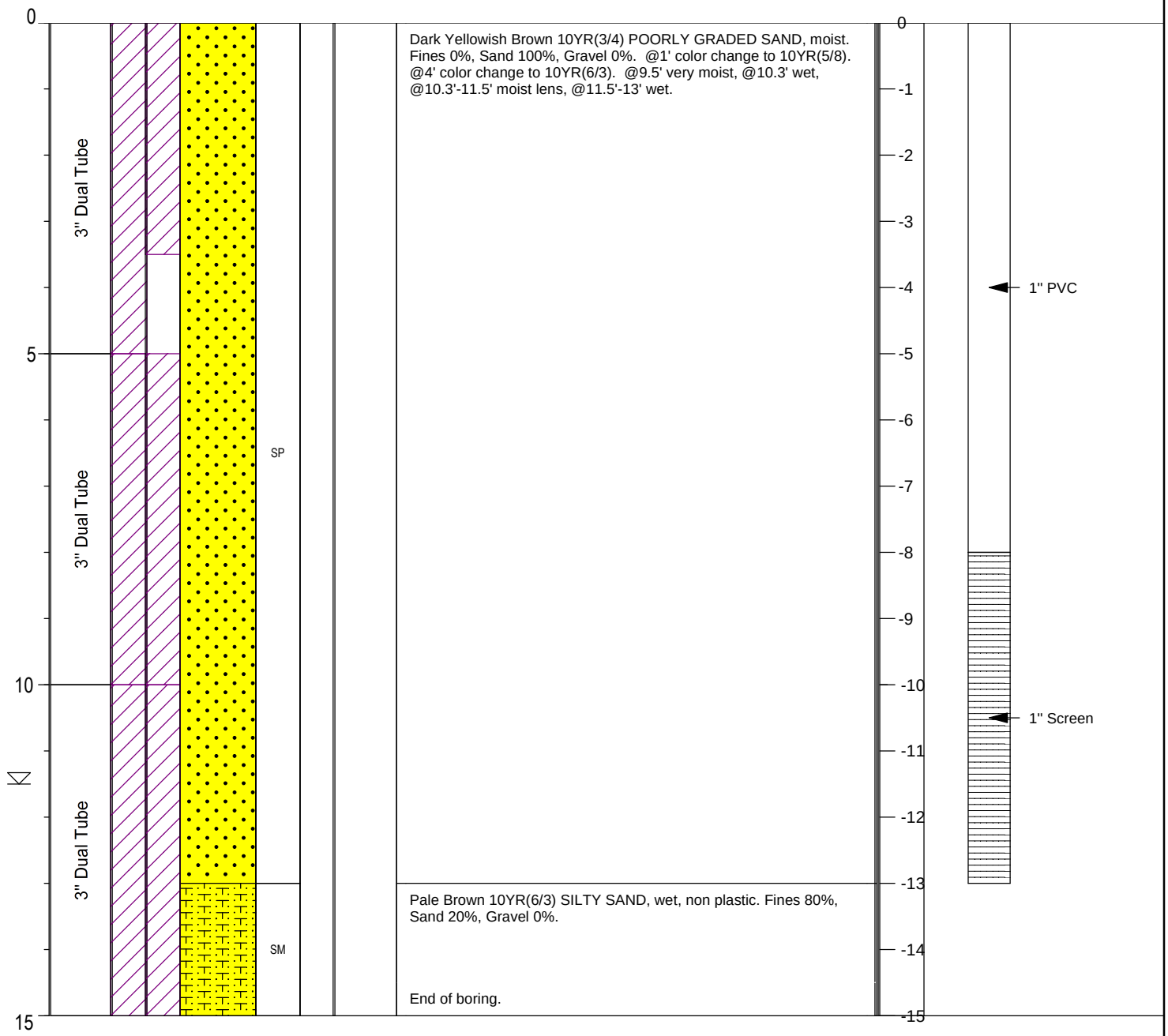
BOREHOLE NO: **TG1-2-TMW5**
TOTAL DEPTH: **15'**

PROJECT INFORMATION

PROJECT:	**Lapeer Plating**
SITE LOCATION:	**Lapeer, MI**
PROJECT NO.:	**60570635**
PROJECT MANAGER:	**John Cuthbertson**
LOGGED BY:	**Stan Krenz**
CREATED BY:	**Stan Krenz**

DRILLING INFORMATION

CONTRACTOR:	**Job Site Services**
CREW CHIEF:	**Dave Mokma**
DRILL RIG TYPE:	**Geoprobe 7720DT**
DRILLING METHOD:	**3" Dual Tube**
HOLE DIAMETER:	**3.25"**
DATE START:	**5/2/18 1115**
DATE END:	**5/2/18 1510**



NOTES:

Water level during drilling Water level in completed well

FIELD BOREHOLE LOG

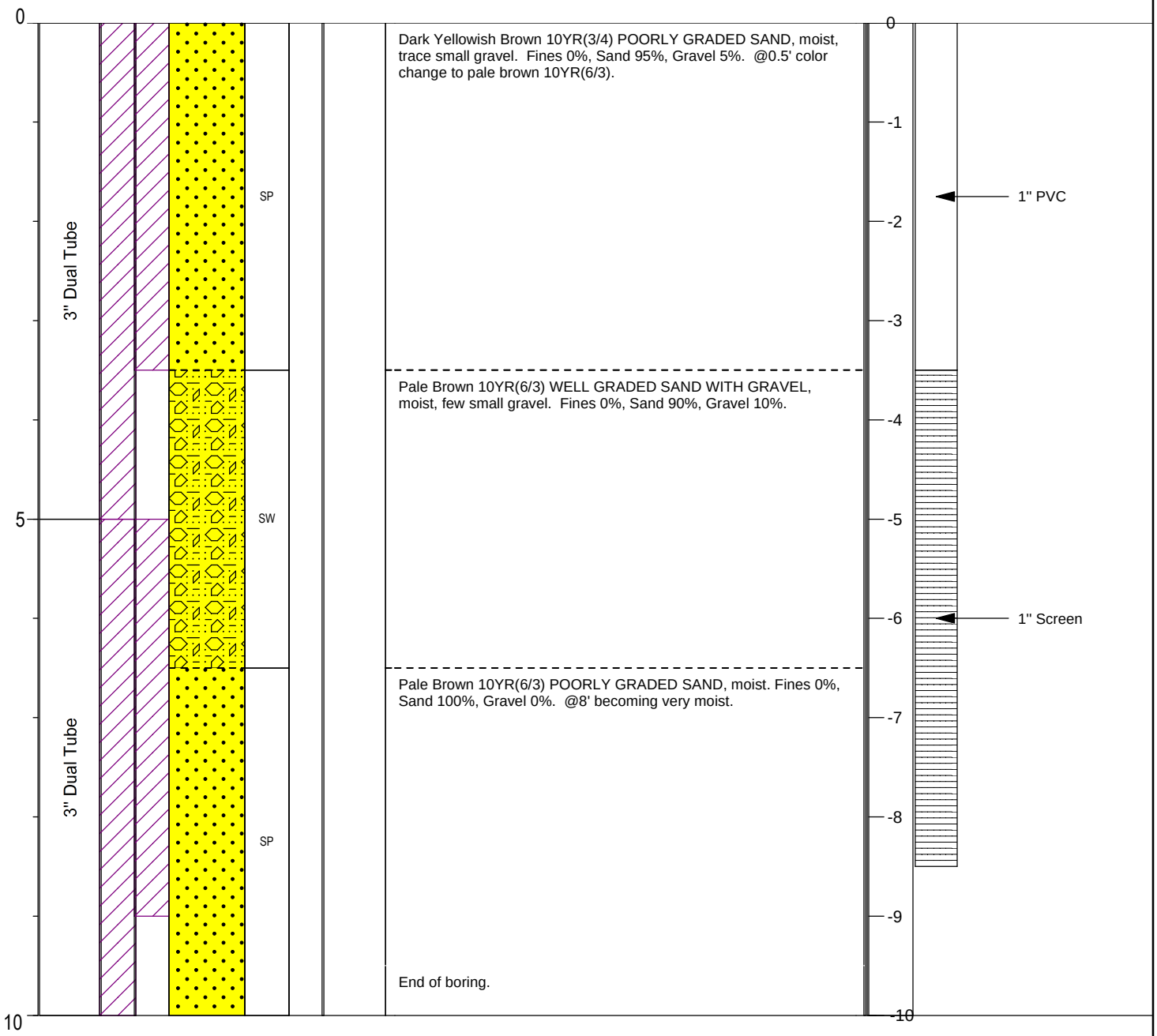
BOREHOLE NO: **TG1-2-TMW6**
TOTAL DEPTH: **10'**

PROJECT INFORMATION

PROJECT:	**Lapeer Plating**
SITE LOCATION:	**Lapeer, MI**
PROJECT NO.:	**60570635**
PROJECT MANAGER:	**John Cuthbertson**
LOGGED BY:	**Stan Krenz**
CREATED BY:	**Stan Krenz**

DRILLING INFORMATION

CONTRACTOR:	**Job Site Services**
CREW CHIEF:	**Dave Mokma**
DRILL RIG TYPE:	**Geoprobe 7720DT**
DRILLING METHOD:	**3" Dual Tube**
HOLE DIAMETER:	**3.25"**
DATE START:	**5/2/18 1020**
DATE END:	**5/2/18 1530**



NOTES:

Water level during drilling Water level in completed well

Appendix B

Boyer loamy sand, 0 to 2 percent slopes (BrA).—This soil is on outwash plains. In some areas the plow layer contains fine gravel. Included in mapping were areas of Wasepi soils in small depressions and narrow drainageways. These included soils dry out slowly in spring and after rain.

Permeability of this Boyer soil is moderately rapid. The available water capacity is moderately low, and lack of sufficient moisture during much of the growing season is a major limitation. There is little or no hazard of water erosion, because surface runoff is very slow, but soil blowing is a hazard if large areas are left bare of vegetation.

Nearly all of this soil is farmed. Corn, small grain, and forage crops are the major crops. (Capability unit IIIs–3 (4a); woodland suitability group M)

Boyer loamy sand, 2 to 6 percent slopes (BrB).—This soil occurs both on outwash plains and on moraines. On the outwash plains, the slopes are long and uniform; on the uplands, the slopes are short to medium in length and are irregular in shape. Next to drainageways, the slopes have a gradient of 4 to 6 percent. In some areas the plow layer contains strong-brown sandy loam plowed up from the subsoil. Included in mapping were areas of Wasepi and Brady soils in narrow drainageways. These included soils dry out slowly in spring and after rain. Also included were small areas of level Boyer soils.

Permeability of this Boyer soil is moderately rapid. The available water capacity is moderately low, and lack of sufficient moisture during much of the growing season is a major limitation. Surface runoff is slow to medium; consequently, there is a slight hazard of water erosion. Soil blowing is a hazard if the surface is bare.

Most of this soil is farmed. Corn, small grain, and forage crops are the major crops. (Capability unit IIIs–4 (4a); woodland suitability group M)

Boyer loamy sand, 6 to 12 percent slopes (BrC).—This soil is on moraines. The slopes are short to medium in length and either uniform or irregular in shape. Where organic matter has accumulated, the color of the uppermost 2 to 4 inches is very dark grayish brown to very dark brown. A few areas included in mapping are moderately eroded, and in these places the surface layer is browner than elsewhere and is more likely to crust.

Permeability of this soil is moderately rapid. The available water capacity is moderately low. Surface runoff is medium or moderately rapid in cultivated areas. The erosion hazard and lack of moisture during the growing season are the major limitations. Where the slopes are short and irregular, it is difficult to farm on the contour or to lay out terraces and diversions for control of runoff.

Boyer loamy sand, 25 to 50 percent slopes (BrF).—This soil is on moraines. The slopes are short and irregular, and the gradient varies considerably within short distances. Included in mapping were slopes of lesser gradient on hills, knolls, and spurs and at the base of slopes; very short, uniform slopes on long bluffs next to major drainageways, large muck depressions, and lakes; and small areas of Fox soils, which are on the crests of ridges.

The slope and the erosion hazard are very severe limitations. Operating farm machinery safely is difficult. Trees and native pasture plants are suitable vegetation.

Almost all of this soil is in woods. A few areas are in native pasture. (Capability unit VIIe–2 (4a); woodland suitability group M)

Chelsea loamy sand, 0 to 6 percent slopes (ChB).—This soil is on broad outwash plains. The plow layer is dark brown or dark grayish brown. Wet depressions and drainageways are included in some of the areas mapped.

Permeability is rapid, and the available water capacity is low. The result is a shortage of moisture during most of the growing season. This lack of moisture is the main limitation.

Most of this soil is idle or is used for native hay or pasture. Large acreages have been planted to pine, and small areas are used for corn and garden vegetables. (Capability unit IVs–4 (5a); woodland suitability group E)

Chelsea loamy sandy, 6 to 12 percent slopes (ChC).—This soil is on moraines. The slopes are short and irregular. The surface layer is dark brown or dark grayish brown; where organic matter has accumulated, the uppermost 4 or 5 inches is very dark grayish brown to very dark brown.

The slope and a shortage of moisture make this soil unsuitable for cultivated crops and limit its use for improved pasture. Enough water is available for trees.

Most of the acreage is in woods or brush. Most cleared areas are in native pasture or native hay. Reforesting of abandoned areas is a desirable practice. (Capability unit VIs–1 (5a); woodland suitability group E)

Montcalm loamy sand, 25 to 50 percent slopes (MrF).—This soil is on moraines in the central and northern parts of the county. It has short, irregular slopes that vary considerably in gradient within short distances. Very short, uniform slopes form bluffs along some of the major drainageways and around large bodies of water.

This soil is too steep, too droughty, and too readily eroded to be used for crops, and it is poorly suited to forage crops because the slope makes seeding difficult.

Nearly all of the acreage is in woods. A cover of trees or other permanent vegetation should be maintained at all times. (Capability unit VIIe–2 (4a); woodland suitability group M)

Appendix C

June 25, 2018

Vista Work Order No. 1800897

Ms. Maya Murshak
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Dear Ms. Murshak,

Enclosed are the results for the sample set received at Vista Analytical Laboratory on May 04, 2018. This sample set was analyzed on a standard turn-around time, under your Project Name 'Lapeer Sampling'.

Vista Analytical Laboratory is committed to serving you effectively. If you require additional information, please contact me at 916-673-1520 or by email at mmaier@vista-analytical.com.

Thank you for choosing Vista as part of your analytical support team.

Sincerely,

Martha Maier
Laboratory Director

Vista Work Order No. 1800897
Case Narrative

Sample Condition on Receipt:

One aqueous sample and five solid samples were received in good condition and within the method temperature requirements. The samples were received and stored securely in accordance with Vista standard operating procedures and EPA methodology.

Analytical Notes:

PFAS Isotope Dilution Method

The aqueous samples were extracted and analyzed for a selected list of PFAS using Vista's PFAS Isotope Dilution Method. This method is listed on Vista's NELAP certificate as Modifed EPA Method 537. The results for PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Results for all other analytes include the linear isomers only.

The aqueous samples contained particulate and were centrifuged prior to extraction.

Holding Times

The sample was extracted and analyzed within the method hold times.

Quality Control

The Initial Calibration and Continuing Calibration Verifications met the method acceptance criteria.

A Method Blank and Ongoing Precision and Recovery (OPR) sample were extracted and analyzed with the preparation batch. No analytes were detected in the Method Blank above 1/2 the LOQ. The recoveries of PFHxA, 6:2 FTS, PFHpS, EtFOSAA, PFDS, PFDoA and PFTrDA were > 130% in the OPR. These analytes were not detected in the sample. The recoveries of all other analytes were within the method acceptance criteria.

The labeled standard recoveries outside the acceptance criteria are listed in the table below.

VAL-PFAS

The solid samples were extracted and analyzed for a selected list of PFAS using VAL Method PFAS. The results for PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Results for all other analytes include the linear isomers only.

Holding Times

The samples were extracted and analyzed within the hold times.

Quality Control

The Initial Calibration and Continuing Calibration Verifications met the method acceptance criteria.

A Method Blank and Ongoing Precision and Recovery (OPR) sample were extracted and analyzed with each preparation batch. No analytes were detected in the Method Blanks above 1/2 the LOQ. The OPR recoveries were within the method acceptance criteria.

The results for 6:2 FTS in sample "TG1-2-TMW6" were reported from a re-extraction of the sample.

The labeled standard recoveries outside the acceptance criteria are listed in the table below.

QC Anomalies

LabNumber	SampleName	Analysis	Analyte	Flag	%Rec
1800897-02	TG1-2-TMW1	VAL - PFAS	13C3-PFBA	H	25.5
1800897-02	TG1-2-TMW1	VAL - PFAS	13C8-PFOSA	H	41.6
1800897-03	TG1-2-TMW2	VAL - PFAS	13C3-PFBA	H	29.3
1800897-03	TG1-2-TMW2	VAL - PFAS	13C8-PFOSA	H	48.2
1800897-04	TG1-2-TMW4	VAL - PFAS	13C8-PFOSA	H	39.7
1800897-05	TG1-2-TMW5	VAL - PFAS	13C3-PFBA	H	23.0
1800897-05	TG1-2-TMW5	VAL - PFAS	13C8-PFOSA	H	32.4
1800897-06	TG1-2-TMW6	VAL - PFAS	13C3-PFBA	H	27.1
1800897-06	TG1-2-TMW6	VAL - PFAS	13C8-PFOSA	H	33.1
B8E0106-BLK1	B8E0106-BLK1	PFAS Isotope Dilution Method	13C8-PFOSA	H	30.6
B8E0106-BS1	B8E0106-BS1	PFAS Isotope Dilution Method	13C8-PFOSA	H	32.1
B8E0194-BLK1	B8E0194-BLK1	VAL - PFAS	13C8-PFOSA	H	30.6
B8E0194-BS1	B8E0194-BS1	VAL - PFAS	13C8-PFOSA	H	30.1

H = Recovery was outside laboratory acceptance criteria.

TABLE OF CONTENTS

Sample Inventory Report

Vista Sample ID	Client Sample ID	Sampled	Received	Components/Containers
1800897-01	TG1TMW318180502N	02-May-18 13:30	04-May-18 09:48	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
1800897-02	TG1-2-TMW1	02-May-18 09:30	04-May-18 09:48	HDPE Bottle, 250 mL
1800897-03	TG1-2-TMW2	02-May-18 11:00	04-May-18 09:48	HDPE Bottle, 250 mL
1800897-04	TG1-2-TMW4	02-May-18 12:00	04-May-18 09:48	HDPE Bottle, 250 mL
1800897-05	TG1-2-TMW5	02-May-18 16:00	04-May-18 09:48	HDPE Bottle, 250 mL
1800897-06	TG1-2-TMW6	02-May-18 17:30	04-May-18 09:48	HDPE Bottle, 250 mL

ANALYTICAL RESULTS

Sample ID: Method Blank

PFAS Isotope Dilution Method

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Matrix: Aqueous

Laboratory Data

Lab Sample: B8E0106-BLK1
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.365	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFPeA	2706-90-3	ND	0.640	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFBS	375-73-5	ND	0.895	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
4:2 FTS	757124-72-4	ND	1.37	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFHxA	307-24-4	ND	1.09	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFPeS	2706-91-4	ND	1.37	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFHpA	375-85-9	ND	0.296	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFHxS	355-46-4	ND	0.474	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
6:2 FTS	27619-97-2	ND	1.00	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFOA	335-67-1	0.368	0.326	2.50	4.00	J	B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFHpS	375-92-8	ND	0.469	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFNA	375-95-1	ND	0.405	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFOSA	754-91-6	ND	0.885	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFOS	1763-23-1	ND	0.404	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFDA	335-76-2	ND	0.745	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
8:2 FTS	39108-34-4	ND	1.03	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFNS	68259-12-1	ND	1.94	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
MeFOSAA	2355-31-9	ND	0.825	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
EtFOSAA	2991-50-6	ND	0.685	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFUnA	2058-94-8	ND	0.525	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFDS	335-77-3	ND	0.615	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFDoA	307-55-1	ND	0.396	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFTrDA	72629-94-8	ND	0.247	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
PFTeDA	376-06-7	ND	0.378	2.50	4.00		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	105	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C3-PFPeA	IS	107	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C3-PFBS	IS	117	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C2-PFHxA	IS	103	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C4-PFHpA	IS	110	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
18O2-PFHxS	IS	92.7	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C2-PFOA	IS	95.1	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C5-PFNA	IS	76.0	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C8-PFOSA	IS	30.6	50 - 150	H	B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C8-PFOS	IS	106	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C2-PFDA	IS	74.4	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
d3-MeFOSAA	IS	62.4	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
d5-EtFOSAA	IS	65.8	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1

Sample ID: Method Blank **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc. Matrix: Aqueous

Project: Lapeer Sampling

Laboratory Data

Lab Sample: B8E0106-BLK1 Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFUnA	IS	63.4	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C2-PFDoA	IS	72.8	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1
13C2-PFTeDA	IS	68.3	50 - 150		B8E0106	16-May-18	0.250 L	28-May-18 07:18	1

DL - Detection Limit

LOD - Limit of Detection

LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: OPR **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Matrix: Aqueous

Laboratory Data

Lab Sample: B8E0106-BS1
Column: BEH C18

Analyte	CAS Number	Amt Found (ng/L)	Spike Amt	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	47.7	40.0	119	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFPeA	2706-90-3	47.2	40.0	118	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFBS	375-73-5	51.2	40.0	128	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
4:2 FTS	757124-72-4	45.9	40.0	115	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFHxA	307-24-4	53.3	40.0	133	70 - 130	H	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFPeS	2706-91-4	52.1	40.0	130	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFHpA	375-85-9	43.2	40.0	108	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFHxS	355-46-4	46.5	40.0	116	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
6:2 FTS	27619-97-2	52.8	40.0	132	60 - 130	H	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFOA	335-67-1	46.0	40.0	115	70 - 130	B	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFHpS	375-92-8	53.3	40.0	133	60 - 130	H	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFNA	375-95-1	47.5	40.0	119	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFOSA	754-91-6	49.6	40.0	124	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFOS	1763-23-1	45.6	40.0	114	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFDA	335-76-2	44.1	40.0	110	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
8:2 FTS	39108-34-4	51.0	40.0	128	60 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFNS	68259-12-1	43.6	40.0	109	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
MeFOSAA	2355-31-9	51.6	40.0	129	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
EtFOSAA	2991-50-6	60.4	40.0	151	70 - 130	H	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFUnA	2058-94-8	42.1	40.0	105	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFDS	335-77-3	53.0	40.0	132	60 - 130	H	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFDoA	307-55-1	54.9	40.0	137	70 - 130	H	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFTrDA	72629-94-8	53.4	40.0	134	60 - 130	H	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
PFTeDA	376-06-7	47.7	40.0	119	70 - 130		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	104	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C3-PFPeA	IS	99.1	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C3-PFBS	IS	102	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C2-PFHxA	IS	96.7	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C4-PFHpA	IS	108	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
18O2-PFHxS	IS	109	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C2-PFOA	IS	83.3	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C5-PFNA	IS	83.8	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C8-PFOSA	IS	32.1	50- 150	H	B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C8-PFOS	IS	105	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1

Sample ID: OPR **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Matrix: Aqueous

Laboratory Data

Lab Sample: B8E0106-BS1
Column: BEH C18

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFDA	IS	75.9	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
d3-MeFOSAA	IS	69.4	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
d5-EtFOSAA	IS	66.8	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C2-PFUnA	IS	67.2	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C2-PFDoA	IS	63.3	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1
13C2-PFTeDA	IS	80.4	50- 150		B8E0106	16-May-18	0.250 L	28-May-18 07:07	1

Sample ID: TGITMW318180502N

PFAS Isotope Dilution Method

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER
Matrix: Water
Date Collected: 02-May-18 13:30

Laboratory Data

Lab Sample: 1800897-01
Date Received: 04-May-18 09:48
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	2.12	0.361	2.47	3.96	J	B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFPeA	2706-90-3	ND	0.633	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFBS	375-73-5	ND	0.885	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
4:2 FTS	757124-72-4	ND	1.36	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFHxA	307-24-4	ND	1.08	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFPeS	2706-91-4	ND	1.36	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFHpA	375-85-9	ND	0.292	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFHxS	355-46-4	ND	0.468	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
6:2 FTS	27619-97-2	ND	0.989	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFOA	335-67-1	1.80	0.322	2.47	3.96	J, B	B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFHpS	375-92-8	ND	0.464	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFNA	375-95-1	ND	0.401	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFOSA	754-91-6	ND	0.876	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFOS	1763-23-1	1.39	0.399	2.47	3.96	J	B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFDA	335-76-2	ND	0.737	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
8:2 FTS	39108-34-4	ND	1.02	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFNS	68259-12-1	ND	1.91	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
MeFOSAA	2355-31-9	ND	0.816	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
EtFOSAA	2991-50-6	ND	0.678	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFUnA	2058-94-8	ND	0.519	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFDS	335-77-3	ND	0.608	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFDoA	307-55-1	ND	0.392	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFTrDA	72629-94-8	ND	0.244	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
PFTeDA	376-06-7	ND	0.373	2.47	3.96		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	98.1	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C3-PFPeA	IS	92.8	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C3-PFBS	IS	115	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C2-PFHxA	IS	92.5	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C4-PFHpA	IS	105	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
18O2-PFHxS	IS	94.4	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C2-PFOA	IS	93.3	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C5-PFNA	IS	95.7	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C8-PFOSA	IS	52.9	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C8-PFOS	IS	101	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C2-PFDA	IS	83.8	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
d3-MeFOSAA	IS	86.4	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
d5-EtFOSAA	IS	80.2	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1

Sample ID: TGITMW318180502N **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER
Matrix: Water
Date Collected: 02-May-18 13:30

Laboratory Data

Lab Sample: 1800897-01
Date Received: 04-May-18 09:48
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFUnA	IS	74.6	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C2-PFDoA	IS	91.9	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1
13C2-PFTeDA	IS	85.7	50 - 150		B8E0106	16-May-18	0.253 L	28-May-18 07:28	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: Method Blank

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Matrix: Solid

Laboratory Data

Lab Sample: B8E0194-BLK1
Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.140	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFPeA	2706-90-3	ND	0.202	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFBS	375-73-5	ND	0.363	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFHxA	307-24-4	ND	0.203	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFHpA	375-85-9	ND	0.205	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFHxS	355-46-4	ND	0.310	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
6:2 FTS	27619-97-2	ND	0.229	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFOA	335-67-1	ND	0.236	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFHpS	375-92-8	ND	0.170	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFOS	1763-23-1	ND	0.845	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFNA	375-95-1	ND	0.178	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFDA	335-76-2	ND	0.256	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
8:2 FTS	39108-34-4	ND	0.285	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFOSA	754-91-6	ND	0.227	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
MeFOSAA	2355-31-9	ND	0.302	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFDS	335-77-3	ND	0.201	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFUnA	2058-94-8	ND	0.354	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
EtFOSAA	2991-50-6	ND	0.321	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFDoA	307-55-1	ND	0.276	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFTrDA	72629-94-8	ND	0.122	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFTeDA	376-06-7	ND	0.198	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFNS	68259-12-1	ND	1.43	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
PFPeS	2706-91-4	ND	0.845	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
4:2 FTS	757124-72-4	ND	0.845	1.00	2.00		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	91.5	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C3-PFPeA	IS	88.2	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C3-PFBS	IS	103	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C2-PFHxA	IS	94.2	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C4-PFHpA	IS	82.1	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
18O2-PFHxS	IS	91.7	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C2-PFOA	IS	74.2	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C8-PFOS	IS	92.1	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C5-PFNA	IS	70.7	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C2-PFDA	IS	70.8	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C8-PFOSA	IS	30.6	50 - 150	H	B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
d3-MeFOSAA	IS	80.0	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C2-PFUnA	IS	70.3	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1

Sample ID: Method Blank

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Matrix: Solid

Laboratory Data

Lab Sample: B8E0194-BLK1
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
d5-EtFOSAA	IS	83.9	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C2-PFDoA	IS	79.1	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1
13C2-PFTeDA	IS	65.0	50 - 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:21	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

The results are reported in dry weight.
The sample size is reported in wet weight.
Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: OPR **VAL - PFAS**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Matrix: Solid

Laboratory Data

Lab Sample: B8E0194-BS1
Column: BEH C18

Analyte	CAS Number	Amt Found (ng/g)	Spike Amt	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	9.18	10.0	91.8	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFPeA	2706-90-3	9.46	10.0	94.6	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFBS	375-73-5	9.22	10.0	92.2	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFHxA	307-24-4	10.2	10.0	102	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFHpA	375-85-9	9.15	10.0	91.5	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFHxS	355-46-4	10.3	10.0	103	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
6:2 FTS	27619-97-2	9.34	10.0	93.4	60 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFOA	335-67-1	9.38	10.0	93.8	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFHpS	375-92-8	11.6	10.0	116	60 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFOS	1763-23-1	9.27	10.0	92.7	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFNA	375-95-1	9.03	10.0	90.3	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFDA	335-76-2	9.02	10.0	90.2	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
8:2 FTS	39108-34-4	10.1	10.0	101	60 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFOSA	754-91-6	10.8	10.0	108	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
MeFOSAA	2355-31-9	10.7	10.0	107	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFDS	335-77-3	11.4	10.0	114	60 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFUnA	2058-94-8	10.6	10.0	106	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
EtFOSAA	2991-50-6	10.1	10.0	101	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFDoA	307-55-1	9.74	10.0	97.4	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFTrDA	72629-94-8	11.2	10.0	112	60 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFTeDA	376-06-7	9.63	10.0	96.3	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFNS	68259-12-1	8.27	10.0	82.7	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
PFPeS	2706-91-4	9.82	10.0	98.2	70 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
4:2 FTS	757124-72-4	8.51	10.0	85.1	60 - 130		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	101	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C3-PFPeA	IS	98.5	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C3-PFBS	IS	112	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C2-PFHxA	IS	98.0	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C4-PFHpA	IS	99.1	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
18O2-PFHxS	IS	88.2	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C2-PFOA	IS	74.4	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C8-PFOS	IS	103	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C5-PFNA	IS	78.8	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C2-PFDA	IS	79.8	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1

Sample ID: OPR **VAL - PFAS**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Matrix: Solid

Laboratory Data

Lab Sample: B8E0194-BS1
Column: BEH C18

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C8-PFOSA	IS	30.1	50- 150	H	B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
d3-MeFOSAA	IS	72.8	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C2-PFUnA	IS	68.1	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
d5-EtFOSAA	IS	75.4	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C2-PFDoA	IS	89.2	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1
13C2-PFTeDA	IS	78.4	50- 150		B8E0194	23-May-18	1.00 g	02-Jun-18 19:11	1

Sample ID: Blank **VAL - PFAS**

Client Data

Name: Merit Laboratories, Inc. Matrix: Solid

Project: Lapeer Sampling

Laboratory Data

Lab Sample: B8F0153-BLK1 Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
6:2 FTS	27619-97-2	ND	0.229	1.00	2.00		B8F0153	20-Jun-18	1.00 g	23-Jun-18 07:28	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-6:2 FTS	IS	82.5	50 - 150		B8F0153	20-Jun-18	1.00 g	23-Jun-18 07:28	1

DL - Detection Limit

LOD - Limit of Detection

LOQ - Limit of quantitation

The results are reported in dry weight.

The sample size is reported in wet weight.

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: LCS **VAL - PFAS**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Matrix: Solid

Laboratory Data

Lab Sample: B8F0153-BS1
Column: BEH C18

Analyte	CAS Number	Amt Found (ng/g)	Spike Amt	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
6:2 FTS	27619-97-2	11.8	10.0	118	60 - 130		B8F0153	20-Jun-18	1.00 g	23-Jun-18 07:18	1

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-6:2 FTS	IS	74.9	50- 150		B8F0153	20-Jun-18	1.00 g	23-Jun-18 07:18	1

Sample ID: TG1-2-TMW1

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER

Matrix: Soil
Date Collected: 02-May-18 09:30

Laboratory Data

Lab Sample: 1800897-02
Date Received: 04-May-18 09:48
% Solids: 84.6

Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.151	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFPeA	2706-90-3	ND	0.217	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFBS	375-73-5	ND	0.390	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFHxA	307-24-4	ND	0.218	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFHpA	375-85-9	ND	0.220	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFHxS	355-46-4	ND	0.333	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
6:2 FTS	27619-97-2	ND	0.246	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFOA	335-67-1	ND	0.254	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFHpS	375-92-8	ND	0.183	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFOS	1763-23-1	ND	0.908	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFNA	375-95-1	ND	0.191	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFDA	335-76-2	ND	0.275	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
8:2 FTS	39108-34-4	ND	0.306	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFOSA	754-91-6	ND	0.244	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
MeFOSAA	2355-31-9	ND	0.325	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFDS	335-77-3	ND	0.216	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFUnA	2058-94-8	ND	0.381	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
EtFOSAA	2991-50-6	ND	0.345	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFDoA	307-55-1	ND	0.297	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFTrDA	72629-94-8	ND	0.131	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFTeDA	376-06-7	ND	0.213	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFNS	68259-12-1	ND	1.54	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
PFPeS	2706-91-4	ND	0.908	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
4:2 FTS	757124-72-4	ND	0.908	1.08	2.15		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	25.5	50 - 150	H	B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C3-PFPeA	IS	84.3	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C3-PFBS	IS	100	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C2-PFHxA	IS	96.0	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C4-PFHpA	IS	102	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
18O2-PFHxS	IS	93.4	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C2-PFOA	IS	99.7	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C8-PFOS	IS	94.9	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C5-PFNA	IS	101	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C2-PFDA	IS	97.2	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C8-PFOSA	IS	41.6	50 - 150	H	B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
d3-MeFOSAA	IS	87.2	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C2-PFUnA	IS	88.0	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1

Sample ID: TG1-2-TMW1 **VAL - PFAS**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER

Matrix: Soil
Date Collected: 02-May-18 09:30

Laboratory Data

Lab Sample: 1800897-02
Date Received: 04-May-18 09:48
% Solids: 84.6

Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
d5-EtFOSAA	IS	88.0	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C2-PFDoA	IS	87.4	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1
13C2-PFTeDA	IS	83.5	50 - 150		B8E0194	23-May-18	1.10 g	02-Jun-18 19:32	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

The results are reported in dry weight.
The sample size is reported in wet weight.
Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TGI-2-TMW2

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER

Matrix: Soil
Date Collected: 02-May-18 11:00

Laboratory Data

Lab Sample: 1800897-03
Date Received: 04-May-18 09:48
% Solids: 87.6

Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.147	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFPeA	2706-90-3	ND	0.212	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFBS	375-73-5	ND	0.380	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFHxA	307-24-4	ND	0.213	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFHpA	375-85-9	ND	0.215	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFHxS	355-46-4	ND	0.325	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
6:2 FTS	27619-97-2	ND	0.240	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFOA	335-67-1	ND	0.247	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFHpS	375-92-8	ND	0.178	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFOS	1763-23-1	ND	0.885	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFNA	375-95-1	ND	0.186	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFDA	335-76-2	ND	0.268	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
8:2 FTS	39108-34-4	ND	0.299	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFOSA	754-91-6	ND	0.238	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
MeFOSAA	2355-31-9	ND	0.316	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFDS	335-77-3	ND	0.211	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFUnA	2058-94-8	ND	0.371	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
EtFOSAA	2991-50-6	ND	0.336	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFDoA	307-55-1	ND	0.289	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFTrDA	72629-94-8	ND	0.128	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFTeDA	376-06-7	ND	0.207	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFNS	68259-12-1	ND	1.50	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
PFPeS	2706-91-4	ND	0.885	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
4:2 FTS	757124-72-4	ND	0.885	1.05	2.10		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	29.3	50 - 150	H	B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C3-PFPeA	IS	102	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C3-PFBS	IS	114	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C2-PFHxA	IS	112	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C4-PFHpA	IS	99.8	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
18O2-PFHxS	IS	95.5	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C2-PFOA	IS	98.1	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C8-PFOS	IS	102	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C5-PFNA	IS	92.8	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C2-PFDA	IS	100	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C8-PFOSA	IS	48.2	50 - 150	H	B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
d3-MeFOSAA	IS	72.7	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C2-PFUnA	IS	92.2	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1

Sample ID: TGI-2-TMW2

VAL - PFAS

Client Data

Name:	Merit Laboratories, Inc.	Matrix:	Soil
Project:	Lapeer Sampling	Date Collected:	02-May-18 11:00
Location:	LAPEER		

Laboratory Data

Lab Sample:	1800897-03	Column:	BEH C18
Date Received:	04-May-18 09:48		
% Solids:	87.6		

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
d5-EtFOSAA	IS	85.1	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C2-PFDoA	IS	102	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1
13C2-PFTeDA	IS	82.3	50 - 150		B8E0194	23-May-18	1.09 g	02-Jun-18 19:42	1

DL - Detection Limit

LOD - Limit of Detection
LOQ - Limit of quantitation

The results are reported in dry weight.
The sample size is reported in wet weight.
Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TGI-2-TMW4

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER

Matrix: Soil
Date Collected: 02-May-18 12:00

Laboratory Data

Lab Sample: 1800897-04
Date Received: 04-May-18 09:48
% Solids: 81.5

Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.147	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFPeA	2706-90-3	ND	0.212	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFBS	375-73-5	ND	0.380	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFHxA	307-24-4	ND	0.213	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFHpA	375-85-9	ND	0.215	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFHxS	355-46-4	ND	0.325	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
6:2 FTS	27619-97-2	ND	0.240	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFOA	335-67-1	ND	0.247	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFHpS	375-92-8	ND	0.178	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFOS	1763-23-1	ND	0.886	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFNA	375-95-1	ND	0.187	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFDA	335-76-2	ND	0.268	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
8:2 FTS	39108-34-4	ND	0.299	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFOSA	754-91-6	ND	0.238	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
MeFOSAA	2355-31-9	ND	0.317	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFDS	335-77-3	ND	0.211	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFUnA	2058-94-8	ND	0.371	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
EtFOSAA	2991-50-6	ND	0.336	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFDoA	307-55-1	ND	0.289	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFTrDA	72629-94-8	ND	0.128	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFTeDA	376-06-7	ND	0.208	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFNS	68259-12-1	ND	1.50	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
PFPeS	2706-91-4	ND	0.886	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
4:2 FTS	757124-72-4	ND	0.886	1.05	2.10		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	95.2	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C3-PFPeA	IS	91.2	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C3-PFBS	IS	106	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C2-PFHxA	IS	92.0	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C4-PFHpA	IS	87.5	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
18O2-PFHxS	IS	92.7	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C2-PFOA	IS	82.7	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C8-PFOS	IS	94.8	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C5-PFNA	IS	88.4	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C2-PFDA	IS	83.8	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C8-PFOSA	IS	39.7	50 - 150	H	B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
d3-MeFOSAA	IS	90.7	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C2-PFUnA	IS	87.1	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1

Sample ID: TGI-2-TMW4

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER
Matrix: Soil
Date Collected: 02-May-18 12:00

Laboratory Data

Lab Sample: 1800897-04
Date Received: 04-May-18 09:48
% Solids: 81.5
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
d5-EtFOSAA	IS	100	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C2-PFDoA	IS	96.8	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1
13C2-PFTeDA	IS	96.3	50 - 150		B8E0194	23-May-18	1.17 g	02-Jun-18 19:53	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

The results are reported in dry weight.
The sample size is reported in wet weight.
Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TGI-2-TMW5

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER

Matrix: Soil
Date Collected: 02-May-18 16:00

Laboratory Data

Lab Sample: 1800897-05
Date Received: 04-May-18 09:48
% Solids: 74.3

Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.153	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFPeA	2706-90-3	ND	0.221	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFBS	375-73-5	ND	0.397	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFHxA	307-24-4	ND	0.222	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFHpA	375-85-9	ND	0.224	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFHxS	355-46-4	ND	0.339	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
6:2 FTS	27619-97-2	ND	0.251	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFOA	335-67-1	ND	0.258	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFHpS	375-92-8	ND	0.186	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFOS	1763-23-1	ND	0.925	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFNA	375-95-1	ND	0.195	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFDA	335-76-2	ND	0.280	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
8:2 FTS	39108-34-4	ND	0.312	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFOSA	754-91-6	ND	0.248	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
MeFOSAA	2355-31-9	ND	0.330	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFDS	335-77-3	ND	0.220	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFUnA	2058-94-8	ND	0.387	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
EtFOSAA	2991-50-6	ND	0.351	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFDoA	307-55-1	ND	0.302	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFTrDA	72629-94-8	ND	0.134	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFTeDA	376-06-7	ND	0.217	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFNS	68259-12-1	ND	1.56	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
PFPeS	2706-91-4	ND	0.925	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
4:2 FTS	757124-72-4	ND	0.925	1.09	2.19		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	23.0	50 - 150	H	B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C3-PFPeA	IS	79.1	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C3-PFBS	IS	89.5	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C2-PFHxA	IS	86.6	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C4-PFHpA	IS	84.3	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
18O2-PFHxS	IS	80.7	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C2-PFOA	IS	78.8	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C8-PFOS	IS	87.0	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C5-PFNA	IS	88.0	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C2-PFDA	IS	79.5	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C8-PFOSA	IS	32.4	50 - 150	H	B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
d3-MeFOSAA	IS	80.8	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C2-PFUnA	IS	75.9	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1

Sample ID: TGI-2-TMW5

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER
Matrix: Soil
Date Collected: 02-May-18 16:00

Laboratory Data

Lab Sample: 1800897-05
Date Received: 04-May-18 09:48
% Solids: 74.3
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
d5-EtFOSAA	IS	83.4	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C2-PFDoA	IS	80.4	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1
13C2-PFTeDA	IS	72.8	50 - 150		B8E0194	23-May-18	1.23 g	02-Jun-18 20:03	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

The results are reported in dry weight.
The sample size is reported in wet weight.
Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TG1-2-TMW6

VAL - PFAS

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer Sampling
Location: LAPEER

Matrix: Soil
Date Collected: 02-May-18 17:30

Laboratory Data

Lab Sample: 1800897-06
Date Received: 04-May-18 09:48
% Solids: 85.1

Column: BEH C18

Analyte	CAS Number	Conc. (ng/g)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.146	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFPeA	2706-90-3	ND	0.210	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFBS	375-73-5	ND	0.378	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFHxA	307-24-4	ND	0.211	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFHpA	375-85-9	ND	0.213	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFHxS	355-46-4	ND	0.322	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
6:2 FTS	27619-97-2	ND	0.228	0.996	1.99		B8F0153	20-Jun-18	1.18 g	23-Jun-18 07:39	1
PFOA	335-67-1	ND	0.245	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFHpS	375-92-8	ND	0.177	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFOS	1763-23-1	ND	0.879	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFNA	375-95-1	ND	0.185	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFDA	335-76-2	ND	0.266	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
8:2 FTS	39108-34-4	ND	0.296	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFOSA	754-91-6	ND	0.236	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
MeFOSAA	2355-31-9	ND	0.314	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFDS	335-77-3	ND	0.209	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFUnA	2058-94-8	ND	0.368	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
EtFOSAA	2991-50-6	ND	0.334	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFDoA	307-55-1	ND	0.287	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFTrDA	72629-94-8	ND	0.127	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFTeDA	376-06-7	ND	0.206	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFNS	68259-12-1	ND	1.49	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
PFPeS	2706-91-4	ND	0.879	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
4:2 FTS	757124-72-4	ND	0.879	1.04	2.08		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	27.1	50 - 150	H	B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C3-PFPeA	IS	87.6	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C3-PFBS	IS	105	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C2-PFHxA	IS	95.9	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C4-PFHpA	IS	109	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
18O2-PFHxS	IS	93.7	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C2-PFOA	IS	94.2	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C8-PFOS	IS	98.8	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C5-PFNA	IS	86.8	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C2-PFDA	IS	93.0	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C8-PFOSA	IS	33.1	50 - 150	H	B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
d3-MeFOSAA	IS	86.2	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C2-PFUnA	IS	82.9	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1

Sample ID: TG1-2-TMW6

VAL - PFAS

Client Data

Name:	Merit Laboratories, Inc.	Matrix:	Soil
Project:	Lapeer Sampling	Date Collected:	02-May-18 17:30
Location:	LAPEER		

Laboratory Data

Lab Sample:	1800897-06	Column:	BEH C18
Date Received:	04-May-18 09:48		
% Solids:	85.1		

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
d5-EtFOSAA	IS	87.5	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C2-PFDoA	IS	81.9	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C2-PFTeDA	IS	72.5	50 - 150		B8E0194	23-May-18	1.13 g	02-Jun-18 20:14	1
13C2-6:2 FTS	IS	87.2	50 - 150		B8F0153	20-Jun-18	1.18 g	23-Jun-18 07:39	1

DL - Detection Limit

LOD - Limit of Detection

LOQ - Limit of quantitation

The results are reported in dry weight.

The sample size is reported in wet weight.

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

DATA QUALIFIERS & ABBREVIATIONS

B	**This compound was also detected in the method blank**
Conc.	**Concentration**
D	**Dilution**
DL	**Detection limit**
E	**The associated compound concentration exceeded the calibration range of the instrument**
H	**Recovery and/or RPD was outside laboratory acceptance limits**
I	**Chemical Interference**
J	**The amount detected is below the Reporting Limit/LOQ**
LOD	**Limits of Detection**
LOQ	**Limits of Quantitation**
M	**Estimated Maximum Possible Concentration (CA Region 2 projects only)**
NA	**Not applicable**
ND	**Not Detected**
Q	**Ion ratio outside of 70-130% of Standard Ratio. (DOD PFAS projects only)**
TEQ	**Toxic Equivalency**
U	**Not Detected (specific projects only)**
*****	**See Cover Letter**

Unless otherwise noted, solid sample results are reported in dry weight. Tissue samples are reported in wet weight.

CERTIFICATIONS

Accrediting Authority	Certificate Number
Alaska Department of Environmental Conservation	17-013
Arkansas Department of Environmental Quality	17-015-0
California Department of Health – ELAP	2892
DoD ELAP - A2LA Accredited - ISO/IEC 17025:2005	3091.01
Florida Department of Health	E87777-18
Hawaii Department of Health	N/A
Louisiana Department of Environmental Quality	01977
Maine Department of Health	2016026
Minnesota Department of Health	1322288
New Hampshire Environmental Accreditation Program	207717
New Jersey Department of Environmental Protection	CA003
New York Department of Health	11411
Oregon Laboratory Accreditation Program	4042-008
Pennsylvania Department of Environmental Protection	014
Texas Commission on Environmental Quality	T104704189-17-8
Virginia Department of General Services	9077
Washington Department of Ecology	C584
Wisconsin Department of Natural Resources	998036160

Current certificates and lists of licensed parameters are located in the Quality Assurance office and are available upon request.

Vista Analytical Laboratory

CHAIN OF CUSTODY

For Laboratory Use Only
Work Order #: 1800897 Temp: 0.2 °C
Storage ID: WR-2 Storage Secured: Yes ☑ No ☐

Project ID: LAPEER SAMPLING PO#: 60570309 Sampler: John Yanchula (name)

TAT (check one): Standard: x 21 days; Rush (surcharge may apply): ☐ 14 days ☐ 7 days Specify:

Invoice to: Name	Company	Address	City	State	Ph#	Fax#
Stephanie Kammer	MDEQ	525 W. Allegan Stree	Lansing	MI	517-897-1597	517-241-3571

Relinquished by (printed name and signature)	Date	Time	Received by (printed name and signature)	Date	Time
John Yanchula	5/3/18	1830	FED EX		
Relinquished by (printed name and signature)	Date	Time	Received by (printed name and signature)	Date	Time
FEDEX			KIM ELRIC	05/04/18	104

SHIP TO: Vista Analytical Laboratory
1104 Windfield Way
El Dorado Hills, CA 95762
Ph: (916) 673-1520; Fax: (916) 673-0106

ATTN: Jennifer Miller

Method of Shipment: FED EX

Tracking No.:

Add Analysis(es) Requested

Sample ID	Date	Time	Location/Sample Description	Container(s) Quantity	Type	Matrix	PFAS Isotope Dilution: List of 21	List of 21 w/Isomers	List of 24	List of 24 w/Isomers	List of 28	Other: Please List Below	USEPA Method 537: PFOA/ PFOS	UCMR3 PFAS List:6	PFAS List: 14	Comments
TG1TMW31B180502N	5/2/18	1330	LAPEER	2		W			X							
TG1-2-TMW1	5/2/18	0930	LAPEER	1		SS			X							SATURATED SOIL
TG1-2-TMW2	5/2/18	1100	LAPEER	1		SS			X							
TG1-2-TMW4	5/2/18	1200	LAPEER	1		SS			X							
TG1-2-TMW5	5/2/18	1600	LAPEER	1		SS			X							
TG1-2-TMW6	5/2/18	1770	LAPEER	1		SS			X							

Special Instructions/Comments: **Send Results and Acknowledgements to the list provided by e-mail to Vista.**

SEND DOCUMENTATION AND RESULTS TO:

Name: Stephanie Kammer
Company: MDEQ
Address: 525 W. Allegan Stree
City: Lansing State: MI Zip: 48909
Phone: 517-897-1597 Fax: 517-241-3571
Email: dorin.bogdan@aecom.com

Container Types: P= HDPE, PJ= HDPE Jar, O = Other:

Bottle Preservation Type: T = Thiosulfate, TZ = Trizma:

Matrix Types: AQ = Aqueous, DW = Drinking Water, EF = Effluent, PP = Pulp/Paper, SD = Sediment, SL = Sludge, SO = Soil, WW = Wastewater, B = Blood/Serum, O = Other:

EXACT COPY OF ORIGINAL
Init JW 5/8/18

Vista Analytical Laboratory

Sample Log-in Checklist

Vista Work Order #: 1800897 **TAT** STD

Samples Arrival:	**Date/Time** 05/04/18 0948	**Initials:** KE	**Location:** WR-2 **Shelf/Rack:** N/A
Logged In:	**Date/Time** 5/8/18 838	**Initials:** JW	**Location:** WR-2 **Shelf/Rack:** A-4

Delivered By:	(FedEx)	UPS	On Trac	GSO	DHL	Hand Delivered	Other
Preservation:	(Ice)	Blue Ice	Dry Ice	None		
Temp °C: 0.3 (uncorrected)	**Time:** 10:13	**Thermometer ID:** IR-4				
Temp °C: 0.2 (corrected)	**Probe used:** Yes☐ No☑					

	YES	NO	NA
Adequate Sample Volume Received?	✓		
Holding Time Acceptable?	✓		
Shipping Container(s) Intact?	✓		
Shipping Custody Seals Intact?	✓		
Shipping Documentation Present?	✓		
Airbill 1 of 3 Trk # 7808 1407 5838	✓		
Sample Container Intact?	✓		
Sample Custody Seals Intact?			✓
Chain of Custody / Sample Documentation Present?	✓		
COC Anomaly/Sample Acceptance Form completed?			✓

If Chlorinated or Drinking Water Samples, Acceptable Preservation?						✓
Preservation Documented:	$Na_2S_2O_3$	Trizma	(None)		Yes	No	(NA)
Shipping Container	Vista	(Client)	Retain	(Return)		Dispose	

Comments:

TGITMW313180502N
TG1-2-TMW1
TG1-2-TMW2
TG1-2-TMW4
TG1-2-TMW5
TG1-2-TMW6

June 12, 2018

Vista Work Order No. 1800934

Ms. Maya Murshak
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Dear Ms. Murshak,

Enclosed are the results for the sample set received at Vista Analytical Laboratory on May 12, 2018. This sample set was analyzed on a standard turn-around time, under your Project Name 'Lapeer'.

Vista Analytical Laboratory is committed to serving you effectively. If you require additional information, please contact me at 916-673-1520 or by email at mmaier@vista-analytical.com.

Thank you for choosing Vista as part of your analytical support team.

Sincerely,

Martha Maier
Laboratory Director

Vista Work Order No. 1800934
Case Narrative

Sample Condition on Receipt:

Three aqueous samples were received in good condition and within the method temperature requirements. The samples were received and stored securely in accordance with Vista standard operating procedures and EPA methodology.

Analytical Notes:

PFAS Isotope Dilution Method

The samples contained particulate and were centrifuged prior to extraction.

The samples were extracted and analyzed for a selected list of PFAS using the PFAS Isotope Dilution Method (Modified EPA Method 537).

Holding Times

The samples were extracted and analyzed within the method hold times.

Quality Control

The Initial Calibration and Continuing Calibration Verifications met the method acceptance criteria. The samples were re-extracted for 6:2 FTS; the re-extractions were performed outside of the hold time.

A Method Blank and Ongoing Precision and Recovery (OPR) sample were extracted and analyzed with each preparation batch. No analytes were detected in the Method Blanks above 1/2 the LOQ. The OPR recoveries were within the method acceptance criteria.

The labeled standard recoveries outside the acceptance criteria are listed in the table below.

QC Anomalies

LabNumber	SampleName	Analysis	Analyte	Flag	%Rec
1800934-01	TG1SW0300180509N	PFAS Isotope Dilution Method	13C8-PFOSA	H	48.8
1800934-01	TG1SW0300180509N	PFAS Isotope Dilution Method	d3-MeFOSAA	H	41.5
1800934-01	TG1SW0300180509N	PFAS Isotope Dilution Method	d5-EtFOSAA	H	47.7
1800934-01	TG1SW0300180509N	PFAS Isotope Dilution Method	13C2-PFTeDA	H	41.8
1800934-02	TG1SW0200180509N	PFAS Isotope Dilution Method	d3-MeFOSAA	H	38.6
1800934-02	TG1SW0200180509N	PFAS Isotope Dilution Method	d5-EtFOSAA	H	42.5
1800934-03	TG1SW0100180509N	PFAS Isotope Dilution Method	13C2-PFTeDA	H	48.8
B8E0148-BLK1	B8E0148-BLK1	PFAS Isotope Dilution Method	13C8-PFOSA	H	49.0
B8F0020-BLK1	B8F0020-BLK1	PFAS Isotope Dilution Method	13C8-PFOSA	H	34.5
B8F0020-BS1	B8F0020-BS1	PFAS Isotope Dilution Method	13C8-PFOSA	H	45.2

H = Recovery was outside laboratory acceptance criteria.

TABLE OF CONTENTS

Sample Inventory Report

Vista Sample ID	Client Sample ID	Sampled	Received	Components/Containers
1800934-01	TG1SW0300180509N	09-May-18 14:05	12-May-18 09:57	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
1800934-02	TG1SW0200180509N	09-May-18 14:25	12-May-18 09:57	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
1800934-03	TG1SW0100180509N	09-May-18 14:35	12-May-18 09:57	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL

Vista Project: 1800934

Client Project: Lapeer

ANALYTICAL RESULTS

Sample ID: Method Blank

PFAS Isotope Dilution Method

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Matrix: Aqueous

Laboratory Data

Lab Sample: B8E0148-BLK1
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.365	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFPeA	2706-90-3	ND	0.640	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFBS	375-73-5	ND	0.895	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
4:2 FTS	757124-72-4	ND	1.37	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFHxA	307-24-4	ND	1.09	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFPeS	2706-91-4	ND	1.37	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFHpA	375-85-9	ND	0.296	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFHxS	355-46-4	ND	0.474	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFOA	335-67-1	ND	0.326	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFHpS	375-92-8	ND	0.469	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFNA	375-95-1	ND	0.405	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFOSA	754-91-6	ND	0.885	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFOS	1763-23-1	ND	0.404	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFDA	335-76-2	ND	0.745	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
8:2 FTS	39108-34-4	ND	1.03	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFNS	68259-12-1	ND	1.94	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
MeFOSAA	2355-31-9	ND	0.825	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
EtFOSAA	2991-50-6	ND	0.685	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFUnA	2058-94-8	ND	0.525	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFDS	335-77-3	ND	0.615	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFDoA	307-55-1	ND	0.396	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFTrDA	72629-94-8	ND	0.247	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
PFTeDA	376-06-7	ND	0.378	2.50	4.00		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	85.9	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C3-PFPeA	IS	85.3	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C3-PFBS	IS	84.5	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C2-PFHxA	IS	88.9	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C4-PFHpA	IS	86.5	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
18O2-PFHxS	IS	78.7	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C2-PFOA	IS	80.7	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C5-PFNA	IS	77.1	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C8-PFOSA	IS	49.0	50 - 150	H	B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C8-PFOS	IS	86.6	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C2-PFDA	IS	75.4	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
d3-MeFOSAA	IS	55.4	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
d5-EtFOSAA	IS	51.4	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C2-PFUnA	IS	75.9	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1

Sample ID: Method Blank **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc. Matrix: Aqueous

Project: Lapeer

Laboratory Data

Lab Sample: B8E0148-BLK1 Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFDoA	IS	64.9	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1
13C2-PFTeDA	IS	67.0	50 - 150		B8E0148	22-May-18	0.250 L	30-May-18 11:01	1

DL - Detection Limit

LOD - Limit of Detection

LOQ - Limit of quantitation

LCL-UCL- Lower control limit - upper control limit

Results reported to the DL.

When reported, PFHxS, PFOA and PFOS include both linear and branched isomers.

Only the linear isomer is reported for all other analytes.

Sample ID: OPR **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Matrix: Aqueous

Laboratory Data

Lab Sample: B8E0148-BS1
Column: BEH C18

Analyte	CAS Number	Amt Found (ng/L)	Spike Amt	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	42.2	40.0	106	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFPeA	2706-90-3	40.6	40.0	101	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFBS	375-73-5	39.8	40.0	99.5	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
4:2 FTS	757124-72-4	42.2	40.0	106	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFHxA	307-24-4	40.4	40.0	101	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFPeS	2706-91-4	43.8	40.0	109	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFHpA	375-85-9	42.3	40.0	106	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFHxS	355-46-4	42.2	40.0	105	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFOA	335-67-1	41.5	40.0	104	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFHpS	375-92-8	49.0	40.0	122	60 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFNA	375-95-1	45.0	40.0	113	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFOSA	754-91-6	40.4	40.0	101	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFOS	1763-23-1	41.5	40.0	104	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFDA	335-76-2	43.7	40.0	109	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
8:2 FTS	39108-34-4	47.5	40.0	119	60 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFNS	68259-12-1	36.4	40.0	90.9	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
MeFOSAA	2355-31-9	37.6	40.0	94.1	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
EtFOSAA	2991-50-6	41.2	40.0	103	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFUnA	2058-94-8	40.9	40.0	102	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFDS	335-77-3	40.8	40.0	102	60 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFDoA	307-55-1	41.6	40.0	104	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFTrDA	72629-94-8	38.4	40.0	96.0	60 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
PFTeDA	376-06-7	44.7	40.0	112	70 - 130		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	88.1	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C3-PFPeA	IS	85.5	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C3-PFBS	IS	93.0	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C2-PFHxA	IS	84.5	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C4-PFHpA	IS	90.8	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
18O2-PFHxS	IS	86.0	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C2-PFOA	IS	82.2	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C5-PFNA	IS	72.6	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C8-PFOSA	IS	51.4	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C8-PFOS	IS	91.6	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C2-PFDA	IS	72.5	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1

Sample ID: OPR **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Matrix: Aqueous

Laboratory Data

Lab Sample: B8E0148-BS1
Column: BEH C18

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
d3-MeFOSAA	IS	60.6	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
d5-EtFOSAA	IS	61.3	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C2-PFUnA	IS	77.9	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C2-PFDoA	IS	68.3	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1
13C2-PFTeDA	IS	70.4	50- 150		B8E0148	22-May-18	0.250 L	30-May-18 10:50	1

Sample ID: Method Blank

PFAS Isotope Dilution Method

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Matrix: Aqueous

Laboratory Data

Lab Sample: B8F0020-BLK1
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	ND	0.365	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFPeA	2706-90-3	ND	0.640	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFBS	375-73-5	ND	0.895	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
4:2 FTS	757124-72-4	ND	1.37	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFHxA	307-24-4	ND	1.09	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFPeS	2706-91-4	ND	1.37	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFHpA	375-85-9	ND	0.296	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFHxS	355-46-4	ND	0.474	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
6:2 FTS	27619-97-2	ND	1.00	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFOA	335-67-1	ND	0.326	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFHpS	375-92-8	ND	0.469	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFNA	375-95-1	ND	0.405	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFOSA	754-91-6	ND	0.885	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFOS	1763-23-1	ND	0.404	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFDA	335-76-2	ND	0.745	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
8:2 FTS	39108-34-4	ND	1.03	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFNS	68259-12-1	ND	1.94	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
MeFOSAA	2355-31-9	ND	0.825	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
EtFOSAA	2991-50-6	ND	0.685	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFUnA	2058-94-8	ND	0.525	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFDS	335-77-3	ND	0.615	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFDoA	307-55-1	ND	0.396	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFTrDA	72629-94-8	ND	0.247	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
PFTeDA	376-06-7	ND	0.378	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	94.6	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C3-PFPeA	IS	92.2	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C3-PFBS	IS	105	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C2-PFHxA	IS	90.8	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C4-PFHpA	IS	95.0	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
18O2-PFHxS	IS	89.6	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C2-PFOA	IS	90.4	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C5-PFNA	IS	82.7	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C8-PFOSA	IS	34.5	50 - 150	H	B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C8-PFOS	IS	95.8	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C2-PFDA	IS	77.9	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
d3-MeFOSAA	IS	58.4	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
d5-EtFOSAA	IS	77.7	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1

Sample ID: Method Blank **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc. Matrix: Aqueous

Project: Lapeer

Laboratory Data

Lab Sample: B8F0020-BLK1 Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFUnA	IS	70.9	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C2-PFDoA	IS	65.8	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1
13C2-PFTeDA	IS	69.4	50 - 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:18	1

DL - Detection Limit

LOD - Limit of Detection

LOQ - Limit of quantitation

LCL-UCL- Lower control limit - upper control limit

Results reported to the DL.

When reported, PFHxS, PFOA and PFOS include both linear and branched isomers.

Only the linear isomer is reported for all other analytes.

Sample ID: OPR **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Matrix: Aqueous

Laboratory Data

Lab Sample: B8F0020-BS1
Column: BEH C18

Analyte	CAS Number	Amt Found (ng/L)	Spike Amt	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	38.3	40.0	95.8	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFPeA	2706-90-3	40.2	40.0	100	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFBS	375-73-5	44.2	40.0	110	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
4:2 FTS	757124-72-4	37.9	40.0	94.8	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFHxA	307-24-4	38.0	40.0	95.1	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFPeS	2706-91-4	41.1	40.0	103	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFHpA	375-85-9	39.2	40.0	98.0	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFHxS	355-46-4	37.7	40.0	94.1	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
6:2 FTS	27619-97-2	46.4	40.0	116	60 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFOA	335-67-1	41.1	40.0	103	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFHpS	375-92-8	43.1	40.0	108	60 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFNA	375-95-1	42.1	40.0	105	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFOSA	754-91-6	41.3	40.0	103	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFOS	1763-23-1	33.7	40.0	84.2	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFDA	335-76-2	40.3	40.0	101	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
8:2 FTS	39108-34-4	38.3	40.0	95.9	60 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFNS	68259-12-1	36.9	40.0	92.3	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
MeFOSAA	2355-31-9	37.8	40.0	94.6	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
EtFOSAA	2991-50-6	35.0	40.0	87.4	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFUnA	2058-94-8	41.0	40.0	102	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFDS	335-77-3	40.2	40.0	100	60 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFDoA	307-55-1	39.4	40.0	98.4	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFTrDA	72629-94-8	45.0	40.0	112	60 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
PFTeDA	376-06-7	40.5	40.0	101	70 - 130		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	89.0	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C3-PFPeA	IS	87.0	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C3-PFBS	IS	95.1	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C2-PFHxA	IS	87.2	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C4-PFHpA	IS	90.8	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
18O2-PFHxS	IS	92.3	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C2-PFOA	IS	80.7	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C5-PFNA	IS	82.4	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C8-PFOSA	IS	45.2	50- 150	H	B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C8-PFOS	IS	90.4	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1

Sample ID: OPR **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Matrix: Aqueous

Laboratory Data

Lab Sample: B8F0020-BS1
Column: BEH C18

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFDA	IS	79.5	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
d3-MeFOSAA	IS	72.6	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
d5-EtFOSAA	IS	80.3	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C2-PFUnA	IS	76.3	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C2-PFDoA	IS	73.9	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1
13C2-PFTeDA	IS	78.8	50- 150		B8F0020	06-Jun-18	0.250 L	08-Jun-18 21:07	1

Sample ID: TG1SW0300180509N **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Location: 08n11e16-TG02
Matrix: Aqueous
Date Collected: 09-May-18 14:05

Laboratory Data

Lab Sample: 1800934-01
Date Received: 12-May-18 09:57
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	2.55	0.363	2.49	3.99	J	B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFPeA	2706-90-3	ND	0.638	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFBS	375-73-5	ND	0.892	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
4:2 FTS	757124-72-4	ND	1.37	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFHxA	307-24-4	ND	1.09	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFPeS	2706-91-4	ND	1.37	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFHpA	375-85-9	1.37	0.295	2.49	3.99	J	B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFHxS	355-46-4	ND	0.472	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
6:2 FTS	27619-97-2	9.90	1.01	2.53	4.05		B8F0020	06-Jun-18	0.247 L	08-Jun-18 21:49	1
PFOA	335-67-1	0.531	0.324	2.49	3.99	J	B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFHpS	375-92-8	ND	0.467	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFNA	375-95-1	0.577	0.404	2.49	3.99	J	B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFOSA	754-91-6	ND	0.882	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFOS	1763-23-1	ND	0.402	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFDA	335-76-2	ND	0.743	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
8:2 FTS	39108-34-4	ND	1.03	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFNS	68259-12-1	ND	1.93	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
MeFOSAA	2355-31-9	ND	0.822	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
EtFOSAA	2991-50-6	ND	0.683	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFUnA	2058-94-8	ND	0.523	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFDS	335-77-3	ND	0.613	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFDoA	307-55-1	ND	0.395	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFTrDA	72629-94-8	ND	0.246	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
PFTeDA	376-06-7	ND	0.376	2.49	3.99		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	67.3	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C3-PFPeA	IS	72.5	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C3-PFBS	IS	72.7	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C2-PFHxA	IS	74.6	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C4-PFHpA	IS	81.2	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
18O2-PFHxS	IS	64.3	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C2-PFOA	IS	63.3	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C5-PFNA	IS	53.7	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C8-PFOSA	IS	48.8	50 - 150	H	B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C8-PFOS	IS	68.4	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C2-PFDA	IS	62.1	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
d3-MeFOSAA	IS	41.5	50 - 150	H	B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
d5-EtFOSAA	IS	47.7	50 - 150	H	B8E0148	22-May-18	0.251 L	30-May-18 12:24	1

Sample ID: TG1SW0300180509N **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Location: 08n11e16-TG02
Matrix: Aqueous
Date Collected: 09-May-18 14:05

Laboratory Data

Lab Sample: 1800934-01
Date Received: 12-May-18 09:57
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFUnA	IS	59.3	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C2-PFDoA	IS	57.0	50 - 150		B8E0148	22-May-18	0.251 L	30-May-18 12:24	1
13C2-PFTeDA	IS	41.8	50 - 150	H	B8E0148	22-May-18	0.251 L	30-May-18 12:24	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation
LCL-UCL- Lower control limit - upper control limit
Results reported to the DL.
When reported, PFHxS, PFOA and PFOS include both linear and branched isomers.
Only the linear isomer is reported for all other analytes.

Sample ID: TG1SW0200180509N **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Location: 08n11e16-TG01
Matrix: Aqueous
Date Collected: 09-May-18 14:25

Laboratory Data

Lab Sample: 1800934-02
Date Received: 12-May-18 09:57
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	4.17	0.361	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFPeA	2706-90-3	0.998	0.634	2.48	3.96	J	B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFBS	375-73-5	ND	0.886	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
4:2 FTS	757124-72-4	ND	1.36	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFHxA	307-24-4	ND	1.08	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFPeS	2706-91-4	ND	1.36	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFHpA	375-85-9	1.91	0.293	2.48	3.96	J	B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFHxS	355-46-4	ND	0.469	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
6:2 FTS	27619-97-2	ND	1.00	2.50	4.00		B8F0020	06-Jun-18	0.250 L	08-Jun-18 22:00	1
PFOA	335-67-1	1.52	0.322	2.48	3.96	J	B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFHpS	375-92-8	ND	0.464	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFNA	375-95-1	0.647	0.401	2.48	3.96	J	B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFOSA	754-91-6	ND	0.877	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFOS	1763-23-1	ND	0.400	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFDA	335-76-2	ND	0.738	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
8:2 FTS	39108-34-4	ND	1.02	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFNS	68259-12-1	ND	1.92	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
MeFOSAA	2355-31-9	ND	0.817	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
EtFOSAA	2991-50-6	ND	0.678	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFUnA	2058-94-8	ND	0.520	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFDS	335-77-3	ND	0.609	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFDoA	307-55-1	ND	0.392	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFTrDA	72629-94-8	ND	0.245	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
PFTeDA	376-06-7	ND	0.374	2.48	3.96		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	60.2	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C3-PFPeA	IS	67.1	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C3-PFBS	IS	55.7	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C2-PFHxA	IS	72.7	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C4-PFHpA	IS	82.5	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
18O2-PFHxS	IS	54.5	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C2-PFOA	IS	67.5	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C5-PFNA	IS	72.6	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C8-PFOSA	IS	59.0	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C8-PFOS	IS	69.2	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C2-PFDA	IS	68.9	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
d3-MeFOSAA	IS	38.6	50 - 150	H	B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
d5-EtFOSAA	IS	42.5	50 - 150	H	B8E0148	22-May-18	0.252 L	30-May-18 12:35	1

Sample ID: TG1SW0200180509N

PFAS Isotope Dilution Method

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Location: 08n11e16-TG01
Matrix: Aqueous
Date Collected: 09-May-18 14:25

Laboratory Data

Lab Sample: 1800934-02
Date Received: 12-May-18 09:57
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFUnA	IS	61.9	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C2-PFDoA	IS	62.6	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1
13C2-PFTeDA	IS	53.7	50 - 150		B8E0148	22-May-18	0.252 L	30-May-18 12:35	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation
LCL-UCL- Lower control limit - upper control limit
Results reported to the DL.
When reported, PFHxS, PFOA and PFOS include both linear and branched isomers.
Only the linear isomer is reported for all other analytes.

Sample ID: TG1SW0100180509N **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Location: 08n11e16-TG01
Matrix: Aqueous
Date Collected: 09-May-18 14:35

Laboratory Data

Lab Sample: 1800934-03
Date Received: 12-May-18 09:57
Column: BEH C18

Analyte	CAS Number	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBA	375-22-4	3.25	0.383	2.63	4.20	J	B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFPeA	2706-90-3	ND	0.672	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFBS	375-73-5	ND	0.940	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
4:2 FTS	757124-72-4	ND	1.44	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFHxA	307-24-4	ND	1.15	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFPeS	2706-91-4	ND	1.44	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFHpA	375-85-9	1.20	0.310	2.63	4.20	J	B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFHxS	355-46-4	ND	0.497	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
6:2 FTS	27619-97-2	ND	0.993	2.48	3.97		B8F0020	06-Jun-18	0.252 L	08-Jun-18 22:10	1
PFOA	335-67-1	0.727	0.342	2.63	4.20	J	B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFHpS	375-92-8	ND	0.492	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFNA	375-95-1	ND	0.425	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFOSA	754-91-6	ND	0.930	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFOS	1763-23-1	1.64	0.424	2.63	4.20	J	B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFDA	335-76-2	ND	0.783	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
8:2 FTS	39108-34-4	ND	1.08	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFNS	68259-12-1	ND	2.03	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
MeFOSAA	2355-31-9	ND	0.867	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
EtFOSAA	2991-50-6	ND	0.720	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFUnA	2058-94-8	ND	0.552	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFDS	335-77-3	ND	0.646	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFDoA	307-55-1	ND	0.416	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFTrDA	72629-94-8	ND	0.259	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
PFTeDA	376-06-7	ND	0.397	2.63	4.20		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	55.0	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C3-PFPeA	IS	57.1	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C3-PFBS	IS	50.1	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C2-PFHxA	IS	63.0	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C4-PFHpA	IS	68.4	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
18O2-PFHxS	IS	51.1	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C2-PFOA	IS	61.5	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C5-PFNA	IS	63.9	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C8-PFOSA	IS	53.9	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C8-PFOS	IS	59.9	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C2-PFDA	IS	61.8	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
d3-MeFOSAA	IS	53.9	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
d5-EtFOSAA	IS	52.9	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1

Sample ID: TG1SW0100180509N **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: Lapeer
Location: 08n11e16-TG01
Matrix: Aqueous
Date Collected: 09-May-18 14:35

Laboratory Data

Lab Sample: 1800934-03
Date Received: 12-May-18 09:57
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-PFUnA	IS	65.8	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C2-PFDoA	IS	67.9	50 - 150		B8E0148	22-May-18	0.238 L	30-May-18 12:45	1
13C2-PFTeDA	IS	48.8	50 - 150	H	B8E0148	22-May-18	0.238 L	30-May-18 12:45	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation
LCL-UCL- Lower control limit - upper control limit
Results reported to the DL.
When reported, PFHxS, PFOA and PFOS include both linear and branched isomers.
Only the linear isomer is reported for all other analytes.

DATA QUALIFIERS & ABBREVIATIONS

B	**This compound was also detected in the method blank**
Conc.	**Concentration**
D	**Dilution**
DL	**Detection limit**
E	**The associated compound concentration exceeded the calibration range of the instrument**
H	**Recovery and/or RPD was outside laboratory acceptance limits**
I	**Chemical Interference**
J	**The amount detected is below the Reporting Limit/LOQ**
LOD	**Limits of Detection**
LOQ	**Limits of Quantitation**
M	**Estimated Maximum Possible Concentration (CA Region 2 projects only)**
NA	**Not applicable**
ND	**Not Detected**
Q	**Ion ratio outside of 70-130% of Standard Ratio. (DOD PFAS projects only)**
TEQ	**Toxic Equivalency**
U	**Not Detected (specific projects only)**
*****	**See Cover Letter**

Unless otherwise noted, solid sample results are reported in dry weight. Tissue samples are reported in wet weight.

CERTIFICATIONS

Accrediting Authority	Certificate Number
Alaska Department of Environmental Conservation	17-013
Arkansas Department of Environmental Quality	17-015-0
California Department of Health – ELAP	2892
DoD ELAP - A2LA Accredited - ISO/IEC 17025:2005	3091.01
Florida Department of Health	E87777-18
Hawaii Department of Health	N/A
Louisiana Department of Environmental Quality	01977
Maine Department of Health	2016026
Minnesota Department of Health	1322288
New Hampshire Environmental Accreditation Program	207717
New Jersey Department of Environmental Protection	CA003
New York Department of Health	11411
Oregon Laboratory Accreditation Program	4042-008
Pennsylvania Department of Environmental Protection	014
Texas Commission on Environmental Quality	T104704189-17-8
Virginia Department of General Services	9077
Washington Department of Ecology	C584
Wisconsin Department of Natural Resources	998036160

Current certificates and lists of licensed parameters are located in the Quality Assurance office and are available upon request.

Vista Analytical Laboratory

CHAIN OF CUSTODY

For Laboratory Use Only
Work Order #: 1800934 Temp: 1.7, 1.9 °C
Storage ID: WR-2 Storage Secured: Yes ☒ No ☐

Project ID: **Lapeer PFAS Biosolids Investigation** PO#: **60570635** Sampler: **Stan Krenz** (name)

TAT (check one): Standard: [x] 21 days; Rush (surcharge may apply): [ ] 14 days [ ] 7 days Specify:

Invoice to: Name	Company	Address	City	State	Ph#	Fax#
Stephanie Kammer	**MDEQ**	**525 W. Allegan Street**	**Lansing**	**MI**	**517-897-1597**	**517-241-3571**

Relinquished by (printed name and signature)	Date	Time	Received by (printed name and signature)	Date	Time
Dorin Bogdan	5/16/2018	17:30			
Relinquished by (printed name and signature)	Date	Time	Received by (printed name and signature)	Date	Time

SHIP TO: Vista Analytical Laboratory
1104 Windfield Way
El Dorado Hills, CA 95762
Ph: (916) 673-1520; Fax: (916) 673-0106

ATTN: Jennifer Miller

Method of Shipment: FED EX`

Tracking No.:

Add Analysis(es) Requested

Container(s)

PFAS Isotope Dilution

USEPA Method 537

Sample ID	Date	Time	Location/Sample Description	Quantity	Type	Matrix	List of 21	List of 21 w/Isomers	List of 24	List of 24 w/Isomers	List of 28	Other: Please List Below	PFOA/ PFOS	UCMR3 PFAS List 6	PFAS List: 14	Comments
TG1SW0300180509N	5/9/18	1405	08n11e16-TG02	2	P	AQ			X							
TG1SW0200180509N	5/9/18	1425	08n11e16-TG01	2	P	AQ			X							
TG1SW0100180509N	5/9/18	1435	08n11e16-TG01	2	P	AQ			X							

Special Instructions/Comments: **Send Results and Acknowledgements to the list provided by e-mail to Vista.**

SEND DOCUMENTATION AND RESULTS TO:

Name: **Stephanie Kammer**
Company: **MDEQ**
Address: **525 W. Allegan Street**
City: **Lansing** State: **MI** Zip: **48909**
Phone: **517-897-1597** Fax: **517-241-3571**
Email: dorin.bogdan@aecom.com

Container Types: P= HDPE, PJ= HDPE Jar, O = Other:

Bottle Preservation Type: T = Thiosulfate, TZ = Trizma:

Matrix Types: AQ = Aqueous, DW = Drinking Water, EF = Effluent, PP = Pulp/Paper, SD = Sediment, SL = Sludge, SO = Soil, WW = Wastewater, B = Blood/Serum, O = Other:

Revised COC - received from Dorin Bogdan 5/17/18 JW

Vista Analytical Laboratory

CHAIN OF CUSTODY

For Laboratory Use Only
Work Order #: 1800934 Temp: 1.7, 1.9 °C
Storage ID: WR-2 Storage Secured: Yes ☒ No ☐

Project ID: **Lapeer** PO#: **60570635** Sampler: **Stan Krenz** (name)

TAT (check one): Standard: [x] 21 days; Rush (surcharge may apply): [ ] 14 days [ ] 7 days Specify:

Invoice to: Name	Company	Address	City	State	Ph#	Fax#
Stephanie Kammer	**MDEQ**	**525 W. Allegan Street**	**Lansing**	**MI**	**517-897-1597**	**517-241-3571**

Relinquished by (printed name and signature)	Date	Time	Received by (printed name and signature)	Date	Time
Stan Krenz	5-11-18	1245	Bethin Benedict	05/12/18	1029
Relinquished by (printed name and signature)	Date	Time	Received by (printed name and signature)	Date	Time

SHIP TO: Vista Analytical Laboratory
1104 Windfield Way
El Dorado Hills, CA 95762
Ph: (916) 673-1520; Fax: (916) 673-0106

ATTN: Jennifer Miller

Method of Shipment: ~~FED EX~~

Tracking No.:

Add Analysis(es) Requested

Sample ID	Date	Time	Location/Sample Description	Container(s): Quantity	Type	Matrix	PFAS Isotope Dilution: List of 21	List of 21 w/Isomers	List of 24	List of 24 w/Isomers	List of 28	Other: Please List Below	USEPA Method 537: PFOA/PFOS	UCMR3 PFAS List:6	PFAS List: 14	Comments
TG1SW0300180509N	5/9/18	1405	Lapeer	2	P	AQ			X							
TG1SW0200180509N	5/9/18	1425	Lapeer	2	P	AQ			X							
TG1SW0100180509N	5/9/18	1435	Lapeer	2	P	AQ			X							

Special Instructions/Comments: **Send Results and Acknowledgements to the list provided by e-mail to Vista.**

SEND DOCUMENTATION AND RESULTS TO:

Name: **Stephanie Kammer**
Company: **MDEQ**
Address: **525 W. Allegan Street**
City: **Lansing** State: **MI** Zip: **48909**
Phone: **517-897-1597** Fax: **517-241-3571**
Email: dorin.bogdan@aecom.com

Container Types: P= HDPE, PJ= HDPE Jar, O = Other:

Bottle Preservation Type: T = Thiosulfate, TZ = Trizma:

Matrix Types: AQ = Aqueous, DW = Drinking Water, EF = Effluent, PP = Pulp/Paper, SD = Sediment, SL = Sludge, SO = Soil, WW = Wastewater, B = Blood/Serum, O = Other:

Vista Analytical Laboratory

Sample Log-in Checklist

Vista Work Order #: 1800934 **TAT** std

Samples Arrival:	**Date/Time** 05/12/18 0957	**Initials:** [illegible]	**Location:** WR-2 **Shelf/Rack:** NA
Logged In:	**Date/Time** 05/12/18 1122	**Initials:** WWS	**Location:** WR-2 **Shelf/Rack:** F-5

Delivered By:	(FedEx)	UPS	On Trac	GSO	DHL	Hand Delivered	Other
Preservation:	(Ice)		Blue Ice		Dry Ice		None

Temp °C: 1.8 (uncorrected)	**Time:** 1028	**Thermometer ID:** IR-4
Temp °C: 1.7 (corrected)	**Probe used:** Yes☐ No☑	

	YES	NO	NA
Adequate Sample Volume Received?	WWS		
Holding Time Acceptable?	WWS		
Shipping Container(s) Intact?	[illegible]		
Shipping Custody Seals Intact?	[illegible]		
Shipping Documentation Present?	[illegible]		
Airbill 1 of 2 Trk # 7722 1188 4532	[illegible]		
Sample Container Intact?	WWS		
Sample Custody Seals Intact?			WWS
Chain of Custody / Sample Documentation Present?	[illegible]		
COC Anomaly/Sample Acceptance Form completed?		WWS	WWS

If Chlorinated or Drinking Water Samples, Acceptable Preservation?						WWS
Preservation Documented:	$Na_2S_2O_3$	Trizma	(None)	Yes	(No)	(NA)
Shipping Container	(Vista)	Client	(Retain)	Return	Dispose	

Comments:

Vista Analytical Laboratory

Sample Log-in Checklist

Vista Work Order #: 1800934 **TAT** Std

Samples Arrival:	**Date/Time** 05/12/18 0957	**Initials:** BLB	**Location:** WR-2 **Shelf/Rack:** NA
Logged In:	**Date/Time** 05/12/18 1122	**Initials:** WS	**Location:** WR-2 **Shelf/Rack:** F-5

Delivered By:	(FedEx)	UPS	On Trac	GSO	DHL	Hand Delivered	Other
Preservation:	(Ice)		Blue Ice		Dry Ice		None

Temp °C: 2.0 (uncorrected)	**Time:** 1034	**Thermometer ID:** IR-4
Temp °C: 1.9 (corrected)	**Probe used:** Yes☐ No☑	

	YES	NO	NA
Adequate Sample Volume Received?	WS		
Holding Time Acceptable?	WS		
Shipping Container(s) Intact?	BLB		
Shipping Custody Seals Intact?	BLB		
Shipping Documentation Present?	BLB		
Airbill 2 of 2 Trk # 7722 1188 4554	BLB		
Sample Container Intact?	WS		
Sample Custody Seals Intact?			WS
Chain of Custody / Sample Documentation Present?		BLB	
COC Anomaly/Sample Acceptance Form completed?		WS	WS
If Chlorinated or Drinking Water Samples, Acceptable Preservation?			WS

Preservation Documented:	$Na_2S_2O_3$	Trizma	(None)	Yes	(No)	(NA)
Shipping Container	(Vista)	Client	(Retain)	Return	Dispose	

Comments:

Appendix D

AECOM
250 Apollo Drive
Chelmsford, MA 01824

978-905-2100 tel
978-905-2101 fax

Memorandum

Project	Lapeer Area PFAS	Page 1
Laboratory	Vista Analytical Laboratory, El Dorado Hills, CA	
Laboratory Work Number	1800898	
Analyses/Method	Per- and Polyfluoroalkyl Substances (PFAS)/Vista Lab SOP No 49, Rev 10	
Validation Level	Limited	
AECOM Project Number	60570365-01	
Prepared by	Waverly Braunstein	
Reviewed by	Robert Kennedy	Completed: July 27, 2018

SUMMARY

A limited validation was performed for the samples collected on April 26, April 27, April 30, May 1, and May 2, 2018 at the Lapeer site. The samples were submitted to Vista Analytical Laboratory (Vista) in El Dorado Hills, CA for analysis. Vista reported the samples under laboratory work order number 1800898.

Sample IDs
CLIDU10100180501N
CLIDU10200180501N
CLIDU10300180501N
CLIDU20100180501N
CLIDU20200180501N
CLIDU20300180501N
CLIDU30100180502N
CLIDU30200180502N
CLIDU30300180502N
TGIDU10100180426N
TGIDU10200180427N
TGIDU10300180427N
TGIDU20100180430N
TGIDU20200180430N
TGIDU20300180430N
TGIDU30100180426N
TGIDU30200180426N
TGIDU30300180426N

Data validation activities were conducted with reference to:

- Vista Analytical Laboratory SOP: Preparation and Analysis for the Determination of Per- and Poly-Fluorinated Compounds (SOP No. 49, Revision 10);
- USEPA National Functional Guidelines for Organic Superfund Methods Data Review (January 2017); and

- USEPA National Functional Guidelines for High Resolution Superfund Methods Data Review (April 2016);

In the absence of method-specific information, laboratory quality control (QC) limits and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following review elements:

✓	Data completeness (chain-of-custody (COC)/sample integrity
✓	Holding times and sample preservation
✓	Initial calibration/initial calibration and continuing calibration verification
✓	Laboratory method blanks/field blanks
NA	Matrix spike (MS) and/or matrix spike duplicate (MSD) results
✓	Ongoing precision and recovery (OPR) results
NA	Field duplicate results
✗	Extracted internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. An "NA" indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as reported and may be used for decision making purposes. Select data points were qualified as estimated due to nonconformances of certain QC criteria (see discussion below).

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Holding Times and Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met.

Initial Calibration/Initial and Continuing Calibration Verification

Calibration data were reviewed for conformance with the QC acceptance criteria to ensure that:

- the initial calibration (ICAL) percent relative standard deviation (%RSD) or correlation coefficient (r)/coefficient of determination (r^2) method acceptance criteria were met;
- the initial calibration verification standard (ICV) percent recovery (%R) acceptance criteria were met; and
- the continuing calibration verification standard (CCV) frequency and method acceptance criteria were met.

All QC acceptance limits were met or qualification of the data was not required.

Laboratory Method Blanks/Field Blanks

Laboratory method blanks and field blanks are evaluated as to whether there are contaminants detected above the detection limit (DL). Target compounds were not detected in the method blank associated with the sample in this data set. A field blank was not submitted with the sample reported in this data set.

MS/MSD Results

MS/MSD analyses were not performed on a sample in this data set. No data validation actions were taken on this basis.

OPR Results

The OPR percent recoveries were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met or qualification of the data was not required.

Field Duplicate Results

Field duplicate samples were not submitted with this data set. No data validation actions were taken on this basis.

Extracted Internal Standard Results

The extracted internal standard (IS) results were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met except for the extracted IS results summarized below.

Sample ID	Extraction IS	% Recovery	QC Limits	Associated Compounds
CLIDU10100180501N	13C8-PFOSA	49.70	50 - 150	PFOSA
CLIDU20100180501N	13C3-PFBA	43.00	50 - 150	PFBA
CLIDU20200180501N	13C3-PFBA	30.40	50 - 150	PFBA
CLIDU20200180501N	13C8-PFOSA	47.50	50 - 150	PFOSA
CLIDU20300180501N	13C3-PFBA	41.10	50 - 150	PFBA
CLIDU20300180501N	13C8-PFOSA	42.70	50 - 150	PFOSA

Samples were qualified as follows (based on NFG 2016):

Criteria	Actions[1]	
	Detected	Nondetected
%R > Upper Acceptance Limit	J	UJ
%R >10% but < Lower Acceptance Limit	J	UJ
%R <10%	See below	
<10% and S/N >10:1	J	R
<10% and S/N <10:1	R	R
[1]The PFAS method is performed using isotope dilution technique; therefore, professional judgment was applied and bias codes were not included in data qualification.		

Qualified sample results are summarized in Table 1.

Sample Results/Reporting Issues

If applicable, compounds detected at concentrations less than the level of quantitation (LOQ) but greater than the DL are qualified by the laboratory as estimated (J). This "J" qualifier is retained during data validation.

It should be noted that the overall bias is considered to be indeterminate in cases where cumulative nonconformances do not show a consistent bias or in cases of the presence of conflicting high and low biases.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

ATTACHMENTS

Attachment A: Qualifier Codes and Explanations

Attachment B: Reason Codes and Explanations

Table 1 - Data Validation Summary of Qualified Data

Sample ID	Matrix	Compound	Result	LOD	LOQ	Units	Validation Qualifiers	Validation Reason
CLIDU20100180501N	SO	Perfluorobutanoic acid	0.497	1.38	2.77	ng/g	J	lc
CLIDU20100180501N	SO	Perfluorooctane sulfonamide		1.38	2.77	ng/g	UJ	lc
CLIDU20200180501N	SO	Perfluorobutanoic acid	0.646	1.17	2.33	ng/g	J	lc
CLIDU20200180501N	SO	Perfluorooctane sulfonamide	0.319	1.17	2.33	ng/g	J	lc
CLIDU20300180501N	SO	Perfluorobutanoic acid	0.572	1.22	2.44	ng/g	J	lc
CLIDU20300180501N	SO	Perfluorooctane sulfonamide	0.558	1.22	2.44	ng/g	J	lc

Attachment A

Qualifier Codes and Explanations

Qualifier	Explanation
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J-	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a potential low bias.
J+	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a potential high bias.
JN	The analyte was tentatively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Attachment B

Reason Codes and Explanations

Reason Code	Explanation
be	Equipment blank contamination
bf	Field blank contamination
bl	Laboratory blank contamination
c	Calibration issue
d	Reporting limit raised due to chromatographic interference
fd	Field duplicate RPDs
h	Holding times
i	Internal standard areas (including recovery standards)
k	Estimated Maximum Possible Concentration (EMPC)
l	LCS or OPR recoveries
lc	Extracted internal standard recovery
ld	Laboratory duplicate RPDs
lp	Laboratory control sample/laboratory control sample duplicate RPDs
m	Matrix spike recovery
md	Matrix spike/matrix spike duplicate RPDs
nb	Negative laboratory blank contamination
p	Chemical preservation issue
r	Dual column RPD
q	Quantitation issue
s	Surrogate recovery
su	Ion suppression
t	Temperature preservation issue
x	Percent solids
y	Serial dilution results
z	ICS results

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Memorandum

Project	Lapeer Area PFAS	Page 1
Laboratory	Vista Analytical Laboratory, El Dorado Hills, CA	
Laboratory Work Number	1800937	
Analyses/Method	Per- and Polyfluoroalkyl Substances (PFAS)/Vista Lab SOP No 49, Rev 10	
Validation Level	Limited	
AECOM Project Number	60570365-01	
Prepared by	Paula DiMattei	
Reviewed by	Robert Kennedy	Completed: July 27, 2018

SUMMARY

A limited validation was performed for the samples collected on May 3, 4, 8, and 9, 2018 at the Lapeer site. The samples were submitted to Vista Analytical Laboratory (Vista) in El Dorado Hills, CA for analysis. Vista reported the samples under laboratory work order number 1800937.

Sample IDs
CL1DR0100180508N
CL1DR0200180509N
CL1DR0300180508N
CL1SW0100180509N
CL1SW0200180509N
CL1SW0300180508N
CL1SW0400180508N
CL1SW0500180508N
CL1TMW0118180503N
CL1TMW0405180504N

Data validation activities were conducted with reference to:

- Vista Analytical Laboratory SOP: Preparation and Analysis for the Determination of Per- and Poly-Fluorinated Compounds (SOP No. 49, Revision 10);
- USEPA National Functional Guidelines for Organic Superfund Methods Data Review (January 2017); and
- USEPA National Functional Guidelines for High Resolution Superfund Methods Data Review (April 2016);

In the absence of method-specific information, laboratory quality control (QC) limits and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following review elements:

✓	Data completeness (chain-of-custody (COC)/sample integrity
✗	Holding times and sample preservation
✓	Initial calibration/initial calibration and continuing calibration verification
✓	Laboratory method blanks/field blanks
NA	Matrix spike (MS) and/or matrix spike duplicate (MSD) results
✓	Ongoing precision and recovery (OPR) results
NA	Field duplicate results
✗	Extracted internal standard results
✓	Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. An "NA" indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as reported and may be used for decision making purposes. Select data points were qualified as estimated due to nonconformances of certain QC criteria (see discussion below).

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

Holding Times and Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with the QC acceptance criteria. All samples were initially extracted and analyzed within holding times. However, samples CL1DR0200180509N and CL1TMW0405180504N were re-extracted outside of holding time because perfluoroundecanoic acid and perfluorodecane sulfonic acid were detected in the these samples in the original analysis and the recoveries in the associated OPR exceeded the upper acceptance limits. These results were reported from the re-extraction as they were associated with compliant OPR recoveries. Professional judgment, as stipulated in the NFG, was applied to qualify these results as estimated (J).

Initial Calibration/Initial and Continuing Calibration Verification

Calibration data were reviewed for conformance with the QC acceptance criteria to ensure that:

- the initial calibration (ICAL) percent relative standard deviation (%RSD) or correlation coefficient (r)/coefficient of determination (r^2) method acceptance criteria were met;
- the initial calibration verification standard (ICV) percent recovery (%R) acceptance criteria were met; and
- the continuing calibration verification standard (CCV) frequency and method acceptance criteria were met.

All QC acceptance limits were met or qualification of the data was not required.

Laboratory Method Blanks/Field Blanks

Laboratory method blanks and field blanks are evaluated as to whether there are contaminants detected above the detection limit (DL). Target compounds were not detected in the method blank associated with the sample in this data set. A field blank was not submitted with the sample reported in this data set.

MS/MSD Results

MS/MSD analyses were not performed on a sample in this data set. No data validation actions were taken on this basis.

OPR Results

The OPR percent recoveries were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met or qualification of the data was not required.

Field Duplicate Results

Field duplicate samples were not submitted with this data set. No data validation actions were taken on this basis.

Extracted Internal Standard Results

The extracted internal standard (IS) results were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met except for the extracted IS results summarized below.

Sample ID	Extraction IS	% Recovery	QC Limits	Associated Compounds
CL1DR0200180509N	13C8PFOSA	41.4	50 – 150	PFOSA
CL1TMW0118180503N	13C8PFOSA	45.2	50 – 150	PFOSA
CL1TMW0405180504N	13C8PFOSA	34.3	50 – 150	PFOSA

Samples were qualified as follows (based on NFG 2016):

Criteria	Actions[1]	
	Detected	Nondetected
%R > Upper Acceptance Limit	J	UJ
%R >10% but < Lower Acceptance Limit	J	UJ
%R <10%	See below	

Criteria	Actions[1]	
	Detected	Nondetected
<10% and S/N >10:1	J	R
<10% and S/N <10:1	R	R
[1]The PFAS method is performed using isotope dilution technique; therefore, professional judgment was applied and bias codes were not included in data qualification.		

Qualified sample results are summarized in Table 1.

Sample Results/Reporting Issues

If applicable, compounds detected at concentrations less than the level of quantitation (LOQ) but greater than the DL are qualified by the laboratory as estimated (J). This "J" qualifier is retained during data validation.

It should be noted that the overall bias is considered to be indeterminate in cases where cumulative nonconformances do not show a consistent bias or in cases of the presence of conflicting high and low biases.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

ATTACHMENTS

Attachment A: Qualifier Codes and Explanations

Attachment B: Reason Codes and Explanations

Table 1 - Data Validation Summary of Qualified Data

Sample ID	Matrix	Compound	Result	LOD	LOQ	Units	Validation Qualifiers	Validation Reason
CL1DR0200180509N	WG	Perfluorooctane sulfonamide		2.51	4.01	ng/l	UJ	lc
CL1DR0200180509N	WG	Perfluoroundecanoic acid	2.41	2.49	3.98	ng/l	J	h
CL1DR0200180509N	WG	Perfluorodecanesulfonic acid	1.17	2.49	3.98	ng/l	J	h
CL1TMW0118180503N	WG	Perfluorooctane sulfonamide		2.47	3.96	ng/l	UJ	lc
CL1TMW0405180504N	WG	Perfluorooctane sulfonamide	12.1	2.47	3.96	ng/l	J	lc
CL1TMW0405180504N	WG	Perfluoroundecanoic acid	10.0	2.45	3.93	ng/l	J	h
CL1TMW0405180504N	WG	Perfluorodecanesulfonic acid	2.03	2.45	3.93	ng/l	J	h

Attachment A

Qualifier Codes and Explanations

Qualifier	Explanation
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J-	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a potential low bias.
J+	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a potential high bias.
JN	The analyte was tentatively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Attachment B

Reason Codes and Explanations

Reason Code	Explanation
be	Equipment blank contamination
bf	Field blank contamination
bl	Laboratory blank contamination
c	Calibration issue
d	Reporting limit raised due to chromatographic interference
fd	Field duplicate RPDs
h	Holding times
i	Internal standard areas (including recovery standards)
k	Estimated Maximum Possible Concentration (EMPC)
l	LCS or OPR recoveries
lc	Extracted internal standard recovery
ld	Laboratory duplicate RPDs
lp	Laboratory control sample/laboratory control sample duplicate RPDs
m	Matrix spike recovery
md	Matrix spike/matrix spike duplicate RPDs
nb	Negative laboratory blank contamination
p	Chemical preservation issue
r	Dual column RPD
q	Quantitation issue
s	Surrogate recovery
su	Ion suppression
t	Temperature preservation issue
x	Percent solids
y	Serial dilution results
z	ICS results

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Memorandum

Project	Lapeer Area PFAS	Page 1
Laboratory	Vista Analytical Laboratory, El Dorado Hills, CA	
Laboratory Work Number	1800896, 1800897, 1800899, 1800933, 1800934, 1800936, and 1800938	
Analyses/Method	Per- and Polyfluoroalkyl Substances (PFAS)/Vista Lab SOP No 49, Rev 10	
Validation Level	Level 1 Plus	
AECOM Project Number	60570365-01	
Prepared by	Waverly Braunstein	
Reviewed by	Robert Kennedy	Completed: August 5, 2018

SUMMARY

A limited validation was performed for the samples collected on April 26 through May 10, 2018 at the Lapeer site. This 'Level 1 Plus' review excluded calibration but included all batch QC elements listed below. The samples were submitted to Vista Analytical Laboratory (Vista) in El Dorado Hills, CA for analysis. Vista reported the samples under laboratory work order numbers 1800896, 1800897, 1800899, 1800933, 1800934, 1800936, and 1800938.

Work Order	Sample IDs	Laboratory ID	Matrix
1800896	SKITMW113180501N	1800896-01	Groundwater
1800896	SKITMW211180501N	1800896-02	Groundwater
1800896	SKITMW308180430N	1800896-03	Groundwater
1800896	SKITMW410180430N	1800896-04	Groundwater
1800896	SKITMW506180430N	1800896-05	Groundwater
1800896	SKITMW606180501N	1800896-06	Groundwater
1800896	EB01-180426	1800896-07	Equipment/field blank
1800896	QC-180426	1800896-08	Equipment/field blank
1800896	EB01-180427	1800896-09	Equipment/field blank
1800896	QC1-180430	1800896-10	Equipment/field blank
1800896	FB1-180430	1800896-11	Equipment/field blank
1800896	EB1-180430	1800896-12	Equipment/field blank
1800896	FB1-180502	1800896-13	Equipment/field blank
1800897	TG1TMW318180502N	1800897-01	Groundwater
1800897	TG1-2-TMW1	1800897-02	Soil
1800897	TG1-2-TMW2	1800897-03	Soil
1800897	TG1-2-TMW4	1800897-04	Soil
1800897	TG1-2-TMW5	1800897-05	Soil
1800897	TG1-2-TMW6	1800897-06	Soil
1800899	SKIDU30300180427N	1800899-01	Soil
1800899	SKIDU30200180427N	1800899-02	Soil
1800899	SKIDU30100180427N	1800899-03	Soil
1800899	SKIDU20100180427N	1800899-04	Soil
1800899	SKIDU20200180427N	1800899-05	Soil
1800899	SKIDU20300180427N	1800899-06	Soil

Work Order	Sample IDs	Laboratory ID	Matrix
1800899	SKIDU10100180427N	1800899-07	Soil
1800899	SKIDU10200180427N	1800899-08	Soil
1800899	SKIDU10300180427N	1800899-09	Soil
1800933	FB1-180503	1800933-01	Equipment/field blank
1800933	FB1-180504	1800933-02	Equipment/field blank
1800933	QC1-180504	1800933-03	Equipment/field blank
1800933	QC1-180509	1800933-04	Equipment/field blank
1800933	FB01-180509	1800933-05	Equipment/field blank
1800933	FB02-180509	1800933-06	Equipment/field blank
1800933	FB03-180509	1800933-07	Equipment/field blank
1800933	FB1-180510	1800933-08	Equipment/field blank
1800934	TG1SW0300180509N	1800934-01	Groundwater
1800934	TG1SW0200180509N	1800934-02	Groundwater
1800934	TG1SW0100180509N	1800934-03	Groundwater
1800936	SK1SW0200180509N	1800936-01	Groundwater
1800936	SK1SW0100180509N	1800936-02	Groundwater
1800936	SK1DR0300180509N	1800936-03	Groundwater
1800936	SK1DR0200180509N	1800936-04	Groundwater
1800936	SK1DR0100180509N	1800936-05	Groundwater
1800936	SK1SW0300180509N	1800936-06	Groundwater
1800936	SK1DR0400180509N	1800936-07	Groundwater
1800936	SK1DR0500180509N	1800936-08	Groundwater
1800938	CL1MW0124180510N	1800938-01	Groundwater
1800938	CL1MW0324180510N	1800938-02	Groundwater
1800938	CL1MW0229180510N	1800938-03	Groundwater
1800938	CL1MW0414180510N	1800938-04	Groundwater
1800896	SKITMW113180501N	1800896-01	Groundwater
1800896	SKITMW211180501N	1800896-02	Groundwater
1800896	SKITMW308180430N	1800896-03	Groundwater

Data validation activities were conducted with reference to:

- Vista Analytical Laboratory SoilP: Preparation and Analysis for the Determination of Per- and Poly-Fluorinated Compounds (SoilP No. 49, Revision 10);
- USEPA National Functional Guidelines for Organic Superfund Methods Data Review (January 2017); and
- USEPA National Functional Guidelines for High Resolution Superfund Methods Data Review (April 2016);

In the absence of method-specific information, laboratory quality control (QC) limits and/or professional judgment were used as appropriate.

REVIEW ELEMENTS

The data were evaluated based on the following review elements:

✓ Data completeness (chain-of-custody (COC)/sample integrity

✓ Holding times and sample preservation
✗ Laboratory method blanks/field blanks
NA Matrix spike (MS) and/or matrix spike duplicate (MSD) results
✗ Ongoing precision and recovery (OPR) results
NA Field duplicate results
✗ Extracted internal standard results
✓ Sample results/reporting issues

The symbol (✓) indicates that no validation qualifiers were applied based on this parameter. An "NA" indicates that the parameter was not included as part of this data set or was not applicable to this validation and therefore not reviewed. The symbol (✗) indicates that a QC nonconformance resulted in the qualification of data. Any QC nonconformance that resulted in the qualification of data is discussed below. In addition, nonconformances or other issues that were noted during validation, but did not result in qualification of data, may be discussed for informational purposes only.

The data appear valid as reported and may be used for decision making purposes. Select data points were negated or qualified as estimated due to nonconformances of certain QC criteria (see discussion below). No data were rejected

RESULTS

Data Completeness (COC)/Sample Integrity

The data package was reviewed and found to meet acceptance criteria for completeness:

- The COCs were reviewed for completeness of information relevant to the samples and requested analyses, and for signatures indicating transfer of sample custody.
- The laboratory sample login sheet(s) were reviewed for issues potentially affecting sample integrity, including the condition of sample containers upon receipt at the laboratory.
- Completeness of analyses was verified by comparing the reported results to the COC requests.

No significant issues were encountered.

Holding Times and Sample Preservation

Sample preservation and preparation/analysis holding times were reviewed for conformance with the QC acceptance criteria.

All samples were initially extracted and analyzed within holding times. The samples tabulated below were re-extracted outside of holding times because 6:2 Fluorotelomer sulfonic acid was detected above the quantitation limit in one or more method blanks.

SampleID
FB1-180502
TG1SW0100180509N
TG1SW0200180509N
TG1SW0300180509N
SK1DR0100180509N
SK1DR0200180509N

SampleID
SK1DR0300180509N
SK1DR0500180509N
SK1SW0100180509N
SK1SW0200180509N
SK1SW0300180509N
CL1MW0124180510N
CL1MW0229180510N
CL1MW0414180510N

Laboratory Method Blanks/Field Blanks

Laboratory method blanks and field blanks are evaluated as to whether there are contaminants detected above the detection limit (DL). Target compounds were not detected in the method blank associated with the sample in this data set. In general, method blanks were free from contamination or the associated samples were re-extracted. There were two exceptions to this resulting in the negation of perfluorooctanoic acid in sample TG1TMW318180502N, and 6:2 fluorotelomer sulfonic acid in sample CL1MW0324180510N.

Multiple field and equipment blanks were submitted with the sample reported in these data sets. The results were not used to qualify data, but were used for informational purposes only. No elevated or systematic contamination issues were noted. The following table summarizes all detected compounds in all field and equipment blanks.

Sample ID	Compound	Result (ng/L)	Quantitation Limit (ng/L)
EB01-180426	Perfluorooctanesulfonic acid	1.59	3.80
EB01-180426	Perfluorooctanoic acid	1.63	3.80
QC1-180504	Perfluoroheptanoic acid	0.432	3.89
QC1-180504	Perfluorohexanesulfonic acid	0.562	3.89
QC1-180504	Perfluorooctanesulfonic acid	0.928	3.89
QC1-180504	Perfluorooctanoic acid	1.13	3.89
FB02-180509	Perfluorooctanesulfonic acid	1.18	3.87

MS/MSD Results

MS/MSD analyses were not performed on a sample in this data set. No data validation actions were taken on this basis.

OPR Results

The OPR percent recoveries were reviewed for conformance with the QC acceptance criteria. All QC acceptance criteria were met or qualification of the data was not required, with the exception of the perfluorooctanesulfonic acid results in samples FB02-180509 and QC1-180504, which were qualified as estimated with a potential high bias due to elevated OPR recoveries.

Field Duplicate Results

Field duplicate samples were not submitted with this data set. No data validation actions were taken on this basis.

Extracted Internal Standard Results

The extracted internal standard (IS) results were reviewed for conformance with the QC acceptance criteria. In general, the recoveries met the acceptance limits. However, there were minor

nonconformances that resulted in qualification of the results as estimated (J/UJ). Details can be found in the validation worksheets.

Sample Results/Reporting Issues

If applicable, compounds detected at concentrations less than the level of quantitation (LOQ) but greater than the DL are qualified by the laboratory as estimated (J). This "J" qualifier is retained during data validation.

It should be noted that the overall bias is considered to be indeterminate in cases where cumulative nonconformances do not show a consistent bias or in cases of the presence of conflicting high and low biases.

QUALIFICATION ACTIONS

Sample results qualified as a result of validation actions are summarized in Table 1. All actions are described above.

ATTACHMENTS

Attachment A: Qualifier Codes and Explanations

Attachment B: Reason Codes and Explanations

Table 1 - Data Validation Summary of Qualified Data

Sample ID	Matrix	Compound	Result	LOD	LOQ	Units	Validation Qualifiers	Validation Reason
EB01-180426	WQ	Perfluorooctane sulfonamide		2.38	3.80	ng/l	UJ	lc
EB01-180427	WQ	Perfluorooctane sulfonamide		2.57	4.11	ng/l	UJ	lc
FB1-180430	WQ	Perfluorooctane sulfonamide		2.37	3.79	ng/l	UJ	lc
FB1-180502	WQ	Perfluorooctanesulfonic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluoroundecanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorooctane sulfonamide		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	4:2 FLUOROTELOMER SULFONIC ACID		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	PERFLUORONONANE SULFONIC ACID		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorotridecanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorotetradecanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	8:2 Fluorotelomer sulfonic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluoroheptanesulfonic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorononanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorobutanesulfonic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluoroheptanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorohexanesulfonic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorobutanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorodecanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorodecanesulfonic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorododecanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorooctanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	EtFOSAA		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluorohexanoic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	PERFLUOROPENTANE SULFONIC ACID		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	6:2 Fluorotelomer sulfonic acid		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	MeFOSAA		2.44	3.91	ng/l	UJ	h
FB1-180502	WQ	Perfluoropentanoic acid		2.44	3.91	ng/l	UJ	h
QC1-180430	WQ	Perfluorooctane sulfonamide		2.38	3.80	ng/l	UJ	lc
QC-180426	WQ	Perfluorooctane sulfonamide		2.41	3.86	ng/l	UJ	lc
SKITMW113180501N	WG	Perfluorooctane sulfonamide		2.39	3.82	ng/l	UJ	lc
SKITMW113180501N	WG	Perfluorobutanesulfonic acid	11.2	2.39	3.82	ng/l	J	lc
SKITMW211180501N	WG	Perfluorobutanesulfonic acid	44.9	2.39	3.82	ng/l	J	lc
SKITMW308180430N	WG	Perfluorooctane sulfonamide		2.53	4.05	ng/l	UJ	lc
SKITMW410180430N	WG	Perfluorooctane sulfonamide		2.41	3.86	ng/l	UJ	lc
SKITMW506180430N	WG	Perfluorobutanesulfonic acid	9.97	2.41	3.86	ng/l	J	lc
TG1TMW318180502N	WG	Perfluorooctanoic acid		3.96	3.96	ng/l	U	bl
TG1-2-TMW1	SO	Perfluorooctane sulfonamide		1.08	2.15	ng/g	UJ	lc
TG1-2-TMW1	SO	Perfluorobutanoic acid		1.08	2.15	ng/g	UJ	lc
TG1-2-TMW2	SO	Perfluorooctane sulfonamide		1.05	2.10	ng/g	UJ	lc
TG1-2-TMW2	SO	Perfluorobutanoic acid		1.05	2.10	ng/g	UJ	lc

Sample ID	Matrix	Compound	Result	LOD	LOQ	Units	Validation Qualifiers	Validation Reason
TG1-2-TMW4	SO	Perfluorooctane sulfonamide		1.05	2.10	ng/g	UJ	lc
TG1-2-TMW5	SO	Perfluorooctane sulfonamide		1.09	2.19	ng/g	UJ	lc
TG1-2-TMW5	SO	Perfluorobutanoic acid		1.09	2.19	ng/g	UJ	lc
TG1-2-TMW6	SO	Perfluorooctane sulfonamide		1.04	2.08	ng/g	UJ	lc
TG1-2-TMW6	SO	Perfluorobutanoic acid		1.04	2.08	ng/g	UJ	lc
FB01-180509	WQ	Perfluorooctane sulfonamide		2.38	3.80	ng/l	UJ	lc
FB02-180509	WQ	Perfluorooctanesulfonic acid	1.18	2.42	3.87	ng/l	J+	l
FB02-180509	WQ	Perfluorooctane sulfonamide		2.42	3.87	ng/l	UJ	lc
FB03-180509	WQ	Perfluorooctane sulfonamide		2.40	3.85	ng/l	UJ	lc
FB1-180503	WQ	Perfluorooctane sulfonamide		2.41	3.86	ng/l	UJ	lc
FB1-180504	WQ	Perfluorooctane sulfonamide		2.45	3.93	ng/l	UJ	lc
FB1-180510	WQ	Perfluorooctane sulfonamide		2.44	3.91	ng/l	UJ	lc
QC1-180504	W	Perfluorooctanesulfonic acid	0.928	2.43	3.89	ng/l	J+	l
QC1-180504	W	Perfluorooctane sulfonamide		2.43	3.89	ng/l	UJ	lc
QC1-180509	W	Perfluorooctane sulfonamide		2.43	3.89	ng/l	UJ	lc
TG1SW0100180509N	WG	Perfluorooctanesulfonic acid	1.64	2.63	4.20	ng/l	J+	l
TG1SW0100180509N	WG	Perfluorotridecanoic acid		2.63	4.20	ng/l	UJ	lc
TG1SW0100180509N	WG	Perfluorotetradecanoic acid		2.63	4.20	ng/l	UJ	lc
TG1SW0100180509N	WG	6:2 Fluorotelomer sulfonic acid		2.48	3.97	ng/l	UJ	h
TG1SW0200180509N	WG	EtFOSAA		2.48	3.96	ng/l	UJ	lc
TG1SW0200180509N	WG	MeFOSAA		2.48	3.96	ng/l	UJ	lc
TG1SW0200180509N	WG	6:2 Fluorotelomer sulfonic acid		2.50	4.00	ng/l	UJ	h
TG1SW0300180509N	WG	Perfluorooctane sulfonamide		2.49	3.99	ng/l	UJ	lc
TG1SW0300180509N	WG	Perfluorotridecanoic acid		2.49	3.99	ng/l	UJ	lc
TG1SW0300180509N	WG	Perfluorotetradecanoic acid		2.49	3.99	ng/l	UJ	lc
TG1SW0300180509N	WG	EtFOSAA		2.49	3.99	ng/l	UJ	lc
TG1SW0300180509N	WG	MeFOSAA		2.49	3.99	ng/l	UJ	lc
TG1SW0300180509N	WG	6:2 Fluorotelomer sulfonic acid	9.90	2.53	4.05	ng/l	J-	h
SK1DR0100180509N	WG	6:2 Fluorotelomer sulfonic acid	4.93	2.55	4.08	ng/l	J	h
SK1DR0200180509N	WG	6:2 Fluorotelomer sulfonic acid	6.28	2.45	3.92	ng/l	J	h
SK1DR0300180509N	WG	6:2 Fluorotelomer sulfonic acid		2.56	4.10	ng/l	UJ	h
SK1DR0500180509N	WG	6:2 Fluorotelomer sulfonic acid	10.6	2.48	3.97	ng/l	J	h
SK1SW0100180509N	WG	6:2 Fluorotelomer sulfonic acid		2.47	3.95	ng/l	UJ	h
SK1SW0200180509N	WG	6:2 Fluorotelomer sulfonic acid		2.57	4.12	ng/l	UJ	h
SK1SW0300180509N	WG	6:2 Fluorotelomer sulfonic acid		2.48	3.97	ng/l	UJ	h
CL1MW0124180510N	WG	6:2 Fluorotelomer sulfonic acid		2.38	3.81	ng/l	UJ	h
CL1MW0229180510N	WG	6:2 Fluorotelomer sulfonic acid		2.50	4.00	ng/l	UJ	h
CL1MW0324180510N	WG	6:2 Fluorotelomer sulfonic acid		3.96	3.96	ng/l	U	bl
CL1MW0414180510N	WG	6:2 Fluorotelomer sulfonic acid	4.03	2.48	3.97	ng/l	J	h

Attachment A

Qualifier Codes and Explanations

Qualifier	Explanation
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J-	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a potential low bias.
J+	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a potential high bias.
JN	The analyte was tentatively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Attachment B

Reason Codes and Explanations

Reason Code	Explanation
be	Equipment blank contamination
bf	Field blank contamination
bl	Laboratory blank contamination
c	Calibration issue
d	Reporting limit raised due to chromatographic interference
fd	Field duplicate RPDs
h	Holding times
i	Internal standard areas (including recovery standards)
k	Estimated Maximum Possible Concentration (EMPC)
l	LCS or OPR recoveries
lc	Extracted internal standard recovery
ld	Laboratory duplicate RPDs
lp	Laboratory control sample/laboratory control sample duplicate RPDs
m	Matrix spike recovery
md	Matrix spike/matrix spike duplicate RPDs
nb	Negative laboratory blank contamination
p	Chemical preservation issue
r	Dual column RPD
q	Quantitation issue
s	Surrogate recovery
su	Ion suppression
t	Temperature preservation issue
x	Percent solids
y	Serial dilution results
z	ICS results

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