DRAFT FINAL

PRELIMINARY EXPOSURE ASSESSMENT AND BASELINE HUMAN HEALTH RISK ASSESSMENT WORK PLAN

PER- AND POLYFLUOROALKYL SUBSTANCE RESPONSE

FORMER LORING AIR FORCE BASE

LIMESTONE, MAINE

Prepared for:

Air Force Civil Engineer Center

Joint Base San Antonio – Lackland, Texas

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LIST OF ACRONYMS AND ABBREVIATIONS

95% UCL	95th percent of the upper confidence level on the mean
ADAF	Age-Dependent Adjustment Factor
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFFF	Aqueous Film Forming Foam
ANWR	Aroostook National Wildlife Refuge
ATSDR	Agency for Toxic Substances and Disease Registry
BGS	Below Ground Surface
BHHRA	Baseline Human Health Risk Assessment
BRAC	Base Realignment and Closure
CADD	Chronic Average Daily Dose
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
COPC	Contaminants of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DoD	Department of Defense
EBGB	East Branch Greenlaw Brook
ELCR	Excess Lifetime Cancer Risk
EPC	Exposure Point Concentrations
ERPIMS	Environmental Restoration Program Information Management System
ESD	Explanation of Significant Difference
FFA	Federal Facilities Agreement
ft	feet
FS	Feasibility Study
GMZs	Groundwater Management Zones
HA	Health Advisory
HEAST	Health Effects Assessment Summary

HFPO-DA	Hexafluoropropylene oxide dimer acid
HI	Hazard Index
HQ	Hazard Quotient
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
ITRC	Interstate Technology Regulatory Council
LADD	Lifetime Average Daily Dose
LDA	Loring Development Authority
LHA	Lifetime Health Advisory
Loring	Former Loring Air Force Base, Maine
LUC/ICs	Land Use Controls and Institutional Controls
MDIFW	Maine Department of Inland Fisheries and Wildlife
MECDC	Maine Center for Disease Control and Prevention
MEDEP	Maine Department of Environmental Protection
MEG	Maximum Exposure Guideline
MG/KG	Milligrams per Kilogram
NCP	National Contingency Plan
NGVD	National Geodetic Vertical Datum
OU	Operable Units
PA	Preliminary Assessment
PCBs	Polychlorinated Biphenyls
PFAS	Per- and Polyfluoroalkyl Substance
PFBA	Perfluorobutanoic Acid
PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexane sulfonate
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PPRTV	Provisional Peer Reviewed Toxicity Values
PRGs	Preliminary Remediation Goals
QPP	Quality Program Plan
QSM	Quality Systems Manual

RAB	Restoration Advisory Board
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RLs	Reporting Limits
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RSL	Regional Screening Level
SI	Site Inspection
SL	Screening Level
SVOC	Semi-volatile Organic Compound
TPH	Total Petroleum Hydrocarbon
µg/L	Micrograms per Liter
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
URF	Unit Risk Factor
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound
Wood	Wood Programs, Inc. and/or Wood Environment & Infrastructure Solutions, Inc.
WSP	WSP USA Environment and Infrastructure Inc.

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1.0 INTRODUCTION

WSP USA Environment and Infrastructure Inc. (WSP) has prepared this Preliminary Exposure Assessment and Baseline Human Health Risk Assessment (BHHRA) Work Plan in support of the Per- and Polyfluoroalkyl Substances (PFAS) Remedial Investigation (RI) at the former Loring Air Force Base (Loring or Site) located in Limestone, Maine (**Figure 1.0-1**). This document provides an initial exposure assessment as well the methods that will be used to evaluate potential human health risk associated with PFAS data collected during previous investigations and planned to be collected during the PFAS RI. RI data collection efforts are described in the Remedial Investigation Work Plan (RIWP) (Wood, 2022a). This Work Plan has been prepared for the United States Air Force (USAF) under Contract Number FA8903-16-D-0027 Task Order FA8903-21-F-1048.

The purpose of this Work Plan is to describe the technical approach to complete the BHHRA, which is primarily focused on PFAS. A preliminary exposure assessment has also been conducted to guide data collection in the RI. This preliminary assessment provides a review of existing information related to potentially complete PFAS migration and exposure pathways for human health and concludes with data collection recommendations to fill existing data gaps. Data collection and reporting focused on defining the nature and extent of PFAS are being executed under separate tasks.

The BHHRA will be completed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP) 40 Code of Federal Regulations (CFR) Part 300 (United States Environmental Protection Agency [USEPA], 1988).

1.1 BASELINE HUMAN HEALTH RISK ASSESSMENT SCOPE OF WORK

The BHHRA will evaluate potential risks to current and foreseeable future receptors at the Site and surrounding area from potentially complete exposure pathways in the absence of any actions to control or mitigate releases of contaminants (i.e., under an assumption of no action). The BHHRA will evaluate risks to human health associated with PFAS and will incorporate additive risks from non-PFAS chemicals where impacts are comingled. The BHHRA will incorporate information from the exposure assessment into the exposure Conceptual Site Model (CSM), which forms the basis for the evaluation, and calculate potential risks for potentially complete exposure scenarios.

This document provides a preliminary exposure assessment (**Section 2**), which includes desktop activities to identify current and reasonably foreseeable media, location, receptor, and activity combinations for potential PFAS migration pathways. This evaluation also includes a preliminary risk-based screening evaluation to refine and confirm the list of potential exposure media and designate and confirm specific exposure points for evaluation. Exposure points are areas where human exposure to potentially impacted media identified in the physical CSM is on-going or reasonably foreseeable.

This Work Plan then describes the specific approach, technical procedures, and applicable guidance citations that will be employed in the BHHRA (**Section 3** through **Section 6**). The Work Plan identifies the analytical data that will be considered in the preparation of the risk assessment, focusing on releases of PFAS to the environment. Additionally, the Work Plan provides an initial screening level evaluation of existing data to provide an indication of the environmental media and impacted areas that will be evaluated.

The evaluation will focus on PFAS chemicals with toxicity values that are compliant with the tiered approach hierarchy defined in Department of Defense (DoD) Instruction 4715.18 and OSWER Directive 9285.7-53 (Human Health Toxicity Values in Superfund Risk Assessments (USEPA,2003)). Presently USEPA toxicity values are available for Perfluorooctanesulfonic acid (PFOS), Perfluorooctanoic acid (PFOA), Perfluorobutanesulfonic acid (PFBS), Perfluorohexane sulfonate (PFHxS), and Perfluorononanoic acid (PFNA), which may be detected in soil, sediment, groundwater, surface water, and biota. Toxicity values are also available for Hexafluoropropylene oxide dimer acid (HFPO-DA), but this chemical was not included in the PFAS analysis at Loring, and therefore it will not be included in the BHHRA. USEPA also finalized the toxicity value for Perfluorobutanoic Acid (PFBA) in December 2022, however DoD has not approved this value for use as of January 2023. If additional USEPA toxicity values are published and adopted by DoD before the Final BHHRA is submitted, they will be considered for use. PFAS chemicals without published toxicity information will be qualitatively addressed to the extent possible including a comparison of the relative total concentrations of unevaluated chemicals to evaluated chemicals and the potential implications within the uncertainty discussion of the BHHRA. These chemicals will not be addressed further in the BHHRA or the Work Plan.

The introduction of the BHHRA will discuss the site history and setting, as well as relevant previous human health risk assessment activities and remediation that have been conducted for environmental releases at Loring. Prior to the current ongoing RI, which focuses on PFAS, contaminants of concern (COCs) at the site included chlorinated volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), Polycyclic Aromatic Hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, metals and certain petroleum contaminants. Cumulative risk calculations for PFAS chemicals with current DoD approved toxicity values will also evaluate residual concentrations from non-PFAS chemicals that remain present at PFAS-impacted areas within the former installation boundary. Non-PFAS data will be collected as part of the RI and the non-PFAS evaluation will mimic methods used to evaluate PFAS. These chemicals are discussed further in **Section 1.4**.

The BHHRA will address potential estimated human health risks associated with PFAS chemicals with available toxicity information (and non-PFAS chemicals where relevant) in groundwater, soil, sediment, surface water, and biota (fish tissue) at the Site and surrounding area. Further refinement of exposure areas will be performed once the investigation has been completed. Additionally, some proposed pathways may be considered incomplete based on new data collected as part of the RI scope.

1.2 SITE HISTORY AND SETTING

In 1946, the Strategic Air Command developed a plan for a global Air Force. The plan called for the Limestone Air Force Base at the northeastern tip of the United States. Loring was first established as Limestone Air Force Base in 1947 and was later renamed after Korean War aviator Charles J. Loring in 1954. Construction began in 1947 and was completed in 1953. Loring Air Force Base was operated by the USAF from 1950 to 1994.

The installation became active in 1953 with the 42nd Bombardment Wing in residence to a series of state of-the art bombers and support aircraft. In 1955, the 42nd Air Refueling Squadron was activated. Starting in 1981, substantial renovations were made to the installation, including the addition of a second runway. Base improvements continued through 1991 with the completion of a renovated alert facility, a new medical center, and a new maintenance facility and upgraded aircraft refueling. The installation was officially deactivated on 30 September 1994. Upon closure, responsibility for environmental cleanup at the installation transferred to the Air Force Base Conversion Agency (AFCEC, 2011). An installation layout map also showing potential PFAS source areas is provided as **Figure 1.2-1**.

The installation was placed on USEPA's National Priorities List of sites in 1990. Under the CERCLA 120, a Federal Facilities Agreement (FFA) between USEPA Region 1, the Maine Department of Environmental Protection (MEDEP), and the USAF, was signed into action January 1991 and amended in 1995. The FFA governs the environmental activities being conducted at Loring. Following the signing of the FFA, Loring was placed on the U. S. Congress Base Closure List (1991) and was closed in September 1994.

After the Air Force Base closure in 1994, the Maine State Legislature created the Loring Development Authority (LDA) to acquire and manage the properties within the geographic boundaries of Loring. The USAF transferred approximately 4,700 acres of land to the United States Fish and Wildlife Service (USFWS) in 1998 for operation as the Aroostook National Wildlife Refuge (ANWR). Additional land was conveyed to construct housing for the local Aroostook Band of Mi'kmaq (Wood, 2018). Current property boundaries are depicted in **Figure 1.2-2**.

Loring is located approximately west longitude 67°89'21" by north latitude 46°94'56" occupying approximately 8,704 acres in the community of Limestone, Maine located in Aroostook County (**Figures 1.0-1 and 1.2-2**). The installation formerly occupied 8,704 acres in the lower Aroostook River Basin.

Loring lies in the lower Aroostook River Basin. Topography of the basin is typified by a succession of gently rolling to steeply sloping ridges separated by narrow valleys. Elevations of the ridges range from 600 to 800 feet (ft) above sea level (referenced elevations are based on the National Geodetic Vertical Datum [NGVD]). Narrow swamps and bogs extend between the ridges. The valleys range in elevation from 500 to 600 ft above the NGVD (ABB, 1997).

1.3 GENERAL LAND AND WATER USE

Parcels within the former Loring Air Force Base boundary are now owned by other entities including the LDA. Currently there is limited commercial and industrial use of the former Air Force Base within the LDA including use as offices, storage/shipping, and a compost operation, in addition to an Inn on Virginia Place, a residential community consisting of a series of rental units managed by a single property agent on Manser Road, and several additional homes on Development Drive. The LDA is supplied by municipal water. The ANWR properties are open to the public for recreational use in designated areas and supplied by private wells. A large parcel to the south is owned by the Aroostook Band of Mi'kmaq and is depicted on **Figure 1.2-2**. This parcel is currently used for a research study and may be used commercially, however further development and construction is planned. The Aroostook Band of Mi'kmaq indicated that they do not currently allow hunting, fishing, or foraging on this parcel of land. Therefore, any foraging currently taking place is considered unauthorized. The airflight control tower is not operational. Planes landing at the former Loring Air Force Base are infrequent and are typically unscheduled.

The land surrounding the installation is primarily rural and agricultural, supplied by private well water. Many residents have small vegetable gardens and at least one home keeps poultry. Agricultural fields in the area grow potatoes, broccoli, kale, and other cold region crops as part of large commercial operations.

1.4 NON-PFAS INVESTIGATION HISTORY AND CURRENT NON-PFAS INVESTIGATION AT LORING

Under the FFA for the former Loring Air Force Base, 15 Installation Restoration Program (IRP) Operable Units (OU) were established for the former Loring Air Force Base according to geographic location, disposal type (e.g., landfill), or affected media. The primary COCs at the site included chlorinated VOCs, semi-volatile organic compounds (SVOCs), and certain total petroleum hydrocarbon (TPH) compounds. Separate RI and Feasibility Study (FS) reports were prepared for each OU. The IRPs and aqueous film forming foam (AFFF)release sites are depicted in **Figure 1.4-1.**

Eleven Records of Decisions (ROD) have been completed at Loring describing site cleanup plans between 1994 and 1999 (ABB Environmental Services, 1994, 1996 and 1997; and Harding Lawson Associates, Inc., 1998 and 1999a, b). An amendment to the OU 12 ROD was completed in 2018 for vapor intrusion (USAF, 2018). An Explanation of Significant Difference (ESD) for OU 12 – Groundwater Management Zone (GMZ)-1 was completed in September 2022. This ESD addresses enhancements to the remedies for the Contractor Storage Shed and Entomology Shop/Jet Engine Buildup Shop plumes and identifies a change in the groundwater remediation goal for naphthalene in GMZ-1 (USAF, 2022).

Construction work required under each ROD has since finished. Remedy optimization, operation and maintenance, and long-term monitoring work are ongoing until cleanup goals have been met for fuels and solvent related contamination. There are several GMZs implemented as remedy components in final RODs as permanent Land Use Controls/Institutional Controls (LUC/ICs). These are discussed further in subsequent sections. The USAF is responsible for five-year reviews (FYR) at the Site where the purpose is to evaluate and determine if the implemented remedies are and will continue to be protective of human health and the environment. Five FYRs have been completed and the latest was conducted in 2020 (Aptim, 2020).

Three IRP Sites at Loring have been addressed during previous programs and are reported to have used AFFF or received soils that may have been exposed to AFFF. The location of the former sites with AFFF use are discussed below. A more detailed description of each of these sites is provided in Section 5 of the RIWP (Wood, 2022a)**:**

- Fire Training Area (FTA) FT007 (IRP Site FT-07): Area was used for fire training exercises, where AFFF was the primary extinguishing agent used between 1970 and 1989. The site consisted of a mock aircraft located in a bermed circular pit. During training exercises, waste fluids consisting of fuels, oils, and solvents were released into the FTA pit, ignited, and extinguished (HLA, 1999a). Extensive excavation has occurred at this location and soils were moved to Landfill LF-3.

- Landfill LF-2 (IRP Site LF002): Landfill LF-2 may have received impacted soil from industrial areas on the installation where AFFF may have been used; however, no specific AFFF disposal was documented. The selected source control remedial action for LF-2 in the OU2 ROD (ABB, 1994) is containment using a low-permeability cap. The cover system was designed in accordance with Resource Conservation and Recovery Act (RCRA) Subtitle C and Maine Hazardous Waste Regulations. Site preparation for the cover system began in 1994, and the cover system was constructed in 1996. The landfill was closed with the construction of RCRA cap.

  A developed rural area exists on the west side of the Installation which is downgradient of LF-2. LF-2 lies in the apparent upgradient vicinity of a residence in the Town of Caribou where sampling of one private water supply well indicated either non-detect or low concentrations of PFOS and PFOA below the 2016 USEPA lifetime Health Advisory (HAs)/Maximum Exposure Guideline (MEG) during sampling rounds in 2015, 2016, and 2017. PFBS was not detected.
- Landfill LF-3 (IRP Site LF020): Landfill LF-3 received contaminated soils excavated from FT-07, which has documented AFFF use. The remedial control selected for this landfill in the OU2 ROD (ABB, 1994) uses a low-permeability cap. The cap was designed in accordance with RCRA Subtitle C and Maine Hazardous Waste Regulations. Installation of the cap was completed in 2000.

  LF-3 lies in the apparent upgradient vicinity of two residences in the Town of Caribou where private well sampling was conducted: one in 2015 and one in 2017. In addition, a multi-resident supply well located downgradient of LF-3 in the rural Westgate area was sampled in 2015, 2016, and 2017. The well's 1,000 ft wellhead protection zone falls within the installation boundary. Analysis of drinking water collected from the three private wells (two private residential wells and one multi-residence private water supply well) indicated low concentrations of PFOS and PFOA below the USEPA lifetime HA/MEG and PFBS was detected below the screening value.
- Although other IRP sites may not have specific AFFF history, there is significant overlap between the AFFF investigation areas and IRP site boundaries as depicted in **Figure 1.4-1**. Therefore, the RI will include limited collection of non-PFAS chemicals at the majority of AFFF areas. This data will include VOCs, SVOCs, PAHs, metals, and PCBs. The RI sampling will also include two chemicals that have not been fully characterized previously: perchlorate and 1,4-dioxane. Sampling for all non-PFAS is within areas sampled for PFAS and not intended to fully characterize non-PFAS outside of PFAS overlap areas. The RIWP (Wood, 2022a) provides more detail on the sampling of non-PFAS chemicals.

In 2006 the Agency for Toxic Substances and Disease Registry (ATSDR) developed a health consultation (ATSDR, 2006) to address concerns expressed by the Mi'kmaq about the safety of using plant and animal resources from Loring lands. The objective of the evaluation was to provide perspective about whether the COCs at Loring are likely to accumulate in plant and animal resources traditionally used by the Mi'kmaq. COCs included metals (barium, cadmium, lead, mercury, silver, and zinc), pesticides (chlordane, DDT, DDD, and DDE), PCBs, PAHs, and petroleum compounds. VOCs are not typically considered bioaccumulative and therefore were not a part of this focus. ATSDR presented observations based on literature reviews about the potential for exposure to contaminants from certain traditional Mi'kmaq practices and came to the following conclusions:

- Ingestion of soil presented the highest potential for risk at sites contaminated with heavy metals
- Workers (basket weavers and/or plant harvesters) may inhale substantial amounts of soil dust due to working in an enclosed environment
- Plant materials present a potential risk if they are consumed for medicinal purposes, used for dyes or paints (including cosmetics and face paint), or burned in sweat lodges (volatilization of contaminants into the air)
- Root crops and low-lying plants grown in contaminated soil are likely to be more harmful than plants and crops that are higher from the ground because crops that grow higher from the ground are not a significant exposure source to contaminants in the soil
- Animal skins and furs may contain high levels of mercury according to literature review

1.5 PFAS USE AND PFAS INVESTIGATION AT LORING

AFFF containing PFAS chemicals was used at the former Loring Air Force Base to respond to petroleum fires and during fire training exercises (Amec Foster Wheeler, 2015). There are no records of when AFFF containing PFAS for firefighting purposes was first used at Loring Air Force Base. However, it is assumed that AFFF was first used at Loring around 1970 which is the same timeframe as use at other installations such as the former Pease Air Force Base in Portsmouth, New Hampshire (NH DHHS, 2015; Prevedouros et al., 2006; ATSDR, 2015; NRL, 2015).

Components of the AFFF, such as PFOA and PFOS, seeped into the soil and groundwater and may have migrated to potential receptors. PFAS were also used at Loring in fire suppression systems at several of the installation buildings (Amec Foster Wheeler, 2015). The location of potential PFAS source areas at Loring Air Force base is depicted in **Figure 1.2-1**.

In 2012 the USAF issued guidance on sampling for emerging contaminants PFOS and PFOA (USAF, 2012). The results of the PFAS sampling prior to the RI are summarized below**.**The BHHRA will consider data from each of the following investigations as well as data collected during the RI. Detailed descriptions of the available data referenced below are presented in **Section 2.1**.

1. *Groundwater, Sediment and Fish Tissue PFOS and PFOA Assessment (2013)* – Groundwater samples were collected from the FTA and fish tissue and sediment samples were collected from several surface water bodies (East Branch Greenlaw Brook (EBGB), Chapman Pit, Durepo Reservoir, Prestile Brook, and East Loring Lake). PFAS were detected in groundwater and fish tissue. One sediment sample was collected from East Loring Lake and analyzed for both PFOS and PFOA. PFOA was not detected in the sediment sample, and the PFOS concentration was 0.930 ng/g (CB&I, 2014).

2. *Preliminary Assessment (2015)* – The PA provided findings from research conducted to determine whether and where AFFF, containing PFAS, was stored, handled, used, or released at the installation. Based on the research conducted during the PA, 22 potential AFFF areas were identified. One of the potential AFFF areas (Base Supply – Area 4) had no documented storage or releases of AFFF and was therefore not investigated. The following 21 AFFF areas were identified that potentially require further action (Amec Foster Wheeler, 2015):
   - Area 1 - FTA FT-07 (IRP Site FT-07): Area was used for fire training exercises, where AFFF was the primary extinguishing agent used between 1970 and 1989.
   - Area 2 - Landfill LF-2 (IRP Site LF-02): Landfill may have received impacted soil from industrial areas on the installation where AFFF may have been used; however, no specific AFFF disposal was documented.
   - Area 3 - Landfill LF-3 (IRP Site LF-20): Landfill received contaminated soils excavated from FT-07, which has documented AFFF use.
   - Area 5 - Building 3005 (Structural Fire Station): AFFF was used occasionally at this location during testing operations.
   - Area 6 - Building 6900 (Fire Department Training/Burn House): Firefighter training was conducted at this location on the operation of AFFF equipment, which likely resulted in the release of AFFF.
   - Area 7 - Building 8202 (Crash Fire Station): Facility stored AFFF in 55-gallon drums, 5-gallon buckets, and an approximate 750-gallon above ground storage tank (AST), and transferred the AFFF onto crash fire trucks. Daily and weekly testing of AFFF equipment was conducted that resulted in a release of approximately 5-gallons of AFFF per test to the concrete pavement or grassy areas at this location. Annual calibration of AFFF equipment was also conducted at this building.
   - Area 8 - Building 8250 (Arch Hangar): Facility reportedly periodically stored AFFF.
   - Area 9 - Building 8260 (Jet Engine Maintenance Building): A 55-gallon drum of AFFF was punctured by a forklift resulting in a release of all drum contents; however, no documentation was available regarding the specific spill location and/or the extent of the material released.
   - Area 10 - Nose Dock Area (ST011) - Nose Dock 11: Approximately 100 to 200 gallons of AFFF were used to extinguish a B-52 aircraft fire at this location on 19 July 1970; however, the specific location of the release is unknown.
   - Area 11 - Nose Dock Area (ST011) – Building 8740/Nose Dock 40: Facility reportedly maintained an AFFF fire suppression system; however, no AFFF releases were documented.
   - Area 12 - Nose Dock Area (ST011) - Building 8744/Nose Dock 44: Facility stored AFFF and maintained an AFFF fire suppression system that had four AFFF releases, one during initial testing/calibration and three separate system activations.

- Area 13 - Nose Dock Area (ST011) - Aircraft Hardstands: AFFF was applied periodically to fuel spills at these locations to protect aircraft and sensitive weapons.
- Area 14 - Nose Dock Area (ST011) - Hardstand 19: Approximately 1,000 gallons of AFFF were applied to a fuel spill resulting from a broken fuel line on a B-52 in the early 1970s to minimize fumes and prevent a potential fire; however, the specific location of the release is unknown.
- Area 15 - Nose Dock Area (ST011) - Ramp #1: Approximately 500 gallons of AFFF were applied to a fuel spill at this location during unloading of a sensitive weapon to protect the aircraft and weapon.
- Area 16 - Fuel Tank Farm: AFFF was applied to numerous fuel spills at this location to minimize fumes and prevent a potential fire.
- Area 17 - Fuel Dump Area: AFFF was applied at the north end of Ramp #2 in response to the release of approximately 20,000-gallons of fuel from a fuel tanker truck to minimize fumes and prevent a potential fire.
- Area 18 - Main Runway Foaming Area: A runway foamer was reportedly tested at least once where AFFF was sprayed along the length of the runway and subsequently hosed down into drainage ditches that discharged into the Flightline Drainage Ditch (FLDD).
- Area 19 - KC-135 Crash Site: A large quantity of AFFF was reportedly applied to a fuel spill resulting from the crash of a KC-135 aircraft off the southern end of the flightline in 1974. The crash appears to have occurred in 1969.
- Area 20 - B-52 Crash Site: A large quantity of AFFF was applied at the north end of the runway in response to the crash of a B-52 aircraft upon takeoff on 28 December 1984.
- Area 21 - FLDD and Building 6538 (Industrial Wastewater Treatment Facility [IWTF]): Unlined drainage ditch received stormwater drainage and potentially AFFF from aircraft hardstand areas, flightline, runway and industrial shop areas including the crash fire station. Storm water and drainage from the FLDD passed through the IWTF located at the southern end of the FLDD.
- Area 22 - Wastewater Treatment Plant (WWTP) Sludge Drying Beds: The WWTP processed industrial wastewater from the sanitary sewer system, which potentially contained AFFF, and sludge from the WWTP digesters was dried via landfarming on the west side of the WWTP prior to disposal.

3. *Site Investigation (2015 and 2017)* – Site investigation (SI) activities were conducted at the installation between 17 August 2015 and 02 June 2017 at 21 AFFF areas identified for inspection during the 2015 PA (Amec Foster Wheeler, 2015). Sixteen of the 21 areas were found to contain PFAS in soil and/or groundwater above screening levels established for the SI in soil (1,300 mg/kg PFBS; 1.26 mg/kg PFOS/PFOA) and/or groundwater (70 ng/l PFOS/PFOA). In addition, PFAS were detected in surface water, sediment, and fish tissue. Drinking water samples were also analyzed from nine private and public drinking water supply well locations. Drinking water wells sampled

as part of the 2015 through 2017 SI activities identified no concentrations of PFOS, PFOA, or PFBS above applicable HAs/MEGs(70 ng/l PFOS/PFOA), Regional Screening Level (RSL) (400,000 ng/l PFBS), or the Maine Center for Disease Control (MECDC) screening values (140,000 ng/l PFBS; 120 ng/l PFOS/PFOA) in effect at the time (Wood, 2018).

Additional activities were conducted during the Fall of 2021 and February 2022, which included sampling existing wells, surface water, and residential/public well sampling. PFAS was detected in groundwater, surface water, and drinking water. This sampling event was performed to identify and characterize data gaps to assist in refining the Loring CSM and in scoping the RIWP. A detailed description of this sampling event is provided in **Section 2.1**. This preliminary RI scoping investigation is part of the RI scope, and analytical data from that sampling event will be incorporated into the BHHRA.

1.6 REGULATORY CONTEXT

The BHHRA will be conducted in accordance with CERCLA requirements and consistent with USEPA risk assessment guidance (including, but not limited to USEPA, 1989). The applicable regulatory requirement is the NCP, 40 CFR Part 300. Additional USEPA national and regional guidance, and state regulations and guidance will be considered, as applicable. The BHHRA will also be conducted in accordance with all applicable DoD and DAF requirements including DERP Manual DOD 4715.2 (DoD, 2018) and Department of the Air Force Instruction 32-7020 (DAF, 2022).

The BHHRA will be performed in general accordance with USEPA guidance including, but not limited to the following documents:

- Risk Assessment Guidance for Superfund (RAGS). Volume 1: Human Health Evaluation Manual
    - Part A, Baseline Risk Assessment, Interim Final, (USEPA, 1989)
    - Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments, (USEPA, 2002a)
    - Part E, Supplemental Guidance for Dermal Risk Assessment, (USEPA, 2004)
    - Part F, Supplemental Guidance for Inhalation Risk Assessment, Final, (USEPA, 2009)
- Guidance for Data Usability in Risk Assessment (USEPA, 1992)
- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002b)
- Exposure Factors Handbook: 2011 Edition (USEPA, 2011) and recent updates
- OSWER Directive 9283.1-42. Determining Groundwater Exposure Point Concentrations, Supplemental Guidance (USEPA, 2014a)
- OSWER Directive 9200.1-120. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Attachment 1. Recommended Default Exposure Factors, (USEPA, 2014b)
- Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24 (USEPA, 2002c)
- Human Health Toxicity Values in Superfund Risk Assessments (USEPA, 2003)

- Guidelines for Carcinogen Risk Assessment, Final (USEPA, 2005a)
- Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b)

1.7 REPORT LAYOUT

The preliminary exposure assessment is provided in Section 2 and the BHHRA methodology is presented in Section 3 through Section 6. In accordance with USEPA guidance the BHHRA will be written in four steps, which are discussed further in the Section 3 through Section 6 of this document:

- Preliminary Exposure Assessment – Section 2
- Hazard Identification - Section 3
- Exposure Assessment - Section 4
- Toxicity Assessment - Section 5
- Risk Characterization - Section 6

2.0 PRELIMINARY EXPOSURE ASSESSMENT

This section documents the preliminary exposure assessment, which was conducted to identify current or anticipated land uses that could be a priority for evaluation and provide input into the data collection within the RIWP (Wood, 2022a). This included site reconnaissance and desktop activities to refine and confirm the list of potential exposure media and designate and identify specific exposure points for evaluation. Exposure points are areas where human exposure to potentially impacted media identified in the physical CSM is on-going or reasonably foreseeable, and may be further updated as part of the BHHRA once the RI data is collected. Outcomes of the preliminary exposure assessment are included at the end of this section.

The preliminary exposure assessment is a separate task from the BHHRA Work Plan. The objective was to support the identification of significant exposure pathways and data gaps for development of the RIWP (Wood, 2022a). This task was performed concurrently with the RIWP, which was finalized in April 2022, and includes data prior to the start of the RI data collection. Therefore, some information in this section including the screening exercise is now outdated and is provided here to document the initial evaluation supporting the RIWP. The BHHRA will use the most up to date screening levels available when the BHHRA is conducted and consider all available data.

2.1 ANALYTICAL DATA DENSITY AND SPATIAL REPRESENTATIVENESS REVIEW

A desktop data review was performed as part of the preliminary exposure assessment to evaluate the quantity, location, and concentrations of PFOS, PFOA, PFBS, PFHxS, and PFNA from available media collected between 2013 and 2017. This evaluation aimed to ascertain whether sufficient data was collected to evaluate potential risk from exposure to these media and identified significant data gaps. If additional data needs were identified, desktop activities were conducted to refine and confirm the list of potential exposure media, designate and confirm specific exposure points for evaluation, and provide input into the RIWP (Wood, 2022a). Analytical data collected during the planned RI and deemed usable following data validation and according to the project-specific QAPP will be evaluated in the BHHRA. Previously collected relevant data adequately validated and deemed usable at the time of collection will also be evaluated.

2.1.1 Soil Data Review

172 soil samples were collected at 56 soil boring locations and 6 surface soil locations during the SI. The soil data is presented in **Table 2.1-1** and a summary of the available data is presented below:

- 2015 – Site Investigation: 64 soil samples were collected October to November 2015 at depths from 0 to 27 ft below ground surface (bgs). 108 soil samples were collected from August to October 2016 at depths from 0-29 ft bgs. PFOS was detected in 110 samples with a maximum concentration 3.57 mg/kg at the Crash Fire Station at a depth of 0-1 ft bgs. PFOA was detected in 45 samples with a maximum concentration of 0.185 mg/kg at the Crash Fire Station at a depth of 0-1 ft bgs. PFBS was detected in 16 samples with a maximum concentration of 0.00232 mg/kg at the Crash Fire Station at a depth of 5-7 ft. PFHxS was detected 75 times with a maximum concentration of 0.0764 mg/kg at the Structure Fire Station at a depth of 0-1 ft. PFNA was detected 44 times with a maximum concentration of 0.012 mg/kg at the Crash Fire Station at a depth of 0-1 ft.

- Soil concentrations of PFOA and PFOS were generally highest at shallow soil depths (0-1 ft bgs) in the suspected source areas.
- PFBS was only detected at the Structural Fire Station, Crash Fire Station, Fire Training Area, and Nose Dock No. 11. It is noted that PFBS concentrations were slightly greater at depths between 5 and 18 ft bgs at the Crash Fire Station.
- Soil has been reworked at Nose Dock No. 11 and Hardstands Area Ramp #1. At Nose Dock No. 11, PFOS was detected three times, PFOA was detected 12 times, and PFBS was detected only once. At the Hardstands Area, PFOS was detected five times, PFOA was detected ten times, and PFBS was not detected.

Additional soil data will be collected at all the potential source areas investigated within the RI as well as additional locations and step-outs to characterize the impacts to soil. The planned sampling program for soil is considered sufficient to characterize concentrations and evaluate potential exposure to soils for known or suspected source areas. The program is further described in the RIWP (Wood, 2022a).

2.1.2 Groundwater Data Review

Five groundwater samples were collected in 2013. 101 groundwater samples were collected from 81 monitoring wells during the 2015 SI and 2017 SI. An additional 13 groundwater samples were collected from 12 monitoring wells in 2021.The groundwater data statistics are presented in **Table 2.1-2** using a rough initial evaluation of flow fields that identifies three separate areas, and a summary of the results is presented below:

- 2013 PFOS and PFOA Assessment: Five bedrock wells were sampled in November 2013 for PFOS and PFOA. PFOS and PFOA were detected in all the samples.
- Site Investigation:
    - 2015/2016: 47 samples were collected from 42 monitoring wells in August and November 2015. 36 samples were collected from 30 monitoring wells in September and October 2016. PFOA was detected 73 times with a maximum concentration of 811 ng/L at the Crash Fire Station at a depth of 9-19 ft. PFOS was detected 78 times with a maximum concentration of 8770 ng/L at Nose Dock No. 44 at a depth of 16 ft. PFBS was detected 44 times with a maximum concentration of 259 ng/L at Nose Dock No. 44 at a depth of 55 ft. PFHxS was detected 79 times with a maximum detection of 2240 ng/L at the Crash Fire Station at a depth of 9-19 ft. PFNA was detected 49 times with a maximum detected concentration of 99.9 ng/L at the Crash Fire Station at a depth of 9-19 ft.
    - 2017: 18 samples were collected from nine monitoring wells at Landfill 2 and Landfill 3 in May and June of 2017. PFOA was detected 10 times with a maximum concentration of 49 ng/L at Landfill 3 at a depth of 14 ft. PFOS was detected 12 times with a maximum concentration of 53.4 ng/L at Landfill 3 at a depth of 53-63 ft. PFBS was not detected. PFHxS was detected 11 times with a maximum detection of

34.4 ng/L at Landfill 3 at a depth of 14 ft. PFNA was detected once with a concentration of 1.38 ng/L Landfill 3 at a depth of 14 ft.

- 2021 RI Sampling: 13 samples were collected from 12 monitoring wells in October 2021. PFOA was detected 11 times with a maximum concentration of 13.3 ng/L at Base Laundry at a depths of 32.6-33.6 ft. PFOS was detected 11 times with a maximum concentration of 40.8 ng/L at the FLDD/EBGB Area at a depth of 56-57 ft. PFBS was detected once with a concentration of 3.97 ng/L at the FLDD/EBGB Area at a depth of 56-57 ft. PFHxS was detected 11 times with a maximum concentration of 43.2 ng/L at the FLDD/EBGB Area at a depth of 56-57 ft. PFNA was not detected.

The groundwater data is presented as statistics based on the rough initial evaluation of flow fields along interpreted bedrock groundwater divides presented in **Figure 2.1-2**. The groundwater data has been split into three areas: Central Flow Field, East Flow Field and West Flow Field. These are the flow fields that were identified circa April 2022 when the preliminary exposure assessment was conducted. The flow fields have been further refined following this initial evaluation, and as of January 2023 six flow fields have been identified. Additional refinements to the flow fields may occur prior to when the BHHRA is conducted. The most current identified flow fields will be used in the BHHRA. Bedrock groundwater flows preferentially along bedding planes and areas of dissolution occurring along intersections of bedding plane and axial plane fractures (ABB-ES, 1997b). The final exposure areas used in the BHHRA will be based on consideration of property ownership information and flow field information. Additional sampling was specifically recommended at the following locations where PFAS concentrations were elevated but few samples were collected:

- Building 6900, Fire Department Training/Burn House
- Nose Dock No. 11
- Wastewater Treatment Plant (WWTP) Sludge Drying Bed Area
- Flight Line Drainage Ditch
- Crash Fire Station

It has been noted that some local crops, mainly potatoes, may be irrigated with groundwater. No irrigation wells have been tested, although some groundwater irrigation wells have been identified.

Additional groundwater data will be collected at all potential source areas investigated within the RI as well as additional locations and step-outs to characterize the impacts to groundwater. Additional private well sampling will also be conducted including irrigation water. The evaluation of groundwater is further described in the RIWP (Wood, 2022a).

2.1.3 Private Well Data Review

45 private and public well samples were collected at 14 locations between 2015 and 2022. Several other public/private drinking water well locations were identified downgradient from the Site. The private well groundwater data is presented in **Table 2.1-3.**

- 2015 – Site Investigation: 14 samples were collected at 10 locations in August and November 2015. 12 samples were collected at 8 locations in May and August 2016. PFOS was detected 14 times with a maximum concentration of 11.4 ng/L. PFOA was detected 13 times with a maximum concentration of 7.24 ng/L. PFBS was detected three times with a maximum concentration of 75.3 ng/L. PFHxS was detected 16 times with a maximum concentration of 151 ng/L. PFNA was detected once with a concentration of 0.474 ng/L.

- 2017 – Site Investigation: Seven samples were collected at four locations in May 2017. PFOS was detected five times with a maximum concentration of 7.07 ng/L. PFOA was detected six times with a maximum concentration of 3.11 ng/L. PFHXS was detected five times with a maximum concentration of 3.53 ng/L. PFBS and PFNA were not detected.
- 2021 – RI Sampling: 11 samples were collected at nine locations in October 2021. PFOS was detected eight times with a maximum concentration of 21.8 ng/L. PFOA was detected eight times with a maximum concentration of 4.06 ng/L. PFHxS was detected eight times with a maximum concentration of 24.8 ng/L. PFBS and PFNA were not detected.
- 2022 – RI Sampling: One sample was collected in February 2022. PFOS was detected at 4.42 ng/L and PFOA was detected at 1.07 ng/L. PFHxS was detected at 7.31 ng/L. PFBS and PFNA was not detected.

Additional private well sampling will be conducted in 2022 including irrigation water. The evaluation of groundwater including private well sampling is further described in the RIWP (Wood, 2022a).

2.1.4 Surface Water and Sediment Data Review

Surface water data is presented as summary statistics based on two identified drainage areas presented in **Figure 2.1-2**:

- Western Drainage – includes surface water bodies to the west of the site including Greenlaw Brook, the principal on-base tributary stream, which receives runoff from the western half of the base and flows southwesterly to the Little Madawaska River.
- Eastern Drainage – includes surface water bodies to the east of the site including Butterfield Brook, the principal tributary stream draining the north and eastern portion of the base, which flows southeasterly to Limestone Stream.

56 surface water samples were collected at 53 locations during between 2015 and 2021. The surface water data statistics are presented in **Table 2.1-4** and a summary of results are presented below:

- Site Investigation:
    - 2015/2016: 26 samples were collected at 23 locations between September and November 2015. 16 samples were collected at 15 locations in August and September 2016. PFOS was detected in all samples with a maximum concentration of 1440 ng/L. PFOA was detected in 55 samples with a maximum concentration of 95.1 ng/L. PFBS was detected in 30 samples with a maximum concentration of 52.3 ng/L. PFHxS was detected in 40 samples with a maximum concentration of 577 ng/L. PFNA was detected 40 times with a maximum concentration of 9.4 ng/L.
    - 2017: Four samples were collected at four locations in September 2017. PFOS was detected in one sample with a concentration of 1.53 ng/L. PFHxS was detected in one sample with a concentration of 4.64 ng/L. PFOA, PFBS, and PFNA were not detected.
- 2021 Sampling: Nine samples were collected at eight locations in October 2021. PFOS, PFOA, and PFHxS were detected in all samples with a maximum concentration of 168 ng/L for PFOS,

13.5 ng/L for PFOA, and 72.5 for PFHxS. PFBS was detected five times with a maximum concentration of 6.84 ng/L. PFNA was detected once with a concentration of 1.26 ng/L.

39 sediment samples were collected at 34 locations during the SI. The sediment data is presented in **Table 2.1-5** and a summary of data is presented below:

- 2013 Report – One sediment sample was collected from East Loring Lake and analyzed for both PFOS and PFOA. PFOA was not detected and PFOS was detected at a concentration of 0.00093 mg/kg.
- 2015 – Site Investigation: 25 samples were collected at 22 locations between September and November 2015. 14 samples were collected at 12 locations in August and September 2016. PFOS was detected 34 times with a maximum concentration of 0.0937 mg/kg. PFOA was detected 19 times with a maximum concentration of 0.0012 mg/kg. PFHxS was detected 20 times with a maximum concentration of 0.00197 mg/kg. PFNA was detected six times with a maximum concentration of 0.000284 mg/kg. PFBS was not detected.

Additional surface water and sediment sampling will be conducted to confirm previous results and fully characterize the surface water migration pathway. The evaluation of surface water and sediment is further described in the RIWP (Wood, 2022a). Surface water and sediment sampling was specifically recommended in the following surface water bodies:

- Chapman Pit (limited previous data and possible recreational area)
- Malabeam Lake (limited previous data and possible recreational area)
- Little Madawaska River (no previous data)
- Durepo Reservoir (recreational area and assumed used for irrigation)
- Noyes Pond (no previous data and assumed used for irrigation)

2.1.5 Stormwater and Porewater Data Review

Fifteen stormwater samples were collected within the Aircraft Hardstands and near the jet engine maintenance building in August 2016 as part of the SI. Data statistics are presented in **Table 2.1-6:**

- 2016 – Site Investigation: Fifteen stormwater samples were collected in August 2016. PFOS, PFOA, and PFHxS were detected in all 15 samples with a maximum concentration of 266 ng/L for PFOS, 42.2 ng/L for PFOA, and 111 ng/L for PFHxs. PFBS was detected five times with a maximum concentration of 5.79 ng/L. PFNA was detected 11 times with a maximum concentration of 7.41 ng/L.

Stormwater is not equivalent to surface water from a risk perspective, as it is within the stormwater system. However, maintenance workers may contact this water during system repairs and therefore it may be evaluated within the BHHRA. Additional stormwater sampling will be conducted to confirm previous results and fully characterize the stormwater migration pathway, especially within the two stormwater lines to the south of the base. The evaluation of stormwater is further described in the RIWP (Wood, 2022a).

Sediment porewater data statistics are presented in **Table 2.1-7** consistent with the surface water drainages, and a summary of data is presented below:

- 2015 – Site Investigation: Eight porewater samples were collected in September 2015. PFOS was detected seven times with a maximum concentration of 423 ng/L. PFOA was detected eight times with a maximum concentration of 29.65 ng/L. PFBS was detected five times with a maximum concentration of 7.48 ng/L. PFHxS was detected eight times with a maximum concentration of 138.5 ng/L. PFNA was detected eight times with a maximum concentration of 14.1 ng/L.

Sediment porewater can be used as a conservative surrogate for surface water. Due to the limited number of samples and the lack of additional sediment porewater sampling within the RI, exposure to pore water will not be assessed as a human exposure media in the BHHRA. This will be discussed in the uncertainty section of the report.

2.1.6 Fish Tissue Data Review

The fish tissue data was collected in 2013 and 2015. This data is presented in **Table 2.1-8** and a summary of the data is presented below:

- 2013 Report: Fish tissue samples were collected from the following water bodies in October and November 2013 for PFOS and PFOA: EBGB, Chapman Pit, Durepo Reservoir, Prestile Brook, and East Loring Lake. PFOS was detected in each fish tissue sample except for one skinless fillet sample collected from reference location, Prestile Brook. PFOS concentrations ranged from 37.8 to 1,080 ng/g. PFOA was below the detection limit in all fish tissue samples.
- 2015 – Site Investigation: 17 samples were collected at 15 locations in September and October 2015. Fish tissue samples collected were primarily comprised of brook trout and one sample of small mouth bass was collected. PFOS was detected in all samples with a maximum concentration of 0.457 mg/kg. PFOA was detected in six samples with a maximum concentration of 0.000743 mg/kg. PFHxS was detected in all samples with a maximum concentration of 0.00772 mg/kg. PFNA was detected eight times with a maximum concentration of 0.00158 mg/kg. PFBS was not detected.

Prior to 2022, the following locations do not have any PFAS fish tissue data available. Sampling is recommended at these locations:

- Noyes Pond
- Malabeam Lake
- Little Madawaska River

Due to the lack of small mouth bass data and the likelihood of variable PFAS uptake across species, additional small mouth bass samples are also recommended. Additional fish sampling will be conducted to confirm previous results and expand the area of investigation. The evaluation of fish tissue is further described in the RIWP (Wood, 2022a).

2.1.7 GIS Review

The desktop review included assessment of previous reports and geographic information systems layers to confirm that relevant surface water features were captured in the evaluation and review of the field reconnaissance observations. The desktop review of surface water and sediment concluded the following, which has been used to develop the RI sampling plan and provide context to evaluate the sampling results:

- The existing dataset included the main waterways and several locations of potential exposure for recreational waders or swimmers. Additional waterways (listed in Section 2.1.4) were recommended based on proximity to the base, previous detections, and exposure potential.
- The various surface water features have differing exposure potential based on the size of the surface water feature, the accessibility, and the location, (some surface water features, or parts of surface water features, may be more likely exposure points than others). Therefore, rather than compositing samples into broad exposure points (i.e., a brook or pond), each branch or waterbody maybe considered a potential exposure point.

2.2 DESKTOP EVALUATION OF EXISTING LAND USE CONTROLS

As discussed in **Section 1.4**, there are several GMZs implemented as remedy components in final RODs as permanent LUC/ICs. Groundwater is prohibited from being used as a water supply currently or in the future and any subsurface exploration, excavation, construction, or subsurface discharge of groundwater is prohibited within the OU12 groundwater zone (USEPA, 2020). GMZs are included in the property deed and are considered permanent LUC/ICs since they are incorporated into the RODs, however they will not prevent the evaluation of a hypothetical future drinking water scenario. GMZs prohibit the installation of new wells, but do not preclude the use of groundwater as a potential future drinking water source.

Currently, there are several OUs with LUCs: OU2 and OU4 (Landfills 2 and 3), OU3 (Outdoor Firing Range), OU10 (Entomology Shop/Jet Engine Buildup Shop), OU11 (Base Laundry), OU12 (Basewide GW), and OU13 (Basewide Surface Water, Sediment, and Fish Tissue).

These following on-base areas are within the OUs listed above and therefore are not anticipated to use groundwater for potable purposes due to the current LUCs and regular LUC inspections:

- Fire Training Area, FT-07 (FTA)
- Landfill No. 2
- Landfill No. 3
- Building 6900, Fire Department Training/Burn House
- Crash Fire Station
- Building 8250, Arch Hangar
- Building 8260: Jet Engine Maintenance
- Nose Dock No. 40 Area
- Building 8744, Nose Dock No. 44
- Fuel Tank Farm
- Flight Line Drainage Ditch and Industrial Wastewater Treatment Facility, Building 6538 (FLDD/IWTF)

2.3 INITIAL LAND-BASED EXPOSURE ASSESSMENT FIELD RECONNAISSANCE

Land-based field reconnaissance to support the preliminary exposure assessment was conducted to evaluate potential wading and swimming exposure pathway locations to identify any current surface water use that could be a priority for evaluation. This does not preclude evaluation of future scenarios. Field reconnaissance activities consisted of evaluating surface water features at Aroostook National Wildlife Refuge to the east and west of the base and in the vicinity of Loring to identify locations where complete or likely-complete surface water and sediment exposure pathways are present. There are a total of 19 waterbodies within 1 mile of the site boundary. The field reconnaissance focused on areas directly to the east and west, which are likely to be the main migration pathways for PFAS in surface water.

Field reconnaissance to support the preliminary exposure assessment was conducted on the 7th and 8th of September 2021. Photo documentation of locations visited are provided as **Appendix A**. Observations of the physical conditions at each location and the potential for swimming or wading activities in surface water features and exposed groundwater were noted. The surface water features where field reconnaissance occurred are shown on **Figure 2.3-1**, and are listed below:

- Drainage to the East:
    - Butterfield Brook;
    - East Loring Lake and,
    - Durepo Reservoir.
- Drainage to the West:
    - Greenlaw Brook West Branch
    - Greenlaw Brook East Branch
    - Flight Line Drainage Ditch;
    - Malabeam Lake and,
    - Chapman Pit.
- The reconnaissance did not include drainage further from the base. This included:
    - Daggett Brook (north);
    - Willard Brook (north);
    - Limestone Stream (east);
    - Noyes Pond (east); and,
    - The Little Madawaska River.

The site reconnaissance concluded the following regarding the potential for human exposure to surface water and sediment while swimming or wading:

- Aroostook National Wildlife Refuge to the east and west of the base have reasonable potential for wading and some potential for swimming based on the size of the waterbodies, proximities to trails, and remoteness of the access points. Canoeing and kayaking are permitted in this area. No evidence of swimming was noted.
- Durepo Reservoir has reasonable potential for contact with surface water and associated sediment by people and livestock and may be used for irrigation water. Possible piping was identified leading from the reservoir towards one of the agricultural areas. Boating is permitted in the reservoir and there is a boat launch. Recreational fishing routinely occurs here. Cars were identified accessing this area. This was the only consistently used publicly accessible waterbody

with potential for regular recreational swimming, wading, and fishing.

- Streams within the LDA property have some potential for recreational exposure due to the presence of residents living within the LDA area. During the site visit, two youths were seen coming out of the woods at the crossing of Greenlaw Brook and Development Road with bicycles parked on the edge of the road. Surface water was accessible for wading at this location.

Most drainage features apart from ponded areas were generally shallow (1 ft or less) under typical conditions, narrow (typically 20 ft or less), and banks are heavily vegetated, making access difficult or improbable. Many of these features are isolated (not near residences or recreational features) and several are in industrial/commercial areas where regular visitor access is not likely to occur. For most drainage features, swimming is impossible due to the shallow depth, and wading is highly unlikely. It is also noted that this site occupies a northern climate, in which surface water is frozen for several months out of the year, further reducing potential exposure.

The site reconnaissance was not exhaustive and did not generally include water features on private land. Since it is possible that additional waterbodies used for recreation may be present, it is noted that the exploration of surface water exposure is an on-going process and may include interviews with community members and local regulators.

It has been noted that some local crops, mainly potatoes and broccoli, may be irrigated with groundwater. During the site reconnaissance, satellite images were reviewed and the concentric circles surrounding irrigation wells were identified. The center point of several circles was viewed, and possible groundwater wells were visible. Further evaluation of groundwater used for irrigation is recommended. These systems may also use surface water intakes. Potential surface water piping was also noted from Durepo Reservoir.

Wild food harvesting and traditional land uses of the Mi’kmaq also present potential exposure pathways. Riparian areas and areas that contain hydric soils were identified. These areas are likely habitats for reeds and potential traditional foods and medicines that could be collected by the Mi’kmaq. Foods and medicines that may be harvested by the Mi’kmaq are included in Section 2.6.2.

2.4 BIOACCUMULATION AND UPTAKE INTO THE FOOD CHAIN

Surface water and groundwater may provide migration pathways into the human food chain. Approaches to uptake and evaluation of food chain pathway is discussed in the preliminary exposure assessment to establish preferred RI approaches for food chain exposure evaluation and guide RI data collection. Human health-protective screening levels exist or can be calculated using readily available tools and algorithms for direct contact pathways in soil, groundwater, surface water and sediment, there are no nationally accepted uptake or bioaccumulation factors for PFAS in these media to allow protection of human food chain exposure from plant or animal tissue. For example, concentrations can be calculated in surface water that would be protective of human health through fish consumption by using a bioaccumulation factor assuming the amount of PFAS in surface water that could be transferred into fish tissue. By necessity, screening levels for consumption pathways from soil, groundwater, surface water and sediment that are protective of human health require the use of assumed bioconcentration factors (BCFs) or uptake factors that represent the predictive transfer of PFAS from water or diet into plant or animal tissue.

Using BCFs or uptake factors can provide a conservative initial assessment of potential plant or animal tissue concentrations when direct measured data are not available. However, because of the high variability noted for PFAS concentrations and BCFs across species, there is a much higher level of uncertainty than with direct measurement.

A wide variety of BCFs have been developed for surface water transfer into fish tissue, the majority of which are based on calculations from measured concentrations in surface water and fish tissue. The final values provided below show a range spanning four orders of magnitude, and the basis for these values shows an even greater level of variability:

- **California**: 13,229 liters per kilogram (L/kg) for PFOS and 894 L/kg for PFOA (CA RWQCB, 2020).
- **The Netherlands**: 4,500 L/kg for marine species for PFOS table A1.2 (RIVM, 2010).
- **Canada**: 31.6 to 3,614 L/kg for PFOS in whole body (ECCC, 2017).
- **Estimated**: 3.2 L/kg for PFOS provided by Estimations Programs Interface (EPI) Suite TM (USEPA, 2017) (recommended by the USEPA RSL User Guide), which estimates various chemical-specific properties.

Calculated BCFs in fish tissue are highly dependent on species, making the general use of BCFs to model concentrations in fish tissue uncertain. BCFs have also been developed for other animal tissues including poultry eggs. Although not widely adopted in the US, potential risks from ingestion of home-grown poultry eggs can be modelled using uptake factors for chickens published by Scolexia (2017). The modelling requires a number of assumptions such as soil and water intake of chickens, egg size and quantity ingested by humans, and egg transfer factors (PFOS = 1, PFHxS = 0.689, PFOA = 0.456). Although the transfer factors for PFAS into chicken eggs are not as high as the BCFs for fish, backyard chickens tend to be the primary source of eggs for residents who keep them, increasing the potential for entry into the food chain.

Uptake factors can also be used to estimate concentrations in home grown produce from soil, groundwater, or surface water concentrations. Uptake factors for PFAS have not been adopted or widely applied within the US, however Soil-to-Plant Concentration Factors (mg/kg fresh weight to mg/kg soil dry weight) (OEH/NSW 2019) and Water-to-Plant Concentration Factors (mg/kg fresh weight to mg/L water) (AECOM, 2017) have been developed for use in Australia. The uncertainty currently inherent in this approach is evident in the fact that current guidance states “using predictive models based on octanol-water partition coefficients (K_{ow}) to predict PFAS exposure is inappropriate” (HEPA 2018). Therefore, PFAS is treated as an inorganic compound for the purpose of the uptake calculation. Given that PFAS are organic compounds, but typical modelling approaches for organic compounds aren’t appropriate, is evidence that the mechanisms for PFAS uptake are not well understood and any modelling-based approach is likely highly uncertain. The Interstate Technology Regulatory Council (ITRC) has also published a summary of available uptake factors into plants (ITRC, 2021). BCFs for plants are typically below 10, suggesting low overall uptake and accumulation compared to animals, such as fish (Blaine et al., 2014). Also, short-chain carboxylates tend to have the highest BCFs for PFAS in plants (Wang et al., 2020).

Screening levels requiring the use of BCFs or uptake factors will not be calculated, as it is assumed that data collection in the RI will favor direct measurement of PFAS in media where uptake into the food chain is probable. The uncertainty involved in modelling these pathways as well as factors driving potential bioaccumulation will be discussed in the BHHRA and RI Report.

2.5 HUNTING AND FISHING REGULATION DESKTOP REVIEW

The desktop review included research on fishing regulations and practices to identify if local hunting or fishing could be a priority for evaluation. This does not preclude evaluation of future scenarios. Fishing regulations were consulted using on-line research to understand what species were present in the area, where they were legally allowed to be harvested, and whether there were restrictions on times of the year fishing could occur, amounts that could be harvested, and other details that might have an impact on exposure potential for local finfish and shellfish harvesters. The desktop review concluded the following, which has been used to provide context to evaluate the sample results and recommendations for additional sampling if needed. More detailed information identified during the desktop research regarding species presence, regulations, and restrictions for fishing is documented in **Appendix B**:

- The Maine Department of Inland Fisheries and Wildlife (MDIFW) has published consumption advisories stating consumption of fish from Chapman Pit, Greenlaw Brook, and Little Madwaska River (and its tributaries) is not advised due to potentially high levels of mercury, PCBs, dioxins, or DDT. Greenlaw Brook is located within the former air force base property boundary. Little Madawaska River is located directly west of the Site within 2 miles. Recreational fishing from these areas are potentially complete exposure pathways; however, fish consumption is likely to be limited from this area. Consumption advisories have also been published for all of Durepo Reservoir and Limestone Stream from Durepo to the dam near Route 229 in Limestone. It is advised that no more than 3 fish meals per year of brook trout are eaten and to not eat smallmouth bass from these waters due to PFAS. Durepo Reservoir and Limestone stream are located east of the site.
- Butterfield Brook Pond (northeast of the Site) is located within the Aroostook Natural Wildlife Refuge, where recreational fishing is prohibited. Therefore, fish consumption is likely to be limited from this area.
- Potential fishing locations/exposure areas where there are no restrictions on fishing include Malabeam Lake (within the former installation) and Noyes Pond, which is a small manmade pond on private property (southeast within 2 miles).

Hunting and trapping in Aroostook County are permitted with a license on public lands and private lands with the consent of the owner. Hunting and trapping are not permitted in Aroostook National Wildlife Refuge. More detailed information identified during the desktop research regarding species presence, regulations, and restrictions for hunting and trapping is documented in **Appendix B**. As discussed in the next section, the Aroostook Band of Mi’kmaq have raised concerns over the ability to hunt moose and other animals on their land within the former Loring AFB boundary. Hunting and gathering guidelines specific to the Mi'kmaq are presented in Section 2.6.2.

2.6 ON-GOING PUBLIC OUTREACH AND INFORMATION GATHERING

A Restoration Advisory Board (RAB) is not currently active for the Site, however efforts to engage the local community are on-going. Public outreach has been conducted as part of the preliminary exposure assessment to identify any current or anticipated land use that could be a priority for evaluation. This does not preclude evaluate of future scenarios.

2.6.1 Public Outreach and Information Gathering

A public information session was held on June 8th, 2022 in the town of Limestone. Two questionnaires have been sent in May/June 2022. One survey was sent to local farmers in an effort to identify the source of irrigation water for commercial crops (i.e. groundwater or surface water) and related information (Questionnaire A). DoD coordinated with the United States Department of Agriculture (USDA) to obtain a list of registered agricultural operations within one mile of Loring, which was used as a basis for the Questionnaire A mailing list. It was noted at the public information session that much of the irrigation infrastructure directly to the east of the former base is using surface water. The second questionnaire was sent to local residents within the former Air Force Base (AFB) to better understand recreational use of the former base (Questionnaire B). Residents were also asked about their level of interest for further community involvement regarding the RI. A summary of the questionnaire results received to date is presented in **Table 2.6-1** and summarized below:

- Questionnaire A: 32 were sent out and two responses were received. The most common fruits and vegetables grown are broccoli, cauliflower, potatoes, grains, and apples. One property uses groundwater for irrigation and both properties use surface water for irrigation. Other uses of groundwater and surface water include car washing and cleaning machinery.
- Questionnaire B: 46 were sent out to on-base residents and eight responses were received. The most visited areas on the former base are Bunker Inn, Runway, Manser Dr, Development Dr, Arkansas Dr, Northcutt Dr, Colony Place, Golf Course, and the Wildlife Refuge. The results indicate that none of the residents use surface water for recreational purposes on the former base or at nearby properties.

2.6.2 Aroostook Band of Mi'kmaq

USAF and WSP held a meeting with the Aroostook Band of Mi'kmaq on September 9th, 2021 to discuss exposure scenarios for consideration on the parcels within the former Loring AFB owned by the Band. The Band indicated that future planned uses of the parcels include primarily commercial/industrial uses such as a pellet mill, which may require use of groundwater and potentially developing a campground, which would potentially include a potable well. There are no current residential or recreational uses and no plants or animals are currently harvested as the Band prohibits hunting and foraging; however, there are no land-use controls in the form of deed restrictions on the land preventing traditional cultural exposure scenarios such as harvesting wild plants. The Band provided attendees with a copy of the Maine First

Nation Exposure Scenarios: Wabanaki Traditional Cultural Lifeways Exposure Scenario (Harper & Ranco, 2009). The Band also indicated that certain EPA default exposure assumptions such as lifetime scenarios aren’t necessarily appropriate for First Nations, as EPA assumes a resident typically lives in one place for 26 years, however a member of the Band is expected to live in one place for their full lifetime. The exposure document was used in conjunction the information obtained at the meeting to draft exposure scenarios for these parcels, which in turn provides the basis for the CSM discussed in the next section. The CSM was communicated to the Band on January 25th, 2022.

A second meeting was held on June 8th, 2022 with USAF, USEPA, MEDEP, WSP and the Aroostook Band of Mi’kmaq. The proposed exposure scenarios were discussed and the need for technical assistance for the Band in reviewing risk assessment documents was discussed. The Band had reviewed the CSM and provided feedback requesting a maximally exposed receptor that lives, works, and hunt/gathers on their lands. The CSM for the Aroostook Band of Mi’kmaq originally included many receptors that were only exposed to certain exposure scenarios. Revisions were made to the CSM in line with the Band’s requests, and the current CSM shows fewer receptors exposed to more comprehensive exposure scenarios.

The Band raised concerns about hunting moose on the property and WSP suggested reaching out to Maine Fish & Game to identify whether any Agency-lead PFAS sampling was being considered. Reaching out to the Aroostook National Wildlife Reservation was also suggested to see if a joint effort might be possible. The discussion also focused on proposed sample collection on the Band property. WSP will work with the Band to identify additional sampling areas within their parcel where specific plants that would be attractive for harvesting may grow, such as fiddlehead ferns, muskrat root, and Labrador tea. The Maine First Nation Exposure Scenarios: Wabanaki Traditional Cultural Lifeways Exposure Scenario (Harper & Ranco, 2009) document also provides details on what animals and plants may be used by the Mi’kmaq. These include:

- Land mammals (i.e., deer, moose, black bear, squirrels), birds (i.e., owls, crows, geese), and fish (i.e. bass, trout, eels) hunted for consumption.
- Nuts (i.e., red oak, hazelnut, beech), fruits (i.e., strawberries, raspberries, blackberries), seeds (i.e., wild sunflower, mustard), greens (i.e., fiddlehead ferns, cattail shoots, milkweed shoots), tubers, and fungi gathered for consumption.
- Various leaves, berries, seeds, and flowers gathered for teas and other medicinal purposes.
- Plant materials collected for other uses such as white pine for canoes, hickory wood for bows, and cattails for thatching and weaving.

That Band also asked about potential risks from other uses of plants such as burning in sweat lodges. It was noted that currently this is not addressed in the proposed risk evaluation. It is currently understood that the BHHRA will be based on abiotic media and that the related biota may be a data gap. Additional sampling density of abiotic media will ensure representative results within Band property and biotic media may follow the abiotic sampling.

2.7 EXPOSURE CONCEPTUAL SITE MODEL

The CSM identifies contaminant sources, release mechanisms, affected media, transport routes, current and future land use and human receptors, and associated exposure scenarios. The preliminary exposure CSM for Loring is summarized in **Figure 2.7-1** and discussed further below. The BHHRA will consider only potentially complete pathways, where a source-pathway-receptor linkage may exist. The selection and exclusion of exposure pathways and receptors is presented on **Table 2.7-1** and a summary of the potentially complete exposure pathways is shown on **Table 2.7-2**. This CSM is preliminary and will be revised based on the results of the RI.

2.7.1 Sources and Migration Pathways

Site data that are considered representative of current conditions will be used to identify source areas and evaluate the nature and extent of PFAS compounds, primarily associated with AFFF use and storage. Exposure areas will be based on distribution of PFAS, however data for legacy chemicals will also be considered. The RI will include limited collection of non-PFAS data at the majority of AFFF areas. These data will include VOCs, SVOCs, PAHs, metals, PCBs, perchlorate and 1,4-dioxane. Previous investigations including long-term groundwater monitoring data will also be evaluated to identify whether these data are appropriate for use in the BHHRA. Evaluation will consider whether residual chemicals at IRP sites are present at the same locations as PFAS and if they are still considered representative of current conditions (i.e., are current/recent for ephemeral media such as groundwater or have not been remediated for media including soil). If residual chemicals are present within the exposure areas developed to evaluate PFAS, these will be included in the BHHRA. Sources for legacy chemicals will not be used as the basis for identifying exposure areas, as the risk from legacy chemicals was previously assessed.

Historical use of AFFF began at the former Loring Air Force Base in 1970 and is the primary source of PFAS found in environmental media at Loring. As described in previous sections, AFFF was confirmed or suspected at the following locations: FTA, Landfill No. 2, Landfill No. 3, Structural Fire Station, Fire Department Training/Burn House, Crash Fire Station, Arch Hangar, Jet Engine Maintenance Building, Nose Dock No. 11, Nose Dock No. 40, Nose Dock No. 44, Aircraft Hardstands, Hardstand 19, Ramp No. 1, Fuel Tank Farm, Fuel Dump Area, Main Runway Foaming Area, KC-135 Crash Area, B-52 Crash Area, FLDD/IWTF, WWTP, Base Laundry, FJETC Area, Greenlaw Brook Drainage, and Butterfield Brook Drainage. After release, AFFF constituents may have migrated through the following pathways. Although some pathways may be ongoing, the following bullets are intended to provide an overview of relevant historical PFAS migration pathways that led to the current detected concentrations in soil, sediment, groundwater, surface water, and biota:

- Surface dispersal – AFFF was historically dispersed as a foam. This foam may have travelled overland to soil in other areas and may have followed stormwater drainage to impact surface water and sediment. The foam may have followed surface water downstream within surface water drainages and may have reached the receiving water bodies (Little Madawaska River and Durepo Reservoir primarily). Once in the river or reservoir, piles of foam may have been subjected to wind transport resulting in further spreading of the foam. The foam may also have dissolved into stormwater and components of the dissolved foam migrated in stormwater to surface drainage features and migrated downstream in those drainage features. Surface water and sediment impacted by the dissolved constituents may have been transported within drainage features and deposited elsewhere, spreading PFAS throughout the stormwater drainage system.

- Leaching – Movement of PFAS from the surface soil through subsurface soil to groundwater.
- Surface water and groundwater interaction – PFAS in groundwater may enter the stormwater drainage system, which discharges to surface water and sediment. Overburden and bedrock groundwater discharge to Greenlaw Brook, Little Madawaska River, Butterfield Brook, and Durepo Reservoir.
- Overburden and bedrock groundwater interaction and flow – Overburden and bedrock groundwater are hydraulically interconnected. Hydraulic gradients (i.e., upward or downward) between the two groundwater zones are variable from site to site and within a flow field downgradient of source areas and PFAS moves between them.
- Groundwater to soil - PFAS may move from shallow groundwater into low-lying/flood-prone soil, also called hydric soils. Groundwater may also be extracted and applied to soil as irrigation water, and PFAS may transfer from irrigation water into the soil.
- Bioaccumulation – PFAS bioaccumulate in plant and animal tissue that is consumed by humans and may enter the food chain through multiple pathways. Because PFAS have both hydrophilic and hydrophobic components in their chemical structure, the bioaccumulation mechanism for PFAS (binding to protein albumin in blood, liver, and eggs and not accumulating in fat tissue) is not consistent with the mechanism for many hydrophobic organic compounds that accumulate in animal tissue (concentrating primarily in lipid).
    - Terrestrially, PFAS may enter the food chain by 1) PFAS in groundwater or surface water being used for irrigation of gardens may be taken up into plants, which are then consumed by humans, 2) PFAS in surface water being used as drinking water by deer/moose or other wild animals, or groundwater or surface water used as stock water and taken up into animals, any of which may be consumed by humans, 3) PFAS in hydric soils entering produce or pasture grass, which is consumed by cattle which may be consumed by humans, or plants harvested for cultural uses including food sources, or 4) PFAS remaining in garden soil from previous irrigation or flooding and subsequently taken up by plants which may be consumed by humans.
    - In aquatic systems, PFAS in surface water and sediment may be taken up by fish either directly from the surface water, or by consuming aquatic plants or other species such as benthic organisms, and accumulate in fish tissue, which may be consumed by humans.

By migrating via the mechanisms above, surface soil, subsurface soil, groundwater, surface water, sediment, and biota are impacted by PFAS. These media are all potential exposure media, which are media that may contain PFAS to which receptors may be exposed.

2.7.2 Exposure Pathways

An exposure pathway describes the course a compound takes from the source to the impacted media to the exposed individual. The primary human exposure pathway to PFAS is typically drinking water consumption. Previous investigation efforts focused on understanding this pathway. Currently it is believed that no one is consuming drinking water with PFOS or PFOA above the 2016 lifetime health advisory (LHA) concentrations, although additional investigation related to this pathway is on-going. This BHHRA will assume that potable use of groundwater may occur in a hypothetical future scenario.

Human receptors may be exposed to media at the site through the following exposure pathways and routes of exposure:

- Direct contact with soil (ingestion and dermal contact);
- Ingestion of groundwater during potable use;
- Direct contact with surface water (dermal contact);
- Direct contact with groundwater during showering or excavation (dermal contact);
- Direct contact with sediment (ingestion and dermal contact);
- Direct contact with surface water (incidental ingestion); and,
- Ingestion of plant or animal tissue through fishing, hunting, farming, and/or foraging as applicable (if impacted).

The additional exposure pathways below are relevant only for residual legacy chemicals on-base such as VOCs (volatile) and metals (have inhalation criteria and may be evaluated as particulates), and not PFAS. The CSM for non-PFAS will be driven by the evaluation for PFAS and if a receptor such as a construction worker is evaluated for direct contact with PFAS and inhalation pathways may be relevant for non-PFAS, then these pathways will be included:

- Inhalation of fugitive dust from soil; and,
- Inhalation of volatiles during showering or excavation from groundwater.

2.7.3 Potential Receptors

Receptors are the theoretical individuals who might be exposed to chemicals of potential concern (COPCs) in environmental media at the site. Receptors are identified based on the current and foreseeable future land uses, as well as hypothetical future land uses (not necessarily foreseeable, but considered for evaluating the need for institutional controls). Receptors are chosen to cover the foreseeable range of potential exposures (exposure media and exposure routes) and to identify the exposure parameters for a theoretical maximally exposed individual in the receptor group. Each receptor may be evaluated for one or more exposure areas, and receptors exposed to soil may be evaluated for exposure to 0-1 ft soils under current conditions, or 0-10 ft soils under future conditions assuming regrading and redevelopment of the site. The following receptors and associated exposure routes will be considered for relevant environments at Loring and the surrounding area in the BHHRA. These are shown in **Figure 2.7-1,** and **Table 2.7-1**. Exposure Areas are shown in **Figure 1.2-2**:

The primary human receptors and relevant environments at Loring are:

- Receptors within the former installation boundary
  - Receptors within the LDA property, within the ANWR or within the Aroostook Band of Mi'kmaq property:
    - Current and future outdoor workers (e.g. landscape workers): may be exposed to surface soil (including garden soils or flood prone soils where relevant) within the former installation boundary.
    - Current and future utility workers: may be exposed to surface soil (including garden soils or flood prone soils where relevant), excavation water, storm water and storm water sediment within the former installation boundary.
    - Future construction worker: may be exposed to surface (including garden soils or flood prone soils where relevant) and subsurface soil and excavation water in all areas within the former installation boundary.
    - Hypothetical future resident (child and adult): may be exposed to surface (including garden soils or flood prone soils where relevant) and subsurface soil and potable and non-potable water in all areas within the former installation boundary.
    - Current and future recreators (child and adult) (e.g. hikers, waders, swimmers): may be exposed to surface soil (including garden soils or flood prone soils where relevant), surface water, and sediment within the former installation boundary.
    - Hypothetical future residents (child and adult): may be exposed to surface soil (including garden soils or flood prone soils where relevant) within the former installation boundary and potable water.
  - LDA property-only:
    - Current and future residents (child and adult): may be exposed to surface soil (including garden soils or flood prone soils where relevant) within the former installation boundary.
  - ANWR-only receptors:
    - Current and future outdoor workers (e.g. landscape workers) and Current and future recreator/hiker (child and adult) (e.g. hikers, waders, swimmers): may be exposed to the soils as described above or sediment/surface water for recreational receptors, and also exposed to ingestion of potable water from the ANWR potable wells.
  - Aroostook Band of Mi'kmaq property-only receptors:

    Two receptors specific to the Aroostook Band of Mi'kmaq lands are presented in the CSM. These are intended to be members of the Aroostook Band of Mi'kmaq. This CSM was developed considering information gathered from the Aroostook Band of Mi'kmaq and the Wabanaki Exposure Document (Harper & Ranco, 2009). The primary receptors are:

  - Current and future unauthorized forager: may be exposed to surface soil (including garden soils or flood prone soils where relevant), surface water, and sediment and may consume wild plants.
  - Hypothetical future Aroostook Band of Mi'kmaq resident (child and adult): may be exposed to soil (including garden soils or flood prone soils where relevant), potable water, surface water, sediment, and may consume wild plants, wild game (including deer, moose, beaver, etc), and fish at a subsistence level.

- Receptors outside the former installation boundary. Note that apart from PFAS migration through flooding and irrigating, soil outside the installation is not assumed to be impacted.
  - Current and future backyard produce consumers (subsistence farmers and residents (child and adult)): may be exposed to garden soil, potable and non-potable water on private land outside of the former installation boundary.
  - Current and future recreators (child and adult) (e.g. hikers, waders, swimmers): may be exposed to flood-prone soil, surface water, and sediment on public land and waterways outside of the former installation boundary.
  - Current and future hunters (child and adult): may be exposed to flood-prone soil and consume wild game on public and private land and waterways outside of the former installation boundary.
  - Hypothetical future fishers (child and adult): may be exposed to flood-prone soil, surface water, sediment, and consume fish on public land and waterways outside of the former installation boundary
  - Hypothetical future construction workers: may be exposed to flood-prone soil and excavation water < 10 ft in all areas outside of the former installation boundary.
  - Hypothetical future residents (child and adult): may be exposed to potable and non-potable water and garden soil in all areas outside of the former installation boundary.

Potentially complete exposure pathways will be carried through the BHHRA.

2.8 COMPARISON TO 2022 USEPA SCREENING LEVELS

This screening exercise is provided here to document the preliminary exposure assessment, supporting data collection with the RI. The BHHRA will be use the most up to date screening levels available when the BHHRA is conducted and consider all available data. Site-specific risk-based screening levels (SLs) are summarized below. These were originally developed by Region 1 USEPA in 2021 and updated using May 2022 USEPA toxicity values for PFOS, PFOA, PFBS, PFHxS, and PFNA once DoD adopted these toxicity values in July 2022. The May 2022 toxicity values are the same as the November 2022 RSL toxicity values. Therefore, although this SL comparison was conducted using the May 2022 RSLs and toxicity values, the outcome would be the same using the November 2022 version. The tables provided by USEPA along with calculation backup and the updated inputs and RSL outputs provided in **Appendix C**. Historical and recent analytical data are compared to the 2022 SLs and this comparison is discussed below based on the CSM.

The 2022 SLs were calculated using the oral Reference Dose (RfD) consistent with the May/November 2022 USEPA RSLs (USEPA, 2022a). Both PFOA and PFNA are evaluated using a chronic oral RfD of 3E-06 mg/kg-day. PFOS used a chronic oral RfD of 2E-06 mg/kg-day and PFHxS used a chronic oral RfD of 2E-05 mg/kg-day. The oral RfD for these PFAS compounds are from ATSDR (ATSDR, 2021). The SL for PFBS was calculated using a chronic oral RfD of 3E-04 mg/kg-day. This value was developed by USEPA's Office of Research and Development (ORD) Center for Public Health and Environmental Assessment (USEPA, 2021d) and is available on USEPA's Provisional Peer Reviewed Toxicity Value (PPRTV) from 2021 (Oak Ridge National Laboratories (ORNL), 2021). The utility worker term was selected by USEPA when calculating Loring-specific screening levels. However, it is noted that the utility worker receptor selected by USEPA is representative of an industrial worker, and is not necessarily appropriate to evaluate an intrusive utility worker scenario. It is also noted that the USEPA screening levels may not be protective of Aroostook Band of Mi'kmaq receptors. Screening levels specific to Mi'kmaq receptors will be considered and evaluated in the BHHRA or a preliminary interim document.

SLs were developed for the following human exposure scenarios: residential, recreational swimming, recreational wading, utility worker [sic industrial worker], fish consumption, and drinking water. All SLs were calculated using a Target Hazard Quotient (THQ) of 0.1. SLs were calculated for both an adult and a child (0-6 years) for exposure to surface water while swimming, sediment while wading, and fish consumption. The SLs for each exposure pathway are shown in **Table 2.8-1.** .

Based on the site reconnaissance, there was no evidence of swimming within surface water apart from potentially Durepo Reservoir. Therefore, the SLs derived for a swimming scenario are likely overly conservative for comparison based on current use in most cases. There may be limited recreational wading in surface water features, but no areas were singled out as consistently used for this activity, with the exception of Durepo Reservoir. Therefore, the wading values assuming that wading occurs 75 days per year are likely to be overly conservative for most of sampling points based on current use.

The CSM suggests that ingestion of produce may be a complete exposure pathway. Bioconcentration factors from surface water and groundwater to produce suggest that PFAS within surface water and groundwater may be at levels sufficient to bioaccumulate. However, no terrestrial biota samples have been collected at this time.

The comparison of PFAS analytical data to SLs are presented below and shown in **Table 2.1-1** through **Table 2.1-8.** This information was used to focus additional sampling efforts and scope the RI investigation and therefore provides a summary of the likely COPCs and exposure areas that will be evaluated in the BHHRA. These will be updated when the RI data is received and based on updated SLs as applicable in the BHHRA.

2.8.1 Groundwater

Groundwater is monitored in a series of dedicated monitoring wells and within several residential drinking water wells. The comparison of monitoring well data to risk-based screening levels is presented in **Table 2.1-2**.

Groundwater will be evaluated for the hypothetical drinking water scenario. Per USEPA guidance (2014a), data representative of wells in the core (or cores) of the plume (to the extent that a core can be identified) will be used to select COPCs. The core (or cores) will be identified based on concentration gradients detected on-site and hydrogeologist interpretations of flowfield dynamics. Each 'core' will be determined based on professional judgement. If there is more than one groundwater plume within any boundary area, the separate plumes will be evaluated separately, and multiple cores may be defined. The decisions will be described in detail within the BHHRA. This will be further evaluated in the BHHRA.

PFOS, PFOA, PFHxS, and PFNA have been detected above their respective USEPA drinking water RSL (4.01 ng/L for PFOS, 6.02 ng/L for PFOA, 39.4 ng/L for PFHxS, and 5.89 ng/L for PFNA)) in overburden and bedrock. PFOS was detected with a maximum concentration of 8770 ng/L, PFOA was detected with a maximum concentration of 811 ng/L, PFHxS was detected with a maximum concentration of 2240 ng/L, and PFNA was detected with a maximum concentration of 99.9 ng/L. PFBS has not been detected above SLs.

Areas where groundwater concentrations exceed SLs are listed below:

- Aircraft Hardstands
- Arch Hangar
- B-52 Crash Area
- Structural Fire Station
- Fire Department Training Burn House
- Jet Engine Maintenance
- Nose Dock No. 44
- Crash Fire Station
- Fire Training Are
- Flight Line Drainage Ditch
- Fuels Tank Farm
- Landfill 2
- Landfill 3
- Main Runway Foaming Area
- Nose Dock No. 40 Area
- WWTP Sludge Drying Bed Area

COPCs in groundwater < 10 ft bgs will be selected for evaluation in the construction worker direct contact scenario, which is not dependent on identification of the core of the plume.

Groundwater representative of the current drinking water scenario is presented in **Table 2.1-3** and compared to risk-based screening levels. COPCs selected from this dataset will be used in calculating risks for current residential and farming scenarios.

2.8.2 Soil

Soil data compared to risk-based screening levels is presented in **Table 2.1-1.** Concentrations of PFBS, PFHxS, and PFNA were below the USEPA utility [sic industrial] worker and residential screening levels. PFOS exceeded screening levels at eight investigation aeas and PFOA exceeded screening levels at one investigation area.

Locations where PFOS and PFOA soil concentrations exceed screening levels are listed below:

- B-52 Crash Area
    - One sample at 0-1 ft bgs and two samples at 5-7 ft bgs exceed the Loring Residential screening level for PFOS (0.0126 mg/kg). The maximum PFOS concentration at this location is 0.0403 mg/kg.
- Structural Fire Station
    - Six samples at 0-1 ft bgs exceed the Loring Residential Child screening level for PFOS (0.0126 mg/kg), Three of those samples also exceed the Adult screening level for PFOS (0.117 mg/kg) and one sample exceeds the Utility Worker screening level for PFOS (0.164 mg/kg). The maximum concentration at this location is 1.46 mg/kg.
- Fire Department Train Burn House
    - One sample at 0-1 ft bgs exceeds the Loring Residential Child screening level for PFOS (0.0126 mg/kg) with a concentration of 0.0273 mg/kg.
- Nose Dock No. 44
    - Two samples at 0-1 ft bgs exceeds the Loring Residential Child screening level for PFOS (0.0126 mg/kg). The maximum concentration at this location is 0.0721 mg/kg.
- Crash Fire Station
    - Eleven samples at varying depths from 0-20 ft bgs exceed the Loring Residential Child screening level for PFOS (0.0126 mg/kg). Seven samples also exceed the Adult screening level for PFOS (0.117 mg/kg). Six samples exceed the Utility Worker screening level for PFOS (0.164 mg/kg). The maximum concentration at this location is 3.57 mg/kg, One sample at 0-1 ft bgs and one sample at 5-7 ft bgs exceed the Loring Residential Child Screening for PFOA (0.019 mg/kg). The maximum detected PFOA concentration at this location is 0.0432 mg/kg.
- Fire Training Area
    - Eleven samples at varying depths from 0-17 ft bgs exceed the Loring Residential Child screening level for PFOS (0.0126 mg/kg). The maximum detected concentration at this location is 0.102 mg/kg.
- KC-135 Crash Area
    - Four samples at 0-1 ft bgs exceed the Loring Residential Child screening level for PFOS (0.0126 mg/kg). The maximum detected concentration at this location is 0.0557 mg/kg.
- Nose Dock No. 11

- One sample with a concentration of 0.0137 mg/kg exceeds the Loring Residential Child screening level for PFOS (0.0126 mg/kg).

2.8.3 Surface Water, Stormwater and Porewater

PFOS, PFOA, PFBS, PFHxS, and PFNA were detected in surface water samples. PFOS has a maximum concentration of 1,440 ng/L, PFOA has a maximum concentration of 95.1 ng/L, PFBS has a maximum concentration of 52.3 ng/L, PFHxS has a maximum concentration of 577 ng/L, and PFNA has a maximum concentration of 9.4 ng/L. Only PFOS exceeded the child recreator direct contact screening level for a swimming scenario (203 ng/L). The data table and comparison to screening levels is included as **Table 2.1-4.**

PFOS, PFOA, PFBS, PFHxS, and PFNA were detected in stormwater samples. Only PFOS exceeded the child recreator direct contact screening level for a swimming scenario (203 ng/L) with a maximum concentration of 266 ng/L as shown in **Table 2.1-6**, however this SL is not applicable to stormwater and no applicable SLs were available for a utility worker exposure to stormwater scenario.

PFOS, PFOA, PFBS, PFHxS, and PFNA were detected in pore water samples. Only PFOS exceeded the child recreator direct contact screening level for a swimming scenario (203 ng/L) with a maximum concentration of 423 ng/L. The data table and comparison to screening levels is included as **Table 2.1-7.**

2.8.4 Sediment

PFOS, PFOA, PFHxS, and PFNA were detected in sediment samples PFBS was not detected in sediment samples. Two samples exceeded the child wading sediment screening level (0.059 mg/kg) and adult wading sediment screening level (0.547 mg/kg) for PFOS. The maximum concentration for PFOS is 0.0937 mg/kg. The data table and comparison to screening levels is included as **Table 2.1-5**.

2.8.5 Fish

PFOS was detected in all fish samples with a maximum concentration of 0.457 mg/kg. The maximum detected concentration of PFOS (0.114 mg/kg) was from the small mouth bass sample; all other samples from Butterfield Brook Drainage were from the brook trout and ranged from 0.0338 to 0.110 mg/kg, suggesting a potential difference in bioaccumulation between these species; however, the number of samples from the small mouth bass is limited. PFOA was detected in six samples, with a maximum concentration of 0.00143 mg/kg, but did not exceed the fish consumption screening level (0.00413 mg/kg). PFHxS was detected in 17 samples, with a maximum concentration of 0.00772 mg/kg, and PFNA was detected in eight samples, with a maximum concentration of 0.00158 mg/kg. PFBS was not detected in any fish samples. The data table and comparison to screening levels is included as **Table 2.1-8.**

- Greenlaw Brook Drainage
    - All PFOS concentrations are above the Loring-Specific Fish Consumption Screening Level for a child (0.00521 mg/kg) and adult (0.00722 mg/kg) the Maine Food Consumption Advisory Child Screening Level (0.00413 mg/kg). One PFNA concentration exceeded the

Maine Food Consumptions Advisory Child Screening Level (0.00062 mg/kg). No PFHxS concentrations exceeded fish consumptions screening levels.

- Butterfield Brook Drainage
  - All PFOS concentrations are above the Loring-Specific Fish Consumption Screening Level for a child (0.00521 mg/kg) and adult (0.00722 mg/kg) and the Maine Food Consumption Advisory Child Screening Level (0.00413 mg/kg). Two PFHxS concentrations exceed the Loring-Specific Fish Consumption screening level for a child (0.00521 mg/kg), one PFHxS concentration exceeds the Loring-Specific Fish Consumption Screening Level for an adult (0.00722 mg/kg), and three PFHxS concentrations exceed the Maine Food Consumptions Advisory Child Screening Level (0.00413mg/kg). One PFNA concentration exceeds the Loring-Specific Fish Consumption Screening Level for a child (0.000782 mg/kg) and for an adult (0.00108 mg/kg). Two PFNA concentrations exceed the Maine Food Consumptions Advisory Child Screening Level (0.00062mg/kg).

2.9 CONCLUSIONS OF THE EXPOSURE ASSESSMENT

The conclusions of the exposure assessment are summarized below along with data gaps identified during the assessment. The preliminary exposure assessment is limited to information available at the beginning of 2022. The results/conclusions regarding identification of data gaps were useful in assisting with the development of the focus of the RI data collection efforts However, the results of screening activities performed to identify extent of source areas, contaminant migration, PFAS impacted media, and individual chemicals of potential concern should be considered preliminary. The nature and extent of contamination will be fully characterized in the forthcoming RI Report and the identification of PFAS chemicals and media of potential concern will be fully evaluated in the forthcoming BHHRA Report. The CSM and comparison to screening levels will be updated in the BHHRA based on the results of the RI. The results of this exposure assessment provide the basis for additional site sampling and analysis. Recommendations incorporated into the 2022 RIWP (Wood, 2022a) have not been repeated here. Additional recommendations not within the 2022 RIWP scope are provided here for information.

2.9.1 Results

The exposure assessment analysis identified exceedances of the RSLs and therefore potential exposure points that will be carried through the full BHHRA for groundwater, soil, surface water, sediment, and fish tissue.

- Groundwater: concentrations exceeded the 2022 tapwater RSL at multiple locations across the LDA. PFAS impacted groundwater migration has not fully been delineated and will be further evaluated in the RI. The exposure assessment analysis also found that large-scale and small-scale irrigation is occurring using groundwater and/or surface water, but no wells have been sampled specifically to evaluate this potential migration and exposure pathway. Additional groundwater data will be collected at potential source areas, as well as additional locations and step-outs to characterize the impacts to groundwater.

- Soil: concentrations exceed 2022 residential RSLs at eight sampling locations and the utility worker screening level at two locations. The current soil data suggests there are likely minimal risks to workers from soil. Additional soil data will be collected at all the potential source areas investigated within the RI as well as additional locations and step-outs to characterize the impacts to soil. Irrigation using groundwater and surface water may cause transference of PFAS into soils distant from the site and samples are recommended to evaluate this potential migration pathway. Use of water for irrigation or stock water will be further evaluated in the RI and soils off-site in agricultural fields of private garden soils may be sampled.
- Surface water/Sediment: concentrations exceeded the 2022 site-specific recreational visitor SLs, suggesting that these media will be further evaluated in the BHHRA. The exposure assessment analysis found very little evidence of recreational surface water use, suggesting that the recreational RSLs are likely conservative. This is further supported by the limited time of year that surface water recreation may occur, and the limited depth of many of the streams. The only areas where regular recreational swimming/wading is considered likely to occur are Durepo Reservoir, and specific, accessible points along streams within the LDA near residential areas. No evidence of wading or swimming was noted within the Aroostook National Wildlife Refuge, although this is a public area and those activities are possible. Additional surface water and sediment samples will be completed with the RI in identified potential exposure areas.
- Fish Tissue: concentrations of PFOS in fish tissue exceeded the 2022 site-specific SLs using Maine-Consumption assumptions, suggesting that this media will be carried through the BHHRA. Additional fish tissue samples are recommended to cover small mouth bass and other species that may be consumed if caught, as well as covering additional potential fishing areas that have not been sampled. However due to recent changes in the fishing advisories, all potential discharges from Loring AFB are now subject to either ‘Do Not Eat’ advisories, or very low consumption (3 meals per year).

Additional potentially complete surface water, and/or groundwater pathways that were not addressed by USEPA site-specific RSLs but were identified by the exposure assessment are:

- Residential vegetable gardens and agricultural fields that may be irrigated with impacted surface water or groundwater;
- Residents ingesting poultry and poultry eggs that may be watered with surface water or impacted groundwater;
- Wild plants growing in potentially impacted riparian areas that may be attractive for harvesting and ingesting such as fiddlehead ferns and muskrat root;
- Wild plants growing in potentially impacted riparian areas that may be attractive for harvesting and traditional non-ingestion uses such as burning in sweat lodges;
- Recreational hunters ingesting moose/deer/bear meat; and,
- Utility worker exposure to stormwater, or construction worker exposure to water.

2.9.2 Data Gaps

The RIWP incorporates recommendations to fill identified data gaps for all abiotic media. Sampling recommendations for abiotic media were incorporated within the RIWP and are not repeated here.

Data gaps within the previous fish tissue sampling program were identified and additional fish tissue data was recommended and incorporated into the RIWP, including at several resample locations, and new locations including Noyes Pond and Little Madawaska River. Additional species were recommended where possible.

One data gap not covered in the RIWP is the collection of terrestrial biota including fruits, vegetables, or animal products to evaluate the potential for uptake from groundwater and surface water into products that will be consumed. There is a potentially complete migration pathway from surface water and groundwater to biota including wild growing plants that may be harvested, and cultivated varieties of plants, and potential for PFAS migration into animal products. Abiotic media will be collected to identify whether there is potential for PFAS to migrate into plants and animals, however without biota data it will not be possible to determine whether PFAS is moving through these theoretical exposure pathways into the human food chain. Therefore, whether these potential pathways are complete is an existing data gap that may be evaluated further in the future to understand whether uptake associated with these pathways is likely.

3.0 HAZARD IDENTIFICATION

This section provides details on the methods used to complete the Hazard Identification step of risk assessment. The hazard identification includes data compilation and evaluation, selection of data to be considered in the BHHRA, summarization of the analytical data considered for the BHHRA, and selection of COPCs for quantitative evaluation. PFAS data will be collected within the RI, and historical PFAS data from 2013 up to the present investigation will also be used, along with data for non-PFAS chemicals as applicable. Relevant reports were discussed and referenced in **Section 1.4** and **1.5**. PFAS data is currently available for soil, groundwater, sediment, surface water, and fish. COPCs are carried through the assessment for each relevant medium, land use, and area.

3.1 DATA COMPILATION

All PFAS data will be compiled. PFAS chemicals without available toxicity information will be summarized and evaluated in the uncertainty section of the BHHRA. Data for PFAS chemicals with available toxicity data and limited data for legacy chemicals collected as part of the RI (see RI WP for more details: Wood, 2022a) will be considered in the four steps of the BHHRA, in addition to previously collected data that are considered representative of current conditions. Cumulative risks from residual contamination will be included where exposure areas and chemicals are comingled. The residual risk is limited to areas within the former installation boundary and may be relevant for overlapping PFAS exposure areas. Residual contamination may include VOCs, SVOCs and PCBs. The approach to non-PFAS data evaluation and usability will be developed further using the Air Force Environmental Restoration Program Information Management System (ERPIMS) database to assess legacy contaminant/background level datasets that are collocated with PFAS exposure areas. This will include an evaluation of COCs identified in the most recent Five-Year Review and RODs (where applicable) for identified PFAS exposure areas.

It is assumed that only media inside of the former installation boundary are impacted by non-PFAS chemicals, this may include land inside or outside of the current LDA property boundary. The remainder of this Work Plan assumes that the only chemicals evaluated outside the former installation boundary will be PFAS chemicals with available toxicity data, although this will be reevaluated as necessary when legacy non-PFAS data is evaluated.

3.2 DATA EVALUATION

The data evaluation and selection of data for use in the BHHRA will be conducted to identify data that are: (1) representative of existing (and to the extent possible, reasonably foreseeable) conditions related to current and potential future use and the associated receptor exposure scenarios; and (2) “usable” (that is, of sufficient quality) for BHHRA purposes, consistent with the Data Evaluation Chapter of the USEPA RAGS, Volume 1, Part A (USEPA, 1989) and the associated *Guidance for Data Usability in Risk Assessment* (USEPA, 2002d). Data will be used from previous PFAS investigations, which will be evaluated to identify whether it is still representative of site conditions (i.e. subsequent remediation is not likely to have removed the contamination represented), and carried through the BHHRA if appropriate for PFAS exposure pathways.

Analytical data collected during the planned RI and deemed usable following data validation and according to the project-specific Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) will be evaluated in the BHHRA. Details on the analytical data collection are provided in the 2022 RIWP (Wood, 2022a). Previously collected relevant data adequately validated and deemed usable at the time of collection will also be evaluated for usability and representativeness in the BHHRA. RAGS Part D Data Useability Worksheets will also be included for each media.

High Non-Detects

For non-detects, reporting limits and detection limits that are above the risk-based screening criteria will be evaluated to assess the usability of the data. Reporting limits above risk-based screening criteria will be discussed as a potential uncertainty. High detection limits will generally be retained within the dataset. However, no detection limits will be used as EPCs, and chemicals never detected will not be evaluated in the BHHRA as COPCs.

3.3 PROCESSING AND SUMMARIZATION OF ANALYTICAL DATA CONSIDERED IN THE BHHRA

Summary statistics will be compiled for each medium and exposure area, by chemical, including minimum and maximum detected concentrations, frequency of detection, range of reporting limits for non-detects, and arithmetic mean concentrations. The following guidance document will be used to develop the summary statistics:

- Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual, Part A (USEPA, 1989)

The steps used to summarize the data by area and medium are discussed as follows. The additional steps used to identify EPCs are presented in the Exposure Assessment (Section 4.0).

Resolution of Duplicate Results

Prior to summarizing the analytical data, the data will be processed and simplified, eliminating duplication for field sample/field duplicate pairs. This process identifies a single result for each parameter within each sampling location/event for use in the data summary.

Treatment of Field Duplicates: For sample locations in which a duplicate sample has also been collected, use of duplicate results will be resolved as follows:

- For each field sample/field duplicate sample pair, if one was a detection and the other was a non-detect, the detected concentration will be selected for use in the risk assessment.
- For each field sample/field duplicate sample pair, if each analytical result was a non-detect then the lower of the two Reporting Limits (RLs) from the two analyses will be selected for use in the risk assessment.
- For each field sample/field duplicate sample pair, if each analytical result was a detection then the arithmetic mean will be selected for use in the risk assessment.

PFAS analysis for all matrices (i.e., groundwater, surface soil, and sediment) have been performed using a liquid chromatography tandem mass spectrometry (LC/MS/MS) method that is on the laboratory's DoD ELAP scope of accreditation and is compliant with the requirements in the DoD QSM (version 5.3) for environmental laboratories, specifically Table B-15 (Wood, 2022b). However, method duplicates may be encountered in the non-PFAS sample data. For analytes that were reported using multiple methods, duplicates will be resolved as follows:

- For each method pair, if one was a detection and the other was a non-detect, the detected concentration will be selected for use in the risk assessment.
- For each method sample pair, if each analytical result was a non-detect then the lower of the two RLs from the two analyses will be selected for use in the risk assessment.
- For each method sample pair, if each analytical result was a detection, then the higher detected concentration will be selected for use in the risk assessment.

The selected value for each compound/medium/area combination will be used in the calculation of summary statistics (including maximum detection and frequency of detection).

3.4 SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN

Analytical data will be available for surface water, sediment, soil, groundwater, and fish tissue. The selection of COPCs for each medium will be documented in RAGS Part D Table 2s.

Essential Nutrient Status

Metals will be evaluated as part of the non-PFAS investigation. Chemicals that are considered essential nutrients (calcium, magnesium, sodium, potassium, and phosphorous) will not be included as COPCs.

Toxicity

Contaminants of Potential Concern (COPCs) for PFAS will be selected for evaluation in the risk assessment following DoD and USEPA guidance (DoD, 2021; USEPA, 2019), by comparison of the maximum detected concentrations per area to the USEPA Regional Screening Levels (RSLs) for soil and groundwater at a target hazard quotient (HQ) of 0.1 or a target cancer risk of $1x10^{-6}$ (whichever is lower). PFAS COPCs for sediment, surface water, worker exposure to soil, and recreational consumption of fish will be selected by comparison to site-specific RSLs calculated by Region 1 for use at Loring (USEPA, 2021a). COPC selection for other biota is not anticipated, however it would require calculation of SLs, which will be discussed further below. The USEPA May 2022 RSLs (USEPA, 2022a) were adopted by DoD in July 2022. All available PFAS toxicity data that is adopted by the DoD at the time the BHHRA will be conducted will be considered. This may result in calculating new Loring-specific SLs for the BHHRA.

The fish consumption SLs were calculated using the USEPA RSL calculator (USEPA, 2021b). The SLs are set at a target HQ of 0.1 and a cancer risk of $1x10^{-6}$. Maine-specific exposure factors were used to calculate the fish consumption SL and the child SL was selected as it is more conservative. The SLs derived for child fish consumption are based on an ingestion rate of 7,567 mg per day of locally caught fish, 350 days per year for a 0-6 year-old child. It is recognized that these SLs may not be sufficiently conservative to account for potential subsistence ingestion by the Aroostook Band of Mi'kmaq. SLs specific to this receptor may also be calculated.

The PFAS COPCs will include PFOS, PFOA, PFBS, PFHXS, and/or PFNA. USEPA also finalized the toxicity value for PFBA in December 2022, however DoD has not approved this value for use as of January 2023. There are currently no health-based screening values available from USEPA for other PFAS compounds, apart from HFPO-DA, which was not included in the chemical analysis at the site. Specific risk-based values to which analytical results will be compared are presented in **Table 2.8-1**.

For consistency with PFAS COPCs, non-PFAS COPCs will be selected using the same RSLs for soil and groundwater. Legacy chemicals in other media will be selected using RSLS calculated consistent with the PFAS RSL approaches per media (this may include surface water, sediment, or fish tissue). Specific RSLs for use in selecting non-PFAS chemicals are not shown in **Table 2.4-1** as the list of non-PFAS chemicals has not yet been identified.

3.5 UPDATED COMPOUND OF POTENTIAL CONCERN SUMMARY

The comparison of PFAS analytical data to screening levels (SLs) was presented as part of the preliminary exposure assessment in **Section 2.8** shown in **Table 2.1-1** through **Table 2.1-8.** The screening exercise based on historical PFAS data provides a preliminary indication of which media COPCs are likely to be selected, and at which locations. Likely COPCs in the various media to be evaluated are summarized below. A final set of COPCs will be selected for each media and exposure area after all RI data has been collected and by using the most current USEPA RSLs available and adopted by DoD at the time when the BHHRA is performed and submitted.

<u>Groundwater</u>

- PFOS, PFOA, PFHxS, and PFNA in all flow fields

<u>Soil: surface (0–1 feet bgs) and combined surface and subsurface (0–10 feet bgs)</u>

- PFOS at the B-52 Crash Area, Structural Fire Station, Fire Department Training Burn House, Nose Dock No. 44, Fire Training Area, KC-135 Crash Area, and Nose Dock No. 11 and PFOS and PFOA at the Crash Fire Station

<u>Fish</u>

- PFOS, PFHxS, and PFNA in Butterfield Brook Drainage and PFOS and PFNA in Greenlaw Brook Drainage

<u>Surface Water</u>

- PFOS in Western Drainage

<u>Sediment</u>

- PFOS at Nose Dock No. 44 and Nose Dock No. 40

COPC selection will only be performed for non-PFAS if there are also PFAS COPCs selected for an exposure scenario. There may be some situations where it may not be possible to fully evaluate media and exposure pathways relevant to non-PFAS chemicals in the BHHRA. This might include inhalation of volatiles/indoor air where the vapor intrusion pathway was not previously evaluated for a legacy IRP site at Loring AFB. Volatile non-PFAS concentrations will be compared to Vapor Intrusion Screening Levels (VISLs) to identify COPCs and determine if there are any data gaps that need to be addressed in the future. In addition to the comparison to VISLs, it will be necessary to determine if risks associated with the volatile COPCs were evaluated in previous risk assessments for legacy IRP sites at Loring AFB.

4.0 EXPOSURE ASSESSMENT

The purpose of the exposure assessment is to estimate the magnitude and frequency of potential human exposure to COPCs present in media of interest at each exposure area. The exposure assessment is based on the exposure CSM. The exposure CSM is an iterative representation of contaminant sources, pathways, and receptors that identifies potentially complete exposure pathways and data gaps. The exposure CSM is linked to the physical CSM developed for other technical focal points, such as hydrogeology or geophysics. The exposure CSM was presented in **Section 2.7** and will be updated to reflect any information that has been realized during field efforts and site visits.

The first step in the exposure assessment process is determining potential receptors (i.e., people who may contact the impacted environmental media of interest). Exposure points and/or exposure areas are also identified during the exposure assessment. Potential exposure scenarios and appropriate environmental media and exposure pathways for current and potential future site uses are then identified. The doses (or average daily intakes for oral and dermal routes) and exposures (average daily exposures for the inhalation route) are calculated using exposure point concentrations (EPCs) and the receptor exposure parameters.

Known source area(s), inter-media transport mechanisms, receptors, and exposure routes will be evaluated in this section. Anticipated exposure media are surface water, sediment, soil, and groundwater, fish, and other food-chain related tissues. Exposure routes are incidental ingestion and dermal contact, as well as possible food-chain exposures. The inhalation exposure pathway will not be quantitatively assessed for PFAS because of the absence of currently recommended toxicity values by USEPA. The inhalation exposure pathway for PFAS will be considered if inhalation toxicity values for PFAS are available at the time the BHHRA is conducted.

4.1 IDENTIFICATION OF POTENTIAL EXPOSURE SCENARIOS

The RI will address impacts within the former installation boundary, as well as migration of PFAS via groundwater and surface water transport into residential, commercial, and agricultural areas outside the former installation boundary.

As described in **Section 1.2** and **Section 1.3**, the former installation is currently segregated into several main parcels including commercial property operated by LDA, the ANWR, and lands owned by the Aroostook Band of Mi’kmaq. The LDA property is surrounded by residential and agricultural use properties. Fishing may occur in local water bodies, although the majority of waterbodies are currently subject to an advisory prohibiting consumption. Apart from PFAS migration through flooding and irrigating, soil outside the installation is not assumed to be impacted.

The BHHRA will consider the receptors and exposure pathways discussed in **Section 2.7** and shown in the preliminary exposure CSM in **Figure 2.7-1.** Potentially complete exposure scenarios are expected to include:

- Current and future outdoor workers within the LDA, ANWR, and Aroostook Band of Mi’kmaq lands - exposed to surface soil and potable water in ANWR parcel only. Soil exposure is for 0-1 ft soils under current conditions, or 0-10 ft soils under future conditions assuming regrading and redevelopment of the site.

- Current and future utility workers within the LDA, ANWR, and Aroostook Band of Mi'kmaq lands - exposed to stormwater and stormwater sediment, soil and shallow groundwater (less than 6 feet bgs) during an excavation.
- Future construction workers within the LDA, ANWR, and Aroostook Band of Mi'kmaq lands – exposed to soil and shallow groundwater (less than 10ft bgs) during an excavation.
- Future construction workers outside of the installation boundary – exposed to exposed to shallow groundwater (less than 10ft bgs) and flood-prone surface soil during excavation.
- Recreator (eg Hiker, waders and swimmers) (Child & Adult) within the LDA, ANWR, Aroostook Band of Mi'kmaq, or on public land and waterways - exposed to shallow soil, sediment or surface water in the surface water drainage features emanating from the site (surface water is evaluated only within the swimming scenario), and potable water at ANWR. Soil exposure for areas within the former installation is for 0-1 ft soils under current conditions, or 0-10 ft soils under future conditions assuming regrading and redevelopment of the site.
- Recreational Fisher (Child & Adult) on public land and waterways - exposed to shallow sediment or surface water in the surface water drainage features emanating from the site (surface water is evaluated only within the swimming scenario) and fish tissue consumption.
- Hunter (Child & Adult) - exposed to low-lying soil and may consume wild game.
- Current and future residents within the LDA (adult and child) - exposed to surface soil. Soil exposure for areas within the former installation is for 0-1 ft soils under current conditions, or 0-10 ft soils under future conditions assuming regrading and redevelopment of the site.
- Hypothetical future residents within the installation boundary apart from the Aroostook Band of Mi'kmaq land (adult and child) – exposed to surface soil, and potable and non-potable groundwater and garden soil. Soil exposure for areas within the former installation is for 0-1 ft soils under current conditions, or 0-10 ft soils under future conditions assuming regrading and redevelopment of the site.
- Hypothetical future residents outside of the installation boundary (adult and child) – exposed to potable or non-potable groundwater and garden soil.
- Subsistence Farmer on private land - Backyard Produce Consumer (Child & Adult) - exposed to groundwater from potable or non-potable use, garden or low-lying soil, and potentially exposed to homegrown produce.
- Current and future unauthorized forager in the Aroostook Band of Mi'kmaq – exposed to surface soil and shallow sediment or surface water in the surface water drainage features emanating from the site and consumption of wild plants.
- Hypothetical future Aroostook Band of Mi'kmaq resident (child and adult) in the Aroostook Band of Mi'kmaq Lands only – exposed to potable groundwater, surface soil, flood-prone soil, surface

water drainage features emanating from the site, sediment, and subsistence-level hunting and foraging for wild plants, wild game, and fish.

Regarding residual VOCs present on-base, this BHHRA will review previous risk assessments to identify whether the vapor intrusion pathway has been sufficiently assessed in previous work. For example, this pathway may have been ruled out as a *de minimis* contributor to risk, or institutional controls may have already been placed regarding future buildings and the need for vapor barriers. Volatile non-PFAS concentrations will also be compared to VISLs to identify if there are any data gaps that need to be addressed in the future. As volatile compounds are not the focus of this assessment, this assessment is not expected to evaluate risks from inhalation of indoor air, because PFAS chemicals with available toxicity information are not expected to contribute risks to this exposure scenario. However, if considered necessary based on the review of previous reports cumulative risks from the vapor intrusion pathway will be included where appropriate. The indoor air pathway is not discussed further within this Work Plan.

Inhalation of volatiles from showering is also not a relevant exposure pathway for PFAS chemicals with available toxicity information. This exposure pathway will be considered for non-PFAS chemicals within the former installation only and included in cumulative risk calculations for the relevant exposure scenario if appropriate. PFAS are not expected to contribute to these exposure pathways, as they are not volatile. Per ATSDR, most PFAS are not volatile so showering does not pose a significant inhalational risk, but people may ingest contaminated water while bathing (ATSDR, 2019).

4.2 EXPOSURE POINTS

Potential exposure points are identified on the basis of current and anticipated future use and the relationship of use to the presence of contaminated media. A location is identified as an exposure point if a human might contact (e.g., ingest) a contaminated medium (e.g., surface soil) at that location. Exposure points are identified based on the information obtained in the Preliminary Exposure Assessment presented in **Section 2**. Further refinement of exposure points will be conducted upon receipt of the full data set; however, anticipated exposure points per medium are discussed below.

Eight areas have soil concentrations of PFAS that have been detected above risk-based screening levels. It is assumed that each area will be evaluated as a single exposure unit for soil exposure. This assumption may change as a result of soil data to be collected as part of the RI field investigations.

Hypothetical future potable use of groundwater may be evaluated within the current LDA property and outside of the LDA, and current exposure from groundwater will be evaluated for residents with potable wells. If multiple groundwater plumes are identified, groundwater will be evaluated separately for each groundwater plume.

Exposure points are anticipated to include the following. However, these assumptions may change as a result of data collected as part of the RI field investigations:

- Eight on-installation investigation areas for soil exposure, including the Crash Fire Station, B-52 Crash Area, Structural Fire Station, Fire Department Train Burn House, Nose Dock No. 44, Fire Training Area, KC-135 Crash Area, and Nose Dock No. 11.

- Private garden soil/hydric soil (0-1 ft) if data is collected and COPCs are selected.
- Approximately three groundwater exposure areas within the installation and two groundwater exposure areas outside of the installation, based on the flow fields and property boundaries.
- Two fish tissue exposure areas will be evaluated for recreational fishing, likely including Greenlaw Brook and Butterfield Brook
- Surface water in the Western Drainage
- Sediment at the on-installation area Nose Dock No. 44 and Nose Dock No. 40
- Individual residential properties will be evaluated for potentially complete exposure pathways if data is collected and COPCs are selected.

4.3 CALCULATION OF EXPOSURE POINT CONCENTRATIONS

EPCs represent the concentration of COPCs that a receptor is assumed to be exposed to at each exposure point, by each exposure route. The majority of EPCs will be calculated using most recent version of USEPA ProUCL software (ProUCL 5.2: USEPA, 2022d), which calculates a 95 percent upper confidence limit (95% UCL) on the arithmetic mean of the analytical results. The Kaplan-Meier method or Regression on Order Statistics (ROS) method are used by ProUCL where non-detects are present. The data distribution (i.e., normal, log-normal, or non-parametric) are determined within ProUCL, and the statistics appropriate for that distribution are applied to calculate the 95% UCL.

The UCL recommended by ProUCL based on the most appropriate statistical fit (whether 95%, 97.5%, or 99%) will be used in the EPC selection process. The EPCs will generally be expressed as the lower of the 95% UCL and the maximum detected concentration. EPC tables (RAGS Part D Table 3s) will be prepared for each medium and exposure point. ProUCL outputs documenting the 95% UCL calculations will be included in an appendix. Based on ProUCL guidance recommending a minimum of 10 observations to compute UCLs for discrete datasets (USEPA, 2022d) and professional judgement, UCLs will be calculated where at least six detected results are available. In cases where too few samples are available, the maximum detected concentration is used as the EPC. These recommendations are provided for purposes of calculating a meaningful UCL. The BHHRA will address the uncertainty associated with calculating EPCs based on a small sample size if relevant. EPCs will be calculated for each COPC in each medium and will be used to estimate exposures for each receptor.

4.3.1 Soil Exposure Point Concentrations

All soil EPCs will be calculated as the lower of the 95% UCL and the maximum detected result. EPCs will be generated for the following exposure areas, which may be refined further based on the investigation results. The majority of SL exceedances were in 0-1 ft soils. EPCs will be calculated for surface soil (0-1 ft) or combined surface and sub-surface soil (0-10 ft) as needed to evaluate current or potential future site conditions:

- Crash Fire Station, B-52 Crash Area, Structural Fire Station, Fire Department Train Burn House, Nose Dock No. 44, Fire Training Area, KC-135 Crash Area, and Nose Dock No. 11. (0-10 ft) – EPCs for current/future recreator, current/future commercial/industrial worker, and hypothetical future resident exposure to soils 0-1 ft bgs and/or 0-10 ft bgs and future utility worker and construction worker to soils 0-6 ft and 0-10 ft bgs, respectively, through ingestion and dermal contact.
- Private garden soil (0-1 ft) (if data is collected within the RI, currently unknown if this transport pathway is complete or if COPCs will be selected) – EPCs for current/future residential backyard produce consumer, current/future subsistence farmer, exposure to soils 0-1 ft bgs through ingestion and dermal contact.
- Flood-prone soil (0-1 ft) (data will be collected within the RI, currently unknown if this transport pathway is complete or if COPCs will be selected) – EPCs for current/future recreator, exposure to soils 0-1 ft bgs through ingestion and dermal contact.

4.3.2 Groundwater

Groundwater EPCs to evaluate a hypothetical potable use will be evaluated from the "core of the plume" or multiple cores, per USEPA GW EPC Directive (USEPA, 2014a). The core of the plume (or multiple plume cores) will be identified using the full dataset in the BHHRA. The core will be identified based on concentration gradients detected on-site and hydrogeologist interpretations of flowfield dynamics. Each groundwater core will be determined based on professional judgement and described in detail within the BHHRA. The EPCs will be calculated as the lower of the 95% UCL and the maximum detected result. EPCs may also consider property boundaries as appropriate (for example groundwater within the LDA would be evaluated separately from groundwater within the Aroostook Band of Mi'kmaq land). Groundwater data has been divided into three flow fields as discussed in **Section 2**. Groundwater EPCs will be calculated based on the flow fields. The BHHRA will address the uncertainty associated with small sample size in groundwater datasets.

- EPCs will be calculated as the lower of the 95% UCL and the maximum detected result to evaluate future construction worker exposure to < 10 ft bgs groundwater and utility worker exposure to < 6 ft bgs groundwater where PFAS is present.
- EPCs will be calculated for private properties for groundwater if COPCs are selected, as the maximum detected concentration per property, unless temporal averaging is appropriate for private well.

4.3.3 Sediment, Surface Water, Stormwater and Pore Water Exposure Point Concentrations

Sediment and surface water EPCs will be calculated as the lower of the 95% UCL and the maximum detected result. EPCs will be generated for exposure areas, based on the Eastern Drainage and Western Drainage discussed in **Section 2.** EPCs may be calculated for each surface water body, or for individual stretches of waterbodies if appropriate. These will be further refined based on the results of the investigation.

- Sediment – EPCs for current/future recreator, current/future residential backyard produce consumer, current/future subsistence farmer, exposure to surface water through ingestion and dermal contact.
- Surface Water – EPCs for current/future recreator, current/future residential backyard produce consumer, current/future subsistence farmer, exposure to surface water through ingestion and dermal contact.

Currently no stormwater EPCs will be calculated as no COPCs have been selected. However, if stormwater COPCs are selected, EPCs will be calculated as the lower of the 95% UCL and the maximum detected result. Porewater EPCs will only be calculated if COPCs are selected, and risk calculations will be conducted within the uncertainty analysis.

4.3.4 Fish Tissue

Fish tissue EPCs will be calculated as the lower of the 95% UCL and the maximum detected result. EPCs will be generated for at least two exposure areas and may also consider species. Areas will likely be based on watershed, consistently with surface water and sediment. EPCs may be calculated for each surface water body, or for individual stretches of waterbodies if appropriate.

4.4 CHEMICAL INTAKE ESTIMATES

Estimates of exposure are based on the EPCs, scenario-specific assumptions, and receptor-specific intake parameters. Exposure estimates (intakes) will be calculated for a reasonable maximum exposure (RME) scenario for each receptor and exposure pathway. The exposure parameters for each receptor have been selected to represent the RME scenario. The RME represents the highest exposure reasonably expected to occur and is calculated using the EPC and the RME exposure parameters. Site-specific exposure parameters and professional judgement will be used when appropriate. When not appropriate USEPA-recommended default exposure parameters (e.g., body weight, soil ingestion rate, frequency of exposure, duration of exposure) obtained from *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Attachment 1. Recommended Default Exposure Factors* (USEPA, 2014b) will be used.

For each receptor, the exposure (or dose) will be estimated for each chemical via each exposure pathway by which the receptor is assumed to be exposed. Exposure dose equations combine the estimates of chemical concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose or daily intake is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day). The generic equations for calculating chemical intake are provided below (USEPA 1989, 2009, 2017):

$$Intake\ (oral\ or\ dermal) = \frac{C \times CR \times EF \times ED}{BW \times AT}$$

where:

I = Intake: the amount of chemical at the exchange boundary from oral or dermal exposure (mg/kg-day for oral and dermal exposure).

C = Chemical concentration for the exposure medium: the EPC (e.g., mg/kg for soil).

CR = Contact rate: the amount of contaminated medium contacted orally or dermally per unit of time or event – may be the ingestion rate or dermal contact rate (e.g., milligrams per day for the ingestion rate of soil).

EF = Exposure frequency: how often the exposure occurs (days per year).

ED = Exposure duration: the number of years in which a receptor comes in contact with the contaminated medium (years).

BW = Body weight: the average body weight of the receptor over the exposure period (kilograms) – applicable only for oral and dermal exposures.

AT = Averaging time: the period over which exposure is averaged (days for oral and dermal exposures). For carcinogens, the averaging time is 25,550 days (oral and dermal exposures) on the basis of a lifetime exposure of 70 years, which represents the average US life expectancy. For noncarcinogens, the averaging time is equal to the exposure duration (ED) expressed in days (ED × 365 days/year) for oral and dermal exposures.

The specific equations used to calculate doses/intakes for soil, groundwater, sediment, and surface water are provided in **Table 4.4-1** through **Table 4.4-5**. These tables identify the exposure profiles for each of the receptors, including proposed exposure parameter values used to calculate the daily intake calculations for each of the receptors and exposure pathways. Exposure parameters for biota ingestion other than fish will be developed if additional biota data is collected, as these will depend on the COPCs selected and therefore the specific biota that is carried through the BHHRA. If COPCs in biota are selected the exposure assumptions selected to evaluate this scenario will be presented in a separate deliverable.

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5.0 TOXICITY ASSESSMENT

The purpose of the toxicity assessment (dose-response assessment) is to identify the types of adverse health effects a chemical may potentially cause, and to define the relationship between the dose of a chemical and the likelihood or magnitude of an adverse effect (response) (USEPA, 1989). Adverse effects are classified by USEPA as potentially carcinogenic or noncarcinogenic (i.e., potential health effects other than cancer). Dose-response values for potentially carcinogenic effects are called cancer slope factors (CSFs) and those for noncarcinogenic effects are called reference doses (RfDs). Dose-response relationships are defined by the USEPA for oral and inhalation exposure. Oral toxicity values are also used to assess dermal exposures, but with appropriate adjustments. Combining the results of the dose-response assessment with information on the magnitude of potential human exposure provides an estimate of potential risk.

The toxicity section will include a discussion of the basis of the toxicity values selected. Toxicity selection will rely on DoD accepted toxicological data, which currently includes reference doses for PFOS, PFOA, PFBS, PFNA, and PFHxS and the oral cancer slope factor for PFOA. All PFAS toxicity information that is available and adopted by DoD at the time of the BHHRA will be included. Additional toxicological data for non-PFAS chemicals if included will be selected and included in the risk assessment if compliant with the hierarchy of toxicity values defined in DoD Instruction 4715.18 and OSWER Directive 9285.7-53 (Human Health Toxicity Values in Superfund Risk Assessments (USEPA,2003)). The USEPA Superfund hierarchy of sources of toxicity values includes three tiers as follows:

- Tier I - USEPA Integrated Risk Information System (IRIS) (USEPA, 2021c)
- Tier II - EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs)
- Tier III - Other Toxicity Values – Tier 3 includes additional EPA and non-EPA sources of toxicity information. Priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed. The USEPA Directive identifies the three Tier III sources below but does not limit Tier III sources to these three.
    - California EPA
    - Agency for Toxic Substances and Disease Registry (ATSDR)
    - USEPA Health Effects Assessment Summary Tables (HEAST)

5.1 DOSE-RESPONSE ASSESSMENT FOR CARCINOGENIC EFFECTS

To determine if a compound has carcinogenic effects (assumed to be non-threshold), USEPA uses a two-part evaluation in which the substance is first assigned a weight-of-evidence classification, and then a CSF or UR is calculated to reflect the carcinogenic potency. In the weight-of-evidence classification, USEPA characterizes the overall evidence for a chemical's carcinogenicity based on the availability of animal, human, and other supportive data (USEPA, 1989). USEPA produced revised guidelines for cancer risk assessment in 2005 with revised nomenclature for the weight-of-evidence (USEPA, 2005a). The weight-of-evidence classification for a given chemical may reflect either of the two classification schemes (1989 or 2005a).

The potency estimate for oral and dermal exposure, which estimates the ability of a chemical to increase the incidence of cancer in a target population by ingestion or dermal contact, is called a cancer slope factor (CSF) in units of (mg/kg-day)-1. No CSFs are available for the dermal route of exposure. The potency estimate for inhalation exposures from particulate dust or vapor emissions is called a unit risk factor (URF) and is expressed in units of $(ug/m3)^{-1}$. The higher the CSF or URF, the greater the carcinogenic potential.

Potential risks from COPCs with a mutagenic mode of action require an additional factor for young receptors than COPCs without a mutagenic mode of action (USEPA, 2005b). The recommended default Age-Dependent Adjustment Factors (ADAFs) will be applied to receptors with exposure <16 years of age for compounds identified by USEPA (2005b, 2015b) as potentially mutagenic.

5.2 DOSE-RESPONSE ASSESSMENT FOR NON-CARCINOGENIC EFFECTS

In contrast to carcinogens, non-carcinogens are believed to have threshold exposure levels below which adverse effects are not expected. USEPA standards and guidelines are based on acceptable levels of exposure for such compounds. Some of the same uncertainties involved in deriving cancer risk estimates (namely, selection of an appropriate data set and extrapolation of high-dose animal data to low-dose human exposure) are also involved in deriving non-carcinogenic dose-response criteria.

The RfD is expressed in units of mg/kg/day and is defined as an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime (USEPA, 1989).

The RfC (in units of milligrams per cubic meter [mg/m^3]) is analogous to the RfD and is developed through a similar process. However, unlike RfDs, which represent a dosage (in mg/kg/day) at which adverse or deleterious effects are unlikely, RfCs represent air concentrations (in mg/m^3) at which adverse or deleterious effects are unlikely. Non-carcinogenic risks due to inhalation exposures are estimated by comparing the environmental air concentration to the inhalation RfC.

Dose-response values are based on the critical endpoints, that the compound is most likely to impact (e.g. liver toxicity, kidney toxicity, reproductive effects, or neurotoxicity). The final stage of the non-carcinogenic risk assessment requires adding HQs per endpoint.

5.3 TOXICITY VALUES FOR PFAS

PFAS are emerging contaminants and the toxicological data for these compounds are limited. There are no RfCs or URFs published for PFOS, PFOA, PFBS, PFHxS, and PFNA in the USEPA IRIS database. An RfD for PFBS was developed by USEPA’s ORD Center for Public Health and Environmental Assessment (USEPA, 2021d) and is available as a USEPA Provisional Peer-Reviewed Toxicity Value (PPRTV) (ORNL, 2021). Only one PFAS has a CSF available, this is PFOA from the USEPA Office of Water Drinking Water Health

Advisories and Human Health Toxicity Assessments (USEPA, 2022b). RFDs for PFOS, PFOA, PFHxS, and PFNA are available from ATSDR (ATSDR, 2021).

The PFAS toxicity values currently approved for DoD use in the BHHRA are provided below. No inhalation Reference Concentration or inhalation Unit Risk values are currently available from DoD or Tier 1, Tier 2, or Tier 3 sources. USEPA also finalized the Tier 1 IRIS oral toxicity value for PFBA in December 2022, however DoD has not yet approved this value for use as of January 2023. No toxicity values will be derived from primary literature. The values listed below will be used in the BHHRA for PFAS unless other DoD-approved values become available prior to completion of the Draft BHHRA.

- Oral RfDs:
  - PFOS – 2.0×10^{-6} mg/kg/day
  - PFOA – 3.0×10^{-6} mg/kg/day
  - PFBS – 3.0×10^{-4} mg/kg/day
  - PFHxS – 2.0×10^{-5} mg/kg/day
  - PFNA – 3.0×10^{-6} mg/kg/day
- Oral CSF for PFOA - 0.07 $(\text{mg/kg/day})^{-1}$

Further research into PFAS is on-going, consequently the BHHRA will use published values or additional values endorsed by the USEPA that are approved by DoD at the time of drafting the report. It is anticipated that new toxicity values can be incorporated if they are finalized before the draft BHHRA is submitted. Substantial changes required after this point could be captured in a supplemental deliverable if needed. Toxicity information will be summarized in the report in detailed tabular format in accordance with RAGS Part D.

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6.0 RISK CHARACTERIZATION

The risk characterization combines the exposure assessment and toxicity values to calculate the total estimated carcinogenic risk and noncarcinogenic hazard for site COPCs for each potential exposure pathway considered in the BHHRA (USEPA, 1989). Risk calculations will be performed in accordance with AFCEC and USEPA protocol.

All calculations will be documented in RAGS D tables. Cancer risk and non-cancer hazard calculations will be documented in RAGS D Tables 7s. Cumulative risks to PFAS will be presented in RAGS D Table 9s. If the BHHRA identifies chemicals exceeding CERCLA based criteria, COCs will be selected, and risk-based Preliminary Remediation Goals (PRGs) will be derived for those chemicals that most significantly contribute to human health risks.

6.1 CARCINOGENIC RISK CHARACTERIZATION

The purpose of carcinogenic risk characterization is to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of exposure to a chemical in environmental media at the site. This likelihood is a function of the dose of a chemical and CSF for that chemical. The Excess Lifetime Cancer Risk (ELCR) is the likelihood over and above the background cancer rate. The risk value is expressed as a probability (e.g., $1x10^{-6}$ or one in one million).

The relationship between the ELCR and the lifetime average daily dose (LADD) of a chemical may be expressed as:

$$ELCR = LADD\ (mg/kg\text{-}day) \times CSF\ (mg/kg\text{-}day)^{-1}$$

This equation is typically used to calculate ELCR in a BHHRA. The product of the CSF and the LADD is unitless and provides an upper-bound estimate of the potential carcinogenic risk associated with a receptor's exposure to that chemical via that pathway.

The potential carcinogenic risk for each exposure pathway is calculated for each receptor. In current regulatory risk assessments, it is assumed that cancer risks are additive. Risk estimates from different exposure pathways are summed to estimate the total site potential cancer risk for each receptor. The sum of the cancer risk estimates for each receptor will be compared with the USEPA's generally acceptable risk management range of 1×10^{-4} to 1×10^{-6}. In the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the USEPA defined general remedial action goals for sites on the NPL (Title 40 of the Code of Federal Regulations [CFR], Section 300.430). The goals include a range for residual cancer risk, which is "an excess upper-bound lifetime cancer risk to an individual of between $1x10^{-4}$ and $1x10^{-6}$," or 1 in 10,000 to 1 in 1,000,000." The goals established in the NCP are applied once a decision to remediate a site has been made. A subsequent USEPA directive (USEPA, 1991c) provides additional guidance on the role of the BHHRA in supporting risk management decisions and, in particular, evaluating whether a response action is necessary.

6.2 NONCARCINOGENIC HAZARD CHARACTERIZATION

The potential for exposure to a chemical resulting in potentially adverse noncarcinogenic health effects will be estimated for each receptor by comparing the chronic average daily dose (CADD) for each COPC with the RfD for that COPC. The resulting ratio, which is unitless, is the HQ for that chemical. The HQ is calculated using the following equation:

$$HQ = \frac{CADD(mg/kg-day)}{RfD(mg/kg-day)}$$

When the HQ is less than or equal to 1, the RfD has not been exceeded, and no adverse noncarcinogenic effects are expected. If the HQ is greater than 1, there may be a potential for adverse noncarcinogenic health effects to occur; however, the magnitude of the HQ is not directly equated to a probability or effect level.

Summing the HQs for each individual chemical identifies the total HI for each exposure pathway. Furthermore, the total site HI is calculated for each potential receptor by summing the HIs for each pathway associated with the receptor. Where the total site HI is greater than 1 for any receptor, a more detailed evaluation of potential noncarcinogenic effects based on specific health or target endpoints (e.g., liver effects, neurotoxicity) will be performed (USEPA, 1989). The target HI is 1 on a per-target endpoint basis.

6.3 CONTAMINANTS OF CONCERN

COPCs that substantially contribute to an HI greater than 1 or COPCs that significantly contribute to cancer risk greater than the $1x10^{-4}$ risk level are identified as COCs. COCs will be identified for each exposure medium with ELCR greater than $1x10^{-4}$ and/or HI greater than 1. The COCs will be selected per area/medium using the following criteria:

- Carcinogens: If the total cumulative ELCR is greater than $1x10^{-4}$ per exposure pathway, COCs will be identified in this area/medium as any compound with an individual ELCR above $1x10^{-6}$.
- Non-Carcinogens: If any total target-endpoint HI is greater than 1, COCs will be identified as any compound in this area/medium with an HQ > 0.1 contributing to that target endpoint.

The risk characterization for PFAS COCs will be summarized in RAGS D Table 10s. In addition, for those exposure areas with both PFAS and non-PFAS legacy COCs, the combined cumulative risks will be presented.

6.4 UNCERTAINTY ANALYSIS

The BHHRA will include an Uncertainty Analysis. Uncertainty and variability are inherent in hazard identification, exposure assessment, toxicity values, and risk characterization. Regulatory risk assessment methodology requires that conservative assumptions be made throughout the risk assessment to ensure that public health is protected. The assumptions that introduce the greatest amount of uncertainty will be discussed. Uncertainty will be quantified wherever possible. If quantitative estimates are not possible, a semi-quantitative or qualitative approach will be used. It is expected that assumptions will generally be discussed in qualitative terms because for most of the assumptions there is not enough information to assign a numerical value that can be factored into the calculation of risk to the uncertainty.

Uncertainties involved in data evaluation include assumptions regarding the decision of which sampling points to include as exposure point concentrations and in the selection of COPCs on the basis of screening. In the exposure assessment, uncertainties exist in the selection of receptors and assumptions concerning rates of ingestion, frequency and duration of exposure, and bioavailability of the chemicals in the medium. Typically, when limited information is available to establish these assumptions, a health-protective estimate of potential exposure is employed. Uncertainties associated with hazard identification include sampling and analysis methods, data validation and evaluation methods, adequacy of detection limits, availability of screening levels, and comparison with background levels.

In the dose-response assessment, uncertainties are involved in animal-to-human extrapolations, high-to-low-dose extrapolations, and the specific models used to develop dose-response values. An additional source of uncertainty for PFAS is the lack of toxicity factors available for many of the PFAS chemicals that may be detected. This uncertainty will be quantified to the extent possible by calculating the total PFAS mass reported for PFAS chemicals with available toxicity values and separately the total PFAS mass for target PFAS analyses reported under QSM 5.3 analyses that do not have toxicity values. The relative masses will be compared to provide some information relative to contribution from PFAS chemicals lacking toxicity information. The risk characterization includes uncertainties in the evaluation of potential exposure to multiple chemicals, the combination of upper-bound exposure estimates with upper-bound toxicity estimates, and the risk to sensitive populations. Each of the major uncertainties involved will be discussed in BHHRA.

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FIGURES

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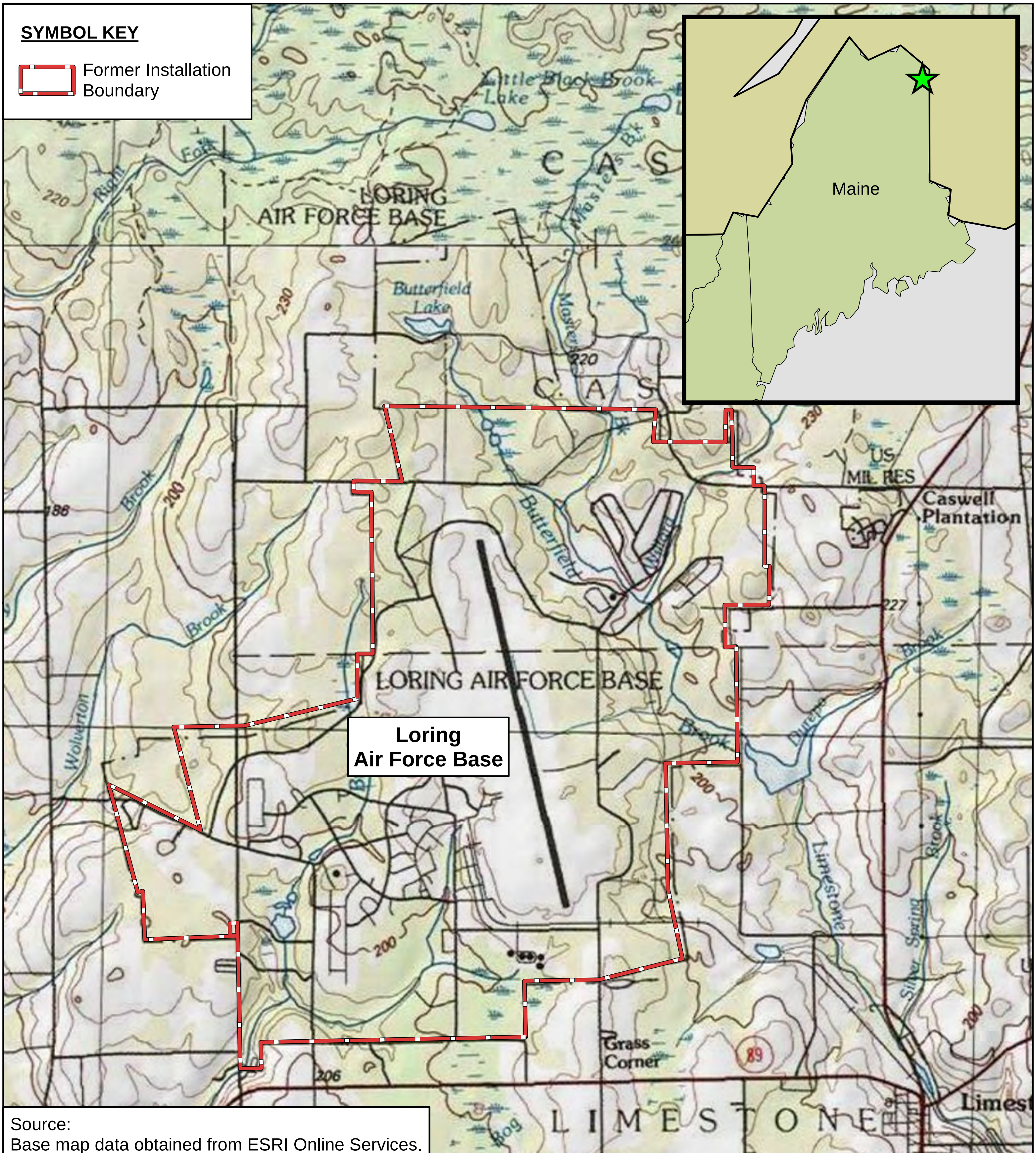

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JBSA Lackland, TX 78236

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Figure 1.0-1
Site Location Map

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base, Limestone, ME

0 1,000 2,000 4,000 6,000 Meters

0 7,000 14,000 21,000 28,000 Feet

04/25/2022	BHHRA_WP_Install_Loc	
PROJ: 775361701	Drawn: BRP	

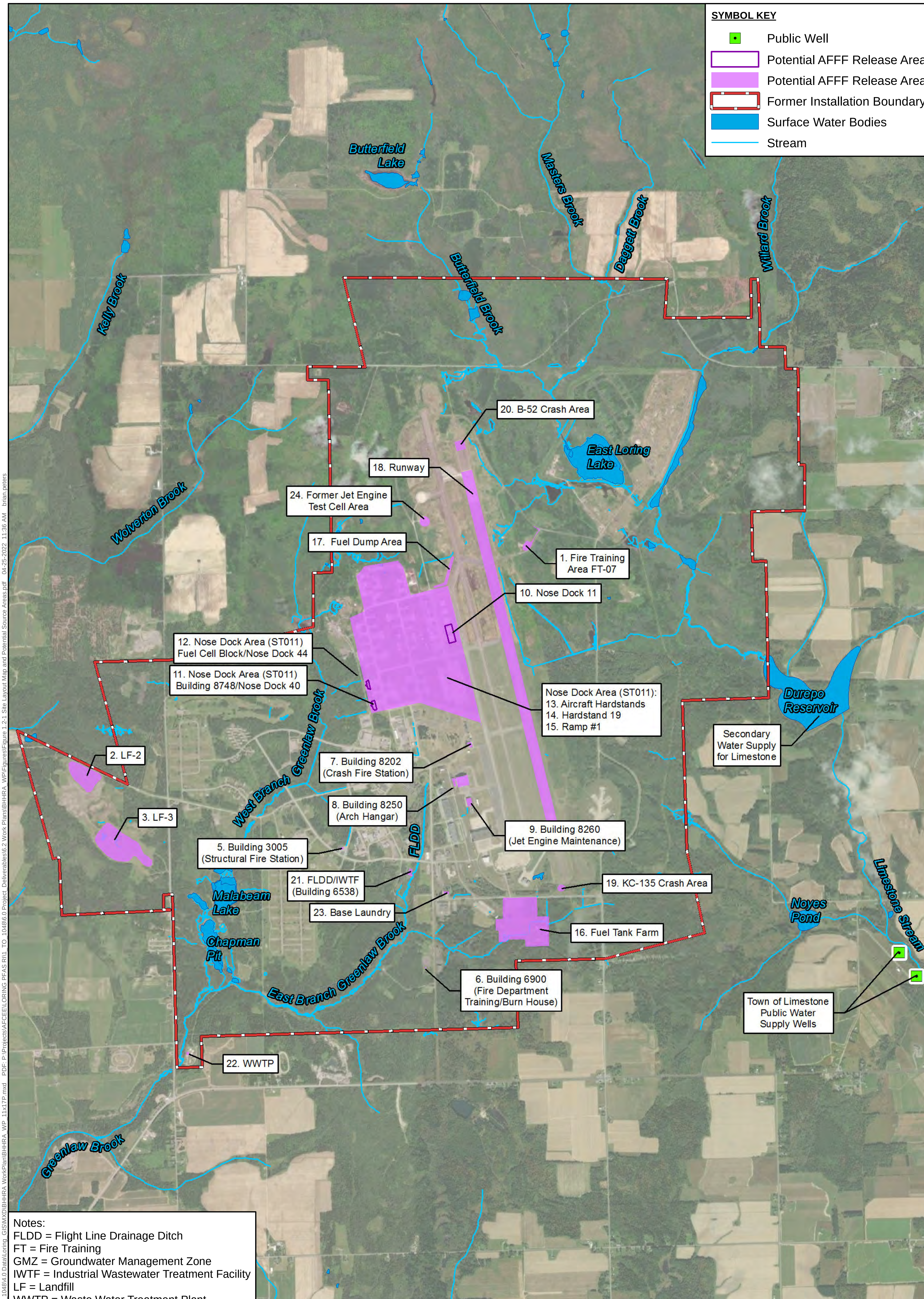

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Figure 1.2-1
Site Layout Map and Potential Source Areas

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base, Limestone, ME

0 400 800 1,600 2,400 3,200 Meters
0 1,400 2,800 5,600 8,400 11,200 Feet

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NOTES:
-Aerial Imagery obtained through ESRI Online Services

04/25/2022	Rev:	BHHRA_WP_11x17P
Drawn: BRP	Chk:	PROJ: 775361701

SYMBOL KEY

Approximate Parcel Boundaries:

- DFAS Parcel (A)
- Job Corps Parcels (B-1, 2, 3 and B-5, 6, 7)
- MEARNG Parcels (C, C-1)
- BIA Parcels (D, D-1)
- USFWS Parcels (E, E-1)
- LDA Parcels (F, F-1)
- Stream
- Surface Water Bodies
- Former Installation Boundary

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0 150 300 600 900 1,200 Meters

0 600 1,200 2,400 3,600 4,800 Feet

Figure 1.2-2
Parcel Boundaries

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base, Limestone, ME

NOTES:
-Aerial Imagery obtained through ESRI Online Services

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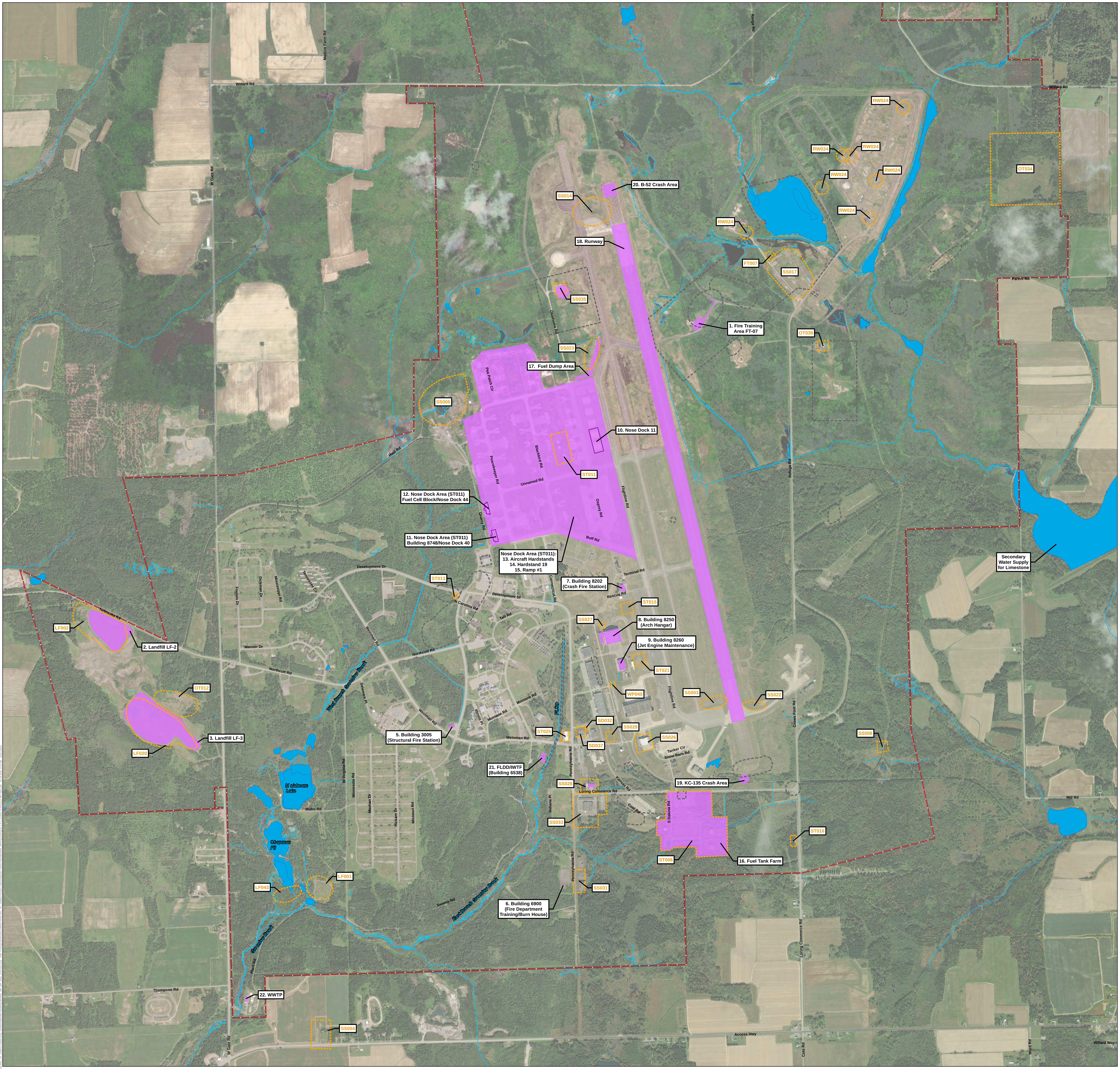

SYMBOL KEY

- IRP Site - Found on Table
- IRP Site - Not Found on Table
- Potential AFFF Release Area
- Potential AFFF Release Area
- Stream
- Surface Water Bodies
- Installation Boundary

Note:
IRP = Air Force Installation Restoration Program

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Figure 1.4-1
Location of Previous IRP Sites
Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base, Limestone, ME

0 100 200 400 600 800 Meters
0 400 800 1,600 2,400 3,200 Feet

NOTES:
-Aerial Imagery obtained through ESRI Online Services

2022-04-25	BHHRA_WP_IRP_Sites_Overview
Drawn: BRP	PROJ: 775361701

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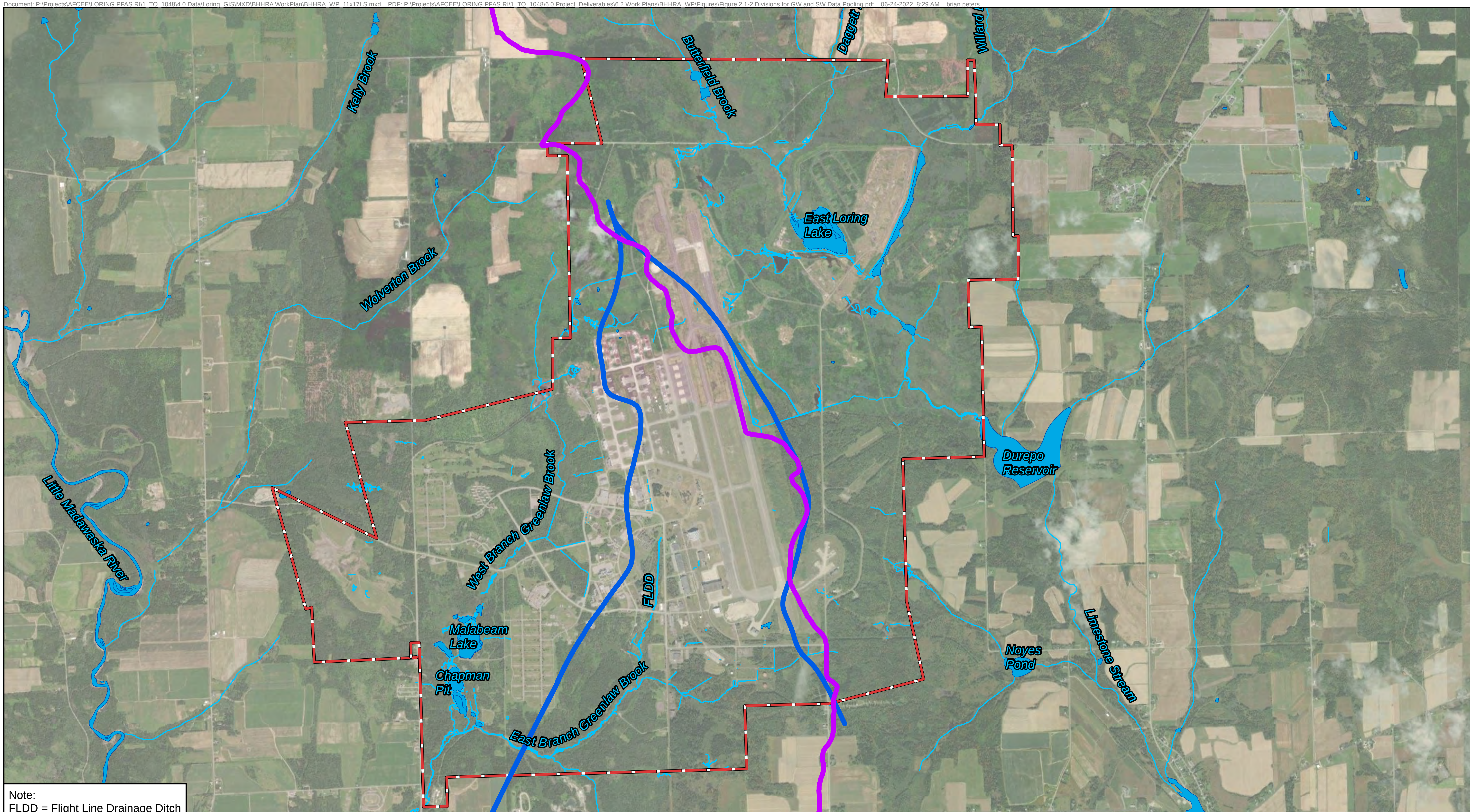

SYMBOL KEY

- Groundwater Division
- Surface Water Division
- Stream
- Surface Water Bodies
- Former Installation Boundary

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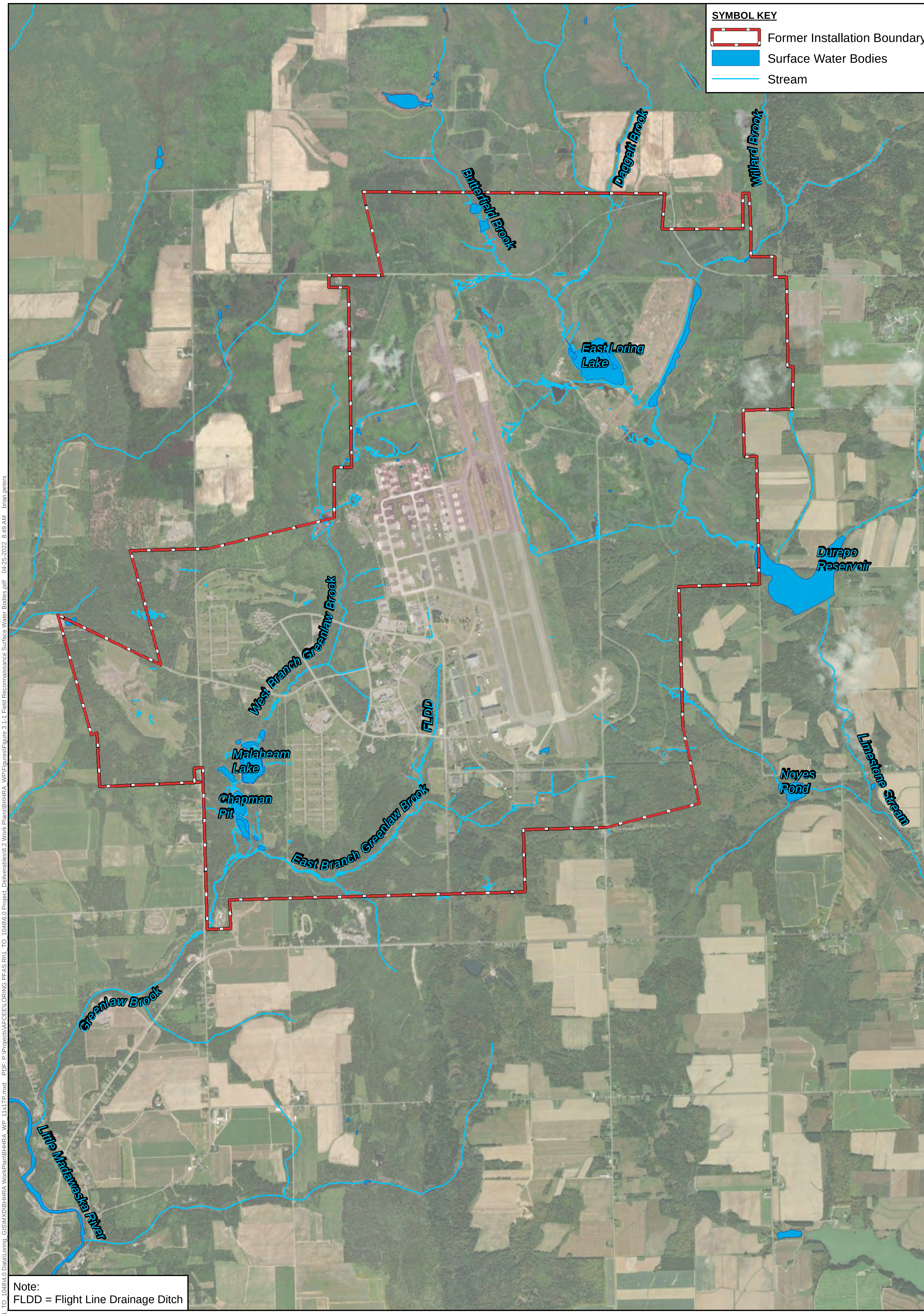
Figure 2.1-2
Divisions for Groundwater and Surface Water Data Pooling

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base, Limestone, ME

0 400 800 1,600 2,400 3,200 Meters
0 1,500 3,000 6,000 9,000 12,000 Feet

NOTES:
-Aerial Imagery obtained through ESRI Online Services

2022-06-24	Rev:		BHHRA_WP_11x17LS
Drawn: BRP	Chk:		PROJ: 775361701



Air Force Civil Engineer Center
2261 Hughes Ave., Suite 163
JBSA Lackland, TX 78236

Figure 2.3-1
Field Reconnaissance Surface Water Bodies

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base, Limestone, ME

0 400 800 1,600 2,400 3,200 Meters
0 1,500 3,000 6,000 9,000 12,000 Feet

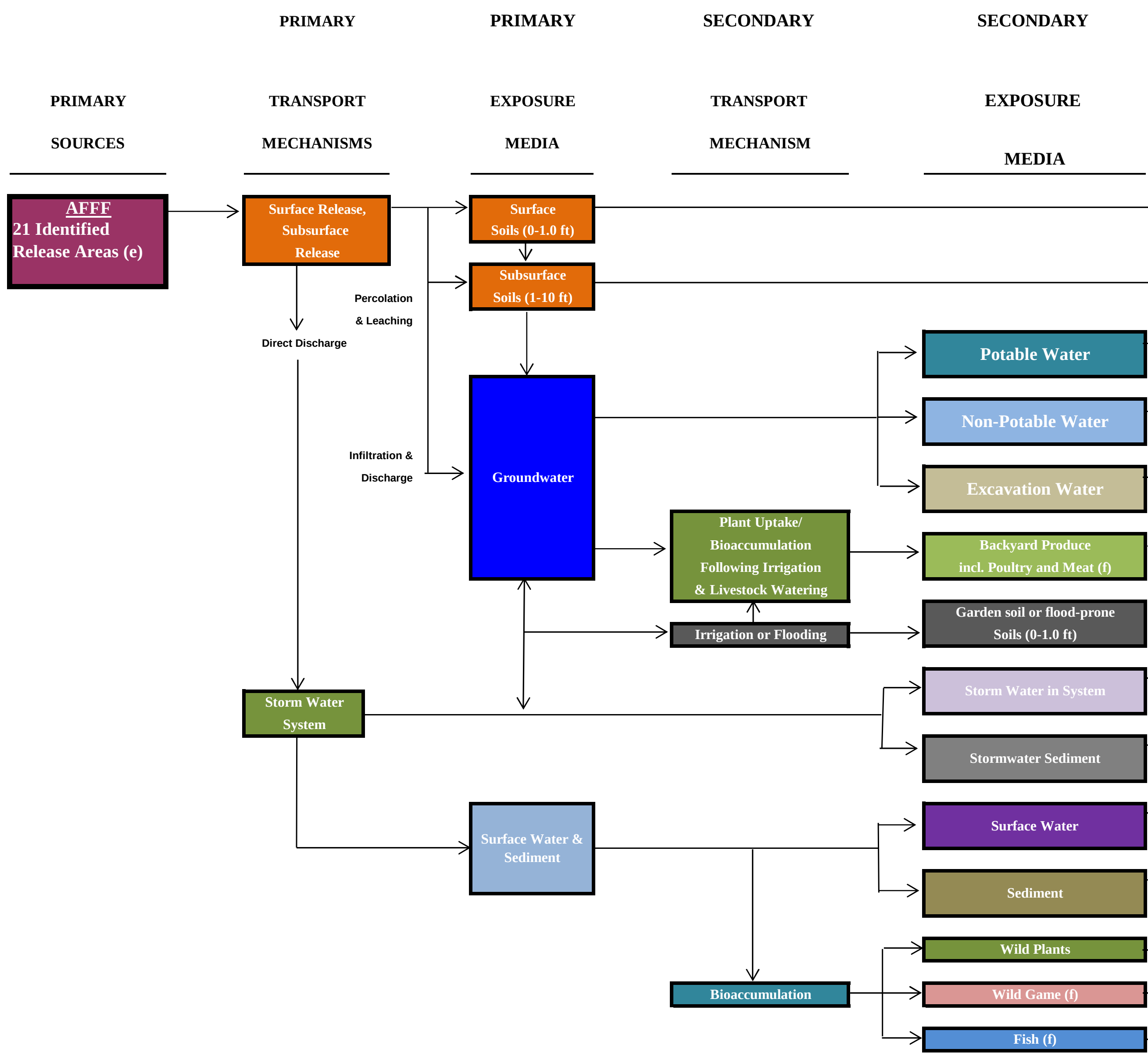
N

NOTES:
-Aerial Imagery obtained through ESRI Online Services

04/25/2022	Rev:	BHHRA_WP_11x17P
Drawn: BRP	Chk:	PROJ: 775361701

Figure 2.7-1
Human Health Risk Assessment Preliminary Conceptual Site Model Chart

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine



	Inside Former Installation Boundary							
	Loring Development Authority (LDA), Aroostook National Wildlife Refuge, and Aroostook Band of Mi'kmaq (g)					Loring Development Authority (LDA)-only (d)	Aroostook Band of Mi'kmaq-only (g)	
	Current and Future			Future	Hypothetical Future	Current and Future	Current and Future	Hypothetical Future
Exposure Route[(a)]	Outdoor Worker	Recreator/ Hiker (Child & Adult)	Utility Worker[(c)]	Construction Worker	Resident (child & adult)	Resident (Child & Adult)	Unauthorized Forager[(h)]	Subsistance Resident (child & adult)
Incidental Ingestion	●	●	●	●	●	●	●	●
Dermal Contact	●	●	●	●	●	●	●	●
Incidental Ingestion	▲	▲	●	●	▲	▲	-	▲
Dermal Contact	▲	▲	●	●	▲	▲	-	▲
Ingestion of Drinking Water	(i)	(i)	-	-	●	-	-	●
Dermal Contact	(i)	(i)	-	-	●	-	-	●
Incidental Ingestion	-	-	-	-	●	-	-	-
Dermal Contact	-	-	-	-	●	-	-	-
Incidental Ingestion	-	-	●	●	-	-	-	-
Dermal Contact	-	-	●	●	-	-	-	-
Ingestion of Backyard Produce	-	-	-	-	-	-	-	-
Incidental Ingestion	●	●	●	●	●	●	●	●
Dermal Contact	●	●	●	●	●	●	●	●
Incidental Ingestion	-	-	●	-	-	-	-	-
Dermal Contact	-	-	●	-	-	-	-	-
Incidental Ingestion	-	-	●	-	-	-	-	-
Dermal Contact	-	-	●	-	-	-	-	-
Incidental Ingestion while Swimming	-	●	-	-	-	-	●	●
Dermal Contact while Swimming	-	●	-	-	-	-	●	●
Incidental Ingestion while Wading	-	●	-	-	-	-	●	●
Dermal Contact while Wading	-	●	-	-	-	-	●	●
Ingestion of Wild Plants	-	-	-	-	-	-	●	●
Ingestion of wild game	-	-	-	-	-	-	-	●
Ingestion of Fish	-	-	-	-	-	-	-	●

→	*Indicates a potentially complete migration pathway*
●	*Indicates an exposure route that may be complete, and will be further evaluated in the exposure pathway analysis of the risk assessment.*
▲	*Indicates an exposure route that may be complete for future receptors only, and will be further evaluated in the exposure pathway analysis of the risk assessment.*
-	*Indicates an exposure route that would not be complete, and is not evaluated further.*

(a) PFOS, PFOA, PFHxS, PFNA, and PFBS are not considered volatile and there are no USEPA toxicity values to evaluate the inhalation pathway. Therefore will not be evaluated for the volatile or dust inhalation pathways. These pathways will be included if relevant for historical chemicals only.

(b) It is assumed that soils outside of the former installation are not Impacted unless PFAS transport through groundwater or surface water has occurred. Soils in private gardens will be evaluated for residents, and flood-prone wetlands will be evaluated for exposure by recreational visitors. The Aroostook National Wildlife Refuge and lands owned by the Aroostook Band of Mi'kmaq are within the former installation boundary.

(c) Utility worker exposure to soil is assumed 0-6 ft and to include stormwater repairs.

(d) Includes parcels fully within the LDA boundary. Future subsurface exposure assumes redevelopment may occur including soil mixing.

(e) FTA, Landfill No. 2, Landfill No. 3, Structural Fire Station, Fire Department Training/Burn House, Crash Fire Station, Arch Hangar, Jet Engine Maintenance Building, Nose Dock No. 11, Nose Dock No. 40, Nose Dock No. 44, Aircraft Hardstands, Hardstand 19, Ramp No. 1, Fuel Tank Farm, Fuel Dump Area, Main Runway Foaming Area, KC-135 Crash Area, B-52 Crash Area, FLDD/IWTF, WWTP, Greenlaw Brook Drainage, and Butterfield Brook Drainage.

(f) The relevance of this pathway will be further explored in the BHHRA, and the final selection of receptors to which these pathways apply will be based on what data are available. Regardless, any pathway that is considered relevant to a given receptor will be evaluated. Risk evalautions based on measured data are preferred, but modeling or qualitative approaches may be considered where relevant.

(g) The Aroostook National Wildlife Refuge and lands owned by the Aroostook Band of Mi'kmaq are within the former installation boundary and it is assumed that soils may be impacted by surface release of PFAS, or PFAS transport through groundwater or surface water to flood-prone wetlands.

(h) Foraging is prohibited on the former Loring property. Therefore, it assumed that anyone foraging is unauthorized. The hypothetical future resident will include authorized foraging.

(i) There are potable wells on the ANWR property, therefore the outdoor worker and recreator will also be evaluated for potable use of groundwater on ANWR property only.

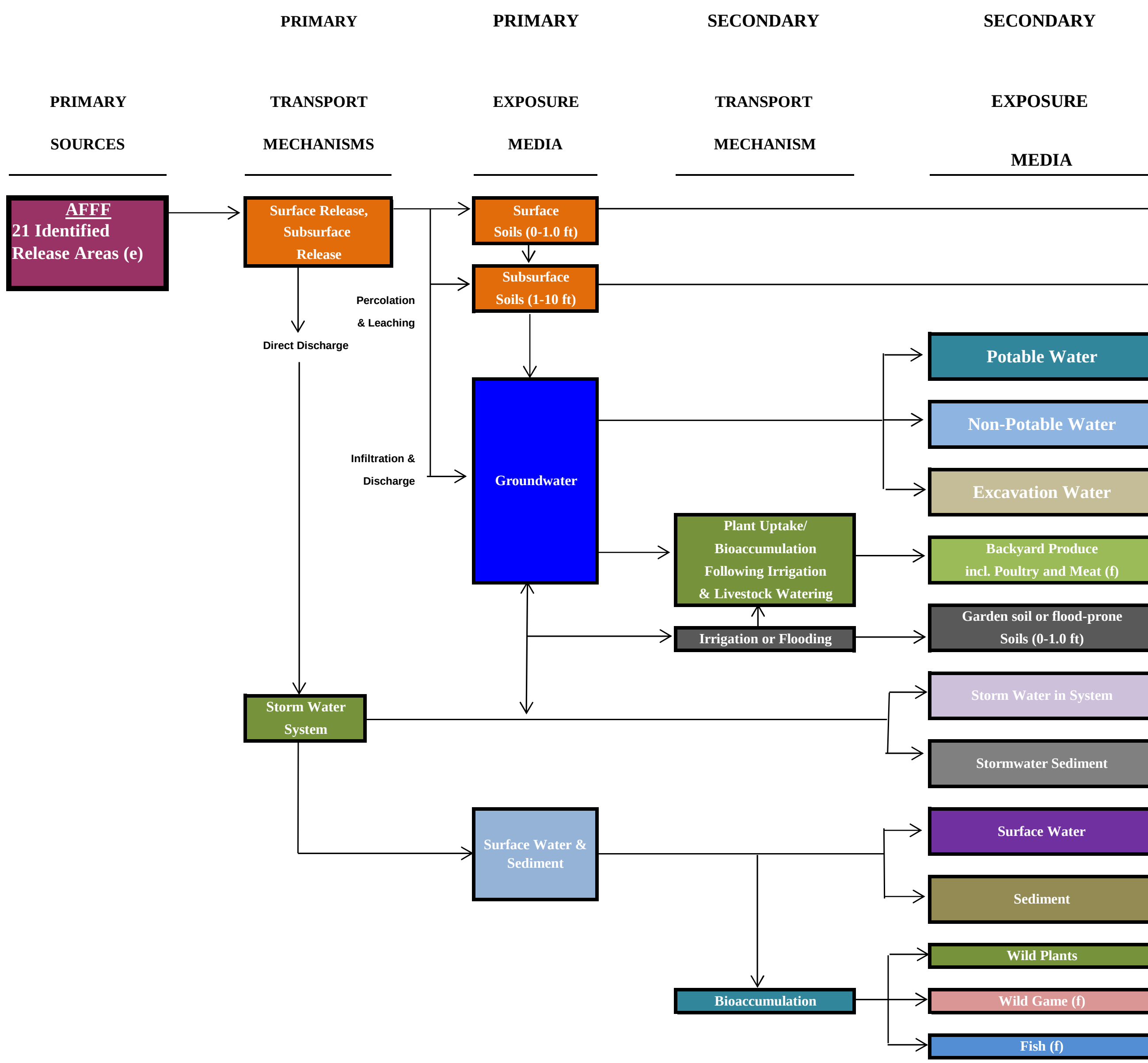
AFFF = Aqueous Film Forming Foam.

USEPA - United States Environmental Protection Agency.

Prepared by: ARQ 11/11/2021
Checked by: KALS 4/21/2022
Revised by: ARQ 1/20/2023

Figure 2.7-1
Human Health Risk Assessment Preliminary Conceptual Site Model Chart

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine



Exposure Route[a]	Outside Former Installation Boundary						
	Private Land		Public Land and Waterways			All Areas Outside of Installation	
	Current and Future		Current and Future		Hypothetical Future	Hypothetical Future	
	Resident - Backyard Produce Consumer (Child & Adult)	Subsistence Farmer - Backyard Produce Consumer (Child & Adult)	Surface Water Recreator (Child & Adult)	Hunter (Child & Adult)	Fisher (Child & Adult)	Construction Worker	Resident (Child & Adult)
Incidental Ingestion	-	-	-	-	-	-	-
Dermal Contact	-	-	-	-	-	-	-
Incidental Ingestion	-	-	-	-	-	-	-
Dermal Contact	-	-	-	-	-	-	-
Ingestion of Drinking Water	●	●	-	-	-	-	●
Dermal Contact	●	●	-	-	-	-	●
Incidental Ingestion	●	●	-	-	-	-	●
Dermal Contact	●	●	-	-	-	-	●
Incidental Ingestion	-	-	-	-	-	●	-
Dermal Contact	-	-	-	-	-	●	-
Ingestion of Backyard Produce	●	●	-	-	-	-	-
Incidental Ingestion	●	●	●	●	●	●	●
Dermal Contact	●	●	●	●	●	●	●
Incidental Ingestion	-	-	-	-	-	-	-
Dermal Contact	-	-	-	-	-	-	-
Incidental Ingestion	-	-	-	-	-	-	-
Dermal Contact	-	-	-	-	-	-	-
Incidental Ingestion while Swimming	-	-	●	-	●	-	-
Dermal Contact while Swimming	-	-	●	-	●	-	-
Incidental Ingestion while Wading	-	-	●	-	●	-	-
Dermal Contact while Wading	-	-	●	-	●	-	-
Ingestion of Wild Plants	-	-	-	-	-	-	-
Ingestion of wild game	-	-	-	●	-	-	-
Ingestion of Fish	-	-	-	-	●	-	-

→ *Indicates a potentially complete migration pathway*
● *Indicates an exposure route that may be complete, and will be further evaluated in the exposure pathway analysis of the risk assessment.*
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(a) PFOS, PFOA, PFHxS, PFNA, and PFBS are not considered volatile and there are no USEPA toxicity values to evaluate the inhalation pathway. Therefore will not be evaluated for the volatile or dust inhalation pathways. These pathways will be included if relevant for historical chemicals only.
(b) It is assumed that soils outside of the former installation are not Impacted unless PFAS transport through groundwater or surface water has occurred. Soils in private gardens will be evaluated for residents, and flood-prone wetlands will be evaluated for exposure by recreational visitors. The Aroostook National Wildlife Refuge and lands owned by the Aroostook Band of Mi'kmaq are within the former installation boundary.
(c) Utility worker exposure to soil is assumed 0-6 ft and to include stormwater repairs.
(d) Includes parcels fully within the LDA boundary. Future subsurface exposure assumes redevelopment may occur including soil mixing.
(e) FTA, Landfill No. 2, Landfill No. 3, Structural Fire Station, Fire Department Training/Burn House, Crash Fire Station, Arch Hangar, Jet Engine Maintenance Building, Nose Dock No. 11, Nose Dock No. 40, Nose Dock No. 44, Aircraft Hardstands, Hardstand 19, Ramp No. 1, Fuel Tank Farm, Fuel Dump Area, Main Runway Foaming Area, KC-135 Crash Area, B-52 Crash Area, FLDD/IWTF, WWTP, Greenlaw Brook Drainage, and Butterfield Brook Drainage.
(f) The relevance of this pathway will be further explored in the BHHRA, and the final selection of receptors to which these pathways apply will be based on what data are available. Regardless, any pathway that is considered relevant to a given receptor will be evaluated. Risk evalautions based on measured data are preferred, but modeling or qualitative approaches may be considered where relevant.
(g) The Aroostook National Wildlife Refuge and lands owned by the Aroostook Band of Mi'kmaq are within the former installation boundary and it is assumed that soils may be impacted by surface release of PFAS, or PFAS transport through groundwater or surface water to flood-prone wetlands.
(h) Foraging is prohibited on the former Loring property. Therefore, it assumed that anyone foraging is unauthorized. The hypothetical future resident will include authorized foraging.
(i) There are potable wells on the ANWR property, therefore the outdoor worker and recreator will also be evaluated for potable use of groundwater on ANWR property only.
AFFF = Aqueous Film Forming Foam.
USEPA - United States Environmental Protection Agency.

Prepared by: ARQ 11/11/2021
Checked by: KALS 4/21/2022
Revised by: ARQ 1/20/2023

TABLES

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Table 2.1-1
Comparison of Soil PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

						Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Loring Residential Child SL	1.9	0.126	0.019	0.0126	0.019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Residential Adult SL	17.6	1.17	0.176	0.117	0.176	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Utility Worker SL	24.6	1.64	0.246	0.164	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Aircraft Hardstands	SB14001	LORNG-SB14001-(0-1)	10/4/2016	0.00-1.00	N	0.000447 U	0.000241 J	0.000224 U	0.00258 B	0.000136 Q	0.000447 UJ	0.000447 U	0.000224 UJ	0.000224 UJ	0.000447 U	0.000447 U	0.000224 U	0.000224 U	0.000447 U	0.000447 U	0.000224 U	0.000224 U	0.000119 Q
		LORNG-SB14001-(0-1)FD	10/4/2016	0.00-1.00	FD	0.000495 U	0.000495 U	0.000247 U	0.00188 B	0.000134 Q	0.000495 UJ	0.000495 U	0.000247 UJ	0.000247 UJ	0.000495 U	0.000171 J	0.000247 U	0.000247 U	0.000495 U	0.000249 J	0.000247 U	0.000247 U	0.000247 U
		LORNG-SB14001-(5-7)	10/4/2016	5.00-7.00	N	0.00047 U	0.00047 U	0.000235 U	0.000371 B	0.000155 Q	0.00047 UJ	0.00047 U	0.000235 UJ	0.000235 UJ	0.00047 U	0.00047 U	0.000235 U	0.000235 U	0.00047 U	0.00047 U	0.000235 U	0.000235 U	0.000108 B
		LORNG-SB14001-(13-15)	10/4/2016	13.00-15.00	N	0.000488 U	0.000488 U	0.000244 U	0.000488 U	0.00014 Q	0.000488 UJ	0.000488 U	0.000244 UJ	0.000244 UJ	0.000488 U	0.000488 U	0.000244 U	0.000244 U	0.000488 U	0.000488 U	0.000244 U	0.000244 U	0.000244 U
	SB14002	LORNG-SB14002-(0-1)	10/4/2016	0.00-1.00	N	0.000469 U	0.000244 J	0.000144 J	0.00167 B	0.000213 Q	0.000469 UJ	0.000469 U	0.000235 UJ	0.000235 UJ	0.000469 U	0.000195 J	0.000235 U	0.000119 J	0.000469 U	0.000469 U	0.000235 U	0.000235 U	0.000235 U
		LORNG-SB14002-(5-7)	10/4/2016	5.00-7.00	N	0.000478 U	0.000478 U	0.000239 U	0.000302 B	0.000095 Q	0.000367 Q	0.000478 U	0.000239 UJ	0.000239 UJ	0.000478 U	0.000478 U	0.000239 U	0.000239 U	0.000478 U	0.000478 U	0.000239 U	0.000239 U	0.000239 U
		LORNG-SB14002-(11-13)	10/4/2016	11.00-13.00	N	0.000443 U	0.000443 U	0.000094 J	0.000443 U	0.000166 Q	0.000443 UJ	0.000443 U	0.000222 UJ	0.000222 UJ	0.000443 U	0.000443 U	0.000222 U	0.000222 U	0.000443 U	0.000195 J	0.000222 U	0.000222 U	0.0001 B
	SB14003	LORNG-SB14003-(0-1)	10/4/2016	0.00-1.00	N	0.000481 U	0.000481 U	0.00024 U	0.000481 U	0.000136 Q	0.000481 UJ	0.000481 U	0.00024 UJ	0.00024 UJ	0.000481 U	0.000481 U	0.00024 U	0.00024 U	0.000481 U	0.000481 U	0.00024 U	0.00024 U	0.00024 U
		LORNG-SB14003-(5-7)	10/4/2016	5.00-7.00	N	0.0005 U	0.0005 U	0.00025 U	0.0005 U	0.00022 Q	0.0005 UJ	0.0005 U	0.00025 UJ	0.00025 UJ	0.0005 U	0.0005 U	0.00025 U	0.00025 U	0.0005 U	0.0005 U	0.00025 U	0.00025 U	0.000088 Q
		LORNG-SB14003-(19-21)	10/4/2016	19.00-21.00	N	0.000468 U	0.000468 U	0.000234 U	0.000468 U	0.000131 Q	0.000468 UJ	0.000468 U	0.000234 UJ	0.000234 UJ	0.000468 U	0.000468 U	0.000234 U	0.000234 U	0.000468 U	0.000468 U	0.000234 U	0.000234 U	0.000234 U
B-52 Crash Area	AA20SB-01	LORNG-SO-001-20151027	10/27/2015	0.00-1.00	N	0.00142 U	0.00142 U	0.00142 U	0.00533	0.00142 U	0.00142 U	0.00142 U	0.00712 UJ	0.00142 UJ	0.00142 U	0.00142 U	0.00142 U	0.00142 U	0.00142 U	0.00142 UJ	0.000369 Q	0.0095 U	0.00142 U
		LORNG-SO-002-20151027	10/27/2015	5.00-7.00	N	0.00147 U	0.00147 U	0.00147 U	0.000737 J	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 UJ	0.000468 Q	0.00979 U	0.00147 U
		LORNG-SO-DUP01-20151027	10/27/2015	5.00-7.00	FD	0.00123 U	0.00123 U	0.00123 U	0.00642	0.00123 U	0.00123 U	0.00123 U	0.00615 U	0.00123 UJ	0.00123 U	0.00123 U	0.00123 U	0.00123 U	0.00123 U	0.00123 UJ	0.000347 Q	0.0082 U	0.00123 U
		LORNG-SO-003-20151027	10/27/2015	14.00-15.00	N	0.00148 U	0.00148 U	0.00148 U	0.000803 J	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 UJ	0.000362 Q	0.00985 U	0.00148 U
	AA20SB-02	LORNG-SO-004-20151027	10/27/2015	0.00-1.00	N	0.0014 U	0.0014 U	0.0014 U	0.000544 J	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 UJ	0.0003 Q	0.00936 U	0.00702 U
		LORNG-SO-005-20151027	10/27/2015	5.00-7.00	N	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 U	0.00131 UJ	0.000469 Q	0.00871 U	0.00131 U
		LORNG-SO-006-20151027	10/27/2015	26.00-27.00	N	0.00134 U	0.00134 UJ	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 UJ	0.00036 Q	0.00896 U	0.00134 U
	AA20SB-03	LORNG-SO-007-20151027	10/27/2015	0.00-1.00	N	0.00134 U	0.00487	0.00134 U	0.0403	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00671 U	0.00134 U	0.00134 U	0.00134 UJ	0.000363 Q	0.0448 UJ	0.00134 U
		LORNG-SO-008-20151027	10/27/2015	5.00-7.00	N	0.00138 U	0.00293	0.00138 U	0.0363	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 UJ	0.000366 Q	0.00923 U	0.00692 U
		LORNG-SO-009-20151027	10/27/2015	14.00-15.00	N	0.00151 U	0.00904	0.00151 U	0.000549 J	0.00051 J	0.00151 U	0.00151 U	0.00151 U	0.00151 U	0.00151 U	0.00151 U	0.00151 U	0.00151 U	0.000544 J	0.00151 UJ	0.00151 U	0.01 U	0.00151 U
	AA20SB-04	LORNG-SO-010-20151027	10/27/2015	0.00-1.00	N	0.00144 U	0.000389 J	0.00144 U	0.00356	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 UJ	0.000366 Q	0.0096 U	0.00144 U
		LORNG-SO-011-20151027	10/27/2015	5.00-7.00	N	0.00145 U	0.00081 J	0.00145 U	0.0135	0.00145 U	0.00145 U	0.00145 U	0.00725 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 UJ	0.00037 Q	0.00967 U	0.00145 U
		LORNG-SO-012-20151027	10/27/2015	14.00-15.00	N	0.00142 U	0.00142 U	0.00142 U	0.00142 U	0.00142 U	0.00142 U	0.00142 U	0.00708 U	0.00142 U	0.00142 U	0.00142 U	0.00708 U	0.00142 U	0.00142 U	0.00142 UJ	0.000459 Q	0.00944 U	0.00142 U

Table 2.1-1
Comparison of Soil PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Area	Location	Sample ID	Sample Date	Sample Depth (ft.)	Sample Type	Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Loring Residential Child SL	1.9	0.126	0.019	0.0126	0.019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Residential Adult SL	17.6	1.17	0.176	0.117	0.176	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Utility Worker SL	24.6	1.64	0.246	0.164	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	Location	Sample ID	Sample Date	Sample Depth (ft.)	Sample Type	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BLDG 3005_STRUCTURAL FIRE STATION	SB/GW05001	LORNG-SB05001-(0-1)	9/20/2016	0.00-1.00	N	0.000489 U	0.00281	0.00138 J	0.0461 J	0.00204 B	0.00403 Q	0.00212 J	0.000245 U	0.000245 U	0.00135 J	0.000236 J	0.000245 U	0.000851 J	0.00131 J	0.00175 J	0.000245 UJ	0.000245 U	0.000254 B
		LORNG-SB05001-(0-1)S	9/20/2016	0.00-1.00	N	0.0003 U	0.0031	0.0018	0.046	0.0017 B	0.0003 U	0.00025 U	0.00014 U	0.00013 U	0.0016	0.00034 U	0.00029 U	0.001 J	0.00088 J	0.0021	0.00026 U	0.0003 U	0.00055 B
		LORNG-SB05001-(0-1)FD	9/20/2016	0.00-1.00	FD	0.000504 U	0.00247	0.00138 J	0.0429 J	0.00136 B	0.00444 J	0.00303 J	0.000252 U	0.000252 U	0.00108 B	0.00022 J	0.000252 U	0.000846 J	0.00112 J	0.00179 J	0.000252 UJ	0.000252 U	0.000263 B
		LORNG-SB05001-(5-7)	9/20/2016	5.00-7.00	N	0.000496 U	0.000553 J	0.000248 UJ	0.00547 Q	0.000124 U	0.000685 Q	0.000496 UJ	0.000248 U	0.000248 U	0.000496 U	0.000496 U	0.000248 U	0.000248 U	0.000496 U	0.000496 U	0.000248 UJ	0.000248 U	0.000248 U
		LORNG-SB05001-(11-13)	9/20/2016	11.00-13.00	N	0.000488 U	0.000247 J	0.000244 UJ	0.000868 Q	0.000122 U	0.000488 UJ	0.000488 UJ	0.000244 U	0.000244 U	0.000488 U	0.000488 U	0.000244 U	0.000244 U	0.000488 U	0.000488 U	0.000244 UJ	0.000244 U	0.000244 U
	SB05002	LORNG-SB05002-(0-1)	9/21/2016	0.00-1.00	N	0.0011 J	0.0764	0.0088	1.46	0.00687	0.036 J	0.0185	0.000251 U	0.000194 J	0.000501 U	0.002 J	0.000284 J	0.00407	0.00482	0.00662	0.000251 U	0.000251 U	0.00185 B
		LORNG-SB05002-(5-7)	9/21/2016	5.00-7.00	N	0.00113 J	0.022	0.000264 J	0.000832 B	0.00636	0.0123 J	0.000504 U	0.000252 U	0.000252 U	0.000527 B	0.000504 UJ	0.000252 U	0.00151 J	0.00241	0.0023	0.000252 U	0.000252 U	0.000252 U
		LORNG-SB05002-(13-15)	9/21/2016	13.00-15.00	N	0.00104 J	0.0232	0.000459 J	0.00503 B	0.00467	0.0111 J	0.000498 U	0.000249 U	0.000249 U	0.000633 B	0.000498 UJ	0.000249 U	0.00207	0.00383	0.00404	0.000249 U	0.000249 U	0.000249 U
	SB05003	LORNG-SB05003-(0-1)	9/20/2016	0.00-1.00	N	0.000501 U	0.00155 J	0.000123 J	0.0102 Q	0.000194 B	0.000501 UJ	0.000501 UJ	0.00025 U	0.00025 U	0.000256 B	0.000181 J	0.00025 U	0.00025 U	0.000213 J	0.000368 J	0.00025 UJ	0.00025 U	0.00025 U
		LORNG-SB05003-(5-7)	9/20/2016	5.00-7.00	N	0.000504 U	0.000504 U	0.000252 UJ	0.000504 UJ	0.000126 U	0.000504 UJ	0.000504 UJ	0.000252 U	0.000252 U	0.000504 U	0.000504 U	0.000252 U	0.000252 U	0.000504 U	0.000504 U	0.000252 UJ	0.000252 U	0.000252 U
		LORNG-SB05003-(9-11)	9/20/2016	9.00-11.00	N	0.000497 U	0.000497 U	0.000249 UJ	0.000497 UJ	0.000124 U	0.000497 UJ	0.000497 UJ	0.000249 U	0.000249 U	0.000497 U	0.000497 U	0.000249 U	0.000249 U	0.000497 U	0.000497 U	0.000249 UJ	0.000249 U	0.000249 U
	SB05004	LORNG-SB05004-(0-1)	9/20/2016	0.00-1.00	N	0.000487 U	0.00404	0.000233 J	0.149	0.00113 Q	0.00156 Q	0.000425 J	0.000243 U	0.000243 U	0.000253 B	0.000278 J	0.000243 U	0.000216 J	0.000656 J	0.000501 J	0.000243 U	0.000243 U	0.000406 B
		LORNG-SB05004-(5-9)	9/20/2016	5.00-9.00	N	0.000484 U	0.00104 J	0.000242 UJ	0.00387 Q	0.000121 U	0.000484 UJ	0.000484 UJ	0.000242 U	0.000242 U	0.000484 U	0.000484 U	0.000242 U	0.000242 U	0.000484 U	0.000484 U	0.000242 UJ	0.000242 U	0.000242 U
		LORNG-SB05004-(9-11)	9/20/2016	9.00-11.00	N	0.000486 U	0.000486 U	0.000243 UJ	0.000486 UJ	0.000122 U	0.000486 UJ	0.000486 UJ	0.000243 U	0.000243 U	0.000486 U	0.000486 U	0.000243 U	0.000243 U	0.000486 U	0.000486 U	0.000243 UJ	0.000243 U	0.000243 U
	SS05005	LORNG-SS05005-083116	8/31/2016	0.00-1.00	N	0.000502 U	0.005	0.000933 J	0.141	0.00129 J	0.00185 J	0.00679	0.000251 UJ	0.000251 U	0.000229 J	0.000717 J	0.000251 U	0.00133 J	0.00096 J	0.00122 J	0.000192 Q	0.000251 U	0.000632 B
BLDG 6900_FIRE DEPT TRAIN BURN HOUS	SB/GW06003	LORNG-SB06003-(0-1)	9/15/2016	0.00-1.00	N	0.0005 U	0.000538 J	0.00025 U	0.00927 B	0.000182 Q	0.00691 J	0.000968 J	0.00025 UJ	0.00025 UJ	0.0005 UJ	0.0005 U	0.00025 UJ	0.00025 U	0.0005 U	0.0005 U	0.000144 Q	0.00025 UJ	0.000125 Q
		LORNG-SB06003-(5-7)	9/15/2016	5.00-7.00	N	0.00048 U	0.00048 UJ	0.00024 U	0.00267 B	0.000093 Q	0.00048 UJ	0.00048 U	0.00024 UJ	0.00024 UJ	0.00048 UJ	0.00048 U	0.00024 UJ	0.00024 U	0.00048 U	0.00048 U	0.000091 Q	0.00024 UJ	0.000299 Q
	SB/OW06001	LORNG-SB06001-(0-1)	9/15/2016	0.00-1.00	N	0.000492 U	0.000713 J	0.000467 J	0.0107	0.000504 Q	0.000594 Q	0.000326 J	0.000246 UJ	0.000246 UJ	0.000255 Q	0.000492 U	0.000246 UJ	0.000242 J	0.000238 J	0.000382 J	0.000139 Q	0.000246 UJ	0.000299 Q
		LORNG-SB06001-(0-1)FD	9/15/2016	0.00-1.00	FD	0.000483 U	0.000502 J	0.000543 J	0.0119	0.000848 Q	0.000668 Q	0.000483 U	0.000242 UJ	0.000242 UJ	0.000405 Q	0.000483 U	0.000242 UJ	0.000419 J	0.000355 J	0.00057 J	0.000096 Q	0.000242 UJ	0.000468 Q
		LORNG-SB06001-(5-7)	9/15/2016	5.00-7.00	N	0.000498 U	0.000498 UJ	0.000249 U	0.00128 B	0.000089 Q	0.000498 UJ	0.000498 U	0.000249 UJ	0.000249 UJ	0.000498 UJ	0.000498 U	0.000249 UJ	0.000249 U	0.000498 U	0.000498 U	0.000121 Q	0.000249 UJ	0.000302 Q
	SB06002	LORNG-SB06002-(0-1)	9/19/2016	0.00-1.00	N	0.000499 U	0.000871 J	0.000126 J	0.0105 B	0.000514 Q	0.0622 J	0.00506 J	0.000249 U	0.000249 U	0.000184 B	0.000499 U	0.000244 J	0.000298 J	0.000429 J	0.000502 J	0.000249 U	0.000249 U	0.000123 Q
		LORNG-SB06002-(0-1)FD	9/19/2016	0.00-1.00	FD	0.000482 U	0.00118 J	0.000241 U	0.012 B	0.000533 Q	0.0533 J	0.0044 J	0.000241 U	0.000241 U	0.000174 B	0.000482 U	0.000135 J	0.000345 J	0.000491 J	0.000484 J	0.000241 U	0.000241 U	0.000166 Q
		LORNG-SB06002-(5-7)	9/19/2016	5.00-7.00	N	0.00049 U	0.0009 J	0.000245 U	0.00445 B	0.000296 Q	0.00182 Q	0.00111 J	0.000245 U	0.000245 U	0.00049 U	0.00049 U	0.000245 U	0.000293 J	0.00049 U	0.00049 U	0.000245 U	0.000245 U	0.000245 U
	SB06004	LORNG-SB06004-(0-1)	9/19/2016	0.00-1.00	N	0.000481 U	0.00177 J	0.000111 J	0.0273	0.000604 Q	0.0241 J	0.00383 J	0.00024 U	0.00024 U	0.000481 U	0.000481 U	0.00024 U	0.000378 J	0.000468 J	0.000453 J	0.00024 U	0.00024 U	0.00024 U
		LORNG-SB06004-(5-7)	9/19/2016	5.00-7.00	N	0.000495 U	0.000738 J	0.000247 U	0.00319 B	0.000208 Q	0.000651 Q	0.000577 J	0.000247 U	0.000247 U	0.000495 U	0.000495 U	0.000247 U	0.000129 J	0.000495 U	0.000495 U	0.000247 U	0.000247 U	0.000247 U

Table 2.1-1
Comparison of Soil PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

						Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Loring Residential Child SL	1.9	0.126	0.019	0.0126	0.019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Residential Adult SL	17.6	1.17	0.176	0.117	0.176	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Utility Worker SL	24.6	1.64	0.246	0.164	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BLDG 8260_JET ENGINE MAINTENANCE	SB09001	LORNG-SB09001-(0-1)	9/22/2016	0.00-1.00	N	0.0005 U	0.0005 U	0.00025 U	0.000838 Q	0.000074 B	0.0005 UJ	0.00031 J	0.00025 U	0.00025 U	0.0005 U	0.0005 UJ	0.00025 U	0.00025 U	0.0005 U	0.0005 U	0.00025 U	0.00025 U	0.000149 Q
		LORNG-SB09001-(0-1)FD	9/22/2016	0.00-1.00	FD	0.000494 U	0.000494 U	0.000247 U	0.00123 Q	0.00011 Q	0.000494 UJ	0.000494 U	0.000247 U	0.000247 U	0.000494 U	0.000494 U	0.000247 U	0.000247 U	0.000494 U	0.000494 U	0.000247 U	0.000247 U	0.0004 B
		LORNG-SB09001-(7-9)	9/23/2016	7.00-9.00	N	0.000499 U	0.000499 U	0.00025 U	0.000499 U	0.000084 B	0.000499 UJ	0.000499 U	0.00025 U	0.00025 U	0.000499 U	0.000499 UJ	0.00025 U	0.00025 U	0.000499 U	0.000499 U	0.00025 U	0.00025 U	0.000099 B
		LORNG-SB09001-(15-17)	9/23/2016	15.00-17.00	N	0.000502 U	0.000502 U	0.000251 U	0.000502 U	0.00007 B	0.000502 UJ	0.000502 U	0.000251 U	0.000251 U	0.000502 U	0.000502 UJ	0.000251 U	0.000251 U	0.000502 U	0.000502 U	0.000251 U	0.000251 U	0.000251 U
	SB09002	LORNG-SB09002-(0-1)	9/26/2016	0.00-1.00	N	0.000488 U	0.000488 U	0.000244 U	0.000262 B	0.000352 B	0.000488 U	0.000488 U	0.000248 UJ	0.000248 UJ	0.000488 U	0.000488 U	0.000248 U	0.000173 J	0.000488 U	0.000488 U	0.000248 U	0.000248 U	0.000227 Q
		LORNG-SB09002-(5-7)	9/26/2016	5.00-7.00	N	0.000494 U	0.000293 J	0.000247 U	0.000601 B	0.000342 B	0.000494 U	0.000494 U	0.000241 UJ	0.000241 UJ	0.000155 B	0.000494 U	0.000247 U	0.000183 J	0.000494 U	0.000494 U	0.000247 UJ	0.000247 UJ	0.000165 B
		LORNG-SB09002-(17-19)	9/26/2016	17.00-19.00	N	0.000492 U	0.000492 U	0.000246 U	0.000492 U	0.000091 B	0.000492 U	0.000492 U	0.000246 UJ	0.000246 UJ	0.000492 U	0.000492 U	0.000246 U	0.000246 U	0.000492 U	0.000492 U	0.000246 U	0.000246 U	0.000082 B
	SB09003	LORNG-SB09003-(0-1)	9/26/2016	0.00-1.00	N	0.000497 U	0.000497 U	0.000248 U	0.00535 B	0.000143 Q	0.000497 UJ	0.000497 U	0.000605 J	0.000248 U	0.000497 U	0.000375 J	0.000325 J	0.000248 U	0.000497 U	0.000497 U	0.000134 Q	0.000248 UJ	0.000434 B
		LORNG-SB09003-(5-7)	9/26/2016	5.00-7.00	N	0.000488 U	0.000488 U	0.000244 U	0.00109 B	0.000253 B	0.000488 U	0.000488 U	0.000248 U	0.000248 UJ	0.000488 U	0.000488 U	0.000244 U	0.000161 J	0.000488 U	0.000488 U	0.000248 U	0.000244 U	0.000244 U
		LORNG-SB09003-(15-17)	9/26/2016	15.00-17.00	N	0.000489 U	0.000489 U	0.000245 U	0.000489 U	0.000226 B	0.000489 U	0.000489 U	0.000251 UJ	0.000251 UJ	0.000489 U	0.000489 U	0.000251 U	0.000164 J	0.000489 U	0.000489 U	0.000251 U	0.000251 U	0.000251 U
BLDG 8744_NOSE DOCK NO 44	SB/OW12001	LORNG-SB12001-(0-1)	9/21/2016	0.00-1.00	N	0.000492 U	0.000894 J	0.00022 J	0.0123 B	0.000327 B	0.000229 Q	0.000492 UJ	0.000246 U	0.000246 U	0.000492 U	0.000492 UJ	0.000246 U	0.000171 J	0.000344 J	0.000281 J	0.000246 U	0.000246 U	0.00027 B
		LORNG-SB12001-(0-1)FD	9/21/2016	0.00-1.00	FD	0.000491 U	0.000421 J	0.000245 U	0.00907 B	0.000264 B	0.000491 UJ	0.000491 U	0.000245 U	0.000245 U	0.000491 U	0.000491 UJ	0.000245 U	0.000245 U	0.000491 U	0.000491 U	0.000245 U	0.000245 U	0.000245 U
		LORNG-SB12001-(5-7)	9/21/2016	5.00-7.00	N	0.000488 U	0.000488 U	0.000244 U	0.00208 B	0.000075 B	0.000488 UJ	0.000488 U	0.000244 U	0.000244 U	0.000488 U	0.000488 UJ	0.000244 U	0.000244 U	0.000488 U	0.000488 U	0.000244 U	0.000244 U	0.000092 B
		LORNG-SB12001-(13-15)	9/21/2016	13.00-15.00	N	0.000494 U	0.000285 J	0.000247 U	0.000494 U	0.000344 B	0.000494 UJ	0.000494 U	0.000247 U	0.000247 U	0.000494 U	0.000494 UJ	0.000247 U	0.000247 U	0.000494 U	0.000494 U	0.000247 U	0.000247 U	0.000247 U
	SB12002	LORNG-SB12002-(0-1)	9/22/2016	0.00-1.00	N	0.000491 U	0.00223	0.000246 U	0.0721	0.000234 B	0.000491 UJ	0.000491 U	0.000246 U	0.000246 U	0.000491 U	0.000491 UJ	0.000246 U	0.000246 U	0.000422 J	0.000491 U	0.000246 U	0.000246 U	0.000172 B
		LORNG-SB12002-(5-7)	9/22/2016	5.00-7.00	N	0.000495 U	0.000928 J	0.000248 U	0.000627 B	0.000273 B	0.000244 Q	0.000495 U	0.000248 U	0.000248 U	0.000495 U	0.000495 U	0.000248 U	0.000176 J	0.000495 UJ	0.000495 U	0.000248 U	0.000248 U	0.000248 U
		LORNG-SB12002-(9-11)	9/22/2016	9.00-11.00	N	0.000497 U	0.00155 J	0.000249 U	0.000497 U	0.000202 B	0.000497 UJ	0.000497 U	0.000249 U	0.000083 J	0.000497 U	0.000497 UJ	0.000249 U	0.000249 U	0.000497 U	0.000497 U	0.000249 U	0.000249 U	0.000249 U
	SB12003	LORNG-SB12003-(0-1)	9/22/2016	0.00-1.00	N	0.000503 U	0.000527 J	0.000251 U	0.00809 B	0.00146 B	0.00062 Q	0.000503 U	0.000251 U	0.000251 U	0.000385 B	0.000503 UJ	0.000251 U	0.000554 J	0.000656 J	0.000623 J	0.000251 U	0.000251 U	0.000397 B
		LORNG-SB12003-(7-9)	9/22/2016	7.00-9.00	N	0.000497 U	0.000497 U	0.000249 U	0.00306 B	0.000086 B	0.000497 UJ	0.000497 U	0.000249 U	0.000249 U	0.000497 U	0.000497 UJ	0.000249 U	0.000249 U	0.000497 U	0.000497 U	0.000249 U	0.000249 U	0.000249 U
	SB12004	LORNG-SB12004-(0-1)	9/22/2016	0.00-1.00	N	0.000495 U	0.00292	0.000149 J	0.0422	0.000535 B	0.000904 Q	0.0005 J	0.000248 U	0.000248 U	0.000495 U	0.000145 J	0.000248 U	0.000217 J	0.000565 J	0.000239 J	0.000248 U	0.000248 U	0.000151 B
		LORNG-SB12004-(5-7)	9/22/2016	5.00-7.00	N	0.000492 U	0.000382 J	0.000246 U	0.000958 B	0.000075 B	0.000705 Q	0.000492 U	0.000246 U	0.000246 U	0.000492 U	0.000492 UJ	0.000246 U	0.000246 U	0.000492 U	0.000492 U	0.000246 U	0.000246 U	0.000246 U
		LORNG-SB12004-(11-13)	9/22/2016	11.00-13.00	N	0.000495 U	0.000354 J	0.000247 U	0.00475 B	0.000095 B	0.000495 UJ	0.000495 U	0.000247 U	0.000247 U	0.000495 U	0.000495 UJ	0.000247 U	0.000247 U	0.000495 U	0.000495 U	0.000247 U	0.000247 U	0.000247 U

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						Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Loring Residential Child SL	1.9	0.126	0.019	0.0126	0.019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Residential Adult SL	17.6	1.17	0.176	0.117	0.176	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Utility Worker SL	24.6	1.64	0.246	0.164	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Crash Fire Station	AA07SB-01	LORNG-SO-019-20151031	10/31/2015	0.00-1.00	N	0.00147 U	0.0171	0.00623	0.253	0.00588	0.0287	0.0218 J	0.00736 U	0.00147 UJ	0.00147 U	0.00126 J	0.00147 U	0.00167 J	0.00421	0.00376	0.000379 Q	0.00982 U	0.00165 J
		LORNG-SO-020-20151031	10/31/2015	5.00-7.00	N	0.00228 J	0.0565	0.00144 U	0.000592 J	0.0432	0.0165	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00473	0.0104	0.00608	0.000409 Q	0.00962 U	0.00144 U
		LORNG-SO-021-20151031	10/31/2015	17.00-18.00	N	0.000828 J	0.0234	0.000618 J	0.0463	0.00708	0.0258	0.00133 J	0.00137 U	0.00137 U	0.000328 J	0.00137 U	0.00137 U	0.000639 J	0.00271 J	0.00114 J	0.000431 Q	0.00915 U	0.00137 U
	AA07SB-02	LORNG-SO-022-20151101	11/1/2015	0.00-1.00	N	0.00149 UJ	0.0438 J	0.00168 J	0.949	0.0375	0.185	0.042 J	0.00141 J	0.00149 U	0.00267 J	0.00149 U	0.00149 U	0.00482	0.0217	0.00587	0.000487 Q	0.00996 UJ	0.00149 U
		LORNG-SO-023-20151101	11/1/2015	5.00-7.00	N	0.000788 J	0.0266 J	0.00113 J	0.85	0.00592	0.0975 J	0.00808 J	0.00145 U	0.00145 U	0.00093 J	0.000729 J	0.00145 U	0.00116 J	0.00589	0.00267 J	0.000572 Q	0.00966 U	0.00145 U
		LORNG-SO-024-20151101	11/1/2015	18.00-20.00	N	0.00112 J	0.0698	0.000347 J	0.128	0.0138	0.109	0.0021 J	0.00147 U	0.00147 U	0.000761 J	0.00147 U	0.00147 U	0.00123 J	0.00565	0.00248 J	0.000508 Q	0.00983 U	0.00147 U
	AA07SB-03	LORNG-SO-025-20151101	11/1/2015	0.00-1.00	N	0.0015 U	0.000847 J	0.000432 J	0.0307	0.000541 J	0.0015 U	0.0015 U	0.00749 UJ	0.0015 UJ	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.000258 J	0.000454 B	0.00998 U	0.0015 U
		LORNG-SO-026-20151101	11/1/2015	5.00-7.00	N	0.00148 U	0.00126 J	0.000472 J	0.0534	0.00047 J	0.00148 U	0.00148 U	0.0074 UJ	0.00148 UJ	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.000228 J	0.000419 B	0.00987 U	0.00148 U
		LORNG-SO-027-20151101	11/1/2015	9.00-10.00	N	0.00146 U	0.000453 J	0.00146 U	0.0122	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.000469 Q	0.00973 U	0.00146 U
	AA07SB-04	LORNG-SO-028-20151101	11/1/2015	0.00-1.00	N	0.0012 J	0.043 J	0.0115	3.57	0.0143	0.163	0.119 J	0.0293 UJ	0.00147 UJ	0.00278 J	0.00259 J	0.00147 U	0.00491	0.00922	0.0111	0.000464 B	0.00978 U	0.00112 J
		LORNG-SO-DUP03-20151101	11/1/2015	0.00-1.00	FD	0.00124 J	0.0422 J	0.012	3.5	0.0154	0.161	0.121 J	0.00148 UJ	0.00148 U	0.00358	0.00276 J	0.00148 U	0.00541	0.01	0.0113	0.000418 B	0.00984 U	0.00111 J
		LORNG-SO-029-20151101	11/1/2015	5.00-7.00	N	0.00232 J	0.0681 J	0.00518	1.51	0.00901	0.164	0.084 J	0.00146 U	0.00146 U	0.00169 J	0.00146 U	0.00146 U	0.00283 J	0.00608	0.00774	0.000407 Q	0.00974 U	0.00146 U
		LORNG-SO-030-20151101	11/1/2015	10.00-12.00	N	0.00143 J	0.00711 J	0.000162 J	0.0145	0.00106 J	0.00829	0.000635 J	0.00146 U	0.00146 U	0.000347 J	0.00146 U	0.00112 J	0.000675 J	0.00179 J	0.00185 J	0.000498 Q	0.00974 U	0.00146 U
Fire Training Area	SB/OW01001	LORNG-SB01001-(0-1)	9/27/2016	0.00-1.00	N	0.000482 U	0.00313 J	0.000702 J	0.0323 J	0.0015 B	0.00217 B	0.000727 J	0.000253 UJ	0.000253 UJ	0.000383 B	0.000325 J	0.000243 J	0.00115 J	0.00119 J	0.00134 J	0.000253 U	0.000253 U	0.00127 B
		LORNG-SB01001-(0-1)FD	9/27/2016	0.00-1.00	FD	0.000232 J	0.00518 J	0.000977 J	0.0552 J	0.00281	0.00245 B	0.00171 J	0.000245 UJ	0.000245 U	0.000578 B	0.000614 J	0.000258 J	0.00178 J	0.00206	0.00249	0.000245 UJ	0.000245 UJ	0.00215 Q
		LORNG-SB01001-(5-7)	9/27/2016	5.00-7.00	N	0.000485 U	0.000872 J	0.000243 U	0.0133 B	0.000465 B	0.00452	0.00261	0.000243 UJ	0.000243 U	0.000485 U	0.000485 U	0.000243 U	0.00024 J	0.000822 J	0.000299 J	0.000243 UJ	0.000243 UJ	0.000179 B
		LORNG-SB01001-(15-17)	9/27/2016	15.00-17.00	N	0.000284 J	0.0037	0.000159 J	0.0325	0.000709 B	0.0229	0.00991 J	0 R	0 R	0.000493 U	0.000244 J	0.000247 U	0.000396 J	0.000609 J	0.000555 J	0.000239 UJ	0.000247 UJ	0.000247 U
	SB01002	LORNG-SB01002-(0-1)	9/27/2016	0.00-1.00	N	0.000744 J	0.0275	0.000909 J	0.102	0.00384	0.00278 B	0.00272	0.000246 UJ	0.000246 U	0.0016 J	0.000505 J	0.000609 J	0.00102 J	0.00353	0.00254	0.000246 UJ	0.000246 UJ	0.00216 Q
		LORNG-SB01002-(5-7)	9/27/2016	5.00-7.00	N	0.000496 U	0.00376	0.000248 U	0.0235	0.000425 Q	0.0052 J	0.0229	0.000248 UJ	0.000248 U	0.000496 U	0.000496 U	0.000248 U	0.000248 U	0.000334 J	0.000496 U	0.000248 UJ	0.000248 UJ	0.000119 B
		LORNG-SB01002-(13-15)	9/27/2016	13.00-15.00	N	0.000285 J	0.00504	0.00018 J	0.0379	0.00102 B	0.00328 B	0.00359	0.000245 UJ	0.000245 U	0.000491 U	0.000491 U	0.000245 U	0.000406 J	0.00113 J	0.000442 J	0.000245 UJ	0.000245 UJ	0.000129 B
	SB01003	LORNG-SB01003-(0-1)	9/28/2016	0.00-1.00	N	0.000505 UJ	0.00434	0.000429 J	0.033	0.00147 Q	0.0059 J	0.00251	0.000252 UJ	0.000252 U	0.000483 B	0.000512 J	0.000252 U	0.000938 J	0.0011 J	0.00116 J	0.000252 UJ	0.000252 UJ	0.00117 B
		LORNG-SB01003-(5-7)	9/28/2016	5.00-7.00	N	0.000492 U	0.000682 J	0.000246 U	0.0165	0.000136 Q	0.000652 Q	0.00881	0.000246 UJ	0.000246 U	0.000492 U	0.000492 U	0.000246 U	0.000246 U	0.000492 U	0.000492 U	0.000246 UJ	0.000246 UJ	0.000101 B
	SB01004	LORNG-SB01004-(0-1)	9/27/2016	0.00-1.00	N	0.000487 U	0.0121	0.00065 J	0.073	0.00379 J	0.00779 J	0.00418	0.000244 UJ	0.000244 U	0.000721 B	0.000204 J	0.000151 J	0.00148 J	0.00204	0.00124 J	0.000244 UJ	0.000244 UJ	0.00149 B
		LORNG-SB01004-(5-7)	9/27/2016	5.00-7.00	N	0.000489 U	0.00602	0.000479 J	0.00724 B	0.00149 B	0.000489 U	0.000489 U	0.000245 UJ	0.000245 U	0.000489 U	0.000489 U	0.000245 U	0.000292 J	0.000464 J	0.000293 J	0.000245 UJ	0.000245 UJ	0.00014 Q
		LORNG-SB01004-(11-13)	9/27/2016	11.00-13.00	N	0.000502 U	0.0029	0.000251 U	0.00951 B	0.00102 B	0.000284 B	0.000502 U	0.000251 UJ	0.000251 U	0.000502 U	0.000502 U	0.000251 U	0.000356 J	0.000378 J	0.000246 J	0.000251 UJ	0.000251 UJ	0.000141 B

Table 2.1-1
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Former Loring Air Force Base
Limestone, Maine

						Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Loring Residential Child SL	1.9	0.126	0.019	0.0126	0.019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Residential Adult SL	17.6	1.17	0.176	0.117	0.176	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Utility Worker SL	24.6	1.64	0.246	0.164	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
FUEL DUMP AREA	SB/OW17001	LORNG-SB17001-(0-1)	9/29/2016	0.00-1.00	N	0.000505 UJ	0.000248 J	0.000252 U	0.00326 Q	0.000074 Q	0.000505 UJ	0.000505 U	0.000252 UJ	0.000252 U	0.000505 U	0.000505 U	0.000252 U	0.000252 U	0.000505 U	0.000505 U	0.000252 UJ	0.000252 UJ	0.000219 B
		LORNG-SB17001-(0-1)FD	9/29/2016	0.00-1.00	FD	0.000492 UJ	0.000284 J	0.000246 U	0.00377 Q	0.000095 Q	0.000492 UJ	0.000492 U	0.000246 UJ	0.000246 U	0.000492 U	0.000492 U	0.000246 U	0.000246 U	0.000492 U	0.000492 U	0.000246 UJ	0.000246 UJ	0.000207 B
		LORNG-SB17001-(5-7)	9/29/2016	5.00-7.00	N	0.000458 U	0.000458 U	0.000229 U	0.000458 U	0.000114 UJ	0.000458 UJ	0.000458 U	0.000229 UJ	0.000229 U	0.000458 U	0.000458 U	0.000229 U	0.000229 U	0.000458 U	0.000458 U	0.000229 UJ	0.000229 UJ	0.000101 Q
		LORNG-SB17001-(27-29)	9/29/2016	27.00-29.00	N	0.000483 U	0.000483 U	0.000242 U	0.000483 U	0.000121 UJ	0.000483 UJ	0.000483 U	0.000242 UJ	0.000242 U	0.000483 U	0.000483 U	0.000242 U	0.000242 U	0.000483 U	0.000483 U	0.000242 UJ	0.000242 UJ	0.0001 B
	SB17002	LORNG-SB17002-(0-1)	9/29/2016	0.00-1.00	N	0.000512 U	0.000512 U	0.000223 J	0.00258 B	0.000182 Q	0.000512 UJ	0.000512 U	0.000256 U	0.000256 UJ	0.000512 U	0.000512 U	0.000256 U	0.000256 U	0.000512 U	0.000512 U	0.000256 U	0.000256 U	0.00011 B
		LORNG-SB17002-(5-7)	9/29/2016	5.00-7.00	N	0.000496 U	0.000496 U	0.000248 U	0.000496 U	0.000124 UJ	0.000496 UJ	0.000496 U	0.000248 U	0.000248 UJ	0.000496 U	0.000496 U	0.000248 U	0.000248 U	0.000496 U	0.000496 U	0.000248 U	0.000248 U	0.000248 U
		LORNG-SB17002-(19-21)	9/29/2016	19.00-21.00	N	0.000479 U	0.000479 U	0.000239 U	0.000479 U	0.00012 UJ	0.000479 UJ	0.000479 U	0.000239 U	0.000239 UJ	0.000479 U	0.000479 U	0.000239 U	0.000239 U	0.000479 U	0.000479 U	0.000239 U	0.000239 U	0.000239 U
	SB17003	LORNG-SB17003-(0-1)	9/30/2016	0.00-1.00	N	0.000471 U	0.000471 U	0.000236 U	0.0022 B	0.000191 Q	0.000471 UJ	0.000471 U	0.000236 U	0.000236 UJ	0.000471 U	0.000471 U	0.000236 U	0.000236 U	0.000471 U	0.000471 U	0.000236 U	0.000236 U	0.000236 U
		LORNG-SB17003-(5-7)	9/30/2016	5.00-7.00	N	0.000502 U	0.000502 U	0.000251 U	0.000502 U	0.000125 UJ	0.000502 UJ	0.000502 U	0.000251 U	0.000251 UJ	0.000502 U	0.000502 U	0.000251 U	0.000251 U	0.000502 U	0.000502 U	0.000251 U	0.000251 U	0.000251 U
		LORNG-SB17003-(19-21)	9/30/2016	19.00-21.00	N	0.000476 U	0.000476 U	0.000238 U	0.000476 U	0.000119 UJ	0.000476 UJ	0.000476 U	0.000238 U	0.000238 UJ	0.000476 U	0.000476 U	0.000238 U	0.000238 U	0.000476 U	0.000476 U	0.000238 U	0.000238 U	0.000238 U
Fuels Tank Farm	SB/OW16001	LORNG-SB16001-(0-1)	9/14/2016	0.00-1.00	N	0.000486 U	0.000486 UJ	0.000243 U	0.00104 B	0.000067 Q	0.000486 UJ	0.000486 U	0.000243 UJ	0.000243 UJ	0.000486 UJ	0.000486 U	0.000243 UJ	0.000243 U	0.000486 U	0.000486 U	0.000113 Q	0.000243 UJ	0.000313 Q
		LORNG-SB16001-(0-1)FD	9/14/2016	0.00-1.00	FD	0.000486 U	0.000235 J	0.000243 U	0.00153 B	0.000107 Q	0.000486 UJ	0.000486 U	0.000243 UJ	0.000243 UJ	0.000486 UJ	0.000486 U	0.000243 UJ	0.000243 U	0.000486 U	0.000338 J	0.000184 Q	0.000243 UJ	0.000201 Q
		LORNG-SB16001-(3-5)	9/14/2016	3.00-5.00	N	0.000494 U	0.000494 UJ	0.000247 U	0.000494 U	0.000121 Q	0.000494 UJ	0.000494 U	0.000247 UJ	0.000247 UJ	0.000494 UJ	0.000494 U	0.000247 UJ	0.000247 U	0.000494 U	0.000494 U	0.000141 Q	0.000247 UJ	0.000399 Q
	SB16002	LORNG-SB16002-(0-1)	9/14/2016	0.00-1.00	N	0.000497 U	0.000362 J	0.000104 J	0.00567 B	0.000484 Q	0.000497 UJ	0.000497 U	0.000249 UJ	0.000249 UJ	0.000497 UJ	0.000497 U	0.000249 UJ	0.000249 U	0.000237 J	0.000497 U	0.000117 Q	0.000249 UJ	0.000233 Q
		LORNG-SB16002-(5-7)	9/14/2016	5.00-7.00	N	0.0005 U	0.0005 UJ	0.00025 U	0.00299 B	0.000158 Q	0.0005 UJ	0.0005 U	0.000084 J	0.00025 UJ	0.0005 UJ	0.0005 U	0.00025 UJ	0.00025 U	0.0005 U	0.0005 U	0.000146 Q	0.00025 UJ	0.000249 Q
		LORNG-SB16002-(9-11)	9/14/2016	9.00-11.00	N	0.000491 U	0.000491 UJ	0.000246 U	0.000239 B	0.000109 Q	0.000491 UJ	0.000491 U	0.000246 UJ	0.000246 UJ	0.000491 UJ	0.000491 U	0.000246 UJ	0.000246 U	0.000491 U	0.000491 U	0.000088 Q	0.000246 UJ	0.000175 Q
	SB16003	LORNG-SB16003-(0-1)	9/13/2016	0.00-1.00	N	0.00048 U	0.00048 UJ	0.00024 U	0.00033 B	0.000135 Q	0.00048 UJ	0.00048 U	0.00024 UJ	0.00024 UJ	0.00048 UJ	0.00048 U	0.00024 UJ	0.00024 U	0.00048 U	0.00048 U	0.000146 Q	0.00024 UJ	0.000222 Q
		LORNG-SB16003-(5-7)	9/13/2016	5.00-7.00	N	0.000502 U	0.000502 UJ	0.000251 U	0.000502 U	0.00012 Q	0.000502 UJ	0.000502 U	0.000251 UJ	0.000251 UJ	0.000502 UJ	0.000502 U	0.000251 UJ	0.000251 U	0.000502 U	0.000502 U	0.000149 Q	0.000251 UJ	0.000173 Q
		LORNG-SB16003-(7-8)	9/13/2016	7.00-8.00	N	0.000497 U	0.000497 UJ	0.000248 U	0.000497 U	0.000161 Q	0.000497 UJ	0.000497 U	0.000248 UJ	0.000248 UJ	0.000497 UJ	0.000497 U	0.000248 UJ	0.000248 U	0.000497 U	0.000497 U	0.000321 Q	0.000248 UJ	0.000212 Q
	SB16004	LORNG-SB16004-(0-1)	9/13/2016	0.00-1.00	N	0.000501 U	0.000501 UJ	0.00025 U	0.000685 B	0.000183 Q	0.000501 UJ	0.000501 U	0.00025 UJ	0.00025 UJ	0.000501 UJ	0.000501 U	0.00025 UJ	0.000511 J	0.000501 U	0.000501 U	0.000142 Q	0.00025 UJ	0.000231 Q
		LORNG-SB16004-(5-7)	9/13/2016	5.00-7.00	N	0.000498 U	0.000498 UJ	0.000249 U	0.000498 U	0.000138 Q	0.000498 UJ	0.000498 U	0.000249 UJ	0.000249 UJ	0.000498 UJ	0.000498 U	0.000249 UJ	0.000249 U	0.000498 U	0.000498 U	0.000249 UJ	0.000249 UJ	0.00025 Q

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						Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Loring Residential Child SL	1.9	0.126	0.019	0.0126	0.019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Residential Adult SL	17.6	1.17	0.176	0.117	0.176	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Utility Worker SL	24.6	1.64	0.246	0.164	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
KC-135 Crash Area	AA19SB-01	LORNG-SO-031-20151030	10/30/2015	0.00-1.00	N	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.000409 Q	0.00966 U	0.00145 U
		LORNG-SO-032-20151030	10/30/2015	5.00-7.00	N	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.000424 Q	0.00993 U	0.00149 U
		LORNG-SO-033-20151030	10/30/2015	18.00-20.00	N	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.0098 U	0.00147 U
	AA19SB-02	LORNG-SO-034-20151030	10/30/2015	0.00-1.00	N	0.00148 U	0.000612 J	0.00148 U	0.00223 J	0.000279 J	0.00148 U	0.00148 U	0.00742 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.000416 Q	0.0099 U	0.00148 U
		LORNG-SO-035-20151030	10/30/2015	3.00-4.00	N	0.0015 U	0.0015 U	0.0015 U	0.000463 J	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.000388 Q	0.01 U	0.0015 U
	AA19SB-03	LORNG-SO-037-20151030	10/30/2015	0.00-1.00	N	0.00146 U	0.00146 U	0.00146 U	0.00202 J	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.000453 Q	0.00975 U	0.00146 U
		LORNG-SO-DUP04-20151030	10/30/2015	0.00-1.00	FD	0.00146 U	0.000516 J	0.00146 U	0.00285 J	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.000401 Q	0.00971 U	0.00146 U
		LORNG-SO-038-20151030	10/30/2015	5.00-7.00	N	0.00155 U	0.0025 J	0.00155 U	0.00257 J	0.000447 J	0.00155 U	0.00155 U	0.00155 U	0.00155 U	0.00155 U	0.00155 U	0.00155 U	0.00155 U	0.00155 U	0.00155 U	0.00155 U	0.0103 U	0.00155 U
		LORNG-SO-039-20151030	10/30/2015	19.00-20.00	N	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.000349 Q	0.00997 U	0.0015 U
	AA19SB-04	LORNG-SO-040-20151031	10/31/2015	0.00-1.00	N	0.00144 U	0.00144 U	0.00144 U	0.000393 J	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.000304 Q	0.00963 U	0.00144 U
		LORNG-SO-041-20151031	10/31/2015	5.00-7.00	N	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.000375 Q	0.00921 U	0.00138 U
		LORNG-SO-042-20151031	10/31/2015	19.00-21.00	N	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.000416 Q	0.00924 U	0.00139 U
	AA19SS-01	LORNG-SS-001-20151102	11/2/2015	0.00-0.50	N	0.00149 U	0.00149 U	0.00149 U	0.000622 J	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00045 Q	0.00991 UJ	0.00149 U
	SS19005	LORNG-SS19005-083116	8/31/2016	0.00-1.00	N	0.000728 U	0.00353	0.00112 J	0.0316 J	0.00203 J	0.000728 UJ	0.000728 UJ	0.000364 UJ	0.000364 U	0.000865 J	0.000743 J	0.000364 U	0.00084 J	0.00109 J	0.000647 J	0.000249 Q	0.000188 J	0.00104 B
		LORNG-SS19005-083116FD	8/31/2016	0.00-1.00	FD	0.000793 U	0.00382	0.00135 J	0.0375 J	0.00285 J	0.000793 UJ	0.000793 U	0.000397 UJ	0.000397 U	0.00114 J	0.000602 J	0.000397 U	0.0011 J	0.0014 J	0.000955 J	0.000325 Q	0.000221 J	0.00112 B
	SS19006	LORNG-SS19006-083116	8/31/2016	0.00-1.00	N	0.00049 U	0.00049 U	0.000245 U	0.000721 J	0.000122 U	0.00049 U	0.00049 U	0.000245 UJ	0.000245 U	0.00049 U	0.00028 J	0.000245 U	0.000245 U	0.00049 U	0.00049 U	0.000163 Q	0.000105 J	0.00041 B
	SS19007	LORNG-SS19007-083116	8/31/2016	0.00-1.00	N	0.000868 U	0.00467	0.000434 U	0.0557	0.000992 B	0.000868 U	0.000868 U	0.000434 UJ	0.000434 U	0.000868 U	0.000868 U	0.000434 U	0.000541 J	0.000688 J	0.000629 J	0.000338 B	0.000239 J	0.000963 B
	SS19008	LORNG-SS19008-083116	8/31/2016	0.00-1.00	N	0.000498 U	0.00125 J	0.00111 J	0.0408	0.0025	0.000498 U	0.000498 U	0.000249 UJ	0.000249 U	0.000498 U	0.000374 J	0.000249 U	0.00113 J	0.000905 J	0.00124 J	0.000155 B	0.000249 U	0.000317 B

Table 2.1-1
Comparison of Soil PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Area	Location	Sample ID	Sample Date	Sample Depth (ft.)	Sample Type	Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Loring Residential Child SL	1.9	0.126	0.019	0.0126	0.019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Residential Adult SL	17.6	1.17	0.176	0.117	0.176	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Utility Worker SL	24.6	1.64	0.246	0.164	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Main Runway Foaming Area	AA18SB-01	LORNG-SO-043-20151030	10/30/2015	0.00-1.00	N	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.0074 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.000399 Q	0.00987 U	0.00148 U
	AA18SB-02	LORNG-SO-046-20151030	10/30/2015	0.00-1.00	N	0.00147 U	0.00147 U	0.00147 U	0.000605 J	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.000423 Q	0.00982 U	0.00147 U
		LORNG-SO-DUP05-20151030	10/30/2015	0.00-1.00	FD	0.00148 U	0.00148 U	0.00148 U	0.0012 J	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00041 Q	0.00986 U	0.00148 U
		LORNG-SO-047-20151030	10/30/2015	5.00-7.00	N	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.000481 B	0.00986 U	0.00148 U
		LORNG-SO-048-20151030	10/30/2015	24.00-25.00	N	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00148 U	0.00046 Q	0.00988 U	0.00148 U
	AA18SB-03	LORNG-SO-049-20151029	10/29/2015	0.00-1.00	N	0.00113 U	0.00113 U	0.00113 U	0.000301 J	0.00113 U	0.00113 U	0.00113 U	0.00563 U	0.00113 U	0.00113 U	0.00113 U	0.00113 U	0.00113 U	0.00113 U	0.00113 UJ	0.000272 Q	0.00751 UJ	0.00563 U
		LORNG-SO-050-20151029	10/29/2015	5.00-7.00	N	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 UJ	0.000394 Q	0.00924 U	0.00139 U
		LORNG-SO-051-20151029	10/29/2015	14.00-16.00	N	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 UJ	0.000377 Q	0.00908 U	0.00136 U
	AA18SB-04	LORNG-SO-052-20151029	10/29/2015	0.00-1.00	N	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00743 U	0.00149 UJ	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 UJ	0.000354 Q	0.0099 U	0.00149 U
		LORNG-SO-053-20151029	10/29/2015	5.00-7.00	N	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00641 U	0.00128 UJ	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00128 UJ	0.000371 Q	0.00855 U	0.00128 U
		LORNG-SO-054-20151029	10/29/2015	24.00-25.00	N	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 U	0.00149 UJ	0.000394 Q	0.00995 U	0.00149 U
	AA18SB-05	LORNG-SO-055-20151028	10/28/2015	0.00-1.00	N	0.00144 U	0.00144 U	0.00144 U	0.000231 J	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 UJ	0.000308 B	0.00958 U	0.00144 U
		LORNG-SO-056-20151028	10/28/2015	5.00-7.00	N	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 UJ	0.00039 Q	0.00968 U	0.00145 U
		LORNG-SO-DUP06-20151028	10/28/2015	5.00-7.00	FD	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.000354 Q	0.00925 U	0.00139 U
		LORNG-SO-057-20151028	10/28/2015	14.00-16.00	N	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 UJ	0.000329 Q	0.00943 U	0.00141 U
	AA18SB-06	LORNG-SO-058-20151028	10/28/2015	0.00-1.00	N	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00725 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 UJ	0.000354 Q	0.00967 U	0.00145 U
		LORNG-SO-059-20151028	10/28/2015	5.00-7.00	N	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 UJ	0.000387 Q	0.00968 U	0.00145 U
		LORNG-SO-060-20151028	10/28/2015	14.00-16.00	N	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 UJ	0.000377 Q	0.00937 U	0.00141 U
NOSE DOCK NO 11	SB10001	LORNG-SB10001-(0-1)	10/5/2016	0.00-1.00	N	0.000502 U	0.000502 U	0.000251 U	0.000711 B	0.000119 Q	0.000502 UJ	0.000502 U	0.000251 UJ	0.000251 UJ	0.000502 U	0.000502 U	0.000251 U	0.000251 U	0.000502 U	0.000502 U	0.000251 U	0.000251 U	0.000157 B
		LORNG-SB10001-(0-1)FD	10/5/2016	0.00-1.00	FD	0.0005 U	0.0005 U	0.00025 U	0.0005 U	0.000146 Q	0.000249 Q	0.0005 U	0.00025 UJ	0.00025 UJ	0.0005 U	0.0005 U	0.00025 U	0.00025 U	0.0005 U	0.0005 U	0.00025 U	0.00025 U	0.00025 U
		LORNG-SB10001-(5-7)	10/5/2016	5.00-7.00	N	0.000502 U	0.000553 J	0.000142 J	0.00284 B	0.000308 Q	0.000502 UJ	0.000502 U	0.000251 UJ	0.000251 UJ	0.000502 U	0.000258 J	0.000251 U	0.00013 J	0.000219 J	0.000298 J	0.000251 U	0.000251 U	0.000106 Q
		LORNG-SB10001-(11-13)	10/5/2016	11.00-13.00	N	0.000492 U	0.000492 U	0.000246 U	0.000492 U	0.000208 Q	0.000492 UJ	0.000501 UJ	0.000246 UJ	0.000246 UJ	0.000492 U	0.000492 U	0.000246 U	0.000246 U	0.000492 U	0.000492 U	0.000246 U	0.000246 U	0.000246 U
	SB10002	LORNG-SB10002-(0-1)	10/5/2016	0.00-1.00	N	0.000502 U	0.000502 U	0.000251 U	0.000502 U	0.000222 Q	0.000502 UJ	0.000502 U	0.000251 UJ	0.000251 UJ	0.000502 U	0.000162 J	0.000251 U	0.000251 U	0.000502 U	0.000502 U	0.000251 U	0.000251 U	0.000152 B
		LORNG-SB10002-(5-7)	10/5/2016	5.00-7.00	N	0.000486 U	0.000486 U	0.000243 U	0.000486 U	0.000132 Q	0.000486 UJ	0.0005 UJ	0.000243 UJ	0.000243 UJ	0.000486 U	0.000272 J	0.000243 U	0.000243 U	0.000486 U	0.000486 U	0.000243 U	0.000243 U	0.000243 U
		LORNG-SB10002-(11-13)	10/5/2016	11.00-13.00	N	0.000496 U	0.000496 U	0.000248 U	0.000496 U	0.000127 Q	0.000496 UJ	0.000496 U	0.000248 UJ	0.000248 UJ	0.000496 U	0.000496 U	0.000248 U	0.000248 U	0.000496 U	0.000496 U	0.000248 U	0.000248 U	0.000088 B
	SB10003	LORNG-SB10003-(0-1)	10/5/2016	0.00-1.00	N	0.000997 U	0.000997 U	0.000498 U	0.000997 U	0.00039 Q	0.000997 UJ	0.000997 U	0.000498 UJ	0.000498 UJ	0.000997 U	0.000997 U	0.000498 U	0.000498 U	0.000997 U	0.000997 U	0.000498 U	0.000498 U	0.00039 Q
		LORNG-SB10003-(5-7)	10/5/2016	5.00-7.00	N	0.000483 U	0.000483 U	0.000242 U	0.000483 U	0.000173 Q	0.000483 UJ	0.000488 UJ	0.000242 UJ	0.000242 UJ	0.000483 U	0.000483 U	0.000242 U	0.000242 U	0.000483 U	0.000483 U	0.000242 U	0.000242 U	0.000242 U
		LORNG-SB10003-(9-11)	10/5/2016	9.00-11.00	N	0.000493 U	0.000493 U	0.000247 U	0.000493 U	0.000145 Q	0.000493 UJ	0.000493 U	0.000247 UJ	0.000247 UJ	0.000493 U	0.000184 J	0.000247 U	0.000247 U	0.000493 U	0.000493 U	0.000247 U	0.000247 U	0.000247 U
	SB10004	LORNG-SB10004-(0-1)	10/5/2016	0.00-1.00	N	0.000239 J	0.00105 J	0.000421 J	0.0137 B	0.000516 Q	0.000499 UJ	0.000499 U	0.00025 UJ	0.00025 UJ	0.000318 B	0.000317 J	0.00025 U	0.000237 J	0.000269 J	0.000351 J	0.00025 U	0.00025 U	0.000232 B
		LORNG-SB10004-(5-7)	10/5/2016	5.00-7.00	N	0.000499 U	0.000499 U	0.000109 J	0.000499 U	0.00015 Q	0.000499 UJ	0.000499 U	0.00025 UJ	0.00025 UJ	0.000499 U	0.000499 U	0.00025 U	0.00025 U	0.000499 U	0.000499 U	0.00025 U	0.00025 U	0.000112 Q
		LORNG-SB10004-(19-20)	10/5/2016	19.00-20.00	N	0.000481 U	0.000481 U	0.000241 UJ	0.000481 UJ	0.00012 U	0.000225 Q	0.000499 UJ	0.000241 UJ	0.000241 UJ	0.000481 U	0.000481 U	0.000241 U	0.000241 U	0.000481 U	0.000481 U	0.000241 U	0.000241 U	0.000241 U

Table 2.1-1
Comparison of Soil PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Area	Location	Sample ID	Sample Date	Sample Depth (ft.)	Sample Type	Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
					Loring Residential Child SL	1.9	0.126	0.019	0.0126	0.019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Residential Adult SL	17.6	1.17	0.176	0.117	0.176	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
					Loring Utility Worker SL	24.6	1.64	0.246	0.164	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Depth (ft.)**	**Sample Type**	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Nose Dock No. 40 Area	AA11SB-01	LORNG-SO-013-20151029	10/29/2015	0.00-1.00	N	0.00143 U	0.00143 U	0.00143 U	0.00202 J	0.00143 U	0.00143 U	0.00143 U	0.00717 U	0.00143 U	0.00126 J	0.00717 U	0.00143 U	0.00143 U	0.00143 U	0.00143 UJ	0.000376 B	0.00956 U	0.00143 U
		LORNG-SO-014-20151029	10/29/2015	5.00-7.00	N	0.0015 U	0.0015 U	0.0015 U	0.000425 J	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.000362 J	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 UJ	0.00045 Q	0.01 U	0.0015 U
		LORNG-SO-015-20151029	10/29/2015	11.00-12.00	N	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 UJ	0.000376 Q	0.0097 U	0.00145 U
	AA11SB-02	LORNG-SO-016-20151029	10/29/2015	0.00-1.00	N	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 UJ	0.000323 Q	0.00939 U	0.00141 U
		LORNG-SO-017-20151029	10/29/2015	5.00-7.00	N	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 U	0.00132 UJ	0.000356 Q	0.0088 U	0.0066 U
		LORNG-SO-DUP02-20151029	10/29/2015	5.00-7.00	FD	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 UJ	0.000409 Q	0.0097 U	0.00145 U
		LORNG-SO-018-20151029	10/29/2015	7.00-8.00	N	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00134 U	0.00672 U	0.00134 U	0.00134 U	0.00134 UJ	0.000422 Q	0.00896 U	0.00134 U

Notes

(yellow) = Result is greater than the Loring Residential Child Screening Level

(pink) = Result is greater than the Loring Residential Adult Screening Level

Underline = Result is greater than the Loring Utility Worker Screening Level

mg/kg - Milligrams per Kilogram

NA - Screening level not available.

SL - Screening Level

Qualifiers shown include:

U - Reported detection limit

J - Estimated Value

UJ - The reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

B - Detected in Blank

Q - The analyte is both B qualified because of blank detection and J qualified because of an additional QC issue

R - Rejected

Sample types shown are "N" for normal field samples and "FD" for field duplicates.

[a]USEPA Region 1 PFAS Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are set at hazard quotient of 0.1. Values were provided via e-mail communication from Mike Daly on 4 November 2021 (USEPA, 2021).

USEPA provided values for "PFOA/PFOS", which have been interpreted as screening values for the individual compounds.

These values were updated based on the 2022 RSL updates.

Table 2.1-2
Comparision of Monitoring Well Groundwater PFAS Sampling Result Statistics to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Flow Category	Date Range		Reporting Analyte	Units	Number of Detection (1)	Number of Tested (1)	Frequency of Detection Percent (2)	Minimum Detection	Maximum Detection (3)	Mean Detect	Minimum Non-Detection DL (4)	Maximum Non-Detection DL (4)	RSL (5)	Is the Max. Detection above the Screening Level? (6)	Number of Detections above RSL
Central Flow Field	8/26/2015	10/23/2021	Perfluorobutanesulfonic acid (PFBS)	ng/L	34	51	67%	1.20	102	11.3	1.89	4.24	601	No	0
Central Flow Field	8/26/2015	10/23/2021	Perfluorohexanesulfonic acid (PFHxS)	ng/L	49	51	96%	1.17	2240	168	1.95	1.99	39.4	Yes	23
Central Flow Field	8/26/2015	10/23/2021	Perfluorononanoic acid (PFNA)	ng/L	26	51	51%	0.443	99.9	6.95	1.88	4.00	5.89	Yes	6
Central Flow Field	8/26/2015	10/23/2021	Perfluorooctanesulfonic acid (PFOS)	ng/L	47	51	92%	1.14	5780	269	0.859	1.99	4.01	Yes	42
Central Flow Field	8/26/2015	10/23/2021	Perfluorooctanoic acid (PFOA)	ng/L	48	51	94%	1.20	811	51.9	1.95	3.94	6.02	Yes	33
East Flow Field	8/24/2015	10/23/2021	Perfluorobutanesulfonic acid (PFBS)	ng/L	9	13	69%	2.67	163	47.4	2.03	4.10	601	No	0
East Flow Field	8/24/2015	10/23/2021	Perfluorohexanesulfonic acid (PFHxS)	ng/L	11	13	85%	3.61	2120	745	2.03	4.10	39.4	Yes	7
East Flow Field	8/24/2015	10/23/2021	Perfluorononanoic acid (PFNA)	ng/L	7	13	54%	0.879	30.8	13.6	2.03	4.10	5.89	Yes	3
East Flow Field	11/20/2013	10/23/2021	Perfluorooctanesulfonic acid (PFOS)	NG/L	16	18	89%	1.47	4000	1130	2.03	4.10	4.01	Yes	14
East Flow Field	11/20/2013	10/23/2021	Perfluorooctanoic acid (PFOA)	NG/L	13	18	72%	1.71	580	187	2.03	4.10	6.02	Yes	11
West Flow Field	8/24/2015	10/23/2021	Perfluorobutanesulfonic acid (PFBS)	ng/L	11	39	28%	1.00	258.5	48.0	1.96	5.79	601	No	0
West Flow Field	8/24/2015	10/23/2021	Perfluorohexanesulfonic acid (PFHxS)	ng/L	32	39	82%	2.23	1835	160	3.76	5.17	39.4	Yes	10
West Flow Field	8/24/2015	10/23/2021	Perfluorononanoic acid (PFNA)	ng/L	12	39	31%	1.17	37.0	5.15	1.96	5.79	5.89	Yes	2
West Flow Field	8/24/2015	10/23/2021	Perfluorooctanesulfonic acid (PFOS)	ng/L	34	39	87%	1.09	8770	592	3.97	5.17	4.01	Yes	29
West Flow Field	8/24/2015	10/23/2021	Perfluorooctanoic acid (PFOA)	ng/L	30	39	77%	0.826	216.5	29.0	3.76	5.21	6.02	Yes	16

Notes:
Units - ug/L
USEPA Tapwater RSL - United States Environmental Protection Agency Regional Screening Levels for Tapwater (USEPA, 2022)
(1) Number of detects / Number of samples analyzed.
(2) The percent of samples detected / Number of samples analyzed.
(3) The maximum detected concentration has been used for screening purposes.
(4) The minimum and maximum reported detection limits are shown.
(5) This column shows the USEPA RSLs for Tapwater at a target Hazard Quotient of 0.1 and an Excess Lifetime Cancer Risk of 1x10-6 (USEPA, 2022).
(6) The codes used for the "Is the Max. Detection above the Screening Level? " are as follows:
Yes - Maximum detected concentration is greater than the selected screening value.
No - Maximum detected concentration is less than the selected screening value.

Table 2.1-3
Comparision of Tapwater PFAS Sampling Result Statistics to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Flow Category	Date Range		Reporting Analyte	Units	Number of Detection (1)	Number of Tested (1)	Frequency of Detection Percent (2)	Minimum Detection	Maximum Detection (3)	Mean Detect	Minimum Non-Detection DL (4)	Maximum Non-Detection DL (4)	RSL (5)	Is the Max. Detection above the Screening Level? (6)	Number of Detections above RSL
Central Flow Field	11/11/2015	10/25/2021	Perfluorobutanesulfonic acid (PFBS)	ng/L	0	5	0%				1.95	4.03	601	No	0
Central Flow Field	11/11/2015	10/25/2021	Perfluorohexanesulfonic acid (PFHxS)	ng/L	5	5	100%	2.65	10.4	5.68			39.4	No	0
Central Flow Field	11/11/2015	10/25/2021	Perfluorononanoic acid (PFNA)	ng/L	0	5	0%				1.95	4.03	5.89	No	0
Central Flow Field	11/11/2015	10/25/2021	Perfluorooctanesulfonic acid (PFOS)	ng/L	3	5	60%	1.04	2.73	2.03	3.94	4.03	4.01	No	0
Central Flow Field	11/11/2015	10/25/2021	Perfluorooctanoic acid (PFOA)	ng/L	2	5	40%	1.62	1.69	1.66	1.95	4.03	6.02	No	0
East Flow Field	8/21/2015	2/10/2022	Perfluorobutanesulfonic acid (PFBS)	NG/L	0	17	0%				1.92	4.50	601	No	0
East Flow Field	8/21/2015	2/10/2022	Perfluorohexanesulfonic acid (PFHxS)	NG/L	7	17	41%	1.24	24.8	8.79	1.95	4.17	39.4	No	0
East Flow Field	8/21/2015	2/10/2022	Perfluorononanoic acid (PFNA)	NG/L	0	17	0%				1.92	4.50	5.89	No	0
East Flow Field	8/21/2015	2/10/2022	Perfluorooctanesulfonic acid (PFOS)	NG/L	8	17	47%	0.895	21.8	7.28	1.95	4.50	4.01	Yes	3
East Flow Field	8/21/2015	2/10/2022	Perfluorooctanoic acid (PFOA)	ng/L	9	17	53%	0.744	4.06	1.97	1.95	4.10	6.02	No	0
West Flow Field	8/19/2015	10/25/2021	Perfluorobutanesulfonic acid (PFBS)	ng/L	3	16	19%	1.94	75.3	26.5	1.97	5.25	601	No	0
West Flow Field	8/19/2015	10/25/2021	Perfluorohexanesulfonic acid (PFHxS)	ng/L	14	16	88%	1.67	151	14.0	5.08	5.25	39.4	Yes	1
West Flow Field	8/19/2015	10/25/2021	Perfluorononanoic acid (PFNA)	ng/L	1	16	6%	0.474	0.474	0.47	1.97	5.25	5.89	No	0
West Flow Field	8/19/2015	10/25/2021	Perfluorooctanesulfonic acid (PFOS)	ng/L	13	16	81%	2.25	11.4	7.54	4.03	5.25	4.01	Yes	11
West Flow Field	8/19/2015	10/25/2021	Perfluorooctanoic acid (PFOA)	ng/L	13	16	81%	0.945	7.24	2.83	3.88	5.08	6.02	Yes	1

Notes:
Units - ug/L
USEPA Tapwater RSL - United States Environmental Protection Agency Regional Screening Levels for Tapwater (USEPA, 2022).
(1) Number of detects / Number of samples analyzed.
(2) The percent of samples detected / Number of samples analyzed.
(3) The maximum detected concentration has been used for screening purposes.
(4) The minimum and maximum reported detection limits are shown.
(5) This column shows the USEPA RSLs for Tapwater at a target Hazard Quotient of 0.1 and an Excess Lifetime Cancer Risk of 1x10-6 (USEPA, 2022).
(6) The codes used for the "Is the Max. Detection above the Screening Level? " are as follows:
Yes - Maximum detected concentration is greater than the selected screening value.
No - Maximum detected concentration is less than the selected screening value.

Table 2.1-4
Comparision of Surface Water PFAS Sampling Result Statistics to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Flow Category	Date Range		Reporting Analyte	Units	Number of Detection (1)	Number of Tested (1)	Frequency of Detection Percent (2)	Minimum Detection	Maximum Detection (3)	Mean Detect	Minimum Non-Detection DL (4)	Maximum Non-Detection DL (4)	Child Swimming SL (5)	Adult Swimming SL (5)	Is the Max. Detection above the Child Screening Level? (6)	Is the Max. Detection above the Adult Screening Level? (6)	Number of Detections above Child SL	Number of Detections above Adult SL
Eastern Drainage	9/29/2015	10/24/2021	Perfluorobutanesulfonic acid (PFBS)	ng/L	1	16	6%	1.20	1.20	1.20	1.98	5.84	30200	173000	No	No	0	0
Eastern Drainage	9/29/2015	10/24/2021	Perfluorohexanesulfonic acid (PFHxS)	ng/L	13	16	81%	4.64	25.9	12.9	5.43	5.84	1750	7640	No	No	0	0
Eastern Drainage	9/29/2015	10/24/2021	Perfluorononanoic acid (PFNA)	ng/L	8	16	50%	1.06	2.18	1.39	1.94	5.84	256	1080	No	No	0	0
Eastern Drainage	9/29/2015	10/24/2021	Perfluorooctanesulfonic acid (PFOS)	ng/L	13	16	81%	1.53	26.2	14.4	5.43	5.84	203	1180	No	No	0	0
Eastern Drainage	9/29/2015	10/24/2021	Perfluorooctanoic acid (PFOA)	ng/L	12	16	75%	2.79	7.58	4.49	5.43	5.84	304	1770	No	No	0	0
Western Drainage	9/28/2015	10/24/2021	Perfluorobutanesulfonic acid (PFBS)	ng/L	26	34	76%	1.85	52.3	7.28	3.85	4.00	30200	173000	No	No	0	0
Western Drainage	9/28/2015	10/24/2021	Perfluorohexanesulfonic acid (PFHxS)	ng/L	32	34	94%	1.55	577	94.5	3.85	3.88	1750	7640	No	No	0	0
Western Drainage	9/28/2015	10/24/2021	Perfluorononanoic acid (PFNA)	ng/L	29	34	85%	0.575	9.4	2.49	2.02	3.88	256	1080	No	No	0	0
Western Drainage	9/28/2015	10/24/2021	Perfluorooctanesulfonic acid (PFOS)	ng/L	34	34	100%	0.466	1440	152			203	1180	Yes	Yes	4	1
Western Drainage	9/28/2015	10/24/2021	Perfluorooctanoic acid (PFOA)	ng/L	32	34	94%	1.81	95.1	17.2	3.85	3.88	304	1770	No	No	0	0

Notes:
Units - ng/L
(1) Number of detects / Number of samples analyzed.
(2) The percent of samples detected / Number of samples analyzed.
(3) The maximum detected concentration has been used for screening purposes.
(4) The minimum and maximum reported detection limits are shown.
(5) USEPA Region 1 PFAS Surface Water, Sediment, Soil, and Fish and Shellfish Consumption Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are set at hazard quotient of 0.1. Values were provided in: Re: Remedial Investigations of Perfluorinated Compounds under the Pease Air Force Base Federal Facility Agreement. 7 November 2017 (USEPA, 2017). USEPA provided values for "PFOA/PFOS", which have been interpreted as screening values for the individual compounds. These values were updated based on the 2022 RSL updates.
(6) The codes used for the "Is the Max. Detection above the Screening Level? " are as follows:
Yes - Maximum detected concentration is greater than the selected screening value
No - Maximum detected concentration is less than the selected screening value

Prepared by: AKN 7/25/22
Checked by: KALS 8/17/2022

Table 2.1-5
Comparison of Sediment PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

					Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
				Loring Child Recreator SL	8.85	0.59	0.0885	0.059	0.0885	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Loring Adult Recreator SL	82.1	5.47	0.821	0.547	0.821	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Type**	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Arch Hangar	SW/SD08001	LORNG-SD08001-083016	8/30/2016	N	0.000491 U	0.000491 U	0.000245 U	0.00199	0.000122 B	0.000286 J	0.000338 J	0.000245 UJ	0.000245 U	0.000491 U	0.000491 U	0.000245 U	0.000245 U	0.000491 U	0.000491 U	0.000147 Q	0.000245 U	0.000275 B
B-52 Crash Area	AA20SD-01	LORNG-SD-018-20151102	11/2/2015	N	0.00147 U	0.000452 J	0.00147 U	0.00318	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.000407 B	0.00978 UJ	0.00147 U
	AA20SD-02	LORNG-SD-019-20151102	11/2/2015	N	0.00144 U	0.00144 U	0.00144 U	0.00751 J	0.00144 U	0.00144 U	0.00144 U	0.00722 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.00144 U	0.000407 B	0.00962 UJ	0.00144 U
		LORNG-SD-DUP01-20151102	11/2/2015	FD	0.00147 U	0.000322 J	0.00147 U	0.0146 J	0.00147 U	0.00147 U	0.00147 U	0.00736 U	0.00147 UJ	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.000407 B	0.00981 UJ	0.00147 U
Background	LORNG-LT-16	LORNG-SD-PFC-16-20151002	10/2/2015	N	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 UJ	0.00146 U	0.00146 U	0.00146 UJ	0.000389 Q	0.00971 UJ	0.00146 U
	LORNG-LT-17	LORNG-PFC-SD02	10/2/2015	FD	0.000871 U	0.000871 U	0.000871 U	0.000871 U	0.000871 U	0.000871 U	0.000871 U	0.000871 U	0.000871 U	0.000799 J	0.000871 U	0.000871 UJ	0.000871 U	0.000871 U	0.000871 UJ	0.000213 Q	0.0058 UJ	0.000871 U
		LORNG-SD-PFC-17-20151002	10/2/2015	N	0.000965 U	0.000965 U	0.000965 U	0.000965 U	0.000965 U	0.000965 U	0.000965 U	0.000965 U	0.000965 U	0.000714 J	0.000965 U	0.000965 UJ	0.000965 U	0.000965 U	0.000965 UJ	0.000225 Q	0.00644 UJ	0.000965 U
BLDG 8744_NOSE DOCK NO 44	SW/SD12006	LORNG-SD12006-083016	8/30/2016	N	0.000494 U	0.000371 J	0.000247 U	0.00864	0.000175 B	0.000494 U	0.000494 U	0.000654 J	0.000385 J	0.000494 U	0.000226 J	0.000206 J	0.000247 U	0.000494 U	0.000494 U	0.000207 B	0.000247 U	0.000431 B
	SW/SD12007	LORNG-SD12007-083016	8/30/2016	N	0.000493 U	0.00197	0.000284 J	0.0784	0.000522 B	0.000838 J	0.00283 J	0.000247 UJ	0.000247 U	0.000493 U	0.000192 J	0.000247 U	0.000241 J	0.000453 J	0.000505 J	0.000154 B	0.000247 U	0.000427 B
Butterfield Brook Drainage	LORNG-LT-13	LORNG-SD-PFC-13-20150929	9/29/2015	N	0.00137 U	0.000431 J	0.00137 U	0.00646	0.000346 J	0.00137 U	0.00137 U	0.00137 U	0.00137 U	0.00137 U	0.00137 U	0.00137 UJ	0.00137 U	0.00137 U	0.00137 UJ	0.000329 Q	0.00913 UJ	0.00137 U
	LORNG-LT-13A	LORNG-SD-PFC-13A-20150929	9/29/2015	N	0.00147 U	0.000827 J	0.00147 U	0.00583	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 UJ	0.00147 U	0.00147 U	0.00147 UJ	0.00035 Q	0.00978 UJ	0.00147 U
	LORNG-LT-14	LORNG-SD-PFC-14-20151002	10/2/2015	N	0.00145 U	0.000316 J	0.000238 B	0.00777	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 U	0.00145 UJ	0.00145 U	0.00145 U	0.00145 UJ	0.000359 Q	0.00967 UJ	0.00145 U
	LORNG-LT-14A	LORNG-SD-PFC-14A-20150929	9/29/2015	N	0.0014 U	0.0014 U	0.0014 U	0.00274 J	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.0014 U	0.000714 J	0.0014 U	0.0014 UJ	0.0014 U	0.0014 U	0.0014 UJ	0.00034 Q	0.00932 UJ	0.0014 U
	LORNG-LT-15	LORNG-SD-PFC-15-20150929	9/29/2015	N	0.0012 U	0.000489 J	0.0012 U	0.000185 J	0.0012 U	0.0012 U	0.0012 U	0.00598 UJ	0.0012 UJ	0.0012 U	0.0012 U	0.00598 UJ	0.0012 U	0.0012 U	0.0012 UJ	0.000301 Q	0.00797 UJ	0.0012 U
	LT18	LORING-SDLT18-092016	9/20/2016	N	0.000499 U	0.000499 U	0.000249 U	0.00169 J	0.00006 B	0.000499 U	0.000499 U	0.000249 U	0.000249 U	0.000499 U	0.000499 U	0.000249 U	0.000249 U	0.000499 U	0.000499 U	0.000249 UJ	0.000249 U	0.000249 U
	LT19	LORING-SDLT19-092016s	9/20/2016	N	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0095 UJ	0.0095 UJ	0.0095 UJ	0.0095 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ	0.0024 UJ
		LORING-SDLT19-092016	9/20/2016	N	0.000495 U	0.000495 U	0.000248 U	0.00415	0.000068 B	0.000495 U	0.000495 U	0.000248 U	0.000248 U	0.000495 U	0.000495 U	0.000248 U	0.000248 U	0.000495 U	0.000495 U	0.000248 UJ	0.000248 U	0.000248 U
	LT-15	1300665-02	9/24/2013	N	NA	NA	NA	0.00093	0.000231 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Flight Line Drainage Ditch	SD21002	LORNG-SD21002-083016	8/30/2016	N	0.000481 U	0.000402 J	0.000241 U	0.00582	0.000221 B	0.000297 J	0.000599 J	0.000205 J	0.000241 U	0.000481 U	0.000159 J	0.000241 U	0.000241 U	0.000214 J	0.000481 U	0.000142 Q	0.000241 U	0.000308 B
	SW/SD21001	LORNG-SD21001-083016	8/30/2016	N	0.000495 U	0.000784 J	0.000247 U	0.0105	0.000176 B	0.000495 U	0.000716 J	0.000247 UJ	0.000247 U	0.000495 U	0.000173 J	0.000247 U	0.000247 U	0.00021 J	0.000495 U	0.000171 Q	0.000136 J	0.000378 B
		LORNG-SD21001-083016FD	8/30/2016	FD	0.000507 U	0.000707 J	0.000254 U	0.01	0.000227 B	0.000507 U	0.000634 J	0.000105 J	0.000108 J	0.000507 U	0.000507 U	0.000127 J	0.000254 U	0.000507 U	0.000507 U	0.000166 B	0.000171 J	0.00033 B
	SW/SD21003	LORNG-SD21003-083016	8/30/2016	N	0.000497 U	0.000489 J	0.000248 U	0.00447	0.000244 B	0.000598 J	0.00226	0.000248 UJ	0.000248 U	0.000497 U	0.000497 U	0.000248 U	0.000114 J	0.000232 J	0.000497 U	0.000157 Q	0.000248 U	0.000319 B
FUEL DUMP AREA	SW/SD17005	LORNG-SD17005-083016	8/30/2016	N	0.00243 U	0.0016 J	0.00121 U	0.0359	0.00106 J	0.00243 U	0.00164 J	0.00121 UJ	0.00121 U	0.00243 U	0.0012 J	0.00121 U	0.00123 J	0.00108 J	0.00243 U	0.000777 B	0.000643 J	0.00226 B
	SW/SD17006	LORNG-SD17006-083016	8/30/2016	N	0.000474 U	0.000474 U	0.000237 U	0.0013 J	0.000059 B	0.000474 U	0.000474 U	0.000237 UJ	0.000237 U	0.000474 U	0.000169 J	0.000237 U	0.000237 U	0.000474 U	0.000474 U	0.000111 B	0.000237 U	0.000417 B
Fuels Tank Farm	SW/SD16005	LORNG-SD16005-083016	8/30/2016	N	0.000506 U	0.000506 U	0.000253 U	0.000506 U	0.000074 B	0.000506 U	0.000506 U	0.000253 UJ	0.000253 U	0.000506 U	0.000506 U	0.000253 U	0.000253 U	0.000506 U	0.000506 U	0.000146 Q	0.000253 U	0.000246 B
	SW/SD16006	LORNG-SD16006-083016	8/30/2016	N	0.000502 U	0.000502 U	0.000251 U	0.00119 J	0.000142 B	0.000502 U	0.000502 U	0.000251 UJ	0.000251 U	0.000502 U	0.000502 U	0.000251 U	0.000251 U	0.000502 U	0.000502 U	0.000128 B	0.000251 U	0.000384 B

Table 2.1-5
Comparison of Sediment PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Area	Location	Sample ID	Sample Date	Sample Type	Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)
				Loring Child Recreator SL	8.85	0.59	0.0885	0.059	0.0885	NA	NA	NA	NA
				Loring Adult Recreator SL	82.1	5.47	0.821	0.547	0.821	NA	NA	NA	NA
Area	Location	Sample ID	Sample Date	Sample Type	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Greenlaw Brook Drainage	LORNG-LT-02	LORNG-SD-PFC-02-20151002	10/2/2015	N	0.00147 U	0.00109 J	0.000216 B	0.0107	0.000406 J	0.00147 U	0.00147 U	0.00147 U	0.00147 U
	LORNG-LT-03	LORNG-SD-PFC-03-20150929	9/29/2015	N	0.00137 U	0.00056 J	0.000224 J	0.00262 J	0.000274 J	0.00137 UJ	0.00137 UJ	0.00137 U	0.00137 U
	LORNG-LT-04	LORNG-SD-PFC-04-20150929	9/29/2015	N	0.00128 U	0.000436 J	0.00128 U	0.00452	0.000264 J	0.00128 U	0.00128 U	0.00128 U	0.00128 U
	LORNG-LT-05	LORNG-SD-PFC-05-20150929	9/29/2015	N	0.00127 U	0.00127 U	0.00127 U	0.00306	0.00127 U	0.00127 U	0.00127 U	0.00127 U	0.00127 U
	LORNG-LT-05A	LORNG-SD-PFC-05A-20151002	10/2/2015	N	0.000891 U	0.000891 U	0.000891 U	0.00637 B	0.000891 U	0.000891 U	0.000891 U	0.000891 U	0.000891 U
	LORNG-LT-10-01	LORNG-SD-PFC-10-01-20150928	9/28/2015	N	0.00136 U	0.000744 J	0.00136 U	0.00869	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U
	LORNG-LT-10-02	LORNG-PFC-SD01	9/29/2015	FD	0.00141 U	0.00141 U	0.00141 U	0.000607 J	0.00141 U	0.00141 U	0.00141 U	0.00141 U	0.00141 U
		LORNG-SD-PFC-10-02-20150929	9/29/2015	N	0.00129 U	0.00129 U	0.00129 U	0.000629 J	0.00129 U	0.00129 U	0.00129 U	0.00129 U	0.00129 U
	LORNG-LT-10-05	LORNG-SD-PFC-10-05-20150929	9/29/2015	N	0.00138 U	0.00138 U	0.00138 U	0.00102 J	0.00138 U	0.00138 U	0.00138 U	0.00138 U	0.00138 U
	LORNG-LT-10-06	LORNG-SD-PFC-10-06-20150929	9/29/2015	N	0.0013 U	0.0013 U	0.0013 U	0.0012 J	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
	LORNG-LT-10-06A	LORNG-SD-PFC-10-06A-20151002	10/2/2015	N	0.00117 U	0.000362 J	0.00117 U	0.00321 B	0.00117 U	0.00117 U	0.00117 U	0.00117 U	0.00117 U
Nose Dock No. 40 Area	AA11SD-01	LORNG-SD-020-20151102	11/2/2015	N	0.00147 U	0.00144 J	0.000196 J	0.0937	0.0012 J	0.00147 U	0.0108	0.00737 U	0.00147 UJ
	AA11SD-02	LORNG-SD-021-20151102	11/2/2015	N	0.00146 U	0.00146 U	0.00146 U	0.00155 J	0.00146 U	0.00146 U	0.00146 U	0.00732 U	0.00146 UJ
	AA11SD-03	LORNG-SD-022-20151102	11/2/2015	N	0.00147 U	0.00105 J	0.00013 J	0.0271	0.000393 J	0.00147 U	0.000914 J	0.00735 U	0.00147 UJ

Area	Location	Sample ID	Sample Date	Sample Type	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
				Loring Child Recreator SL	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Loring Adult Recreator SL	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	Location	Sample ID	Sample Date	Sample Type	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Greenlaw Brook Drainage	LORNG-LT-02	LORNG-SD-PFC-02-20151002	10/2/2015	N	0.00102 J	0.00147 U	0.00147 UJ	0.00147 U	0.00147 U	0.00147 UJ	0.00035 Q	0.00983 UJ	0.00147 U
	LORNG-LT-03	LORNG-SD-PFC-03-20150929	9/29/2015	N	0.00137 U	0.00137 U	0.00137 UJ	0.00137 U	0.00137 U	0.00137 UJ	0.000365 Q	0.00911 UJ	0.00137 U
	LORNG-LT-04	LORNG-SD-PFC-04-20150929	9/29/2015	N	0.00128 U	0.00128 U	0.00128 UJ	0.00128 U	0.000493 J	0.000495 J	0.000331 Q	0.00855 UJ	0.00128 U
	LORNG-LT-05	LORNG-SD-PFC-05-20150929	9/29/2015	N	0.00127 U	0.00127 U	0.00127 UJ	0.00127 U	0.00127 U	0.00127 UJ	0.000331 Q	0.00849 UJ	0.00127 U
	LORNG-LT-05A	LORNG-SD-PFC-05A-20151002	10/2/2015	N	0.000891 U	0.000891 U	0.000891 UJ	0.000891 U	0.000891 U	0.000891 UJ	0.000219 Q	0.00594 UJ	0.000891 U
	LORNG-LT-10-01	LORNG-SD-PFC-10-01-20150928	9/28/2015	N	0.00136 U	0.00136 U	0.00136 UJ	0.00136 U	0.00136 U	0.00136 UJ	0.000357 Q	0.00904 UJ	0.00136 U
	LORNG-LT-10-02	LORNG-PFC-SD01	9/29/2015	FD	0.00141 U	0.00141 U	0.00141 UJ	0.00141 U	0.00141 U	0.00141 UJ	0.000331 Q	0.00942 UJ	0.00141 U
		LORNG-SD-PFC-10-02-20150929	9/29/2015	N	0.00129 U	0.00129 U	0.00129 UJ	0.00129 U	0.00129 U	0.00129 UJ	0.000285 Q	0.00861 UJ	0.00129 U
	LORNG-LT-10-05	LORNG-SD-PFC-10-05-20150929	9/29/2015	N	0.00138 U	0.00138 U	0.00138 UJ	0.00138 U	0.00138 U	0.00138 UJ	0.000318 Q	0.00921 UJ	0.00138 U
	LORNG-LT-10-06	LORNG-SD-PFC-10-06-20150929	9/29/2015	N	0.0013 U	0.0013 U	0.0013 UJ	0.0013 U	0.0013 U	0.0013 UJ	0.00032 Q	0.00869 UJ	0.0013 U
	LORNG-LT-10-06A	LORNG-SD-PFC-10-06A-20151002	10/2/2015	N	0.00117 U	0.00117 U	0.00117 UJ	0.00117 U	0.00117 U	0.00117 UJ	0.000293 Q	0.00777 UJ	0.00117 U
Nose Dock No. 40 Area	AA11SD-01	LORNG-SD-020-20151102	11/2/2015	N	0.00147 U	0.00147 U	0.00147 U	0.000691 J	0.00108 J	0.000784 J	0.000629 Q	0.00983 UJ	0.00147 U
	AA11SD-02	LORNG-SD-021-20151102	11/2/2015	N	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.00146 U	0.000219 J	0.000349 B	0.00976 UJ	0.00146 U
	AA11SD-03	LORNG-SD-022-20151102	11/2/2015	N	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.00147 U	0.000474 B	0.00981 UJ	0.00147 U

Notes

Gray Text = Indicates the parameter was not detected.

mg/kg - Milligrams per Kilogram

NA - Screening level not available.

SL - Screening Levels

Qualifiers shown include:

U - Reported detection limit

J - Estimated Value

UJ - The reported quantitation limit is approximate and may or may not represent the actual limit of quanitation necessary to accurately and precisely measure the analyte in the sample

B - Detected in Blank

Q - The analyte is both B qualified because of blank detection and J qualified because of an additional QC issue

Sample types shown are "N" for normal field samples and "FD" for field duplicates.

[a] USEPA Region 1 PFAS Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are set at hazard quotient of 0.1. Values were provided via e-mail communication from Mike Daly on 4 November 2021 (USEPA, 2021).

USEPA provided values for "PFOA/PFOS", which have been interpreted as screening values for the individual compounds. These values were updated based on the 2022 RSL updates.

Table 2.1-6
Comparision of Stormwater PFAS Sampling Result Statistics to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Flow Category	Date Range		Reporting Analyte	Units	Number of Detection (1)	Number of Tested (1)	Frequency of Detection Percent (2)	Minimum Detection	Maximum Detection (3)	Mean Detect	Minimum Non-Detection DL (4)	Maximum Non-Detection DL (4)	Child Swimming SL (5)	Adult Swimming SL (5)	Is the Max. Detection above the Child Screening Level? (6)	Is the Max. Detection above the Adult Screening Level? (6)	Number of Detections above Child SL	Number of Detections above Adult SL
Western Drainage	8/30/2016	8/30/2016	Perfluorobutanesulfonic acid (PFBS)	ng/L	4	14	29%	2.48	5.79	3.86	3.94	4.27	30200	173000	No	No	0	0
Western Drainage	8/30/2016	8/30/2016	Perfluorohexanesulfonic acid (PFHxS)	ng/L	14	14	100%	9.62	111	31.0			1750	7640	No	No	0	0
Western Drainage	8/30/2016	8/30/2016	Perfluorononanoic acid (PFNA)	ng/L	11	14	79%	1.09	7.41	2.18	2.00	2.07	256	1080	No	No	0	0
Western Drainage	8/30/2016	8/30/2016	Perfluorooctanesulfonic acid (PFOS)	ng/L	14	14	100%	10.8	266	49.0			203	1180	Yes	No	1	0
Western Drainage	8/30/2016	8/30/2016	Perfluorooctanoic acid (PFOA)	ng/L	14	14	100%	2.17	42.2	8.69			304	1770	No	No	0	0

Notes:
Units - ng/L
(1) Number of detects / Number of samples analyzed.
(2) The percent of samples detected / Number of samples analyzed.
(3) The maximum detected concentration has been used for screening purposes.
(4) The minimum and maximum reported detection limits are shown.
(5) USEPA Region 1 PFAS Surface Water, Sediment, Soil, and Fish and Shellfish Consumption Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are set at hazard quotient of 0.1. Values were provided in: Re: Remedial Investigations of Perfluorinated Compounds under the Pease Air Force Base Federal Facility Agreement. 7 November 2017 (USEPA, 2017). These values were updated based on the 2022 RSL updates.
(6) The codes used for the "Is the Max. Detection above the Screening Level? " are as follows:
Yes - Maximum detected concentration is greater than the selected screening value
No - Maximum detected concentration is less than the selected screening value

Table 2.1-7
Comparision of Porewater PFAS Sampling Result Statistics to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Flow Category	Date Range		Reporting Analyte	Units	Number of Detection (1)	Number of Tested (1)	Frequency of Detection Percent (2)	Minimum Detection	Maximum Detection (3)	Mean Detect	Minimum Non-Detection DL (4)	Maximum Non-Detection DL (4)	Child Swimming SL (5)	Adult Swimming SL (5)	Is the Max. Detection above the Child Screening Level? (6)	Is the Max. Detection above the Adult Screening Level? (6)	Number of Detections above Child SL	Number of Detections above Adult SL
Eastern Drainage	9/3/2015	9/3/2015	Perfluorobutanesulfonic acid (PFBS)	ng/L	0	1	0%				4.10	4.10	30200	173000	No	No	0	0
Eastern Drainage	9/3/2015	9/3/2015	Perfluorohexanesulfonic acid (PFHxS)	ng/L	1	1	100%	9.42	9.42	9.42			1750	7640	No	No	0	0
Eastern Drainage	9/3/2015	9/3/2015	Perfluorononanoic acid (PFNA)	ng/L	1	1	100%	2.76	2.76	2.76			256	1080	No	No	0	0
Eastern Drainage	9/3/2015	9/3/2015	Perfluorooctanesulfonic acid (PFOS)	ng/L	1	1	100%	6.74	6.74	6.74			203	1180	No	No	0	0
Eastern Drainage	9/3/2015	9/3/2015	Perfluorooctanoic acid (PFOA)	ng/L	1	1	100%	4.03	4.03	4.03			304	1770	No	No	0	0
Western Drainage	9/1/2015	9/2/2015	Perfluorobutanesulfonic acid (PFBS)	ng/L	5	7	71%	4.13	7.48	5.32	4.00	4.39	30200	173000	No	No	0	0
Western Drainage	9/1/2015	9/2/2015	Perfluorohexanesulfonic acid (PFHxS)	ng/L	7	7	100%	5.47	139	70.0			1750	7640	No	No	0	0
Western Drainage	9/1/2015	9/2/2015	Perfluorononanoic acid (PFNA)	ng/L	7	7	100%	0.806	14.1	4.41			256	1080	No	No	0	0
Western Drainage	9/1/2015	9/2/2015	Perfluorooctanesulfonic acid (PFOS)	ng/L	6	7	86%	6.39	423	145	4.00	4.00	203	1180	Yes	No	1	0
Western Drainage	9/1/2015	9/2/2015	Perfluorooctanoic acid (PFOA)	ng/L	7	7	100%	1.35	29.7	15.6			304	1770	No	No	0	0

Notes:
Units - ug/L
(1) Number of detects / Number of samples analyzed.
(2) The percent of samples detected / Number of samples analyzed.
(3) The maximum detected concentration has been used for screening purposes.
(4) The minimum and maximum reported detection limits are shown.
(5) USEPA Region 1 PFAS Surface Water, Sediment, Soil, and Fish and Shellfish Consumption Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are set at hazard quotient of 0.1. Values were provided in: Re: Remedial Investigations of Perfluorinated Compounds under the Pease Air Force Base Federal Facility Agreement. 7 November 2017 (USEPA, 2017). These values were updated based on the 2022 RSL updates.
(6) The codes used for the "Is the Max. Detection above the Screening Level? " are as follows:
Yes - Maximum detected concentration is greater than the selected screening value.
No - Maximum detected concentration is less than the selected screening value.

Table 2.1-8
Comparison of Fish PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

							Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
						Finfish Consumption Under ME Food Consumption Advisory - Child SL	0.062	0.00413	0.00062	0.000413	0.00062	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
						Loring-specific Fish Consumption Adult SL	0.108	0.00722	0.00108	0.000722	0.00108	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
						Loring-specific Fish Consumption Child SL	0.0782	0.00521	0.000782	0.000521	0.000782	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Type**	**Fish Species**	**Tissue Type**	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
Background	LORNG-LT-16	LORNG-FT-PFC-16-20151002	10/2/2015	N	Brook Trout	Composite	0.00143 UJ	0.000958 Q	0.00143 UJ	0.0028 J	0.00143 UJ	0.00143 UJ	0.00143 UJ	0.00143 UJ	0.00143 UJ	0.00143 UJ	0.00143 UJ	0.00143 UJ	0.00143 UJ	0.00143 UJ	0.00037 J	0.00143 UJ	0.00952 UJ	0.000486 Q
	LORNG-LT-17	LORNG-FT-PFC-17-20151015	10/15/2015	N	Brook Trout	Composite	0.00128 U	0.000453 Q	0.00128 U	0.00217 J	0.00128 U	0.00128 U	0.00128 UJ	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00128 U	0.00186 J	0.00128 UJ	0.00855 UJ	0.000426 Q
	LT-16	1300730-10	9/26/2013	N	Unknown	Fillet	NA	NA	NA	0.00145	0.0005 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-11	9/26/2013	N	Unknown	Offal	NA	NA	NA	0.0434	0.0005 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-12	10/2/2013	N	Unknown	Fillet	NA	NA	NA	0.00102 U	0.00051 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-13	10/2/2013	N	Unknown	Offal	NA	NA	NA	0.0378	0.000424 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butterfield Brook Drainage	LORNG-LT-13	LORNG-FT-PFC-13-20151015	10/15/2015	N	Brook Trout	Composite	0.00139 U	0.00119 B	0.000645 J	0.11	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.000808 J	0.00139 U	0.00139 U	0.00139 U	0.000485 J	0.00139 UJ	0.00926 UJ	0.000749 B
	LORNG-LT-13A	LORNG-FT-PFC-13A-20151013	10/13/2015	N	Brook Trout	Fillet	0.00139 U	0.000904 Q	0.00139 U	0.0467	0.00139 U	0.00139 UJ	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.00139 U	0.000647 J	0.00139 UJ	0.00926 UJ	0.000635 B
		LORNG-FT-PFC-13A2-20151015	10/15/2015	N	Brook Trout	Composite	0.00129 U	0.00176 Q	0.000433 J	0.0827	0.000317 J	0.00129 UJ	0.00129 U	0.00129 UJ	0.00129 U	0.00129 U	0.00129 U	0.00129 U	0.00129 U	0.00129 U	0.00244 J	0.00129 UJ	0.00862 UJ	0.000626 B
	LORNG-LT-14	LORNG-FT-PFC-14-20150930	9/30/2015	N	Brook Trout	Composite	0.00136 UJ	0.0011 Q	0.00136 UJ	0.0463 J	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.000333 J	0.00136 UJ	0.00909 UJ	0.000413 Q
		LORNG-FTSB-PFC-14-20150930	9/30/2015	N	Smallmouth Bass	Fillet	0.00136 UJ	0.000818 Q	0.00136 UJ	0.114 J	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.000562 J	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00909 UJ	0.00102 Q
	LORNG-LT-14A	LORNG-FT-PFC-14A-20151001	10/1/2015	N	Brook Trout	Composite	0.00126 UJ	0.000991 Q	0.00126 UJ	0.0338 J	0.00126 UJ	0.00126 UJ	0.00126 UJ	0.00126 UJ	0.00126 UJ	0.00126 UJ	0.00126 UJ	0.00126 UJ	0.00126 UJ	0.00126 UJ	0.00151 J	0.00126 UJ	0.0084 UJ	0.000482 Q
	LORNG-LT-15	LORNG-FT-PFC-15-20150929	9/29/2015	N	Brook Trout	Composite	0.00135 UJ	0.00147 Q	0.00135 UJ	0.0476 J	0.00135 UJ	0.00135 UJ	0.00135 UJ	0.00135 UJ	0.00135 UJ	0.00135 UJ	0.00135 UJ	0.00135 UJ	0.00135 UJ	0.00135 UJ	0.00028 J	0.00135 UJ	0.00901 UJ	0.000537 Q
	LT-14	1300730-08	9/23/2013	N	Unknown	Fillet	NA	NA	NA	0.114	0.000532 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-09	9/23/2013	N	Unknown	Offal	NA	NA	NA	0.62	0.0142 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LT-15	1300732-13	9/24/2013	N	Unknown	Fillet	NA	NA	NA	0.0412	0.00231 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300732-14	9/24/2013	N	Unknown	Offal	NA	NA	NA	0.278	0.000243 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LT18	LORNG-FTLT18-092016	9/20/2016	N	Brook Trout	Fillet	0.000472 U	0.001 J	0.000299 J	0.0398	0.000132 J	0.000472 U	0.000236 U	0.000236 U	0.000472 U	0.000472 U	0.000228 J	0.000236 U	0.000236 U	0.000472 U	0.000472 U	0 R	0 R	0.000128 J
	LT19	LORNG-FTLT19-092016	9/20/2016	N	Brook Trout	Fillet	0.000495 U	0.000917 J	0.000382 J	0.0591	0.000248 U	0.000495 UJ	0.000248 U	0.000248 U	0.000495 U	0.000495 U	0.000246 J	0.000248 U	0.000248 U	0.000495 U	0.000495 U	0.000248 UJ	0.000495 U	0.000233 J
Greenlaw Brook Drainage	LORNG-LT-02	LORNG-FT-PFC-02-20151014	10/14/2015	N	Brook Trout	Fillet	0.00126 U	0.000754 Q	0.00126 U	0.0205	0.00126 U	0.00126 U	0.00126 UJ	0.00126 UJ	0.00126 U	0.00126 U	0.00126 U	0.00126 U	0.00126 U	0.00126 U	0.00104 J	0.00126 UJ	0.0084 UJ	0.000636 B
	LORNG-LT-05	LORNG-FT-PFC-05-20151002	10/2/2015	N	Brook Trout	Fillet	0.00125 UJ	0.00234 Q	0.00125 UJ	0.118 J	0.00125 UJ	0.00125 UJ	0.00125 UJ	0.00125 UJ	0.00125 UJ	0.00125 UJ	0.00125 UJ	0.00125 UJ	0.00125 UJ	0.00125 UJ	0.00167 J	0.00125 UJ	0.00833 UJ	0.000571 Q
	LORNG-LT-10-01	LORNG-FT-PFC-10-01-20151013	10/13/2015	N	Brook Trout	Composite	0.00136 U	0.00452 Q	0.000539 J	0.108	0.000477 J	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00136 U	0.00083 J	0.00136 UJ	0.00909 UJ	0.000603 B
	LORNG-LT-10-05	LORNG-FT-PFC-10-05-20151013	10/13/2015	N	Brook Trout	Composite	0.00136 U	0.00772 J	0.000613 J	0.164	0.000699 J	0.00136 UJ	0.00136 UJ	0.00136 U	0.00136 U	0.00136 U	0.000507 J	0.00136 U	0.00136 U	0.00136 U	0.00156 J	0.00136 UJ	0.00909 UJ	0.000658 Q
	LORNG-LT-10-06	LORNG-FT-PFC-10-06-20151014	10/14/2015	N	Brook Trout	Composite	0.00133 U	0.0058 B	0.00158 J	0.457	0.000743 J	0.00133 UJ	0.000477 J	0.00133 U	0.00133 U	0.00133 U	0.000976 J	0.00133 U	0.00133 U	0.000275 J	0.00907 J	0.00133 UJ	0.00885 UJ	0.00106 Q
	LORNG-LT-10-06A	LORNG-FT-PFC-10-06A-20150930	9/30/2015	N	Brook Trout	Composite	0.00136 UJ	0.00345 Q	0.00063 J	0.191 J	0.000452 J	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.000556 J	0.00136 UJ	0.00136 UJ	0.00136 UJ	0.000704 J	0.00136 UJ	0.00909 UJ	0.000645 Q
	LT-05	1300730-01	9/24/2013	N	Unknown	Fillet	NA	NA	NA	0.266	0.000455 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-02	9/24/2013	N	Unknown	Fillet	NA	NA	NA	0.096	0.000532 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-03	9/24/2013	N	Unknown	Fillet	NA	NA	NA	0.52	0.00543 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-04	9/24/2013	N	Unknown	Offal	NA	NA	NA	1.08	0.0134 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-05	9/24/2013	N	Unknown	Offal	NA	NA	NA	0.93	0.000439 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LT-10	1300730-06	9/25/2013	N	Unknown	Fillet	NA	NA	NA	0.103	0.00532 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		1300730-07	9/26/2013	N	Unknown	Fillet	NA	NA	NA	0.18	0.00472 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2.1-8
Comparison of Fish PFAS Sampling Results to Risk-Based Screening Levels

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

							Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
Finfish Consumption Under ME Food Consumption Advisory - Child SL							0.062	0.00413	0.00062	0.000413	0.00062	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Loring-specific Fish Consumption Adult SL							0.108	0.00722	0.00108	0.000722	0.00108	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Loring-specific Fish Consumption Child SL							0.0782	0.00521	0.000782	0.000521	0.000782	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Area	**Location**	**Sample ID**	**Sample Date**	**Sample Type**	**Fish Species**	**Tissue Type**	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG

Notes

Gray Text = Indicates the parameter was not detected.

(shaded) = Result is greater than the Loring-Specific Fish Consumption Child Screening Level

Bold = Result is greater than the Loring-Specific Fish Consumption Adult Screening Level

Underlined = Result is greater that the Finfish Consumption Under ME Food Consumption Advisory Child Screening

mg/kg - Milligrams per Kilogram

NA - Screening level not available.

SL - Screening Levels

Qualifiers shown include:

U - Reported detection limit

J - Estimated Value

UJ - The reported quantitation limit is approximate and may or may not represent the actual limit of quanitation necessary

B - Detected in Blank

Q - The analyte is both B qualified because of blank detection and J qualified because of an additional QC issue

R - Rejected

Sample types shown are "N" for normal field samples and "FD" for field duplicates.

Composite tissue type are samples with 6-12 inch fish that were prepared as composites after removing heads, inards, and

[a] Fish consumption rates calculated based on Maine's FCA limits for mercury (i.e. two meals per month for adults and one

US EPA (2014). Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-

https://www.epa.gov/sites/production/files/2015-01/documents/fish-consumption-rates-2014.pdf

[b] USEPA Region 1 PFAS Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are USEPA provided values for "PFOA/PFOS", which have been interpreted as screening values for the individual compounds. These values were updated based on the 2022 RSL updates.

Prepared by: AKN 7/25/2022
Checked by: KALS 8/17/2022

Table 2.6-1
Summary of Questionnaire Responses

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Questionnaire A: Groundwater (GW) and Surface Water (SW) Use Other than Drinking Water [a]

Surveys Sent	Response Received	Percent Received	Residences that farm or garden	Type of fruits or vegetables grown for consumption	GW or SW Used to Irrigate Gardens	Active Wells In use	Treated Wells	SW on Property	Surface Water used for irrigation	Poultry Eggs	Other meat/dairy	Type of meat	Other uses of Groundwater
32	2	6%	2	Broccoli, Cauliflower, Potatoes, Grains, Apples	2	2 (only 1 used for irrigation)	1 (Accutab Chlorintion with pump)	2	2	0	0	0	Car washing, cleaning machinery

Questionnaire B: On-Base Residential Land Use

Surveys Sent	Response Received	Percent Received	Average Length of Residency	Average Number of People Living in Household	On-Base Locations Visited	Residences Using Surface Water for Recreational Use	Off-Base Surface Water Locations Used Recreationally	Frequency of Recreational Surface Water Use	Residences Aware of PFAS Investigation
46	8	17%	8	2	Bunker Inn, Runway, Manser Dr, Development Dr, Arkansas Dr, Northcutt Dr, Colony Place, Golf Course, Wildlife Refuge	0	0	NA	5

Notes:
[a] Department of Defense coordinated with the United States Department of Agriculture to obtain a list of registered agricultural operations within one mile of Loring, which was used as a basis for the Questionnaire A mailing list.

Prepared by: KALS 8/16/2022
Checked by: ARQ 8/21/22

Table 2.7-1
Selection of Exposure Pathways (RAGS D: Table 1)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current and Future	**Soil**	**Surface Soil (0-1 ft) or Flood-prone Soil (0-1 ft) (if impacted)**	Areas within the Former Installation Boundary: LDA, Aroostook National Wildlife Refuge and Aroostook Band of Mi'kmaq	Current/Future Outdoor Worker	Adult	Ingestion/Dermal	Quantitative	Outdoor workers may be exposed to 0-1' soils.
				Current/Future Utility Worker	Adult	Ingestion/Dermal	Quantitative	Utility worker exposure to combined 0-6' soils.
				Current/Future Recreator/Hiker	Adult	Ingestion/Dermal	Quantitative	Hikers may be exposed to 0-1' soils.
					Child	Ingestion/Dermal	Quantitative	
				Current/Future Resident within LDA	Adult	Ingestion/Dermal	Quantitative	Residents may be exposed to 0-1' soils. Current/Future residents are only in the LDA.
					Child	Ingestion/Dermal	Quantitative	
				Current/Future Unauthorized Forager within the Aroostook Band of Mi'kmaq Lands	Adult	Ingestion/Dermal	Quantitative	Foragers in the Aroostook Band of Mi'kmaq Lands may be exposed to 0-1' soils.
		Flood-prone Soil (0-1 ft) (if impacted) or Garden soil (if collected (b))	Areas outside the former Installation Boundary (c)	Current/Future Resident/Farmer	Adult	None	None	Soils off-site are considered un-impacted for the purpose of this workplan, but if impacts are identified, these receptors may be evaluated.
					Child	None	None	
				Current/Future Recreator	Adult	None	None	
					Child	None	None	
				Current/Future Hunter	Adult	None	None	
					Child	None	None	
		Surface and Subsurface Soil (0-10 ft) (if impacted)	Areas within the Former Installation Boundary: LDA, Aroostook National Wildlife Refuge and Aroostook Band of Mi'kmaq	Current/Future Outdoor Worker	Adult	Ingestion/Dermal	Quantitative	Current industrial workers would not be exposed to soils > 1'. Future industrial workers may be exposed to 1-10' soils following re-grading. This future scenario is included in the CSM as a placeholder.
				Current/Future Utility Worker	Adult	Ingestion/Dermal	Quantitative	Utility worker exposure to combined 0-6' soils.
				Current/Future Recreator/Hiker	Adult	Ingestion/Dermal	Quantitative	Current recreators or residents would not be exposed to soils > 1'. Deeper soil exposure may be evaluated if contamination is present and LUCs are not in place to prevent re-grading. This future scenario is included in the CSM as a placeholder.
					Child	Ingestion/Dermal	Quantitative	
				Current/Future Resident within LDA	Adult	Ingestion/Dermal	Quantitative	
					Child	Ingestion/Dermal	Quantitative	
				Current/Future Unauthorized Forager within the Aroostook Band of Mi'kmaq Lands	Adult	None	None	Unauthorized foragers are not expected to be exposed to soils >1'.
			Areas outside the former Installation Boundary (c)	Current/Future Resident/Farmer	Adult	None	None	Soils off-site are considered un-impacted for the purpose of this workplan, but if impacts are identified, these receptors may be evaluated.
					Child	None	None	
				Current/Future Hunter	Adult	None	None	
					Child	None	None	
				Current/Future Recreator	Adult	None	None	
					Child	None	None	
Future Only	**Soil**	**Surface and Subsurface Soil (0-10 ft) (if impacted) Flood-prone Soil (0-1 ft) (if impacted)**	Areas within the Former Installation Boundary: LDA, Aroostook National Wildlife Refuge and Aroostook Band of Mi'kmaq	Future Construction Worker	Adult	Ingestion/Dermal	Quantitative	Construction workers may be exposed to 0-10' soils.
				Hypothetical Future Resident	Adult	Ingestion/Dermal	Quantitative	> 10' soil exposure may be evaluated if contamination is present and LUCs are not in place to prevent re-grading. This future scenario is included in the CSM as a placeholder.
					Child	Ingestion/Dermal	Quantitative	
				Hypothetical Future Resident/Subsistence Hunter/Gatherer within the Aroostook Band of Mi'kmaq Lands	Adult	Ingestion/Dermal	Quantitative	This residential scenario for the Aroostook Band of Mi'kmaq is intended to include a maximally exposed subsistence resident including hunting, gathering, fishing, and collecting native plants such as brown ash, white cedar, or white birch for traditional basket weaving.
					Child	Ingestion/Dermal	Quantitative	
			Areas outside the former Installation Boundary (c)	Future Construction Worker	Adult	None	None	Soils off-site are considered un-impacted for the purpose of this workplan, but if impacts are identified, these receptors may be evaluated.
				Hypothetical Future Resident	Adult	None	None	
					Child	None	None	
		Soil-Derived Dust	All Potential Exposure Points	All Potentially Exposed Receptors	All	Inhalation	None	Although exposure to dust from soil may occur, this pathway is not evaluated due to lack of PFAS toxicity values for inhalation pathways.

Prepared by: JPK 12/22/2022
Checked by: ARQ 1/20/2023

Table 2.7-1
Selection of Exposure Pathways (RAGS D: Table 1)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current and Future	**Groundwater**	**Groundwater**	Areas within the Former Installation Boundary: LDA, Aroostook National Wildlife Refuge and Aroostook Band of Mi'kmaq	Current/Future Outdoor Worker	Adult	Ingestion/Dermal	Quantitative	Workers will not be exposed to groundwater in the LDA (supplied by public water) and there are no current workers in the Aroostook Band of Mi'kmaq lands. Workers may be exposed to groundwater via the existing public wells on the ANWR property.
				Current/Future Utility Worker	Adult	Ingestion/Dermal	Quantitative	Utility workers may be exposed to groundwater < 6 ft in depth.
				Current/Future Recreator/Hiker	Adult	Ingestion/Dermal	Quantitative	Recreators will not be exposed to groundwater in the LDA (supplied by public water) and there are no current recreators in the Aroostook Band of Mi'kmaq lands .Recreator/hikers may be exposed to groundwater via the existing public wells on the ANWR property.
					Child	Ingestion/Dermal	Quantitative	
				Current/Future Resident within LDA	Adult	None	None	Current/future drinking water in the LDA is supplied by municipal water.
					Child	None	None	
				Current/Future Unauthorized Forager within the Aroostook Band of Mi'kmaq Lands	Adult	None	None	Foragers in the Aroostook Band of Mi'kmaq Lands would not be exposed to groundwater.
			Areas outside the former Installation Boundary	Current/Future Resident/Farmer	Adult	Ingestion/Dermal	Quantitative	Groundwater may be extracted for use as drinking water or non-potable purposes such as irrigation or pool filling.
					Child	Ingestion/Dermal	Quantitative	
				Current/ Future Hunter	Adult	None	None	Hunters would not be exposed to groundwater.
					Child	None	None	
				Current/ Future Recreator	Adult	None	None	Recreators would not be exposed to groundwater.
					Child	None	None	
Future Only	**Groundwater**	**Groundwater**	Areas within the Former Installation Boundary: LDA, Aroostook National Wildlife Refuge and Aroostook Band of Mi'kmaq	Future Construction/Utility Worker	Adult	Ingestion/Dermal	Quantitative	Construction workers are expected to practice de-watering to limit exposure by this pathway. However groundwater 0-10 ft exposure is conservatively included.
				Hypothetical Future Resident	Adult	Ingestion/Dermal	Quantitative	Groundwater may be extracted for use as drinking water or non-potable purposes such as irrigation or pool filling.
					Child	Ingestion/Dermal	Quantitative	
				Hypothetical Future Resident/Subsistence Hunter/Gatherer within the Aroostook Band of Mi'kmaq Lands	Adult	Ingestion/Dermal	Quantitative	This residential scenario for the Aroostook Band of Mi'kmaq is intended to include a maximally exposed subsistence resident including hunting, gathering, fishing, and collecting native plants such as brown ash, white cedar, or white birch for traditional basket weaving. It is assumed they also have a potable well.
					Child	Ingestion/Dermal	Quantitative	
			Areas outside the former Installation Boundary (c)	Future Construction Worker	Adult	Ingestion/Dermal	Quantitative	Construction workers are expected to practice de-watering to limit exposure by this pathway. However groundwater 0-10 ft exposure is conservatively included.
				Hypothetical Future Resident	Adult	Ingestion/Dermal	Quantitative	Groundwater may be extracted for use as drinking water or non-potable purposes such as irrigation or pool filling.
					Child	Ingestion/Dermal	Quantitative	

Prepared by: JPK 12/22/2022
Checked by: ARQ 1/20/2023

Table 2.7-1
Selection of Exposure Pathways (RAGS D: Table 1)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current and Future	**Surface Water**	**Surface Water**	Areas within the former Installation Boundary	Current/Future Outdoor Worker	Adult	None	None	Workers are not expected to be exposed to surface water.
				Current/Future Utility Worker	Adult	None	None	Utility workers are not expected to be exposed to surface water.
				Current/Future Recreator	Adult	Ingestion/Dermal	Quantitative	There is surface water within the former installation boundary. Therefore it is possible that recreators may be exposed to surface water.
					Child	Ingestion/Dermal	Quantitative	
				Current/Future Resident within LDA	Adult	None	None	Current/future residents are not expected to be exposed to surface water.
					Child	None	None	
				Current/Future Unauthorized Forager within the Aroostook Band of Mi'kmaq Lands	Adult	Ingestion/Dermal	Quantitative	Foragers in the Aroostook Band of Mi'kmaq Lands may be exposed to surface water.
			Areas outside the former Installation Boundary	Current/Future Resident/Farmer	Adult	None	None	Although there is surface water on many properties throughout parts of the year, this scenario will be evaluated within the recreational scenario, which is considered representative of a local resident
					Child	None	None	
				Current/ Future Hunter	Adult	None	None	Recreational hunters are not expected to be exposed to surface water.
					Child	None	None	
				Current/ Future Recreator	Adult	Ingestion/Dermal	Quantitative	Recreational users are assumed to potentially be exposed to surface water via swimming.
					Child	Ingestion/Dermal	Quantitative	
Future Only	**Surface Water**	**Surface Water**	Areas within the Former Installation Boundary: LDA, Aroostook National Wildlife Refuge and Aroostook Band of Mi'kmaq	Future Construction Worker	Adult	None	None	Construction workers are not expected to be exposed to surface water.
				Hypothetical Future Resident	Adult	None	None	Residents are not expected to be exposed to surface water.
					Child	None	None	
				Hypothetical Future Resident/Subsistence Hunter/Gatherer within the Aroostook Band of Mi'kmaq Lands	Adult	None	None	This residential scenario for the Aroostook Band of Mi'kmaq is intended to include a maximally exposed subsistence resident including hunting, gathering, fishing, and collecting native plants such as brown ash, white cedar, or white birch for traditional basket weaving. They may wade through surface water and sediment while gathering materials.
					Child	None	None	
			Areas outside the former Installation Boundary (c)	Future Construction Worker	Adult	None	None	Construction workers are not expected to be exposed to surface water.
				Hypothetical Future Resident	Adult	None	None	Residents are not expected to be exposed to surface water.
					Child	None	None	
Current and Future	**Sediment**	**Sediment**	Areas within the former Installation Boundary: LDA and Aroostook National Wildlife Refuge	Current/Future Outdoor Worker	Adult	None	None	Workers are not expected to be exposed to sediment.
				Current/Future Utility Worker	Adult	None	None	Utility workers are not expected to be exposed to sediment.
				Current/Future Recreator	Adult	Ingestion/Dermal	Quantitative	There is surface water within the former installation boundary. Therefore it is possible that recreators may be exposed to sediment regularly.
					Child	Ingestion/Dermal	Quantitative	
				Current/Future Resident within LDA	Adult	None	None	Residents are not expected to be exposed to sediment.
					Child	None	None	
				Current/Future Unauthorized Forager within the Aroostook Band of Mi'kmaq Lands	Adult	Ingestion/Dermal	Quantitative	Foragers in the Aroostook Band of Mi'kmaq Lands may be exposed to sediment.
			Areas outside the former Installation Boundary	Current Future Resident/Farmer	Adult	None	None	Although there is surface water on many properties throughout parts of the year, this scenario will be evaluated within the recreational scenario, which is considered representative of a local resident
					Child	None	None	
				Current/Future Hunter	Adult	None	None	Recreational hunters are not expected to be exposed to sediment.
					Child	None	None	
				Current/Future Recreator	Adult	Ingestion/Dermal	Quantitative	Recreational users/hikers are assumed to potentially be exposed to sediment via wading.
					Child	Ingestion/Dermal	Quantitative	

Table 2.7-1
Selection of Exposure Pathways (RAGS D: Table 1)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route (a)	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future Only	**Sediment**	**Sediment**	Areas within the Former Installation Boundary: LDA, Aroostook National Wildlife Refuge and Aroostook Band of Mi'kmaq	Hypothetical Future Construction Worker	Adult	None	None	Construction workers are not expected to be exposed to sediment.
				Hypothetical Future Resident	Adult	None	None	Hypothetical residents are not expected to be exposed to sediment.
					Child	None	None	
				Hypothetical Future Resident/Subsistence Hunter/Gatherer within the Aroostook Band of Mi'kmaq Lands	Adult	None	None	This residential scenario for the Aroostook Band of Mi'kmaq is intended to include a maximally exposed subsistence resident including hunting, gathering, fishing, and collecting native plants such as brown ash, white cedar, or white birch for traditional basket weaving. They may wade through surface water and sediment while gathering materials.
					Child	None	None	
			Areas outside the former Installation Boundary (c)	Hypothetical Future Construction Worker	Adult	None	None	Construction workers are not expected to be exposed to sediment.
				Hypothetical Future Resident	Adult	None	None	Hypothetical residents are not expected to be exposed to sediment.
					Child	None	None	
Current and Future	**Stormwater System**	**Stormwater and Stormwater Sediment**	Areas within the former Installation Boundary	Current/Future Utility Worker	Adult	Ingestion/Dermal	Quantitative	Utility workers may be exposed to surface water and sediment in the stormwater system.
Current and Future	**Biota**	**Wild Plants**	Aroostook Band of Mi'kmaq Lands	Current/Future Unauthorized Forager within the Aroostook Band of Mi'kmaq Lands	Adult	Ingestion	Quantitative	It is assumed the unauthorized forager in the Aroostook Band of Mi'kmaq Lands may collect medicines and consumable wild plants.
					Child	Ingestion	Quantitative	
		Wild Game	All areas where hunting may occur	Current/Future Hunter	Adult	Ingestion	Qualitative	Although hunting is currently not allowed anywhere within the LDA, ANWR property, or Aroostook Band of Mi'kmaq Lands, poaching may occur and animals may leave those lands and be harvested along the property boundary. Therefore, this exposure scenario may be relevant currently.
					Child	Ingestion	Qualitative	
		Backyard Produce (fruit, veg, animal)	Areas outside the former Installation Boundary	Current/Future Resident/Farmer	Adult	Ingestion	Quantitative	Residents using private water to irrigate plants or water animals such as chicken may be exposed to PFAS through the foodchain by this route.
					Child	Ingestion	Quantitative	
Future Only	**Biota**	**Fish**	All areas where surface water is present	Hypothetical Future Fisher	Adult	Ingestion	Quantitative	The majority of waterbodies are subject to a do-not-eat consumption advisory. However, hypothetical future fishers are assumed to consume fish that they catch.
					Child	Ingestion	Quantitative	
			Aroostook Band of Mi'kmaq Lands	Hypothetical Future Resident/Subsistence Hunter/Gatherer within the Aroostook Band of Mi'kmaq Lands	Adult	Ingestion	Quantitative	Hypothetical future Subsistence Hunter/Gatherers within the Aroostook Band of Mi'kmaq Lands are assumed to consume fish that they catch.
					Child	Ingestion	Quantitative	
		Wild Plants			Adult	Ingestion	Quantitative	It is assumed the future hypothetical resident may collect medicines and consumable wild plants
					Child	Ingestion	Quantitative	
		Wild Game			Adult	Ingestion	Qualitative	Hypothetical future Subsistence Hunter/Gatherers within the Aroostook Band of Mi'kmaq Lands are assumed to consume wild game that they catch.
					Child	Ingestion	Qualitative	

Notes:

(a) PFOS, PFOA, PFBS, PFHxS, and PFNA are not considered volatile and there are no USEPA toxicity values to evaluate the inhalation pathway. Therefore will not be evaluated for the volatile or dust inhalation pathways.
These pathways will be included if relevant for historical chemicals only and are not shown on this table.

(b) Garden soil may be evaluated outside of the installation. There are no current vegetable gardens inside the installation irrigated with private well water. Surface water irrigation within the installation is not anticipated.

(c) Impacts to soil outside of the installation boundary are only anticipated through transport from irrigation water or flooding.

Table 2.7-2
Summary of Potential Exposure Pathways for Human Health Receptors

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Receptors	Primary Media	Exposure Point	Exposure Pathway[a] Ingestion and Dermal Contact: Soil	Sediment	Groundwater	Surface Water	Stormwater System	Ingestion-only: Biota	Inhalation of Dust from Soil
Inside Former Installation Boundary									
Current and Future Outdoor Worker (Adult)	Current Conditions - No Regrading - Surface Soil (0-1 ft)	Loring Development Authority (LDA), Aroostook National Wildlife Refuge, and Aroostook Band of Mi'kmaq (d)	X						NE
	Future Conditions - Assumed Regrading - Surface and Subsurface Soil (0-10 ft)		X						NE
	Potable or Non-Potable Groundwater	Groundwater well at Aroostook National Wildlife Refuge			X				
Current and Future Recreator (Child & Adult)	Current Conditions - No Regrading - Surface Soil (0-1 ft)	Loring Development Authority (LDA), Aroostook National Wildlife Refuge, and Aroostook Band of Mi'kmaq (d)	X						NE
	Future Conditions - Assumed Regrading - Surface and Subsurface Soil (0-10 ft)		X						NE
	Surface Water					X			
	Sediment			X					
	Potable or Non-Potable Groundwater	Groundwater well at Aroostook National Wildlife Refuge			X				
Current and Future Utility Worker[c] (Adult)	Surface Soil and Subsurface Soil (0-6 ft)	Loring Development Authority (LDA), Aroostook National Wildlife Refuge, and Aroostook Band of Mi'kmaq (d)	X						NE
	Groundwater < 6 ft				X				
	Stormwater						X		
	Stormwater Sediment						X		
Future Construction Worker (Adult)	Surface and Subsurface Soil (0-10 ft)	Loring Development Authority (LDA), Aroostook National Wildlife Refuge, and Aroostook Band of Mi'kmaq (d)	X						NE
	Excavation Water < 10 ft				X				
Current and Future Resident (Child & Adult)	Current Conditions - No Regrading - Surface Soil (0-1 ft)	LDA - only	X						NE
	Future Conditions - Assumed Regrading - Surface and Subsurface Soil (0-10 ft)		X						NE

Table 2.7-2
Summary of Potential Exposure Pathways for Human Health Receptors

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Receptors	Primary Media	Exposure Point	Exposure Pathway[a]						
			Ingestion and Dermal Contact					Ingestion-only	Inhalation of Dust from Soil
			Soil	Sediment	Groundwater	Surface Water	Stormwater System	Biota	
Inside Former Installation Boundary continued									
Hypothetical Future Resident (Child & Adult)	Current Conditions - No Regrading - Surface Soil (0-1 ft)	Loring Development Authority (LDA) and Aroostook National Wildlife Refuge (d)	X						NE
	Future Conditions - Assumed Regrading - Surface and Subsurface Soil (0-10 ft)		X						NE
	Potable or Non-Potable Groundwater	Location(s) of highest groundwater concentration (i.e. core(s) of plume)			X				
Current and Future Unauthorized Forager (Adult)	Surface Soil (0-1 ft)	Aroostook Band of Mi'kmaq Lands - only	X						NE
	Surface Water					X			
	Sediment			X					
	Wild Plants							X	
Hypothetical Future Aroostook Band of Mi'kmaq Resident (Child & Adult)	Current Conditions - No Regrading - Surface Soil (0-1 ft)	Aroostook Band of Mi'kmaq Lands - only	X						NE
	Future Conditions - Assumed Regrading - Surface and Subsurface Soil (0-10 ft)		X						NE
	Surface Water					X			
	Sediment			X					
	Potable or Non-Potable Groundwater	Location of highest groundwater concentration or concentrations within Band Land (i.e. core(s) of plume)			X				
	Wild Plants	Aroostook Band of Mi'kmaq Lands - only						X	
	Fish							X	
	Wild Game							X	

Table 2.7-2
Summary of Potential Exposure Pathways for Human Health Receptors

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Receptors	Primary Media	Exposure Point	Exposure Pathway[a]						
			Ingestion and Dermal Contact					Ingestion-only	Inhalation of Dust from Soil
			Soil	Sediment	Groundwater	Surface Water	Stormwater System	Biota	
Outside Former Installation Boundary (b)									
Current and Future Resident (Child & Adult) or Subsistence Farmer	Private gardens and flood-prone soil (0-1 ft) (if impacted)	Private land	X						NE
	Potable or Non-Potable Groundwater (from tap water or private wells)				X				
	Backyard Produce (fruit, veg, animal)							X	
Hypothetical Future Resident (Child & Adult) or Subsistence Farmer	Private gardens and flood-prone soil (0-1 ft) (if impacted)	All Areas Outside of Installation	X						NE
	Potable or Non-Potable Groundwater	Location of highest groundwater concentration(s) outside of LDA (i.e. core(s) if plume)			X				
	Backyard Produce (fruit, veg, animal)	All Areas Outside of Installation						X	
Current and Future Recreator (Child & Adult)	Flood-prone Soil (0-1 ft) (if impacted)	Public Waterways and Land	X						NE
	Surface Water					X			
	Sediment			X					
Current and Future Hunter (Child & Adult)	Flood-prone Soil (0-1 ft) (if impacted)	Public Land	X						NE
	Wild Game							X	
Hypothetical Future Fisher (Child & Adult)	Flood-prone Soil (0-1 ft) (if impacted)	Public Waterways and Land	X						NE
	Surface Water					X			
	Sediment			X					
	Fish							X	
Future Construction Worker (Adult)	Flood-prone Soil (0-1 ft) (if impacted)	All Areas Outside of Installation	X						NE
	Groundwater < 10 ft	Excavation Water			X				

Table 2.7-2
Summary of Potential Exposure Pathways for Human Health Receptors

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Receptors	Primary Media	Exposure Point	Exposure Pathway[a]						
			Ingestion and Dermal Contact					Ingestion-only	Inhalation of Dust from Soil
			Soil	Sediment	Groundwater	Surface Water	Stormwater System	Biota	

Notes:

Blank cells indicate pathway(s) associated with this receptor will not be qualitatively or quantitatively evaluated
LDA - Loring Development Authority
NE - Not Evaluated due to lack of toxicity values for inhalation pathways.
X - Indicates pathway(s) associated with this receptor and medium are potentially complete and will be quantitatively evaluated

(a) PFOS, PFOA, PFBS, PFHxS and PFNA are not considered volatile and there are no USEPA toxicity values to evaluate the inhalation pathway. Therefore will not be evaluated for the volatile or dust inhalation pathways. These pathways will be included if relevant for historical chemicals only and are not shown on this table.

(b) It is assumed that soils outside of the former installation are not impacted unless PFAS transport through groundwater or surface water has occurred. Soils in private gardens will be evaluated for residents, and flood-prone wetlands will be evaluated for exposure by recreational visitors.

(c) Utility worker exposure to soil is assumed 0-6 ft and to include stormwater repairs. Groundwater may be < 6 ft.

(d) Includes parcels fully within the LDA boundary. Unless prevented by existing Land Use Controls, if subsurface COPCs are selected, future subsurface exposure will be evaluated for residential and commercial use, assuming redevelopment may occur including soil mixing.

Table 2.8-1
Updated Human Health Screening Levelswith 2022 Toxicity Values

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

		Soil			Sediment		Surface Water		Fish		Finfish Consumption Under Maine's Mercury Food Consumption Advisory (FCA) for brook trout fish[d]			Groundwater	
		Health Based Screening Levels and Toxicity-based PRGs[a]													
		Utility Worker Soil[b]	Adult Residential Soil[b]	Child Residential Soil[b]	Adult Wading Sediment[b]	Child Wading Sediment[b]	Adult Swimming[c]	Child Swimming[c]	Fish Consumption Adult	Fish Consumption Child	Fish Consumption Adult	Fish Consumption Childbearing Adult	Fish Consumptio n Child	Loring Resident Drinking Water Adult	Loring Resident Drinking Water Child
Parameter	CAS #	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/L)	(ng/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/L)	(ng/L)
PFBS	375-73-5	24.6	17.6	1.90	82.1	8.85	173,000	30,200	0.108	0.0782	0.165	0.331	0.062	1,000	601
PFHxS	355-46-4	1.64	1.17	0.126	5.47	0.590	7,640	1,750	0.00722	0.00521	0.0110	0.0221	0.00413	65.4	39.4
PFNA	375-95-1	0.246	0.176	0.0190	0.821	0.0885	1,080	256	0.00108	0.000782	0.00165	0.00331	0.000620	9.78	5.89
PFOS	1763-23-1	0.164	0.117	0.0126	0.547	0.0590	1,180	203	0.000722	0.000521	0.00110	0.00221	0.000413	6.67	4.01
PFOA	335-67-1	0.246	0.176	0.0190	0.821	0.0885	1,770	304	0.00108	0.000782	0.00165	0.00331	0.000620	10.0	6.02

Notes:

[a]USEPA Region 1 PFAS Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are set at hazard quotient of 0.1.
The recalculated screening levels use the exposure assumptions provided via email communication from Mike Daly on 4 November 2021.

[b]Value based on ingestion and dermal contact.

[c]Value based on ingestion and dermal contact for PFBS, PFHxS, and PFNA. Value based on ingestion only for PFOS and PFOA

[d] Fish consumption rates calculated based on Maine's FCA limits for mercury (i.e. two meals per month for adults and one meal per month for pregnant adults & children).

CAS = Chemical Abstract Service
mg/kg = milligrams per kilogram
NA=Not Available
ng/L = nanograms per liter
PFBS = Perfluorobutane sulfonic acid
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
PFOS = Perfluorooctanesulfonic acid
PFOA = Perfluorooctanoic acid
PRGs = Preliminary Remediation Goals
USEPA = United Stated Environmental Protection Agency

Table 4.4-1
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Soil (0-1.0 feet and 0-10 feet)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Ingestion	Current, Future, and Hypothetical Future Resident and Farmer	Child (0-6 years)	Soil [b]	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	200	mg/day	Default residential child value	USEPA, 2014	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	350	days/year	Default resident exposure frequency	USEPA, 2014	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		
		Adult [d] (6-26 years)	Soil [b]	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	100	mg/day	Default residential adult value	USEPA, 2014	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	350	days/year	Default resident exposure frequency	USEPA, 2014	
				ED	Exposure Duration	20	year	Default based on 26 year residence in one location.	USEPA, 2014	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		
	Hypothetical Future Aroostook Band of Mi'kmaq Resident [c]	Child (0-6 years)	Mi'kMaq Lands	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	400	mg/day	Recommended value for indigenous communities	Harper & Ranco, 2009	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	365	days/year	Recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		
		Adolescent/ Adult (6-70 years)	Mi'kMaq Lands	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	400	mg/day	Recommended value for indigenous communities	Harper & Ranco, 2009	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	365	days/year	Recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	23,360	day	Exposure duration (64 years x 365 days)	Assumption/ USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		

Table 4.4-1
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Soil (0-1.0 feet and 0-10 feet)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Ingestion Cont'd	Current and Future Unauthorized Forager, Recreator, and Hunter	Child (0-6 years)	Soil [b]	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	200	mg/day	Residential child value	USEPA, 2014	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	75	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	6	year	Default based on age range	Assumption	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		
		Adult [d] (6-26 years)	Soil [b]	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	100	mg/day	Residential adult value	USEPA, 2014	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	75	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	20	year	Default based on age range	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		
	Current and Future Outdoor Worker	Adult	Soil [b]	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	100	mg/day	Default outdoor worker value	USEPA, 2014	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	250	days/year	Default worker exposure frequency	USEPA, 2014	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	25	year	Default work duration	USEPA, 2014	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	9,125	day	Exposure duration (25 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		
	Future Construction Worker	Adult	Soil [b]	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	330	mg/day	Default Construction Worker Value	USEPA, 2002b	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	250	days/year	Default worker exposure frequency	USEPA, 2014	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	1	year	Excavation assumed to take place within one year	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	365	day	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		

Table 4.4-1
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Soil (0-1.0 feet and 0-10 feet)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Ingestion Cont'd	Current and Future Utility Worker	Adult	Soil [b]	CSoil	Chemical Concentration in Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Soil	330	mg/day	Default Construction Worker Value	USEPA, 2002b	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability in Soil	chemical-specific	unitless	-	USEPA, 2012	
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	USEPA, 2014	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	12	year	Approximately half the default worker exposure duration	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	4380	day	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		
Dermal Contact	Current, Future, and Hypothetical Future Resident and Farmer	Child (0-6 years)	Soil [b]	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				AF	Adherence Factor	0.2	mg/cm²-event	Default residential child value	USEPA, 2014	
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	2,373	cm^2	Default residential child value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	350	days/year	Default resident exposure frequency	USEPA, 2014	Where DA_{event} =
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and Equation 3.12 (USEPA, 2004)
				CF	Conversion Factor	1.0E-06	kg/mg	-		
		Adult [d] (6-26 years)	Soil [b]	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				AF	Adherence Factor	0.07	mg/cm²-event	Default residential adult value	USEPA, 2014	
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	6,032	cm^2	Default residential adult value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	350	days/year	Default resident exposure frequency	USEPA, 2014	Where DA_{event} =
				ED	Exposure Duration	20	year	Default based on 26 year residence in one location.	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and Equation 3.12 (USEPA, 2004)
				CF	Conversion Factor	1.0E-06	kg/mg	-		
	Hypothetical Future Aroostook Band of Mi'kmaq Resident [c]	Child (0-6 years)	Mi'kMaq Lands	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.1	mg/cm²-event	Provisional recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	2,373	cm^2	Default residential child value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	365	days/year	Recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	Where DA_{event} =
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and Equation 3.12 (USEPA, 2004)
				CF	Conversion Factor	1.0E-06	kg/mg	-		

Table 4.4-1
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Soil (0-1.0 feet and 0-10 feet)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Dermal Contact cont'd	Hypothetical Future Aroostook Band of Mi'kmaq Resident [c]	Adolescent/ Adult [d] (6-70 years)	Mi'kMaq Lands	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.1	mg/cm²-event	Provisional recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				SA	Available Skin Surface Area	6,032	cm^2	Default residential adult value	USEPA, 2014	
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	365	days/year	Recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	Where DA_{event} =
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	23,360	day	Exposure duration (64 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				CF	Conversion Factor	1.0E-06	kg/mg	-		Equation 3.12 (USEPA, 2004)
	Current and Future Unauthorized Forager, Recreator, and Hunter	Child (0-6 years)	Soil [b]	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.2	mg/cm²-event	Default residential child value	USEPA, 2014	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	2,373	cm^2	Default residential child value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	75	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	Where DA_{event} =
				ED	Exposure Duration	6	year	Default based on age range	Assumption	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				CF	Conversion Factor	1.0E-06	kg/mg	-		Equation 3.12 (USEPA, 2004)
	Current and Future Unauthorized Forager, Recreator, and Hunter	Adult [d] (6-26 years)	Soil [b]	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.07	mg/cm²-event	Default residential adult value	USEPA, 2014	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	6,032	cm^2	Default residential adult value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	75	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	Where DA_{event} =
				ED	Exposure Duration	20	year	Default based on age range	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				CF	Conversion Factor	1.0E-06	kg/mg	-		Equation 3.12 (USEPA, 2004)

Table 4.4-1
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Soil (0-1.0 feet and 0-10 feet)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Dermal Contact Cont'd	Current and Future Outdoor Worker	Adult	Soil [b]	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.12	mg/cm²-event	Default industrial value	USEPA, 2014	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	3,527	cm^2	Default worker value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	250	days/year	Default worker exposure frequency	USEPA, 2014	Where DA_{event} =
				ED	Exposure Duration	25	year	Default work duration	USEPA, 2014	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	9,125	day	Exposure duration (25 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				CF	Conversion Factor	1.0E-06	kg/mg	-		Equation 3.12 (USEPA, 2004)
	Future Construction Worker	Adult	Soil [b]	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.3	mg/cm²-event	Construction Worker Value	USEPA, 2002b	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	3,527	cm^2	Default worker value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	250	days/year	Default worker exposure frequency	USEPA, 2014	Where DA_{event} =
				ED	Exposure Duration	1	year	Excavation assumed to take place within one year	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	365	day	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part E, Equation 3.11 and
				CF	Conversion Factor	1.0E-06	kg/mg	-		Equation 3.12 (USEPA, 2004)
	Current and Future Utility Worker	Adult	Soil [b]	CSoil	Chemical Concentration In Soil	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.3	mg/cm²-event	Construction Worker Value	USEPA, 2002b	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	3,527	cm^2	Default worker value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	USEPA, 2014	Where DA_{event} =
				ED	Exposure Duration	12	year	Approximately half the default worker exposure duration	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	4380	day	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part E, Equation 3.11 and
				CF	Conversion Factor	1.0E-06	kg/mg	-		Equation 3.12 (USEPA, 2004)

Prepared by: KALS 2/15/2022
Checked by: ARQ 7/6/22
Revised by: ARQ 1/21/23

Table 4.4-1
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Soil (0-1.0 feet and 0-10 feet)

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name

Definitions and Notes:

95% UCL - The 95 percent Upper Confidence Limit of the mean concentration, which equals or exceeds the true mean with 95 percent confidence.
BHHRA - Baseline Human Health Risk Assessment.
cm^2 - square centimeters
kg - kilogram
mg - milligram
mg/cm^2-event - milligram/centimeter squared per event.
mg/kg - milligram/kilogram
LDA - Loring Development Authority
[a] - Relative Bioavailability in soil is 100% for all compounds anticipated to be evaluated in the BHHRA.
[b] - Using the 2021 USEPA residential RSLs there are eight areas that will be evaluated for soil exposure within the former installation. Please refer to the text for other potential exposure areas.
Including flood-prone soils and garden soils for relevant receptors, if impacted. Receptors may be evaluated for 0-1 ft or 0-10 ft soils depending on the scenario.
[c] - The future indigenous resident scenario assumes a tribal resident may live in one place for their entire lifetime, work on the property, hunt, fish, and gather.
[d] - The adult exposure assumptions in these scenarios are used for the age class from 6-26 years of age. These calculations are based on an adult, but are protective of the adolescent/adult age range.

References:

Harper, B. and Ranco, D. Wabanaki Traditional Cultural Lifeways Exposure Scenario. July 9, 2009. [URL: https://www.epa.gov/sites/default/files/2015-08/documents/ditca.pdf]
USEPA, 1989. Risk Assessment Guidance for Superfund (RAGS) Volume I Human Health Evaluation Manual (Part A): EPA/540/1-89/002.
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USEPA, 2002b. "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites." OSWER 9355.4-24. December.
USEPA, 2004. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.
USEPA, 2012. Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil and recommendations for Default Value for Relative Bioavailability of Arsenic in Soil Documents. OSWER 9200.1-113. Washington, D.C. December 31, 2012.
USEPA, 2014. OSWER Directive 9200.1-120. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Attachment 1. Recommended Default Exposure Factors.
USEPA, 2021. USEPA Region 1 PFAS Screening Levels calculated using USEPA Regional Screening Level calculator. Values were provided via e-mail communication from Mike Daly on 4 November 2021.
Note, 75 days is also the recreator frequency assumed by RAIS (2013). The Risk Assessment Information System (RAIS) Preliminary Remediation Goals (PRGs) for Chemicals User's Guide. Oak Ridge National Laboratory.

Table 4.4-2
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Groundwater

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Potable and Non-Potable Water, Water pooling in an excavation

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Drinking Water	Current, Future, and Hypothetical Future Resident and Farmer - Potable Scenario	Child (0-6 years)	Various [a]	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated per USEPA, 2014b	The calculation for Intake is shown below: $$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$
				IR	Ingestion Rate	0.78	L/day	Default residential child value	USEPA, 2014a	
				EF	Exposure Frequency	350	days/year	Default resident exposure frequency	USEPA, 2014a	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014a	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	365 days for 6 years	USEPA, 2014a	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
		Adult	Various [a]	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated per USEPA, 2014b	The calculation for Intake is shown below: $$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$
				IR	Ingestion Rate	2.5	L/day	Default residential adult value	USEPA, 2014a	
				EF	Exposure Frequency	350	days/year	Default resident exposure frequency	USEPA, 2014a	
				ED	Exposure Duration	20	year	Default based on 26 year residence in one location.	USEPA, 2014a	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	7,300	days	365 days for 20 years	USEPA, 2014a	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
	Hypothetical Future Aroostook Band of Mi'kmaq Resident [b]	Child (0-6 years)	Aroostook Band of Mi'kmaq Lands	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated per USEPA, 2014b	The calculation for Intake is shown below: $$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$
				IR	Ingestion Rate	0.78	L/day	Default residential child value	USEPA, 2014a	
				EF	Exposure Frequency	365	days/year	Recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014a	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	365 days for 6 years	USEPA, 2014a	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
		Adult (6-70 years)	Aroostook Band of Mi'kmaq Lands	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated per USEPA, 2014b	The calculation for Intake is shown below: $$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$
				IR	Ingestion Rate	2.5	L/day	Default indigenous adult value based on USEPA Exposure Factors Handbook	Harper & Ranco, 2009	
				EF	Exposure Frequency	365	days/year	Recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	23,360	days	365 days for 64 years	USEPA, 2014a	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)

Table 4.4-2
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Groundwater

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Potable and Non-Potable Water,
Water pooling in an excavation

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Drinking Water (cont.)	Current/ Future Recreator	Child (0-6 years)	ANWR Well	CW	Chemical Concentration in Surface Water	95% UCL	mg/L	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.39	L/day	Half the daily water intake for a child	Assumption	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	45	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
		Adolescent/ Adult (6-26 years)	ANWR Well	CW	Chemical Concentration in Surface Water	95% UCL	mg/L	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	1.25	L/day	Half the daily water intake for an adult	Assumption	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	45	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	
				ED	Exposure Duration	20	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
	Current and Future Outdoor Worker	Adult	ANWR Well	CSoil	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The calculation for Intake is shown below:
				IR	Ingestion Rate	1.25	L/day	Half the daily water intake for an adult	USEPA, 2014	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	250	days/year	Default worker exposure frequency	USEPA, 2014	
				ED	Exposure Duration	25	year	Default work duration	USEPA, 2014	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	9,125	day	Exposure duration (25 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
	Current and Future Utility Worker	Adult	ANWR Well	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The calculation for Intake is shown below:
				IR	Ingestion Rate	1.25	L/day	Half the daily water intake for an adult	Assumption	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	Assumption	
				ED	Exposure Duration	12	year	Half the default worker exposure duration	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	4,380	days	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
Incidental Ingestion	Current, Future, and Hypothetical Future Resident and Farmer - Non-Potable Scenario (Pool Swimmer)*	Child (0-6 years)	Various [a]	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated per USEPA, 2014b	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.192	L/day	Amount ingested while swimming for a child, upper bound estimate of 0.096 L/hr for child age 6<11 (Table 3-7; USEPA, 2019); assumed 2 hours swimming per day	USEPA, 2019	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	90	days/year	Assumes swimming in backyard pool takes place 5 days per week - May 15 to September 15 (18 wks)	Assumption	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014a	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	365 days for 6 years	USEPA, 2014a	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)

Prepared by: KALS 2/15/2022
Checked by: ARQ 7/6/22
Revised by: ARQ 1/21/23

Table 4.4-2
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Groundwater

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Potable and Non-Potable Water, Water pooling in an excavation

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Incidental Ingestion (cont.)	Current, Future, and Hypothetical Future Resident and Farmer - Non-Potable Scenario (Pool Swimmer)*	Adult	Various [a]	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated per USEPA, 2014b	The calculation for Intake (mg/kg-day) is shown below:
				IR	Ingestion Rate	0.2225	L/day	Amount ingested while swimming for an adult, upper bound estimate of 0.11125 L/hr as average ingestion rate for age 6-26 (Table 3-7; USEPA, 2019); assumed 2 hours swimming per day	USEPA, 2019	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	90	days/year	Assumes swimming in backyard pool takes place 5 days per week - May 15 to September 15 (18 wks)	Assumption	
				ED	Exposure Duration	20	year	Default based on 26 year residence in one location.	USEPA, 2014a	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	7,300	days	365 days for 20 years	USEPA, 2014a	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
	Current and Future Utility Worker	Adult	Various within the Loring Development Authority Boundary	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.011125	L/day	1/10th the amount ingested while swimming for an adult, upper bound estimate of 0.11125 L/hr as average ingestion rate for age 6-26 (Table 3-7; USEPA, 2019).	Assumption	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	Assumption	
				ED	Exposure Duration	12	year	Approximately half the default worker exposure duration	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	4,380	days	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
	Future Construction Worker	Adult	Various within the Loring Development Authority Boundary	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.011125	L/day	1/10th the amount ingested while swimming for an adult, upper bound estimate of 0.11125 L/hr as average ingestion rate for age 6-26 (Table 3-7; USEPA, 2019).	Assumption	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	250	days/year	Default worker exposure frequency	USEPA, 2014a	
				ED	Exposure Duration	1	year	Excavation assumed to take place within one year	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	
				AT-N	Averaging Time (Non-Cancer)	365	days	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)

Table 4.4-2
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Groundwater

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Potable and Non-Potable Water,
Water pooling in an excavation

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Dermal Contact	Current, Future, and	Child	Various [a]	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
	Hypothetical	(0-6 years)		Daevent	Equation 3.2 (USEPA,2004)	calculation	mg/cm^2-event	Chemical-Specific inputs in BHHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
	Future			SA	Available Skin Surface Area	6,365	cm^2	Residential child value for showering	USEPA, 2014a	
	Resident and			t_{event}	Event Duration	0.54	hours/event	Residential child water exposure time	USEPA, 2014a	
	Farmer -			EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific
	Potable			EF	Exposure Frequency	350	days/year	Default resident exposure frequency	USEPA, 2014a	parameters: B, t*, T_{event}, and K_p, using the algorithm that is
	Scenario			ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014a	appropriate for the relationship between t_{event} and t* per
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014a	Equation 3.2 and Equation 3.3.
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	2,190	days	365 days for 6 years	USEPA, 2014a	Equation 3.2, and Equation 3.3 (USEPA, 2004)
		Adult	Various [a]	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA,2004)	calculation	mg/cm^2-event	Chemical-Specific inputs in BHHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				SA	Available Skin Surface Area	20,900	cm^2	Residential adult value for showering	USEPA, 2014a	
				t_{event}	Event Duration	0.71	hours/event	Residential adult water exposure time	USEPA, 2014a	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific
				EF	Exposure Frequency	350	days/year	Default resident exposure frequency	USEPA, 2014a	parameters: B, t*, T_{event}, and K_p, using the algorithm that is
				ED	Exposure Duration	20	year	Default based on 26 year residence in one location.	USEPA, 2014a	appropriate for the relationship between t_{event} and t* per
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	Equation 3.2 and Equation 3.3.
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	7,300	days	365 days for 20 years	USEPA, 2014a	Equation 3.2, and Equation 3.3 (USEPA, 2004)
	Hypothetical Future	Child	Aroostook Band	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
	Aroostook Band of Mi'kmaq Resident [b]	(0-6 years)	of Mi'kmaq Lands	DA_{event}	Equation 3.2 (USEPA,2004)	calculation	mg/cm^2-event	Chemical-Specific inputs in BHHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				SA	Available Skin Surface Area	6,365	cm^2	Residential child value for showering	USEPA, 2014a	
				t_{event}	Event Duration	0.54	hours/event	Residential child water exposure time	USEPA, 2014a	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific
				EF	Exposure Frequency	365	days/year	Recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	parameters: B, t*, T_{event}, and K_p, using the algorithm that is appropriate for the relationship between t_{event} and t* per
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014a	Equation 3.2 and Equation 3.3.
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	2,190	days	365 days for 6 years	USEPA, 2014a	Equation 3.2, and Equation 3.3 (USEPA, 2004)

Table 4.4-2
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Groundwater

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Potable and Non-Potable Water,
Water pooling in an excavation

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Dermal Contact (cont.)	Hypothetical Future Aroostook Band of Mi'kmaq Resident [b]	Adult (6-70 years)	Aroostook Band of Mi'kmaq Lands	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA,2004)	calculation	mg/cm^2-event	Chemical-Specific inputs in BHHRA	USEPA, 2004	$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$$
				SA	Available Skin Surface Area	20,900	cm^2	Residential adult value for showering	USEPA, 2014a	
				t_{event}	Event Duration	0.71	hours/event	Residential adult water exposure time	USEPA, 2014a	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and K_p, using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				EF	Exposure Frequency	365	days/year	Recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	23,360	days	365 days for 64 years	USEPA, 2014a	Equation 3.2, and Equation 3.3 (USEPA, 2004)
	Current, Future, and Hypothetical Future Resident and Farmer - Non-Potable Scenario (Pool Swimmer)*	Child (0-6 years)	Various [a]	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA, 2004)	Calculation	mg/cm2-event	Chemical-Specific inputs in HHRA	USEPA, 2004	$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$$
				SA	Available Skin Surface Area	6,365	cm2	Residential child value	USEPA, 2014	
				t_{event}	Event Duration	2	hours/event	Estimate of time spent in direct contact of pool water	Assumption	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and K_p, using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				EF	Exposure Frequency	90	days/year	Assumes swimming in backyard pool takes place 5 days per week - May 15 to September 15 (18 wks)	Assumption	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014a	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	2,190	days	365 days for 6 years	USEPA, 2014a	Equation 3.2, and Equation 3.3 (USEPA, 2004)
		Adult	Various [a]	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA, 2004)	Calculation	mg/cm2-event	Chemical-Specific inputs in HHRA	USEPA, 2004	$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$$
				SA	Available Skin Surface Area	20,900	cm2	Residential adult value	USEPA, 2014	
				t_{event}	Event Duration	2	hours/event	Estimate of time spent in direct contact of pool water	Assumption	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and K_p, using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				EF	Exposure Frequency	90	days/year	Assumes swimming in backyard pool takes place 5 days per week - May 15 to September 15 (18 wks)	Assumption	
				ED	Exposure Duration	20	year	Default based on 26 year residence in one location.	USEPA, 2014a	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	7,300	days	365 days for 20 years	USEPA, 2014a	Equation 3.2, and Equation 3.3 (USEPA, 2004)

Table 4.4-2
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4):
Reasonable Maximum Exposure - Groundwater

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Potable and Non-Potable Water,
Water pooling in an excavation

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Dermal Contact (cont.)	Current and Future Utility Worker	Adult	Various Areas within the Loring Development Authority Boundary	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA, 2004)	Calculation	mg/cm2-event	Chemical-Specific inputs in HHRA	USEPA, 2004	
				SA	Available Skin Surface Area	3,527	cm2	Default worker value for direct contact with soil	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				t_{event}	Event Duration	2	hours/event	Estimate of time spent in direct contact with excavation water	Assumption	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and K_p, using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	Assumption	
				ED	Exposure Duration	12	year	Approximately half the default worker exposure duration	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	4,380	days	Exposure duration (1 year x 365 days)	Assumption	Equation 3.2, and Equation 3.3 (USEPA, 2004)
	Future Construction Worker	Adult	Various Areas within the Loring Development Authority Boundary	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA, 2004)	Calculation	mg/cm2-event	Chemical-Specific inputs in HHRA	USEPA, 2004	
				SA	Available Skin Surface Area	3,527	cm2	Default worker value for direct contact with soil	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				t_{event}	Event Duration	2	hours/event	Estimate of time spent in direct contact with excavation water	Assumption	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and K_p, using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				EF	Exposure Frequency	250	days/year	Default worker exposure frequency	USEPA, 2014a	
				ED	Exposure Duration	1	year	Excavation assumed to take place within one year	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014a	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014a	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	365	days	Exposure duration (1 year x 365 days)	Assumption	Equation 3.2, and Equation 3.3 (USEPA, 2004)

Definitions:
95% UCL - The 95 percent Upper Confidence Limit of the mean concentration, which equals or exceeds the true mean with 95 percent confidence.
BHHRA - Baseline Human Health Risk Assessment.
kg - kilogram
L/day - Liters per day
mg/L - milligram per liter
[a] - Groundwater exposure points will be determined based on the final dataset considering flow fields, property boundaries, and EPA guidance related to identification of the core of the plume.
[b] - The future indigenous resident scenario assumes a tribal resident may live in one place for their entire lifetime, work on the property, hunt, fish, and gather.

References:
Harper, B. and Ranco, D. Wabanaki Traditional Cultural Lifeways Exposure Scenario. July 9, 2009. [URL: https://www.epa.gov/sites/default/files/2015-08/documents/ditca.pdf]
USEPA, 1989. Risk Assessment Guidance for Superfund (RAGS) Volume I Human Health Evaluation Manual (Part A): EPA/540/1-89/002.
USEPA, 2004. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.
USEPA, 2014a. OSWER Directive 9200.1-120. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Attachment 1. Recommended Default Exposure Factors.
USEPA, 2014b. OSWER Directive 9283.1-42. Determining Groundwater Exposure Point Concentrations, Supplemental Guidance. February.
USEPA, 2019. Update for Chapter 3 of the Exposure Factors Handbook, Ingestion of Water and Other Select Liquids . Office of Research and Development. EPA/600/R-18/259F. February.
* Ingestion while swimming is considered as the most conservative non-potable use for an ingestion-only scenario. Incidental ingestion while irrigating may also be evaluated, however this will be considered at a later stage.

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Checked by: ARQ 7/6/22
Revised by: ARQ 1/21/23

Table 4.4-3
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Surface Water and Stormwater
Exposure Medium: Surface Water and Stormwater

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Ingestion	Current and Future Recreator and Fisher	Child (0-6 years)	Eastern and Western Drainages	CW	Chemical Concentration in Surface Water	95% UCL	mg/L	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.192	L/day	Amount ingested while swimming for a child, upper bound estimate of 0.096 L/hr for child age 6<11 (Table 3-7; USEPA, 2019); assumed 2 hours swimming per day	USEPA, 2019	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	45	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
		Adolescent/ Adult (6-26 years)	Eastern and Western Drainages	CW	Chemical Concentration in Surface Water	95% UCL	mg/L	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.2225	L/day	Amount ingested while swimming for an adult, upper bound estimate of 0.11125 L/hr as average ingestion rate for age 6-26 (Table 3-7; USEPA, 2019); assumed 2 hours swimming per day	USEPA, 2019	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	45	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	
				ED	Exposure Duration	20	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
	Hypothetical Future Aroostook Band of Mi'kmaq Resident [a] or Unauthorized Forager	Child (0-6 years)	Surface Water on Mi'kMaq Lands	CW	Chemical Concentration in Surface Water	95% UCL	mg/L	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.192	L/day	Amount ingested while swimming for a child, upper bound estimate of 0.096 L/hr for child age 6<11 (Table 3-7; USEPA, 2019); assumed 2 hours swimming per day	USEPA, 2019	$Intake = \frac{CW \times IR \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	120	days/year	Approximately 1/3 of the year, and 1/3 the value recommended value for indigenous communities for soil direct contact pathway, assuming surface water is available for contact in the warmer months and contact is not daily	Assumption	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)

Table 4.4-3
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Surface Water and Stormwater
Exposure Medium: Surface Water and Stormwater

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Ingestion cont'd	Hypothetical Future Aroostook Band of Mi'kmaq Resident [a] or Unauthorized Forager	Adolescent/ Adult (6-70 years)	Surface Water on Mi'kMaq Lands	CW	Chemical Concentration in Surface Water	95% UCL	mg/L	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.2225	L/day	Amount ingested while swimming for an adult, upper bound estimate of 0.11125 L/hr as average ingestion rate for age 6-26 (Table 3-7; USEPA, 2019); assumed 2 hours swimming per day	USEPA, 2019	$Intake=\frac{CW\times IR\times EF\times ED}{BW\times AT}$
				EF	Exposure Frequency	120	days/year	Approximately 1/3 of the year, and 1/3 the value recommended value for indigenous communities for soil direct contact pathway, assuming surface water is available for contact in the warmer months and contact is not daily	Assumption	
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	23,360	day	Exposure duration (64 years x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
	Current and Future Utility Worker	Adult	Stormwater within the Loring Development Authority Boundary	CW	Chemical Concentration in Surface Water	Calculation	mg/L	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	0.011125	L/day	1/10th the amount ingested while swimming for an adult, upper bound estimate of 0.11125 L/hr as average ingestion rate for age 6-26 (Table 3-7; USEPA, 2019).	USEPA, 2019	$Intake=\frac{CW\times IR\times EF\times ED}{BW\times AT}$
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	Assumption	
				ED	Exposure Duration	12	year	Half the default worker exposure duration	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	4,380	days	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-11 (USEPA, 1989)
Dermal Contact	Current and Future Recreator and Fisher	Child (0-6 years)	Eastern and Western Drainages	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA, 2004)	Calculation	mg/cm2-event	Chemical-Specific inputs in HHRA	USEPA, 2004	$DAD=\frac{DA_{event}\times EF\times ED\times EV\times SA}{BW\times AT}$
				SA	Available Skin Surface Area	6,365	cm2	Residential child value	USEPA, 2014	
				t_{event}	Event Duration	2	hours/event	Estimate of time spent in direct contact of surface water	Assumption	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and K_p, using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				EF	Exposure Frequency	45	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	Assumption	Equation 3.2, and Equation 3.3 (USEPA, 2004)

Table 4.4-3
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Surface Water and Stormwater
Exposure Medium: Surface Water and Stormwater

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Dermal Contact cont'd	Current and Future Recreator and Fisher	Adolescent/ Adult (6-26 years)	Eastern and Western Drainages	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA, 2004)	Calculation	mg/cm2-event	Chemical-Specific inputs in HHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				SA	Available Skin Surface Area	20,900	cm2	Residential adult value	USEPA, 2014	
				t_{event}	Event Duration	2	hours/event	Estimate of time spent in direct contact of surface water	Assumption	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and $K_{p,}$ using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				EF	Exposure Frequency	45	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	
				ED	Exposure Duration	20	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	Assumption	Equation 3.2, and Equation 3.3 (USEPA, 2004)
	Hypothetical Future Aroostook Band of Mi'kmaq Resident [a] or Unauthorized Forager	Child (0-6 years)	Surface Water on Mi'kMaq Lands	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA,2004)	calculation	mg/cm^2-event	Chemical-Specific inputs in BHHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				SA	Available Skin Surface Area	6,365	cm^2	Residential child value for showering	USEPA, 2014	
				t_{event}	Event Duration	2	hours/event	Assumption	Assumption	
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	120	days/year	Approximately 1/3 of the year, and 1/3 the value recommended value for indigenous communities for soil direct contact pathway, assuming surface water is available for contact in the warmer months and contact is not daily	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and $K_{p,}$ using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	Assumption	Equation 3.2, and Equation 3.3 (USEPA, 2004)

Table 4.4-3
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Surface Water

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Surface Water and Stormwater
Exposure Medium: Surface Water and Stormwater

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Dermal Contact cont'd	Hypothetical Future Aroostook Band of Mi'kmaq Resident [a] or Unauthorized Forager	Adolescent/ Adult (6-70 years)	Surface Water on Mi'kMaq Lands	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA,2004)	calculation	mg/cm^2-event	Chemical-Specific inputs in BHHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				SA	Available Skin Surface Area	20,900	cm^2	Residential adult value for showering	USEPA, 2014	
				t_{event}	Event Duration	8	hours/event	Assumed Indigenous adult may spend up to 8 hours working in surface water	Harper & Ranco, 2009	
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	120	days/year	Approximately 1/3 of the year, and 1/3 the value recommended value for indigenous communities for soil direct contact pathway, assuming surface water is available for contact in the warmer months and contact is not daily	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and $K_{p,}$ using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	23,360	day	Exposure duration (64 years x 365 days)	Assumption	Equation 3.2, and Equation 3.3 (USEPA, 2004)
	Current and Future Utility Worker	Adult	Stormwater within the Development Authority Boundary	CW	Chemical Concentration in Groundwater	95% UCL	mg/L	EPC Calculations in HHRA	Calculated	The equation for Dermally Absorbed Dose (DAD) (mg/kg-day) from dermal is shown below
				DA_{event}	Equation 3.2 (USEPA, 2004)	Calculation	mg/cm2-event	Chemical-Specific inputs in HHRA	USEPA, 2004	
				SA	Available Skin Surface Area	3,527	cm2	Default worker value for direct contact with soil	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				t_{event}	Event Duration	2	hours/event	Estimate of time spent in direct contact with stormwater	Assumption	
				EV	Event Frequency per Day	1	event/day	-	Assumption	Where DA_{event} is t_{event} multiplied by chemical-specific parameters: B, t*, T_{event}, and $K_{p,}$ using the algorithm that is appropriate for the relationship between t_{event} and t* per Equation 3.2 and Equation 3.3.
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	Assumption	
				ED	Exposure Duration	12	year	Approximately half the default worker exposure duration	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	days	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.1,
				AT-N	Averaging Time (Non-Cancer)	4,380	days	Exposure duration (1 year x 365 days)	Assumption	Equation 3.2, and Equation 3.3 (USEPA, 2004)

Definitions:

95% UCL - The 95 percent Upper Confidence Limit of the mean concentration, which equals or exceeds the true mean with 95 percent confidence.
L/day - Liters per day
mg/L - milligram/Liter
[a] - The future Aroostook Band of Mi'kmaq resident scenario assumes a tribal resident may live in one place for their entire lifetime, work on the property, hunt, fish, and gather.

References:

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Table 4.4-4
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment and Stormwater sediment

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Ingestion	Current/ Future Recreator and Fisher	Child (0-6 years)	Eastern and Western Drainages	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Sediment	200	mg/day	Default residential child value for soil ingestion	USEPA, 2014	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability	chemical-specific	unitless	-	Assumption	
				EF	Exposure Frequency	75	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.
		Adolescent/ Adult (6-26 years)	Eastern and Western Drainages	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Sediment	100	mg/day	Default residential adult value for soil ingestion	USEPA, 2014	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability	chemical-specific	unitless	-	Assumption	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				EF	Exposure Frequency	75	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	
				ED	Exposure Duration	20	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.
	Hypothetical Future Aroostook Band of Mi'kmaq Resident [a] or Unauthorized Forager	Child (0-6 years)	Sediment on Mi'kMaq Lands	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake (mg/kg-day) from ingestion is shown below
				IR	Ingestion Rate of Sediment	400	mg/day	Recommended soil value for indigenous communities [c]	Harper & Ranco, 2009	
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability	chemical-specific	unitless	-	Assumption	
				EF	Exposure Frequency	120	days/year	Approximately 1/3 of the year, and 1/3 the value recommended value for indigenous communities for soil direct contact pathway, assuming surface water is available for contact in the warmer months and contact is not daily	Assumption	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.

Table 4.4-4
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment and Stormwater sediment

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Ingestion cont'd	Hypothetical Future Aroostook Band of Mi'kmaq Resident [a] or Unauthorized Forager	Adolescent/ Adult (6-26 years)	Sediment on Mi'kMaq Lands	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake
				IR	Ingestion Rate of Sediment	400	mg/day	Recommended soil value for indigenous communities [c]	Harper & Ranco, 2009	(mg/kg-day) from ingestion is shown below
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability	chemical-specific	unitless	-	Assumption	
				EF	Exposure Frequency	120	days/year	Approximately 1/3 of the year, and 1/3 the value recommended value for indigenous communities for soil direct contact pathway, assuming surface water is available for contact in the warmer months and contact is not daily	Assumption	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	23,360	day	Exposure duration (64 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.
	Current and Future Utility Worker	Adult	Stormwater Sediment within the Loring Development Authority Boundary if impacted	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Chronic Daily Intake
				IR	Ingestion Rate of Sediment	330	mg/day	Construction Worker Value for soil ingestion	USEPA, 2002b	(mg/kg-day) from ingestion is shown below
				FI	Fraction Ingested	1	unitless	-	Assumption	
				RBA[a]	Relative Bioavailability	chemical-specific	unitless	-	Assumption	
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	Assumption	$Intake = \frac{C_{soil} \times IR \times FI \times RBA \times EF \times ED \times CF1}{BW \times AT}$
				ED	Exposure Duration	12	year	Half the default worker exposure duration	Assumption	
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	4380	day	Exposure duration (1 year x 365 days)	Assumption	Source: RAGS Part A, Exhibit 6-14 (USEPA, 1989)
				CF1	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.
Dermal Contact	Current and Future Recreator and Fisher	Child (0-6 years)	Eastern and Western Drainages	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.2	mg/cm^2-event	Default child (0-6 years) value for soil	USEPA, 2014	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	
				SA	Available Skin Surface Area	2,373	cm^2	Default residential child value	USEPA, 2014	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	75	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	Where DA_{event} =
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Equation 3.12 (USEPA,2004)
				CF	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.

Table 4.4-4
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment and Stormwater sediment

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Dermal Contact Cont'd	Current and Future Recreator and Fisher	Adolescent/ Adult (6-26 years)	Eastern and Western Drainages	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.07	ng/cm²-ever	Default 6-26 year old value for soil	USEPA, 2014	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				SA	Available Skin Surface Area	6,032	cm^2	Default residential adult value	USEPA, 2014	
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	75	days/year	Default for recreator assumed by USEPA in Region 1 Recreational Screening Values developed for Loring	USEPA, 2021	Where DA_{event} =
				ED	Exposure Duration	20	year	Default based on age range	USEPA, 2014	$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	USEPA, 2014	Equation 3.12 (USEPA,2004)
				CF	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.
	Hypothetical Future Aroostook Band of Resident [a] or Unauthorized Forager	Child (0-6 years)	Sediment on Mi'kMaq Lands	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.1	ng/cm²-ever	Provisional recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$
				SA	Available Skin Surface Area	2,373	cm^2	Default residential child value	USEPA, 2014	
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	120	days/year	Approximately 1/3 of the year, and 1/3 the value recommended value for indigenous communities for soil direct contact pathway, assuming surface water is available for contact in the warmer months and contact is not daily	Assumption	Where DA_{event} = $DA_{event} = C_{soil} \times CF \times AF \times ABS_d$
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Equation 3.12 (USEPA,2004)
				CF	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.

Table 4.4-4
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Sediment
Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment and Stormwater sediment

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name
Dermal Contact Cont'd	Hypothetical Future Aroostook Band of Mi'kmaq Resident [a] or Unauthorized Forager	Adolescent/ Adult (6-70 years)	Sediment on Mi'kMaq Lands	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.1	mg/cm²-event	Provisional recommended value for indigenous communities for soil direct contact pathway	Harper & Ranco, 2009	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$$
				SA	Available Skin Surface Area	6,032	cm^2	Default residential adult value	USEPA, 2014	
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	120	days/year	Approximately 1/3 of the year, and 1/3 the value recommended value for indigenous communities for soil direct contact pathway, assuming surface water is available for contact in the warmer months and contact is not daily	Assumption	Where DA_{event} =
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	$$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$$
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				AT-N	Averaging Time (Non-Cancer)	23,360	day	Exposure duration (70 years x 365 days)	USEPA, 2014	Equation 3.12 (USEPA,2004)
				CF	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.
	Current and Future Utility Worker	Adult	Stormwater Sediment within the Loring Development Authority Boundary if impacted	CSediment	Chemical Concentration in Sediment	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002a	The equation for Dermally Absorbed Dose (DAD)
				AF	Adherence Factor	0.3	mg/cm²-event	Construction Worker Value for soil	USEPA, 2002b	(mg/kg-day) from dermal is shown below
				ABS_d	Absorption Factor	chemical-specific	unitless	Chemical-Specific inputs in BHHRA	USEPA, 2004	$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$$
				SA	Available Skin Surface Area	3,527	cm^2	Default worker value	USEPA, 2014	
				EV	Event Frequency per Day	1	event/day	-	Assumption	
				EF	Exposure Frequency	30	days/year	Assumed to be working at site 30 days per year	Assumption	Where DA_{event} =
				ED	Exposure Duration	12	year	Half the default worker exposure duration	Assumption	$$DA_{event} = C_{soil} \times CF \times AF \times ABS_d$$
				BW	Body Weight	80	kg	Default adult body weight	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	Source: RAGS Part E, Equation 3.11 and
				AT-N	Averaging Time (Non-Cancer)	4380	day	Exposure duration (1 year x 365 days)	Assumption	Equation 3.12 (USEPA,2004)
				CF	Conversion Factor	1.0E-06	kg/mg	-		CSoil and CSediment are equivalent.

Table 4.4-4
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Sediment

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment and Stormwater sediment

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Location	Reference	Intake Equation / Model Name

Definitions and Notes:
95% UCL - The 95 percent Upper Confidence Limit of the mean concentration, which equals or exceeds the true mean with 95 percent confidence.
cm^2 - square centimeters
kg - kilograms
mg/cm^2-event - milligram/centimeter squared per event.
mg/kg - milligrams/kilogram
[a] - Relative Bioavailability in sediment is 100% for all compounds anticipated to be evaluated in the BHHRA.
[b] - The future indigenous resident scenario assumes a tribal resident may live in one place for their entire lifetime, work on the property, hunt, fish, and gather.
[c] - The soil ingestion rate may need to be increased if a traditional hunter/gatherer exposure scenario is evaluated in isolation from a resident.

References:

USEPA, 1989. Risk Assessment Guidance for Superfund (RAGS) Volume I Human Health Evaluation Manual (Part A): EPA/540/1-89/002.
USEPA, 2002a. "Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10.
USEPA, 2002b. "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites." OSWER 9355.4-24. December.
USEPA, 2004. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.
USEPA, 2014. OSWER Directive 9200.1-120. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Attachment 1. Recommended Default Exposure Factors.
USEPA, 2021. USEPA Region 1 PFAS Screening Levels calculated using USEPA Regional Screening Level calculator. Values were provided via e-mail communication from Mike Daly on 4 November 2021.
Note, 75 days is also the recreator frequency assumed by RAIS (2013). The Risk Assessment Information System (RAIS) Preliminary Remediation Goals (PRGs) for Chemicals User's Guide. Oak Ridge National Laboratory.
Harper, B. and Ranco, D. Wabanaki Traditional Cultural Lifeways Exposure Scenario. July 9, 2009. [URL: https://www.epa.gov/sites/default/files/2015-08/documents/ditca.pdf]

Table 4.4-5
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Biota

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Biota
Exposure Medium: Fish

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name
Ingestion of Fish	Hypothetical Future Fisher	Child (0-6 years)	Eastern and Western Drainages	C_{fish}	Chemical Concentration in Fish	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	7,567	mg/day	Consumption rate under Maine's Mercury Food Consumption Advisory (FCA) for brook trout fish	MaineCDC, 2022	$Intake = \frac{C_{fish} \times IR \times FI \times EF \times ED}{BW \times AT}$
				FI	Fraction Ingested from Contaminated Sou	1	unitless	-	Assumption	
				EF	Exposure Frequency	350	days/year	Default days spent at home	USEPA, 2014	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child (0-6 years) value	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-17 (USEPA, 1989)
		Adolescent/ Adult (6-26 years)	Eastern and Western Drainages	C_{fish}	Chemical Concentration in Fish	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	15,133	mg/day	Consumption rate under Maine's Mercury Food Consumption Advisory (FCA) for brook trout fish	MaineCDC, 2022	$Intake = \frac{C_{fish} \times IR \times FI \times EF \times ED}{BW \times AT}$
				FI	Fraction Ingested from Contaminated Sou	1	unitless	-	Assumption	
				EF	Exposure Frequency	350	days/year	Default days spent at home	USEPA, 2014	
				ED	Exposure Duration	20	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	80	kg	Default 6-26 year old value	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	7,300	day	Exposure duration (20 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-17 (USEPA, 1989)
	Hypothetical Future Aroostook Band of Mi'kmaq Resident [a]	Child (0-6 years)	Surface Water on Mi'kMaq Lands	C_{fish}	Chemical Concentration in Fish	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	100,000	mg/day	Assumptions for subsistance intake for Washoe Tribe, as Wabanaki intake not available	AESE, 2005	$Intake = \frac{C_{fish} \times IR \times FI \times EF \times ED}{BW \times AT}$
				FI	Fraction Ingested from Contaminated Sou	1	unitless	-	Assumption	
				EF	Exposure Frequency	365	days/year	Tribal dietary rates are daily averages	Assumption	
				ED	Exposure Duration	6	year	Default based on age range	USEPA, 2014	
				BW	Body Weight	15	kg	Default child (0-6 years) value	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	2,190	day	Exposure duration (6 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-17 (USEPA, 1989)
		Adolescent/ Adult (6-70 years)	Surface Water on Mi'kMaq Lands	C_{fish}	Chemical Concentration in Fish	95% UCL	mg/kg	EPC Calculations in BHHRA	USEPA, 2002	The calculation for Intake is shown below:
				IR	Ingestion Rate	286,000	mg/day	Wabanaki adult inland non-anadromous fish diet intake	Harper & Ranco, 2009	
				FI	Fraction Ingested from Contaminated Sou	1	unitless	-	Assumption	$Intake = \frac{C_{fish} \times IR \times FI \times EF \times ED}{BW \times AT}$
				EF	Exposure Frequency	365	days/year	Tribal dietary rates are daily averages	Assumption	
				ED	Exposure Duration	64	year	Professional Judgement based on total lifetime and assumed residence in one location	Assumption	
				BW	Body Weight	80	kg	Default 6-26 year old value	USEPA, 2014	
				AT-C	Averaging Time (Cancer)	25,550	day	Lifetime (70 years x 365 days)	USEPA, 2014	
				AT-N	Averaging Time (Non-Cancer)	23,360	day	Exposure duration (64 years x 365 days)	USEPA, 2014	Source: RAGS Part A, Exhibit 6-17 (USEPA, 1989)

Table 4.4-5
Exposure Assumption Values Used For Daily Intake Calculations (RAGS D: Table 4)
Reasonable Maximum Exposure - Biota

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Scenario Timeframe: Current/Future
Medium: Biota
Exposure Medium: Fish

Exposure Route	Receptor	Receptor Age	Exposure Points	Parameter Code	Parameter Definition	Value	Units	Rationale/ Table	Reference	Intake Equation / Model Name

Definitions:
95% UCL - The 95 percent Upper Confidence Limit of the mean concentration, which equals or exceeds the true mean with 95 percent confidence.
[a] - The future indigenous resident scenario assumes a tribal resident may live in one place for their entire lifetime, work on the property, hunt, fish, and gather.

References:

AESE, Inc., 2005, Draft Washoe Tribe Provisional Reasonable Maximum Exposure Factors (RME) for the Leviathan Mine Superfund Site Risk Assessments, June 27.
USEPA, 1989. Risk Assessment Guidance for Superfund (RAGS) Volume I Human Health Evaluation Manual (Part A): EPA/540/1-89/002.
USEPA, 2002. "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites." OSWER 9355.4-24. December.
USEPA, 2014. OSWER Directive 9200.1-120. Attachment 1. Recommended Default Exposure Factors (2014).
USEPA, 2021. USEPA Region 1 PFAS Screening Levels calculated using USEPA Regional Screening Level calculator. Values were provided via e-mail communication from Mike Daly on 4 November 2021.
Maine CDC, 2022. Freshwater Fish Safe Eating Guidelines.
Harper, B. and Ranco, D. Wabanaki Traditional Cultural Lifeways Exposure Scenario. July 9, 2009. [URL: https://www.epa.gov/sites/default/files/2015-08/documents/ditca.pdf]

APPENDIX

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APPENDIX A

Exposure Assessment Site Reconnaissance

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Surface Water Drainage features and nearby surface water features include:

Eastern Drainages – Bunkers are located to the east, flight line and fire training area are located to the west. Limestone creek flows to the southeast.

Figure 1. This view is a picnic area at East Loring Lake (looking northeast)

Figure 2. Map in Aroostook National Wildlife Refuge leading to Beaver Pond Trail, which runs parallel to the runway

Figure 3. Close up of Map in Aroostook National Wildlife Refuge leading to Beaver Pond Trail, which runs parallel to the runway.

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Figure 4. The view of this picnic table is looking west (towards the runway) from the clearing in the northern portion of Beaver Pond Trail.

Figure 5. The view of a drainage channel from the runway area as seen from a bridge on Beaver Pond Trail. View is looking north northwest (towards the runway) from Beaver Pond Trail.

Figure 6. The view of a bench is looking east (away from the runway) from Beaver Pond Trail.

Figure 7. Example potentially attractive harvesting mushrooms growing along Beaver Pond Trail.

Figure 8. Example of local irrigation system, used on the agricultural fields to the east of the former base, and example of local crops (typically broccoli and potatoes are grown locally).

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Figure 9. View of Durepo Reservoir looking west showing surface water extraction equipment.

Western Drainages – Flight line is located to the southeast. Greenlaw Brook flows to the southwest in two main branches.

Figure 10. View of the outfall at the start of the Flight Line Drainage Ditch and the East branch of Greenlaw Brook (unknown photo date).

Figure 11. View of Greenlaw Brook West Branch where it crosses Development Road, looking South (photo taken June 7th 2022).

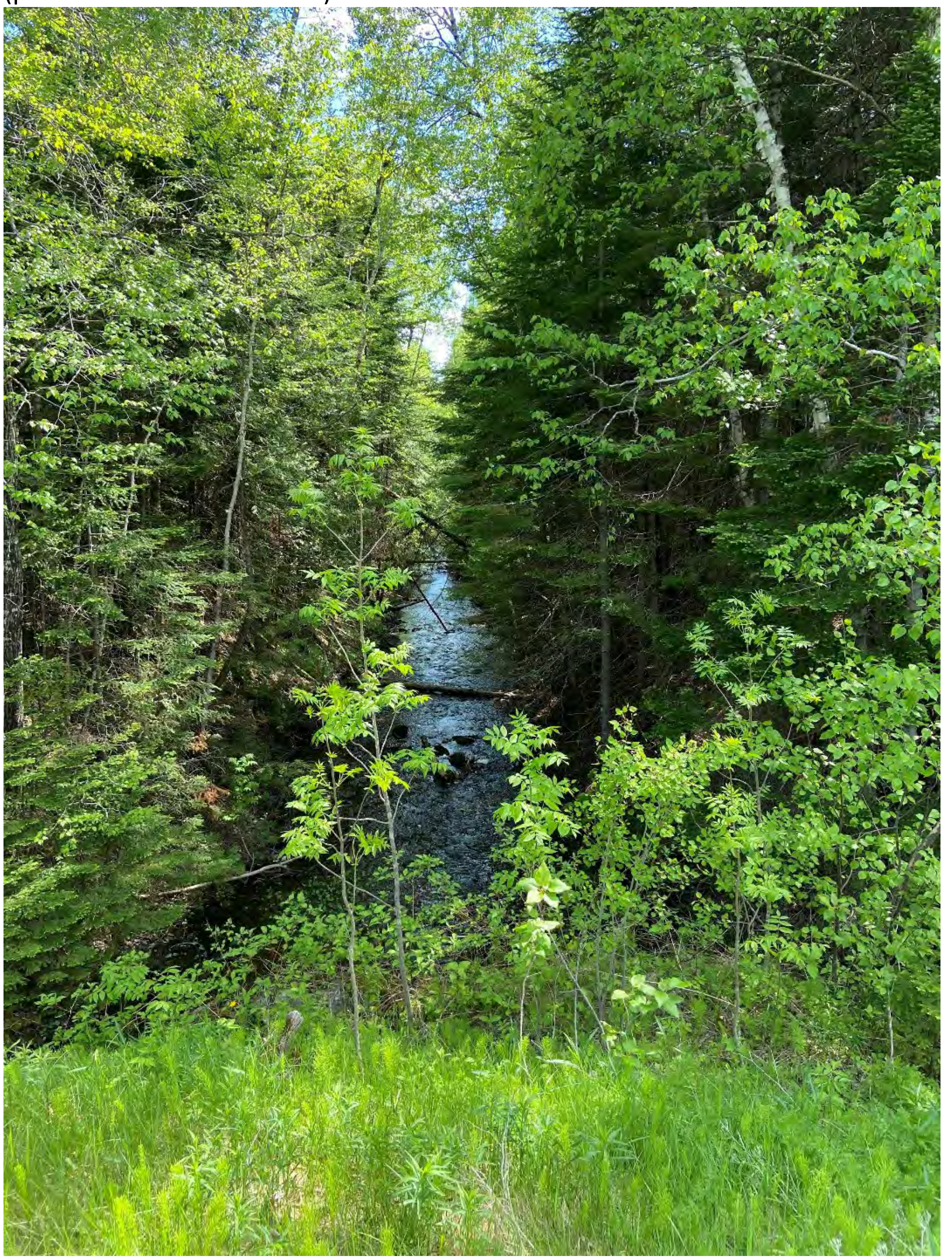

Figure 12. View of West Virginial Road parking area information sign looking west, towards Chapman Pond.

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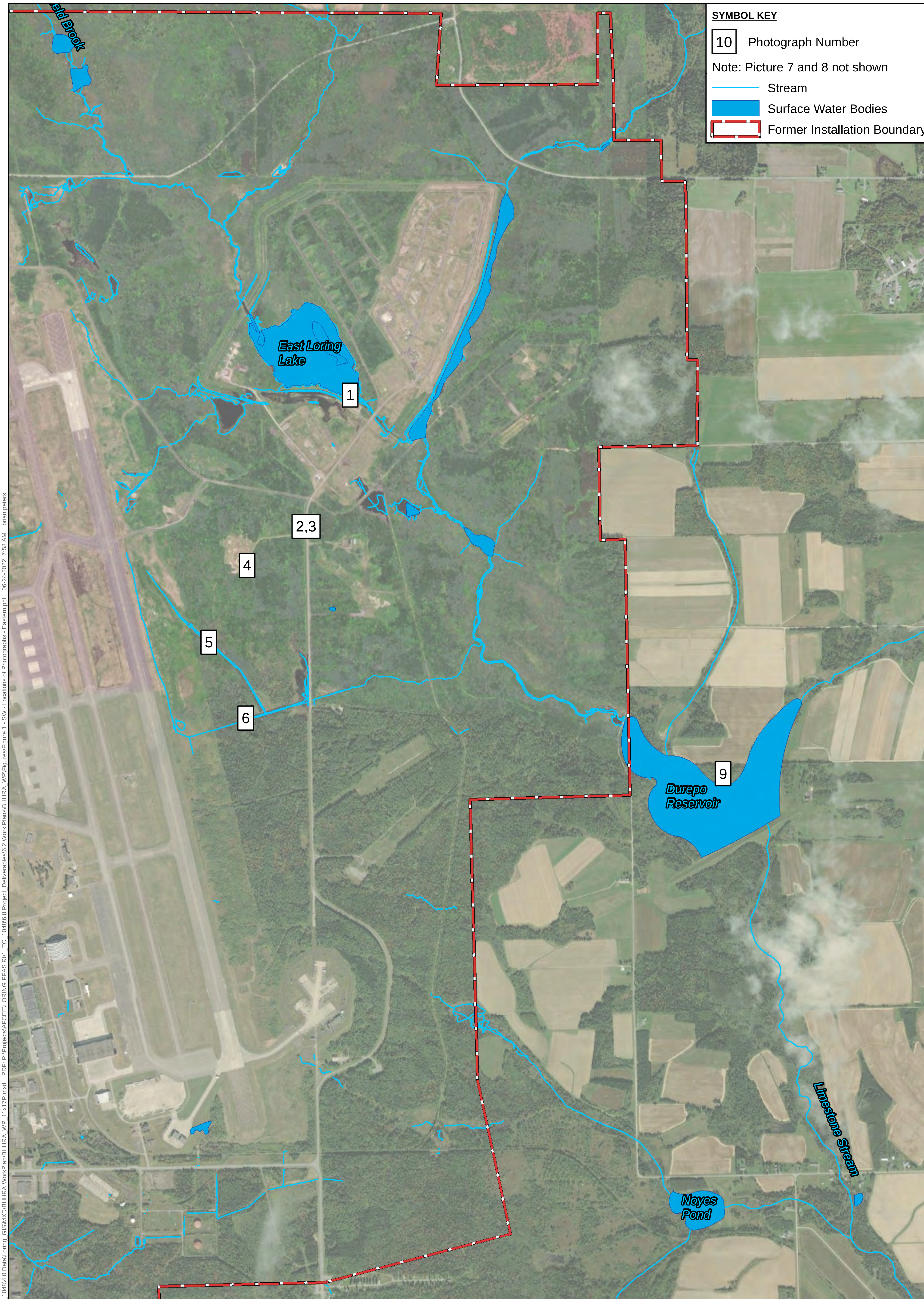
Figure 13. Greenlaw Brook in an area of restored habitat adjacent to hiking trails.

Figure 14. View of area at Chapman Pond with waterfowl.

Figure 15. View of recreational area at Chapman Pond (installed by Eagle Scouts in 2016 according to the cement foundation).



Air Force Civil Engineer Center
2261 Hughes Ave., Suite 163
JBSA Lackland, TX 78236

Figure 1
Surface Water - Locations of Photographs
Eastern Drainage Features
Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base, Limestone, ME

0 200 400 800 1,200 1,600 Meters
0 750 1,500 3,000 4,500 6,000 Feet

N

NOTES:
-Aerial Imagery obtained through ESRI Online Services

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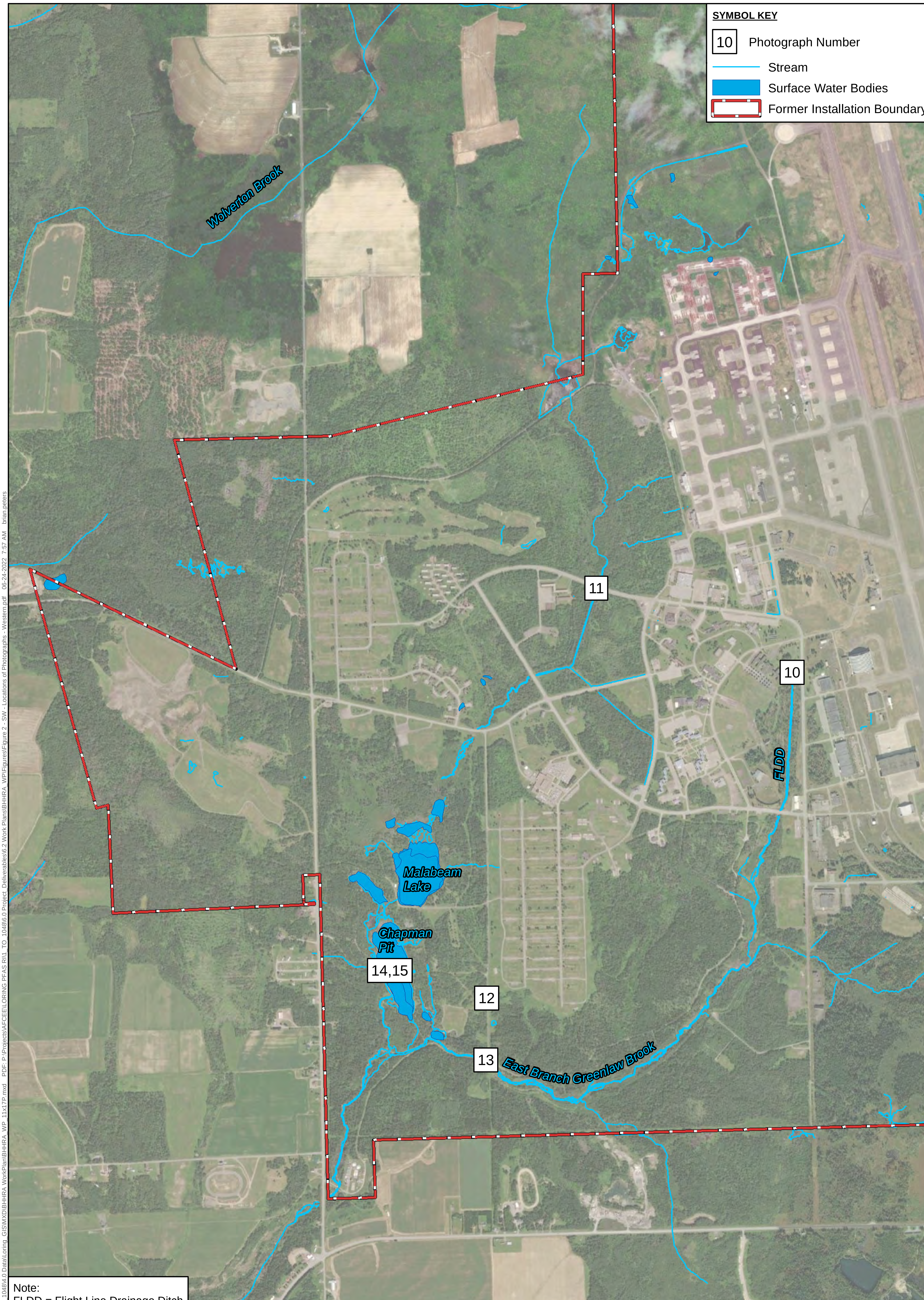
Drawn: BRP	Chk:	PROJ: 775361701



Air Force Civil Engineer Center
2261 Hughes Ave., Suite 163
JBSA Lackland, TX 78236

Figure 2
Surface Water - Locations of Photographs
Western Drainage Features
Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base, Limestone, ME

0 200 400 800 1,200 1,600 Meters
0 750 1,500 3,000 4,500 6,000 Feet

N

NOTES:
-Aerial Imagery obtained through ESRI Online Services

06/22/2022	Rev:	BHHRA_WP_11x17P
Drawn: BRP	Chk:	PROJ: 775361701

APPENDIX B

Hunting/Fishing Regulations

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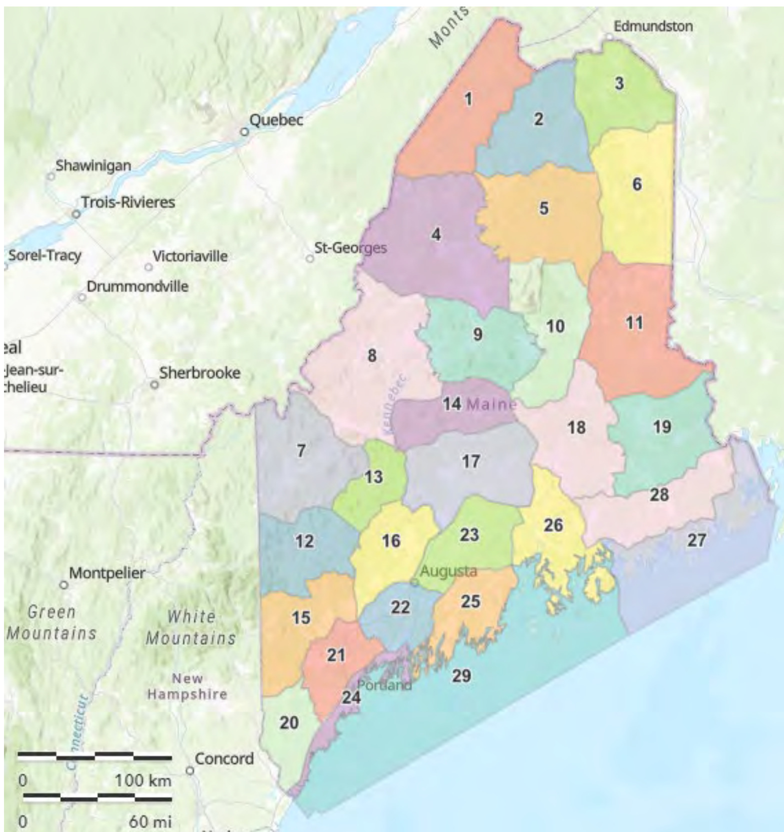
1. Introduction

Loring Air Force Base is located within Aroostook County in proximity to the towns of Limestone and Caribou in Northeast Maine. Several freshwater rivers, creeks, and streams are located near the Site that are potential sources of freshwater fishing. Additionally, there is potential for hunting of wild game in the surrounding region of the Site as well. The following text presents a summary of hunting and fishing regulations and consumption advisories. This research was performed to identify which species are present and regulated, and what amounts are allowed to be harvested, when and where they can be harvested.

2. Wild Game Regulations

Hunting regulations in Maine are specific to Wildlife Management Districts (WMDs) shown below.



Loring Air Force Base is located within Wildlife Management District (WMD) 3; with downgradient areas spilling into WMD 6 south of the Site. The following text provides a summary of wild game hunting regulations; a complete guide of state hunting license requirements can be found through Maine Department of Inland Fisheries and Wildlife (MDIFW, 2021a).

- Hunting Licenses are required in Maine. There are over 30 different hunting licenses available that vary by categories including game, equipment used, residency status, and age. Hunters under 16 years of age require a Junior License. Landowners and their immediate family members are allowed to hunt on their land without a license, but only with firearms, archery, crossbow, and muzzleloader and the hunting must be for agricultural purposes.

- Permits are required to hunt for certain game or with certain equipment. Some permits are included in certain licenses.
- It is illegal to hunt on Sundays in Maine. Legal hunting hours are from a half-hour before sunrise to a half-hour after sunset. Exceptions to the legal hunting hours are migratory game birds, raccoons, and coyotes.

2.1 Allowed Rates for Wild Game

Recreational Limits (MDIFW, 2021)

- Bear
  - 2 Bear per year (1 by hunting & 1 by trapping)
  - Adults and youth can hunt
- Deer
  - 1 Deer per year
  - Only deer with antlers at least 3 inches long may be taken from October 30-December 11, 2021, except that any deer may be taken in designated WMDs by hunters with any-deer permits
  - Adults and youth can hunt (no age limits)
  - Deer Permit Lottery (https://www.maine.gov/ifw/hunting-trapping/anydeerfaqs.html)
  - Must have a valid Maine License to hunt big game. Exceptions are land owners
- Moose
  - Permit required (https://www.maine.gov/ifw/hunting-trapping/moose-permit.html)
  - Administered in 4 ways
  - 3 chance lottery drawings (resident, non-resident, and the adaptive management zone)
  - Competitive auction
  - Controlled moose hunt for disabled veterans
  - Hunting lodge moose lottery
  - Eligibility
  - Hunting License required
  - Minimum age of 10
  - Comply with Hunter Safety law (Age 16+)
  - Number of permits Varies year to year depending on the WMD’s management goals – Based on the public’s input
- Turkey
  - Adult and youth can hunt
  - Spring:
    - 1 bearder wild turkey (WMDs 3 and 6)
  - Fall:
    - 1 wild turkey (WMDs 3 and 6)
- Other Species
  - Upland & migratory Birds
    - Ruffed Grouse & Bobwhite Quail
      - WMD: All
      - Daily Bag: 4
      - Possession: 8

        - Pheasant
            - WMD: All
            - Daily Bag: 2
            - Possession: 4
        - Woodcock, Common Snipe, Sora & Virginia Rails (and Gallinules)
            - WMD: All
            - Daily Bag: Not listed (says more detailed season info on a separate page-Not in the link)
            - Possession: Not listed (says more detailed season info on a separate page-Not in the link)
        - Crows
            - WMD: 1-6 & 7-29
            - Daily Bag: No Limit
            - Possession: No Limit
- Other
    - Gray Squirrel/ Gray Squirrel (Falconry)
        - WMD: All
        - Daily Bag: 4
        - Possession: 8
    - Snowshoe Hare
        - WMD: All & Vinalhaven Island, Knox County
        - Daily Bag: 4
        - Possession: 8
    - Bobcat, Fox, Raccoon, Skunk, Opossum, Coyote Night Hunt
        - WMD: All
        - Daily Bag: No Limit
        - Possession: No Limit
    - Coyote, Woodchuck, Porcupine, Red Squirrel
        - No Closed Season for Hunting
    - Spruce Grouse, Lynx, Cottontail Rabbit
        - No Open Season for Hunting

2.2 Harvest Rates by Town

Loring is in the town of Limestone adjacent to the towns of Caribou (west of Limestone) and Caswell (north of Limestone). The following text provides the most recently available harvest rates for these three towns (https://www.maine.gov/ifw/hunting-trapping/harvest-information.html).

- Bear - 2020
    - Limestone: 10
    - Caribou: 22
    - Caswell: 3
- Deer - 2021

- Limestone: 9
- Caribou: 28
- Caswell: 2

- Moose - 2021
  - Limestone: 4
  - Caribou: 4
  - Caswell: 11
- Turkey – 2019
  - Spring Harvest
    - Limestone: 1
    - Caribou: 2
    - Caswell: None
  - Fall Harvest – Hunting of wild turkeys is closed during the fall season in these towns.

3. Fish Regulations

The following text provides a summary of licensing requirements for fish. A complete guide of state inland fishing license requirements can be found through MDIFW (MDIFW, 2021b). Fishing regulations in Maine are divided into the North and South Zones. Loring Airforce Base and the surrounding potential exposure areas are located within Aroostook County in the North Zone.

3.1 MDIFW Recreational Licensing

Recreational fishing requires a fishing license for any person 16 years of age or older. The license is for fishing from inland waters and transportation of fish taken from inland waters.

3.2 Fish Species

Regulated Inland Fish (MDIFW, 2021b):

- Bass (Largemouth & Smallmouth)
- Brook Trout
- Brown Trout
- Landlocked Salmon
- Rainbow Trout
- Sea-run Atlantic Salmon
- Smelt

- Togue (Lake Trout)
- Whitefish

Regulated Migratory Fish (MDIFW, 2021b):

- American Eel
- River Herring
- Shad
- Striped Bass
- Sturgeon

3.3 Areas Open to Fishing and Schedules

Lake and pond fishing is open in the North Zone from April 1 to September 30.
River, stream, and brook fishing is open from April 1 to August 15. From August 16 to September 30, fishing is restricted to artificial lures and flies only.

- Brook Trout, Rainbow Trout, Brown Trout & their Hybrids
  - Rivers & Streams: January 1 - October 15
  - Wild Trout Streams: January 1 - Labor Day
  - Trout Ponds: 4th Saturday in April - October 15
  - Wild Trout Ponds: 4th Saturday in April - Labor Day
  - Lake Trout and/or Salmon Waters: January 1 - September 30 (fish can be taken by ice fishing only January 1 – March 31)
  - All Other Waters: No closed season
- Lake Trout
  - All Waters: January 1 - September 30 (Fish can be taken by ice fishing only January 1 – March 31)
- Landlocked Salmon
  - April 1 - September 30
  - Fourth Saturday in April - September 30 (Pleasant Lake, New London only)
- Largemouth Bass & Smallmouth Bass
  - Rivers & Streams: January 1 - October 15; Catch & Release May 15 - June 15
  - Trout Ponds: 4th Saturday in April - October 15; Catch & Release May 15 - June 15
  - Lake Trout and/or Salmon waters: No closed season (Fish can be taken by ice fishing only January 1 – March 31)
  - All Other Waters: No closed season; Catch & Release May 15 - June 15
- All Other Species
  - Rivers & Streams: January 1 - October 15
  - Trout Ponds: 4th Saturday in April - October 15

- Lake Trout and/or Salmon waters: No closed season (Fish can be taken by ice fishing only January 1 – March 31)
- All Other Waters: No closed season

3.4 Allowed Rates for Fishing

The following are the recreational limits for all inland waters open to fishing (MDIFW, 2021b); note that this list is inclusive of species that may not be found in the potential exposure areas of the Site.

- American Eel – 25 fish per day
- Bass (Largemouth & Smallmouth) – unlimited (North Zone)
- Brook Trout – 5 fish per day (North Zone)
- Brown Trout – 2 fish per day
- Landlocked Salmon – 2 fish per day
- Rainbow Trout – 2 fish per day
- River Herring – 25 fish per day
- Sea-run Atlantic Salmon – No fishing permitted
- Shad – 2 fish per day
- Smelts – 2 quarts per day
- Striped Bass – 1 fish per day
- Sturgeon – No fishing permitted
- Togue (Lake Trout) – 2 fish per day
- Whitefish – 3 fish per day
- Inland Species not listed above – unlimited

4. Consumption Advisories

Current consumption guidelines will be taken into consideration when evaluating potential for PFAS exposure. MDIFW note that mercury in fish may harm babies of pregnant and nursing mothers, as well as small children. Additionally, the Maine Center for Disease Control and Prevention (MCDCP) caution that Maine freshwater fish may have high levels of PCBs, Dioxins, or DDT. Consumption Guidelines for inland fish from MDIFW and MCDCP are provided below (MDIFW, 2021b).

- Brook trout and landlocked salmon
  - Pregnant and nursing women, women who may get pregnant, and children under age 8 can eat one meal per month.
  - For all other adults and children older than 8, one meal per week.
- All other freshwater fish from Maine inland waters
  - Pregnant and nursing women, women who may get pregnant, and children under age 8 should not eat any freshwater fish from inland waters.
  - For all other adults and children older than 8, two freshwater fish meals per month

- Fish from Little Madawaska River & tributaries
  - Consumption of fish from these waters is not advised
- Green Pond, Chapman Pit, and Greenlaw Brook
  - Consumption of fish from these waters is not advised

The MDIFW and the Maine Center for Disease Control and Prevention recommend that the liver and kidneys of moose not be eaten because of possible contamination with the heavy metal cadmium. Several states, Canadian provinces and Scandinavian countries have issued similar warnings.

While cadmium may accumulate in the liver and kidneys, there is no known health risk from eating the meat of moose or deer. Air pollution from copper and nickel industries and from the burning of fossil fuels accounts for much of the cadmium deposited in eastern North America. Cadmium is ingested by moose with their food.

Maine health officials recommend that deer liver consumption be limited to 0.8 pounds in one sitting and 1 to 1 1/3 pounds per week. Human symptoms of acute cadmium poisoning include severe nausea, vomiting, diarrhea, muscle cramps and salivation.

5. Aroostook National Wildlife Refuge

- The refuge is open during daylight hours only.
- Hunting and fishing are not permitted on the Refuge
- Dogs must be on hand-held leases no longer than 10 feet.
- Use of motorized vehicles is permitted only on the Auto Tour Route. Motorized vehicles disturb wildlife, cause erosion, disturb other refuge visitors, and shatter the tranquility of the refuge.
- All plants and animals, parts thereof, and other objects of nature are protected from disturbance. Collection is prohibited.
- https://www.fws.gov/refuge/Aroostook/

6. References

Maine Department of Inland Fisheries & Wildlife (MDFIW), 2021a. Hunting & Trapping in Maine, Accessed: March 2022. https://www.maine.gov/ifw/hunting-trapping/index.html

Maine Department of Inland Fisheries & Wildlife (MDFIW), 2021b. Fishing & Boating Maine, Accessed: March 2022. https://www.maine.gov/ifw/fishing-boating/index.html

APPENDIX C

USEPA Region 1 Loring-Specific Screening Levels

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Appendix C
Updated Human Health Screening Levels with 2022 Toxicity Values

Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

		Soil			Sediment		Surface Water		Fish		Finfish Consumption Under Maine's Mercury Food Consumption Advisory (FCA) for brook trout fish[d]			Groundwater	
		Health Based Screening Levels and Toxicity-based PRGs[a]													
		Utility Worker Soil[b]	Adult Residential Soil[b]	Child Residential Soil[b]	Adult Wading Sediment[b]	Child Wading Sediment[b]	Child Swimming[c]	Adult Swimming[c]	Fish Consumption Adult	Fish Consumption Child	Fish Consumption Adult	Fish Consumption Childbearing Adult	Fish Consumption Child	Loring Resident Drinking Water Child	Loring Resident Drinking Water Adult
Parameter	CAS #	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/L)	(ng/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ng/L)	(ng/L)
PFBS	375-73-5	24.6	17.6	1.90	82.1	8.85	30,200	173,000	0.108	0.0782	0.165	0.331	0.062	601	1000
PFHxS	355-46-4	1.64	1.17	0.126	5.47	0.590	1,750	7,640	0.00722	0.00521	0.0110	0.0221	0.00413	39.4	65.4
PFNA	375-95-1	0.246	0.176	0.0190	0.821	0.0885	256	1,080	0.00108	0.000782	0.00165	0.00331	0.00062	5.89	9.78
PFOS	1763-23-1	0.164	0.117	0.0126	0.547	0.0590	203	1,180	0.000722	0.000521	0.00110	0.00221	0.000413	4.01	6.67
PFOA	335-67-1	0.246	0.176	0.0190	0.821	0.0885	304	1,770	0.00108	0.000782	0.00165	0.00331	0.00062	6.02	10.0

Notes:

[a]USEPA Region 1 PFAS Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are set at hazard quotient of 0.1.
The recalculated screening levels use the exposure assumptions provided via email communication from Mike Daly on 4 November 2021.

[b]Value based on ingestion and dermal contact.

[c]Value based on ingestion.

[d] Fish consumption rates calculated based on Maine's FCA limits for mercury (i.e. two meals per month for adults and one meal per month for pregnant adults & children).

CAS = Chemical Abstract Service
mg/kg = milligrams per kilogram
NA=Not Available
ng/L = nanograms per liter
PFBS = Perfluorobutane sulfonic acid
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
PFOS = Perfluorooctanesulfonic acid
PFOA = Perfluorooctanoic acid
PRGs = Preliminary Remediation Goals
USEPA = United Stated Environmental Protection Agency

Appendix C
Summary Loring AFB PFAS PRGs - Summary Dashboard
Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

PFAS PRGs were developed for the following exposure scenarios for Loring Air Force Base (AFB).
Below is an overview of the PRGs under default assumptions. **Bolded** values represent the most conservative exposu
To view the parameters and inputs, or the PRGs by individual expsoure route, please click the hyperlink to be brough

Exposure Scenario	Exposure Route	PRG		
		PFOA/PFOS	PFBS	Units
Recreator/Trespasser				
Sediment				
Adult Recreator	ingestion + dermal	5.47E+00	8.21E+01	mg/kg
Child Recreator	ingestion + dermal	**5.90E-01**	**8.85E+00**	**mg/kg**
Surface Water				
Adult Recreator	ingestion + dermal	1.18E+01	1.73E+02	µg/L
Child Recreator	ingestion + dermal	**2.03E+00**	**3.02E+01**	**µg/L**
Utility Worker				
Utility Worker	ingestion + dermal	1.64E+00	2.46E+01	mg/kg
Resident - Soil				
Adult	ingestion + dermal	1.17E+00	1.76E+01	mg/kg
Child	ingestion + dermal	**1.26E-01**	**1.90E+00**	**mg/kg**
Resident - Drinking Water				
Adult	Ingestion + dermal	6.67E-02	1.00E+00	µg/L
Child	Ingestion + dermal	**4.01E-02**	**6.01E-01**	**µg/L**
Finfish Consumption				
Adult	ingestion	0.00722	0.108	mg/d
Child	ingestion	**0.00521**	**0.0782**	**mg/d**
Finfish Consumption Under ME Food Consumption Advisory				
Adult	ingestion	0.011	0.165	mg/kg
Child bearing Adult	ingestion	0.0221	0.331	mg/kg
Child	ingestion	0.00413	0.062	mg/kg

PRGs developed November 1, 2021

Appendix C
Summary Loring AFB PFAS PRGs - PRGs Loring AFB
Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Table 1. Sediment PRGs for Adult & Child Recreator

Receptor	Exposure Route	Exposure Medium	PFOA/PFOS SL	PFBS SL	Units	THQ (unitless)	EF (d/yr)	ED (yr)	ET hr/event	SA (cm^2)	BW (kg)	IR_S (mg/d)	AT (days)	RfD (mg/kg-d) PFOA/PFOS	RfD (mg/kg-d) PFBS	AF (mg/cm^2)
Adult Recreator	ingestion	sediment	7.79E+00	1.17E+02	mg/kg	0.1	75	20	1	-	80	100	7300	2.0E-05	3.0E-04	-
Adult Recreator	dermal	sediment	1.84E+01	2.77E+02	mg/kg	0.1	75	20	1	6032	80	100	7300	2.0E-05	3.0E-04	0.07
Adult Recreator	ingestion + dermal	sediment	**5.47E+00**	**8.21E+01**	**mg/kg**	0.1	75	20	1	6032	80	100	7300	2.0E-05	3.0E-04	0.07
Child Recreator	ingestion	sediment	7.30E-01	1.10E+01	mg/kg	0.1	75	6	1	-	15	200	2190	2.0E-05	3.0E-04	-
Child Recreator	dermal	sediment	3.08E+00	4.61E+01	mg/kg	0.1	75	6	1	2373	15	200	2190	2.0E-05	3.0E-04	0.2
Child Recreator	ingestion + dermal	sediment	**5.90E-01**	**8.85E+00**	**mg/kg**	0.1	75	6	1	2373	15	200	2190	2.0E-05	3.0E-04	0.2

Table 2. Surface Water PRGs for Adult & Child Recreator

Receptor	Exposure Route	Exposure Medium	PFOA/PFOS SL	PFBS SL	Units	THQ (unitless)	EF (d/yr)	ED (yr)	EV (ev/d)	ET (hr/event)	BW (kg)	IR_W (L/d)	AT (days)	RfD (mg/kg-d) PFOA/PFOS	RfD (mg/kg-d) PFBS
Adult Recreator	ingestion	surface water	1.18E+01	1.77E+02	µg/L	0.1	45	20	1	1	80	0.11	7300	2.0E-05	3.0E-04
Adult Recreator	dermal	surface water	-	8.28E+03	µg/L	0.1	45	20	1	1	80	0.11	7300	2.0E-05	3.0E-04
Adult Recreator	ingestion + dermal	surface water	**1.18E+01**	**1.73E+02**	**µg/L**	0.1	45	20	1	1	80	0.11	7300	2.0E-05	3.0E-04
Child Recreator	ingestion	surface water	2.03E+00	3.04E+01	µg/L	0.1	45	6	1	1	15	0.12	2190	2.0E-05	3.0E-04
Child Recreator	dermal	surface water	-	4.80E+03	µg/L	0.1	45	6	1	1	15	0.12	2190	2.0E-05	3.0E-04
Child Recreator	ingestion + dermal	surface water	**2.03E+00**	**3.02E+01**	**µg/L**	0.1	45	6	1	1	15	0.12	2190	2.0E-05	3.0E-04

Table 3. Soil PRG for Utility Worker**

Receptor	Exposure Route	Exposure Medium	PFOA/PFOS SL	PFBS SL	Units	THQ (unitless)	EF (d/yr)	ED (yr)	SA (cm^2)	BW (kg)	IR_S (mg/d)	AT (days)	RfD (mg/kg-d) PFOA/PFOS	RfD (mg/kg-d) PFBS	AF (mg/cm^2)
Utility worker	ingestion	soil	2.34E+00	3.50E+01	mg/kg	0.1	250	25	-	80	100	9125	2.0E-05	3.0E-04	-
Utility worker	dermal	soil	5.52E+00	8.28E+01	mg/kg	0.1	250	25	3527	80	-	9125	2.0E-05	3.0E-04	0.12
Utility worker	ingestion + dermal	soil	**1.64E+00**	**2.46E+01**	**mg/kg**	0.1	250	25	3527	80	100	9125	2.0E-05	3.0E-04	0.12

***Composite Worker scenario and defualts was selected to represent the Loring AFB Utility Worker*

Table 4. Soil PRG for Resident Adult & Child

Receptor	Exposure Route	Exposure Medium	PFOA/PFOS SL	PFBS SL	Units	THQ (unitless)	EF (d/yr)	ED (yr)	SA (cm^2)	BW (kg)	IR_S (mg/d)	AT (days)	RfD (mg/kg-d) PFOA/PFOS	RfD (mg/kg-d) PFBS	AF (mg/cm^2)
Adult	ingestion	soil	1.67E+00	2.50E+01	mg/kg	0.1	350	20	-	80	100	7300	2.0E-05	3.0E-04	-
Adult	dermal	soil	3.95E+00	5.93E+01	mg/kg	0.1	350	20	6032	80	-	7300	2.0E-05	3.0E-04	0.07
Adult	ingestion + dermal	soil	**1.17E+00**	**1.76E+01**	**mg/kg**	0.1	350	20	6032	80	100	7300	2.0E-05	3.0E-04	0.07
Child	ingestion	soil	1.56E-01	2.35E+00	mg/kg	0.1	350	6	-	15	200	2190	2.0E-05	3.0E-04	-
Child	dermal	soil	6.59E-01	9.89E+00	mg/kg	0.1	350	6	2373	15	-	2190	2.0E-05	3.0E-04	0.2
Child	ingestion + dermal	soil	**1.26E-01**	**1.90E+00**	**mg/kg**	0.1	350	6	2373	15	200	2190	2.0E-05	3.0E-04	0.2

Appendix C
Summary Loring AFB PFAS PRGs - PRGs Loring AFB
Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
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Table 5. Tapwater or Groundwater PRG for Resident Adult & Child

Receptor	Exposure Route	Exposure Medium	PFOA/PFOS SL	PFBS SL	Units	THQ (unitless)	EF (d/yr)	ED (yr)	SA (cm^2)	BW (kg)	IR_W (L/d)	RfD (mg/kg-d) PFOA/PFOS	RfD (mg/kg-d) PFBS
Adult	Ingestion	Tapwater	6.67E-02	1.00E+00	μg/L	0.1	350	20	19652	80	2.5	2.00E-05	3.00E-04
Adult	Dermal	Tapwater	-	1.26E+03	μg/L	0.1	350	20	19652	80	2.50	2.00E-05	3.00E-04
Adult	Ingestion + dermal	Tapwater	**6.67E-02**	**1.00E+00**	μg/L	0.1	350	20	19652	80	2.50	2.00E-05	3.00E-04
Child	Ingestion	Tapwater	4.01E-02	6.02E-01	μg/L	0.1	350	6	6365	15	0.78	2.00E-05	3.00E-04
Child	Dermal	Tapwater	-	8.39E+02	μg/L	0.1	350	6	6365	15	0.78	2.00E-05	3.00E-04
Child	Ingestion + dermal	Tapwater	**4.01E-02**	**6.01E-01**	μg/L	0.1	350	6	6365	15	0.78	2.00E-05	3.00E-04

Table 6. Finfish Consumption PRGs for Adult & Child

Chemical	SL Adult Fish Consumption[1] (mg/kg) IRF = 23,100 mg/d	SL Child Fish Consumption[1] (mg/kg) IRF = 6,000 mg/d	THQ (unitless)	AT-N (days)	BW Adult (kg)	BW Child (kg)	EF (d/yr)	ED Adult (yr)	ED Child (yr)	RfD (mg/kg-d) PFOA/PFOS	RfD (mg/kg-d) PFBS
PFOA/PFOS	**7.22E-03**	**5.21E-03**	0.1	365	80	15	350	26	6	2.0E-05	3.0E-04
PFBS	**1.08E-01**	**7.82E-02**	0.1	365	80	15	350	26	6	2.0E-05	3.0E-04

[1] Northeast fish consumption data are based on NHANES Suvey, 2003-2010 (EPA, 2014). See *Fish Consumption Data* worksheet*, Appendix A.*

Table 7. Finfish Consumption PRGs under Maine State Wide Mercury Consumption Advisories[2]

Chemical	SL Adult Fish Consumption[3] (mg/kg) IRF = 15,133 mg/d	SL Child Bearing Adult, Fish Consumption[3,4] (mg/kg) IRF = 7,567 mg/d	SL Child Fish Consumption[3] (mg/kg) IRF = 7,567 mg/d	THQ (unitless)	AT-N (days)	BW Adult (kg)	BW Child (kg)	EF (d/yr)	ED Adult (yr)	ED Child (yr)	RfD (mg/kg-d) PFOA/PFOS	RfD (mg/kg-d) PFBS
PFOA/PFOS	**1.10E-02**	**2.21E-02**	**4.13E-03**	0.1	365	80	15	350	26	6	2.0E-05	3.0E-04
PFBS	**1.65E-01**	**3.31E-01**	**6.20E-02**	0.1	365	80	15	350	26	6	2.0E-05	3.0E-04

[2] These PRGs were calculated for exploratory purposes to aid in the assessment whether a chemical specific Food Consumption Advisory (FCA) for PFAS could potentially be considered my ME CDC.

[3] Fish consumption rates calculated based on Maine's FCA limits for mercury (i.e. two meals per month for adults and one meal per month for pregnant adults & children). See *Fish Consumption Data worksheet, Appendix B.*

[4] Fish consumption rates in Table 6 were calculated and published for select sub-populations; it did include child bearing adults. Therefore, the screening levels calcluated here are not directly compareable to Table 6, but are still being provided.

Acronyms

AF	Adherence Factor
AT	Average Time
BW	Body Weight
ED	Exposure Duration
EF	Exposure Frequency
ET	Exposure Time
EV	Event Time
IR_F	Ingestion Rate Fish
IR_S	Ingestion Rate Soil
IR_W	Ingestion Rate Water
RfD	Reference Dose
SA	Skin Area
TQH	Target Hazard Quotient

Reference

US EPA (2014). Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010). Accessible via: https://www.epa.gov/sites/production/files/2015-01/documents/fish-consumption-rates-2014.pdf

Appendix C
Summary Loring AFB PFAS PRGs - Fish Consumption Data
Baseline Human Health Risk Assessment Work Plan
Former Loring Air Force Base
Limestone, Maine

Appendix A. Freshwater & Estuarine Fish for Northeast U. S. Coastal and Inland Adults and Youth (EPA, 2014)

Freshwater and Estuarine Fish

Age	Region	Coastal Status	Ingestion rate (g/day) 50th %	Ingestion rate (g/day) 90th %	EPA, 2014 Table No.
Adult ≥21 yr	Northeast	Coastal & Noncoastal	5.8	**23.1**	9b
	Northeast	Inland	5.0	21.0	9b
Youth <21 yr	Northeast	Coastal & Noncoastal	0.9	**6.0**	20b
	Northeast	Inland	0.7	5.1	20b

Consumption rate in bold is selected for risk screening
The 90th percentile consumption rate is used for risk screening.
Inland defined as >25 miles from Atlantic Ocean
Coastal defined as within county bordering Atlantic Ocean
Northeast = PA, NY, NJ, CT, RI, MA, NH, VT, ME

Data from: EPA (April 2014) Estimated Fish Consumption Rates for the U. S. Population and Selected Subpopulations (NHANES 2003-2010) Final Report (EPA-820-R-14-002)
https://www.epa.gov/sites/production/files/2015-01/documents/fish-consumption-rates-2014.pdf

Appendix B. Calculation of fish consumption rate under Maine's Mercury Food Consumption Advisory (FCA) for brook trout fish

Age	Maine Fish Consumption Advisory	Ingestion Rate (g/month)	Daily Ingestion Rate (mg/d)
Adults, General Population	2 meals/month	454	15,133
Pregnant Adult & Child	1 meal/ month	227	7,567

One meal is 8 oz (227 g). Calculation assumes one month is 30 days.

Default

Composite Worker Risk-Based Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_o Ref	IUR $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		-		3.00E-04	P	-	
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		-		2.00E-05	A	-	
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		-		3.00E-06	A	-	
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		-		2.00E-06	A	-	
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	-		3.00E-06	A	-	

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Composite Worker Risk-Based Regional Screening Levels (RSL) for Soi

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm^3/g)	K_d (cm^3/g)	HLC ($atm\text{-}m^3/mole$)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point BP (K)	BP Ref
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	1.00E+00	1.00E-01	1.00E+00	-	2.57E+05	6.17E+01	-	-	-		4.71E+02	3M
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	1.00E+00	1.00E-01	1.00E+00	-	-	1.12E+02	-	-	-		5.12E+02	3M
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	1.00E+00	1.00E-01	1.00E+00	-	-	2.46E+02	4.00E+00	-	-		4.91E+02	3M
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	1.00E+00	1.00E-01	1.00E+00	-	6.80E+02	3.72E+02	-	4.43E-07	1.81E-05	3M	5.22E+02	3M
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	1.00E+00	1.00E-01	1.00E+00	-	9.50E+03	1.15E+02	1.50E+01	3.57E-06	1.46E-04	ATSDR Profile	4.62E+02	3M

Output generated 06JUL2022:15:53:31

Default

Composite Worker Risk-Based Regional Screening Levels (RSL) for Soi

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Critical Temperature T_C (K)	T_C Ref	Chemical Type	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor Unlimited Reservoir (m^3/kg)	Volatilization Factor Mass Limit (m^3/kg)	Volatilization Factor Selected (m^3/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		PFAS	2.68E-02	7.10E-06	-	1.36E+09	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		PFAS	2.33E-02	6.01E-06	-	1.36E+09	-	-	-
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		PFAS	2.13E-02	5.43E-06	-	1.36E+09	-	-	-
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		PFAS	2.07E-02	5.25E-06	-	1.36E+09	-	-	-
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	-		PFAS	2.26E-02	5.79E-06	-	1.36E+09	-	-	-

Output generated 06JUL2022:15:53:31

Default

Composite Worker Risk-Based Regional Screening Levels (RSL) for Soi

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL THQ=0.1 (mg/kg)	Dermal SL THQ=0.1 (mg/kg)	Inhalation SL THQ=0.1 (mg/kg)	Noncarcinogenic SL THI=0.1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-	-	-	-	3.50E+01	8.28E+01	-	2.46E+01	2.46E+01 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-	-	-	-	2.34E+00	5.52E+00	-	1.64E+00	1.64E+00 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-	-	-	-	3.50E-01	8.28E-01	-	2.46E-01	2.46E-01 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-	-	-	-	2.34E-01	5.52E-01	-	1.64E-01	1.64E-01 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	4.67E+01	1.10E+02	-	3.28E+01	3.50E-01	8.28E-01	-	2.46E-01	2.46E-01 nc

Output generated 06JUL2022:15:53:31

Site-specific

Resident Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_o Ref	IUR (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		-		3.00E-04	U	-		1.00E+00	1.00E-01	1.00E+00
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		-		2.00E-05	U	-		1.00E+00	1.00E-01	1.00E+00
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		-		3.00E-06	U	-		1.00E+00	1.00E-01	1.00E+00
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		-		2.00E-06	U	-		1.00E+00	1.00E-01	1.00E+00
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	U	-		3.00E-06	U	-		1.00E+00	1.00E-01	1.00E+00

Output generated 06JUL2022:16:02:35

Site-specific

Resident Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm^3/g)	K_d (cm^3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T_C (K)	T_C Ref
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-	2.57E+05	6.17E+01	-	-	-		4.71E+02	U	-	
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-	-	1.12E+02	-	-	-		5.11E+02	U	-	
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-	-	2.46E+02	4.00E+00	-	-		4.91E+02	U	-	
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-	6.80E+02	3.72E+02	-	4.43E-07	1.81E-05	U	5.22E+02	U	-	
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	-	9.50E+03	1.15E+02	1.50E+01	3.57E-06	1.46E-04	U	4.62E+02	U	-	

Output generated 06JUL2022:16:02:35

Site-specific

Resident Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Chemical Type	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor Unlimited Reservoir (m^3/kg)	Volatilization Factor Mass Limit (m^3/kg)	Volatilization Factor Selected (m^3/kg)	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	BTEX	2.68E-02	7.10E-06	-	1.36E+09	-	-	-	-	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	BTEX	2.33E-02	6.01E-06	-	1.36E+09	-	-	-	-	-	-	-
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	BTEX	2.13E-02	5.43E-06	-	1.36E+09	-	-	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	BTEX	2.07E-02	5.25E-06	-	1.36E+09	-	-	-	-	-	-	-
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	BTEX	2.26E-02	5.79E-06	-	1.36E+09	-	-	-	9.93E+00	3.53E+01	-	7.75E+00

Output generated 06JUL2022:16:02:35

Site-specific

Resident Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Ingestion SL Child THQ=0.1 (mg/kg)	Dermal SL Child THQ=0.1 (mg/kg)	Inhalation SL Child THQ=0.1 (mg/kg)	Noncarcinogenic SL Child THI=0.1 (mg/kg)	Ingestion SL Adult THQ=0.1 (mg/kg)	Dermal SL Adult THQ=0.1 (mg/kg)	Inhalation SL Adult THQ=0.1 (mg/kg)	Noncarcinogenic SL Adult THI=0.1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	2.35E+00	9.89E+00	-	1.90E+00	2.50E+01	5.93E+01	-	1.76E+01	1.90E+00 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	1.56E-01	6.59E-01	-	1.26E-01	1.67E+00	3.95E+00	-	1.17E+00	1.26E-01 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	2.35E-02	9.89E-02	-	1.90E-02	2.50E-01	5.93E-01	-	1.76E-01	1.90E-02 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	1.56E-02	6.59E-02	-	1.26E-02	1.67E-01	3.95E-01	-	1.17E-01	1.26E-02 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	2.35E-02	9.89E-02	-	1.90E-02	2.50E-01	5.93E-01	-	1.76E-01	1.90E-02 nc

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Site-specific

Recreator Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_o Ref	IUR (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)	K_{oc} (cm^3/g)	K_d (cm^3/g)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		-		3.00E-04	P	-		1.00E+00	1.00E-01	1.00E+00	-	2.57E+05	6.17E+01	-
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		-		2.00E-05	A	-		1.00E+00	1.00E-01	1.00E+00	-	-	1.12E+02	-
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		-		3.00E-06	A	-		1.00E+00	1.00E-01	1.00E+00	-	-	2.46E+02	4.00E+00
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		-		2.00E-06	A	-		1.00E+00	1.00E-01	1.00E+00	-	6.80E+02	3.72E+02	-
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	D	-		3.00E-06	A	-		1.00E+00	1.00E-01	1.00E+00	-	9.50E+03	1.15E+02	1.50E+01

Output generated 06JUL2022:15:36:27

Site-specific

Recreator Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T_C (K)	T_C Ref	Chemical Type	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	D_A (cm^2/s)	Particulate Emission Factor (m^3/kg)	Volatilization Factor Unlimited Reservoir (m^3/kg)	Volatilization Factor Mass Limit (m^3/kg)	Volatilization Factor Selected (m^3/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-	-		4.71E+02	3M	-		PFAS	2.68E-02	7.10E-06	-	1.36E+09	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-	-		5.12E+02	3M	-		PFAS	2.33E-02	6.01E-06	-	1.36E+09	-	-	-
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-	-		4.91E+02	3M	-		PFAS	2.13E-02	5.43E-06	-	1.36E+09	-	-	-
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	4.43E-07	1.81E-05	3M	5.22E+02	3M	-		PFAS	2.07E-02	5.25E-06	-	1.36E+09	-	-	-
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	3.57E-06	1.46E-04	ATSDR Profile	4.62E+02	3M	-		PFAS	2.26E-02	5.79E-06	-	1.36E+09	-	-	-

Output generated 06JUL2022:15:36:27

Site-specific

Recreator Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL Child THQ=0.1 (mg/kg)	Dermal SL Child THQ=0.1 (mg/kg)	Inhalation SL Child THQ=0.1 (mg/kg)	Noncarcinogenic SL Child THI=0.1 (mg/kg)	Ingestion SL Adult THQ=0.1 (mg/kg)	Dermal SL Adult THQ=0.1 (mg/kg)	Inhalation SL Adult THQ=0.1 (mg/kg)	Noncarcinogenic SL Adult THI=0.1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-	-	-	-	1.10E+01	4.61E+01	-	8.85E+00	1.17E+02	2.77E+02	-	8.21E+01	8.85E+00 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-	-	-	-	7.30E-01	3.08E+00	-	5.90E-01	7.79E+00	1.84E+01	-	5.47E+00	5.90E-01 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-	-	-	-	1.10E-01	4.61E-01	-	8.85E-02	1.17E+00	2.77E+00	-	8.21E-01	8.85E-02 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-	-	-	-	7.30E-02	3.08E-01	-	5.90E-02	7.79E-01	1.84E+00	-	5.47E-01	5.90E-02 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	4.63E+01	1.65E+02	-	3.62E+01	1.10E-01	4.61E-01	-	8.85E-02	1.17E+00	2.77E+00	-	8.21E-01	8.85E-02 nc

Output generated 06JUL2022:15:36:27

Site-specific

Recreator Regional Screening Levels (RSL) for Surface Water

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_o Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	RAGSe GIABS (unitless)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	Organics	-		3.00E-04	P	-		1.00E+00
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	Organics	-		2.00E-05	A	-		1.00E+00
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	Organics	-		3.00E-06	A	-		1.00E+00
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	Organics	-		2.00E-06	A	-		1.00E+00
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	Organics	7.00E-02	D	3.00E-06	A	-		1.00E+00

Output generated 06JUL2022:15:42:16

Site-specific

Recreator Regional Screening Levels (RSL) for Surface Water

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Chemical Type	K_p (cm/hr)	MW	FA (unitless)	In EPD?	$DA_{event (ca)}$	$DA_{event (nc child)}$	$DA_{event (nc adult)}$	Ingestion SL TR=1E-06 (ug/L)	Dermal SL TR=1E-06 (ug/L)	Carcinogenic SL TR=1E-06 (ug/L)	Ingestion SL (Child) THQ=0.1 (ug/L)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	Organics	1.93E-05	3.00E+02	1.00E+00	Yes	-	5.73E-04	9.91E-04	-	-	-	3.04E+01
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	Organics	2.58E-04	4.00E+02	1.00E+00	Yes	-	3.82E-05	6.60E-05	-	-	-	2.03E+00
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	Organics	1.99E-04	4.64E+02	1.00E+00	Yes	-	5.73E-06	9.91E-06	-	-	-	3.04E-01
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	Organics	4.69E-07	5.00E+02	1.00E+00	No	-	-	-	-	-	-	2.03E-01
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	Organics	-	4.14E+02	0.00E+00	No	-	-	-	1.07E+02	-	1.07E+02	3.04E-01

Output generated 06JUL2022:15:42:16

Site-specific

Recreator Regional Screening Levels (RSL) for Surface Water

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Chemical Type	Dermal SL (Child) THQ=0.1 (ug/L)	Noncarcinogenic SL (Child) THQ=0.1 (ug/L)	Ingestion SL (Adult) THQ=0.1 (ug/L)	Dermal SL (Adult) THQ=0.1 (ug/L)	Noncarcinogenic SL (Adult) THQ=0.1 (ug/L)	Screening Level (ug/L)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	Organics	4.80E+03	3.02E+01	1.77E+02	8.28E+03	1.73E+02	3.02E+01 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	Organics	1.25E+01	1.75E+00	1.18E+01	2.16E+01	7.64E+00	1.75E+00 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	Organics	1.61E+00	2.56E-01	1.77E+00	2.79E+00	1.08E+00	2.56E-01 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	Organics	-	2.03E-01	1.18E+00	-	1.18E+00	2.03E-01 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	Organics	-	3.04E-01	1.77E+00	-	1.77E+00	3.04E-01 nc

Output generated 06JUL2022:15:42:16

Site-specific

Fish Regional Screening Levels (RSL) for Fish

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	$SF_o(mg/kg\text{-}day)^{-1}$	SF_oRef	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-06 (mg/kg)	Ingestion SL THQ=0.1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	U	-	1.08E-01	1.08E-01 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		2.00E-05	U	-	7.22E-03	7.22E-03 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		3.00E-06	U	-	1.08E-03	1.08E-03 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-06	U	-	7.22E-04	7.22E-04 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	U	3.00E-06	U	1.39E-01	1.08E-03	1.08E-03 nc

Output generated 07JUL2022:14:25:06

Site-specific

Fish Regional Screening Levels (RSL) for Fish

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_oRef	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-06 (mg/kg)	Ingestion SL THQ=0.1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	U	-	7.82E-02	7.82E-02 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		2.00E-05	U	-	5.21E-03	5.21E-03 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		3.00E-06	U	-	7.82E-04	7.82E-04 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-06	U	-	5.21E-04	5.21E-04 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	U	3.00E-06	U	4.35E-01	7.82E-04	7.82E-04 nc

Output generated 07JUL2022:14:27:52

Site-specific

Fish Regional Screening Levels (RSL) for Fish

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_oRef	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-06 (mg/kg)	Ingestion SL THQ=0.1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	U	-	1.65E-01	1.65E-01 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		2.00E-05	U	-	1.10E-02	1.10E-02 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		3.00E-06	U	-	1.65E-03	1.65E-03 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-06	U	-	1.10E-03	1.10E-03 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	U	3.00E-06	U	2.12E-01	1.65E-03	1.65E-03 nc

Output generated 07JUL2022:15:43:27

Site-specific

Fish Regional Screening Levels (RSL) for Fish

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_oRef	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-06 (mg/kg)	Ingestion SL THQ=0.1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	U	-	3.31E-01	3.31E-01 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		2.00E-05	U	-	2.21E-02	2.21E-02 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		3.00E-06	U	-	3.31E-03	3.31E-03 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-06	U	-	2.21E-03	2.21E-03 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	U	3.00E-06	U	4.24E-01	3.31E-03	3.31E-03 nc

Output generated 07JUL2022:15:40:02

Site-specific

Fish Regional Screening Levels (RSL) for Fish

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_oRef	RfD (mg/kg-day)	RfD Ref	Ingestion SL TR=1E-06 (mg/kg)	Ingestion SL THQ=0.1 (mg/kg)	Screening Level (mg/kg)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		3.00E-04	U	-	6.20E-02	6.20E-02 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		2.00E-05	U	-	4.13E-03	4.13E-03 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		3.00E-06	U	-	6.20E-04	6.20E-04 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		2.00E-06	U	-	4.13E-04	4.13E-04 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	U	3.00E-06	U	3.45E-01	6.20E-04	6.20E-04 nc

Output generated 07JUL2022:15:30:43

Site-specific

Resident Regional Screening Levels (RSL) for Tap Water

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o(mg/kg-day)$^{-1}$	SF_oRef	IUR (ug/m^3)$^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-		-		3.00E-04	U	-
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-		-		2.00E-05	U	-
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-		-		3.00E-06	U	-
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-		-		2.00E-06	U	-
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	7.00E-02	U	-		3.00E-06	U	-

Output generated 06JUL2022:16:05:33

Site-specific

Resident Regional Screening Levels (RSL) for Tap Water

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	RfC Ref	GIABS	K_p (cm/hr)	MW	B (unitless)	t^*(hr)	τ_{event}(hr/event)	FA (unitless)	In EPD?	$DA_{event\ (ca)}$	$DA_{event\ (nc\ child)}$
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics		1.00E+00	1.93E-05	3.00E+02	1.29E-04	1.21E+01	5.04E+00	1.00E+00	Yes	-	7.37E-05
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics		1.00E+00	2.58E-04	4.00E+02	1.98E-03	4.39E+01	1.83E+01	1.00E+00	Yes	-	4.92E-06
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics		1.00E+00	1.99E-04	4.64E+02	1.65E-03	1.00E+02	4.18E+01	1.00E+00	Yes	-	7.37E-07
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics		1.00E+00	4.69E-07	5.00E+02	4.03E-06	1.59E+02	6.64E+01	1.00E+00	No	-	-
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics		1.00E+00	-	4.14E+02	-	5.28E+01	2.20E+01	-	No	-	-

Output generated 06JUL2022:16:05:33

Site-specific

Resident Regional Screening Levels (RSL) for Tap Water

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	$DA_{event\ (nc\ adult)}$	MCL (ug/L)	Ingestion SL TR=1E-06 (ug/L)	Dermal SL TR=1E-06 (ug/L)	Inhalation SL TR=1E-06 (ug/L)	Carcinogenic SL TR=1E-06 (ug/L)	Ingestion SL Child THQ=0.1 (ug/L)	Dermal SL Child THQ=0.1 (ug/L)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	1.27E-04	-	-	-	-	-	6.02E-01	8.38E+02
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	8.49E-06	-	-	-	-	-	4.01E-02	2.19E+00
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	1.27E-06	-	-	-	-	-	6.02E-03	2.82E-01
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-	-	-	-	-	-	4.01E-03	-
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	-	-	1.11E+00	-	-	1.11E+00	6.02E-03	-

Output generated 06JUL2022:16:05:33

Site-specific

Resident Regional Screening Levels (RSL) for Tap Water

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	Inhalation SL Child THQ=0.1 (ug/L)	Noncarcinogenic SL Child THI=0.1 (ug/L)	Ingestion SL Adult THQ=0.1 (ug/L)	Dermal SL Adult THQ=0.1 (ug/L)	Inhalation SL Adult THQ=0.1 (ug/L)	Noncarcinogenic SL Adult THI=0.1 (ug/L)	Screening Level (ug/L)
Perfluorobutanesulfonic acid (PFBS)	375-73-5	No	No	Organics	-	6.01E-01	1.00E+00	1.26E+03	-	1.00E+00	6.01E-01 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	No	No	Organics	-	3.94E-02	6.67E-02	3.30E+00	-	6.54E-02	3.94E-02 nc
Perfluorononanoic acid (PFNA)	375-95-1	No	No	Organics	-	5.89E-03	1.00E-02	4.25E-01	-	9.78E-03	5.89E-03 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No	No	Organics	-	4.01E-03	6.67E-03	-	-	6.67E-03	4.01E-03 nc
Perfluorooctanoic acid (PFOA)	335-67-1	No	No	Organics	-	6.02E-03	1.00E-02	-	-	1.00E-02	6.02E-03 nc

Output generated 06JUL2022:16:05:33