United States Coast Guard

Combined Focused Preliminary Assessment/Site Investigation Report

United States Coast Guard
Air Station Traverse City
Traverse City, Michigan

April 9, 2021

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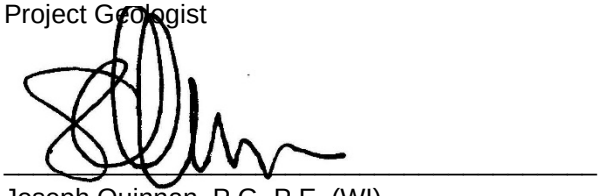

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Acronyms and Abbreviations

µg/kg	micrograms per kilogram
AFFF	Aqueous Film Forming Foam
Arcadis	Arcadis of Michigan, LLC
ASTs	above ground storage tanks
ASTC	Air Station Traverse City
bgs	below ground surface
CCA	Cherry Capital Airport
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DoD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DW	drinking water
EGLE	Michigan Department of Environment, Great Lakes, and Energy
ELAP	Environmental Laboratory Accreditation Program
FSS	Fire Suppression System
GSI	Groundwater Surface Water Interface
HASP	Health and Safety Plan
IATA	International Air Transport Association
msl	mean sea level
ng/L	nanograms per liter
OWS	oil/water separator
PA	Preliminary Assessment
Pace	Pace Analytical Laboratories of West Columbia, South Carolina
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonic acid
PID	photoionization detector
QSM	Quality Systems Manual
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control

SI	Site Investigation
site	United States Coast Guard Air Station Traverse City
SVOCs	semi-volatile organic compounds
TCE	trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VAP	vertical aquifer profiling
VOCs	volatile organic compounds

1 Background

In September 2020, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) completed a groundwater investigation along Parsons Road, downgradient of the United States Coast Guard (USCG) Air Station Traverse City (ASTC; the site) and the Cherry Capital Airport (CCA), and upgradient of private drinking water wells located north of Parsons Road (EGLE 2020a). The EGLE groundwater investigation consisted of ten vertical aquifer profile (VAP) borings to depths ranging from 34 to 54 feet below ground surface (bgs) with up to five groundwater sampling intervals per boring. Concentrations of either perfluorooctanoic acid (PFOA) or perfluorooctane sulfonic acid (PFOS) exceeded EGLE Part 201 Drinking Water (DW) Criteria or Groundwater Surface Water Interface (GSI) Criteria at all 10 locations. The source of the PFOA/PFOS detected along Parsons Road has not been confirmed. The potential sources of the per- and polyfluoroalkyl substances (PFAS) include historical releases of Aqueous Film Forming Foam (AFFF) at CCA and USCG. Based on the findings by EGLE, USCG initiated a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) based, PFAS focused Preliminary Assessment/Site Investigation (PA/SI) at the USCG property.

1.1 Site Setting

The site occupies approximately 16 acres in Grand Traverse County, Michigan and is located approximately one-half mile from the southern shore of East Grand Traverse Bay (**Figure 1-1**). It is bordered by the CCA to the south and west, mixed commercial and industrial properties to the east, and athletic fields to the north. It consists of several storage buildings, a multi-use building, a public works building, and one hangar (**Figure 1-2**). The hangar is used for helicopter storage and maintenance and is the primary building of interest. The hangar is equipped with an AFFF Fire Suppression System (FSS) supplied with AFFF stored in two 1,000-gallon above ground storage tanks (ASTs) in the Fire Suppression Pump House.

1.1.1 Regional Geology

The Traverse City region is geologically composed of an array of glacial and lacustrine deposits overlying shale bedrock of Late-Devonian to Early-Mississippian age. Based on lithology observed during this site investigation as well as previous subsurface investigations, overburden stratigraphy in the area of the site consists primarily of lacustrine and glacial outwash sand and gravel deposits to a depth of approximately 20 to 60 feet bgs underlain by a lacustrine clay. Lacustrine deposits extend from the bay to the southern edge of CCA. South of CCA, the geology consists of outwash deposits and glacial till (United States Geological Survey [USGS] 1985). The lacustrine sands thicken toward the east arm of Grand Traverse Bay. The bedrock surface exhibits significant relief and ranges from 200 feet below mean sea level (msl) to 600 feet above msl within Grand Traverse County (USGS 1990). Depth to bedrock in the northeast quarter of East Bay Township, where the site is located, is estimated to range from 200 to 700 feet bgs.

1.1.2 Site Topography

The site is relatively flat with ground surface elevations ranging from 611 feet above msl in the southeastern portion of the site to 616 feet above msl in the southwestern portion.

1.1.3 Site Hydrogeology

The site hydrogeology has been characterized by the installation of soil borings shown on **Figure 1-2**. Soil boring logs are provided in **Appendix A**. The following sections summarize the subsurface geology, depth to groundwater and flow, and surface water features.

1.1.3.1 Subsurface Geology

The site-specific geology consists of fine- to coarse-grained sand overlaying a layer of clay. A gravel layer was encountered on the east side of the property.

Geologic cross sections were prepared for the site based on the soil boring logs. **Figure 2-1** and **Figure 2-2** present the geologic cross sections A-A' (northwest/southeast) and B-B' (southwest/northeast) prepared for the site, respectively. These cross sections depict the contacts identified in soil borings between the sand and the clay. The USGS completed a 1985 study of groundwater contamination in East Bay Township focusing on the USCG property and the downgradient area. The USGS study suggests that the clay is a continuous impermeable unit at least 100-feet thick, extending from the southern boundary of CCA to East Traverse Bay (USGS 1985).

1.1.3.2 Groundwater

Groundwater occurs throughout the lacustrine sand and gravel deposits underlying the site. The lacustrine sands and gravels underlying the site comprise an unconfined aquifer that flows toward Grand Traverse Bay at an estimated velocity of 5 to 6 feet per day (USGS 1985). Hydraulic conductivities within the unconfined aquifer range from 85 to 150 feet per day (USGS 1985). Depth to water ranges from approximately 10 to 15 feet bgs at the site. Several private household water supply wells are screened within the unconfined aquifer to the north of Parsons Road. Beyond the extent of the lacustrine deposits, confined aquifers are present in outwash deposits located within glacial tills to the south of CCA, and public Type I and II water supply wells located upgradient and side gradient to the site are screened within the confined sands.

1.1.3.3 Surface Water

The surface water features at the site include a retention pond located east of the hangar, and storm drains in the tarmac south of the hangar. The storm lines drain water from the roof drains and the tarmac to the unlined retention pond where it seeps into the ground. Mitchell Creek is located approximately 7,000 feet to the south and 5,000 feet east of the site. Grand Traverse Bay is located approximately 4,000 feet northeast of the site, and Boardman Lake is approximately 8,000 feet to the west.

1.2 Site History

The site is located on property operated as an air station by the United States Navy from 1942 until 1945, when the USCG took possession of the land and all associated buildings.

Many of the former buildings, including five barracks, a dispensary, a bachelor officer quarters, and a mess hall were razed during the 1950s and 1960s. The northern 27 acres of the property, including the portion of the site formerly consisting of the five barracks and mess hall, was transferred to the Traverse City Area Public Schools by congressional legislation in February 1997. The remaining 16 acres of the site are operated by the USCG as a helicopter air station.

1.2.1 Previous Remedial Investigations/Activities

The site was part of the Avenue E Groundwater Contamination Superfund Site, which closed in 2006 and was associated with releases of aviation gasoline and jet fuel. Between 1983 and 1999, USCG implemented remediation actions leading the site to closure (United States Environmental Protection Agency [USEPA] 2006). In 2004, trichloroethylene (TCE) was also detected in monitoring wells downgradient of the site; however, the source could not be located (USEPA 2006).

In July 2015, approximately 5 to 15 gallons of ANSULITE 6%, a fire-fighting foam effective on hydrocarbon fuels, was discharged from the deluge system in the east end of the hangar for several minutes. Reportedly, all agent was captured in the hangar's oily waste system and discharged:

- to the Traverse City Wastewater Plant via city sanitation lines (USCG 2020); and
- potentially to the retention pond located roughly 100 feet from the east end of the hangar building.

EGLE conducted a groundwater investigation downgradient of the site (EGLE 2020) and confirmed the presence of PFAS, including detections of PFOS and PFOA, in groundwater exceeding Part 201 DW or GSI criteria.

2 Preliminary Assessment

Arcadis of Michigan, LLC (Arcadis) completed a PFAS focused PA for the site to determine current and historical storage, usage, and potential discharge of PFAS-containing AFFF or other PFAS-containing substances.

2.1 Summary of Preliminary Assessment Activities

A PA site visit was performed to conduct site reconnaissance that included the hangar area, AFFF storage areas, fire suppression pump house, and potential release and surrounding areas. Arcadis also reviewed available as-builts and mechanical drawings provided by the facility during site reconnaissance.

2.1.1 Site Activities

The PA site visit was completed on December 11 and 14, 2020 and included the following tasks:

- Interviews with current personnel familiar with firefighting and maintenance operations at the site including:
  - Current Environmental Protection Specialist, Terry Tice (formerly the Active-Duty Facilities Engineer)
    - Time on installation: 4.5 years
  - Current Facilities Chief and Fire Marshal, Chief Petty Officer Mike Ackiss
    - Time on installation 1.5 years
- Visual site inspection of potential areas for PFAS storage or release
- Review of available as-builts and mechanical drawings provided by the facility

2.1.2 Summary of Preliminary Assessment Interviews

The Environmental Protection Specialist indicated that AFFF is only used in the fire suppression system for Building OH-1 and the fire suppression pump house is the only area where AFFF is stored. A paved area toward the west side of the site was indicated as the area where the adjacent CCA and Traverse City Fire Department conduct annual fire training exercises; however, the site Facilities Chief and Fire Marshal stated that they do not use AFFF during the training events.

According to the Facilities Chief and Fire Marshal, no testing of the AFFF system has been conducted during his 1.5-year tenure, due to a USCG directive prohibiting the discharge of AFFF for non-emergencies.

No firsthand accounts of the July 2015 hangar deluge system activation were available at the time of the site visit; however, both the Environmental Protection Specialist and Facilities Chief and Fire Marshal provided second-hand accounts of the incident, as well as photos showing the results of the system activation (provided as **Appendix B**). According to both personnel, the easternmost deluge system zone (one of four) was inadvertently activated by a contractor during maintenance. The three pumps that supply high pressure fire suppression water to the system were locked out and did not activate. Municipal water supply at a relatively low pressure and volume caused residual AFFF to discharge from sprinklers in the hangar. Water pressure was insufficient to produce a spray from the sprinkler nozzles, causing AFFF and water to discharge into an elevated office area as well as the main floor of the hangar. According to the Environmental Protection Specialist, the water pressure was not sufficient to activate the mixing valve and allow fresh AFFF concentrate into the system. The fire suppression

system was activated for approximately one minute, releasing approximately 5 to 15 gallons of AFFF. All liquids released during the incident were captured by the trench drains in the hangar, which discharge to the oily waste treatment system before discharging to the sanitary sewer.

2.1.3 Visual Site Inspection and Review of Site Drawings

Photographs from the visual site inspection are included as **Appendix C** and site drawings obtained during the PA site visit are included as **Appendix D**. The visual site inspection combined with a review of site drawings identified the following:

- AFFF is stored in two 1,000-gallon ASTs located in the pump house (**Appendix C – Photographs 3 through 5**). Both AFFF ASTs are located on raised concrete pads within a secondary containment structure. Fire suppression water is supplied via three diesel-powered pumps. AFFF is mixed into the fire suppression water via a pressure-activated mixing valve and distributed to the deluge system in the hangar. The AFFF tanks, secondary containment, and fire suppression piping appeared to be in good condition with no evidence of release at the time of inspection (**Appendix C – Photographs 6 through 8, and 17 through 20**).
- The concrete floors of the pump house and hangar appear to be in good condition, except for peeling epoxy at the east end of the hangar (**Appendix C – Photographs 15 and 16**).
- The concrete paved area south of the hangar (**Appendix C – Photographs 22 through 24**) is gently sloped toward two catch basins that drain to a small retention pond east of OH-1. The concrete pavement appears to be in good condition, although it contains numerous expansion joints.
- Construction plans show an overflow pipe from the hangar drainage system that extends from the collection structure in the hangar (**Appendix C – Photograph 10**) to the easternmost catch basin south of the hangar. During full activation of the hangar deluge system, this structure is intended to divert water and foam to the retention pond to avoid overfilling an oil/water separator (OWS).
- Standing water was present in the retention pond (**Appendix C – Photograph 1**) at a similar elevation as the groundwater table. A 1978 as-built construction drawing indicates that the bottom of the pond was lined with six inches of gravel to facilitate drainage (**Appendix D – Site Civil Plan**) and that the remaining basin area was sodded.
- Two rectangular areas of asphalt exhibit evidence of heat damage (**Appendix C – Photographs 26 and 27**) near the west side of the site (the general area where annual airport fire training takes place).

2.2 Preliminary Assessment Results and Discussion

2.2.1 AFFF Use and Storage at Air Station Traverse City

According to the site Environmental Protection Specialist, AFFF historically and currently is stored in two 1,000-gallon ASTs located in the Pump House. When activated, AFFF is pumped from the storage tanks to a deluge system where it is mixed with municipal water. The AFFF/water mixture is then pumped to the fire suppression deluge system located in the hangar, where it is dispersed through an overhead fire sprinkler system. The AFFF/water mixture flows toward catch basins located inside the hangar, which direct the mixture to below-grade piping that empties to the OWS and, if the volume exceeds the influent capacity of the OWS, into an on-site retention pond. Known releases of AFFF from the FSS are limited to the 2015 partial FSS activation, and annual

testing of the FSS AFFF concentrations. Annual testing has involved discharge of a small volume of AFFF via a hose located in the hangar. Discharge for testing took place on the tarmac south of the hangar and was used to verify the proper proportioning of AFFF concentrate to water. Annual AFFF discharge for testing purposes was discontinued in 2018. **Figure 3-1** shows potential on-site AFFF sources.

2.2.2 Off-Site PFAS Source Areas

CCA conducted a soil and groundwater investigation to identify potential sources of PFAS on their property (Gosling Czubak Engineering Sciences, Inc. 2020). The investigation identified four potential source areas within the airport boundaries (**Figure 3-2**). One area is located northwest of the Air Station, near the runway at the taxi strip. Another area is located upgradient to the west of the Air Station property, bordering at the site. This is the area were CCA conducted fire drills. A third area is approximately 400 feet upgradient to the south of the site. The fourth potential release area on the CCA property is located approximately 1,800 feet upgradient to the south (**Figure 3-2**).

The potential for other off-site sources of PFAS will be further assessed during the next step of the investigation.

3 Site Investigation Activities

A focused SI was completed concurrently with the PA, based on results of the 2020 EGLE Parsons Road Vertical Aquifer Sampling Groundwater Investigation (EGLE 2020), which suggested PFAS sources in the vicinity of the site as well as existing knowledge of AFFF usage at the site. The SI included sampling and analysis of soil, sediment, surface water, and groundwater for PFAS with the following objectives:

- Determine whether historical AFFF usage and releases at the site have impacted soil and groundwater.
- Evaluate groundwater downgradient of the potential PFAS source areas to determine whether on-site releases are contributing to concentrations of PFAS detected in groundwater along Parsons Road.
- Evaluate groundwater along the upgradient site boundaries to assess the potential for on-site migration of PFAS-impacted groundwater.

Arcadis developed a site-specific Health and Safety Plan (HASP) before mobilization to the site that established health and safety procedures to minimize potential risk to Arcadis and/or subcontractors implementing the SI activities.

Ground Penetrating Radar Systems Inc. of Michigan completed a private utility locate on December 11, 2020 to clear direct-push boring locations of underground utilities/obstructions. Soil borings were advanced by Cascade Remediation Services of Flint, Michigan.

SI activities were completed from December 14 to 23, 2020 and December 29 to 30, 2020. Sample locations and results are shown on **Figures 4** and **5**. All SI activities were completed in accordance with the Quality Assurance Project Plan (QAPP) prepared for the SI (Arcadis 2021), which included the HASP, and was approved by USCG on January 21, 2021.

3.1 Subsurface Investigation

The subsurface investigation was conducted using soil sampling and VAP methods. Direct-push technology was utilized to advance a total of 12 soil borings (**Figure 1-2**) to log the geology at the selected locations and to identify intervals to collect groundwater samples using VAP methods. The borings were advanced to the top of the lacustrine clay underlying the sand and gravel aquifer. The soil profiles were continuously logged by the Arcadis field geologist, and soil core samples were inspected and screened for potential volatile organic co-contaminants using a photoionization detector (PID). Groundwater samples were collected from a second boring next to the initial boring.

3.1.1 Groundwater Sampling Methodology

In general, VAP groundwater samples were collected at nominal 10-foot intervals beginning at the water table using direct-push screen point tooling with a 48-inch retractable screen (i.e., screen-point sampler). Top-down sampling methods were used to ensure that samples were representative and to prevent cross-contamination between intervals. Between sampling intervals, the sample tooling was pulled out of the formation, decontaminated at the surface, and then driven to the next sample interval. A peristaltic pump and PFAS-free tubing were used to purge the sample interval until it was relatively free of fine-grained sediment, or for a maximum of 30 minutes, and then a sample was collected into laboratory-provided containers.

The sampling intervals were selected based on stratigraphy described in the soil borings. One groundwater sample was collected from each of the two suspected source areas (VAP-01 and VAP-02) and up to five samples were collected from the remaining borings (**Figure 4**). The number of samples was based on the depth to the underlying till. All groundwater samples were collected using a peristaltic pump and disposable tubing in accordance with *Arcadis Technical Guidance Instructions PFAS Field Sampling Guidance_Rev4* as outlined in the QAPP (Arcadis 2021).

3.1.2 Soil Sampling Methodology

Soil samples were collected from two areas with potential releases of AFFF (**Figure 5**). Three samples (at depths of 4.5 to 5.0, 6.5 to 7.5, and 8.5 to 9.0 feet bgs) were collected from boring VAP-01 advanced next to the retention pond that receives water from the storm drains. Three soil samples (at depths of 1.0 to 1.5, 6.5 to 7.0, and 11.5 to 12.0 feet bgs) were collected from boring VAP-02 next to the storm sewer system on the tarmac south of the hangar. The samples were collected from the Geoprobe® liner and placed in laboratory-provided sampling containers. All soil samples were collected accordance with Arcadis Technical Guidance Instructions *PFAS Field Sampling Guidance_Rev4* as outlined in the QAPP (Arcadis 2021). Soil boring logs are attached in **Appendix A**.

3.2 Surface Water and Sediment Sampling

Based on the potential for the retention pond to capture AFFF released from the hangar deluge system and AFFF released on the tarmac during historical testing, a surface water sample and sediment sample were collected from the retention pond.

The surface water sample was collected by submerging laboratory-provided sampling containers below the surface of the water and allowing them to fill. The sediment sample was collected below the outfall to the pond using a clean acetate sampling liner. The liner was advanced approximately 6 inches into the sediment. All sediment contained in the liner was then homogenized in a clean stainless steel mixing container and used to fill a laboratory-provided sample container. Surface water and sediment sample locations are depicted on **Figures 4** and **5**, respectively.

3.3 Analytical Methods

All groundwater, surface water, sediment, and soil samples were submitted to Pace Analytical of West Columbia, South Carolina (Pace), a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) certified laboratory. All samples were analyzed for the 28 PFAS included in the EGLE PFAS Minimum Recommended Analyte List (EGLE 2019) using Modified USEPA Method 537 consistent with DoD Quality Systems Manual (QSM) version 5.3 Table B-15 (DoD 2019).

Laboratory reports and data validation reports are attached in **Appendix E**.

3.4 Investigation-Derived Waste

All soil and liquid waste, including purge and decontamination water, was stored on-site in sealed, 55-gallon drums and analyzed before disposal. Soil and liquid waste samples were analyzed for the following:

- PFAS in accordance with Modified USEPA Method 537 consistent with DoD QSM version 5.3 Table B-15.

- Toxicity Characteristic Leaching Procedure (TCLP) volatile organic compounds (VOCs) in accordance with USEPA Method 8260.
- TCLP semi-volatile organic compounds (SVOCs) in accordance with USEPA Method 8270.
- TCLP metals including mercury in accordance with USEPA Methods 6010 and 7470.
- Ignitability and pH in accordance with USEPA Methods 1030 and 9045.

All laboratory reports are attached in **Appendix E**.

4 Quality Assurance/Quality Control

4.1 Sample QA/QC

Quality assurance/quality control (QA/QC) samples associated with SI activities included field equipment blanks, field duplicates, matrix spikes, and matrix spike duplicates. All QA/QC samples were prepared and collected according to the protocols specified in the QAPP (Arcadis 2021) and were submitted to Pace for analysis. The analytical results from all QA/QC samples are provided in **Tables 1** and **2**; laboratory reports are attached in **Appendix E**.

4.2 Chain-of-Custody

Chain-of-custody forms identifying each sample contained in a shipping container were completed and signed by Arcadis field sampling personnel, sealed in a plastic bag, and taped to the inside of each cooler lid. One chain-of-custody form was retained for the field records; the remaining copies were placed inside the plastic bag. Samples were shipped to Pace using an overnight carrier service, with custody seals in place on the outside of the cooler. All samples were handled and shipped in accordance with current Department of Transportation (DOT) and International Air Transport Association (IATA) guidelines.

4.3 Field Documentation

Site activities were documented on daily logs. Included in the daily documentation were:

- Procedures for sampling and other routine activities associated with the site activities.
- Logging of soil borings, field screening results, and analytical samples collected.
- Personnel working at the site.
- Chronological log of site activities.
- Photo documentation as part of the daily logs.

A copy of field notes for the SI activities is provided in **Appendix F**.

4.4 Data Validation

Laboratory analytical reports were reviewed and validated in accordance with the QAPP (Arcadis 2021), using DoD QSM 5.3 and USEPA's National Functional Guidelines (USEPA 1999, 2004, 2017a, 2017b) as appropriate for data validation, laboratory control limits, and professional judgment. The laboratory's overall system performance and data quality were acceptable and within the guidelines specified in the analytical method. Data validation reports are included in **Appendix E**.

5 Results and Discussion

The following section summarizes the groundwater and soil analytical results for the SI. Solely to maintain consistency for comparison purposes with CCA and EGLE, groundwater and surface water data were compared to EGLE Part 201, Table 1, updated December 2020, DW and GSI criteria (EGLE 2020b). Soil and sediment results were compared to EGLE Part 201 Table 3, updated June 2018, GSI protection criteria (EGLE 2018). PFAS compounds are not regulated at the federal level; however, the USEPA has provided a health advisory for PFOA and PFOS in drinking water at 70 nanograms per liter (ng/L).

Validated groundwater and surface water analytical data are summarized in **Table 1** and on **Figure 4**. Soil and sediment analytical results are summarized in **Table 2** and on **Figure 5**. The certified laboratory analytical reports and data validation reports are included in **Appendix E**.

5.1 Groundwater and Surface Water Analytical Results

A total of 47 groundwater samples, including QA/QC samples, were collected from the 12 soil borings advanced at the site and one surface water sample (SW-01) was collected from the retention pond (**Figure 4** and **Table 1**).

Groundwater samples collected from 11 of the 12 boring locations (VAP-01 through VAP-06 and VAP-08 through VAP-12) exceeded the DW and/or GSI criteria for PFAS compounds regulated by EGLE. PFAS compounds were detected in VAP-07 but did not exceed their respective DW or GSI criteria.

PFAS at various concentrations were detected in all sampling intervals. **Exhibit 1** summarizes the VAP locations exceeding DW criteria.

Exhibit 1. Sample Locations Exceeding EGLE Drinking Water Criteria

	PFHxS	PFNA	PFOS	PFOA
VAP location exceeding criteria at one or more sampling intervals	VAP-02, VAP-03, VAP-04, VAP-05, VAP-06	VAP-03, VAP-08, VAP-10, VAP-11, VAP-12	VAP-01, VAP-02, VAP-03, VAP-04, VAP-05, VAP-08	VAP-02, VAP-03, VAP-04, VAP-05, VAP-06, VAP-08, VAP-09 VAP-10, VAP-11, VAP-12

PFOS and PFOA were the only compounds exceeding criteria in the surface water sample.

PFOA and PFNA were identified in samples collected from upgradient VAP borings VAP-08 through VAP-12 along the western and southern property boundary at the same order of magnitude or higher as in borings VAP-05 through VAP-07, downgradient from the suspected on-site source areas.

PFOS concentrations above criteria entering the site were detected only in VAP-08. On-site PFOS concentrations above criteria were found in samples collected from VAP-01 and VAP-02, located in the suspected on-site source areas, and in samples from downgradient borings VAP-03, VAP-04, VAP-05, located along the eastern property boundary.

5.2 Soil and Sediment Analytical Results

A total of seven soil samples, including QA/QC samples, were collected from VAP-01 and VAP-02 and one sediment sample (SD-01) was collected from the retention pond (**Figure 5** and **Table 2**).

PFOS detected in soil samples collected near the retention pond (VAP-01) and beneath the tarmac (VAP-02) exceeded EGLE criteria for GSI protection criterion (0.24 micrograms per kilogram [µg/kg]) and GSI protection for surface water used as drinking water source of 0.22 µg/kg. The concentration in soil ranged from non-detect to 0.65 µg/kg in VAP-01 and from non-detect to 3.3 µg/kg in VAP-02. PFOA was not detected in any of the soil samples.

The sediment sample collected from the retention pond (SD-01) contained 7.0 µg/kg of PFOS, but no PFOA (**Table 2**).

5.3 Data Gaps and Proposed Path Forward

The lateral extent of the PFAS impacts to groundwater has not been fully delineated during this SI. Groundwater samples from VAP borings downgradient from the potential on-site source areas along the eastern property boundary are impacted with PFAS exceeding EGLE drinking water and GSI criteria. The downgradient extent of the plume in the northern portion of the site has not been defined. PFAS impacts are believed to be bounded vertically by the clay unit underlying the surficial aquifer.

An evaluation of the storm and sanitary sewer system drawings during the PA indicated that the OWS and associated sewer infrastructure receive water from the hangar drains and could act as a migration pathway for PFAS. PFAS impacts to the sewers could also be caused by infiltrating groundwater. Further evaluation of the sewer system is needed to evaluate potential impacts. The soils and groundwater adjacent to the OWS were not assessed as part of this SI and constitute a potential secondary release area for PFAS. The on-site retention pond will be further evaluated to determine if it was lined.

Based on the information reviewed during the PA as well as the SI results, a supplemental SI is recommended to address data gaps in the conceptual site model and define the nature and extent of PFAS detected in soils and groundwater at the site.

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Tables

Table 1
Groundwater and Surface Water Analytical Results
USCG Air Station Traverse City,
Traverse City, Michigan

Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	SW-01 12/18/2020 ASTC-SW01-(121820)	VAP-01 8.5 - 12.5 bgs 12/30/2020 ASTC-VAP-01-GW(8.5-12.5)-(123020)	VAP-02 11 - 15 bgs 12/30/2020 ASTC-VAP-02-GW(11-15)-(123020)	VAP-03 9 - 13 bgs 12/15/2020 ASTC-VAP-03-GW(9-13)-(121520)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 11 UJ-	< 7.8 U	< 7.5 U	< 7.5 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 11 UJ-	< 7.8 U	< 7.5 U	< 7.5 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 11 UJ-	< 7.8 U	< 7.5 U	< 7.5 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 11 UJ-	< 7.8 U	< 7.5 U	< 7.5 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	140 J-	25	34	< 7.2 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 11 UJ-	2.8 J	< 7.5 U	< 7.5 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 11 UJ-	< 7.8 U	< 7.5 U	< 7.5 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 11 UJ-	< 7.8 U	< 7.5 U	< 7.5 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 11 UJ-	< 7.8 U	< 7.5 U	< 7.5 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	8.0 J-	18	13	6.1
Perfluorobutanoic acid (PFBA)	NC	NC	NA	65 J-	11	96	17
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 5.5 UJ-	22	2.8 J	< 3.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 5.5 UJ-	1.2 J	2.3 J	< 3.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 5.5 UJ-	< 3.9 U	< 3.8 U	< 3.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	1.5 J-	< 3.9 U	9.8	< 3.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	41 J-	5.2	59	9.3
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	34 J-	11	130	48
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	120 J-	23	210	16
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 5.5 UJ-	< 3.9 U	< 3.8 U	< 3.8 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	< 5.5 UJ-	1.3 J	3.4 J	< 3.8 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	3.5 J-	130	3.7 J	< 3.8 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	66 J-	57	1,400 DJ	12
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	8.2 J-	2.9 J	14	3.6 J
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	2.6 J-	1.3 J	4.7	< 3.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	190 J-	25	380	26
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 5.5 UJ-	< 3.9 U	< 3.8 U	< 3.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 5.5 UJ-	< 3.9 U	< 3.8 U	< 3.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 5.5 UJ-	< 3.9 U	< 3.8 U	< 3.8 U

See Notes on last page.

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USCG Air Station Traverse City,
Traverse City, Michigan

Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-03 12/15/2020 ASTC-VAP-DUP02-(121520)	VAP-03 18 - 22 bgs 12/15/2020 ASTC-VAP-03-GW(18-22)-(121520)	VAP-03 30 - 34 bgs 12/15/2020 ASTC-VAP-03-GW(30-34)-(121520)	VAP-03 46 - 50 bgs 12/15/2020 ASTC-VAP-03-GW(46-50)-(121520)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.4 U	< 7.4 U	< 7.1 U	< 7.3 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.4 U	< 7.4 U	< 7.1 U	< 7.3 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.4 U	< 7.4 U	< 7.1 U	< 7.3 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.4 U	< 7.4 U	< 7.1 U	< 7.3 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	< 7.3 U	2.2 J	62	150
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.4 U	< 7.4 U	< 7.1 U	< 7.3 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.4 U	< 7.4 U	< 7.1 U	< 7.3 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.4 U	< 7.4 U	< 7.1 U	< 7.3 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.4 U	< 7.4 U	< 7.1 U	< 7.3 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	6.8	13	1.6 J	2.0 J
Perfluorobutanoic acid (PFBA)	NC	NC	NA	17	19	120	40
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.7 U	< 3.7 U	< 3.5 U	< 3.7 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 3.7 U	< 3.7 U	< 3.5 U	< 3.7 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.7 U	< 3.7 U	< 3.5 U	< 3.7 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.7 U	4.1	< 3.5 U	< 3.7 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	11	6.2	60	47
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	48	69	4.0	1.2 J
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	17	33	210	85
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.7 U	< 3.7 U	< 3.5 U	< 3.7 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	< 3.7 U	5.6	18	23
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.7 U	< 3.7 U	< 3.5 U	< 3.7 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	12	650 DJ	18	8.7
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	3.3 J	9.7	140	250
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	< 3.7 U	3.8	< 3.5 U	< 3.7 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	26	54	470	130
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.7 U	< 3.7 U	< 3.5 U	< 3.7 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.7 U	< 3.7 U	< 3.5 U	< 3.7 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 3.7 U	< 3.7 U	< 3.5 U	< 3.7 U

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USCG Air Station Traverse City,
Traverse City, Michigan

Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-03 56 - 60 bgs 12/16/2020 ASTC-VAP-03-GW(56-60)-(121620)	VAP-04 12 - 16 bgs 12/17/2020 ASTC-VAP-04-GW(12-16)-(121720)	VAP-04 12/17/2020 ASTC-VAP-DUP03-(121720)	VAP-04 17 - 21 bgs 12/17/2020 ASTC-VAP-04-GW(17-21)-(121720)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 7.5 UJ
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 7.5 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 7.5 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 7.5 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	19	2.7 J	< 7.1 U	680
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 7.5 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 7.5 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 7.5 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 7.5 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	< 3.6 U	3.8	4.2	31
Perfluorobutanoic acid (PFBA)	NC	NC	NA	19	6.6 BJ+	6.9	380
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	23
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	24	2.6 J	2.3 J	110
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	1.3 J	8.3	9.2	330
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	31	9.3	10	1,100 DJ
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.8 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	3.2 J	< 3.5 UJ	< 3.5 U	2.7 J
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.8 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	4.9	5.0 BJ+	5.4	2,100 DJ
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	190	7.4 BJ+	7.3	20
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	17
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	49	6.6	7.4	1,600 DJ
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.8 U

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USCG Air Station Traverse City,
Traverse City, Michigan

Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-04 25 - 29 bgs 12/17/2020 ASTC-VAP-04-GW(25-29)-(121720)	VAP-04 34 - 38 bgs 12/17/2020 ASTC-VAP-04-GW(34-38)-(121720)	VAP-04 46 - 50 bgs 12/17/2020 ASTC-VAP-04-GW(46-50)-(121720)	VAP-05 11 - 15 bgs 12/18/2020 ASTC-VAP-05-GW(11-15)-(121820)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 36 U	< 7.5 U	< 7.1 U	< 6.9 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 36 U	< 7.5 U	< 7.1 U	< 6.9 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 36 U	< 7.5 U	< 7.1 U	< 6.9 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 36 U	< 7.5 U	< 7.1 U	< 6.9 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	1,400 DJ	80	17	14
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 36 U	< 7.5 U	< 7.1 U	< 6.9 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 36 U	< 7.5 U	< 7.1 U	< 6.9 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 36 U	< 7.5 U	< 7.1 U	< 6.9 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 36 U	< 7.5 U	< 7.1 U	< 6.9 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	27 DJ	2.9 J	1.1 J	2.2 J
Perfluorobutanoic acid (PFBA)	NC	NC	NA	120 DJ	26	27	8.2
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 18 U	< 3.7 U	< 3.6 U	< 3.5 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 18 U	< 3.7 U	< 3.6 U	< 3.5 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 18 U	< 3.7 U	< 3.6 U	< 3.5 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	25 DJ	2.2 J	< 3.6 U	< 3.5 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	62 DJ	15	22	3.5
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	320 DJ	38	7.1	21
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	290 DJ	43	67	5.9
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 18 U	< 3.7 U	< 3.6 U	< 3.5 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	< 18 U	2.1 J	2.8 J	< 3.5 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 18 U	< 3.7 U	< 3.6 U	< 3.5 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	2,100 DJ	160	19	27
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	40 DJ	20	100	12
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	17 DJ	2.2 J	< 3.6 U	< 3.5 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	490 DJ	73	84	3.5 UB
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 18 U	< 3.7 U	< 3.6 UJ	< 3.5 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 18 U	< 3.7 U	< 3.6 U	< 3.5 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 18 U	< 3.7 U	< 3.6 U	< 3.5 U

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USCG Air Station Traverse City,
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Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-05 23 - 27 bgs 12/18/2020 ASTC-VAP-05-GW(23-27)-(121820)	VAP-05 34 - 38 bgs 12/18/2020 ASTC-VAP-05-GW(34-38)-(121820)	VAP-06 12 - 16 bgs 12/18/2020 ASTC-VAP-06-GW(12-16)-(121820)	VAP-06 20 - 24 bgs 12/18/2020 ASTC-VAP-06-GW(20-24)-(121820)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.5 U	< 7.1 U	< 7.2 UJ	< 7.2 UJ
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.5 U	< 7.1 U	< 7.2 U	< 7.2 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.5 U	< 7.1 U	< 7.2 U	< 7.2 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.5 U	< 7.1 U	< 7.2 U	< 7.2 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	5.8 J	6.9 J	6.2 J	2.4 J
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.5 U	< 7.1 U	< 7.2 U	< 7.2 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.5 U	< 7.1 U	< 7.2 U	< 7.2 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.5 U	< 7.1 U	< 7.2 U	< 7.2 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.5 U	< 7.1 U	< 7.2 UJ	< 7.2 UJ
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	13	1.2 J	1.4 J	3.7
Perfluorobutanoic acid (PFBA)	NC	NC	NA	67	20	4.0	10
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	50	27	1.3 J	4.6
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	55	5.8	5.2	110
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	140	43	4.6	20
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 UJ	< 3.6 UJ
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	1.1 J	< 3.6 U	< 3.6 U	3.6
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	28	3.6 UB	1.7 J	8.6
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	19	16	4.3	22
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	4.7	< 3.6 U	< 3.6 U	1.9 J
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	240	49	1.5 J	10
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U

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PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.2 UJ	< 7.1 U	< 7.1 U	< 6.9 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 6.9 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 6.9 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 6.9 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	2.9 J	< 7.1 U	< 7.1 U	< 6.9 UB
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 6.9 UJ
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 6.9 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.2 U	< 7.1 U	< 7.1 U	< 6.9 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.2 UJ	< 7.1 U	< 7.1 U	< 6.9 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	1.5 J	0.96 J	2.1 J	0.88 J
Perfluorobutanoic acid (PFBA)	NC	NC	NA	5.4	2.4 J	11	13
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.5 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.5 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.5 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.5 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	2.2 J	< 3.5 U	3.4 J	11
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	21	1.7 J	5.8	2.2 J
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	4.0	< 3.5 U	5.6	12
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.6 UJ	< 3.5 U	< 3.5 UJ	< 3.5 UJ
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	4.4	< 3.5 U	3.2 J	2.2 J
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.5 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	11	< 3.5 U	11	2.5 J
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	6.9	< 3.5 U	5.0	6.1
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.5 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	3.0 J	< 3.5 U	9.2	22
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.6 U	< 3.5 UJ	< 3.5 U	< 3.5 UJ
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.5 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 3.6 U	< 3.5 U	< 3.5 U	< 3.5 U

See Notes on last page.

Table 1
Groundwater and Surface Water Analytical Results
USCG Air Station Traverse City,
Traverse City, Michigan

Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-08 9 -13 bgs 12/22/2020 ASTC-VAP-08-GW(9-13)-(122220)	VAP-08 14 - 18 bgs 12/22/2020 ASTC-VAP-08-GW(14-18)-(122220)	VAP-08 12/22/2020 ASTC-VAP-DUP04-(122220)	VAP-08 22 - 26 bgs 12/22/2020 ASTC-VAP-08-GW(22-26)-(122220)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.3 U	< 7.3 U	< 6.9 U	< 7.2 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	1.1 J	17	18	1.6 J
Perfluorobutanoic acid (PFBA)	NC	NC	NA	13	8.1	8.0	11
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 3.7 U	3.1 J	3.2 J	< 3.6 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	2.0 J	11	11	6.9
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	2.3 J	2.6 J	2.5 J	1.5 J
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	2.1 J	12	14	13
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	< 3.7 U	15	13	< 3.6 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	1.1 J	37	38	3.3 J
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	2.5 J	15	17	3.5 J
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	2.7 J	11	11	25
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 3.7 U	< 3.6 U	< 3.5 U	< 3.6 U

See Notes on last page.

Table 1
Groundwater and Surface Water Analytical Results
USCG Air Station Traverse City,
Traverse City, Michigan

Location:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-08	VAP-09	VAP-09	VAP-09
Sample Depth (in Feet):				30.5 - 34.5 bgs	9 - 13 bgs	16 - 20 bgs	25 - 29 bgs
Sample Date:				12/22/2020	12/23/2020	12/23/2020	12/23/2020
Sample ID:				ASTC-VAP-08-GW(30.5-34.5)-(122220)	ASTC-VAP-09-GW(9-13)-(122320)	ASTC-VAP-09-GW(16-20)-(122320)	ASTC-VAP-09-GW(25-29)-(122320)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.1 U	< 7.3 U	< 7.3 U	< 6.9 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	1.9 J	1.3 J	< 3.6 U	< 3.5 U
Perfluorobutanoic acid (PFBA)	NC	NC	NA	17	7.7	38	15
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	9.5	7.2	21	25
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	4.9	2.3 J	3.9	1.7 J
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	33	6.7	49	28
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	< 3.5 U	1.6 J	< 3.6 U	< 3.5 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	2.5 J	7.2	4.1	3.6
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	9.5	7.3	27	36
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	66	8.9	62	37
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U

See Notes on last page.

Table 1
Groundwater and Surface Water Analytical Results
USCG Air Station Traverse City,
Traverse City, Michigan

Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-10 8 - 12 bgs 12/23/2020 ASTC-VAP-10-GW(8-12)-(122320)	VAP-10 17 - 21 bgs 12/23/2020 ASTC-VAP-10-GW(17-21)-(122320)	VAP-10 26 - 30 bgs 12/23/2020 ASTC-VAP-10-GW(26-30)-(122320)	VAP-11 7 - 11 bgs 12/29/2020 ASTC-VAP-11-GW(7-11)-(122920)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.2 U	< 7.3 U	< 7.1 U	< 7.5 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	2.0 J	< 3.7 U	< 3.6 U	< 3.7 U
Perfluorobutanoic acid (PFBA)	NC	NC	NA	27	140	10	3.0 J
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	< 3.6 U	3.6 J	< 3.6 U	< 3.7 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	43	130	110	3.6 J
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	1.6 J	4.5	1.4 J	< 3.7 U
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	74	420	74	3.6 J
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	4.4	6.2	< 3.6 U	< 3.7 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 UJ
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	6.1	9.0	0.91 J	4.9
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	52	210	54	4.4
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	130	740	48	3.2 J
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U

See Notes on last page.

Table 1
Groundwater and Surface Water Analytical Results
USCG Air Station Traverse City,
Traverse City, Michigan

Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-11 20 - 24 bgs 12/29/2020 ASTC-VAP-11-GW(20-24)-(122920)	VAP-11 30 - 34 bgs 12/29/2020 ASTC-VAP-11-GW(30-34)-(122920)	VAP-12 7.5 - 11.5 bgs 12/30/2020 ASTC-VAP-12-GW(7.5-11.5)-(123020)	VAP-12 21 - 25 bgs 12/30/2020 ASTC-VAP-12-GW(21-25)-(123020)
PFAS							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.5 U	< 7.9 U	< 7.8 U	< 7.8 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.5 U	< 7.9 U	< 7.8 U	< 7.8 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.5 U	< 7.9 U	< 7.8 U	< 7.8 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.5 U	< 7.9 U	< 7.8 U	< 7.8 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	2.3 J	< 7.9 U	4.9 J	4.8 J
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.5 U	< 7.9 U	< 7.8 U	2.5 J
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.5 U	< 7.9 U	< 7.8 U	< 7.8 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.5 U	< 7.9 U	< 7.8 U	< 7.8 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.5 U	< 7.9 U	< 7.8 U	< 7.8 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	< 3.7 U	< 3.9 U	< 3.9 U	< 3.9 U
Perfluorobutanoic acid (PFBA)	NC	NC	NA	33	14	44	65
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.7 U	< 3.9 U	< 3.9 U	< 3.9 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	18	< 3.9 U	< 3.9 U	2.3 J
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.7 U	< 3.9 U	< 3.9 U	< 3.9 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.7 U	< 3.9 U	< 3.9 U	< 3.9 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	82	26	95	120
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	1.6 J	2.1 J	1.2 J	1.4 J
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	120	32	110	270
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.7 U	< 3.9 U	< 3.9 U	< 3.9 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	18	2.8 J	2.6 J	11
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.7 UJ	< 3.9 UJ	< 3.9 UJ	< 3.9 UJ
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	10	< 3.9 U	3.2 J	8.4
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	230	60	60	200
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	< 3.7 U	< 3.9 U	< 3.9 U	< 3.9 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	97	39	110	300
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.7 U	< 3.9 U	< 3.9 U	< 3.9 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.7 U	< 3.9 U	< 3.9 U	< 3.9 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	1.9 J	< 3.9 U	< 3.9 U	26

See Notes on last page.

Table 1
Groundwater and Surface Water Analytical Results
USCG Air Station Traverse City,
Traverse City, Michigan

Location: Sample Depth (in Feet): Sample Date: Sample ID:	EGLE DW Criteria	EGLE GSI Criteria	EGLE Surface Water Quality Criteria*	VAP-12 28 -32 bgs 12/30/2020 ASTC-VAP-12-GW(28-32)-(123020)	Equip Blank ASTC-EB01-(121620) 12/16/2020	Equip Blank ASTC-EB02-(121620) 12/16/2020	Equip Blank ASTC-EB03-(121620) 12/16/2020	Equip Blank ASTC-EB04-(121720) 12/17/2020
PFAS								
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	NA	< 7.6 U	< 7.2 U	< 7.7 U	< 7.3 U	< 7.1 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370 (A)	NC	NA	< 7.6 U	< 7.2 U	< 7.7 U	< 7.3 U	< 7.1 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	NA	< 7.6 U	< 7.2 U	< 7.7 U	< 7.3 U	< 7.1 U
4:2 Fluorotelomer sulfonate	NC	NC	NA	< 7.6 U	< 7.2 U	< 7.7 U	< 7.3 U	< 7.1 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	NA	2.0 J	< 7.2 U	< 7.5 U	< 7.4 U	< 7.1 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	NA	< 7.6 U	< 7.2 U	< 7.7 U	< 7.3 U	< 7.1 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	NA	< 7.6 U	< 7.2 U	< 7.7 U	< 7.3 U	< 7.1 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	NA	< 7.6 U	< 7.2 U	< 7.7 U	< 7.3 U	< 7.1 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	NA	< 7.6 U	< 7.2 U	< 7.7 U	< 7.3 U	< 7.1 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	NA	< 3.8 U	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorobutanoic acid (PFBA)	NC	NC	NA	81	1.6 J	1.6 J	1.5 J	1.6 J
Perfluorodecane sulfonic acid (PFDS)	NC	NC	NA	< 3.8 U	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorodecanoic acid (PFDA)	NC	NC	NA	2.1 J	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorododecanoic acid (PFDoA)	NC	NC	NA	< 3.8 U	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	NA	< 3.8 U	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	NA	80	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorohexane sulfonic acid (PFHxS)	51 (A)	NC	NA	1.6 J	0.97 J	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorohexanoic acid (PFHxA)	400,000 (A)	NC	NA	270	1.3 J	1.1 J	1.3 J	1.1 J
Perfluorononane sulfonic acid (PFNS)	NC	NC	NA	< 3.8 U	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorononanoic acid (PFNA)	6 (A)	NC	NA	2.8 J	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	NA	< 3.8 UJ	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorooctane sulfonic acid (PFOS)	16 (A)	12 (X) / 11	11	3.8	2.4 J	2.6 J	2.4 J	2.1 J
Perfluorooctanoic acid (PFOA)	8 (A)	12,000 (X) / 420	420	110	2.6 J	2.7 J	2.9 J	2.2 J
Perfluoropentane sulfonate (PFPeS)	NC	NC	NA	< 3.8 U	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluoropentanoic acid (PFPeA)	NC	NC	NA	360	1.3 J	1.3 J	1.5 J	1.2 J
Perfluorotetradecanoic acid (PFTeA)	NC	NC	NA	< 3.8 UJ	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	NA	< 3.8 U	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	NA	4.5	< 3.6 U	< 3.8 U	< 3.6 U	< 3.6 U

See Notes on last page.

Table 1
Groundwater and Surface Water Analytical Results
USCG Air Station Traverse City,
Traverse City, Michigan

Notes:
All units are measured in nanograms per liter (ng/L).
Shaded - Analytical results exceed the associated criteria.
bgs - below ground surface
DUP - Duplicate
DW - Drinking water
EB - Equipment Blank
GSI - Groundwater/Surface Water Interface
NC - No criteria
SW - Surface Water
ng/L - nanograms per liter
< - Analytical result is less than the limit of quantitation (LOQ).
Samples were analyzed using modified United States Environmental Protection Agency (USEPA) Method 537 consistent with Department of Defense (DoD) Quality Systems Manual (QSM) version 5.3 Table B-15.
Analytical results were compared to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Criteria Reference: EGLE. 12/21/2020. Table 1. Residential and Nonresidential Groundwater Criteria. Available online at: https://www.michigan.gov/documents/egle/deq-rrd-Rules-Groundwater_698452_7.pdf.

Criteria Footnotes:
A - Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.
X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV).

Laboratory Notes:
B - The compound has been found in the sample as well as its associated blank, its presence in the sample may be suspect.
DJ - Concentration is based on a diluted sample analysis. The reported result was an estimated value with an unknown bias.
J - The reported result is an estimated value.
J- - The result was an estimated quantity, but the result may be biased low.
J+ - The result was an estimated quantity, but the result may be biased high.
U - Analyte was not detected.
UJ - The analyte was not detected and was reported as less than the LOD. However, the associated numerical value is approximate.

Footnote:
* - Surface water criteria based on Michigan Department of Environmental Quality (MDEQ) Rule 57 human non-cancer values for surface water used as a drinking water source.

Table 2
Soil and Sediment Analytical Results
USCG Air Station Traverse City,
Traverse City, Michigan

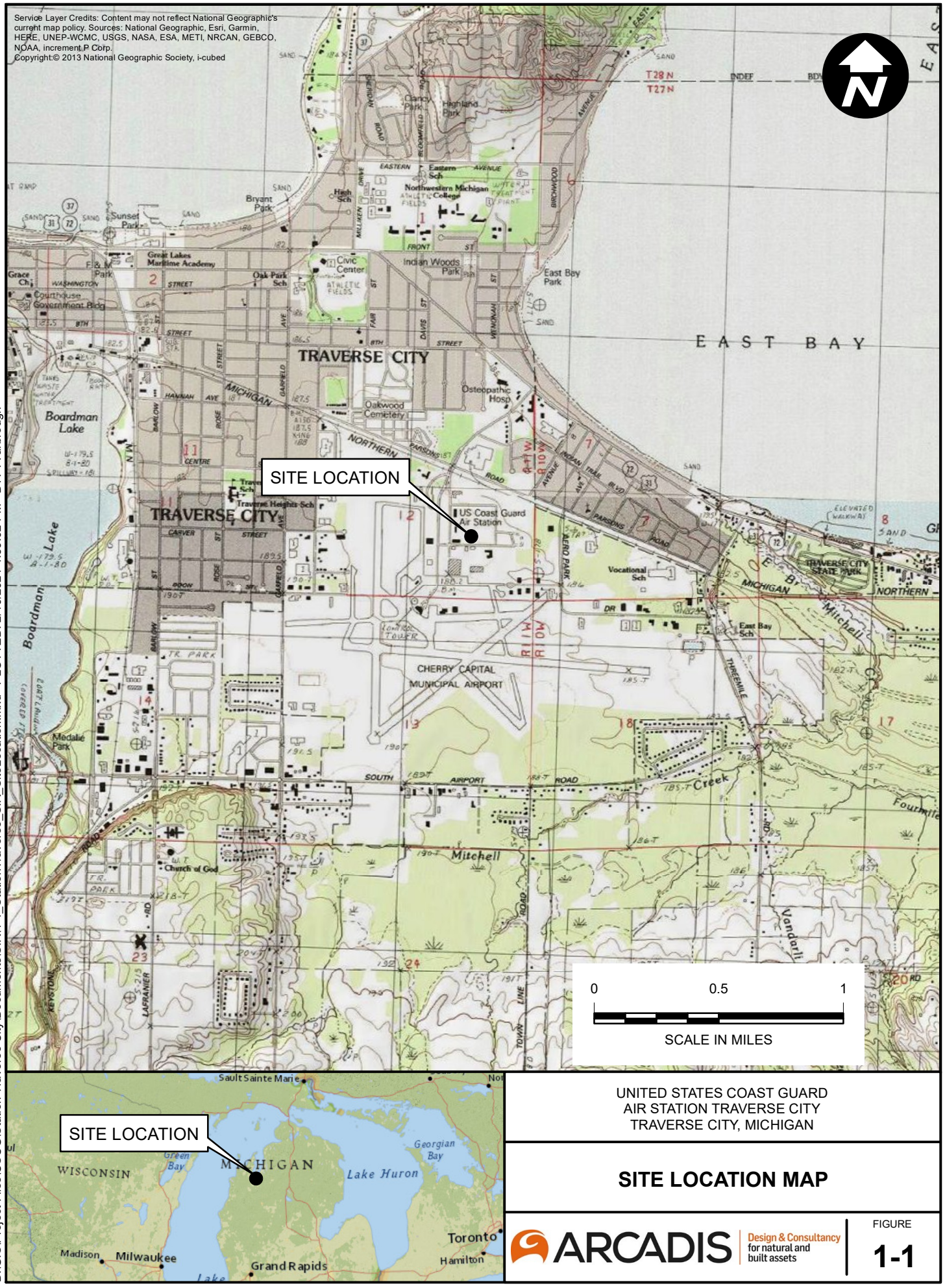
Location ID:			SD-01	VAP-01	VAP-01	VAP-01	VAP-01	VAP-02	VAP-02	VAP-02
Sample Depth:	EGLE GSI		0.0 - 0.5 bgs	4.5 - 5.0 bgs		6.5 - 7.5 bgs	8.5 - 9.0 bgs	1.0 - 1.5 bgs	6.5 - 7.0 bgs	11.5 - 12 bgs
Date Collected:	Protection		12/18/2020	12/30/2020	12/30/2020	12/30/2020	12/30/2020	12/30/2020	12/30/2020	12/30/2020
Sample Name:	Criteria	Units	ASTC-SD01(0-0.5)-(121820)	ASTC-VAP-01-SS(4.5-5)-(123020)	ASTC-VAP-DUP01SS-(123020)	ASTC-VAP-01-SS(6.5-7.5)-(123020)	ASTC-VAP-01-SS(8.5-9)-(123020)	ASTC-VAP-02-SS(1-1.5)-(123020)	ASTC-VAP-02-SS(6.5-7)-(123020)	ASTC-VAP-02-SS(11.5-12)-(123020)
PFASs										
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	µg/kg	< 2.6 U	< 2.0 U	< 1.9 U	< 1.8 U	< 2.2 U	< 2.1 U	< 1.8 U	< 2.1 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	µg/kg	< 5.3 U	< 4.0 U	< 3.8 U	< 3.5 U	< 4.4 U	< 4.1 U	< 3.6 U	< 4.2 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	µg/kg	< 2.6 U	< 2.0 U	< 1.9 U	< 1.8 U	< 2.2 U	< 2.1 U	< 1.8 U	< 2.1 U
4:2 Fluorotelomer sulfonate	NC	µg/kg	< 2.6 U	< 2.0 U	< 1.9 U	< 1.8 U	< 2.2 U	< 2.1 U	< 1.8 U	< 2.1 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	µg/kg	< 2.6 U	< 2.0 U	< 1.9 U	< 1.8 U	< 2.2 U	< 2.1 U	< 1.8 U	< 2.1 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	µg/kg	< 2.6 U	< 2.0 UJ	< 1.9 U	< 1.8 UJ	< 2.2 UJ	< 2.1 UJ	< 1.8 UJ	< 2.1 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	µg/kg	< 2.6 U	< 2.0 U	< 1.9 U	< 1.8 U	< 2.2 U	< 2.1 U	< 1.8 U	< 2.1 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	µg/kg	< 2.6 U	< 2.0 U	< 1.9 U	< 1.8 U	< 2.2 U	< 2.1 U	< 1.8 U	< 2.1 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	µg/kg	< 2.6 U	< 2.0 U	< 1.9 U	< 1.8 U	< 2.2 U	< 2.1 U	< 1.8 U	< 2.1 U
Perfluorobutane sulfonic acid (PFBS)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorobutanoic acid (PFBA)	NC	µg/kg	0.33 J	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorodecane sulfonic acid (PFDS)	NC	µg/kg	3.1	< 1.0 UJ	< 0.96 U	< 0.89 UJ	< 1.1 UJ	< 1.0 UJ	< 0.90 UJ	< 1.1 U
Perfluorodecanoic acid (PFDA)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorododecanoic acid (PFDoA)	NC	µg/kg	0.30 J	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluoroheptanoic acid (PFHpA)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorohexane sulfonic acid (PFHxS)	NC	µg/kg	1.4	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	0.28 J	< 1.1 U
Perfluorohexanoic acid (PFHxA)	NC	µg/kg	0.50 J	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorononane sulfonic acid (PFNS)	NC	µg/kg	0.46 J	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorononanoic acid (PFNA)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorooctane sulfonamide (PFOSA)	NC	µg/kg	0.78 J	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorooctane sulfonic acid (PFOS)	0.24 (X) / 0.22	µg/kg	7.0	0.44 J	0.27 J	< 0.89 U	0.65 J	3.3	< 0.90 U	1.9
Perfluorooctanoic acid (PFOA)	10,000 (X) / 350	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluoropentane sulfonate (PFPeS)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluoropentanoic acid (PFPeA)	NC	µg/kg	0.85 J	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorotetradecanoic acid (PFTeA)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluorotridecanoic acid (PFTrDA)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
Perfluoroundecanoic acid (PFUdA)	NC	µg/kg	< 1.3 U	< 1.0 U	< 0.96 U	< 0.89 U	< 1.1 U	< 1.0 U	< 0.90 U	< 1.1 U
GenChem										
Percent Solids		%	66.1	96.5	96.5	94.7	88.2	94.8	96.3	86.5

Notes:
Shaded - Analytical results exceed the associated criteria.
bgs - below ground surface
DUP - Duplicate
GSI - Groundwater/Surface Water
NC - No criteria
SD - Sediment
µg/kg - microgram per kilogram
< - Analytical result is less than the limit of quantitation (LOQ).
% - percent
Samples were analyzed using modified United States Environmental Protection Agency (USEPA) Method 537 consistent with Department of Defense (DoD) Quality Systems Manual (QSM) version 5.3 Table B-15.
Analytical results were compared to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Criteria Reference: EGLE. 6/25/2018.Table 3. Nonresidential Soil Criteria. Available online at: https://www.michigan.gov/documents/deq/deq-rrd-Rules-Table3SoilNonresidential_447075_7.pdf.

Criteria Notes:
X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV).

Laboratory Notes:
J - The reported result is an estimated value.
U - Analyte was not detected.
UJ - The analyte was not detected and was reported as less than the Limit of Detection (LOD). However, the associated numeric value is approximate.

Figures



UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1-1

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sclafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
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VAP-07
VAP-06
VAP-05
VAP-04
VAP-03
VAP-02
VAP-01
VAP-08
VAP-09
VAP-10
VAP-11
VAP-12

SAN
STM
OW
RD

Stultz Dr
Airport Access Rd

FSS PUMPHOUSE
OIL/WATER SEPARATOR
HANGAR
RETENTION BASIN

LEGEND

- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- VERTICAL AQUIFER PROFILE (VAP) LOCATION
- MANHOLE/CATCH BASIN
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY

ASTC - AIR STATION TRAVERSE CITY

0 150 300

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

SITE LAYOUT

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1-2

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sclafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
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A

ASTC-VAP-07

ASTC-VAP-06

ASTC-VAP-05

ASTC-VAP-04

ASTC-VAP-03

ASTC-VAP-01

A’

Elevation (feet amsl)

610 -

600 -

590 -

580 -

570 -

560 -

550 -

0

500 feet

1,000 feet

Vertical Exaggeration = 10X

ND/ND

11 ng/L / 5 ng/L

2.5 J ng/L / 6.1 ng/L

1.7 J ng/L / 4.3 ng/L

8.6 ng/L / 22 ng/L

11 ng/L / 6.9 ng/L

27 ng/L / 12 ng/L

28 ng/L / 19 ng/L

3.2 J ng/L / 16 ng/L

19 ng/L / 100 ng/L

5 ng/L / 7.4 ng/L

2,100 ng/L / 20 ng/LI

2,100 ng/L / 40 ng/L

160 ng/L / 20 ng/L

0.44 J µg/kg

ND

0.65 J µg/kg

12 ng/L / 3.6 J ng/L

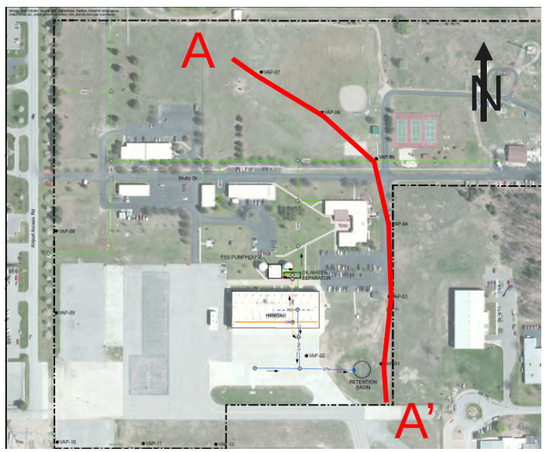
57 ng/L / 2.9 J ng/L

650 ng/L / 9.7 ng/L

18 ng/L / 140 ng/L

8.7 ng/L / 250 ng/L

4.9 ng/L / 190 ng/L



Lithology

- Clay
- Moderately Sorted Fine to Medium Sand
- Poorly Sorted Fine to Coarse Sand
- Sandy Gravel
- No Recovery

Approximate Water Table

- Soil Sample – ND
- Soil Sample – PFOS Detected
- Groundwater Sample Interval (Left Half = PFOS Result. Right Half = PFOA Result)

Groundwater Analytical (PFOS and PFOA)

- < MCL
- > MCL (PFOS: 16 ng/L / PFOA: 8 ng/L)
- > 100 ng/L
- > 1,000 ng/L

Notes:

MCL = maximum contaminant level
ND = not detected
ng/L = nanograms per liter
µg/kg = micrograms per kilogram
amsl = above mean sea level

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

CROSS-SECTION A – A’

ARCADIS

FIGURE
2-1

3/25/2021 4:21:04 PM

B

B’

ASTC-VAP-11

ASTC-VAP-02

ASTC-VAP-04

Elevation (feet amsl)

610 -

600 -

590 -

580 -

570 -

560 -

-

3.3 µg/kg

ND

1.9 µg/kg

4.9 ng/L / 4.4 ng/L

1,400 ng/L / 14 ng/L

5 ng/L / 7.4 ng/L

10 ng/L / 230 ng/L

2,100 ng/L / 20 ng/L

2,100 ng/L / 40 ng/L

0.91 J ng/L /60 ng/L

160 ng/L / 20 ng/L

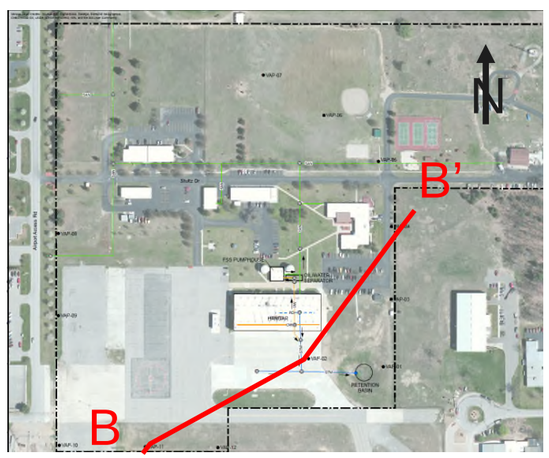
19 ng/L / 100ng/L

0

500 feet

1,000 feet

Vertical Exaggeration = 10X



Lithology

- Clay
- Moderately Sorted Fine to Medium Sand
- Poorly Sorted Fine to Coarse Sand
- Sandy Gravel
- No Recovery

Approximate Water Table

- Soil Sample – ND
- Soil Sample – PFOS Detected
- Groundwater Sample Interval (Left Half = PFOS Result. Right Half = PFOA Result)

Groundwater Analytical (PFOS and PFOA)

- < MCL
- > MCL (PFOS: 16 ng/L / PFOA: 8 ng/L)
- > 100 ng/L
- > 1,000 ng/L

Notes:

MCL = maximum contaminant level
ND = not detected
ng/L = nanograms per liter
µg/kg = micrograms per kilogram
amsl = above mean sea level

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

CROSS-SECTION B – B’

ARCADIS

FIGURE
2-2

3/25/2021 4:14:20 PM

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VAP-07
VAP-06
VAP-05
VAP-04
VAP-03
VAP-02
VAP-01
VAP-08
VAP-09
VAP-10
VAP-11
VAP-12

SAN
STM
OW
RD

Stultz Dr
Airport Access Rd

FSS PUMPHOUSE
OIL/WATER SEPARATOR
HANGAR
RETENTION BASIN

LEGEND

- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- VERTICAL AQUIFER PROFILE (VAP) LOCATION
- MANHOLE/CATCH BASIN
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY
- AFFF RELEASE AREA

AFFF - AQUEOUS FILM FORMING FOAM

ASTC - AIR STATION TRAVERSE CITY

0 150 300

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

POTENTIAL ON-SITE SOURCES

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-1

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sciafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
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Centre St
Kinross St
Hastings St
S Garfield Ave
Carver St
Baldwin St
Plainview Ave
Boon St
Garfield Rd
N Garfield Rd
Airport Access Rd
Airport Access Rd
Westminster Rd
Calvin Dr
Avenue B
Avenue C
Avenue D
Avenue D
Avenue E
Parsons Rd
Indian Trail Blvd
Eleanor St
Tamarack St
Juniper St
Hemlock St
Anne St
Holly St
Balsam St
Pine Grove Ave
US 31
Traverse City SP Service
Tart Trail
Mitchell St
North Aero Park Ct
West Aero Park Ct
Aero Park Dr
Business Park Dr
Wright Dr
Fly Dont Dr
George St
E South Airport R

LEGEND

- ASTC PROPERTY BOUNDARY
- POTENTIAL OFF-SITE SOURCE AREA

ASTC - AIR STATION TRAVERSE CITY

SOURCE REFERENCE: Gosling Czuback Engineering Sciences, Inc. 2020. PFAS Soil Investigation Report, Cherry Capital Airport (TVC), Traverse City, Michigan. December

0 700 1,400

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

POTENTIAL OFF-SITE SOURCES

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-2

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sclafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
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VAP-07							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
10 - 14	< 7.1 U	0.96 J	1.7 J	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U
18 - 22	< 7.1 U	2.1 J	5.8	5.6	3.2 J	11	5.0
27.5 - 31.5	< 6.9 U	0.88 J	2.2 J	12	2.2 J	2.5 J	6.1

VAP-06							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
12 - 16	< 7.2 U	1.4 J	5.2	4.6	< 3.6 U	1.7 J	4.3
20 - 24	< 7.2 U	3.7	110	20	3.6	8.6	22
28.5 - 32.5	< 7.2 U	1.5 J	21	4.0	4.4	11	6.9

VAP-05							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
11 - 15	< 6.9 U	2.2 J	21	5.9	< 3.5 U	27	12
23 - 27	< 7.5 U	13	55	140	1.1 J	28	19
34 - 38	< 7.1 U	1.2 J	5.8	43	< 3.6 U	3.6 UB	16

VAP-04							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
12 - 16	< 7.1 U	3.8	8.3	9.3	< 3.5 UJ	5.0 BJ+	7.4 BJ+
17 - 21	< 7.5 U	31	330	1,100DJ	2.7 J	2,100 DJ	20
25 - 29	< 36 U	27 DJ	320 DJ	290 DJ	< 18 U	2,100 DJ	40 DJ
34 - 38	< 7.5 U	2.9 J	38	43	2.1 J	160	20
46 - 50	< 7.1 U	1.1 J	7.1	67	2.8 J	19	100

VAP-08							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
9 - 13	< 7.3 U	1.1 J	2.3 J	2.1 J	< 3.7 U	1.1 J	2.5 J
14 - 18	< 7.3 U	17	2.6 J	12	15	37	15
22 - 26	< 7.2 U	1.6 J	1.5 J	13	< 3.6 U	3.3 J	3.5 J
30.5 - 34.5	< 7.1 U	1.9 J	4.9	33	< 3.5 U	2.5 J	9.5

VAP-09							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
9 - 13	< 7.3 U	1.3 J	2.3 J	6.7	1.6 J	7.2	7.3
16 - 20	< 7.3 U	< 3.6 U	3.9	49	< 3.6 U	4.1	27
25 - 29	< 6.9 U	< 3.5 U	1.7 J	28	< 3.5 U	3.6	36

VAP-03							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
9 - 13	< 7.5 U	6.1	48	16	< 3.8 U	12	3.6 J
18 - 22	< 7.4 U	13	69	33	5.6	650 DJ	9.7
30 - 34	< 7.1 U	1.6 J	4.0	210	18	18	140
46 - 50	< 7.3 U	2.0 J	1.2 J	85	23	8.7	250
56 - 60	< 7.2 U	< 3.6 U	1.3 J	31	3.2 J	4.9	190

VAP-10							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
8 - 12	< 7.2 U	2.0 J	1.6 J	74	4.4	6.1	52
17 - 21	< 7.3 U	< 3.7 U	4.5	420	6.2	9.0	210
26 - 30	< 7.1 U	< 3.6 U	1.4 J	74	< 3.6 U	0.91 J	54

VAP-01							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
8.5 - 12.5	< 7.8 U	18	11	23	1.3 J	57	2.9 J

VAP-11							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
7 - 11	< 7.5 U	< 3.7 U	< 3.7 U	3.6 J	< 3.7 U	4.9	4.4
20 - 24	< 7.5 U	< 3.7 U	1.6 J	120	18	10	230
30 - 34	< 7.9 U	< 3.9 U	2.1 J	32	2.8 J	< 3.9 U	60

SW-01							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
0.0 - 0.5	< 11 UJ-	8.0 J-	34 J-	120 J-	< 5.5 UJ-	66 J-	8.2 J-

VAP-02							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
11 - 15	< 7.5 U	13	130	210	3.4 J	1,400 DJ	14

VAP-12							
Depth (ft. bgs)	HFPO-DA	PFBS	PFHxS	PFHxA	PFNA	PFOS	PFOA
Criteria	370	420	51	400,000	6	16	8
7.5 - 11.5	< 7.8 U	< 3.9 U	1.2 J	110	2.6 J	3.2 J	60
21 - 25	< 7.8 U	< 3.9 U	1.4 J	270	11	8.4	200
28 - 32	< 7.6 U	< 3.8 U	1.6 J	270	2.8 J	3.8	110

VAP-07 VAP-06 VAP-05 VAP-04 VAP-08 VAP-09 VAP-03 VAP-10 VAP-01 VAP-11 SW-01 VAP-02 VAP-12

SAN SAN SAN SAN SAN

Stultz Dr

Airport Access Rd

FSS PUMPHOUSE

OIL/WATER SEPARATOR

HANGAR

OW OW RD STM STM

RETENTION BASIN

SW-01

West Aero Park Ct

LEGEND

- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- VERTICAL AQUIFER PROFILE (VAP) LOCATION
- MANHOLE/CATCH BASIN
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY
- AFFF RELEASE AREA

MAXIMUM CONCENTRATIONS OF PFOS, PFOA, PFHxS, OR PFNA IN GROUNDWATER (COMPOUND WITH THE HIGHEST VALUE IS SHOWN)

- < MICHIGAN CRITERIA
- > CRITERIA ≤ 100 ng/L
- > 100 ng/L - ≤1,000 ng/L
- > 1,000 ng/L - ≤10,000 ng/L

PFAS - PER- AND POLYFLUOROALKYL SUBSTANCES

EGLE - MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY

AFFF - AQUEOUS FILM FORMING FOAM

ASTC - AIR STATION TRAVERSE CITY

ft. bgs - FEET BELOW GROUND SURFACE

NOTES:

1. ALL SAMPLES WERE ANALYZED BY MODIFIED USEPA METHOD 537 PER QSM 5.3.

2. ANALYTICAL RESULTS WERE COMPARED TO THE EGLE DRINKING WATER CRITERIA, EGLE 12/21/2020, TABLE 1. RESIDENTIAL AND NONRESIDENTIAL GROUNDWATER CRITERIA.

3. RESULTS ARE REPORTED IN NANOGRAMS PER LITER (ng/L).

4. SAMPLES WERE COLLECTED BETWEN 12/16/2020 and 12/30/2020.

LABORATORY NOTES:

B THE COMPOUND HAS BEEN FOUND IN THE SAMPLE AS WELL AS ITS ASSOCIATED BLANK, ITS PRESENCE IN THE SAMPLE MAY BE SUSPECT.

DJ CONCENTRATION IS BASED ON A DILUTED SAMPLE ANALYSIS. THE REPORTED RESULT WAS AN ESTIMATED VALUE WITH AN UNKNOWN BIAS.

J THE REPORTED RESULT IS AN ESTIMATED VALUE.

J- THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED LOW.

J+ THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED HIGH.

U ANALYTE WAS NOT DETECTED.

UJ THE ANALYTE WAS NOT DETECTED AND WAS REPORTED AS LESS THAN THE LOD. HOWEVER, THE ASSOCIATED NUMERICAL VALUE IS APPROXIMATE.

< ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITATION (LOQ).

0 200 400

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 4

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

SAN

VAP-07

VAP-06

VAP-05

Stultz Dr

VAP-08

VAP-04

FSS PUMPHOUSE

OIL/WATER SEPARATOR

OW

VAP-09

VAP-03

HANGAR

RD

OW

STM

VAP-02

RETENTION BASIN

VAP-01

STM

SD-01

Airport Access Rd

VAP-10

VAP-11

VAP-12

West Aero Park Ct

VAP-01		
Depth (ft.)	PFOS	PFOA
GSIP Criteria	0.24	10,000
4.5 - 5.0	0.44 J	< 1.0 U
6.5 - 7.5	< 0.89 U	< 0.89 U
8.5 - 9.0	0.65 J	< 1.1 U

VAP-02		
Depth (ft.)	PFOS	PFOA
GSIP Criteria	0.24	10,000
1.0 - 1.5	3.3	< 1.0 U
6.5 - 7	< 0.90 U	< 0.90 U
11.5 - 12.0	1.9	< 1.1 U

SD-01		
Depth (ft.)	PFOS	PFOA
GSIP Criteria	0.24	10,000
0.0 - 0.5	7.0	< 1.3 U

LEGEND

- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- VERTICAL AQUIFER PROFILE (VAP) LOCATION
- MANHOLE/CATCH BASIN
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY
- AFFF RELEASE AREA
- EXCEEDS CRITERIA FOR ONE OR MORE PFAS COMPOUNDS

PFAS - PER- AND POLYFLUOROALKYL SUBSTANCES

GSIP - GROUNDWATER/SURFACE WATER INTERFACE PROTECTION

EGLE - MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY

AFFF - AQUEOUS FILM FORMING FOAM

ASTC - AIR STATION TRAVERSE CITY

NOTES:

1. ALL SAMPLES WERE ANALYZED BY MODIFIED USEPA METHOD 537 PER QSM 5.3.

2. ANALYTICAL RESULTS WERE COMPARED TO THE EGLE GSI PROTECTION CRITERIA. EGLE, 6/25/2018, TABLE 3. NONRESIDENTIAL SOIL CRITERIA.

3. RESULTS ARE REPORTED IN MICROGRAMS PER KILOGRAM (µg/kg).

4. SAMPLES WERE COLLECTED BETWEEN 12/16/2020 AND 12/30/2020.

LABORATORY NOTES:

J - THE REPORTED RESULT IS AN ESTIMATED VALUE.

U - ANALYTE WAS NOT DETECTED.

< - ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITATION (LOQ).

0 200 400

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

SOIL AND SEDIMENT ANALYTICAL RESULTS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 5

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sclafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
D:\GIS\Project Files\USCG\Station Traverse City\Documents\SIR\5_StationTraverse_SIR_SoilSedimentAnalytical.mxd PLOTTED: 4/7/2021 12:06:04 PM BY: TYarbrough