FINAL
NO FURTHER RESPONSE ACTION PLANNED DECISION DOCUMENT
SITE TU001
DULUTH INTERNATIONAL AIRPORT

SITE TU001
148TH FIGHTER WING
MINNESOTA AIR NATIONAL GUARD
DULUTH, MINNESOTA

Contract #: W9133L-14-D-0002
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July 2020

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LIST OF ACRONYMS

AMSL	Above Mean Sea Level
ANG	Air National Guard
AOC	Area of concern
ARARs	Applicable or relevant and appropriate requirements
BB&E	BB&E Consulting Engineers and Professionals
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DD	Decision Document
DIA	Duluth International Airport
DRO	Diesel range organics
ESI	Engineering Science, Inc.
°F	Degrees Fahrenheit
ft	Feet
FS	Feasibility Study
FW	Fighter Wing
GRO	Gasoline range organics
HBVs	Health Base Value
HRLs	Human Risk Levels
ISLs	Intrusion Screening Levels
ISVs	Intrusion Screening Values
MCLs	Maximum contaminant level
MDH	Minnesota Department of Health
mi^2	Square miles
MNANG	Minnesota Air National Guard
MPCA	Minnesota Pollution Control Agency
NCDC	National Climate Data Center
NERS	Newly Evaluated Restoration Sites
NFA	No Further Action
NFRAP	No Further Response Action Planned
PA	Preliminary Assessment
RAAs	Risk Assessment Advice Values
RI	Remedial investigation
RSLs	Regional Screening Levels
SI	Site Investigation
SLVs	Soil Leaching Values
SRVs	Soil reference values
TPH	Total petroleum hydrocarbons
Site TU001	Site TU001 - Building 500 Alert Hanger Underground Storage Tanks
ug/L	Micrograms per liter
USAF	U.S. Air Force
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USTs	Underground Storage Tanks

UU/UE	Unlimited use and unrestricted exposure
VOCs	Volatile organic compounds

DECLARATION

Name of Installation

148TH Fighter Wing
Minnesota Air National Guard
Duluth, Minnesota

Site Name and Location

TU001: Building 500 Alert Hanger Underground Storage Tanks (USTs)

Statement of Basis and Purpose

This Decision Document (DD) identifies a preferred alternative of Unlimited Use/Unrestricted Closure for Site TU001 at the 148th Fighter Wing (FW) of the Minnesota Air National Guard (MNANG), Duluth Air National Guard (ANG) Base in Duluth, Minnesota. Site TU001 is located within the extent of the ANG Base. The 148th Wing is currently active and their core mission is to fly, maintain, and support F-16 aircraft stationed at Duluth ANG Base. Site TU001 is being addressed as part of the Newly Evaluated Restoration Sites (NERS) program. Through the NERS program, potential contamination at Department of Defense installations and formerly owned or used properties is investigated and remediated, as appropriate. The NERS is carried out in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended in 1986 by the Superfund Amendments and Reauthorization Act, and the National Oil and Hazardous Substances Pollution Contingency Plan National Contingency Plan. The ANG is the lead agency for the NERS and works closely with the Minnesota Pollution Control Agency (MPCA) to investigate, clean up, and ultimately close NERS sites.

Description of the Selected Remedy

Based on the current conditions at Site TU001, it has been determined that Site TU001 poses no significant risk or threat to public health or the environment. Therefore, Site TU001 falls under the No Further Response Action Planned (NFRAP) Category III under the CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986, and no further investigation is required for Site TU001.

Declaration Statement

This Category III NFRAP DD has been prepared in accordance with the September 2009 Air Nation Guard Investigation Guidance. This NFRAP DD presents the selected response action for Site TU001 developed in accordance with CERCLA, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. It also satisfies the requirements of the National Environmental Policy Act that apply to CERCLA response actions. According to the September 2009 Air Nation Guard Investigation Guidance, a Category III NFRAP decision is appropriate for a geographically contiguous area or parcel of real property where environmental evidence demonstrates that hazardous substances or petroleum products or their derivatives have been stored, released, or disposed of, but are present in quantities that require no response action to protect human health and the environment. It has been determined that the selected remedy of no further action (NFA) allowing for unlimited use and unrestricted exposure (UU/UE) is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost effective. The statutory preference for further investigation is not applicable because Site TU001 has been determined to present no significant threat to human health or the environment; therefore, NFA is warranted for Site TU001.

NGB/A4OR

Concurrence Record
For the No Further Response Action Planned Decision at:

- **TU001 - Building 500 Alert Hanger Underground Storage Tanks.**

148th Fighter Wing
Minnesota Air National Guard
Duluth, Minnesota

Elaine Magdinec
ANG/A4V Environmental Division Chief

Date

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1.0 INTRODUCTION

This Decision Document (DD) supports a No Further Action (NFA) decision for the Site TU001 - Building 500 Alert Hanger Underground Storage Tanks [USTs]) (Site TU001) at the 148th Fighter Wing (FW), Minnesota Air National Guard (MNANG), Duluth, Minnesota (herein referred to as "the Base").

The Duluth International Airport (DIA) is located approximately 7 miles northwest of the City of Duluth, Minnesota. The DIA is comprised of approximately 2,000 acres. The Base property is composed of 7 areas that total 290 acres and is located adjacent to the DIA. Most of the Base acreage is leased from the City of Duluth and the State of Minnesota. The Base is operated by the MNANG. Overall, the Base is surrounded by forested areas and wetlands with open spaces to the north. Lake Superior is located approximately 7.5 miles to the east (**Figure 1** and **Figure 2**).

The purpose of this Category III DD is to summarize the existing data, to evaluate potential risks to human health and the environment, and to provide the rationale for the proposed NFA decision for Site TU001. The primary sources of information that were used to derive and support the NFA decision for Site TU001 include the following reports:

- Screening Level Risk Assessment (Amec Foster Wheeler, 2017)
- Draft-Final Remedial Investigation/Feasibility Study (RI/FS) Report, Great Lakes Region 148th FW, Duluth International Airport Areas of Concern (AOCs) AT028 and TU001 (Amec Foster Wheeler, June 2018)

It should be noted that the Draft-Final RI/FS Report (Amec Foster Wheeler, 2018) was prepared for two AOCs and addressed both AT028 and TU001. This NFA DD is reporting on Site TU001 exclusively.

A description of Site TU001 and the surrounding area is provided in **Section 1.1**. Site history and enforcement actions (if any) are discussed in **Section 1.2**. Community participation efforts conducted by the Base are presented in **Section 1.3**. **Section 1.4** discusses the scope of the proposed response action. The physiography, geologic setting, climatology, site soil and groundwater characteristics, and any potential site receptors, are presented in **Section 2.0**. An analysis of available site-related data, as well as an evaluation of any human health risks that may be potentially posed by Site TU001, are presented in **Section 3.0**. **Section 4.0** presents the selected response action for Site TU001 and the rationale for selection of this action. **Appendix A**

provides the Risk Assessment completed for both sites included in the RI activities, including Sites AT028 and TU001. **Appendix B** provides the Ecological Conceptual Site Model prepared for AT028 for completeness. However, it should be noted that Site TU001 was not included in the Ecological Conceptual Site Model (**Appendix B**) as ecological receptors were determined to be negligible (**Section 2.2**). Amec Foster Wheeler recommended NFA for Site TU001 in the Draft-Final RI/FS Report (Amec Foster Wheeler, 2018) and the Minnesota Pollution Control Agency (MPCA) concurred with the recommendation in a letter dated December 12, 2018. The MPCA Concurrence letter is included in **Appendix C**.

1.1 Site Name, Location, and Description

This section presents an overview of Site TU001 including the site description, information on site topography, a discussion of critical environments, adjacent land uses, and nearby populations.

1.1.1 Site Description

The 148th FW is located on approximately 290 acres of property that the MNANG has exclusive license under a United States Air Force (USAF) lease from the State of Minnesota. Site TU001 is located to the North-East of the airport (**Figure 1**).

1.1.2 Topography

The Base is located adjacent to and northeast of the DIA. It is approximately 7 miles northwest of the City of Duluth in St. Louis County, Minnesota. Lake Superior is located approximately 7.5 miles east of the Base. The Base is located on relatively flat terrain with a surface elevation of approximately 1,400 ft above mean sea level (AMSL) (SAIC, 2003).

The Duluth area lies within the North Shore Highland section of the Superior Upland, a submaturely dissected, recently glaciated peneplain overlying complexly structured crystalline rocks. The regional land surface typically appears flat to gently rolling. Low areas have developed swamps and bogs due to perennially wet conditions and generally poor area drainage (Engineering Science, Inc. [ESI], 1982).

Surface elevations in the Duluth area range from 900 ft AMSL overlooking Lake Superior east of Duluth to 1,500 ft AMSL at the Canadian border. Area relief is the result of glacial activity during the last period of major glaciation, which has covered area bedrock with a relatively thin veneer of glacial drift. Locally, relief may be very distinct due to the presence of deposits of unconsolidated materials in the form of such glacial landforms as karnes (irregular, rounded,

sometimes dome-like hillocks of stratified drift), kettles (depressions in the topographic surface that are caused by melting pockets of glacial ice that may fill with water, forming ponds), and moraines (accumulations of glacial till pushed up by the glacier) (SAIC, 2003).

1.1.3 Adjacent Land Uses

Majority of the Base acreage is leased from the City of Duluth and the State of Minnesota. The main Base is leased from the State of Minnesota while Base areas to the north and south of the runways are leased from the City of Duluth. Largely, the Base is surrounded by forested areas and wetlands with open spaces to the north. Developed land is located to the south and sporadically to the west.

1.1.4 Nearby Populations

Site TU001 is located on the north-eastern portion of the airport. DIA is located approximately 7.5 miles west of the City of Duluth, Minnesota. The airport is largely surrounded by open, vegetated land with suburban residential and commercial properties to the south. DIA is located within Hermantown Minnesota with a population of 9,414 (suburbanstats.org).

1.1.5 General Surface Water and Groundwater Resources

DIA lies within the east-central groundwater province of Minnesota. Groundwater resources of the region typically are derived from unconsolidated glacial sediments or underlying rock aquifers. The major source of recharge to local aquifers consists of precipitation falling directly on the unsaturated portion of the aquifer or percolation through a communicating unit in contact with the aquifer (ESI, 1982). DIA and adjacent communities use the City of Duluth water supplies which are drawn from Lake Superior. Individual domestic or agricultural consumers located in isolated areas tend to rely on small capacity glacial drift wells, or deep low producing bedrock wells with sufficient open hole storage to provide adequate water supply. These deep bedrock wells often recharge with a significant amount of water derived from the shallow overlying glacial drift aquifer.

Surface water drainage at the Base is part of the St. Louis watershed of the Great Lakes Basin (Olcott et al., 1978). The southeastern corner of the watershed, north of the St. Louis River, is drained by several small creeks which flow southeastwardly and join the St. Louis River near its mouth. The remainder of the watershed north of the river drains to the southwest and the smaller streams and tributaries join the St. Louis River along it upper extent. The St. Louis River is the largest river to flow into Lake Superior from Minnesota (SAIC, 2003).

1.1.6 Surface and Subsurface Features

TU001 is an alert hanger that has an active 500-gallon gasoline UST installed under the north end of the building. The UST is used for fueling a pump in the case of a fire.

1.1.7 Critical Environments

According to the U.S. Fish and Wildlife Service (USFWS), as of June 2019, the following mammals and birds are federally endangered, threatened, proposed, and/or listed as candidate species in St. Louis County, Minnesota (the Base is located in St. Louis County) (USFWS, 2019):

- Lynx canadensis (Canada Lynx) – Threatened;
- Myotis septentrionalis (Northern Long-eared Bat) – Proposed as Endangered;
- Canis lupus (Gray Wolf) – Threatened;
- Charadrius melodus (Piping Plover) – Endangered; and,
- Calidris canutus rufa (Red knot) – Threatened.

There is no natural habitat within Site TU001 boundaries. None of these species are known to have critical habitats identified on the Base according to 148th FW, MNANG Environmental Manager.

1.2 Site History and Enforcement Activities

The following subsections present the site history for Site TU001, and briefly discusses the enforcement activities (if any), which have occurred.

1.2.1 Site History

The Building 500 Alert Hangar UST (TU001) is located at the western portion of the Base and north of DIA's main runway 9-27 (**Figure 1**). An "As Built" map from May 1956 reportedly indicated that a 500-gallons gasoline UST was installed at Building 500 to serve the emergency fire pump generator located inside the north end of the building (BB&E Consulting Engineers and Professionals [BB&E], 2011). Based on the "As Built" map, a portion of the 500-gallons gasoline UST was situated at IRP Site 23 – Airport Parking Ramp, which is adjacent to the north and east of Building 500. During a preliminary assessment (PA) conducted by Leidos in December 2013, the 148th FW Environmental Manager indicated that the Building 500 Alert Hangar floor was renovated in approximately 2004 (Personal Communication, 2013). MPCA was contacted during the 2004 Building 500 floor renovations because the soil beneath the floor ignited during the removal of the concrete floor. Following removal of contaminated soils, a vapor barrier and

passive soil vent system was installed.

1.2.2 Regulatory Agency Involvement

There is no history of the U.S. Environmental Protection Agency (USEPA) or the MPCA enforcement activities at Site TU001. There are no permits or agreements that govern response actions at Site TU001. The MPCA has reviewed the *Draft-Final RI/FS Report* (Amec Foster Wheeler, 2018) and has concurred with the conclusion that Site TU001 does not warrant further investigation in a letter dated December 12, 2018 (**Appendix C**).

1.3 Community Participation

No community relations actions have been taken specifically with regard to Site TU001. The ANG provides a Community Participation Plan for the Base.

1.4 Scope of Response Action

This DD addresses the previous investigations that were conducted at Site TU001.

TU001 Leidos PA/SI

Site Investigation (SI) activities were performed by Leidos in 2014 at TU001 which included the installation and sampling of three soil boring/temporary monitoring wells, one permanent monitoring well and a geophysical investigation. Prior to soil boring/well installation, a geophysical investigation was conducted to verify the presence or absence of a UST. Results of the geophysical investigation revealed utility traces and no isolated or symmetrical anomalies consistent with the presence of a UST.

The 2014 soil boring/temporary wells (TU001 SB-1 through SB-3) were advanced at the locations shown in **Figure 2**. Soil boring TU001 SB-3 was converted to a permanent monitoring well (SB03/TU001 MW03). Two soil samples and one groundwater sample were collected from each of the three borings to determine if the historical UST contributed to potential contamination in soil and groundwater. Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), lead, total petroleum hydrocarbons (TPH)-diesel range organics (DRO), and TPH-gasoline range organics (GRO).

Soil concentrations were compared against the residential and industrial soil reference values (SRVs) established by the Minnesota Department of Health (MDH) and the USEPA Regional Screening Levels (RSLs) for soil. Groundwater concentrations were screened against residential

drinking water criteria established by the MDH and USEPA Maximum Contaminant Levels (MCLs) and RSLs.

Soil sampling results indicated lead, two VOCs (benzene and naphthalene), and TPH-DRO were detected. However, none of the detected concentrations exceeded the residential direct contact soil screening criteria. However, it should be noted that TPH-DRO and TPH-GRO do not have SRVs or RSLs.

Groundwater sampling results indicated detections of lead, three VOCs (bromodichloromethane, chloroform, methyl isobutyl ketone), and TPH-DRO. Lead, bromodichloromethane and chloroform were the only constituents that exceeded the residential drinking water criteria. Lead was detected at concentrations ranging from 120 to 130 micrograms per liter (µg/L), in exceedance of the federal MCL (15 µg/L) at temporary wells completed at SB-1 (120 µg/L) and SB-2 (130 µg/L). Bromodichloromethane and chloroform were detected at concentrations exceeding USEPA RSLs.

The Leidos PA/SI Report (Leidos, 2015) recommended the installation of two additional permanent monitoring wells and sampling of the existing well and two additional wells for TPH-DRO, TPH-GRO and VOCs at TU001 Building 500 former USTs.

TU001 Amec Foster Wheeler RI

RI activities were performed by Amec Foster Wheeler in 2016. Six permanent groundwater monitoring wells were installed at Site TU001. Two groundwater samples were collected from each well and submitted for laboratory analysis of VOCs using USEPA Method 8260, lead using USEPA Method 6010/6020, and DRO and GRO using Method WI95. DRO was detected in four monitoring wells (TU001-04, 05, 08 and 09). However, DRO detections ranged from 0.18 mg/L to 0.11 mg/L and there are currently no Human Risk Levels (HRLs) for DRO. VOC and GRO compounds were not detected above laboratory reporting limits.

2.0 SUMMARY OF SITE CHARACTERISTICS

This section provides a summary of the physiography, geologic setting and climatology of the Base. Analytical results obtained for Site TU001 and potential receptors (if any) are also discussed in this section.

2.1 Physiography, Geologic Setting, and Climatology

The consolidated rocks underlying DIA are upper Precambrian age anorthositic, troctolitic, grabbroic, granodioritic, and granitic intrusive (igneous) materials collectively assigned to the Duluth Complex. The Duluth Complex occurs in an arcuate pattern extending from the City of Duluth northward 150 miles to the Canadian border, with a surface area of approximately 2,500 square miles (mi^2). This unit may have originated as one large mass of magma that developed into a sublayered, somewhat differentiated rock sequence through internal convective movements. No faults have been mapped in this unit in the DIA area (ESI, 1982).

The only significant unconsolidated unit is represented by Pleistocene age glacial drift. These materials (consisting of a heterogeneous mixture of cobbles, gravel, sand, silt, and clay) were deposited over the older consolidated Duluth Complex and are known to vary in thickness at the DIA from 10 to 60 feet (ft). Numerous poorly drained low areas became swamps and peat bogs on the drift surface (ESI, 1982). Immediately below the drift is the consolidated rock (Gabbro) aquifer, composed of the Duluth Complex rocks. Water is contained in this unit in fractures, fissures, interstices and other secondary openings under generally unconfined conditions. Rock aquifer wells usually encounter groundwater between 10 and 30 ft below ground surface (bgs). The water in this aquifer is reported to be of good quality (ESI, 1982).

The climate in Duluth, Minnesota is influenced by the Canadian jet stream. Summers tend to be cool and mild and winters are cold. The average daily high temperature is 46.8 degrees Fahrenheit (°F), and the average daily low temperature is 29.6°F (National Climatic Data Center [NCDC], 2013). The winters are cold with the maximum daily temperature remaining below freezing for an average of 139 days per year (NCDC, 2013). The mean annual snowfall is 48.6 inches. The mean annual precipitation is 31.75 inches (NCDC, 2013). Approximately 69% of the annual precipitation (21.98 inches) occurs during the growing season from May through September (NCDC, 2013).

2.2 Screening Level Ecological Risk Assessment

TU001 lies within the concrete apron and constructed buildings. Natural habitat is not present within the site boundaries of TU001. Chemical parameters located below paved surfaces are inaccessible to plants and wildlife. The exposure pathway at TU001 is incomplete. Risk to ecological receptors at TU001 is negligible and does not warrant further evaluation.

It should be noted that an ecological risk assessment was completed as part of the RI activities for both Site AT028 and Site TU001. Therefore, the Ecological Risk Assessment provided in **Appendix A** contains information for both Sites AT028 and TU001. However, as stated above, the ecological receptors at TU001 are negligible and were not further evaluated. Therefore, a CSM for TU001 was not created. The CSM created for AT028 is presented in **Appendix B**.

The ecological conceptual site model for each AOC describes:

- The source areas - historical releases;
- Transport mechanisms - processes that partition chemicals among various environmental media;
- Exposure to media - those environmental media from which organisms may be exposed to site-related chemicals; and
- Receptors – potential ecological receptor organisms.

2.3 Soil Characteristics

Soil interpretation records show that extensive filling has preceded construction of the entire DIA area. The sources of fill materials are unknown (SAIC, 2003). For surface soils, the Duluth office of the U.S. Soil Conservation Service (Diers, 1983) noted that DIA falls within the Highland Moraine soil area.

2.3.1 Soil Analytical Results

Analytical results were summarized and compared to MPCA Soil Leaching Values, Residential and Industrial SRVs and USEPA Residential and Industrial RSL values. Analytical results indicated that concentrations of constituents of concern were either below MPCA and USEPA criteria or below laboratory detection limits.

Soil analytical results are summarized in **Table 1**.

2.4 Soil Sampling Activities

The 2017 RI activities at TU001 included the completion of nine soil borings. Borings were installed to a maximum depth of 25 ft bgs. Soil samples were collected from intervals above the groundwater table (i.e. unsaturated) from the borings and submitted for laboratory analysis (nine soil samples total). Samples were analyzed for VOCs, lead, TPH-DRO, and TPH-GRO.

2.5 Groundwater

This section briefly describes the hydrogeologic characteristics and groundwater impacts (if any) detected at Site TU001 during the various investigations.

2.5.1 Hydrogeologic Setting

Most of the DIA area appears to lie within a groundwater discharge zone. This is supported by typically high soil unit water levels, perennial stream flow on and adjacent to the area, and the presence of numerous large permanent wetlands on and adjacent to the area (ESI, 1982).

Two distinct hydrogeologic units were identified beneath the DIA and the Base. These include glacial drift and consolidated rock aquifers. Groundwater within the glacial drift aquifer ranges from 3 to 25 ft bgs and groundwater within the consolidated rock aquifer ranges from 10 to 30 ft bgs. Groundwater flow at DIA generally fans outward from the facility. For the Base, groundwater in the surficial aquifer flows toward Miller Creek to the southeast. However, groundwater northwest of runway 9-27 (including IRP Site 2) will flow slightly to the northeast (BB&E, 2008).

2.5.2 Groundwater Sampling Activities

The 2017 RI activities at TU001 included the completion of six permanent monitoring wells at Site TU001. Two rounds of samples were collected from the six monitoring wells and one round was collected from one existing monitoring well (13 groundwater samples total). Groundwater samples were analyzed for VOCs, TPH- DRO, TPH- GRO, and lead.

2.5.3 Groundwater Analytical Results

Groundwater analytical results were reviewed and compared to MPCA residential and industrial criteria. VOC, GRO and lead concentrations were not detected above the reporting limits. Detections of DRO were observed in at least one sample collected from MW04, MW05, MW08 and MW09. However, there are no MDH HRL, USEPA tap water RSL and USEPA groundwater MCL for DRO.

Analytical results are summarized in **Table 3.**

2.6 Surface Water/Sediment

Surface water is not present at Site TU001 and has not been identified in previous activities conducted at Site TU001. Therefore, no surface water investigation activities have been conducted.

2.6.1 Surface Water Setting

Surface water drainage at the Base is part of the St. Louis watershed of the Great Lakes Basin (Olcott et al., 1978). The southeastern corner of the watershed, north of the St. Louis River, is drained by several small creeks which flow southeastwardly and join the St. Louis River near its mouth. The remainder of the watershed north of the river drains to the southwest and the smaller streams and tributaries join the St. Louis River along it upper extent. The St. Louis River is the largest river to flow into Lake Superior from Minnesota (SAIC, 2003).

DIA is drained mainly by a large north-south drainage ditch flowing northward and eventually into Wild Rice Lake. The lake drains into the Beaver River and then the Cloquet River, which joins the St. Louis River approximately 19 miles west of the airport. Because of its location on the eastern portion of the airport, the Base drains eastward into Miller Creek. Miller Creek flows southeastward and joins the St. Louis River at St. Louis Bay (SAIC, 2003).

Stream flow varies during the year, with the highest flows in April and May, resulting from snow melt and spring rains. Stream flow then recedes through the summer, increasing only temporarily due to occasional periods of storm water runoff. Flow increases slightly as evapotranspiration losses diminish in the fall. During the winter, stream flow is sustained by groundwater discharge and recedes slowly until March when accumulated snow begins to melt. Hundreds of surface water bodies surround the Base. These water bodies consist of wooded bogs, wetlands, and small ponds (SAIC, 2003).

2.7 Soil Vapor

Soil vapor samples were requested by the MPCA for informational purposes to evaluate future use of Site TU001, should site conditions change, etc. Sampling was performed in accordance with *MPCA Vapor Intrusion Assessments, Performed During Site Investigations*, Guidance Document 4-01a, October 2010. A total of six soil vapor samples were collected directly from the borehole of the six soil boring locations at Site TU001, adjacent to Building 500. Soil vapor samples were analyzed for VOCs using USEPA Method TO-15.

Analytical results indicated 1,3-Butadiene detected in soil vapor samples exceeding the MPCA Industrial Intrusion Screening Values (ISVs) in each of the six soil vapor samples collected. Soil vapor sample analytical results also indicated exceedances of MPCA Residential ISVs for benzene in TU001-SV07 and TU001-SV08.

Soil vapor analytical results are presented in **Table 4**.

2.8 Receptors

Amec Foster Wheeler conducted an ecological risk assessment at Site TU001 as part the RI/FS activities. The *Screening Level Ecological Risk Assessment, Duluth International Airport, Duluth Minnesota, 2018* is included in **Appendix A**. It was concluded that Site TU001 lies within the concrete apron and constructed buildings. Natural habitat is not present within Site TU001 boundaries. Chemical parameters located below paved surfaces are inaccessible to plants and wildlife. The exposure pathway at Site TU001 is incomplete. Therefore, the risk to receptors at Site TU001 is negligible and not further evaluated.

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3.0 REMEDIAL INVESTIGATION DATA ANALYSIS/RISK ASSESSMENT

3.1 Applicable or Relevant and Appropriate Requirements

An applicable or relevant and appropriate requirements (ARARs) are an environmental and/or public health statute used in identifying site contamination that may pose human health or environment concerns at a Site. Soil and groundwater standards are federal and state human health- and environment-based requirements and guidelines used to:

- Determine the appropriate levels of site clean-up;
- Define and formulate remedial action alternatives; and,
- Govern implementation and operation of the selected remedial action.

All analytical data are compared to appropriate risk-based screening criteria and/or established regulatory criteria to determine whether further investigation is required. Chemical-specific requirements include limitations set on the amount or concentration of a chemical that can be either present in or discharged to the environment under promulgated federal and/or state regulations. These limits are typically health- or risk-based requirements.

For Site TU001, the soil concentrations are screened against:

- Residential and industrial SRVs and the Soil Leaching Values (SLVs) established by MPCA; and
- USEPA RSLs (residential and Industrial) for soil.

Groundwater concentrations are screened against:

- MDH HRLs, MDH Health Based Values (HBVs) and MDH Risk Assessment Advice Values (RAAs); and
- USEPA MCLs, and groundwater RSLs.

The soil and groundwater screening tables are provided by the MPCA website (http://www.pca.state.mn.us/index.php/view-document.html?gid=3152) and MDH website (http://www.health.state.mn.us/divs/eh/risk/guidance/gw/table.html). Federal MCL and USEPA RSL screening tables are provided by the USEPA website (http://www.epa.gov/region9/superfund/prg/).

Soil gas concentrations will be screened against MPCA Vapor Intrusion Screening Level (ISLs). The Vapor ISLs are provided by the MPCA website (https://www.pca.state.mn.us/waste/intrusion-screening-values).

3.2 Soil

Impacts in soil have been fully delineated. Nine soil samples were submitted for analysis for VOCs, lead, DRO and GRO. Analytical results indicated that concentrations of constituents of concern in each of the nine samples were either below the applicable MPCA criteria or not detected above laboratory limits. No additional soil sampling is recommended for the former 500-gallon UST located at AOC TU001.

3.3 Groundwater

At TU001, groundwater samples were compared against MDH HRLs, HBVs as well as USEPA MCLs, groundwater RSLs. Thirteen groundwater samples were submitted for analysis for VOCs, DRO, GRO and lead. Groundwater analytical results indicated each of the 13 samples were either below the applicable MPCA criteria or not detected above laboratory limits.

Groundwater analytical results are presented in **Table 3.**

3.4 Soil Vapor

Analytical results indicated concentrations of 1,3 Butadiene exceeding Industrial ISVs in each of the six soil vapor samples collected. Benzene was also observed exceeding Residential ISV criteria in TU001-SV07 and TU001-SV08.

3.5 Surface Water/Sediment

Surface water investigation activities were not conducted during the 2017 RI activities.

3.6 Summary

Based on the analytical data collected, VOCs were either not detected or were detected at concentrations below applicable criteria in soil and groundwater samples collected.

Analytical results indicated that concentrations of 1,3-butadiene exceeded Industrial ISVs in each of the six soil vapor samples collected. Benzene was also observed exceeding Residential ISVs criteria in TU001-SV07 and TU001-SV08. However, as the soil and groundwater samples collected from the same locations indicate all analytes below detection limits, it appears the soil vapor results are more representative of overall property usage and condition rather than attributed to Site TU001.

The conclusions in the risk assessment were that risk to ecological receptors at Site TU001 is negligible. Further, as soil analytical results and groundwater analytical results were below the Residential SRVs and Residential HRLs, respectively, risk to human receptors is negligible. Therefore, no further investigation is warranted, and a status of unlimited use and unrestricted exposure (UU/UE) is requested for Site TU001.

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4.0 SELECTED ACTION: NO FURTHER ACTION

Soil

Analytical results indicate that concentrations of constituents of concern in soil were either non-detect or below MPCA criteria. NFA for soil is recommended for TU001.

Groundwater

Analytical results indicate that concentrations of constituents of concern in groundwater were either non-detect or below MPCA criteria. NFA for groundwater is recommended for TU001.

Soil Vapor

Analytical results indicated that concentrations of 1,3-butadiene exceeded Industrial ISVs in each of the six soil vapor samples collected. Benzene was also observed exceeding Residential ISVs criteria in TU001-SV07 and TU001-SV08. However, as the soil and groundwater samples collected from the same locations indicate all analytes below detection limits, it appears the soil vapor results are more representative of overall property usage and condition rather than attributed to Site TU001.

Soil vapor samples were collected per request by the MPCA during the project Kickoff Meeting held on 19 November 2015. Soil vapor samples were to be collected for informational purposes only to evaluate future use of Site TU001, should site conditions change, etc. Sampling was performed in accordance with *MPCA Vapor Intrusion Assessments, Performed During Site Investigations, Guidance Document 4-01a, October 2010*.

It has been determined that the selected remedy of NFA is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost effective. The statutory preference for further investigation is not applicable because Site TU001 has been determined to present no significant threat to human health or the environment; therefore, UU/UE NFA is necessary for Site TU001.

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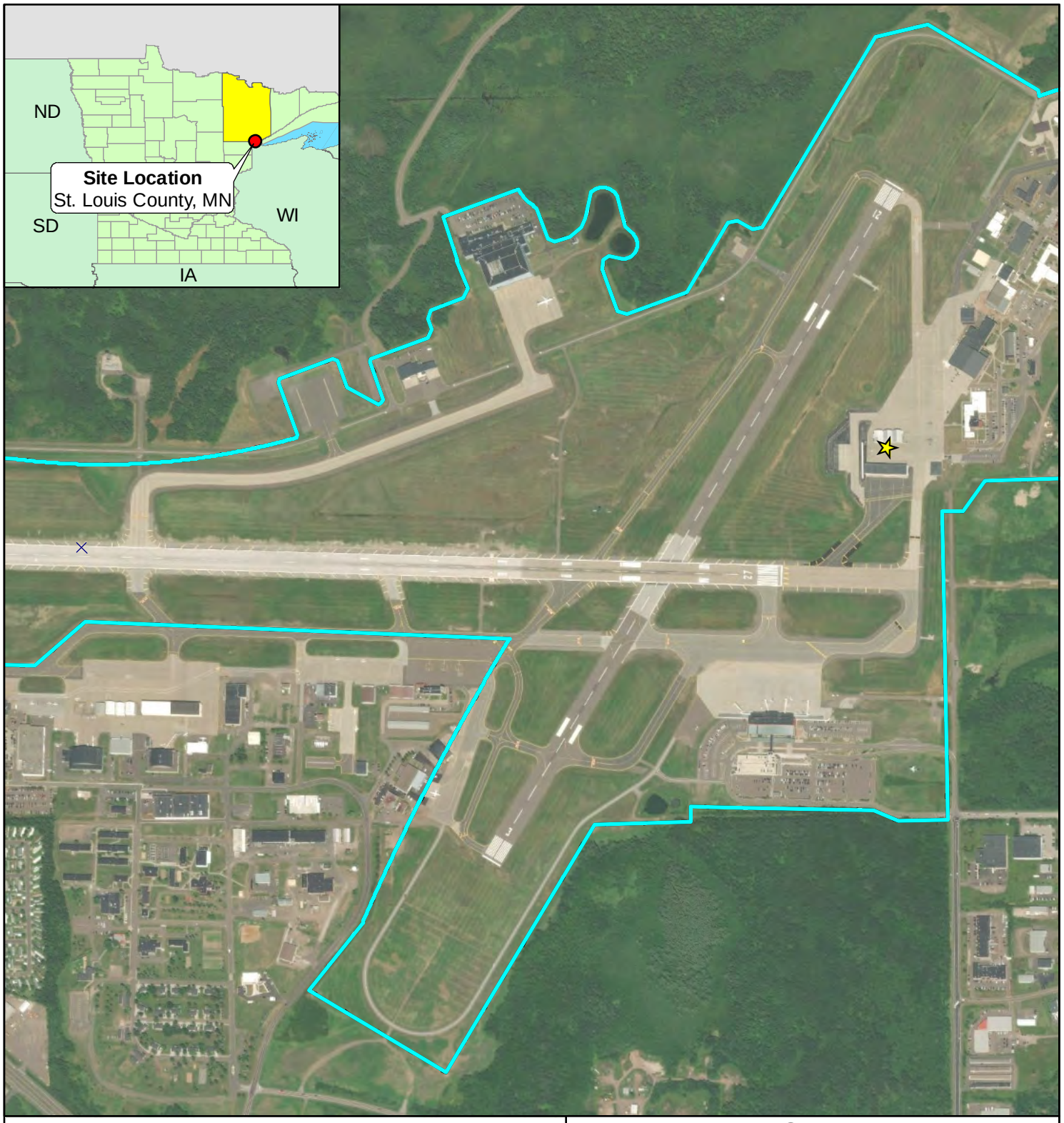
FIGURES



TU001 Site Locations

DIA Property Boundary

0 375 750 1,500 2,250 3,000 Feet

FIGURE 1

SITE LOCATION MAP

Air National Guard
Great Lakes Region
Duluth International Airport

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

N W E S	Date: June 2020	Project No. 291330002	amec foster wheeler
	Drawn: DJ	Figure: 1	
	Checked: RC		

Document Path: G:\Duluth\a_MXD\TU001\GreatLakeDDReport\TU001SiteLocation.mxd

Legend

- 2014 Monitoring Well
- 2016 Monitoring Well/Soil Boring Locations
- 2014 Soil Boring
- Former UST Location (TU001) Investigation Area

0 20 40 80 120 160 Feet

FIGURE 2

TU001 SITE MAP

Air National Guard
Great Lakes Region
Duluth International Airport

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

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Legend

- 2016 Monitoring Well/Soil Boring Locations
- Inferred Groundwater Contour
- 2014 Soil Boring
- Former UST Location (TU001) Investigation Area
- Estimated Local Groundwater Flow Direction (Nov. 2016)

0 20 40 80 120 160 Feet

FIGURE 3

TU001 GROUNDWATER CONTOUR MAP

Air National Guard
Great Lakes Region
Duluth International Airport

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

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TABLES

Table 1
TU001 - Soil Analytical Table
Duluth ANGB, Duluth, MN
1 of 2

Sample ID	CAS	Soil Leaching Values (SLVs)	USEPA Residential RSL	USEPA Industrial RSL	MPCA Residential SRV (Tier I)	MPCA Industrial SRV (Tier II)	MPCA Industrial Short-Term Worker SRV (Tier II)	TU001-SB04				TU001-SB05						TU001-SB06			
Date Collected								10/25/2016				10/25/2016						10/26/2016			
Depth Collected								2-3		14-15		3-5		DUP (3-5)		13-15		2-3		14-15	
Volatile Organic Compounds																					
Methylene chloride	75-09-2	0.01664908	57	1000	97	158	158	<20	U	**48**		**52**		**46**		**50**		**43**		<17	U
All Other Analytes	Various	Various	Various	Various	Various	Various	Various	ND		ND		ND		ND		ND		ND		ND	
Total Phase Hydrocarbons																					
All Analytes	Various	Various	Various	Various	Various	Various	Various	ND		ND		ND		ND		ND		ND		ND	
Metals																					
Lead	7439-92-1	2700	400	800	300	700	700	**2**		**3**		**1.5**		**1.6**		**3.3**		**1.9**		**2.2**	

USEPA = United States Environmental Protection Agency
NA = No criteria established
ND = Not detected above laboratory detection limit
ft bgs = feet below ground surface
D= Dilution
B = Compound was also detected in the method blank
J = The concentration detected is below the reporting limit
SRV-Soil Reference Value
MPCA- Minnesota Pollution Control Agency

Table 1
TU001 - Soil Analytical Table
Duluth ANGB, Duluth, MN
2 of 2

Sample ID	CAS	Soil Leaching Values (SLVs)	USEPA Residential RSL	USEPA Industrial RSL	MPCA Residential SRV (Tier I)	MPCA Industrial SRV (Tier II)	MPCA Industrial Short-Term Worker SRV (Tier II)	TU001-SB07		TU001-SB08						TU001-SB09			
Date Collected								10/27/2016		10/28/2016						11/8/2016			
Depth Collected								3-5		3-5		DUP (3-5)		16-17		3-5		15-17	
Volatile Organic Compounds																			
Methylene chloride	75-09-2	0.01664908	57	1000	97	158	158	<15	U	<15	U	<15	U	<15	U	<15	U	<0.13	U
All Other Analytes	Various	Various	Various	Various	Various	Various	Various	ND		ND		ND		ND		ND		ND	
Total Phase Hydrocarbons																			
All Analytes	Various	Various	Various	Various	Various	Various	Various	ND		ND		ND		ND		ND		ND	
Metals																			
Lead	7439-92-1	2700	400	800	300	700	700	**1.7**		**1.6**		**1.8**		**4.7**		**1.2**		**2.2**	

USEPA = United States Environmental Protection Agency
NA = No criteria established
ND = Not detected above laboratory detection limit
ft bgs = feet below ground surface
D= Dilution
B = Compound was also detected in the method blank
J = The concentration detected is below the reporting limit
SRV-Soil Reference Value
MPCA- Minnesota Pollution Control Agency

Table 2
Permanent Wells Groundwater Elevations
Duluth ANGB, Duluth, MN

Well ID	Northing	Easting	Well Casing Elevation (feet amsl)	Top of Well Screen Elevation (feet amsl)	Total Depth of Well (feet bgs)	Bottom of Well Screen Elevation (feet amsl)	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Depth to Water (feet)	Groundwater Elevation (feet amsl)
TU001										
							1-Nov-2016		**16-Nov-2016**	
TU001-MW3	454676.82	2855835.52	1425.9	1406.43	29.47	1396.43	18.85	1407.05	NS	NS
TU001-MW4	454827.81	2855724.72	1425.46	1411.26	24.20	1401.26	16.10	1409.36	16.10	1409.36
TU001-MW5	454779.49	2855704.43	1426.16	1412.76	23.40	1402.76	16.92	1409.24	16.92	1409.24
TU001-MW6	454781.26	2855803.67	1425.98	1411.78	24.20	1401.78	18.16	1407.82	18.16	1407.82
TU001-MW7	454668.23	2855731.03	1425.91	1412.71	23.20	1402.71	16.83	1409.08	16.83	1409.08
TU001-MW8	454671.87	2855902.24	1425.88	1410.28	25.60	1400.28	19.31	1406.57	19.31	1406.57
TU001-MW9	454634.34	2855834.58	1425.22	1410.22	25.00	1400.22	NS	NS	18.79	1406.43

Notes:
amsl = above mean sea level
bgs = below ground surface
btoc = feet below top of casing
All water levels recorded within a 24 hour period
NS- Not Sampled

Table 3
Groundwater Analytical Results
Duluth ANGB, Duluth, MN
1 of 1

Sample ID	CAS	MDH HRL	US EPA Tapwater RSL	USEPA Ground-water MCL	TU001-MW3		TU001-MW04		TU001-MW04		TU001-MW05		TU001-MW05		TU001-MW06		TU001-MW06		TU001-MW07		TU001-MW07		TU001-MW07		TU001-MW08		TU001-MW08		TU001-MW09		TU001-MW09	
Date Collected					11/2/2016		11/1/2016		11/16/2016		11/1/2016		11/16/2016		11/1/2016		11/16/2016		11/2/2016		11/2/2016 (Duplicate)		11/16/2016		11/2/2016		11/16/2016		11/16/2016		11/18/2016	
Volatile Organic Compounds																																
All analytes non-detect	Various	Various	Various	Various	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total Phase Hydrocarbons																																
DRO (C10-C28)	TPHC10C28	NC	NC	NC	<0.019	U	**0.18**		**0.16**	H	<0.018	U	**0.16**	H	<0.019	U	ND	UH	<0.019	U	0.12		ND	UH	**0.11**		ND	UH	**0.1**	H	ND	UH
GRO (C6-C10)	TPHC6C10	NC	NC	NC	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U	<17	U
Metals																																
Lead	7439-92-1	NC	15	15	<0.00033	U	<0.00033	U	<0.00033	U	<0.00033	U	<0.00033	U	<0.00033	U	<0.00033	U	<0.00033	U	<1.3	U	<0.00033	U	<0.00033	U	<0.00033	U	<0.00033	U	<0.00033	U

Bold Results above laboratory detection limits
All units in micrograms per liter (ug/L)
MDH = Minnesota Department of Health
U - Analyte not detected
ND = non-detect
HRL-Health Risk Value
MCL-Maximum contaminant level
NC- No criteria

Table 4
Soil Vapor Analytical Results
Duluth ANGB, Duluth, MN
1 of 1

Sample ID		MPCA Residential ISV	MPCA Industrial ISV	TU001-SV04		TU001-SV05		TU001-FD-02		TU001-SV06		TU001-SV07		TU001-SV08		TU001-SV09	
Date Collected				10/25/2016		10/26/2016		10/26/2016		10/26/2016		10/27/2016		10/27/2016		10/27/2016	
Volatile Organic Compounds																	
1,1,1-Trichloroethane (TCA)	71-55-6	5000	10000	**12**		<1.3	U	<1.4	U	<1.4	U	<1.4	U	<1.4	U	<1.4	U
1,2,4-Trimethylbenzene	95-63-6	7	20	**2.6**		**4.7**		**3.4**		**4.1**		**3.2**		**3.3**		**3.9**	
1,3-Butadiene	106-99-0	0.3	1	**8.1**		**17**		**4.3**		**2.3**		**17**		**9.7**		**4.1**	
2-Hexanone	591-78-6	NC	NC	<1.4	U	<1.4	U	<1.5	U	<1.5	U	**1.7**		<1.5	U	<1.5	U
4-Methyl-2-pentanone	108-10-1	3000	8000	**1.9**		**2.3**		<1.4	U	**1.8**		**2.6**		**2.2**		**1.7**	
Acetone	67-64-1	31000	87000	**36**		**31**		**26**		**31**		**52**		**28**		**35**	
Benzene	71-43-2	4.5	13	**2.5**		**4.3**		**2.4**		**2.1**		**5.8**		**4.9**		**3.3**	
Chloromethane	74-87-3	90	300	<1.3	U	**1.9**		<1.3	U	<1.3	U	<1.3	U	<1.3	U	<1.3	U
Dichlorodifluoromethane (CFC 12)	75-71-8	200	600	**3.8**		**2.9**		**4.1**		**3**		**2.6**		**2.5**		**2.5**	
d-Limonene	5989-27-5	NC	NC	**1.9**		<1.4	U	<1.4	U	<1.4	U	<1.4	U	<1.4	U	<1.4	U
Ethylbenzene	100-41-4	1000	3000	**3.4**		**2.1**		**4.4**		**6**		**4.5**		**56**		**11**	
m,p-Xylenes	179601-23-1	NC	NC	**9.9**		**7.2**		**12**		**17**		**12**		**210**		**39**	
Naphthalene	91-20-3	9	30	<1.3	U	<1.3	U	<1.3	U	<1.4	U	**1.8**		<1.3	U	**1.8**	
n-Heptane	142-82-5	NC	NC	**3.9**		**5.9**		**5.2**		**3.9**		**10**		**10**		**3.7**	
n-Hexane	110-54-3	2000	6000	**7.9**		**12**		**5.8**		**3.6**		**16**		**12**		**3.1**	
n-Nonane	111-84-2	NC	NC	**2.1**		<1.3	U	**2.8**		**3.2**		**2.8**		**34**		**5.1**	
n-Octane	111-65-9	NC	NC	**6.7**		**9.6**		**15**		**19**		**16**		**45**		**15**	
o-Xylene	95-47-6	100	300	**3.8**		**4.5**		**4.6**		**6.2**		**4.4**		**60**		**14**	
Propene	115-07-1	3000	8000	**86**		**160**		**23**		**18**		**140**		**62**		**32**	
Tetrachloroethene	127-18-4	20	60	**2.2**		<1.3	U	<1.3	U	<1.4	U	<1.4	U	<1.3	U	<1.4	U
Toluene	108-88-3	5000	10000	**8.1**		**5.7**		**11**		**14**		**12**		**12**		**12**	
Trichlorofluoromethane (CFC 11)	75-69-4	700	2000	**1.7**		<1.3	U	<1.3	U	<1.4	U	<1.4	U	<1.3	U	<1.4	U
All other analytes	various	various	various	**All analytes non-detect**													

Bold	Results above laboratory detection limits
Bold	Results exceed MPCA Residential ISL
Bold	Results exceed MPCA Industrial ISL

All units in micrograms per meter cubed (ug/m^3)
MPCA = Minnesota Pollution Control Agency
ISV - Intrusion Screening Value
U - Analyte not detected
NC- No Criteria

APPENDIX A

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

APPENDIX A

DRAFT SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

DULUTH INTERNATIONAL AIRPORT
MINNESOTA AIR NATIONAL GUARD
DULUTH, MINNESOTA

January 24, 2018

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Figure 2 AOC AT0028 Fire Training Areas 1 and 2
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Figure 4 Generic Ecological Conceptual Site Model

TABLES

Table 1 Samples used in the SLERA
Table 2 PFOS Hazard Quotients by Receptor

ACRONYMS

AOC	area of concern
BERA	baseline ecological risk assessment
BSAF	biota-soil-accumulation factor
COPEC	contaminant of potential ecological concern
CSM	conceptual site model
DIA	Duluth International Airport
EPC	exposure point concentration
ERAGS	Ecological Risk Assessment Guidance for Superfund
FCSAP	Federal Contaminated Sites Action Plan
FTA	Fire Training Area
HQ	hazard quotient

MNANG	Minnesota Air National Guard
MNDNR	Minnesota Department of Natural Resources
mg/kg	milligrams per kilogram
mg/kg bw/d	milligrams per kilogram body weight/day
NOAEL	no observed adverse effects level
NOEC	no observed effect concentration
PFASs	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
RI	remedial investigation
SLERA	screening level ecological risk assessment
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
USFWS	United States Fish & Wildlife Service
UST	underground storage tank

1.0 INTRODUCTION

The purpose of this ecological risk assessment is to assess the potential for chemicals detected at two areas of concern (AOCs) at the 148th Fighter Wing, Minnesota Air National Guard (MNANG) Facility at Duluth International Airport (DIA) in Duluth, St. Louis County, Minnesota (Figure 1), to adversely affect the environment:

- AT028 - Installation Restoration Program Site 2, Former Fire Training Area (FTA)
- TU001 - Building 500 Alert Hanger Underground Storage Tanks (USTs)

AT028 was previously investigated and closed (MWH, 2002), but has been re-opened to investigate per- and polyfluoroalkyl substances (PFAS).

This risk assessment is appended to the Remedial Investigation (RI) Report (Amec Foster Wheeler, 2018). The following documents were used as guidance for conducting the risk assessment:

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA, 1997)
- Framework for Ecological Risk Assessment (USEPA, 1992)
- Guidelines for Ecological Risk Assessment (USEPA, 1998)
- The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments (BERA), ECO Update (USEPA, 2001)
- ECO Updates published between 1991 and 2008 (USEPA 1991-2008)
- Risk Assessment Guidance for Superfund (RAGS), Volume II: Environmental Evaluation Manual (USEPA, 1989)
- Wildlife Exposure Factor Handbook Volumes I and II (USEPA, 1993)

The *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA, 1997), herein referred to as the ERAGS, provides an accepted framework for ecological risk assessment.

The ERAGS outlines an iterative two tier approach to ecological risk assessment. The screening level ecological risk assessment (SLERA) is the first tier. In a SLERA, site-related contaminants and ecological exposure pathways are identified, and screening level risk characterizations of contaminants of potential ecological concern (COPECs) are developed by comparing detected concentrations to conservative ecological screening benchmarks. If the SLERA is inconclusive, the second tier of the risk assessment process is implemented where COPECs are evaluated in greater detail and in the context of site-specific factors as part of a Baseline Ecological Risk

Assessment (BERA). If the SLERA shows that risks are negligible then no further action is required.

Thus, in accordance with the ERAGS (USEPA, 1997), this SLERA:

- Documents the environmental setting and natural communities for each AOC;
- Identifies complete exposure pathways;
- Selects COPECs using conservative exposure estimates and risk calculations;
- Provides conclusions as detailed below.

This SLERA includes the first two of the eight steps of ecological risk assessments identified in the 1997 ERAGS. The first step is the Screening Level Problem Formulation and Screening Level Effects Evaluation (presented in Sections 2 and 3 of this SLERA). The second step is the Screening-Level Exposure Estimate and Risk Calculation (presented in Section 4 of this SLERA). Section 5, Refinement & Risk Characterization, is known as Step 3A. Major sources of uncertainty are summarized in Section 6. Section 7 presents SLERA Conclusions. References are presented in Section 8.

This SLERA finds that risk to ecological receptors at the AOCs discussed herein is negligible and no further ecological investigation is necessary.

2.0 PROBLEM FORMULATION

The problem formulation provides the framework upon which the risk assessment is organized. For each AOC, this section:

- Identifies site locations;
- Summarizes land uses and natural communities at each site;
- Identifies complete exposure pathways;
- Presents the Ecological Conceptual Site Model; and
- Identifies assessment and measurement endpoints.

2.1 Site Locations

The DIA is located approximately seven miles northwest of the City of Duluth, MN and 7.5 miles west of Lake Superior. The DIA is comprised of approximately 2,000 acres. The MNANG property is composed of seven areas that total 290 acres and is located adjacent to the DIA. Most of the MNANG acreage is leased from the city of Duluth and the State of Minnesota.

This SLERA evaluates the following AOCs, as shown on Figure 1:

Site Name	Description
AT028	Installation Restoration Program Site 2, Former Fire Training Area (FTA)
TU001	Building 500 Alert Hanger Underground Storage Tanks (USTs)

2.2 Environmental Setting

This section describes historical and current land uses and natural communities at each AOC. Operational history and descriptions of each release and AOC are more fully documented in the main text of the RI Report.

2.2.1 Description of AOCs

The Former FTA (AT028) is located on the north side of DIA. It encompasses 50 acres of grassy and lightly wooded areas (SAIC, 2003) **(Figure 2).** This AOC is located on DIA property (between existing Taxiway C and Main Runway 9-27) and not on MNANG property. The AOC was further delineated as two separate areas (FTA 1 and FTA 2) which have been combined in this SLERA. From 1960 until 1987, fire training activities were reportedly held twice a month. During that time, jet propulsion fuel #4, along with smaller volumes of contaminated fuels and oils, paint thinners, and solvents, were burned during fire training exercises. The fires were extinguished with an aqueous film forming foam (AFFF) used for fire suppression and these foams are known to have contained per- and polyfluoroalkyl substances (PFASs) (MWH, 2011). Non-PFAS chemicals have previously been investigated and closed-out (MWH, 2002).

The Building 500 Alert Hangar USTs (TU001), located at the western portion of the MNANG Base and north of DIA's main runway 9-27 **(Figure 3)**, is characterized by concrete airport apron and constructed buildings. There is no natural habitat within AOC boundaries.

An "as-built" map from May 1956 indicates that a 500-gallon gasoline UST was installed at Building 500 to serve the emergency fire pump generator located inside the north end of the building (BB&E Consulting Engineers and Professionals, 2011). A portion of the 500-gallon gasoline UST was situated at IRP Site 23 – Airport Parking Ramp, which is adjacent to the north and east of Building 500. A vapor barrier and passive soil vent system were installed below the concrete floor following the removal of contaminated soil in 2004.

2.2.2 Critical Habitat & Threatened/Endangered Species

According to the U.S. Fish and Wildlife Service, as of January 2018, the following mammals and birds are federally endangered, threatened, proposed, and/or listed as candidate species in St. Louis County, MN (USFWS, 2018):

- *Calidris canutus rufa* (rufa red knot) – Threatened
- *Lynx canadensis* (Canada lynx) – Threatened
- *Canis lupus* (gray wolf) – Threatened
- *Myotis septentrionalis* (northern long-eared bat) – Threatened

None of these species are expected to inhabit the AOCs.

The rufa red knot migrates annually between its breeding grounds in the Canadian Artic and its wintering regions in the southeast US, Gulf of Mexico, and South America (USFWS, 2014). During migrations, the rufa red knot is usually recorded somewhere in MN along inland lake shores - most frequently at Park Point, Duluth, where it has been seen in 6 of 10 years. A maximum flock size of 15 (date unspecified) has been noted at Duluth. Because red knot rufa is approximately 11 miles away from Park Point, and lacks the large inland lakeshore that this bird requires, the rufa red knot is unlikely to inhabit the subject AOCs.

Canada lynx live in dense forests in northern Minnesota, especially in mountainous areas (MNDNR, 2018a). Considering that the DIA consists of vast open (i.e. unforested) spaces, and that the DIA is over 100 miles from suitable Canada lynx habitat in the northern reaches of St. Louis County, Canada lynx are unlikely to inhabit the subject AOCs.

Gray wolf is listed by the USFWS as threatened in Minnesota (USFWS, 2018), but the Minnesota Department of Natural Resources delisted it as a species of concern in 2012 (MNDNR, 2018b). As of 2013, the population in Minnesota is estimated at 2,200 individuals, which exceeds the federal delisting goal of 1,250-1,400. Minnesota's gray wolf population has remained stable over the last 10 years, with most areas of suitable habitat in the state now occupied. These data suggest that the population has fully recovered and special concern status is no longer necessary. Gray wolves tend to inhabit the forested portions of northern and central Minnesota. Though dispersing individuals have been documented in southern Minnesota, gray wolves are unlikely to inhabit the subject AOCs.

Northern long-ear bats are generally associated with richly forested areas where they make use of tree roosts, especially near water sources (MNDNR, 2018a). As this this habitat is absent from DIA, northern long-eared bats are not expected to occur in any of the AOCs. Additionally, northern long-eared bats forage “on the fly”, and thus would have negligible contact with affected soil even if they were to forage or nest at an AOC.

2.3 Incomplete Exposure Pathways

TU001 lies within concrete apron and constructed buildings. Natural habitat is not present within TU001 boundaries. Chemical parameters located below paved surfaces are inaccessible to plants and wildlife. The exposure pathway at TU001 is incomplete. Risk to ecological receptors at TU0001 is negligible and not further evaluated.

2.3.1 Ecological Conceptual Site Model

A generic ecological conceptual site model (CSM) for AT028 is presented in **Figure 4**. Specific assessment and measurement endpoints are not identified because generic endpoints were used (as discussed in Section 3.2.3). The ecological conceptual site model is based on the current understanding of Site conditions, and serves as a framework for evaluating ecological exposure and risk. The ecological conceptual site model for AT028 describes:

- The source areas - historical releases;
- Transport mechanisms - processes that partition chemicals among various environmental media;
- Exposure to media - those environmental media from which organisms may be exposed to site-related chemicals; and
- Receptors – potential ecological receptor organisms.

2.3.2 Assessment and Measurement Endpoints

Endpoints in the SLERA define ecological attributes that are to be protected (assessment endpoints) and a measurable characteristic of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has occurred or may occur.

Assessment endpoints for the SLERA are generic assessment endpoints associated with screening ecotoxicity endpoints. The endpoints are considered generic because they are based on a variety of organisms and are therefore considered to be representative of entire communities.

Assessment Endpoint	Measurement Endpoints
1. Sustainability (survival, growth, reproduction of local communities of terrestrial plants and terrestrial invertebrates and populations of birds and mammals exposed to soil.	a. Compare maximum soil analyte concentrations to soil screening benchmarks.

3.0 SCREENING LEVEL EFFECTS EVALUATION

As described in Section 4.1, PFASs are the only chemicals at AT028 considered in this SLERA. As of this writing, no United States federal or state agencies have developed ecological soil screening benchmarks for PFAS. Furthermore, PFOS (perfluorooctane sulfonate) is the only PFAS for which an ecological screening benchmarks has been developed outside the United States.

The Environment Canada Federal Environmental Quality Guidelines for PFOS (Environment Canada, 2017) has developed an ecological soil screening benchmark for PFOS of 0.012 mg/kg, selected as the lowest value from among plant, soil invertebrate, mammal, and bird endpoints and is protective of food chain exposures.

Because there is general agreement in the scientific community that PFOS is more toxic than other PFAS detected in site soil such as PFOA (perfluorooctanoic acid) and PFHxS (perfluorohexanesulfonic acid) (Wang et al., 2016; Giesy et al., 2010), this knowledge gap is expected to introduce minimal uncertainty into the risk assessment.

4.0 SCREENING LEVEL ECOLOGICAL RISK CALCULATION

This section identifies data used in the screening level risk calculation, identifies exposure point concentrations (EPCs), performs the screening level risk calculation, and summarizes the screening results. If a parameter was undetected in all samples or if its maximum detected concentration was below its screening benchmark, risk was determined to be negligible and that parameter was eliminated further review. If the maximum detected concentration for a given parameter was above its screening benchmark, the parameter was retained for further risk refinement (Section 5).

4.1 Data Used in the SLERA

Data for this SLERA were collected as described in the main RI Report (Amec Foster Wheeler, 2018). Only samples from unpaved areas and samples collected from a starting depth interval within the zone of biological activity, i.e. the 0-2 foot soil interval (USEPA, 2015) were evaluated **(Table 1)**. Samples located below paved or otherwise impervious surfaces and samples located below the zone of biological activity are considered inaccessible to wildlife.

Soil samples at AT028 were analyzed for the following PFAS compounds using USEPA Method 537 Revision 1.1:

- Perfluorobutanesulfonic acid (PFBS)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorononanoic acid (PFNA)
- Perfluorooctanoic acid (PFOA)
- Perfluorooctane sulfonate (PFOS)

4.2 Screening Level Exposure Estimate

Maximum detected concentrations of PFOS in surface soil at AT028 was selected as screening level EPC and compared to the screening benchmark to calculate a hazard quotient (HQ) as follows[1]:

$$HQ = \frac{\text{Maximum Concentration}}{\text{Benchmark Value}} \qquad \text{(Equation 1)}$$

An HQ ≤1 indicates that the chemical constituent alone is unlikely to cause adverse ecological effects and can be eliminated from further review. However, maximum PFOS concentration (0.0991 mg/kg, see **Table 1**) was above the screening benchmark (0.012 mg/kg), resulting in an HQ of approximately 8. PFOS was therefore identified as COPEC and retained for further evaluation.

The maximum concentrations of PFOS (0.0991 mg/kg) occurred at AT028-SB04. The maximum concentration of PFNA (0.00187 mg/kg) occurred at AT028-SB07. The maximum concentration of the remaining compounds occurred at AT028-SB02.

Additional lines of evidence were introduced to further refine and characterize risk estimates for COPCs, as discussed in Section 5.

5.0 STEP 3A: REFINEMENT & RISK CHARACTERIZATION

Ecological risk assessment is an iterative process that allows for and encourages modification as additional site information becomes available. At this stage of the risk assessment process (Step 3A), following the Screening Level Exposure Estimate and Risk Calculation, ERAGS provides for the use of additional calculations, analyses, and data review to refine and further characterize risk (or lack thereof) of COPECs that were carried forward.

The screening level risk calculation was made with a benchmark that represents concentrations at or below which adverse effects are not expected to occur. The screening benchmark for PFOS relied on Environment Canada ecological soil screening benchmarks, which as stated in Section 3, was selected as the lowest value protective of plants, invertebrates, birds, and mammals. To refine risk estimates, the maximum PFOS concentration was first compared to the individual plant,

[1] As previously stated, PFOS was the only chemical for which a screening level benchmark has been developed and so is the only one for which an HQ has been calculated.

invertebrate, bird, and mammal benchmarks. As shown in **Table 2,** the maximum PFOS concentration was above the benchmark for insectivorous mammals, and below the benchmarks for the other receptors. Risk to plants, soil invertebrates, birds (herbivore and omnivore) and mammals (herbivore, carnivore, and omnivore) is negligible and these receptors can be eliminated from further risk evaluation.

A food chain model was performed to refine the estimate of risk to mammal insectivores from PFOS at AT028 using site-specific information. The short-tailed shrew (*Blarina brevicauda*), an insectivorous mammal, was selected as the representative receptor. The short-tailed shrew is found throughout the state and is the most common member of the shrew family in Minnesota (MNDNR, 2018a). Using the maximum detected concentration (0.0991 mg/kg), the food chain model estimated an average daily total dose of 0.013 mg/kg bw/d as shown in Equation 2 through Equation 5:

$$Dose_{Total} = Dose_{soil} + Dose_{diet} \qquad \text{(Equation 2)}$$

where:

$$Dose_{soil} = FIR * P_s * C_s / BW \qquad \text{(Equation 3)}$$

and

FIR = mammal food ingestion rate (0.0011 kg dw/d; Nagy, 2001)
Ps = incidental ingestion of soil as a percentage of FIR (0.02, i.e. 2%; USEPA, 1993)
C_s = Soil concentration based on maximum detected surface soil concentration (0.0991 mg/kg)
BW = body weight (0.0055 kg; CRC, 1995)

and

$$Dose_{diet} = FIR * P_i * C_i / BW \quad \text{(Equation 4)}$$

where

P_i = proportion of invertebrate in diet (1, i.e. 100%)

and

C_i = concentration of PFOS in invertebrate tissue = C_s * BSAF (Equation 5)

where

BSAF = biota-to-soil accumulation factor (0.65, dry weight); (Zhao et al., 2013)

The model conservatively assumed that the shrew eats only soil invertebrates obtained from within AT028 all year long.

The BSAF was obtained from Zhao et al. (2013) who measured soil-to-earthworm BSAFs for a variety of perfluorinated compounds at three exposure concentrations. The BSAF (0.097 ww) for the highest PFOS concentration group (500 ng/g) was selected because it was closest to the maximum PFOS site soil concentration. Zhao reported BSAFs based on wet weight (ww) of organisms. BSAFs were converted to dry weight (dw) basis (0.65 dw) assuming that earthworms consist of 85% water.

The modeled dose was divided by a toxicity reference value (TRV) to calculate an HQ as shown in Equation 6:

$$HQ = \frac{Dose}{TRV} \qquad \text{(Equation 6)}$$

The Dutch National Institute for Public Health and the Environment (RVIM, 2010) reported mammal no-observed-adverse-effects-limits (NOAELs) in the range of 0.1 mg/kg bw/d to 0.4 mg/kg bw/d based on chronic studies on reproduction or other sub-lethal endpoints to mice, rats, and rabbits.

The estimated PFOS daily dose (0.013 mg/kg bw/d) falls below the range of mammalian NOAELs (0.1 to 0.4 mg/kg bw/d), resulting an HQ less than 1Risk to mammal insectivores from PFOs in surface soil (0-2 ft bgs) is therefore negligible at AT028.

Considering the much lower maximum concentration and lower toxicity of the remaining PFASs, it is inferred that risks to mammals from the remaining PFASs in AT028 soil is also negligible.

6.0 UNCERTAINTY

This section presents and discusses the uncertainties associated with the various measurements, calculations, and assumptions which form the basis of the risk characterization. SLERAs by design are intended to rely on conservative assumptions. Awareness of the uncertainties involved in each step of the risk assessment is critical to interpreting and understanding Site risk.

Exposure Point Concentrations

The maximum detected PFOS concentration (0.0991 mg/kg) was selected as the EPC for the screening level risk calculation. This assumption likely overestimates concentrations to which communities of receptors would be exposed over time and across the Site. The average PFOS concentration which represents the concentration to which a receptor would be exposed over time and across the entire exposure area, would provide a more realistic EPC.

Screening Benchmarks & Toxicity Reference Values

The screening level risk calculation and the food chain model assumed that receptors are always and continuously exposed to site chemicals (*e.g.* no migration), that 100 percent of the contaminant in the diet is bioavailable, that the receptor life stage is the most sensitive stage, that 100 percent of the diet is affected by Site releases, and that body weight and food ingestion rates are conservative. These conservative assumptions likely result in an overestimation of risk.

PFAS Analytes

Soil samples at AT028 were analyzed for PFAS compounds using USEPA Method 537. This method reports concentrations of only six substances (PFBS, PFHpA, PFHxS, PFNA, PFOA, and PFOS) but it is one of the standardized test methods currently available. Other PFAS substances sometimes encountered in AFFF formulations (e.g. perfluorodecanoic acid (PFDeA), perfluorobutyric acid (PFBA), perfluoroheptanoic acid (PFHpA), perfluoroundecanoic acid (PFUA), perfluorobutane sulfonic acid (PFBuS)) were not analyzed, resulting in some uncertainty regarding the nature and extent of AFFF released at the site. Considering that PFOS was analyzed, and that it is currently believed to be more toxic than other PFAS substances (Wang et al., 2016; Giesy et al., 2010), it may be inferred that risks from uncharacterized PFAS are also negligible.

For each PFAS analysed, the laboratory reported total concentrations, i.e. the sum of linear and branched isomers. In this respect, concentrations of the reported PFAS are not underestimated.

7.0 CONCLUSIONS

The SLERA concludes that that risk to ecological receptors is negligible and that no further ecological investigation is necessary for the following AOCs:

- AT028 - Installation Restoration Program Site 2, Former FTA
- TU001 - Building 500 Alert Hangar USTs

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FIGURES

Legend

- AOC Site Locations
- Property Boundary

0 375 750 1,500 2,250 3,000 Feet

AOC SITE LOCATION MAP

Air National Guard
Great Lakes Region
Duluth International Airport

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

N W E S	Date: January 2018	Project No. 291330002	
	Drawn: KH	Figure: 1	
	Checked: MM		

amec foster wheeler

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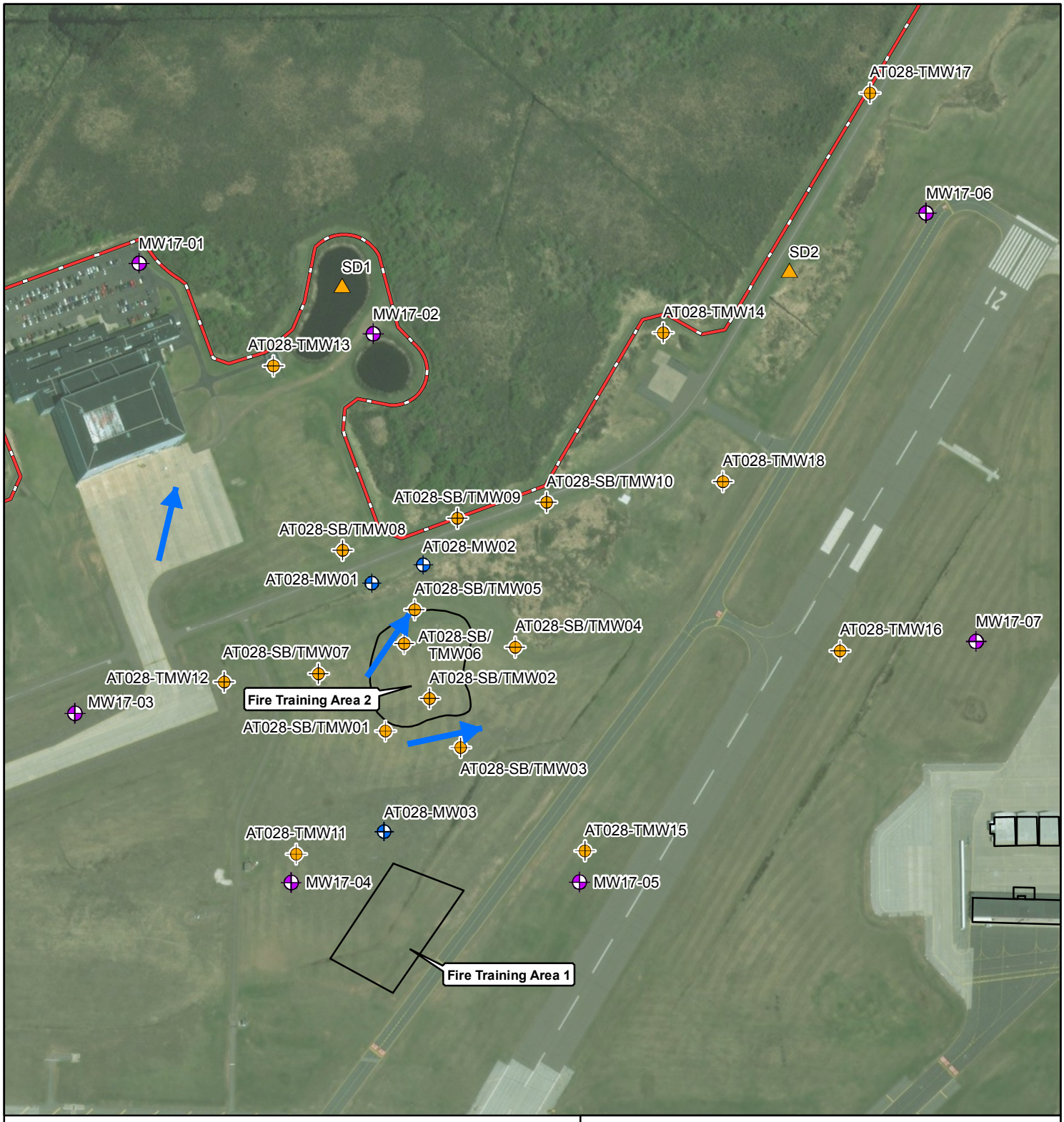

Legend

- Existing Monitoring Well
- Monitoring Well (2017)
- Temporary Monitoring Well
- Sediment Sample
- Former Fire Training Areas (AT028) Investigation Area
- Property Boundary
- Estimated Local Groundwater Flow Direction (July 2017)

0 105 210 420 630 840 Feet

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AOC AT028
FIRE TRAINING AREAS 1 AND 2

Air National Guard
Great Lakes Region
Duluth International Airport

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

Date:	January 2018	Project No.	291330002
Drawn:	KH	Figure:	2
Checked:	MM		

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Legend

- 2016 Monitoring Well/Soil Boring Locations
- 2014 Monitoring Well
- 2014 Soil Boring
- Former UST Location (TU001) Investigationg Area
- Estimated Local Groundwater Flow Direction (Nov. 2016)

0 20 40 80 120 160 Feet

AOC TU001 SITE MAP
FORMER BUILDING
500 ALERT HANGAR UST

Air National Guard
Great Lakes Region
Duluth International Airport

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

Date:	January 2018	Project No.	291330002
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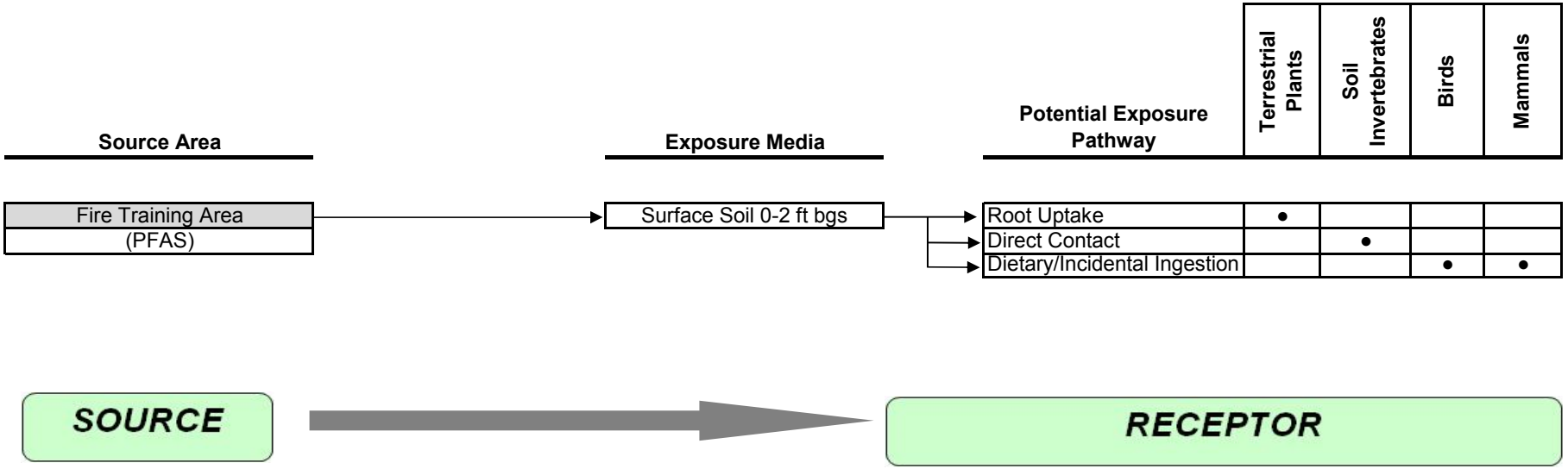
Figure 4.
Ecological Conceptual Site Model
Duluth International Airport, Duluth MN



Notes:
● - Indicates a potentially complete exposure pathway.
A blank cell indicates that a pathway is not applicable for the corresponding receptor.

ft bgs - feet below ground surface

TABLES

Table 1. Soil Samples Used in the SLERA (0-2 ft bgs) [a]
Screening Level Ecological Risk Assessment
148th Fighter Wing, MN Air National Guard
Duluth International Airport
Duluth, MN

Analyte	Maximum	AT028-SB01	AT028-SB02		AT028-SB03	AT028-SB04	AT028-SB05	AT028-SB06		AT028-SB07	AT028-SB09	AT028-SB10	AT028-SB11	AT028-SB12		AT028-SB13	AT028-SB14	AT028-SB15	AT028-SB16	AT028-SB17	AT028-SB18
Date Sample Collected		8/8/2016	8/8/2016		8/8/2016	8/8/2016	8/8/2016	8/8/2016		8/9/2016	8/9/2016	8/9/2016	10/24/2016	10/24/2016		10/25/2016	10/25/2016	10/28/2016	10/28/2016	11/7/2016	11/8/2016
Sample Depth (ft bgs)		0-2	0-1	1-3	0-2	1-3	0-2	0-1	1-2	1-2	1-2	1-3	0-2	0-1	1-2	0-2	1-2	1-2	2-3	0-1	0-1
Perflurochemicals by EPA Method 537 Revision 1.1 (mg/kg)																					
Perfluorobutanesulfonic acid (PFBS)	0.00558 J	0.000258 J	0.00558 J	0.00521 J	0.000459 J	0.00035 J	ND	ND	ND	0.000564 J	0.00212	ND	ND	ND	ND	ND	0.00045 J	ND	ND	ND	ND J
Perfluoroheptanoic acid (PFHpA)	0.00243	0.000270 J	0.00228	0.00243	0.000506 J	0.000401 J	ND	0.000107 J	ND	0.0011 J	0.000633 J	ND	ND	ND	ND	ND	0.000121 J	ND	ND	ND	0.000635 J
Perfluorohexanesulfonic acid (PFHxS)	0.111	0.0138	0.0789	0.111	0.0226	0.0316	0.000889 J	0.00209	0.00156 J	0.1	0.015	ND	0.000363 J	ND	ND	ND	0.00284	ND	ND	0.00107 J	0.00686
Perfluorononanoic acid (PFNA)	0.00187	0.000173 J	0.000136 J	0.000357 J	0.000392 J	0.0011 J	ND	ND	ND	0.00187 J	0.000441 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00161
Perfluorooctanoic acid (PFOA)	0.025 B	0.00534 B	0.0144 B	0.025 B	0.00289 B	0.0042 B	0.000392 JB	0.000622 JB	0.000204 JB	0.015 B	0.0011 JB	ND	0.00013	ND	ND	ND	0.00168 J	ND	ND J,B	0.000198 J,B	0.00119 J,B
Perfluorooctane sulfonate (PFOS)	0.0991	0.000173	0.0178	0.0502	0.015	0.0991	0.000325 J	0.004	0.00776	0.0494	0.0292	0.0044	0.000214 J,B	0.00042 JB	0.000362 J	0.000205 J,B	0.00484 B	0.000153 J,B	0.000593	0.00146 J	0.0229

Notes:
[a] Only smaples with a start depth of less than 2 ft bgs were used in the SLERA. Samples from below impervious areas were excluded from the SLERA.

ND - Not detected above laboratory detection limit
ft bgs - feet below ground surface
B - Compound was also detected in the method blank
J - The concentration detected is below the reporting limit

Table 2. PFOS Hazard Quotients by Receptor at AT028
Screening Level Ecological Risk Assessment
148th Fighter Wing, MN Air National Guard
Duluth International Airport
Duluth, MN

	Receptor							
		Bird		Mammal				
Parameter	**Plant & Invertebrate**	**Herbivore**	**Omnivore**	**Herbivore**	**Insectivore**	**Omnivore**	**Carnivore (Wolf)**	**Carnivore (Red Fox)**
PFOS benchmark (mg/kg) [a]	11	5.1	0.33	2.2	0.01	0.17	2.6	0.63
Maximum Concentration HQ [b]	0.01	0.02	0.3	0.05	**8.3**	0.6	0.04	0.2

Created by AMR, 9/28/2017
Checked by: SEB, 10/2/2017

Notes:

[a] PFOS soil screening benchmarks were obtained for Environment Canada (2017).

[b] Hazard quotients (HQs) were calculated by dividing the maximum detected PFOS concentration in AT028 soil (0.0991 mg/kg) by the screening level benchmark provided.

PFOS - perfluorooctane sulfonate

Bold value indicates a HQ > 1.

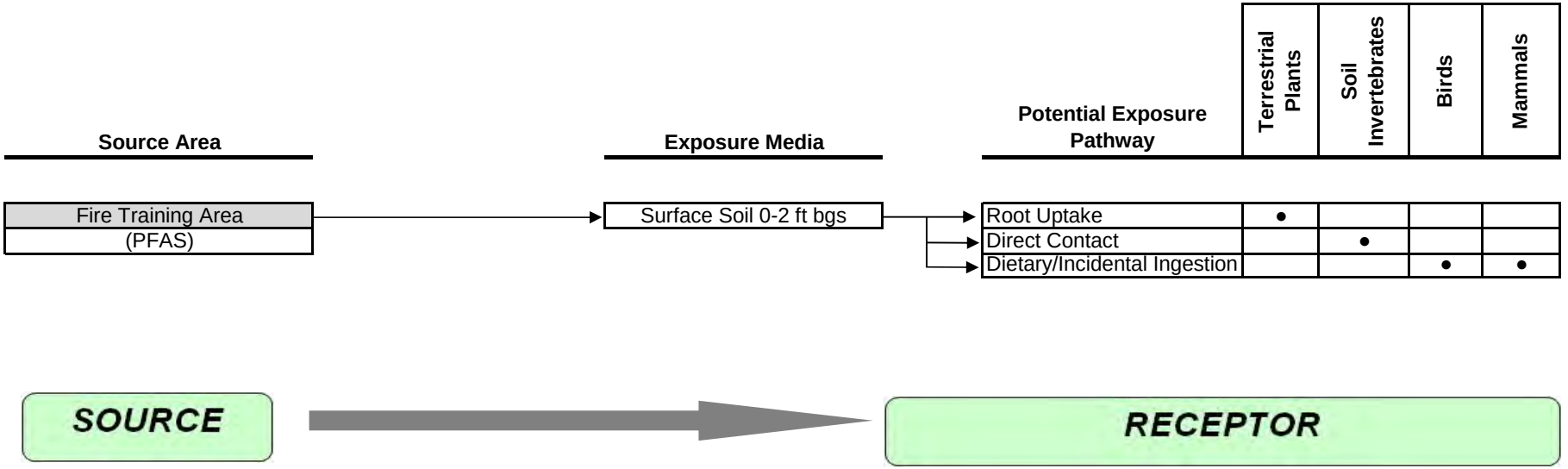
Sources:

Environment Canada. 2017. Federal Environmental Quality Guidelines: Perfluorooctane Sulfonate (PFOS). February.

APPENDIX B

ECOLOGICAL CONCEPTUAL SITE MODEL

Appendix B
Ecological Conceptual Site Model
Duluth International Airport, Duluth MN



Notes:
● - Indicates a potentially complete exposure pathway.
A blank cell indicates that a pathway is not applicable for the corresponding receptor.

ft bgs - feet below ground surface

APPENDIX C

MPCA APPROVAL LETTER

MINNESOTA POLLUTION CONTROL AGENCY

Duluth Office | 525 Lake Avenue South | Suite 400 | Duluth, MN 55802 | 218-723-4660

800-657-3864 | Use your preferred relay service | info.pca@state.mn.us | Equal Opportunity Employer

March 13, 2020

Mr. Tim Appleman, PE
Restoration Program Manager
ANG/A4OR
3500 Fetchet Avenue
Andrews AFB, MD 20762-5157

RE: Review of Draft-Final No Further Response Action Planned Decision Document
Building 500 Alert Hangar, NERS Site TU001, Duluth Air National Guard Base
Duluth International Airport, Duluth Minnesota
MPCA Project Number SR354

Dear Mr. Appleman:

The Minnesota Pollution Control Agency (MPCA) staff in the Site Remediation and Redevelopment Section (MPCA staff) has reviewed the Draft-Final No Further Action Planned Decision Document (NFRAP DD) for the Building 500 Alert Hangar, NERS TU001, located on the Minnesota Air National Guard 148th Fighter Wing Base on the Duluth International Airport in Duluth, Minnesota (the Site). The National Guard Bureau/A4OR (NGB) submitted this draft final NFRAP DD to the MPCA to review on November 8, 2019.

A Remedial Investigation/Feasibility Study Repot (RI/FS Report) for this Site dated June 22, 2018 provided a summary of investigation results and a recommendation for No Further Action (NFA). The MPCA staff responded in a letter dated November 28, 2018 concurring with the RI/FS Report conclusions and NFA recommendation.

The MPCA staff concurs with the No Further Action (NFA) decision for this Site as documented the draft final NFRAP DD. However, the MPCA has the following requested revision that must be addressed in the Final NFRAP DD to attain our formal concurrence.

- The MPCA staff requests removing our organization (Minnesota Pollution Control Agency) as a signatory on the Concurrence Record page. Instead of signing the Final NFRAP DD directly, we can issue an approval letter signed by our Site Remediation and Redevelopment Section Manager for the final document after our review and approval. In this approval letter, we can state that the MPCA is in agreement with the NFRAP decision and we agree the process for investigating this Site was consistent with State of Minnesota Environmental Response and Liability Act response action requirements.

We appreciate the opportunity review and comment on NGB environmental response work at the Duluth International Airport, and we look forward to continuing to work with the NGB and Minnesota Air National Guard. If you have any questions regarding this letter, please contact me at 218-302-6649 or mark.elliott@state.mn.us.

Sincerely,

Mark C. Elliott

This document has been electronically signed.

Mark C. Elliott
Hydrologist/Project Manager
Duluth Office
Site Remediation Division

ME:pp

cc: Major Ryan Blazevic, USAF, Minnesota Air National Guard, 148th Fighter Wing