

Notice: Use this form to request a **written response (on agency letterhead)** from the Department of Natural Resources (DNR) regarding technical assistance, a post-closure change to a site, a specialized agreement or liability clarification for Property with known or suspected environmental contamination. A fee will be required as is authorized by s. 292.55, Wis. Stats., and NR 749, Wis. Adm. Code., unless noted in the instructions below. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Definitions

"Property" refers to the subject Property that is perceived to have been or has been impacted by the discharge of hazardous substances.

"Liability Clarification" refers to a written determination by the Department provided in response to a request made on this form. The response clarifies whether a person is or may become liable for the environmental contamination of a Property, as provided in s. 292.55, Wis. Stats.

"Technical Assistance" refers to the Department's assistance or comments on the planning and implementation of an environmental investigation or environmental cleanup on a Property in response to a request made on this form as provided in s. 292.55, Wis. Stats.

"Post-closure modification" refers to changes to Property boundaries and/or continuing obligations for Properties or sites that received closure letters for which continuing obligations have been applied or where contamination remains. Many, but not all, of these sites are included on the GIS Registry layer of RR Sites Map to provide public notice of residual contamination and continuing obligations.

Select the Correct Form

This form should be used to request the following from the DNR:

- Technical Assistance
- Liability Clarification
- Post-Closure Modifications
- Specialized Agreements (tax cancellation, negotiated agreements, etc.)

Do **not** use this form if one of the following applies:

- Request for an **off-site liability exemption or clarification** for Property that has been or is perceived to be contaminated by one or more hazardous substances that originated on another Property containing the source of the contamination. Use DNR's Off-Site Liability Exemption and Liability Clarification Application Form 4400-201.
- Submittal of an Environmental Assessment for the **Lender Liability Exemption**, s 292.21, Wis. Stats., **if no response or review by DNR is requested**. Use the Lender Liability Exemption Environmental Assessment Tracking Form 4400-196.
- Request for an **exemption to develop on a historic fill site** or licensed landfill. Use DNR's Form 4400-226 or 4400-226A.
- **Request for closure** for Property where the investigation and cleanup actions are completed. Use DNR's Case Closure - GIS Registry Form 4400-202.

All forms, publications and additional information are available on the internet at: dnr.wi.gov/topic/Brownfields/Pubs.html.

Instructions

1. Complete sections 1, 2, 6 and 7 for all requests. Be sure to provide adequate and complete information.
2. Select the type of assistance requested: Section 3 for technical assistance or post-closure modifications, Section 4 for a written determination or clarification of environmental liabilities; or Section 5 for a specialized agreement.
3. Include the fee payment that is listed in Section 3, 4, or 5, unless you are a "Voluntary Party" enrolled in the Voluntary Party Liability Exemption Program **and** the questions in Section 2 direct otherwise. Information on to whom and where to send the fee is found in Section 8 of this form.
4. Send the completed request, supporting materials and the fee to the appropriate DNR regional office where the Property is located.

See the map on the last page of this form. A paper copy of the signed form and all reports and supporting materials shall be sent with an electronic copy of the form and supporting materials on a compact disk. For electronic document submittal requirements see: <http://dnr.wi.gov/files/PDF/pubs/rr/RR690.pdf>

The time required for DNR's determination varies depending on the complexity of the site, and the clarity and completeness of the request and supporting documentation.

Technical Assistance, Environmental Liability Clarification or Post-Closure Modification Request

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Section 1. Contact and Recipient Information

Requester Information

This is the person requesting technical assistance or a post-closure modification review, that his or her liability be clarified or a specialized agreement and is identified as the requester in Section 7. DNR will address its response letter to this person.

Last Name Wahl	First Scott	MI	Organization/ Business Name Tyco Fire Products LP
Mailing Address 2700 Industrial Parkway South		City Marinette	State WI
		ZIP Code 54143	
Phone # (include area code)	Fax # (include area code)	Email	

The requester listed above: (select all that apply)

- Is currently the owner
 Is considering selling the Property
 Is renting or leasing the Property
 Is considering acquiring the Property
 Is a lender with a mortgagee interest in the Property
 Other. Explain the status of the Property with respect to the applicant:

Contact Information (to be contacted with questions about this request)

Select if same as requester

Contact Last Name Johnson	First Shauna	MI M	Organization/ Business Name Arcadis
Mailing Address 126 N Jefferson Street, Suite 400		City Milwaukee	State WI
		ZIP Code 53202	
Phone # (include area code) (312) 575-3732	Fax # (include area code)	Email Shauna.Johnson@arcadis.com	

Environmental Consultant (if applicable)

Contact Last Name Johnson	First Shauna	MI M	Organization/ Business Name Arcadis
Mailing Address 126 N Jefferson Street, Suite 400		City Milwaukee	State WI
		ZIP Code 53202	
Phone # (include area code) (312) 575-3732	Fax # (include area code)	Email Shauna.Johnson@arcadis.com	

Section 2. Property Information

Property Name Tyco Fire Technology Center - PFCs	FID No. (if known) 438005590
BRRTS No. (if known) 0238580694	Parcel Identification Number
Street Address 2700 Industrial Parkway South	City Marinette
	State WI
	ZIP Code 54143
County Marinette	Municipality where the Property is located <input checked="" type="radio"/> City <input type="radio"/> Town <input type="radio"/> Village of Marinette
	Property is composed of: <input type="radio"/> Single tax parcel <input type="radio"/> Multiple tax parcels
	Property Size Acres 380

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1. Is a response needed by a specific date? (e.g., Property closing date) Note: Most requests are completed within 60 days. Please plan accordingly.

No Yes

Date requested by: _____

Reason: _____

2. Is the "Requester" enrolled as a Voluntary Party in the Voluntary Party Liability Exemption (VPLE) program?

No. **Include the fee that is required for your request in Section 3, 4 or 5.**

Yes. **Do not include a separate fee.** This request will be billed separately through the VPLE Program.

Fill out the information in Section 3, 4 or 5 which corresponds with the type of request:

Section 3. Technical Assistance or Post-Closure Modifications;

Section 4. Liability Clarification; or Section 5. Specialized Agreement.

Section 3. Request for Technical Assistance or Post-Closure Modification

Select the type of technical assistance requested: [Numbers in brackets are for WI DNR Use]

- No Further Action Letter (NFA) (Immediate Actions) - NR 708.09, [183] - **Include a fee of \$350.** Use for a written response to an immediate action after a discharge of a hazardous substance occurs. Generally, these are for a one-time spill event.
- Review of Site Investigation Work Plan - NR 716.09, [135] - **Include a fee of \$700.**
- Review of Site Investigation Report - NR 716.15, [137] - **Include a fee of \$1050.**
- Approval of a Site-Specific Soil Cleanup Standard - NR 720.10 or 12, [67] - **Include a fee of \$1050.**
- Review of a Remedial Action Options Report - NR 722.13, [143] - **Include a fee of \$1050.**
- Review of a Remedial Action Design Report - NR 724.09, [148] - **Include a fee of \$1050.**
- Review of a Remedial Action Documentation Report - NR 724.15, [152] - **Include a fee of \$350**
- Review of a Long-term Monitoring Plan - NR 724.17, [25] - **Include a fee of \$425.**
- Review of an Operation and Maintenance Plan - NR 724.13, [192] - **Include a fee of \$425.**

Other Technical Assistance - s. 292.55, Wis. Stats. [97] (For request to build on an abandoned landfill use Form 4400-226)

- Schedule a Technical Assistance Meeting - **Include a fee of \$700.**
- Hazardous Waste Determination - **Include a fee of \$700.**
- Other Technical Assistance - **Include a fee of \$700.** Explain your request in an attachment.

Post-Closure Modifications - NR 727, [181]

- Post-Closure Modifications: Modification to Property boundaries and/or continuing obligations of a closed site or Property; sites may be on the GIS Registry. This also includes removal of a site or Property from the GIS Registry. **Include a fee of \$1050, and:**
 - Include a fee of \$300 for sites with residual soil contamination; and
 - Include a fee of \$350 for sites with residual groundwater contamination, monitoring wells or for vapor intrusion continuing obligations.

Attach a description of the changes you are proposing, and documentation as to why the changes are needed (if the change to a Property, site or continuing obligation will result in revised maps, maintenance plans or photographs, those documents may be submitted later in the approval process, on a case-by-case basis).

Skip Sections 4 and 5 if the technical assistance you are requesting is listed above and complete Sections 6 and 7 of this form Section 6. Other Information Submitted

Identify all materials that are included with this request.

Send both a paper copy of the signed form and all reports and supporting materials, and an electronic copy of the form and all reports, including Environmental Site Assessment Reports, and supporting materials on a compact disk.

Include one copy of any document from any state agency files that you want the Department to review as part of this request. The person submitting this request is responsible for contacting other state agencies to obtain appropriate reports or information.

Phase I Environmental Site Assessment Report - Date: _____

Phase II Environmental Site Assessment Report - Date: _____

**Technical Assistance, Environmental Liability
Clarification or Post-Closure Modification Request**

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- Legal Description of Property (required for all liability requests and specialized agreements)
- Map of the Property (required for all liability requests and specialized agreements)

Analytical results of the following sampled media: Select all that apply and include date of collection.

Groundwater Soil Sediment Other medium - Describe: _____

Date of Collection: _____

- A copy of the closure letter and submittal materials
- Draft tax cancellation agreement
- Draft agreement for assignment of tax foreclosure judgment
- Other report(s) or information - Describe: Air Pathway Site Investigation Work Plan; WDNR Fee Check #: 314923

For Property with newly identified discharges of hazardous substances only: Has a notification of a discharge of a hazardous substance been sent to the DNR as required by s. NR 706.05(1)(b), Wis. Adm. Code?


- Yes - Date (if known): _____
- No

Note: The Notification for Hazardous Substance Discharge (non-emergency) form is available at:
dnr.wi.gov/files/PDF/forms/4400/4400-225.pdf.

Section 7. Certification by the Person who completed this form

- I am the person submitting this request (requester)
- I prepared this request for: Scott Wahl
Requester Name

I certify that I am familiar with the information submitted on this request, and that the information on and included with this request is true, accurate and complete to the best of my knowledge. I also certify I have the legal authority and the applicant's permission to make this request.


Signature

4/13/2021
Date Signed

Project Environmental Specialist
Title

(312) 575-3732
Telephone Number (include area code)

Technical Assistance, Environmental Liability Clarification or Post-Closure Modification Request

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Section 8. DNR Contacts and Addresses for Request Submittals

Send or deliver one paper copy and one electronic copy on a compact disk of the completed request, supporting materials, and fee to the region where the property is located to the address below. Contact a [DNR regional brownfields specialist](#) with any questions about this form or a specific situation involving a contaminated property. For electronic document submittal requirements see: <http://dnr.wi.gov/files/PDF/pubs/rr/RR690.pdf>.

DNR NORTHERN REGION

Attn: RR Program Assistant
Department of Natural Resources
223 E Steinfest Rd Antigo, WI 54409

DNR NORTHEAST REGION

Attn: RR Program Assistant
Department of Natural Resources
2984 Shawano Avenue
Green Bay WI 54313

DNR SOUTH CENTRAL REGION

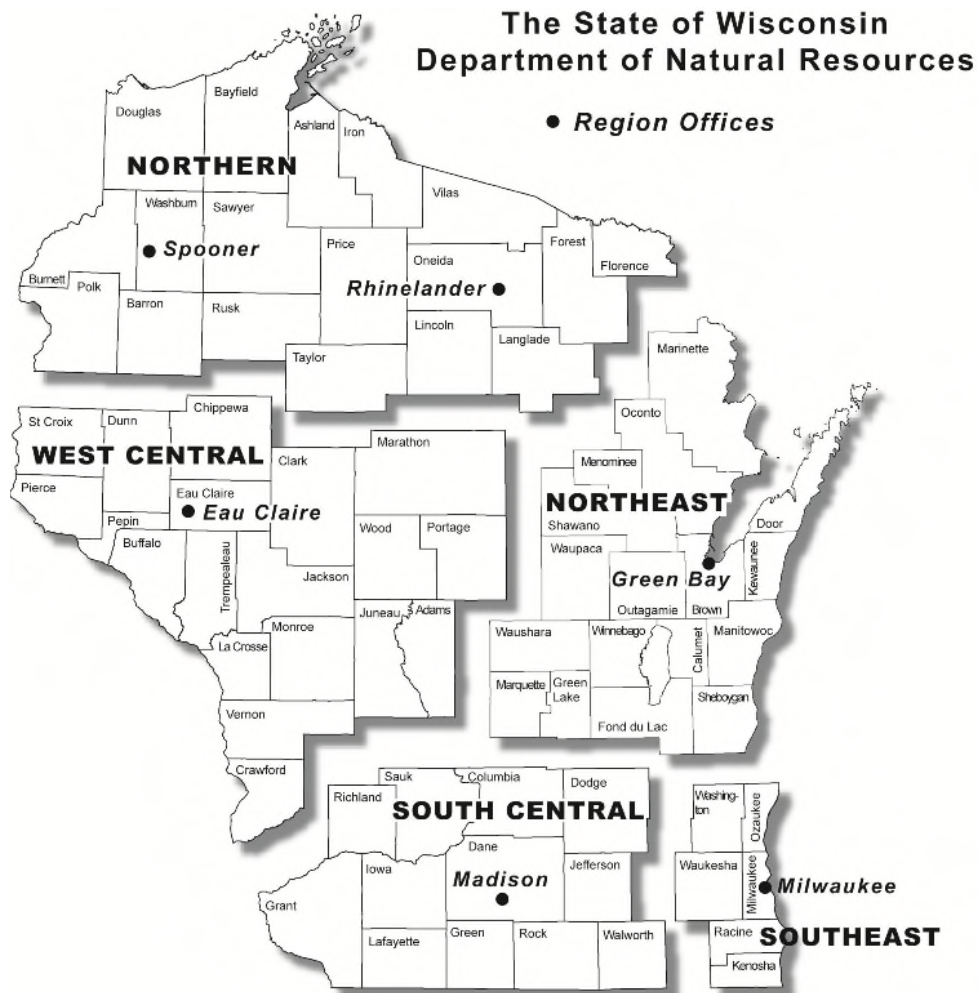
Attn: RR Program Assistant
Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg WI 53711

DNR SOUTHEAST REGION

Attn: RR Program Assistant
Department of Natural Resources
2300 North Martin Luther King Drive
Milwaukee WI 53212

DNR WEST CENTRAL REGION

Attn: RR Program Assistant
Department of Natural Resources
1300 Clairemont Ave.
Eau Claire WI 54702



Note: These are the Remediation and Redevelopment Program's designated regions. Other DNR program regional boundaries may be different.

DNR Use Only			
Date Received	Date Assigned	BRRTS Activity Code	BRRTS No. (if used)
DNR Reviewer		Comments	
Fee Enclosed? <input type="radio"/> Yes <input type="radio"/> No	Fee Amount \$	Date Additional Information Requested	Date Requested for DNR Response Letter
Date Approved	Final Determination		

Alyssa Sellwood, PE
Complex Sites Project Manager – Remediation & Redevelopment Program
Wisconsin Department of Natural Resources
101 S. Webster Street
Box 7921
Madison, WI 53707-7921

Arcadis U.S., Inc.
126 North Jefferson
Street
Suite 400
Milwaukee
Wisconsin 53202
Phone: 414 276 7742
Fax: 414 276 7603
www.arcadis.com

Date: April 23, 2021

Our Ref: 30015294

Subject:

Air Pathway Site Investigation Work Plan
Tyco Fire Technology Center, Marinette, Wisconsin
BRRTS #: 02-38-580694

Dear Ms. Sellwood,

Arcadis U.S., Inc. (Arcadis) has prepared this Air Pathway Site Investigation Work Plan (work plan) on behalf of Tyco Fire Products LP (Tyco) for the Fire Technology Center (FTC, Site) located in the City of Marinette, Wisconsin. This work plan responds to the Wisconsin Department of Natural Resources (WDNR) comment letter dated February 23, 2021 regarding the Arcadis Aerial Deposition Evaluation Report (Report) dated June 2020. The WDNR stated that the potential air transport and deposition of per- and polyfluoroalkyl substances (PFAS) from activities associated with the aqueous film forming foam (AFFF) at the Site need further evaluation. Accordingly, the WDNR directed Tyco to submit a work plan by April 26, 2021 to address five questions identified in the February 23 comment letter. The WDNR requested the following activities be conducted:

1. Evaluation of other potential aerial discharge mechanisms of PFAS
2. Evaluation of variability in PFAS fingerprint
3. Additional soil sampling to evaluate potential airborne deposition of PFAS
4. Additional groundwater data to support conclusions in the Report
5. Additional information provided to evaluate/confirm air modeling in the Report.

The scope of this work plan is intended to address all five questions using a data driven approach that assesses potential "cause and effect" with regards to the existence of an air pathway. The work plan proposes to address questions #3 (Additional Soil Sampling) and #4 (Additional Groundwater Data) through a multi-phase, statistically based, sampling program to delineate PFAS concentrations and test whether aerial transport and deposition of PFAS occurred historically or may be occurring at levels that could contribute to off-site soil or groundwater impacts. Supporting information will be provided, to the extent it is available, to address the WDNR's question #1 (Aerial Discharge Mechanisms); question #2 (Variability in PFAS Fingerprint), and question #5 (Air Modeling Information) in alignment with the overall approach.

The data-driven approach is necessary because aerial transport and deposition of PFAS constitutes an emerging area of research that does not yet encompass the situation presented at the FTC. To date, air pathway studies in published literature most often represent emissions sources and release scenarios, such as point source

emissions from tall stacks at primary manufacturing or processing facilities that are not representative of the FTC. Although the state-of-the-science on the chemistry and mechanics of PFAS aerial transport and deposition continues to evolve, the question of whether aerial deposition is occurring has been answered successfully in other studies by collecting field samples where deposition may have occurred and by assessing those data statistically to test whether they are correlated with potential releases from the Site. Therefore, additional soil sampling in response to the WDNR's question #3 will be the centerpiece of the air pathway investigation. Methods employed will draw from published studies and available guidance for soil sampling programs designed to assess PFAS (as described further in the "Scope of Work"). On-site soil samples are proposed for the first phase of the investigation because of the way in which the AFFF was tested and released, and existing on-site soil data show a sharp decline in PFAS concentrations within a short on-site distance from the areas where AFFF testing occurred (Figures 1 and 2). These data appear to line up with FTC activities that involved relatively low-elevation releases of AFFF and low-temperature, controlled fires of very short duration.

AFFF have high molecular weights and are designed to effectively quench and extinguish the fires within seconds whether outdoors or indoors. Fire testing that used AFFF products occurred at the Outdoor Testing/Training Area (OTA). Foam spray and nozzle testing occurred at the Hydraulics Laboratory and associated outdoor areas. All outdoor foam testing at the Site ceased in November 2017. The test fires ran for very short periods of time and used low flashpoint fuels, based on military or other specifications. Outdoor releases of AFFF were typically at ground-level or shoulder height, which are less likely than a stack height release to produce the potential for aerial transport and deposition off-site. The surface characteristics of the property in the dominant wind direction (to the northeast as shown on Figures 3 and 4) are also likely to impede off-site transport of low-elevation, short-duration AFFF releases. Smoke may have emanated from roof openings atop the fire test houses while they were in use, but at very low flows (estimated between 10 to 20 cubic feet per minute), at relatively low exhaust temperatures (as compared to a wildfire, for example), and at an approximate 50-foot height. The release height and flow rate are much lower than from a typical stack at a manufacturing plant. Low temperature exhausts from the test houses would also produce less buoyancy needed for aerial transport of emissions off-site.

For these reasons, the work plan described below emphasizes empirical data collection and analysis, beginning with on-site shallow soil sampling. Groundwater sampling will not be conducted in the first phase of the work plan. As a data-driven investigation seeking to assess cause and effect, the soil data collected during the first phase needs to justify a correlation to aerial deposition for the sampling program to proceed. Additional phases of data collection, if indicated by on-site shallow soil sample results, would then continue in a stepwise manner, and thereafter based on the results of each phase of sampling. To the extent information is available or exists, Tyco will also address the remaining questions raised by the WDNR with the goal of supporting the empirical air pathway investigation.

We believe that this Air Pathway Site Investigation Work Plan represents a good faith effort to respond to the five questions raised by the WDNR.

Scope of Work

This work plan lays out a framework for:

- Addressing questions #3 and #4 through a multi-phase, statistically based soil sampling program to delineate PFAS concentrations and test whether aerial deposition of PFAS may have occurred at levels that could contribute to potential off-site soil and groundwater impacts.

- Providing supporting information to address questions #1, #2, and #5 in alignment with the overall approach to evaluating the air pathway.

Aerial Discharge Mechanisms (Question #1)

The plan to further evaluate aerial discharge mechanisms will include, as feasible given the availability of data and the current state of the science:

- A review of relevant published literature on PFAS transformation and volatilization, and aerial transport and deposition.
- General descriptions of the characteristics and behavior of AFFF when used in testing operations (i.e., charged functional groups that inhibit volatilization, high density, intermittent fugitive emissions, low-release heights, etc.) which is markedly different than other release scenarios such as continuous point source emissions of PFAS at a primary manufacturing plant directed through a stack, for example.
- Descriptions of the durations, temperatures, and fire behaviors for test fires performed at the FTC to consider the potential for PFAS transformation or volatilization.
- If available, other historical records on indoor and outdoor testing, AFFF use, and building operating conditions. Records previously submitted to the WDNR will be listed to frame the historical data set that is available.
- Other potential sources of PFAS emissions in the vicinity.

Data compiled in response to this question will be provided as an appendix to the Air Pathway Site Investigation report.

Variability in PFAS Fingerprint (Question #2)

Following a review of the soil results obtained through question #3, compositional information will be developed from soil and groundwater data compiled to date for the overall PFAS investigations to graphically present the proportion of PFAS compounds in each sample. This analysis will incorporate the 36 analytes required by the WDNR. The analytical data for soils collected in the first phase of this work plan (and subsequent phases, if needed) will be assessed with respect to relevant compositional markers that characterize historical AFFF use at the Site.

Shallow Soil Sampling Program (Question #3)

Tyco will conduct a phased shallow soil sampling program starting with an initial soil sampling phase conducted on Tyco property. Additional phases of soil sampling may be conducted off-site should the on-site soil sampling results indicate the potential for off-site aerial deposition from Site activities. The shallow soil sampling program is designed to “inform on potential impacts [i.e., cause and effect] from aerial deposition”.¹ The sampling plan will expand the existing on-site soil data set (Figure 2). The proposed data analysis will incorporate wind patterns based on the annual and seasonal wind data from nearby Menominee Regional Airport. Figure 3 shows the frequency, speed, and direction of local winds in 10-degree increments on a 24-hour basis over a 5-year period (2015-2019). Figure 4 shows the primary, secondary, and tertiary wind directions where the wind blows most often based on the wind rose in Figure 3. Note that all soil samples shown on Figure 2 are believed to have been

¹ WDNR comment letter to Tyco, February 23, 2021, page 3.

collected from locations that have not been excavated for remediation or reconstruction activities in at least two decades (Figure 5). The soil concentration isopleths in Figure 2 show sharp declines in PFOA and PFOS concentrations moving away from the OTA and other areas where historical AFFF testing operations occurred.

In the first phase of the multi-phase program (Step 1), Tyco will collect a high density of shallow soil samples from undisturbed locations throughout the Site and analyze the samples for PFAS. Data collected will be used to delineate concentrations outward from areas of potential PFAS emissions and tested for correlation with distance and/or dominant wind patterns.

Sampling Locations and Methodology

Approximately 52 new on-site soil samples from undisturbed locations are proposed in a single sampling event to facilitate the delineation of PFAS concentrations in unsaturated, surface soils and a statistical evaluation of results. Samples will be collected by hand augers from a depth of 0 to 6 inches to represent surface soil conditions where concentrations resulting from aerial deposition would be expected to be highest. Sampling methods employed will be based on best available guidance and existing studies.^{2,3} United States Environmental Protection Agency (U.S. EPA) Region 4 guidance, for example, states that if a thick, matted root zone, gravel, concrete, or other debris is present at or near the surface, it will be removed prior to sample collection. The sampling interval will begin at the top of the soil horizon immediately below removed material. Existing on-site surface soil sampling data and/or locations will be included as part of the data set, as appropriate, for the air pathway investigation.

Figure 6 shows the proposed sample locations overlain on a shaded relief map of the FTC that also shows wetlands. Soil sample locations were selected in areas believed to be undisturbed, including forested or open areas where there is no record of excavation or active use during the period of FTC operations. Wetland areas will be avoided to the extent feasible, particularly on the eastern half of the FTC where there is potential for interaction with groundwater or surface water with PFAS impacts. Therefore, proposed soil sample locations shown on Figure 6 are approximate and will be adjusted in the field, as necessary. The selected distribution of sample locations is based on a target spacing of 400 to 500 feet, biased where needed toward higher ground, to avoid potential interference from shallow groundwater. A wetlands delineation will be performed to verify suitability of locations and adjust them if needed.

Note that one soil sample is proposed to be collected adjacent to the location of shallow groundwater sample VAP-22 on the northwest FTC property boundary. This location was specifically referenced in the WDNR comments on the Report. VAP-22 has been previously identified as within the PFAS plume associated with the FTC; however, the recent soil concentration data collected proximate to VAP-22 (SS182; PFOS 0.23J µg/kg, PFOA 0.88 µg/kg) are very low, indicating the air to groundwater pathway is incomplete. Shallow soil sampling at VAP-22 will be used to assess whether additional evaluation is needed.

Soil sample handling, chain-of-custody, data quality objectives and analytical procedures will be executed in accordance with the Draft Quality Assurance Project Plan (QAPP), Tyco PFAS Site Investigation and Private Well

² For example, Region 4 U.S. Environmental Protection Agency, Laboratory Services and Applied Science Division, "Soil Sampling Operating Procedure", ID: LSASDPROC-300-R4, Athens, Georgia, June 11, 2020. (See Section 3, *Samples Collected for Volatile Organic Compounds (VOC) or for Per- and Polyfluoroalkyl Substances (PFAS) Analyses* and Section 4, *Manual Soil Sampling Methods*.)

³ See also Interstate Technology & Regulatory Council (ITRC) online PFAS module 11 on *Sampling and Analytical Methods*. <https://pfas-1.itrcweb.org/11-sampling-and-analytical-methods/>

Allyssa Sellwood, PE
WDNR
April 23, 2021

Sampling Activities, Marinette, Wisconsin on April 15, 2020. The samples will be analyzed using Modified U.S. EPA Method 537 for the 36 PFAS analytes required by the WDNR and as indicated in the Draft QAPP. Soil data will be tabulated for statistical analysis and data interpretation.

Statistical Evaluation and Soil Data Interpretation

An iterative process, driven by the data, will be implemented to assess and interpret the results, then determine if additional phases are necessary to complete the air pathway investigation. Data will be statistically tested using appropriate analytical tools to evaluate correlations between concentrations and distance and/or dominant wind patterns. Individual PFAS analyte detections will also be subjected to statistical analysis. Statistical tests will be applied to compare the central tendencies of the concentrations of the PFAS analytes in the soil data. Soil data collected through this work plan will be compared to previously collected soil data from the FTC and existing groundwater data, in part to compare data tendencies to those of the PFAS plume. Other supporting information will be developed if needed and to the extent feasible given the state of the science, to interpret data from the soil sampling program, such as potential aerial discharge mechanisms associated with AFFF (i.e., question #1), the PFAS compositional markers that may characterize the Site (i.e., question #2), and other potential sources of PFAS in the local area.

The selected statistical approach will depend on the normality of the data. Prior to performing these tests, the statistical distributions of the data sets will be established. The data will be combined and tested for lines of evidence that they are a single statistical population. After establishing normality of the data, concentration gradients will be developed to represent the results by plotting concentration and distance to test for correlation(s).

To assess a potential air pathway and to determine whether to proceed with additional phases of the investigation, the decision process will involve an assessment of various factors, such as whether or not a correlation exists; whether PFAS concentrations in soil decline to a pattern of low concentrations consistent with local background levels before reaching the property boundary; whether concentrations vary with annual or seasonal wind patterns, and/or other relevant factors indicated by the soil data. Isolated hotspots observed in the soil data will be evaluated in a similar manner, considering parametric distribution and statistical test results, the potential for a laboratory anomaly and the reproducibility of the result, available compositional markers, and the relevance of nearby land use and activities, for example.

If the results indicate that the air pathway is incomplete, i.e., there are no potential off-site soil or groundwater impacts, then no further soil sampling and no groundwater sampling will be recommended. Alternatively, the results may indicate a need for additional phases of the site investigation to further assess the air pathway, including off-site shallow soil sampling (Step 2, question #3) and shallow groundwater sampling at a subset of upgradient soil sampling locations (i.e., Step 3, question #4). Should the investigation proceed to Steps 2 and 3, an addendum to this work plan will be provided to the WDNR for review and approval. As noted above, groundwater sampling will not be conducted in the first phase of the investigation. Methods, analytical data, statistical analysis, and conclusions concerning cause and effect as regards the air pathway will be presented in the Air Pathway Site Investigation report.

Shallow Groundwater Sampling Program (Question #4)

As noted above, groundwater sampling will be performed as part of the air pathway site investigation only after soil sampling results are evaluated and only then if the data show the potential for off-site impacts. If this phase is initiated, groundwater samples will be collected only in areas where the overall groundwater plume has not been evaluated (i.e., upgradient locations) and are not connected to surface water or bedrock. The number and placement of proposed upgradient groundwater sampling locations will be based on soil data, to test whether the air-to-soil-to-groundwater transport pathway is complete (i.e., to test cause and effect, not to complete delineation). As with soil, well installation will be phased, starting with on-site locations. If on-site groundwater data do not show a soil-groundwater impact (for example, PFAS concentrations in groundwater above WDNR Preventative Action Levels) that are attributable to aerial deposition, no off-site groundwater sampling will be proposed. As noted, wells will only be recommended at locations outside the known PFAS groundwater plume. If phases of groundwater sampling are initiated based on the data gathering and evaluation described above, details for the design, implementation and reporting of the will be provided to the WDNR in an addendum to this work plan.

The potential groundwater sampling program will involve permanent wells constructed to screen shallow groundwater (e.g., upper 2 to 3 feet below water table), where the presence of PFAS that leached from soil would be detectable and least likely to be confused with migration from unrelated upgradient sources. Locations are expected to be completed as short-screened monitoring wells and may be installed by hand-auger where drill-rig access is not feasible. If deviations from NR 141 well construction requirements are needed for constructability or to meet the data objectives, Tyco will provide recommended specifications in an addendum to this work plan.

Groundwater sampling methods, handling, chain-of-custody, and analysis completed under this program will be performed in accordance with the Draft QAPP. Analysis of groundwater samples will be performed for the 36 analytes required by the WDNR. Existing groundwater data such as the WDNR's residential well data and the PFAS compositional information developed by Tyco to address question #2 will be incorporated into the evaluation and compared to the data obtained through the air pathway site investigation.

Air Modeling Information (Question #5)

The 24-hour annual wind rose for a 5-year period is provided in Figure 3 as discussed under the "Shallow Soil Sampling Program" section of this work plan. A table of the air dispersion modeling inputs discussed in the Air Deposition Evaluation Report (June 2020) will be prepared as an appendix to the Air Pathway Site Investigation report.

Schedule

Soil sampling can be initiated within 4 weeks of approval and a report will be submitted approximately 8 weeks after all laboratory analyses are received and validated. The report will be developed to respond to the WDNR questions and will provide recommendations for additional phases of work if necessary, based on the soil data evaluation.

Allyssa Sellwood, PE
WDNR
April 23, 2021

Closing

We look forward to WDNR approval of this air pathway site investigation work plan. Should you have any questions or wish to discuss any part of this work plan, please do not hesitate to contact us.

Sincerely,
Arcadis U.S., Inc.



Christopher S. Peters, PG (WI)
Principal Geologist

Email: Chris.Peters@arcadis.com
Direct Line: 517.324.5052
Mobile: 517.927.3611



Linda Kemp
U.S. Air Practice Leader

Linda.Kemp@arcadis.com
720.425.2005

CC. Jeff Danko, Tyco

Enclosures:

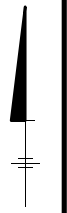
- | | |
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| Figure 1 | AFFF Test Areas and Buildings |
| Figure 2 | PFOA and PFOS Soil Concentration Isopleths at the FTC |
| Figure 3 | Annual 24-Hr Wind Rose 2015-2019 ("From") |
| Figure 4 | Annual 24-Hr Wind Rose Showing Dominant Wind Directions ("To") |
| Figure 5 | Historical Soil Sample Locations and Soil Excavations Within/Near the AFFF Test Areas |
| Figure 6 | Proposed On-Site Soil Sampling Locations |

Figures



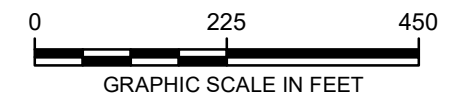
LEGEND:

- DITCH/STREAM
- AFFF TEST AREAS AND BUILDINGS



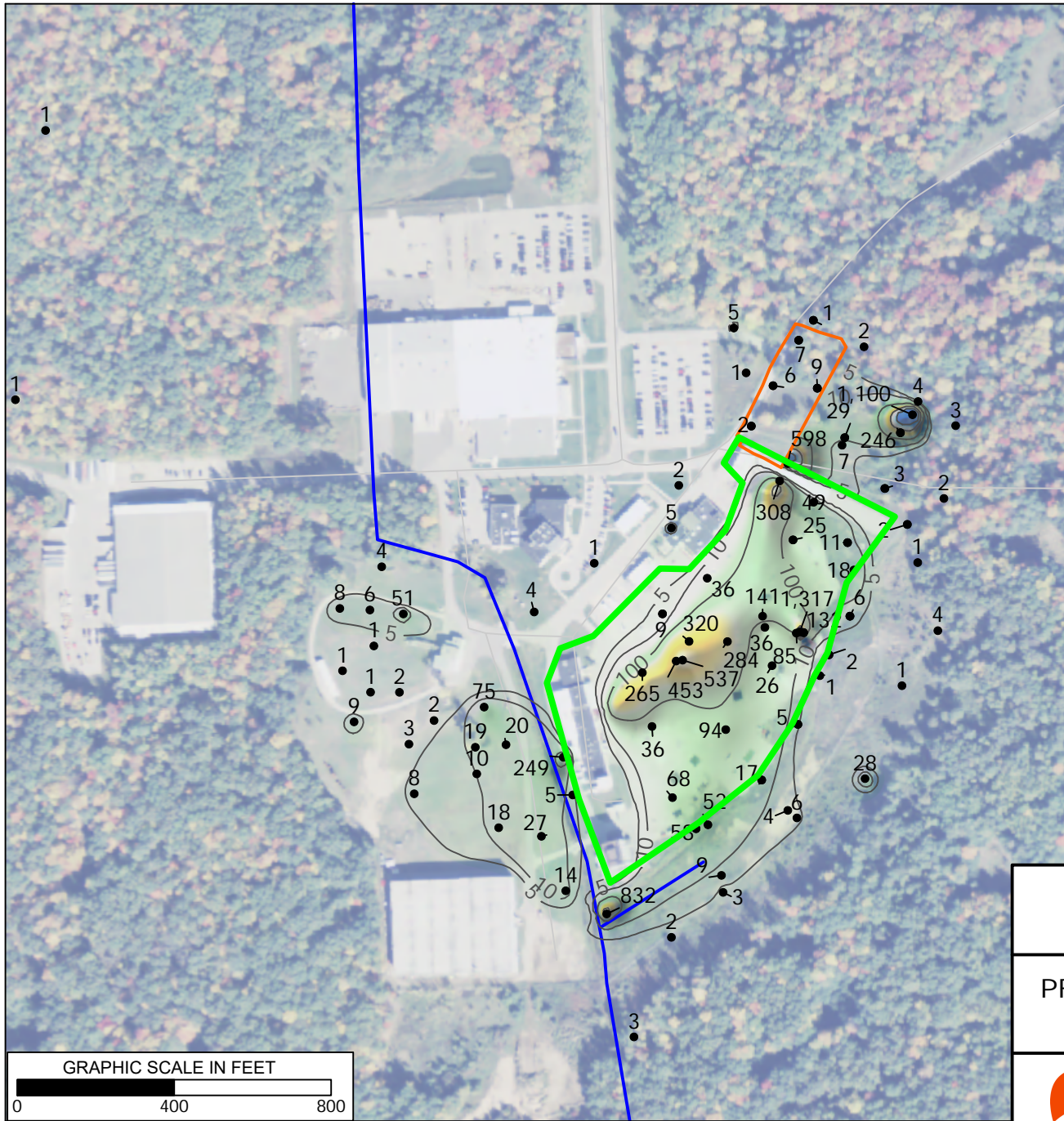
NOTES:

1. AERIAL IMAGERY SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY



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AFFF TEST AREAS AND BUILDINGS



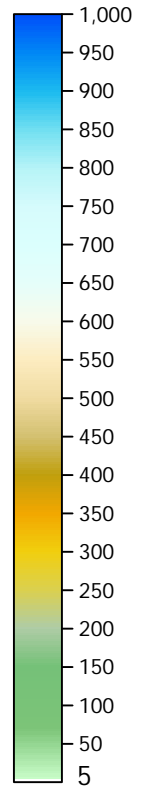
LEGEND

- 832 SOIL BORING LOCATION (PFOA +PFOS CONCENTRATION SHOWN)
-
- DITCH
- BUILDING 105 EXCAVATION
- AFFF TEST AREAS AND BUILDINGS

NOTES

1. µg/kg = MICROGRAM PER KILOGRAM
2. AERIAL MAP FROM USGS.
3. SOIL DATA REPRESENT DEPTHS RANGING FROM EXISTING GROUND SURFACE TO THE GROUNDWATER TABLE (0 TO 4 FT BELOW GROUND SURFACE).
4. PFOA+PFOS CONCENTRATIONS REPRESENT THE CONCENTRATIONS AT A GIVEN LOCATION.

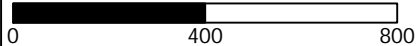
PFOA+PFOS SOIL CONCENTRATION (µg/kg)



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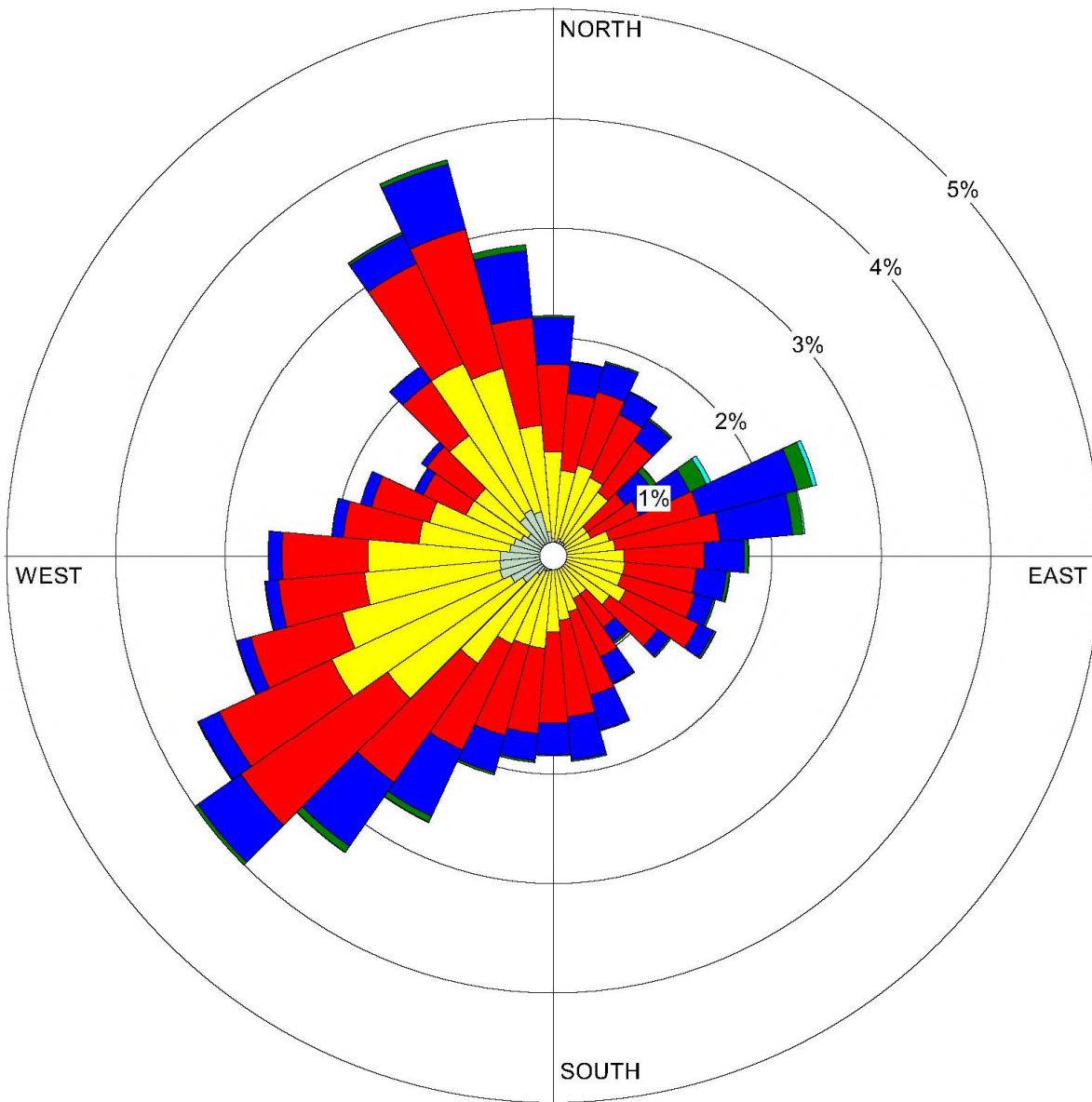
PFOA AND PFOS SOIL CONCENTRATION ISOPLETHS AT THE FTC

GRAPHIC SCALE IN FEET

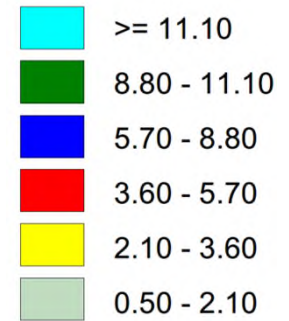


FIGURE

2



**WIND SPEED
(m/s)**



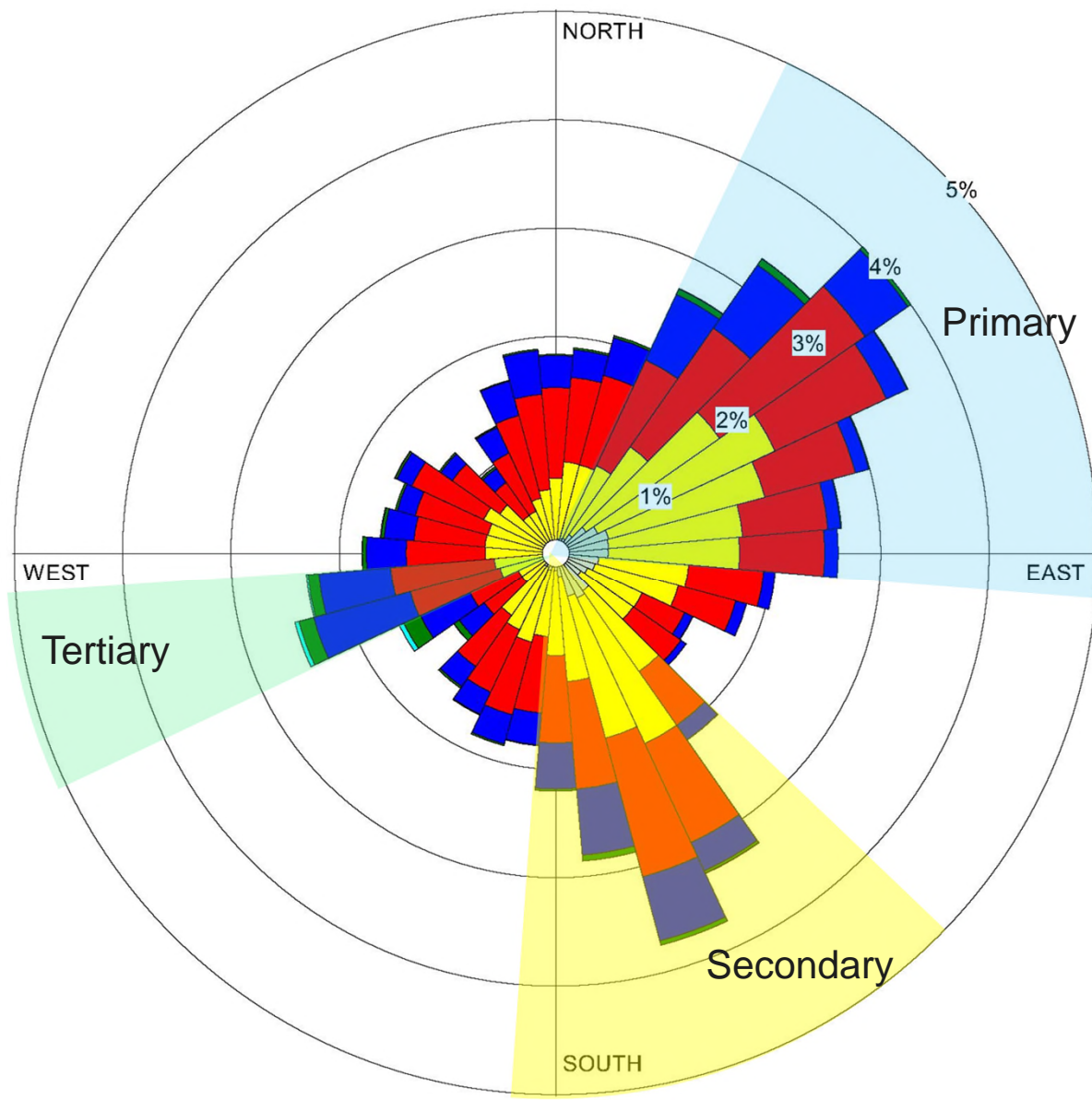
Calms: 13.30%

NOTE:
1. WIND ROSE DATA ARE
FROM THE MENOMINEE
REGIONAL AIRPORT

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**ANNUAL 24-HOUR WIND ROSE
2015-2019 ("FROM")**





**WIND SPEED
(m/s)**

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 13.30%

NOTE:
1. WIND ROSE DATA ARE FROM THE MENOMINEE REGIONAL AIRPORT

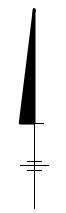
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**ANNUAL 24-HOUR WIND ROSE
SHOWING DOMINANT WIND DIRECTIONS
("TO")**



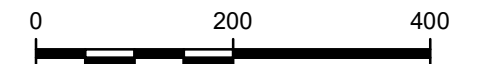
LEGEND:

- ▲ HISTORICAL PFAS SOIL SAMPLING LOCATIONS
- ▭ BUILDING 105 EXCAVATION (SEE NOTE 4)
- ▭ EXTENT OF EXCAVATION (EARTH TECH, 2006)
- REMOVED PIPING (EARTH TECH, 2006)



NOTES:

1. AERIAL IMAGERY: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY
2. HISTORICAL SOIL SAMPLING EVENTS WERE COMPLETED IN 2013, 2014, 2016, 2018, 2019, AND 2020. SAMPLES WERE ANALYZED FOR PFAS CONSTITUENTS.
3. SOURCE OF EXCAVATION AND REMOVED PIPING: EARTH TECH, INC. 2007. SOIL EXCAVATION DOCUMENTATION, FIRE TECHNOLOGY CENTER AND R&D GROUNDS - FUEL DISTRIBUTION SYSTEM UPGRADE PROJECTS, BRRTS NO. 03-38-001345. MAY.
4. SOIL SAMPLES COLLECTED WITHIN BUILDING 105 FOOTPRINT EXCAVATION PREDATE EXCAVATION.

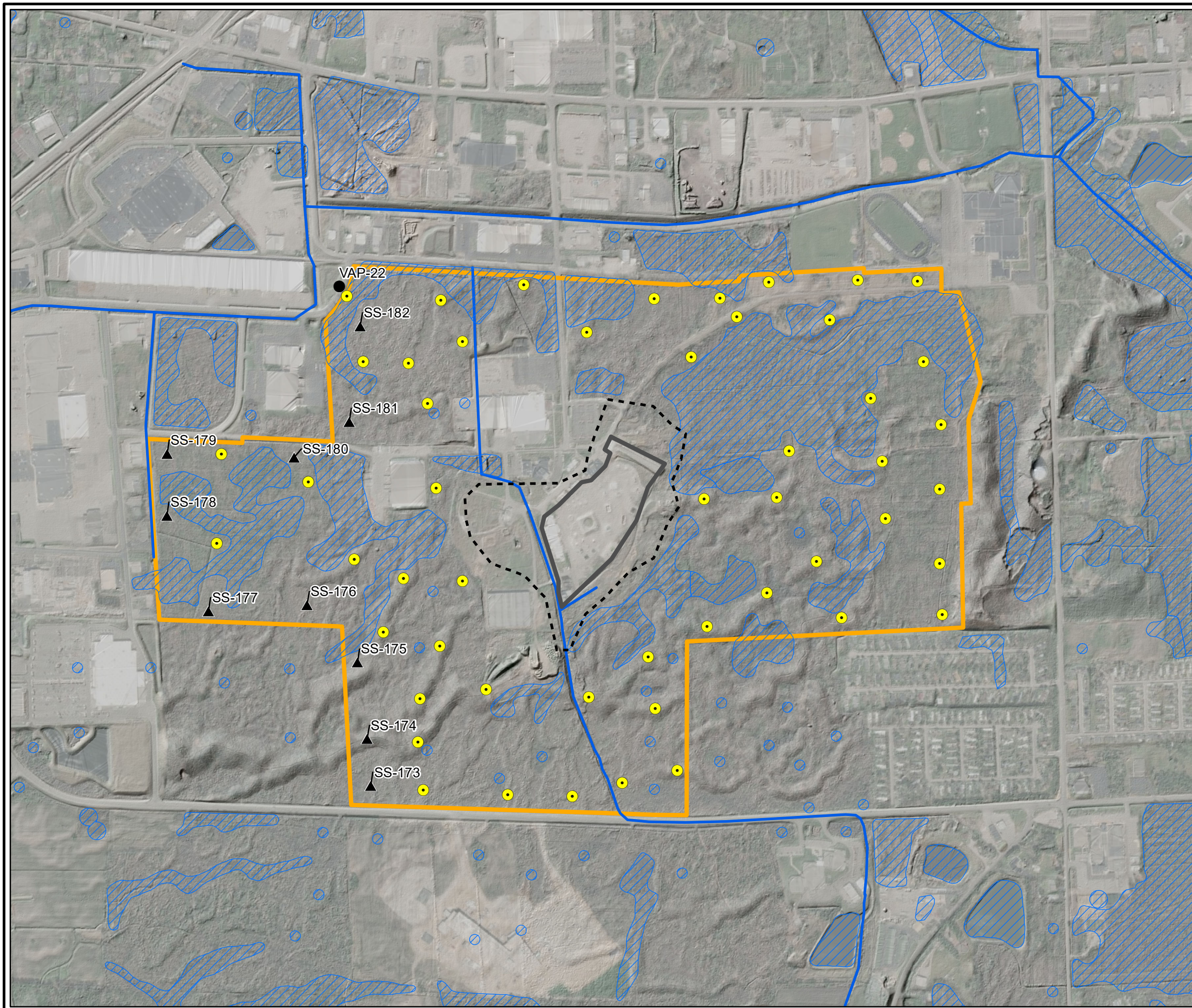


GRAPHIC SCALE IN FEET

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HISTORICAL SOIL SAMPLE LOCATIONS AND SOIL EXCAVATIONS WITHIN/NEAR THE AFF TEST AREAS





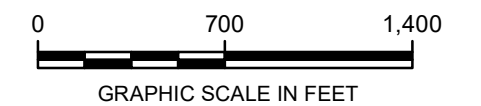
LEGEND:

- PROPOSED SURFACE SOIL SAMPLE LOCATION
- 2020 SURFACE SOIL SAMPLE LOCATION
- VAP BORING LOCATION
- LOCATION OF EXISTING AFFF TESTING AREA SOIL DATA
- AFFF TEST AREAS AND BUILDINGS
- APPROXIMATE SITE PROPERTY BOUNDARY
- DITCH/STREAM
- WETLAND



NOTES:

1. DITCH/STREAM DATA SOURCE: U.S. GEOLOGICAL SURVEY NATIONAL HYDROGRAPHY DATASET, ACCESSED FALL 2017.
2. AERIAL IMAGERY: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY
3. WETLANDS SOURCE: WISCONSIN WETLAND INVENTORY, ACCESSED SPRING 2020.
4. THE LOCATION OF AFFF TESTING AREA SOIL DATA IS REPRESENTATIVE OF THE SOIL SAMPLE LOCATIONS PRESENTED ON FIGURE 5.
5. THE SOIL SAMPLE CO-LOCATED WITH VAP-22 WILL BE COLLECTED ONSITE WHERE NO STANDING WATER OCCURS.



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**PROPOSED ONSITE SOIL SAMPLING
LOCATIONS**