ENVIRONMENTAL ASSESSMENT
Macro Tower and Cell Nodes Installation
Hanscom Air Force Base, MA

November 2024

ENVIRONMENTAL ASSESSMENT

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ACRONYMS AND ABBREVIATIONS

ABG	Air Base Group
ACAM	Air Conformity Applicability Model
ACM	asbestos-containing material
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AFCRL	Air Force Cambridge Research Laboratories
AFMAN	Air Force Manual
AFMC	Air Force Materiel Command
AFRL	Air Force Research Laboratory
ALTA	American Land Title Association
APIMS	Air Program Information Management System
AST	Aboveground Storage Tank
BSA	Base Support Agreement
C&D	Construction and Demolition
CAA	Clean Air Act
CE	Civil Engineering/Environmental
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH_4	Methane
CHP	Central Heat Plant
CMR	Code of Massachusetts Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalents
CSL-MIF	Compound Semiconductor Laboratory/Microelectronics Integration Facility
CWP	Chilled Water Plant
CZN	NEPA Division
DAF	Department of the Air Force
dB	Decibel
DoD	Department of Defense
DoDI	Department of Defense Instruction

EA	Environmental Assessment
EHS	Environmental Health & Safety
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement (federal)
EISA	Energy Independence and Security Act
EMCS	Energy Management Control System
EO	Executive Order
EPF	Engineering and Prototyping Facility
ERP	Environmental Restoration Program
FAR	Federal Acquisition Regulation
FFRDC	Federally Funded Research & Development Center
FIRM	Flood Insurance Rate Map
FMP	Facility Modernization Plan
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GCR	General Conformity Regulations
GHG	Greenhouse Gas
HAFB	Hanscom Air Force Base
HARM	Hazard Assessment Rating Methodology
HSG	Hydrologic Soil Group
IDP	Installation Development Plan
INRMP	Integrated Natural Resources Management Plan
IPaC	Information for Planning and Consultation
IRP	Installation Restoration Program
JAC	Joint Advisory Committee
kW	Kilowatt
kWh	Kilowatt hour
kV	Kilovolt
MassDEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Bureau of Geographic Information
Massport	Massachusetts Port Authority
MBTA	Massachusetts Bay Transportation Authority
MHC	Massachusetts Historical Commission
MILCON	Military Construction

MSL	mean sea level
MWRA	Massachusetts Water Resources Authority
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NHESP	Natural Heritage & Endangered Species Program
NHPA	National Historic Preservation Act
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSR	New Source Review
O_3	Ozone
OSHA	Occupational Safety and Health Administration
PAL	Public Archaeology Laboratory
Pb	Lead
PCBs	Polychlorinated Biphenyls
PM	Particulate Matter
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
R&D	Research & Development
RCRA	Resource Conservation and Recovery Act
SAF/IE	Deputy Assistant Secretary of the Air Force for Environment, Safety, and Infrastructure
SAGE	Semi-Automatic Ground Environment Air Defense System
SAP	Satellite Accumulation Point
SARA	Superfund Amendments and Reauthorization Act
SDS	Safety Data Sheets
sf	square foot (feet)
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan

TMDL	Total Maximum Daily Load
TPY	Tons Per Year
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
UFC	Unified Facilities Criteria
USEPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish & Wildlife Service
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The First Responder Network Authority (FirstNet Authority) is an independent agency within the U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA). The FirstNet Authority was established to create a single, nationwide broadband network specifically for first responders. Construction of the network, called FirstNet, started in 2018 through a public-private partnership with AT&T. In their efforts to build the FirstNet broadband network, AT&T has identified a lack of coverage in the vicinity of Hanscom Air Force Base (Hanscom AFB or base) and the surrounding communities (Figure 1-1 and 1-2).

The Proposed Action consists of installing FirstNet Communications network equipment throughout Hanscom AFB, located in Middlesex County, Massachusetts in order improve and enhance wireless coverage and capacity of AT&T FirstNet Communications within Middlesex County to include Hanscom AFB (Figure 1-3). Hanscom's host unit is the 66th Air Base Group. More than 10,000 active duty, Reserve and National Guard military personnel, Department of Defense civilians, and contractors live and/or work on the base.

Figure 1-1. HAFB Location Map

Figure 1-2. Boldyn Networks Tower and Fiber Locations at Hanscom AFB

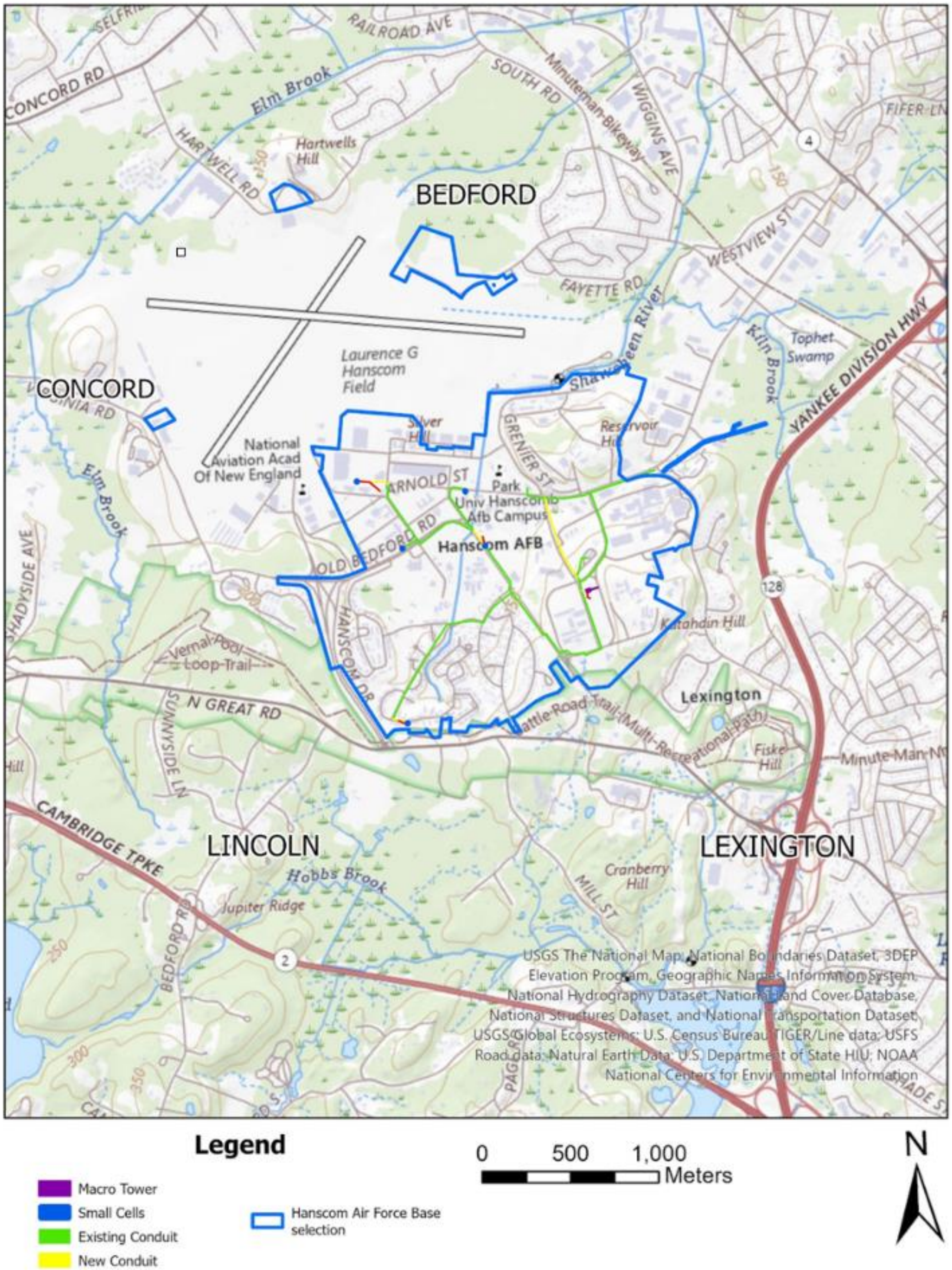


Figure 1-3. Existing FirstNet Coverage Map Around Hanscom AFB

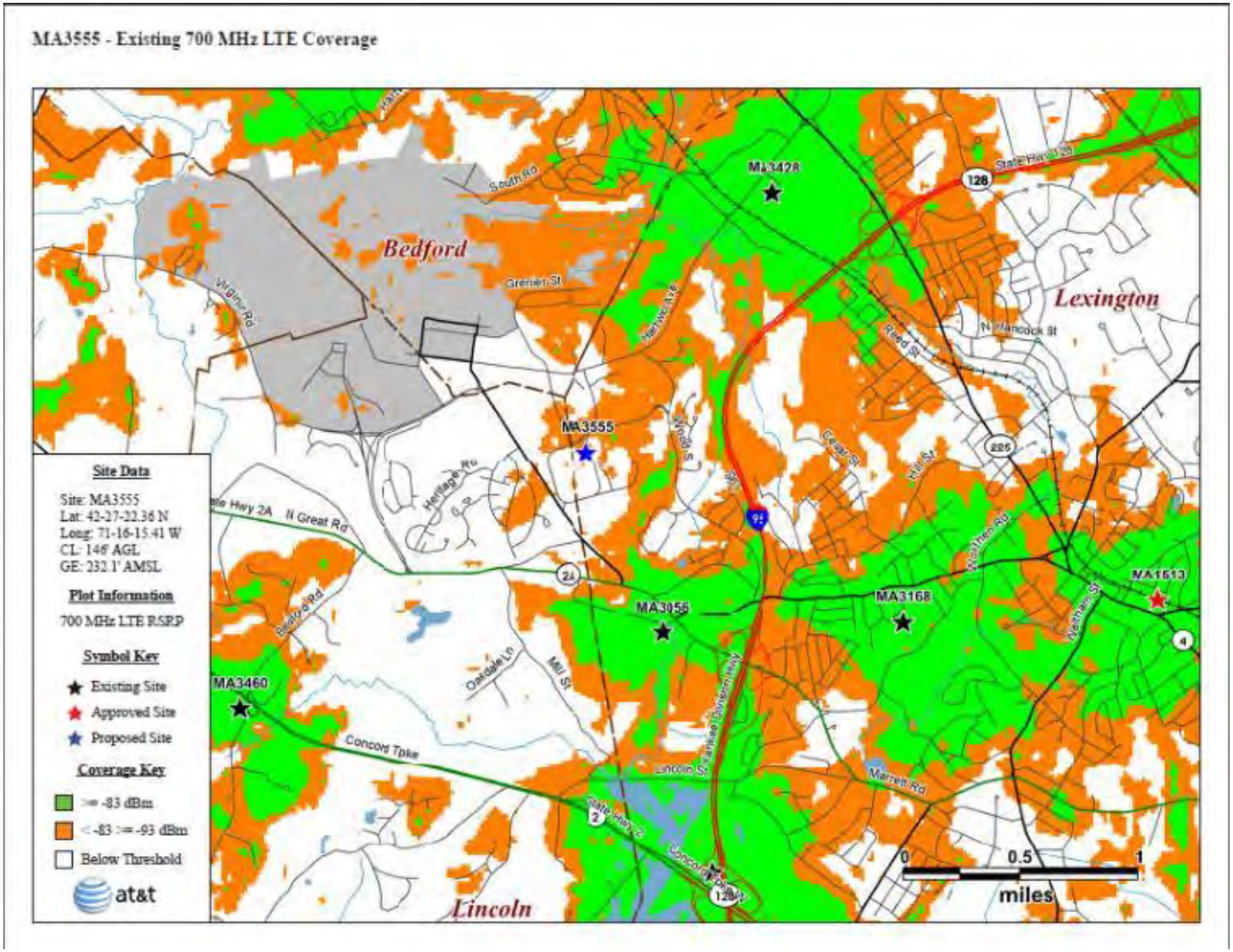
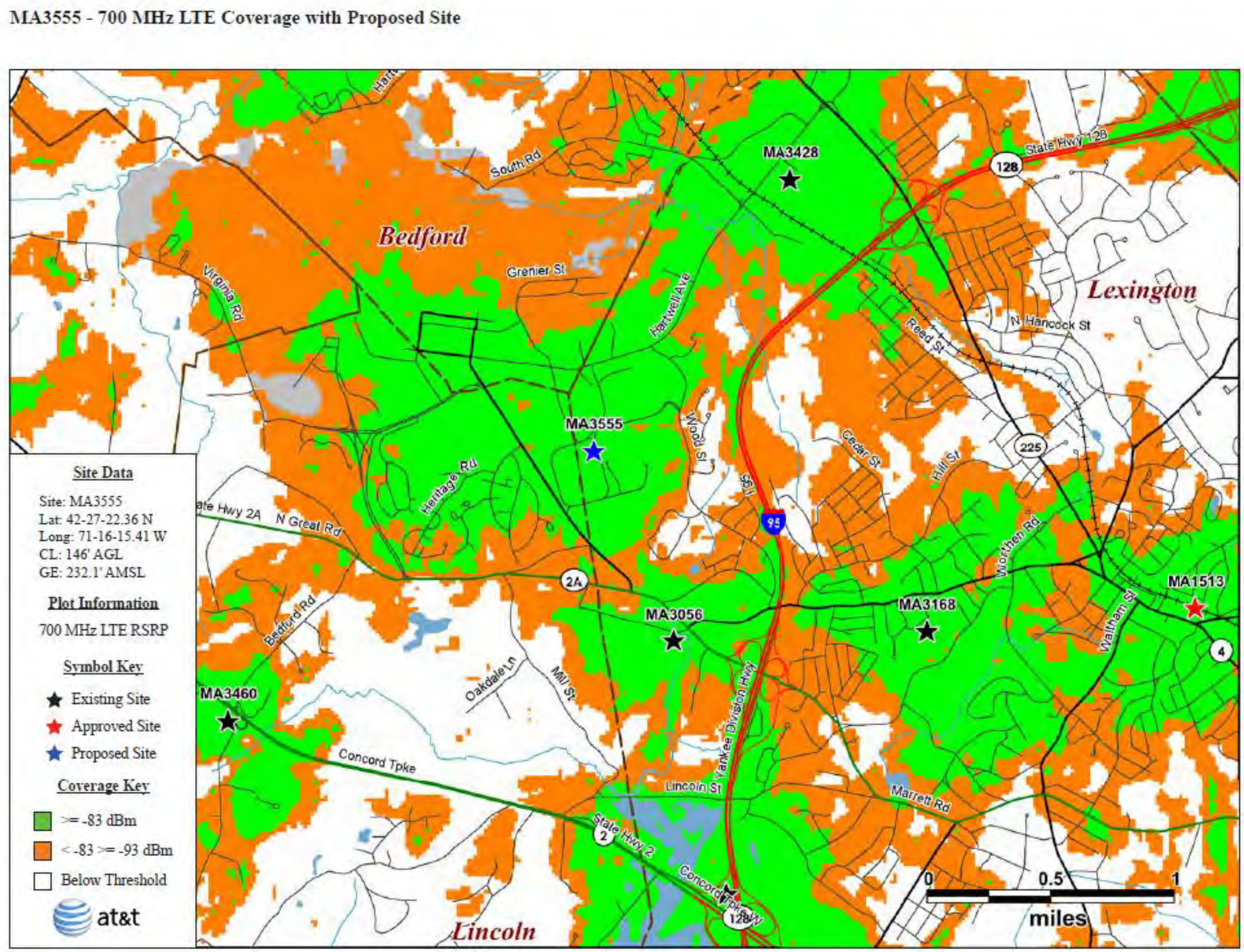


Figure 1-4. Proposed FirstNet Coverage Map Around Hanscom AFB



1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to improve and enhance wireless coverage and capacity of AT&T FirstNet Communications within Middlesex County to include Hanscom AFB. Currently, first responders rely on thousands of different radio networks for communication with each other. This presents a major problem in times of emergency and within parts of the United States lacking adequate coverage such as Hanscom AFB and the surrounding communities. In areas with poor coverage, attempts to respond to any emergency are often met with significant delays – which may result in otherwise preventable disasters such as death or injury of those in need. First responders have first priority of the FirstNet bandwidth while using FirstNet devices during an emergency event; however, commercial users also benefit. AT&T can use the FirstNet infrastructure to provide improved commercial cell service coverage when there is no need to utilize FirstNet first responder prioritization of the signal.

Action is needed due to a lack of existing FirstNet Communications network coverage and a need for robust connectivity and coverage at Hanscom AFB and the surrounding communities.

1.3 APPLICABLE FEDERAL LAWS AND REGULATIONS

This Environmental Assessment (EA) addresses the Proposed Action and the No Action alternative in accordance with NEPA (42 USC 4321-4347), Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 CFR Parts 1500 – 1508), and Department of the Air Force (DAF) Environmental Impact Analysis Process (EIAP) regulations (32 CFR Part 989).

The EA is a written analysis that serves to:

- provide analysis sufficient to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI); and
- aid federal agencies in complying with NEPA when no EIS is required.

If this EA were to determine the Proposed Action would have the potential to significantly degrade the environment, have the potential to significantly threaten public health or safety, or generate substantial environmental controversy concerning the significance or nature of the environmental impact, then an EIS would be completed. An EIS involves a comprehensive assessment of project impacts and alternatives and a high degree of public input. Alternatively, if this EA results in a FONSI, then the action would not be the subject of an EIS. The level and extent of detail and analysis in the EA is commensurate with the importance of the environmental issues involved and with the information needs of both the decision-makers and the general public.

In addition, this EA evaluates the compliance of the Proposed Action with potential requirements of the following federal environmental laws and regulations:

- Clean Air Act (CAA)Clean Water Act
- Pollution Prevention Act
- National Historic Preservation Act (NHPA)

- Archaeological Resources Protection Act
- Endangered Species Act
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- Resource Conservation and Recovery Act (RCRA)
- Toxic Substances Control Act (TSCA)
- Occupational Safety and Health Administration (OSHA) regulations
- Executive Order (EO) 11988 (Floodplain Management)
- EO 11990 (Protection of Wetlands)
- EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)
- EO 13045 (Protection of Children from Environmental Health Risks and Safety Risks
- EO 13990 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis)
- EO 14057 (Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability)
- EO 14008 (Tackling the Climate Crisis at Home and Abroad)
- Air Force Instruction (AFI) 32-1001, Civil Engineer Operations
- AFI 32-1015, Integrated Installation Planning
- AFI 32-7001, Environmental Management
- AFI 32-7020, Environmental Restoration Program
- Air Force Manual (AFMAN)32-7002, Environmental Compliance and Pollution Prevention
- Department of the Air Force Manual (DAFMAN) 32-7003, Environmental Conservation AFMAN 32-1067, Water and Fuel Systems

1.4 REQUIRED FEDERAL, STATE, AND LOCAL PERMITS

Proposed Action may require the following federal and state permits or approvals (or modification of existing permits):

- Base Civil Engineering Work Clearance Request (AF Form 103), known as a “dig permit”
- United States Environmental Protection Agency (USEPA) Construction General Permit (for stormwater discharges for projects that disturb 1 or more acres)
- Municipal Separate Storm Sewer System (MS4) Permit Compliance (≥ 1 acre)
- Federal Aviation Administration (FAA) Navigable Airspace Notice of Proposed Construction
- Compliance Certification for New Generator
- Construction and Demolition Debris Diversion Plan
- Massachusetts Department of Environmental Protection BWP AQ 06 – Notification Prior to Construction or Demolition (if applicable)
- Asbestos Notifications (if applicable)
- State Historic Preservation Office (SHPO) Consultation (applicable)
- Tribal Historic Preservation Office (THPO) Consultation (applicable)
- United States Fish and Wildlife Service (USFWS) Consultation (if applicable)
- Hanscom Air Force Base Contractor Environmental Guide

1.5 INTERGOVERNMENTAL COORDINATION, PUBLIC AND AGENCY PARTICIPATION

HAFB consulted the Hanscom Area Towns (HATS) Committee, the Bedford Town Manager, the Concord Town Manager, the Lexington Town Manager and the Lincoln Town Administrator, Massachusetts Port Authority (MassPORT), Federal Aviation Authority – New England Region (FAA), Minute Man National Historical Park (MMNHP), Massachusetts Historical Commission (MHC), the Mashpee Wampanoag Tribe, and Wampanoag Tribe of Gay Head (Aquinnah).
Copies of the Draft EA and FONSI were made available for agencies and public review at the following internet link:

https://www.hanscom.af.mil/About-Us/Fact-Sheets/Display/Article/379486/civil-engineering/

Thirty days were allowed for the agencies and the public to comment on the Draft EA/FONSI. The public comment period ended on 20 December 2024. The public comment notification is included in Appendix B.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 SELECTION STANDARDS AND CRITERIA

As part of the FirstNet deployment process, AT&T identifies areas that lack adequate FirstNet coverage and then searches for potential sites for new telecommunications installations. A search ring is established, centered on the most desirable area for an installation. Areas of interest within the search ring are then evaluated for their proximity to tall buildings, access to existing power and communications infrastructure and construction feasibility. AT&T identified Hanscom AFB as an area of interest, and after further evaluation, sites were identified that would accommodate the small cell nodes and macro tower. NEPA and CEQ regulations require the consideration of reasonable alternatives to accomplish the Proposed Action. CEQ regulations define 'reasonable alternatives' as 'a reasonable range of alternatives that are technically and economically feasible, and meet the purpose and need for the proposed action' (40 CFR 1508.1(hh))

Alternatives for the Proposed Action must meet the following selection standards:

1. Extend FirstNet network access to Hanscom AFB and surrounding communities to improve first responder communications;
2. Increase network capacity within Hanscom AFB;
3. Site size is adequate for the proposed tower and 75-foot x 75-foot equipment compound;
4. Site must be able to accommodate construction equipment and activities, and there must be nearby telecommunications and power infrastructure; and
5. Site must have minimal impact on cultural resources.

The selection standards were applied to the following alternatives (Table 2-1):

Alternative 1: New tower constructed on Hanscom AFB, to be located off Tinker Loop, and five small cell nodes constructed on base.

Alternative 2: Collocation of telecommunications equipment on an existing structure on Hanscom AFB.
Alternative 3: New tower constructed outside Hanscom AFB.
Alternative 4: No Action Alternative

DAF EIAP regulations provide that DAF 'may expressly eliminate alternatives from detailed analysis, based on reasonable selection standards (for example, operational, technical, or environmental standards suitable to a particular project)' (32 CFR 989.8(c)). The selection standards were applied to each alternative to determine which alternative(s) would fulfill the purpose and need for the action as pass or fail (Table 2-1). Any alternative not achieving a passing score in all five criteria was eliminated and not analyzed further.

2.2 ALTERNATIVES ELIMINATED FROM FURTHER ANALYSIS

The following alternatives would not sufficiently meet the selection standards and purpose and need and have been eliminated from further consideration:

Alternative 2: Collocation on an existing structure on Hanscom AFB.
There is existing telecommunications equipment on the smokestacks of a building on Randolph Road, owned by a different carrier (Figure 2-3). This option would improve FirstNet coverage on base; however, structural evaluations of the smokestacks determined that their current condition would not support the added weight of an additional collocation. The site is not adequate for FirstNet equipment, and it is not buildable; therefore, it was eliminated from further consideration.
Alternative 3: Construction of a new tower at an off-base location
Constructing a new telecommunications tower elsewhere in the AT&T search ring, but not on Hanscom AFB. This alternative would improve FirstNet network coverage in the area; however, it would limit improvements to the network capacity on base. A site that could accommodate a new tower and compound was not identified. Additionally, Minute Man National Historical Park is located south and southwest of the base, limiting the choice of alternative locations that would have minimal impact on cultural resources.

Table 2-1. Site Selection Analysis

Table 2-1. Site Selection Analysis					
	Standard 1	**Standard 2**	**Standard 3**	**Standard 4**	**Standard 5**
Alternative 1 - **New tower on base**	Pass	Pass	Pass	Pass	Pass
Alternative 2 -Collocation	Pass	Pass	Fail	Fail	Pass
Alternative 3 -New tower off base	Pass	Fail	Fail	Fail	Fail
Alternative 4 - **No Action Alternative**	Fail	Fail	NA	NA	Pass

2.3 ALTERNATIVES CARRIED FORWARD FOR ANALYSIS

Boldyn Networks and HAFB are carrying forward two alternatives for further analysis:

Alternative 1 (Proposed Action): New Tower off Tinker Loop and five small cell nodes on base (Preferred Alternative)
Alternative 4: No Action Alternative

2.3.1 No Action Alternative

The No Action alternative is the baseline for the rest of the analysis and helps determine the extent to which the Proposed Action would impact the environment. While the No Action alternative does not fulfill the Purpose nor Need for the Proposed Action, the consequences of the No Action alternative are evaluated in this EA in accordance with 32 CFR 989.8

Under the No Action alternative, Boldyn would not construct the new tower or small cell nodes, leaving the currently aging network infrastructure unchanged. With the ever-growing need for more bandwidth and access to stable and reliable network coverage, the No Action alternative would maintain the status quo as is with no change resulting in the continued aging of the existing network infrastructure and inadequate FirstNet coverage. The No Action alternative would have no environmental impact and the impacts of other alternatives will be compared against this baseline.

2.3.2 Proposed Action/Preferred Alternative

The proposed action would be to construct a new macro telecommunications tower within a 75’ x 75’ equipment compound off Tinker Loop with an approximately 65-foot long access road (Figure 2-1 and 2-2) and construct five small cell nodes designated as cRAN 640, cRAN 646, cRAN 647, cRAN 648, and cRAN 649 on base at various locations (Figure 2-2). The proposed macro tower location is a grass-covered area between Grenier Street to the west, Tinker Loop to the east, a parking lot to the south and a small, wooded area to the north. The new tower would be a 150-foot monopole and would be able to accommodate up to three carriers. The macro tower will be lit as required by the FAA, in accordance with FAA Advisory Circular 70/7460-1 M, Obstruction Marking and Lighting, utilizing a medium-dual system. The macro tower would not have guy wires, because this is a monopole tower design. The macro tower compound would include a single, EPA and CARB emissions certified, 20kW backup generator, only to be utilized during times when backup power is required. The generator will store 54 gallons of diesel fuel within a UL142 (double wall), self-contained diesel fuel tank with an overfill prevention valve. Full generator specifications can be found in Appendix C. New small cell nodes would be approximately 40 feet in height and would resemble existing light poles on base. Construction activities would include ground disturbance to install footings for the macro tower, direct-bury the small cell monopoles, install underground conduit for power and fiber, and establish an access drive to the tower site. New conduit would be installed with micro-trenching, directional boring, or hand digging as needed. The location of the small cell nodes would be within previously disturbed road rights-of-way. The new infrastructure would tie in to the existing internet service provider (ISP) node via the Meet-Me-Point. The Meet-Me-Point is a general term for the spot/location where the ISP from outside the fence will meet Boldyn just inside the fence.

This site location minimizes the amount of required clearing and grading to construct the new tower while also remaining as close as possible to the road, existing power and telecommunications sources, and the center of the original search ring. This location also minimizes the disruption to the surrounding environment, including extensive access lanes, and associated costs. The compound is designed to meet the needs of up to 3 additional carriers within the compound, encouraging future collocations. Photo simulations have shown that the proposed tower will have minimal impact on nearby historic resources, specifically Minute Man National Historical Park. This location best fits the site selection standards, would meet the purpose and need for the Proposed Action, and has been deconflicted by the Base prior to approval via Facility Board.

The new tower off Tinker Loop and five small cell nodes on base is the Preferred Alternative and thus the Proposed Action evaluated in this EA.

2.4 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

Potential environmental impacts associated with the No Action alternative and the Proposed Action for all resources are summarized as follows:

- As there would be no tower nor buildout of the fiber run and additional small cell nodes under the No Action alternative, implementation of this alternative would have no significant impacts.
- As the Proposed Action is a transaction that would involve the installation of an AT&T FirstNet Communications network on Hanscom AFB to improve wireless coverage and capacity, AT&T, in partnership with Boldyn Networks, would construct and install one macro tower, five small cell nodes and connecting fiber lines between the locations, utilizing existing rights-of-way, implementation of this alternative would have no significant impacts.

Figure 2-1. Alternative 1: Macro tower and compound location.

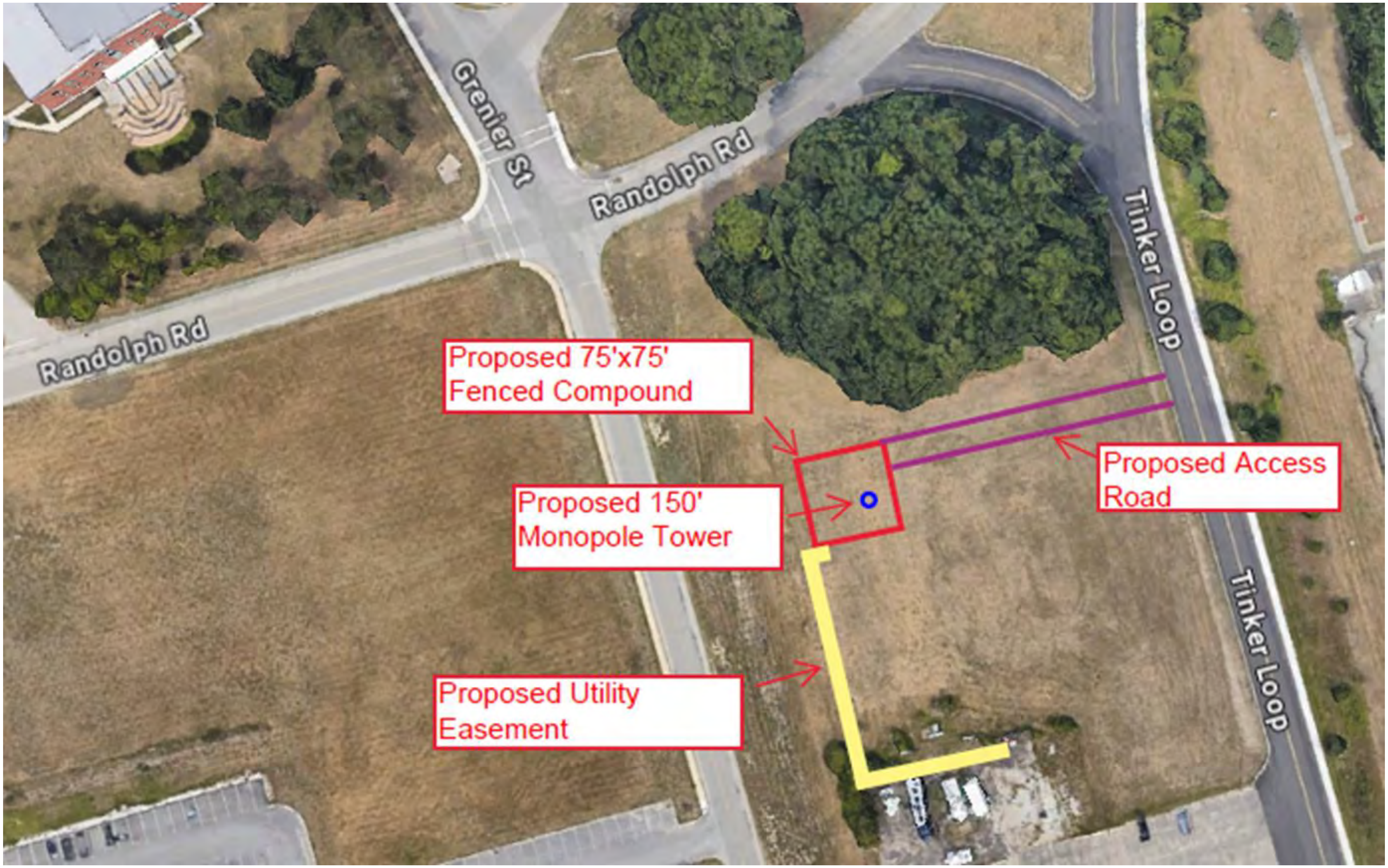
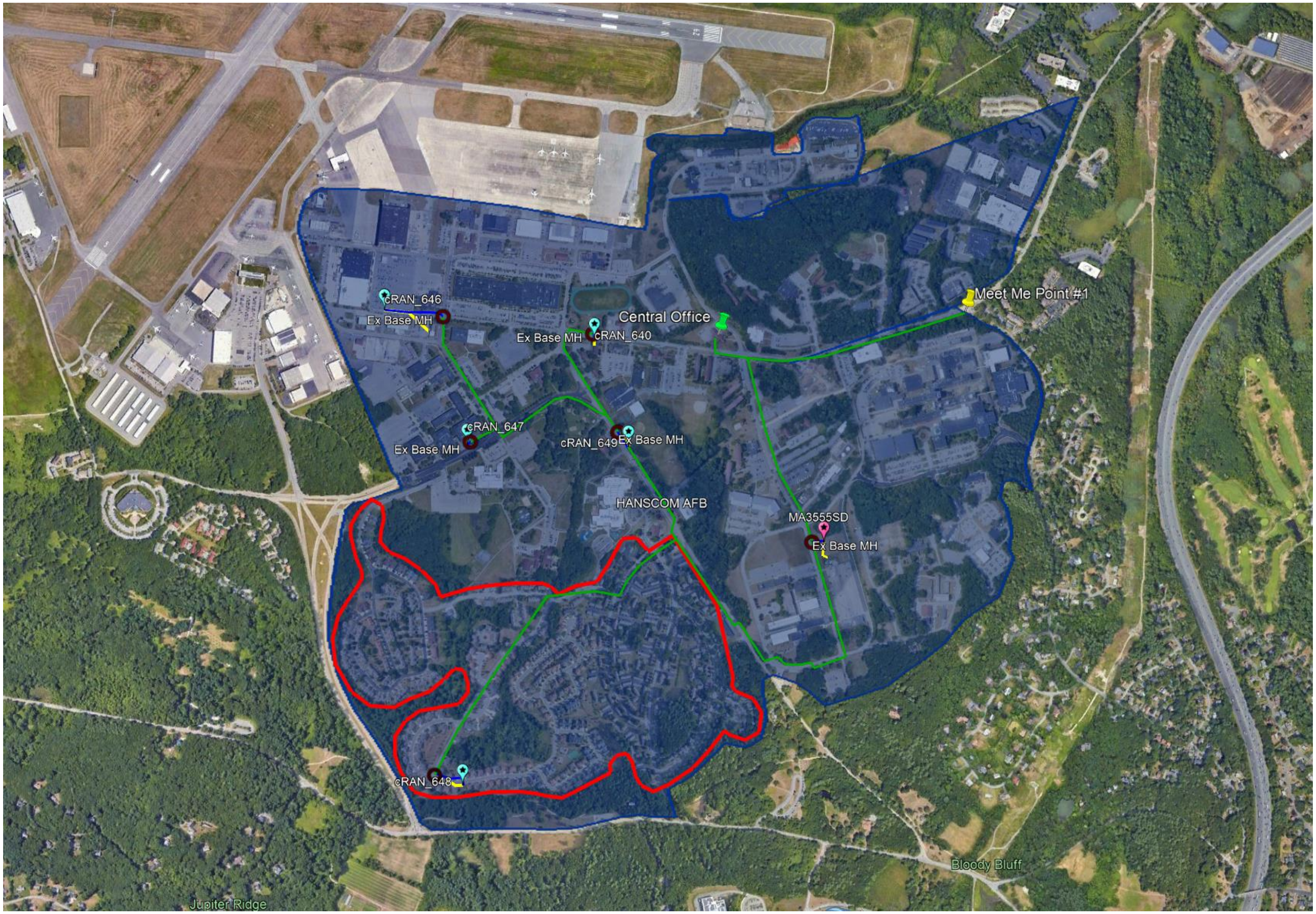


Figure 2-2. Map of small cell node and fiber locations for Alternative 1.



3.0 AFFECTED ENVIRONMENT AND ANTICIPATED ENVIRONMENTAL IMPACTS

3.1 REASONABLY FORESEEABLE ACTIONS AND CUMULATIVE EFFECTS

3.1.1 Past, Present, and Reasonably Foreseeable Actions

CEQ regulations require that all federal agencies include an analysis of potential direct and indirect cumulative effects on the environment from the incremental effect of a proposed action when added to the other past, present, and reasonably foreseeable future actions. Cumulative effects are most likely to arise when a relationship or synergy exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or close to a proposed action would be expected to have more potential for a relationship than those more geographically separated.

3.1.2 Assessment of Cumulative Impacts

This EA considers the effects of cumulative impacts consistent with 40 CFR 1508.1(i)(3), which includes cumulative effects or impacts within the definition of effects or impacts. A cumulative effect, as defined by the CEQ (40 CFR 1508.(1)(3) are "…effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time".

The following projects have occurred at Hanscom AFB within the last five years:

- Construction of Sartain (Vandenberg) Gate Complex and roadway System, FONSI issued in 2022;
- 24-Hour Access Gate at Hanscom AFB; FONSI issued in 2022;
- AAFES Consolidation and Gas Station at Hanscom; FONSI issued 2021;
- Installation Development Plan EA; FONSI issued 2020; and
- Leasing Off-Base Space for HBN Personnel; FONSI issued 2020

Future anticipated projects on Hanscom AFB include:

- Construction of a New Child Development Center, FONSI issued in 2024;
- Replacement of Lead Service Lines, FONSI staffed to be signed in 2024
- Senior Leadership Network Ground Entry Point, FONSI anticipated in 2024
- New Fire Station and Air Passenger Terminal EA, FONSI anticipated in 2024
- Implement Goals and Objectives of the Integrated Natural Resources Management Plan (INRMP) EA, FONSI anticipated in 2024
- Repair (Relocate) Stormwater Pipelines, Tinker Loop Field, CATEX 2024
- MS4 Permit Requirements - Storm Water BMP, Infiltration Basins, Tinker Loop, CATEX 2024
- Reconfiguration of the Ruiz (aka Hartwell) Gate Complex, FONSI issued 2023; and
- NC3 MILCON, Mission Consolidation at Hanscom AFB; FONSI issued 2021

For projects listed above, no significant impacts on socioeconomic/environmental justice, noise, climate change, geology and soils, floodplains, or the environmental restoration program hazardous waste were identified in the project EAs or the installation Environmental Impact Analysis Process (EIAP). The short-term increases in solid waste during construction for these projects would be minor because recycled materials would be utilized, and efficient building technologies were included in the building design. Traffic increases from projects would be minimized by the implementation of traffic demand management (TDM) strategies. Specific to the construction of buildings with Hanscom AFB, minor increases in demands on the water supply, wastewater, electrical, telecommunications, and natural gas systems, as a result of a small increase in the base population, were determined not to be adverse.

The projects to Repair (Relocate) Stormwater Pipelines and Infiltration basins at Tinker Loop Field will occur at the same location or very close in proximity of the Preferred Alternative Site for the macro tower. Hanscom Air Force Base (HAFB) would remove and relocate existing stormwater catch basins, manholes and pipelines. This effort includes the removal and installation of up to 300 linear feet of concrete pipe (3000 square feet (6000 cubic feet) of ground disturbance on previously disturbed land). The effort also includes the removal of five existing manholes and the addition of one manhole (600 square feet (4800 cubic feet) of ground disturbance of previously disturbed land). This project is being performed by the Installation and is not directly related to the Proposed Action of this EA. The projects just happen to be at the same location and would occur whether the Proposed Action of this EA occurred or not. These projects are best management practices (BMP) to meet the Installations' Municipal Separate Storm Sewer System (MS4) Permit Requirements. The Installation's EIAP process determined that these projects qualify for a Categorical Exclusion (CATEX). By following the HAFB Environmental Contractor Guide, suspect infrastructure materials would be tested for asbestos, lead, and/or PCBs if necessary. Any repair or removal of asbestos would be done by a licensed asbestos contractor. There would be no change to land use. There would be no air quality impacts. The proposed action will occur in an area that is in maintenance for ozone; however emissions from the action will be de minimus, so no conformity determination under the Clean Air Act is required. The site is within the historic district, but no consultation with Massachusetts State Historic Preservation Office (SHPO) is required for these BMP projects to move forward. The projects are adequately covered by the Installations' Programmatic Agreement with the SHPO. Overall, these projects' intentions are to improve the storm water sewer system, thus they would have a positive impact to the infrastructure storm drainage system.

No significant cumulative impacts on topography, geology, and soils are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section.

3.2 TOPOGRAPHY, GEOLOGY, AND SOILS

3.2.1 Affected Environment

The topography surrounding HAFB is distinguished by a southeasterly incline side slope surrounded by gently sloping hills. HAFB exhibits an elevation approximately 220 feet above mean sea level (MSL). The HAFB campus is located at a lower elevation when compared to topography to the south-southeast which consists of rolling hills which generally slope to the northeast (GZA, 2013). Topography to the north-northwest is comprised of swamp/marsh land and river floodplain roughly at 130 feet MSL.

The primary bedrock formations underlying the base are Siluro-Ordovician intrusive igneous rocks. Andover granite is the most common bedrock underlying the base. Assabet quartz diorite and Shawsheen gneiss are also present in the northeast portion of the base (HAFB, 2010a). Bedrock is exposed at a few locations within the base (HAFB, 2010a). In general, depth to bedrock on or immediately adjacent to the Massachusetts Institute of Technology Lincoln Laboratory (MIT LL) campus ranges from as little as 7 feet (in the west) to as much as 67 feet (in the south and southwest). Surficial geology and geomorphology on the base reflect the presence of several large glaciers during the Pleistocene era, when much of HAFB was covered by Glacial Lake Concord. As the glaciers retreated, eroded bedrock and mixed rock particles were deposited as till, drumlins, kames, and kame terraces (HAFB, 2010a).

Soils at HAFB were generally formed in glacial till/outwash, or ground moraines, with the south and eastern side (higher elevations) of the base primarily formed in glacial till and the western and northern sides formed in glacial outwash (HAFB, 2010a). Due to earthmoving activities since construction of the base in the early 1940s, most of the soils have been modified and are now urban land or udorthents (HAFB, 2010a). Areas on base that still maintain the original soil are primarily comprised of sandy loam or loamy sand (HAFB, 2010a).

In general, most of the soils at HAFB, especially in the areas with low degree of relief, fall into Hydrologic Soil Group (HSG) C, indicating moderately high runoff potential when soils are thoroughly wetted. However, areas with a high degree of relief fall into HSG A and B, soils with low to moderately low runoff potential when thoroughly wet (USDA, 2007).

3.2.1.1 Soil Types mapped within the project area.

The online United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey was consulted for soil information within the project area.

As indicated in the Custom Soil Resource Report (USDA, 2024), disturbed soils within the project area consist of Urban land (map unit symbol 602), Udorthents-Urban land complex (map unit symbol 656), Deerfield loamy fine sand, 0 to 3 percent slopes (map unit symbol 256A), and Merrimac-Urban land complex, 0 to 8 percent slopes (map unit symbol 626B). A total of 6 unique soil disturbance areas are associated with the proposed action. These areas include the macro tower compound and associated conduit, designated as MA3555D, as well as each of the 5 small cell locations, designated as, cRAN 640, cRAN 646, cRAN 647, cRAN 648, and cRAN 649 (see appendix D). Construction plans for all small cell locations consist of directional boring or micro trenching for new conduit and a single 2-foot x 2-foot auger hole for the proposed pole.

The Urban Land series (map unit symbol 602) is defined as soils altered or obscured by buildings, industrial areas, paved parking lots, sidewalks, roads, railroad yards, etc. These soils have a primary parent material of excavated and filled land and are classified as “Not Prime Farmland.” A majority of the soils to be disturbed for the proposed action will take place in this soil type. Of the six unique disturbance areas, four areas are made up either wholly or partially of Urban Land. Three of these locations (cRAN 640, cRAN 646, cRAN 647) consist exclusively of this soil type while the macro tower location (MA3555D) is also comprised of approximately half Urban Land soils, and the other half Udorthents-Urban land complex.

Construction plans for all small cell locations consist of directional boring or micro trenching for new conduit and a single 2-foot x 2-foot auger hole for the proposed pole.

The Udorthents-Urban land complex series (map unit symbol 656) is a soil that has been previously altered by leveling and cutting or covered with a loamy fill material in preparation for construction. Udorthents and Urban Land soils are classified as "Not Prime Farmland." The disturbance level of this soil type is limited to one small cell node designated as "cRAN_649" and the macro tower location. Ground disturbance consists of a single 2-foot x 2-foot auger hole for the proposed pole with approximately 60 feet of accompanying fiber and power conduit within existing, previously disturbed soils, to nearby, existing infrastructure along Airport Road. Disturbance of this soil type will also occur at the macro tower location (MA3555D) which is also comprised of approximately half Udorthents-Urban land complex and half Urban Land soils.

The Deerfield Series map (unit symbol 256A) is comprised of very deep, moderately well drained soils formed in glaciofluvial deposits. Deerfield are nearly level to strongly sloping soils located on terraces, deltas, and outwash plains. Slope ranges from 0 to 15 percent and saturated hydraulic conductivity is high or very high. These soils are classified as "Additional farmland of statewide importance," which, per 7 CFR 657.5(c), "is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops." This soil type is limited to one small cell node designated as "cRAN_649." Ground disturbance would consist of a single 2-foot x 2-foot auger hole for the proposed pole with approximately 140 feet of accompanying fiber and power conduit within existing, previously disturbed soils, to nearby, existing infrastructure along Airport Road. In accordance with Natural Resources Conservation Service regulations implementing the Farmland Protection Policy Act at 7 CFR Part 658, HAFB determined that this site is not "farmland" as defined in 7 CFR 658.2(a). 7 CFR 658.2(a) provides that the definition of "farmland" does not include land already in urban development. Although the native soil type is classified as "Additional farmland of statewide importance," this site meets the description of "Farmland already in urban development" in 7 CFR 658.2(a), because it is land "identified as 'urbanized area' (UA) on the Census Bureau Map." Therefore, no further action is required for this site under those regulations.

Merrimac-Urban land complex (map unit symbol 626B) consists of Urban land that has been altered by human activity mixed with the Merrimac Series. The Merrimac Series is comprised of very deep, somewhat excessively drained soils that are formed in outwash material. These soils range in slope between 0 to 35 percent on outwash terraces and plains and other glaciofluvial landforms. Saturated hydraulic conductivity is high or very high. This altered soil complex is classified as "Not Prime Farmland." The disturbance level of this soil type is limited exclusively to one small cell node designated as "cRAN_648." Ground disturbance consists of a single 2-foot x 2-foot auger hole for the proposed pole with approximately 775 feet of new fiber and power conduit utilizing directional boring or micro trenching within existing, previously disturbed soils, to nearby, existing infrastructure along Liberty Ln.

3.2.2 Anticipated Environmental Impacts

3.2.2.1 No Action

The No Action alternative would result in the continued aging of the existing, inadequate network infrastructure and AT&T FirstNet Communications network on HAFB and the surrounding communities. As there would be no new construction, there would be no change to topography, geologic features, or soils on HAFB. Implementation of this alternative would have no significant impacts to topography, geology, and soils.

3.2.2.2 Preferred Alternative

The Preferred Alternative includes the construction of a new macro telecommunications tower within a 75-foot x 75-foot equipment compound off Tinker Loop with an approximately 65-foot-long access road (Figure 2-1 and 2-2) and construction of five small cell nodes at various locations (Figure 2-2). The proposed macro tower location is a previously disturbed, grass-covered area between Grenier Street to the west, Tinker Loop to the east, a parking lot to the south and a small, wooded area to the north. The new tower would be a 150-foot monopole and would be able to accommodate up to three future carriers. The macro tower would not have guy wires, because this is a monopole tower design. The overall disturbance area for the macro tower will consist of approximately 6900 square feet which is to take place in previously disturbed soils. Due to the already disturbed nature of the project area from separate stormwater work to be completed at the location by HAFB (described in section 3.1.2) prior to construction of the tower compound, no adverse impacts to topography, geology, and soils will occur as a result of the proposed action. All disturbed areas not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction methods for all small cell locations would utilize directional boring or micro trenching to minimize the amount of overall disturbance for new conduit and of a single 2-foot x 2-foot auger hole for the proposed pole which is proposed to resemble existing light poles on base. As all new conduit is to be placed in or near areas of existing conduit in previously disturbed areas, and all small cell poles are to resemble existing light poles on base, no significant short-term impacts to topography, geology, and soils are expected. No significant long-term direct or indirect impacts to topography, geology, and soils would occur as a result of the proposed action.

No significant cumulative impacts to topography, geology, and soils are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

3.3 LAND USE

3.3.1 Affected Environment

HAFB is located approximately 18 miles northwest of Boston, Massachusetts, just outside the Route 128/I-95 circumferential expressway. The base is located just west of a major light industrial and office park corridor, which leads to the HAFB gate (Hartwell Avenue) closest to AT&T meet-me-point. HAFB occupies approximately 846 acres of federally owned land within the towns of Bedford, Lexington, and

Lincoln, all of which are primarily suburban residential communities with commercial centers. HAFB encompasses 846-acres of land, 713 acres of which are developed or altered with the remaining 133 undeveloped acres on the base being semi-improved or forested, and wetland areas (HAFB, 2023a). These developed or altered areas currently support 731 private housing units, 413 administrative and research facilities/buildings, roads, parking lots and sidewalks. The remaining 133 undeveloped acres on the base are semi-improved or forested, and wetland areas. The closest residential areas to the Macro Tower location are located approximately 1850 feet to the southeast east along Wood Street.

The Laurence G. Hanscom Field airport (Hanscom Field) is located directly adjacent to HAFB in the towns of Bedford and Concord. While the DAF no longer owns Hanscom Field, the military does use it for occasional flight operations. The airport is currently owned and managed by the Commonwealth of Massachusetts and administered by the Massachusetts Port Authority (Massport). There are two runways at the airport, approximately 5,000 and 7,000 feet long. According to Massport, less than 1 percent of the flights are military (HAFB, 2017).

The Minute Man National Historical Park (MMNHP), operated by the National Park Service, is adjacent to the southern perimeter of HAFB, directly south of the Macro Tower, and spans the towns of Lexington, Lincoln, and Concord. MMNHP, totaling 967 acres, was created by an act of Congress in 1959 to commemorate the events, ideas, significant historic sites and landscapes associated with the Battle of Lexington and Concord.

The proposed action consists of the installation of an AT&T FirstNet Communications network in order to improve wireless coverage and capacity. AT&T in partnership with Boldyn Networks proposes to construct and install one macro tower, five small cell nodes and a total of approximately 2.600 linear feet of new conduit for power and fiber connection to the new small cell nodes and macro tower in order to tie in to existing infrastructure. The land use for the areas of the proposed fiber lines and small cell poles includes mostly currently utilized rights-of-way, and previously developed land. The location of the Macro Tower consists of an undeveloped, maintained grass lot. The proposed action is located within the town boundaries of Bedford, Lexington, and Lincoln.

3.2.1.1 Area Specific Land Use

There are 11 major land use classifications designated on HAFB, as identified in the 2023 HAFB Integrated Natural Resources Management Plan and shown in Figure 3-1. The predominant land uses within the proposed action areas include Administration and Family Housing (HAFB, 2023a).

Although the proposed action would occur throughout many different land use zones, a large majority of the work area would be limited to currently existing conduit in existing rights-of-way for the fiber conduit. Most of the existing rights-of-way currently have existing utility conduit under the ground which would be utilized for the proposed fiber path.

Section 1 encompasses the macro tower and accompanying fiber lines to the AT&T meet-me-point located north of macro tower on Hartwell Avenue just south of the Kelliher Center - Day Habilitation building. This section also includes the fiber segment going south to Wright St., traveling west to Airport Rd. Section 1 land use classification consists of three major land use types: Administration, Industrial and Open Space Buffer (Figure 3-1).

The macro tower would be located in the manicured grass lot directly north-northeast of the Hanscom Conference Center within the Administration land use classification zone. The accompanying fiber line to the AT&T meet-me-point passes through three major land use types: Administration, Industrial and Open Space Buffer. All proposed disturbance within the Industrial and Open Space Buffer would be below ground fiber conduit located in existing rights-of-way (Figure 3-1).

Section 2 encompasses three small cell locations and accompanying fiber lines which begin at the intersection of Barksdale Street and Grenier Street, and additionally includes the sections along the northern part of Marrett Street, and down Vandenberg Drive. Section 2 land use classification consists of six land use types: Administration, Community Commercial, Open Space Buffer, Community Service, Industrial and Medical/Dental (Figure 3-1). All proposed action areas are located within currently developed areas and/or existing rights-of-way.

Section 3 encompasses two small cell locations and accompanying fiber lines which begins at the intersection of Marrett Street, and Vandenberg Drive and continues south along Airport Road, Ent Road, Heritage Road, and Liberty Lane. Section 3 land use classification consists of five land use types: Community Commercial, Recreation, Open Space Buffer, Community Service, and Family Housing (Figure 3-1). All proposed action areas would occur within currently developed areas and/or existing rights-of-way.

3.3.2 Anticipated Environmental Impacts

3.3.2.1 No Action

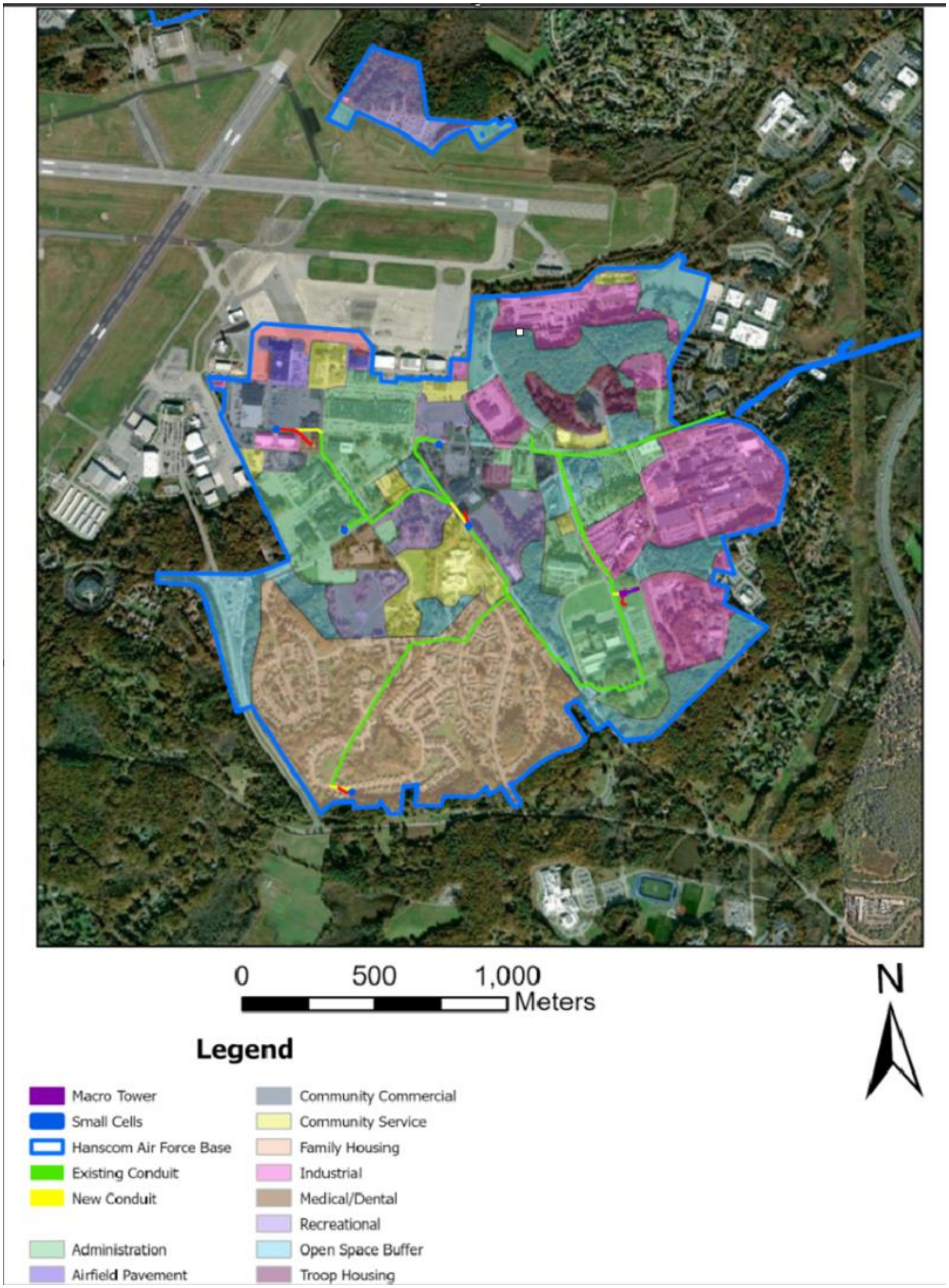
The No Action alternative would result in the continued aging of the existing, inadequate network infrastructure and AT&T FirstNet Communications network on HAFB and the surrounding communities. As there would be no new construction, there would be no change in designated land uses. Implementation of this alternative would have no significant impacts on land use.

3.3.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction methods for all small cell locations would utilize directional boring or micro trenching to minimize the amount of overall disturbance for new conduit in addition to of a single 2-foot x 2-foot auger hole for the proposed pole. The proposed pole is to resemble existing light poles on base. As all new conduit is to be placed in or near areas of existing conduit in previously disturbed areas, and all small cell poles are to resemble existing light poles on base, no change in land use classification is expected. The macro tower location consists of a 75-foot x 75-foot equipment compound off Tinker Loop with an approximately 65-foot-long access road (Figure 2-1 and 2-2) and construction of five small cell nodes designated as cRAN 640, cRAN 646, cRAN 647, cRAN 648, and cRAN 649 on base at various locations (Figure 2-2). The proposed macro tower location is a previously disturbed, grass-covered area between Grenier Street to the west, Tinker Loop to the east, a parking lot to the south and a small, wooded area to the north. The new tower would be a 150-foot monopole and would be able to accommodate up to three future carriers. The macro tower would not have guy wires, because this is a monopole tower design. Due to the small-scale nature of the macro tower compound and access road, no long-term, direct, or indirect adverse impacts to land use would occur as a result of the proposed action.

No significant cumulative impacts to land use are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

Figure 3-1. Land Use in Vicinity of Proposed Action Area



3.4 WATER RESOURCES

3.4.1 Affected Environment

The characteristics of surface water and groundwater, as well as associated wetlands and floodplains, on HAFB are discussed in this section and generally describe the conditions within and surrounding the parcels utilized for the proposed action and HAFB.

3.4.1.1 Surface Water

Most of HAFB and all of the proposed action parcels are located in the Shawsheen River Watershed, a tributary of the Merrimack River Basin supporting a population of approximately 250,000 people, representing one of the smaller watersheds in the state. Predating the construction of the base, the headwaters of the Shawsheen on HAFB originated from a small pond which has since been filled, and the pond drained northeast through wetlands (HAFB, 2010a.) The headwaters now originate from a swampy area in the southwest portion of the base just north of Folly Pond and North Great Road (Massachusetts Department of Environmental Protection). Two unnamed tributaries flow from the swampy area to a culvert at Marrett Street and Old Bedford Road, where the river enters closed conduits and resurfaces further to the northeast on HAFB (MassDEP, 2003).

Surface runoff in the area, which originates from rain and/or snowmelt events, varies seasonally, with heavy flow in the spring due to accumulated snowmelt and an increase in rain, and consequently lower flow in the winter months due to lack of rainfall. No surface water is present near areas of new disturbance for the proposed action areas.

3.4.1.2 Groundwater

Groundwater exists in the saturated zone beneath the ground surface and includes underground streams and aquifers. The aquifer located under HAFB is categorized as “Medium Yield,” having a yield between 100- and 300-gallons per minute and flows directionally to the northeast. The aquifer consists of an upper, unconfined aquifer with lacustrine deposits of glacial origin, which is underlain by a semi-confined lower aquifer above bedrock (Massachusetts Bureau of Geographic Information (MassGIS), 2007).

The groundwater table on HAFB averages between 10 to 20 feet below ground level, not including areas within the vicinity of wetlands and areas of lower elevation which are known to have ground water ranging from 3 to 7 feet (HAFB, 2003). The depth to the water table throughout the base generally ranges from 3 to approximately 23 feet (HAFB, 2003, MIT LL, 1988).

Groundwater on the base, which is not used for drinking water, in many locations contains naturally occurring dissolved manganese and iron, which exceed the respective drinking water standards (HAFB, 2003). Additionally, groundwater in some areas has been contaminated due to past activities on base; therefore, the Environmental Restoration Program (ERP) monitors and treats several sites for groundwater contamination (HAFB, 2003). See Section 3.10.1.3 for additional detail on the ERP.

3.4.1.3 Wetlands

Predating construction of the base in the early 1940s, abundant wetlands comprised the land area currently occupied by the base. Many of the wetland areas were filled in during construction of the base (MassDEP, 2003). A base-wide Comprehensive Ecological Analysis report completed in August of 1997 and updated in 2007, identified and delineated 35 wetlands on HAFB (HAFB, 2010a). Wetlands encompassed approximately 43 acres, comprising five percent, of the Main Base. According to the 2010 Integrated Natural Resources Management Plan (HAFB, 2010a), wetlands range from wet meadow to mature forested swamp. A small number of wetlands are located outside of and proximate to the perimeter of proposed fiber lines along the north and northeast sections (Figure 3-2). The closest wetland to proposed action is a freshwater swamp located approximately 30 feet east and south of the proposed fiber conduit in the existing right-of-way at the intersection of Barksdale St., and Renier St. The wetlands also contribute groundwater discharge towards the Shawsheen River Watershed and if contaminated could pose a risk to the nearby Shawsheen River (HAFB, 2010a).

3.4.1.4 Floodplains

The National Flood Insurance Rate Map (FIRM) indicates a portion of HAFB is located within a floodplain in the northeast area of the base, from the headwaters of the river to where it crosses the HAFB boundary (MassGIS, 2023). No floodplains are present within the boundaries of the Proposed Action area (Figure 3-3).

3.4.2 Anticipated Environmental Impacts

3.4.2.1 No Action

The No Action alternative would not result in any alteration of the surface water, groundwater, wetland, or floodplain resources on HAFB. Implementation of this alternative would have no significant impacts on water resources.

3.4.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction methods for all small cell locations would utilize directional boring or micro trenching to minimize the amount of overall disturbance for new conduit in addition to of a single 2-foot x 2-foot auger hole for the proposed pole. All fiber lines to be installed in the area will utilize existing conduit and therefore will not have any effect upon any wetland areas. All new conduit is to be placed in or near areas of existing conduit in previously disturbed areas, and there are no existing water resources in or near the new proposed disturbance areas.

The overall disturbance area for the macro tower will consist of approximately 6900 square feet which is to take place in previously disturbed soils. All construction site operators performing land disturbance activities greater than 5,000 square feet within Hanscom AFB’s MS4 jurisdiction must develop and implement a sediment and erosion control plan. Land disturbance activities include demolition, construction, clearing, excavation, grading, filling, and reconstruction. Construction site operators must provide a sediment and erosion control plan (both drawings and narrative text) compliant with the

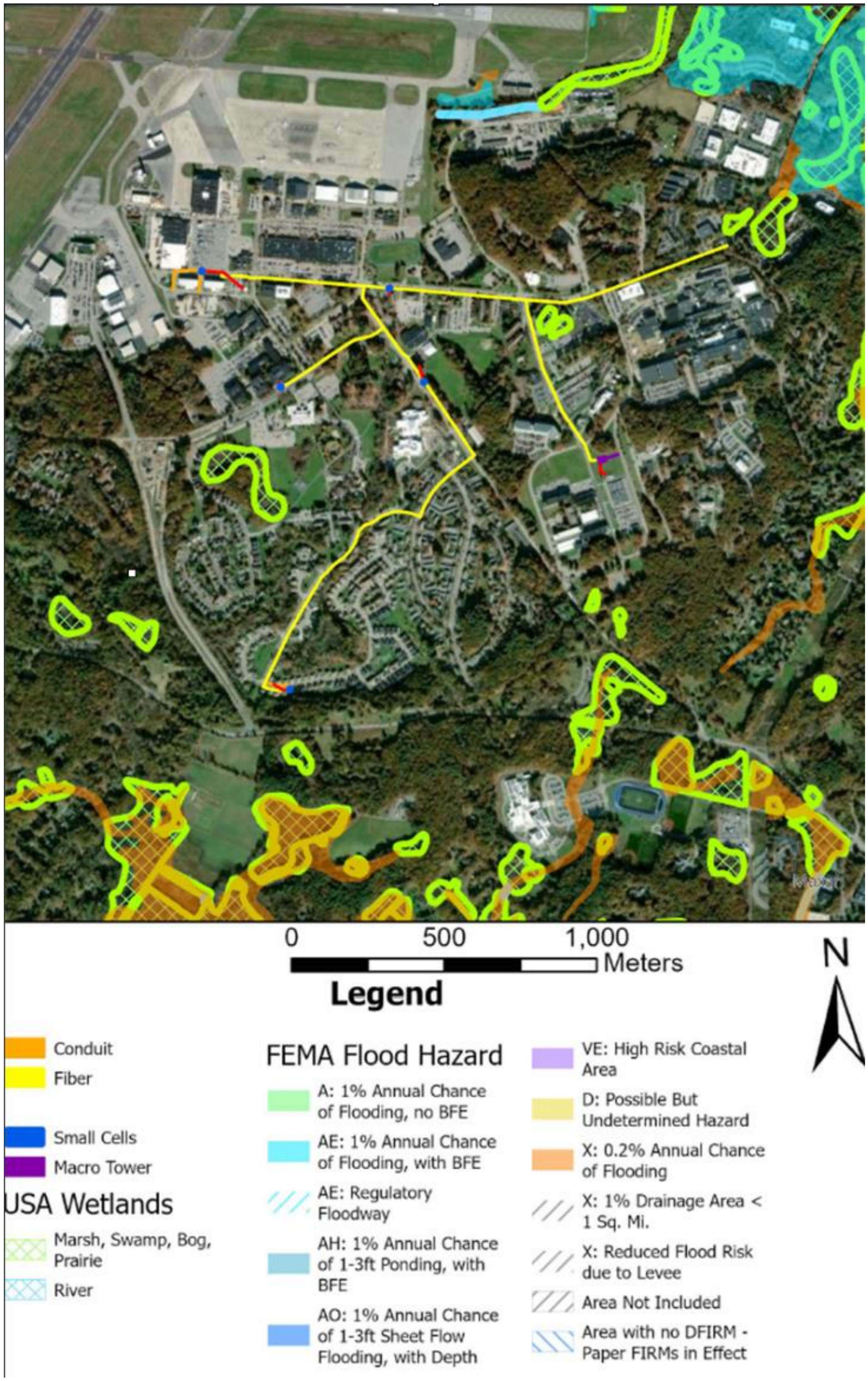
Massachusetts Stormwater Handbook Standard 8, documenting appropriate site erosion control measures including:

- Minimizing the amount of disturbed area and protecting natural resources, particularly the Shawsheen River and Shawsheen River headwater wetlands.
- Stabilizing sites when projects are complete, or operations have temporarily ceased.
- Protecting slopes on the construction site.
- Protecting all storm drain inlets and armoring all newly constructed outlets.
- Using perimeter controls at the site.
- Stabilizing construction site entrances and exits to prevent off-site tracking.
- Inspecting stormwater control at least once every 7 calendar days or once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches or greater, or the occurrence of runoff from snowmelt sufficient to cause a discharge.

No long-term, direct, or indirect, adverse impacts to water resources would occur as a result of the proposed action due to implementation of a sediment and erosion control plan.

No significant cumulative impacts to water resources are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. Regarding HAFB removing/relocating existing stormwater catch basins, manholes and pipelines in previously disturbed areas, this work is to be completed by HAFB at the proposed action area for the macro tower and is not directly related to the proposed action. This scope of work is part of another stormwater management project that is occurring on the base and as such is not fully evaluated in this EA as part of the proposed action. Refer to section 3.1.2 for more information on this undertaking. All of the actions listed in section 3.1.2 were evaluated and determined to have no significant individual or cumulative impacts.

Figure 3-2. Wetlands and Floodplains in Vicinity of Proposed Action Area



3.5 BIOLOGICAL RESOURCES

3.5.1 Affected Environment

This section contains descriptions of biological resources, including vegetation, wildlife, and threatened or endangered species for HAFB and within and immediately surrounding the proposed action area.

3.5.1.1 Vegetation

Due to development of the base since its inception in the early 1940s, most of the native vegetation on base has been modified. Areas of forested uplands consist primarily of roadways, parking areas, structures, and recreational fields and comprise 22 percent of the total base area. Undisturbed remnant grasslands comprise less than 5 percent of uplands on base and occur adjacent to developed areas (HAFB, 2010a). Vegetation present on base is representative of species present within the region. Developed areas of the base are planted with grasses (dominated by rye (Lolium spp.), fescue (Festuca spp.), and bluegrass (Poa spp.)), shrubs, and trees for aesthetics and erosion control. Erosion is minimized on base as part of the maintenance program. Plant selection, fertilization, and terracing techniques are used to ensure successful plantings and minimize soil exposure.

Invasive plants at HAFB include Tartarian honeysuckle (Lonicera tatarica), European buckthorn (Rhamnus frangula), multiflora rose (Rosa multiflora), garlic mustard (Alliaria officinalis), purple loosestrife (Lythrum salicaria), Oriental bittersweet (Celastrus orbiculatus), Japanese knotweed (Polygonum cuspidatum), and common reed (Phragmites australis) (HAFB, 2010a). Most of these species are interspersed throughout the upland and wetland systems. These invasive plants are not currently managed at a large scale on base. On a smaller scale, however, work was performed in 2010 to remove common reed from a stormwater retention area on base; this area continues to be managed. Selected wetland areas may be managed in the future for common reed and purple loosestrife.

3.5.1.2 Wildlife

HAFB is classified by the Massachusetts Division of Fisheries and Wildlife as a Category II installation (pursuant to AFMAN 32-7003, Environmental Conservation), defined as installations that “are unsuitable for conserving and managing fish and wildlife because of mission restrictions or resource limitations, or they are of limited size and do not have unimproved grounds” (HAFB, 2010a). HAFB fits this categorization due to the lack of continuous habitat, and the lack of potential management areas for wildlife habitat (HAFB, 2010a). However, HAFB is adjacent to the Great Meadows National Wildlife Refuge. Approximately 85 percent of the refuge’s more than 3,800 acres is comprised of valuable freshwater wetlands stretching along 12 miles of the Concord and Sudbury Rivers. The United States Fish & Wildlife Service (USFWS) protects and manages Great Meadows as nesting, resting, and feeding habitat for wildlife, with special emphasis on migratory birds.

The USFWS has established “Service Guidance on the Siting, Construction, Operation and Decommissioning of Communication Towers” to reduce potential impact to migratory birds. These guidelines suggest, if collocating on an existing tower or non-tower structure is not possible, that proposed towers be constructed 199 feet or less in overall height, without the use of guy wires, and in a facility with a minimum possible footprint. The Macro Tower for the proposed action perfectly fits the USFWS criteria to minimize the effects to migratory birds. Studies show that approximately 68–86% fewer fatalities occur at medium guyed towers (381-479 ft AGL) than at tall, guyed towers (<1000 ft AGL). Night-migrating songbirds collide most frequently with communication towers, accounting for approximately 92% of all fatalities observed (Gehring et al 2011). Depending on a variety of factors including wind velocity, cloud cover and many others, night-migrating songbirds typically fly between 299 ft and 2001 ft AGL (Kerlinger and Moore 1989). Considering the significantly reduced height the proposed tower would occupy compared to a tall tower, it is reasonable to infer it would have a much less detrimental effect on migrating birds. Similarly, a long-term study at a communication tower in Florida detected a significant decrease in bird fatalities after the tower height was decreased from 1010 ft to 298 ft AGL (Crawford and Engstrom 2001). The relationship between avian fatalities and guy wires has been determined to have a significant positive correlation between locations of tower guy wires and locations of bird carcasses (Gehring et al 2011). Additionally, the USFWS suggests towers be unlit or lit with only white or red strobe lights. The proposed macro tower would follow this guidance.

Wildlife occurring or potentially occurring on HAFB include birds, mammals, amphibians, fish, and macroinvertebrates; however, diversity and abundance are limited on base due to habitat fragmentation. Additionally, the base does not support significant populations of larger mammals, whose movement would be restricted by the base's perimeter fence. Nonetheless, the fragmented nature of the base habitat has created a favorable environment for avian and small mammal species well adapted to humans and development. For mature woodlots such as those present near the macro tower location, as well as other nearby woodlands, the oaks and beeches provide a source of nuts for species such as the eastern gray squirrel (Sciurus carolinensis) and wild turkey (Meleagris gallopavo). Otherwise, there is no noteworthy habitat for wildlife present within the proposed action area.

3.5.1.3 Threatened and Endangered Species

The list of federally protected species in the vicinity of HAFB was reviewed using the USFWS Information for Planning and Consultation (IPaC) tool (USFWS, 2024) to identify threatened, endangered, proposed, and candidate species that may occur in areas that may be affected by the Proposed Action. According to the list generated from the IPaC tool, there are no federally listed species known to occur within HAFB or within the proposed action areas, with the exception of the northern long-eared bat (Myotis septentrionalis) and the monarch butterfly (Danaus plexippus). While no longer listed as threatened/endangered, the bald eagle remains protected under the Bald and Golden Eagle Protection Act (16 USC 668-668d); however, no bald eagles are known to nest on HAFB.

Northern Long-Eared Bat

The northern long-eared bat, which has the potential to be located throughout Massachusetts, was listed as threatened under the Endangered Species Act on April 1, 2015. However, with the ongoing spread of deadly white-nose syndrome increasing the risk of extinction, the USFWS reclassified the Northern long-eared bat as endangered in November 2022, effective as of January 30, 2023. Northern long-eared bats spend winters hibernating in caves and mines with constant temperatures, high humidity and no air currents. A suitable summer habitat consists of forest and woodland habitat, and also may include adjacent edges of agricultural fields, old fields, and pastures (USFWS, 2014).

Monarch Butterfly

On December 17, 2020, the USFWS (2020) announced that listing the monarch butterfly as endangered or threatened under the Endangered Species Act is warranted but precluded by the Service's work on higher-priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. With this decision, the monarch butterfly was listed as a candidate species under the Act and its status will be reviewed annually until a listing decision is made. Although candidate species receive no statutory protection under the Endangered Species Act, the USFWS encourages cooperative conservation efforts for these species. Monarch habitat is varied—encompassing fields, roadside areas, open areas, wet areas, and urban gardens—and, as such, potential habitat for the species occurs on and within the immediate vicinity of both HAFB and the proposed action areas.

Grasshopper Sparrow and Upland Sandpiper

There are two state-listed species known to inhabit the grasslands adjacent to the runways on Massport's Hanscom Field: grasshopper sparrow (Ammodramus savannarum), listed as threatened, and upland sandpiper (Bartramia longicauda), listed as endangered (HAFB, 2010a; NHESP, 2020). Habitat for both species is predominantly grassland fields (HAFB, 2010a).

The Massachusetts Natural Heritage & Endangered Species Program (NHESP) has identified portions of HAFB, located near Hanscom Field to the northwest, as being within Priority Habitat and Estimated Habitat for both species (HAFB, 2010a). However, it is important to note that according to MassGIS data, no NHESP Estimated Habitat of Rare Wildlife are located on HAFB, although the data does document Priority Habitat of Rare Species in the location described above, the nearest point to any proposed action area is approximately 1200 feet northwest.

3.5.2 Anticipated Environmental Impacts

3.5.2.1 No Action

The No Action alternative would not result in any short- or long-term, direct, indirect, or cumulative impacts to vegetation, wildlife, or threatened/endangered species on HAFB. Implementation of this alternative would have no significant impacts on biological resources.

3.5.2.2 Preferred Alternative

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction methods for all small cell locations would utilize directional boring or micro trenching to minimize the amount of overall disturbance for new conduit and a single 2-foot x 2-foot auger hole for the proposed pole which is proposed to resemble existing light poles on base. As all new conduit is to be placed in or near areas of existing conduit in previously disturbed areas, no NLEB are present on base, and the overall height and tower style is designed to minimize effects to avian species, no significant impacts to biological resources are expected. No significant short-term, long-term, direct, or indirect, adverse impacts to biological species would occur as a result of the proposed action.

Northern Long-Eared Bat

The project area does not contain any forested or wooded areas that could potentially provide summer habitat for northern long-eared bats. Regardless, a bat acoustic survey was conducted on HAFB which resulted in the inability to confirm the presence of northern long-eared bat on the property (Schwab, 2018). On March 21, 2024, HAFB extended through March 31, 2029, its original determination, dated October 2, 2018, that proposed undertakings within the boundaries of the base will have "no effect" on the federally listed northern long-eared bat (see Appendix B).

Monarch Butterfly
As a clear majority of the proposed action areas consist of previously developed areas, manicured grass lots and/or existing rights-of-way currently in use for similar purposes, no significant impacts to the existing habitat are expected to occur. Due to the small-scale nature of the project and amount of disturbance to preferred habitats, no significant adverse impacts to the Monarch butterfly are expected to occur.

Grasshopper Sparrow and Upland Sandpiper
As a clear majority of the proposed action taking place near the Priority Habitat of Rare Species area consists of previously developed areas, manicured grass lots and/or existing rights-of-way currently in use for similar purposes, no preferred habitat for the Grasshopper Sparrow or Upland Sandpiper is to be disturbed. Due to the small-scale nature of the project and amount of disturbance to preferred habitats for these species, no significant adverse impacts to the Grasshopper Sparrow or Upland Sandpiper are expected to occur.

No significant cumulative impacts to biological resources are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

3.6 CULTURAL RESOURCES

3.6.1 Affected Environment

The HAFB region contains areas of prominent prehistoric and historic importance. HAFB is located to the north of Minute Man National Historical Park (MMNHP), a National Park Service-administered property encompassing significant properties associated with the start of the American Revolution. Analysis in this EA focuses on cultural districts, eligible historic structures and areas of archaeological sensitivity that could be impacted due to site disturbance and/or direct modification as a result of the Proposed Action.

Four prehistoric archaeological sites are recorded adjacent to the base, and several small prehistoric sites (temporary camps, chipping stations, and lithic workshops) have been reported in the vicinity of the base. The 1997 Phase I Archaeological Survey concluded there are no areas of the main base at HAFB that contain prehistoric resources (Parsons, 1998).

3.6.1.1 Historic Resources

The Air Force Cambridge Research Laboratories (AFCRL) Historic District encompasses the macro tower location as well as a short section of fiber conduit. The AFCRL had developed a system that digitized data into code for transmission on phone lines. In 1950 the DAF Air Research and Development Command selected Hanscom Field for the location of the AFCRL. The facility was intended to be an exemplary

Modern Style research complex modeled on International Style precedents. The DAF constructed the core buildings of the AFCRL between 1954 and 1956 as an integrated lab and office complex. Additional laboratory and office buildings were added to this complex in 1961, 1971, 1986, and 1991. The buildings in the Katahdin Hill area were constructed for AFCRL, on an as-needed basis, for activities for which there was no room in the historic Phillips Laboratories buildings or had specialized spatial or equipment needs. These laboratories were subsequently renamed, first as the Air Force Geophysics Laboratory and then as two Directorates of the Air Force Research Laboratories. All of these lab activities were transferred to Wright-Patterson AFB and Kirtland AFB, and most of the buildings have since been demolished.

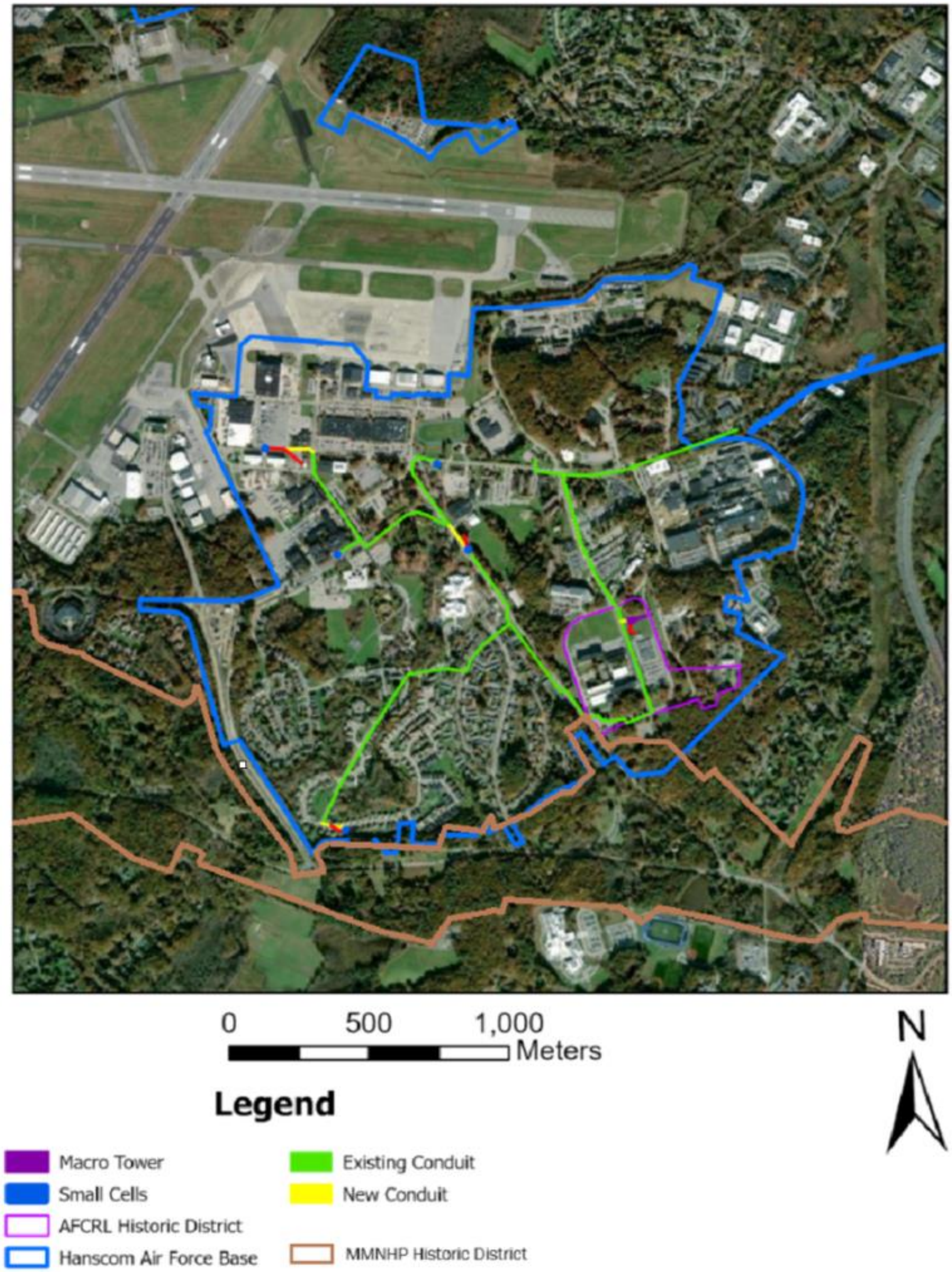
MMNHP, located just south of HAFB along the southern border of the base is under the jurisdiction of the National Park Service and protects 970 acres (392.5 ha) in and around the Massachusetts towns of Lexington, Lincoln, and Concord. It honors the first battles of the American Revolution and is home to several battle sites, including Concord and Lexington. At MMNHP, the Battles of Lexington and Concord are brought to life through the preservation, restoration and interpretation of significant sites from "that famous day and year" when Colonists took up arms in defense of liberty and touched off the American Revolution.

Hanscom AFB has determined that management activities, which includes ongoing operations and maintenance, leases, and future development activities may have an effect on known aboveground historic properties and unknown archaeological properties eligible for inclusion in the National Register of Historic Places (NRHP) within the Air Force Cambridge Research Laboratory (AFCRL) Historic District. Therefore, in 2015, HAFB entered into a programmatic agreement with the Massachusetts State Historic Preservation Officer (SHPO).

3.6.1.2 Archaeological Resources

In 1998, Parsons Engineering Science, Inc. (Parsons, 1998) conducted a Phase I archaeological survey of 34 previously identified areas that were considered to have moderate to high potential for archaeological resources on HAFB. No cultural materials were discovered in these areas. The Massachusetts State Historic Preservation Officer, i.e., MHC, in its 22 June 1998 letter regarding this survey report, wrote "The report indicated that no significant historical or archaeological resources were encountered in the archaeological survey of the 34 areas previously determined to have moderate to high potential to contain archaeological resources.” MHC concurred with this finding stating, "no further archaeological research is warranted for these surveyed areas" (MHC, 1998).

Figure 3-3. AFCRL Historic District Boundaries in Vicinity of Proposed Action Areas



3.6.2 Anticipated Environmental Impacts

3.6.2.1 No Action

The No Action alternative would result in the continued aging of the existing, inadequate network infrastructure and AT&T FirstNet Communications network on HAFB and the surrounding communities. As there would be no new construction, there would be no change to historic or archaeological resources. Implementation of this alternative would have no significant impacts on cultural resources.

3.6.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction methods for all small cell locations would utilize directional boring or micro trenching to minimize the amount of overall disturbance for new conduit in addition to of a single 2-foot x 2-foot hole for the proposed pole. The proposed pole for each small cell is to resemble existing light poles on base therefore there will have a minimal visual impact for each small cell location. All new conduit is to be placed in or near areas of existing conduit in previously disturbed areas, and all small cell poles are to resemble existing light poles on base. The 1997 Phase I Archaeological Survey also concluded there are no areas within the undertaking's area of potential effect that contain archaeological resources, therefore no impact to archaeological resources is expected. Photo simulations were analyzed by DAF and MMNHP personnel and it was determined there would be "no adverse effect" to above ground historic properties for the proposed action.

MMNHP was included as a consulting party prior to undertaking any action with the potential to adversely affect historic properties. Photo simulations and site walks were completed to evaluate any potential effects on the resource. On February 29, 2024, MMNHP concurred with the "No Adverse Effect" determination.

On March 7, 2024, HAFB submitted a letter to MHC (see Appendix A) informing the commission of the proposed New Tower off Tinker Loop with Five Small Cell Nodes on Base, and DAF's determination that, there will be No Adverse Effect to historic properties. A copy of this letter also was sent to MMNHP. On May 8, 2024, MHC concurred with the "No Adverse Effect" determination.

On April 29, 2024, HAFB sent letters to the Tribal Nations—specifically, the Mashpee Wampanoag Tribe, and Wampanoag Tribe of Gay Head (Aquinnah)—requesting their assistance in identifying historic properties of religious and cultural significance to the tribes on the base and within the proposed lease area. On July 16, 2024, HAFB followed up with each tribe asking them to please advise if they were interested in consulting on the undertaking. HAFB has not received any responses.

Concurrence of the "No Adverse Effect" determination was received from all parties supporting the conclusion that no significant short- or long-term, direct, or indirect, or cumulative adverse impacts to cultural resources would occur as a result of this alternative.

No significant cumulative impacts to cultural resources are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. Regarding HAFB removing/relocating existing stormwater catch basins, manholes and pipelines in previously disturbed areas, this work is exempt from section 106 review by the SHPO under the Programmatic Agreement, Section III (A)(3). In the Programmatic Agreement these actions are listed as undertakings found to routinely have No Adverse Effect on historic properties involved as defined by 36 CFR § 800.5. These activities will be monitored by the base Cultural Resources Manager but do not require review by the SHPO. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

3.7 AIR QUALITY

3.7.1 Affected Environment

Air quality is defined by the ambient air concentration of various pollutants in the atmosphere. Air quality is determined by the number and type of pollutants emitted into the atmosphere, which are determined by the USEPA to be of concern to the health and welfare of the general public. The significance of a pollutant's concentration is determined by comparing it to federal and/or state ambient air quality standards. The federal CAA, 42 U.S.C. Sections 7401–7671q provides that emission sources must comply with the air quality standards and regulations that have been established by federal and state regulatory agencies. These standards and regulations focus on (1) the maximum allowable ambient pollutant concentrations, and (2) the maximum allowable emissions from individual sources.

3.7.1.1 Criteria Pollutants and National Ambient Air Quality Standards

The USEPA sets National Ambient Air Quality Standards (NAAQS) for six criteria pollutants, as required by the CAA: ozone (O3); nitrogen dioxide (NO2); particulate matter equal to or less than 10 microns in aerodynamic diameter (PM10) and particulate matter equal to or less than 2.5 microns in aerodynamic diameter (PM2.5); carbon monoxide (CO); sulfur dioxide (SO2); and lead (Pb). O3 is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors. The O3 precursors are oxides of nitrogen (NOx) and volatile organic compounds (VOCs). States may either adopt the NAAQS or establish their own more stringent standards. The Commonwealth of Massachusetts has adopted the NAAQS to regulate air pollution levels.

Areas that meet the NAAQS standard for a criteria pollutant are designated as being "in attainment" while areas where criteria pollutant levels exceed the NAAQS are designated as "nonattainment." A maintenance area is a former nonattainment area that has recently been re-designated as an attainment area. However, during the maintenance period, most of the CAA rules for a nonattainment area are still applicable to a maintenance area. In general, an attainment area is considered to have a good ambient air quality condition. The CAA requires states to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan to attain the standards for each area designated nonattainment for a NAAQS. These plans, known as State Implementation Plans, are developed by state and local air quality management agencies and submitted to USEPA for approval.

3.7.1.2 Clean Air Act Conformity

40 CFR Part 93, Subpart B, commonly referred to as the General Conformity Regulations (GCR), requires federal actions occurring in nonattainment or maintenance areas to conform to any State Implementation Plan approved or promulgated under Section 110 of the CAA. HAFB is located predominantly within the town of Bedford, Middlesex County, Massachusetts, with portions extending into the adjoining towns of Lincoln and Lexington. A portion of the town of Concord previously extended into HAFB, but that area now is within Hanscom Field. In addition, Hanscom is located in the Northeast Ozone Transport Area. The project is located in Middlesex County, Massachusetts, which is in attainment for all six criteria air pollutants, just recently meeting attainment standards for ozone.

The DAF has developed an automated screening tool known as the Air Conformity Applicability Model (ACAM) to perform a simplified GCR applicability analysis for DAF proposed projects in nonattainment or maintenance areas, and a NEPA air analysis in attainment areas. ACAM is used in conjunction with other DAF guideline documents to identify proposed actions and alternatives that would likely result in no or minimal emission increases and those that may require further air quality analysis and undergo a GCR determination.

While the GCR de minimis thresholds are intended to be used to perform an applicability analysis, they can also be used as a general indicator for air quality NEPA assessments. General Conformity De Minimis Thresholds, in the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide –Volume II - Advanced Assessments (AFCEC, 2020), are the maximum net change an action can acceptably emit in nonattainment and maintenance areas; these threshold values would also be a conservative indicator whether an action's emissions within an attainment area would result in significant impact.

The project is located in Middlesex County, Massachusetts, which is in attainment for all six criteria air pollutants, just recently meeting attainment standards for ozone. On March, 12th 2008, a new 8-hour ozone standard became effective and the previous, 1997 8-hour ozone standard was revoked on February, 13th 2017. Middlesex County achieved attainment for ozone when the 1997 ozone standard was revoked. However, because the area is still considered a maintenance area for ozone, the emissions of VOC and NOx must be accounted for as they are precursors for the formation of ozone.

3.7.1.3 Stationary and Mobile Source Emissions

New major stationary sources are subject to Prevention of Significant Deterioration (PSD) and/or New Source Review (NSR) programs to ensure these sources are constructed without significant deterioration of the air in the area. USEPA oversees programs for stationary source operating permits (Title V) and for new or modified major stationary source construction and operation. Mobile sources, such as aircraft, vehicles, or nonroad equipment, are regulated under the CAA Title II through enforcing emissions standards on sources manufactured.

HAFB maintains a Title V Operating Permit, as the base is considered a major stationary source due to its potential to emit NOx emissions exceeding 50 tons per year; however, the Proposed Action would not require any heating as they are all unmanned facilities. The total amount of emissions would consist of a single diesel generator which would be located at the Macro Tower location off Tinker Loop.

3.7.1.4 Climate Change and Greenhouse Gases

Although the Earth's climate naturally changes through time, recent scientific evidence has shown the process has been exacerbated in the past several decades, most likely due to human activities such as fossil fuel combustion and deforestation. Evidence of a changing climate includes increases in average air temperature and changes in precipitation patterns and storm intensity. This change has been attributed to an excess of greenhouse gases (GHG) in the atmosphere, which absorb solar energy and radiate it back to the Earth surface, rather than radiating solar energy back out of the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and hydrofluorocarbons.

There are several state and federal programs regulating GHG emissions. On a national level, the USEPA Mandatory Reporting of Greenhouse Gases Rule (40 CFR Part 98) includes GHG emissions reporting requirements for large emissions sources. In Massachusetts, the Climate Protection and Green Economy Act, Massachusetts General Laws Chapter 21N, has GHG reporting and compliance requirements outlined in 310 Code of Massachusetts Regulations (CMR) 7.71, Reporting of Greenhouse Gas Emissions. Facilities regulated under Title V of the CAA must report GHG emissions in accordance with both regulations; therefore, HAFB reports GHG emissions, converted into one value known as a CO2 equivalent (CO2e), using approved factors to weigh each pollutant. The 2018 CO2e emissions for stationary and mobile sources at the base, as reported to USEPA and MassDEP, were approximately 28,700 metric tons per year (APIMS, 2018). The DAF has adopted the Prevention of Significant Deterioration threshold for greenhouse gases (GHGs) of 75,000 tons per year (tpy) of carbon dioxide equivalent (CO2e) (or 68,039 metric tpy) as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; however, it provides a threshold to identify actions that are insignificant. Actions with a net change in CO2e emissions below the insignificance indicator are considered too insignificant on a global scale to warrant any further analysis.

The potential climate change effects of an action are indirectly addressed and put into context through providing the theoretical Social Cost of Greenhouse Gases (SC GHG) associated with an action. It is a tool intended to provide additional context to a GHG's potential impacts through approximating the long-term monetary damage that may result from a GHG emissions' effect on climate change.

3.7.2 Anticipated Environmental Impacts

3.7.2.1 No Action

The No Action alternative would result in the current network infrastructure being maintained and the AT&T FirstNet Communications network on HAFB would not be built. As there would be no new construction, total air emissions from HAFB would remain at volumes similar to those generated under current operations. Implementation of this alternative would have no significant impacts on air quality.

3.7.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. The macro tower location is the only location proposed which will include a device that produces emissions. This consists of a single, EPA and CARB emission certified, 20kW backup generator. The generator is only to be utilized during times when backup power is required. Full generator specifications can be found in Appendix C. Considering the size, style, and usage of the proposed generator, operations under the Proposed Action would not significantly increase air emissions compared to current conditions and the No Action alternative. Construction related activities have also been accounted for as part of the ACAM. Table 3-1 provides a summary of the ACAM results in Appendix E for criteria pollutants. The criteria pollutants (or their precursors) with a General Conformity threshold listed in Table 3-1 are pollutants within one or more designated nonattainment or maintenance area/s for the associated NAAQS. Because the project area is still considered a maintenance area for ozone, the emissions of VOC and NOx must be accounted for as they are precursors for the formation of ozone, with thresholds for VOC being 50 ton/yr and NOx being 100 ton/year. As summarized in Table 3-1, the proposed action would not exceed the thresholds for VOC or NOx; therefore, a GCR Determination would not be required. The project area is within an attainment area for all other criteria pollutants. The other criteria pollutants have an insignificance indicator of 250 ton/yr (Prevention of Significant Deterioration major source threshold) for CO, SOx, PM 10, PM 2.5, and NH3, and 25 ton/yr for Pb (GCR de minimis value). Criteria pollutants below their insignificance indicators are rates so insignificant that they will not cause or contribute to an exceedance of one or more NAAQS. As summarized in Table 3-1, all other criteria pollutants would not exceed their respective insignificance indicators. As summarized in Table 3-2, the annual net change in GHG emissions would be less than the insignificance indicator of 68,039 metric tons of CO2e. Based on the discussion above in this section, the Proposed Action would have no significant impact on air quality.

No significant cumulative impacts to air quality are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

Table 3-1. ACAM Summary Table (2024 ACAM Appendix E)

Conformity Analysis Summary:

2024 – Construction

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
Boston-Lawrence-Worcester (E. MA), MA			
VOC	0.005	50	No
NOx	0.041	100	No
CO	0.062	-	No
SOx	0.000	-	No
PM 10	0.037	-	No
PM 2.5	0.001	-	No
Pb	0.000	-	No
NH3	0.000	-	No

2025 – Construction/Operating (Steady State)

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
Boston-Lawrence-Worcester (E. MA), MA			
VOC	0.059	50	No
NOx	0.523	100	No
CO	0.610	-	No
SOx	0.002	-	No
PM 10	0.193		No
PM 2.5	0.023	-	No
Pb	0.000	-	No
NH3	0.001	-	No

2026 – Operating (Steady State)

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
Boston-Lawrence-Worcester (E. MA), MA			
VOC	0.001	50	No
NOx	0.004	100	No
CO	0.003	-	No
SOx	0.001	-	No
PM 10	0.001	-	No
PM 2.5	0.001	-	No
Pb	0.000	-	No
NH3	0.000	-	No

Table 3-2. Summary of Greenhouse Gas Emissions (2024 ACAM Appendix E)

The following table summarizes the action-related GHG emissions on a calendar-year basis through the projected life cycle of the action.

Action-Related Annual GHG Emissions (mton/yr)						
YEAR	CO2	CH4	N2O	CO2e	Threshold	Exceedance
2024	8	0.0003171	0.00007008	8	68,039	No
2025	95	0.00389028	0.00084955	96	68,039	No
2026 [SS Year]	0	0.00001638	0.00000328	0	68,039	No
2027	0	0.00001638	0.00000328	0	68,039	No
2028	0	0.00001638	0.00000328	0	68,039	No
2029	0	0.00001638	0.00000328	0	68,039	No
2030	0	0.00001638	0.00000328	0	68,039	No
2031	0	0.00001638	0.00000328	0	68,039	No
2032	0	0.00001638	0.00000328	0	68,039	No
2033	0	0.00001638	0.00000328	0	68,039	No
2034	0	0.00001638	0.00000328	0	68,039	No
2035	0	0.00001638	0.00000328	0	68,039	No
2036	0	0.00001638	0.00000328	0	68,039	No

Table 3-3. Summary of USEPA NAAQS for Criteria Pollutants (USEPA 2024)

Criteria Pollutant	Primary/ Secondary	Standard: Averaging Time	Standard: Level	Form
Carbon Monoxide	Primary	8-hour	9 parts per million (ppm)	Not to be exceeded more than once per year
		1-hour	35 ppm	
Lead	Primary and Secondary	Averaged over a rolling 3-month period	0.15 µg/m^3	Not to be exceeded
Nitrogen Dioxide	Primary	1-hour	100 parts per billion (ppb)	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and Secondary	Annual	53 ppb	Annual Mean
Sulfur Dioxide	Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year
Particulate Matter ($PM_{2.5}$)	Primary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
	Secondary	Annual	15 µg/m^3	Annual mean, averaged over 3 years
	Primary and secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
Particulate Matter (PM_{10})	Primary and Secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Ozone	Primary and Secondary	8-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years

3.8 NOISE

3.8.1 Affected Environment

Noise is defined as a sound, especially one that is loud or unpleasant or that causes disturbance. The primary source of noise in the vicinity of HAFB results from normal base operation and military and civilian aircraft usage at Hanscom Field. Military activity has consistently represented less than 2 percent of the activity during the past four decades, while its contribution to the noise energy has ranged from 1.8 percent to 47 percent (Massport, 2023).

The purpose of the Air Installations Compatible Use Zones (AICUZ) program is to achieve compatibility between air installations and neighboring communities by protecting the health, safety, and welfare of civilians and military personnel by encouraging land use which is compatible with aircraft operations.

The associated noise contours generally reflect proximity to the runways. As illustrated by Figure 3-4, which shows 2017 Day Night Average Sound Level (DNL) noise contours, the area of highest decibel readings (85 dB and higher) is located in the immediate vicinity of the runways. Extended areas of higher-level noise occur along the aircraft approach and departure corridors. The DNL 65 dB contour is entirely within Hanscom Field property.

The Macro Tower and a majority of the proposed action is located a considerable distance from the runways; therefore, aircraft operations do not contribute significantly to existing ambient noise levels. The northwestern most section of the proposed action area is located just outside of areas indicated to have an average ambient noise level of 55 dB, therefore can be assumed to be less than 55 DB on average (Massport, 2023).

3.8.2 Anticipated Environmental Impacts

3.8.2.1 No Action

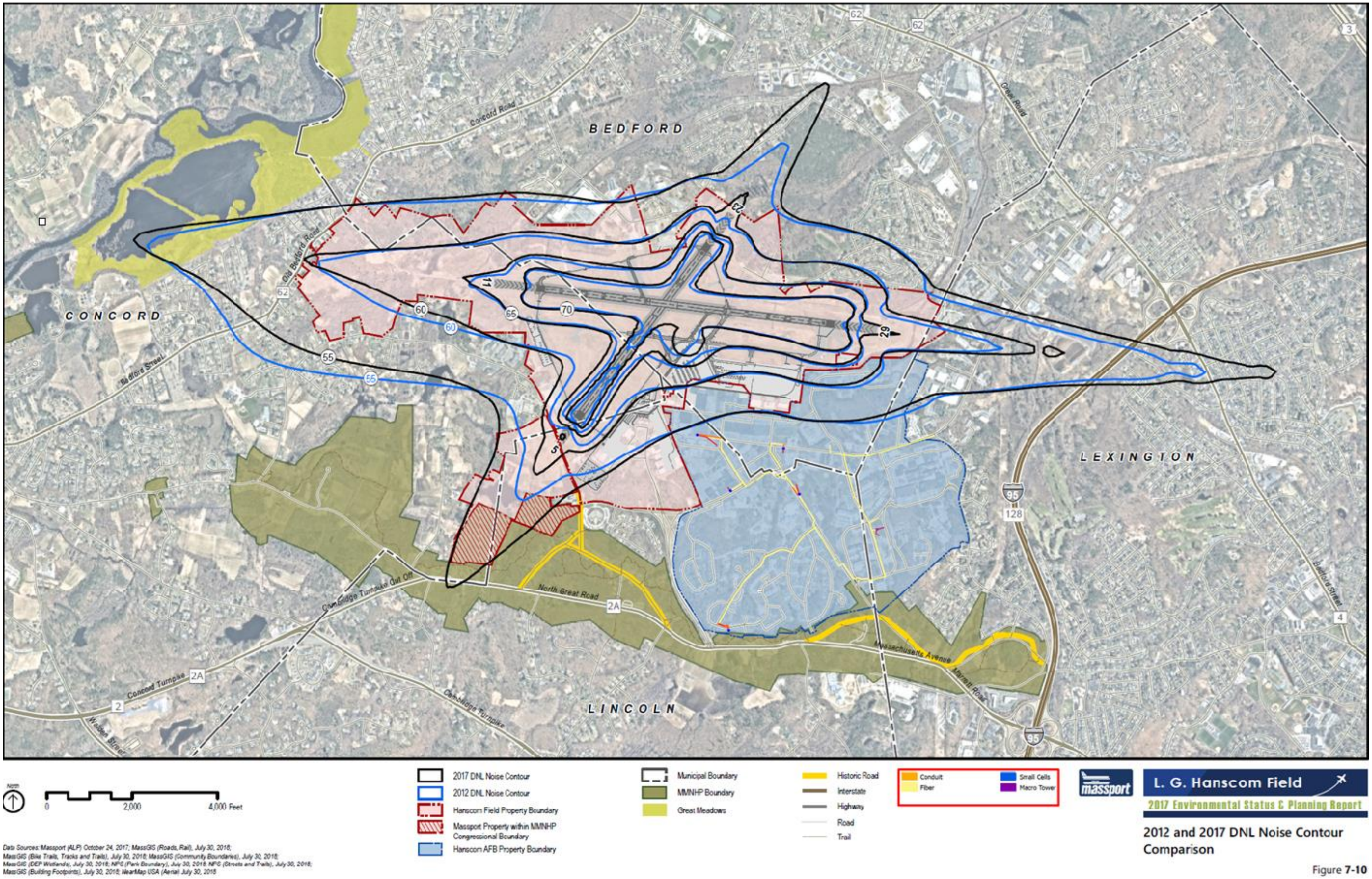
The No Action alternative would result in the existing network infrastructure and inadequate FirstNet coverage being maintained and the AT&T FirstNet Communications network on HAFB would not be built. As there would be no new construction, the No Action alternative would not result in a change in the ambient noise levels at HAFB. Implementation of this alternative would have no significant impacts to the noise environment.

3.8.2.2 Preferred Alternative

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. The macro tower location is the only location proposed which will include a device that produces sound. This consists of a single, low noise, 20kW backup generator with noise readings <66.0 dBA @ 7 meters (@ max load), and low vibration so as not to disturb local residents. The generator is only to be utilized during times when backup power is required. Considering the size, style, and usage of the proposed generator, operations under the Proposed Action would not significantly increase the sound environment under current conditions and the No Action alternative. Construction related activities are projected to utilize equipment commonly used for small scale telecommunications projects and will consist of roughly one 10-man team for each building phase which is expected to be completed over the span of 3-4 months. The equipment utilized to complete the Proposed Action includes but is not limited to a trackhoe/excavator, skid steer, boring rig, mini excavator, loader/dozer, and a crane. As the scale of the proposed construction is limited and for a short duration of time, no significant adverse impacts to the noise environment are expected during the construction phase of the project. As the only impacts to the noise environment from operation of this alternative would be from a single small scale diesel generator, operation of this alternative after construction activities would have no significant adverse impacts to the noise environment. Based on the reasons described above in this section implementation of this alternative would have no significant adverse impacts to the noise environment.

No significant cumulative impacts to noise are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

Figure 3-4. DNL Noise Contours



3.9 INFRASTRUCTURE

3.9.1 Affected Environment

The existing utility services and associated infrastructure at HAFB, in the vicinity of the proposed action areas, are discussed in this section based on review of the GIS data layers in the HAFB geodatabase. The utilities include water, wastewater, electricity, telephone, fiber optic, natural gas, and steam and chilled water. Fire protection is also discussed in this section.

3.9.1.1 Water Supply

Nearly the entire potable water supply to HAFB is provided by the town of Lexington. Lexington receives its water from the Massachusetts Water Resources Authority (MWRA), for which the Quabbin Reservoir serves as the primary source. Water is distributed throughout HAFB via 2- to 16-inch diameter lines that run parallel to, or alongside of, a majority of the fiber lines for the proposed action. The proposed action consists solely of unmanned telecommunication facilities with accompanying fiber lines and involves no need for water to any of the proposed facilities.

3.9.1.2 Wastewater

The wastewater system on HAFB includes two pumping stations; the lower station collects approximately 75 percent of the daily flow on base, and the upper station collects the remaining daily flow. HAFB discharges wastewater to the MWRA sewerage system. The proposed action consists solely of unmanned telecommunication facilities which include no generation of wastewater.

3.9.1.3 Storm Drainage

The majority of surface runoff from HAFB enters a subterranean system of culverts which ultimately drains into the Shawsheen River, located along the northeastern boundary of the fence. Surface runoff from the eastern portion of the base drains eastward into Kiln Brook, eventually discharging into the Shawsheen River, which eventually unites with the Merrimack River in North Andover/south Lawrence. The southern portion of HAFB drains beneath the fenced boundary of the base, under Airport Road, through the Battle Road Unit of Minute Man National Historical Park, and under Route 2A (North Great Road) before ultimately discharging into one of the reservoirs that serves as water supply for the city of Cambridge. HAFB employs three detention basins and one holding tank on the base for the settling and storage of stormwater runoff (HAFB, 2017).

Stormwater infrastructure runs underneath the macro tower location as well as many other portions of the connecting fiber conduit and small cell poles. The proposed action consists solely of unmanned telecommunication facilities, a majority of which utilize existing rights-of-way or occur in currently developed areas. The proposed action would not significantly modify stormwater drainage.

3.9.1.4 Electricity

The existing electrical system is owned and operated by HAFB. HAFB obtains its power from Eversource's Station 320. The primary distribution service is provided at 14.4 kilovolts (kV) through three sets of cables to the base substation. HAFB's electrical demand is well below the capacity of the transmission lines on base and nearly all transmission lines within HAFB are underground. 31.3 percent of electrical capacity is currently in use, which results in approximately 11.8 MW of additional available capacity. HAFB has implemented a base-wide Energy Management Control System (EMCS), which includes monitoring and control of energy use.

Boldyn networks in partnership with AT&T proposes to tie into the existing electrical infrastructure and receive power directly from HAFB. The proposed action also includes the addition of one small 20KW backup diesel generator located at the macro tower location.

3.9.1.5 Telecommunications

In addition to standard dial-up telephone service, HAFB and MIT LL have a fiber optic backbone that services much of the developed portions of HAFB. Existing telephone and fiber optic lines are located in the vicinity of a majority of the proposed action areas. The proposed action would create a more robust and reliable fiber network on base as well as increase network capacity throughout the base and surrounding communities.

3.9.1.6 Natural Gas

Hanscom AFB's natural gas infrastructure is under mixed ownership by two entities, National Grid and Hanscom AFB. Each owner is responsible for their portions of the system. In 2019, in order to improve overall capacity, Hanscom AFB tied into the Kinder Morgan transmission pipeline that runs through the base. This 24-inch steel line was sized to accommodate 25 percent more flow than the expected peak demand (HAFB, 2017).

Natural gas lines run parallel as well as underneath a small portion of Section 1's proposed fiber conduit. Natural gas lines also run parallel to, or alongside of, a majority of the proposed fiber conduit for Section 3. The proposed action consists solely of unmanned telecommunication facilities, a majority of which will utilize existing rights-of-way or occur in currently developed areas. The proposed action would not require natural gas.

3.9.1.7 Heating and Cooling

Steam heat is provided by the HAFB Civilian Health Promotion (CHP) to approximately 70 percent of the base (excluding housing), through nearly 40,000 feet of steam lines, which are mostly underground (HAFB, 2017). Steam lines run parallel to, or alongside of, a majority of the fiber lines for Section 1 and Section 2 of the proposed action area.

The HAFB CHP also generates chilled water for the base. The existing chilled water system is underutilized and there exists the capacity to supply chilled water to new projects (HAFB, 2017). The proposed action consists solely of unmanned telecommunication facilities, a majority of which would utilize existing rights-of-way or occur in currently developed areas. The proposed action would not require access to any heating or cooling.

3.9.1.8 Fire Protection

The fire station is located north of Section 2 of the proposed action along Robbins Street. The HAFB Fire Department performs firefighting and/or rescue for all structures, both military and civilian. The Fire

Department also performs hazardous material response and stabilization, and confined space rescue. In addition to providing emergency response for all HAFB facilities and MIT LL, the Fire Department also provides mutual aid for surrounding communities (including Bedford, Lincoln, Lexington, and Concord), which likewise provide mutual aid support to the HAFB Fire Department. The Massport fire station on Hanscom Field performs firefighting and/or rescue for all aircraft.

3.9.2 Anticipated Environmental Impacts

3.9.2.1 No Action

The No Action alternative would result in the current network infrastructure and inadequate FirstNet coverage being maintained and the AT&T FirstNet Communications network on HAFB would not be built. As there would be no new construction, the No Action alternative would have a negative effect upon the network infrastructure as the increasing need for reliable and fast speeds may not be met.

3.9.2.2 Preferred Alternative

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction related activities are projected to utilize equipment commonly used for small scale telecommunications projects and will consist of roughly one 10-man team for each building phase of the project which is expected to be completed over the span of 3-4 months. The project does consist of new electrical and fiber conduit near the macro tower and small cell locations which would add to the existing infrastructure of the base. Site location and design was completed in coordination with Hanscom Engineering Team (Michael Lynch and Al Kopek), and was approved from an engineering perspective based on existing utility lines, current and future projects, etc. The new macro tower along with the small cell nodes would bring FirstNet coverage to the base and surrounding communities and bolster existing wireless coverage which is becoming increasingly important as network-based services continue to grow. The equipment utilized to complete the Proposed Action is expected to utilize a trackhoe/excavator, skid steer, boring rig, mini excavator, loader/dozer, and a crane. As the scale of the proposed construction is limited and for a short duration of time, no significant adverse impact to infrastructure is expected during the construction phase of the project. As this installation includes additional FirstNet coverage in addition to better cell coverage for the base and surrounding communities, implementation of this alternative would include long-term benefits as a result of the Proposed Action. No short or long-term, significant adverse impacts to infrastructure are expected as a result of the Proposed Action.

No significant cumulative impacts to infrastructure are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

3.10 TRANSPORTATION

3.10.1 Affected Environment

Vehicular traffic enters HAFB via one of the following control points:

- Gate 1 (Sartain Gate; formally Vandenberg Gate)
- Gate 2
- Gate 3 (Wood Street)
- Gate 3A (Schilling Gate)
- Gate 4 (Ruiz Gate; formally the Hartwell Gate/Barksdale Gate)

Both Gate 3 and Gate 3A are closed with no timeline as to when they will be reopened and are located nearest to the Macro Tower location.

The road network on HAFB consists of major/minor arterials, collectors, and local streets. The major arterials include:

- Barksdale Street from the Sartain Gate to Eglin Street
- Eglin Street from Barksdale Street to Vandenberg Drive
- Vandenberg Drive from the Sartain Gate to Marrett Street
- Marrett Street from Vandenberg Drive to Barksdale Street

3.10.1.1 Traffic

Traffic congestion in the vicinity of the base historically occurred during the peak morning and late afternoon/early evening, as workers arrive and depart via the local and regional highway system. Due to the increase in teleworking due to the COVID-19 pandemic, many traffic constraints caused by commuting have lessened. Based on traffic counts undertaken during a Wednesday in July 2009, approximately 60 percent of the morning traffic entering the base uses the two eastern gates (Ruiz and Wood Street). Despite having lower traffic counts, Sartain Gate experiences traffic queuing, because visitors and trucks must stop at the gate or the adjacent visitor center for pass clearances (HAFB, 2010b). The July 2009 counts were conducted during the morning and evening peak periods, between the hours of 6:00 AM and 9:30 AM, and between 3:00 PM and 6:00 PM, respectively.

A more recent traffic study conducted during the preparation of the IDP EA found that 'the addition of approximately 521 base personnel due to the development projects resulted in a negligible change in commuting patterns.' It concluded that the overall development plan would not have a significant impact on local traffic or the region (HAFB, 2023b).

3.10.1.2 Parking

Hanscom AFB is located within the greater Boston metropolitan area. Hanscom AFB commuters primarily use Route 2A and Route 4 to access Hanscom Drive and Route 4/225 to access Hartwell Avenue to enter the base. A comprehensive parking study was conducted within MIT LL and adjoining portions of HAFB in October and November 2012. Seven distinct areas were surveyed, with a total official capacity of 4,097 spaces. The study concluded that while many of the more heavily used buildings filled or exceeded their parking capacity, parking lots to the west of Bestic Drive operated at less than 75 percent capacity; meanwhile the Lower AFRL parking lot indicated utilization less than 20 percent (MIT LL, 2013). Further studies conducted by HAFB indicated that when employee parking lots next to the busier buildings exceed occupancy, additional parking options are available on base within a short walking distance (HAFB, 2017).

3.10.2 Anticipated Environmental Impacts

3.10.2.1 No Action

The No Action alternative would result in the current network infrastructure being maintained and the AT&T FirstNet Communications network on HAFB would not be built. As there would be no new construction, the No Action alternative would not result in a change to the traffic or parking conditions on or around HAFB. Implementation of this alternative would have no significant impacts to transportation.

3.10.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction related activities are projected to utilize equipment commonly used for small scale telecommunications projects and will consist of roughly one 10-man team for each building phase which is expected to be completed over the span of 3-4 months. The equipment used to complete the Proposed Action is expected to utilize a trackhoe/excavator, skid steer, boring rig, mini excavator, loader/dozer, and a crane. As the scale of the proposed construction is limited to small teams and will last for a short duration of time, some small-scale disruptions to traffic and parking are expected and will be deconflicted with the base prior to construction. Due to the project consisting solely of unmanned facilities no effects to traffic and parking will occur after construction of the Proposed Action. Based on the reasons described above in this section, implementation of this alternative would have no significant adverse impacts to transportation.

No significant cumulative impacts to transportation are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

3.11 SOLID WASTES AND HAZARDOUS MATERIALS AND WASTES

3.11.1 Affected Environment

HAFB currently has an Integrated Solid Waste Management Program that includes a Waste Management Plan, a Qualified Recycling Plan, an Environmental Management System, a Hazardous Materials Operation Plan, and a Hazardous Waste Management Plan (HAFB, 2019a). This section describes the use/location of hazardous materials, solid waste management practices, the environmental remediation program, and the storage of fuels on HAFB.

3.11.1.1 Hazardous Materials and Wastes

Hazardous waste generated on HAFB primarily comes from the operation and maintenance activities of the 66th Air Base Group (ABG). Hazardous wastes, including adhesives, sealants, greases, waste paint and thinners, solvents, and corrosive cleaning compounds, are accumulated at satellite accumulation points (SAPs) and transferred to the 90-day accumulation site, with final disposal off base. HAFB has both a Hazardous Materials Operation Plan and a Hazardous Waste Management Plan, which are focused on reducing the purchases of industrial toxic substances, eliminating the purchase of ozone depleting chemicals, and reducing the amount of hazardous waste for disposal.

3.11.1.2 Solid Waste

HAFB is required by 310 CMR 19.000 to recycle certain items, including paper, cardboard, glass, plastic, aluminum, and metal. The base operates a solid waste transfer facility that consolidates recyclables. The types of solid waste generated on base include food, various grades of office paper, newspaper, cardboard, cans, glass and plastic containers, scrap metals, and C&D debris (HAFB, 2019b).

3.11.1.3 Environmental Restoration Program

HAFB has historically used, generated, and disposed of numerous hazardous substances, including fuel, aromatic solvents, polychlorinated biphenyls (PCBs), and chlorinated solvents. The Environmental Restoration Program (ERP), formerly known as Installation Restoration Program (IRP), began in 1988 with an Installation-wide Preliminary Assessment/Record Search to identify potentially contaminated sites that required further investigation. Since the implementation of the ERP, 22 non-per- and polyfluoroalkyl substances (PFAS) ERP sites have been identified within the larger Hanscom AFB/Hanscom Field area (as shown in Figure 3-5). Of these, 14 sites require no further action and are considered closed, and four sites are currently undergoing remedial action operations (RAO) (ERP Sites 1, 2, 21, and 22); three are located within the Installation boundary (ERP Sites 21, 22, and 6). Two ERP sites (Site 4 and 6) are undergoing long-term monitoring (LTM). Of the 22 total sites, eight (Sites 1, 2, 3, 4, 6, and 21) have land use controls (LUC) in place (as shown in Figure 3-6). Site 22 is being addressed under Massachusetts Contingency Plan (MCP) as a Post-Temporary Solution Site, to which LUCs do not apply, but applicable restrictions are present. The disturbance of these sites must be reviewed and approved by the HAFB Environmental Office.

The Department of Air Force (DAF) is currently conducting a remedial investigation of PFAS associated with the use of aqueous film-forming foam at three separate release sites within the Hanscom Field/Hanscom Air Force Base Superfund Site. The DAF is completing a Draft Due Diligence for Supplemental PFAS Sources Report, which will evaluate potential PFAS source areas unrelated to aqueous film-forming foam (AFFF). A report schedule is currently unknown.

No active AFFF, PFAS or ERP sites are located within the proposed action areas.

Figure 3-5. AFFF Site Locations in Vicinity of Proposed Action Areas.

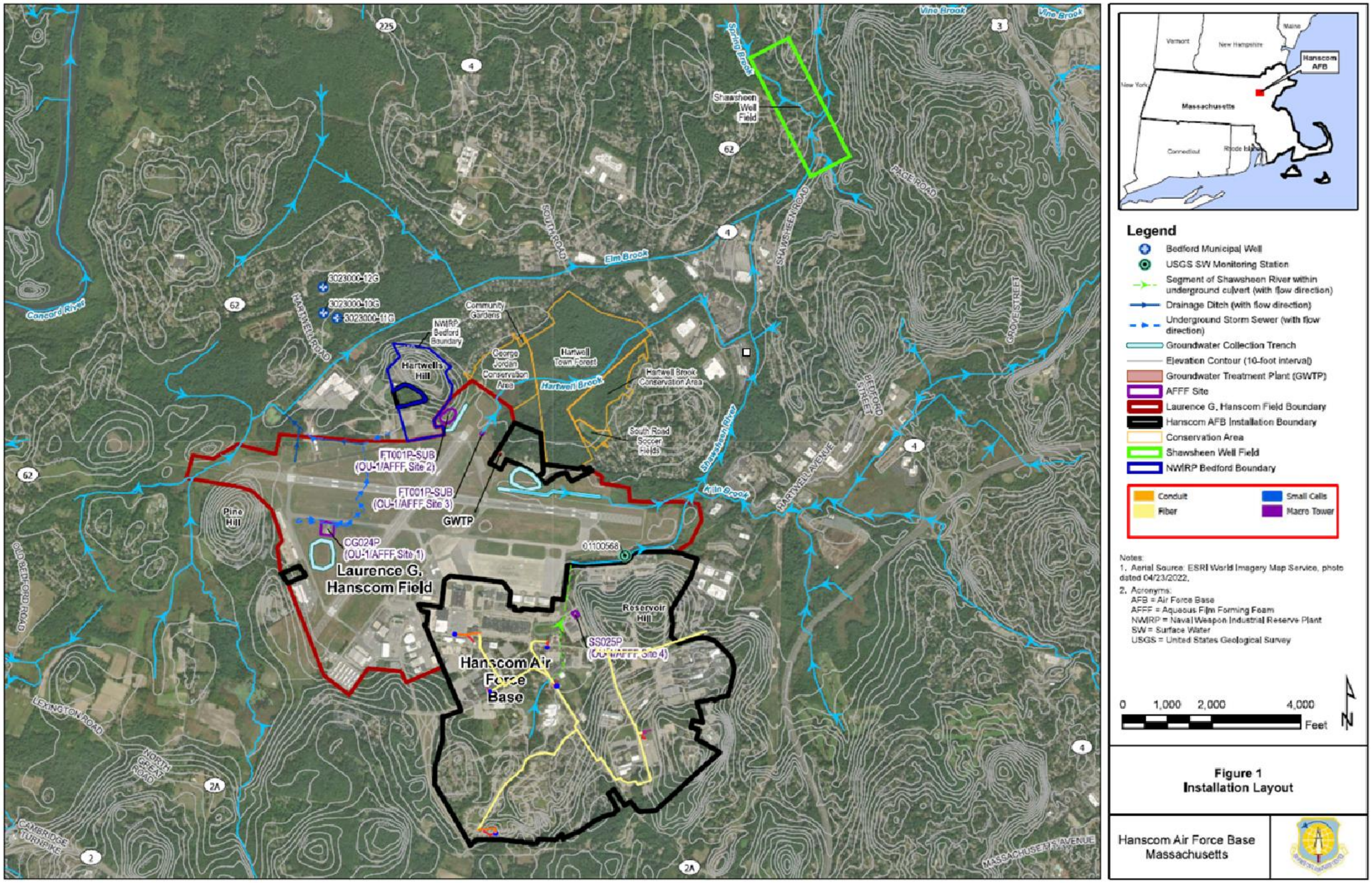
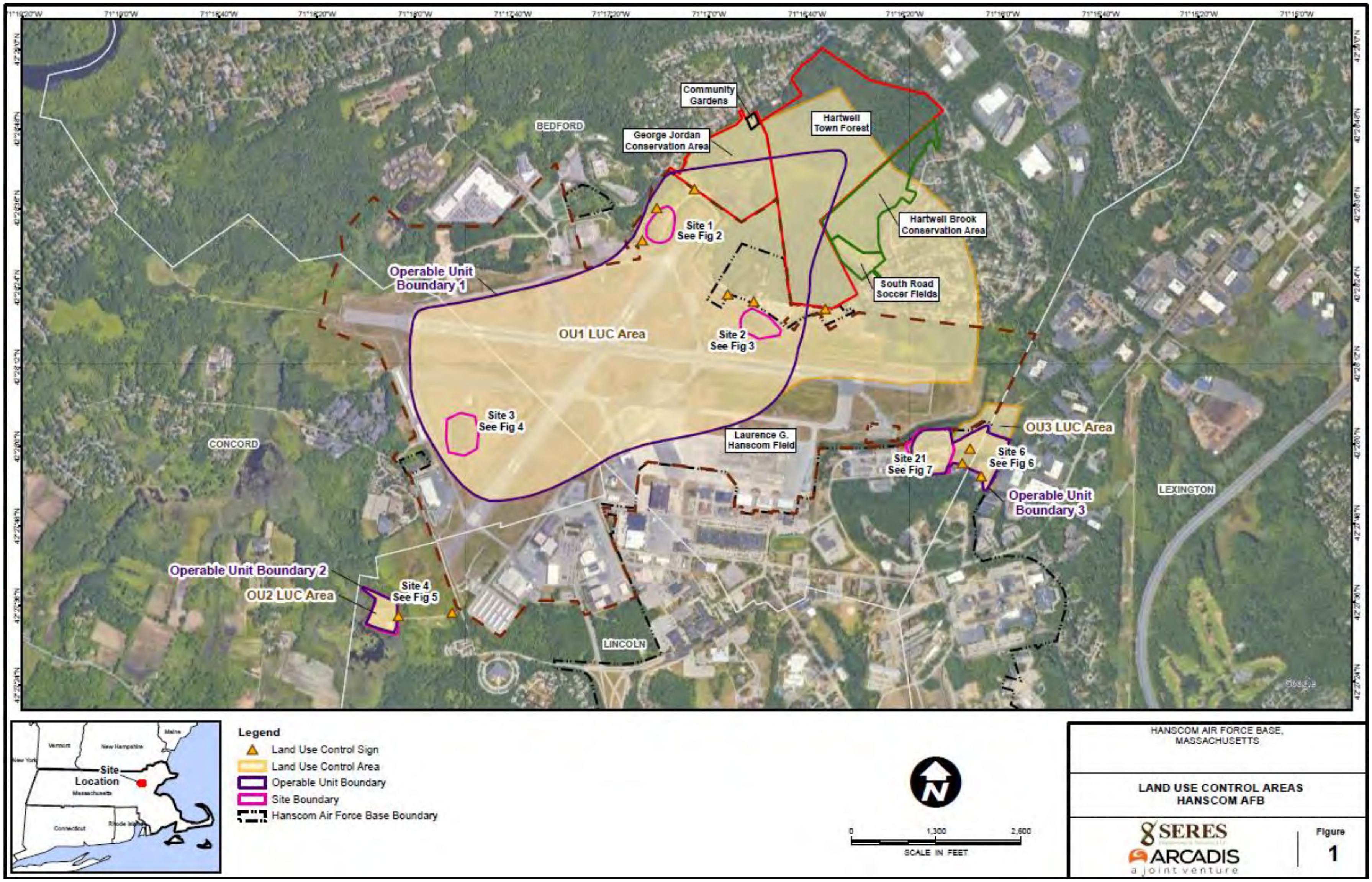


Figure 3-6. IRP CERCLA Sites.



3.11.1.4 Stored Fuels

A variety of different fuel types are stored on HAFB which include gasoline, diesel fuel, waste oil, kerosene, propane, #6 fuel oil, and #2 fuel oil which are stored in permitted underground storage tanks (USTs) and aboveground storage tanks (ASTs). The only bulk ASTs on base are used to store #6 fuel at the CHP, located just north of the macro tower location (HAFB, 2003). The lone fuel to be stored for the proposed action includes a single 54-gallon UL142 (double wall) self-contained diesel tank for the 20kw emergency/backup generator at the macro tower location. This fuel tank is integrated into the generator and no standalone tank is proposed.

3.11.2 Anticipated Environmental Impacts

3.11.2.1 No Action

The No Action alternative would result in the current network infrastructure being maintained and the AT&T FirstNet Communications network on HAFB would not be built. As there would be no new construction, the No Action alternative would result in no solid/hazardous waste or ERP impacts.

3.11.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction related activities are projected to utilize equipment commonly used for small scale telecommunications projects and will consist of roughly one 10-man team for each building phase which is expected to be completed over the span of 3-4 months. The equipment used to complete the Proposed Action is expected to utilize a trackhoe/excavator, skid steer, boring rig, mini excavator, loader/dozer, and a crane. As the scale of the proposed construction is limited to small teams and will last for a short duration of time, solid and construction material waste generation is likely to occur on a small scale. Hazardous materials for this project will be limited to a single 20kw, emergency backup generator which is to store 54 gallons of diesel fuel within a UL142 (double wall), self-contained diesel fuel tank with an overfill prevention valve. All solid waste is to be thrown in dumpsters which is then to be taken off base for disposal. Construction will also include the need for portable restrooms which are proposed to be brought on site prior to the start of construction and emptied and cleaned regularly as needed. All waste generated during construction is to be collected and taken off base for disposal. Due to the project consisting solely of unmanned facilities the Proposed Action would not adversely affect the current solid/hazardous waste or ERP impact conditions on or around HAFB, as all facilities are unmanned facilities and are well outside the boundaries of any active restoration site. Any storage of hazardous materials related to construction equipment would be in accordance with installation procedures and installation, spill, prevention and response plan. The diesel tank related to the emergency generator would be managed in accordance with manufacturer specifications including routine inspections and maintenance. Based on the reasons described above in this section, implementation of this alternative would have no significant adverse impacts to solid wastes and hazardous materials and wastes as a result of the Proposed Action.

No significant cumulative impacts to solid wastes and hazardous materials and wastes are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

3.12 SAFETY AND OCCUPATIONAL HEALTH

3.12.1 Affected Environment

Boldyn Networks will ensure the proposed action will be built in compliance with all, but not limited to the following codes:

- Uniform Building Code
- Building Officials & Code Administrators (Boca)
- Uniform Mechanical Code
- International Building Code Michigan Addition (Ibc)
- Ansi/Eia-222-G Life Safety Code Nfpa-101
- Uniform Plumbing Code
- National Electric Code
- Local Building Code
- City/County Ordinances
- Occupational Safety and Health Administration (OSHA) regulations

Boldyn Networks will also ensure Federal Communications Commission (FCC) licensees transmitting on antenna structures will comply with the established criteria regarding radio frequency exposure limits in accordance with the Second Report and Order, as well as the FCC Code of Federal Regulations [47 CFR § 1.1307, § 1.1310] published at the time of this report.

Boldyn Networks shall ensure the construction contractor attains and verifies a structural evaluation report of existing tower, once built, for exact placement of antennas and coax cables. Contractor shall also comply with all requirements of the Structural evaluation report and notify signal point construction manager in the case of any discrepancies. Any structural modification, if required, shall be done prior to the installation of antennas.

3.12.2 Anticipated Environmental Impacts

3.12.2.1 No Action

The No Action alternative would result in the current network infrastructure being maintained and the AT&T FirstNet Communications network on HAFB would not be built. As there would be no new construction, the No Action alternative would not result in any change in short- or long-term, direct, indirect, or cumulative impacts to safety and occupational health on HAFB. Implementation of this alternative would have no significant impacts to safety and occupational health.

3.12.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Construction related activities are projected to utilize equipment commonly used for small scale telecommunications projects and will consist of roughly one 10-man team for each building phase which is expected to be completed over the span of 3-4 months. The equipment used to complete the Proposed Action is expected to utilize a trackhoe/excavator, skid steer, boring rig, mini excavator, loader/dozer, and a crane. Boldyn and its contractors will follow OSHA general regulations in addition to many other codes and regulations listed above. As the scale of the proposed construction is limited to small teams and will last for a short duration of time, no significant adverse effects to safety or occupational health are expected as a result of the proposed construction activities. Due to the project consisting solely of unmanned facilities, implementation of this alternative would have no significant adverse impacts on safety and occupational health after completion of the proposed construction activities.

No significant cumulative impacts to safety and occupational health are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

3.13 AESTHETICS

3.13.1 Affected Environment

Features such as runways, aircraft hangars, lights, antennae, and towers in the vicinity of Hanscom Field impart a functional aesthetic quality on the base; these aesthetic qualities are considered to be an integral part of the HAFB landscape. These basic features and airfield-related activities give the impression of an organized and functional military installation. HAFB has policies, including the Architectural Compatibility Plan, regarding the aesthetic appearance and architectural compatibility of the grounds and buildings (HAFB, 2017).

3.13.2 Anticipated Environmental Impacts

3.13.2.1 No Action

The No Action alternative would result in the current network infrastructure being maintained and the AT&T FirstNet Communications network on HAFB would not be built. As there would be no new construction, the No Action alternative would not result in any change in short- or long-term, direct, indirect, or cumulative impacts to aesthetics on HAFB. Implementation of this alternative would have no significant impacts to aesthetics.

3.13.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

All disturbed areas, not directly disturbed as part of the proposed action would be repaired and brought back to pre-construction state by use of construction best management practices (BMPs). This includes areas not under gravel in and around the macro tower compound and access road, all new conduit runs and areas around the new small cell poles. Implementation of this alternative would maintain the functional aesthetic qualities which are considered to be an integral part of the HAFB landscape, further reinforcing the impression of an organized and functional military installation. The proposed pole for each small cell would resemble existing light poles on base, and therefore would have minimal aesthetic impacts for each small cell location. As the proposed action also consists of a single 150-foot monopole telecommunications tower, there will be visibility of the tower throughout some of the base which falls in line with the current functional aesthetic scheme which is already prevalent throughout HAFB. Based on the reasons described above in this section, implementation of this alternative would have no significant adverse impacts to aesthetics.

No significant cumulative impacts to aesthetics are anticipated when the Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

3.14 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.14.1 Affected Environment

The workforce at HAFB is comprised of nearly 7,000 total employees, which consists of active-duty military, military reservists, Department of DoD civilians, non-DoD civilians, and contractors. Under EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Under EO 13045 Protection of Children From Environmental Health Risks and Safety Risks, each Federal agency shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children, and ensure that its activities address disproportionate risks to children that result from environmental health risks or safety risks. Therefore, HAFB must analyze whether the proposed action would have disproportionately high and adverse impacts on minority populations and low-income populations or result in environmental health risks and safety risks that may disproportionately affect children.

The proposed action area is located within HAFB. For purposes of environmental justice, the region of influence for the proposed action is limited to the three towns in which the proposed action is to take place. The closest census tract with a minority population percentage meaningfully greater than the minority population percentage for Middlesex County (33.7 percent) is tract 3583 in Lexington. The Environmental Justice (EJ) Viewer dictates there are 21 EJ block groups, near the proposed action area, which have a population that has been designated as an Environmental Justice population, most of which are located in Lexington.

3.14.2 Anticipated Environmental Impacts

3.14.2.1 No Action

The No Action alternative would result in the current network infrastructure and inadequate FirstNet coverage being maintained and the AT&T FirstNet Communications network on HAFB would not be built. As there would be no new construction, the No Action alternative would have a negative effect as it relates to first time responder time in the local communities on and surrounding Hanscom AFB which may result in a change to short- or long-term, direct, indirect, or cumulative impacts to socioeconomic conditions, disproportionate adverse impacts to minority or low- income populations, or disproportionate environmental health or safety risks to children at HAFB or the surrounding communities.

3.14.2.2 New Tower off Tinker Loop with Five Small Cell Nodes on Base (Preferred Alternative)

Construction related activities are projected to utilize equipment commonly used for small scale telecommunications projects and will consist of roughly one 10-man team for each building phase which is expected to be completed over the span of 3-4 months. The equipment used to complete the Proposed Action is expected to utilize a trackhoe/excavator, skid steer, boring rig, mini excavator, loader/dozer, and a crane. As the scale of the proposed construction is limited to small teams and will last for a short duration of time, no significant effects to socioeconomics or environmental justice are expected as a result of the proposed construction activities. Due to the self-contained nature of the base and small number of residents who reside on Hanscom AFB, work on base has limited direct impacts on surrounding communities. As the proposed action consists of solely unmanned telecommunications facilities, which would be in compliance with all health and safety regulations applicable to telecommunication projects, little to no noise outside of backup generator use during emergencies no disproportionate adverse impacts on socioeconomics and environmental justice would occur as a result of the proposed action. Generator use under normal circumstances would consist of no noise as it is only to be utilized during emergency situations where backup power is required. If it were to be used, the noise levels would be minimal due to the generator model and size. These noise levels would not be heard by local businesses or the closest minority populations.

Based on the information in the above section, implementation of this alternative would have no disproportionate adverse impacts to minority populations, low-income populations or children. Access to HAFB would be restricted to credentialed professionals; meaning limited number of civilians and children would have potential to be near the proposed macro tower. The proposed tower compound would also be fenced and locked, allowing access to only approved or trained personnel, further reducing any potential environmental health or safety risks. As the project would follow all guidance for tower and antenna siting as required by the FCC and OSHA, no disproportionate environmental health or safety risks to children would occur. Therefore, the Proposed Action is consistent with the objectives of the following:

- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*

No significant cumulative impacts to Socioeconomics and Environmental Justice are anticipated when the

Preferred Alternative is evaluated together with past, present, and reasonably foreseeable actions listed in section 3.1.2. All of these actions were evaluated and determined to have no significant individual or cumulative impacts.

4.0 LIST OF PREPARERS

This document was prepared to fulfill the requirements of the NEPA for the Proposed Action at HAFB in Massachusetts. The following persons authored and provided direct oversight for the preparation of this EA.

Landers, Jordan. B.S. Biology. A environmental scientist with many years in NEPA compliance, and technical report writing, reviewed maps and land use data to help determine impact statements and authored substantial portions of the EA.

Sanchez, Eric B.A. Anthropology. An archaeologist with over 15 years field and report writing experience, as well as extensive experience in Section 106 NHPA compliance work and cultural resources management laws, reviewed soils, cultural resources information and other pertinent information to determine impact statements for the project.

McDevitt, Jill. M.S. Historic Preservation. A historic preservation professional with over 10 years of experience documenting and evaluating historic resources and experience in Section 106 compliance reviewed cultural resources information and authored portions of the EA.

Smith, Andrew. M.A. Anthropology. A specialist in GIS, mapping, and an archaeologist with over 18 years of extensive field and report writing experience, as well as experience managing staff for grant and contracted archaeological investigations, reviewed GIS data to make maps and graphics as well as impact statements for the EA, and also provided technical and regulatory guidance to the project team and reviewed sections of the EA.

5.0 LIST OF PERSONS CONSULTED AND/OR PROVIDED COPIES

The following Boldyn Networks and HAFB personnel were consulted during the preparation of this Environmental Assessment:

Boldyn Networks

- Joe Sisko, Boldyn Networks, Site Acquisition Project Manager
- Jason Brittain, Boldyn Networks, Project Manager, Deployment

HAFB

- Scott Sheehan, HAFB, 66 ABG/CEIE, Hanscom AFB Environmental Management System Coordinator
- Michael Watkin, 66 ABG/CENPL, Base Community Planner / MILCON Programmer
- Michael Lynch, HAFB, 66 ABG/CE, Capital Asset Manager
- James Maravelias, 66 ABG/CEIE, HAFB NEPA Manager

- Patterson H. White, 66 ABG/CENME, HAFB Chief, Execution Support / GeoBase – GIO

Many other additional parties and agencies were consulted as a part of the proposed action (see section 1.5). HAFB consulted Bedford Hanscom Area Towns Committee (HATS), Beford Town Manager, Concord HATS, Concord Town Manager, Lexington HATS, Lexington Town Manager, Lincoln Town Manager, Massachusetts Port Authority (MassPORT)-Hanscom, Federal Aviation Authority – New England Region (FAA), Minute Man National Historical Park (MMNHP), Massachusetts Historical Commission (MHC), the Mashpee Wampanoag Tribe, and Wampanoag Tribe of Gay Head (Aquinnah). Concurrence of a "no adverse effect" determination was received from MHC and MMNHP. No objections were received form any of the other consulted parties.

5.1 PUBLIC REVIEW

The public was offered a 30-day period to comment on this EA. A public notice was published in The Bedford Citizen, The Lexington Minuteman and The Concord Journal on 14 November – 2024. Copies of the Draft EA and Draft FONSI were available for review and can be downloaded at the following internet link: https://www.hanscom.af.mil/About-Us/Fact-Sheets/Display/Article/379486/civil-engineering/

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USFWS, 2024. U.S. Fish & Wildlife Service IPaC Information for Planning and Consultation. 2 January 2024. https://ipac.ecosphere.fws.gov

Appendix A – Agency Consultation

Minute Man National Historical Park

State Historic Preservation Office, Massachusetts Historic Commission

Tribal Historic Preservation Office, Mashpee Wampanoag Tribe

Tribal Historic Preservation Office, Wampanoag Tribe of Gay Head – Aquinnah

RECEIVED

APR 0 9 2024

MASS. HIST. COMM

RC.74341

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 66TH AIR BASE GROUP
HANSCOM AIR FORCE BASE MASSACHUSETTS

March 7, 2024

CONCURRENCE: Brona Simon
5/8/24
BRONA SIMON
STATE HISTORIC
PRESERVATION OFFICER
MASSACHUSETTS
HISTORICAL COMMISSION

Mr. Scott Sheehan
66 ABG/CEIE
120 Grenier Street
Hanscom AFB, MA 01731-1910

Ms. Brona Simon
Commonwealth of Massachusetts
Executive Director, Massachusetts Historical Commission (MHC)
220 Morrissey Boulevard
Boston, MA 02125-3314

SUBJECT: Proposed AT&T/Boldyn Cell Tower and Nodes, Hanscom AFB

Dear Ms. Simon:

The Department of the Air Force (DAF), in partnership with AT&T FirstNet and Boldyn Networks, is proposing an undertaking at Hanscom AFB in the towns of Lexington and Lincoln, MA. The proposed undertaking would construct a 150' high monopole telecommunications tower within a 50' x 50' leased area. The undertaking would include a small access road and ground support equipment at the tower, as well as five small cell nodes of telephone-pole height and supporting utility lines within existing rights-of-way on the base. The proposed project is needed to expand the AT&T FirstNet network for first responders in the rural areas surrounding the base and to increase network coverage on the base. We have identified both direct and indirect Areas of Potential Effect (APE) as depicted in attachment 1. Visual representation of the proposed monopole tower is included at attachment 2.

The Direct Area of Potential Effect (APE) for the proposed undertaking is the proposed leased area which includes the site for the tower, the tower's support equipment, and a small paved access; and the small cell node locations in the rights of way as shown in attachment 3. The proposed tower, leased area, and access drive is located on undeveloped put previously disturbed land within the Air Force Cambridge Research Laboratory (AFCRL) Historic District, and the small cell nodes will be placed along existing road rights-of-way outside of the district throughout the installation. The Indirect APE for potential visual effects associated with the tower is defined as an area of 0.5-mile radius around the tower site.

Based on our evaluation, there is one historic resource within the direct APE, the AFCRL Historic District, in which the tower will be constructed. Per the *Programmatic Agreement (PA) Among Hanscom Air Force Base and the Massachusetts State Historic Preservation Office (SHPO), Regarding Management of Historic Properties in the Air Force Cambridge Research Laboratory (AFCRL) Historic District at Hanscom Air Force Base, Massachusetts,* Section VI regarding new construction within the district, we've assessed that the tower design is responsive to the character of the district and meets the Secretary of the Interior Standards and DoD Guidelines for new construction in historic districts. In addition, being new construction, the tower could be removed in the future to restore the site to existing conditions. As a result, we have concluded there would be no direct adverse effect.

Within the Indirect APE for visual effects, we have identified seven potential historic properties that are not owned or operated by the DAF. Those include the Minute Man National Historical Park (MMNHP) (and its multiple listed historic properties) which is located approximately 0.31 miles south of the proposed tower, and six properties in the Town of Lexington (three being extant) located on Wood Street between 0.35 miles and 0.5 miles to the east of the proposed tower (see attachment 4).

Based on the topography as well as existing development between the proposed tower and the six properties in Lexington, we've assessed that the tower would not be visible at these locations. The proposed tower base would sit at 231 feet above sea level (asl) and the top at 381 feet asl. Topography between the tower and properties labeled 1 through 3 in attachment 4 gradually rises to 305 feet asl at a distance of 0.3 miles from the tower, then sharply drops off to 200 feet asl where the private properties lie. Similarly, existing development and vegetation between the proposed tower and the property labeled 4 in attachment 4 provides a visual barrier to the tower for this property. As it relates to the MMNHP, Hanscom AFB consulted with MMNHP and developed photo simulations of the proposed tower depicting both a leaves-on and a leaves-off vegetation configuration. Hanscom AFB also erected a crane topped by a signal flag to simulate the tower in place and walked the MMNHP property with their staff on December 19, 2023. On January 31, 2024, we sent MMNHP formal consultation resulting in a no adverse effect determination, to which the MMNHP concurred on February 29. 2024. Copies of these communications are included at attachment 5.

As it relates to potential archaeological resource impacts, none of the proposed action lies within any areas identified as potentially sensitive as annotated in attachment 6. In 1998, Parson Engineering Science, Inc. conducted a Phase I archaeological survey of 34 previously identified areas that were considered to have moderate to high potential for archaeological resources on Hanscom AFB, inclusive of Direct APE. No cultural materials were discovered in these areas. The MA State Historic Preservation Officer, i.e., the Massachusetts Historical Commission (MHC), in its June 22, 1998 letter regarding this survey report, wrote "The report indicated that no significant historical or archaeological resources were encountered in the archaeological survey of the 34 area previously determined to have moderate to high potential to contain archaeological resources." MHC advised that "no further archaeological research is warranted for these surveyed areas" (MHC 1998). As we do in all ground disturbing projects, we will incorporate the provisions for inadvertent discovery of archaeological resources into the project requirements.

Based on our analysis summarized above, and in accordance with Section 106 of the National Historic Preservation Act (54 United States Code 306018) and its implementing regulations at 36 CFR Part 800, the DAF has determined that there would be ***No Adverse Effect*** to historic properties as a result of implementing the proposed action. We seek your concurrence with our finding, or your comments, within 30 days from receipt of this letter. Please feel free to contact me via e-mail at scott.sheehan.1@us.af.mil or at (781) 367-7168 with any questions or if you need additional information. Thank you for your consideration and I look forward to hearing from you.

Sincerely

SCOTT E. SHEEHAN, GS-12, DAF
Hanscom AFB Cultural Resources Manager

6 Attachments:
1. Areas of Potential Effect
2. Visual Representation of the Proposed Monopole Tower
3. Locations of Small Cell Nodes and Existing Rights of Way
4. Identification of Potential Historic Properties Within the Indirect APE
5. Consultation with Minute Man National Historic Park
6. Areas of Previously-identified Archeological Sensitivity on Hanscom AFB

Cc:
Minute Man National Historic Park
Lexington Historical Commission
Lincoln Historical Commission

United States Department of the Interior
NATIONAL PARK SERVICE
Minute Man National Historical Park
174 Liberty Street
Concord, Massachusetts 01742

1.A.2

February 29, 2024

Mr Scott Sheehan
66 ABG/CEIE
120 Grenier Street
Hanscom AFB, MA 01731-1910

Mr. Sheehan,

Thank you for the notification regarding the AT&T and Boldyn Networks undertaking to construct a 150’ monopole telecommunications tower within Hanscom Air Force Base in Lincoln. In collaboration with your team, we identified potential viewpoint locations, walked the site during leaf-on and leaf-off times of year, and reviewed the photo simulations generated as part of examining the Area of Potential Effect for the park and its historic district. We concur that the undertaking will have No Adverse Effect on historic resources within Minute Man National Historical Park. Thank you for communicating with the park regarding the undertaking.

Sincerely,

M C Brown

Margaret C Brown
Natural and Cultural Resource Program Manager
Margie_coffin_brown@nps.gov
617 620 2942

cc: Simone Monteleone, Superintendent, Minute Man NHP
Nicole Walsh, NHPA Specialist, Minute Man NHP
Kiah Walker, NEPA Specialist, Minute Man NHP
Brona Simon, MA SHPO, Massachusetts Historical Commission

January 31, 2024

Mr. Jim Maravelias
66 ABG/CEIE
120 Grenier Street
Hanscom AFB, MA 01731-1910

Ms. Brona Simon
SHPO & Executive Director
Massachusetts Historical Commission
220 Morrissey Blvd
Boston, MA 02125

Dear Ms. Simon,

The Department of the Air Force (DAF), in partnership with AT&T FirstNet and Boldyn Networks, is proposing an undertaking at Hanscom AFB in Lincoln, MA. The proposed undertaking would construct a 150-foot monopole telecommunications tower within a 75-foot x 75-foot lease area and five small cell nodes within existing rights-of-way on base. The proposed project is needed to expand the AT&T FirstNet network for first responders in the rural areas surrounding the base and to increase network coverage on the base. Locations were considered for the undertaking, both on and off base (alternatives 1, 2 and 3), however alternatives 2 and 3 will not be considered further due to site limitations. Alternative 1 is the preferred alternative and additional plans for the site are included.

The Direct Area of Potential Effect (APE) for the proposed undertaking is the proposed tower and small cell node locations, proposed equipment lease area, and proposed access drive. The proposed macro tower, lease area, and access drive will be located on undeveloped land, and the small cell nodes will be placed along existing road rights-of-way. New conduit for the fiber paths will be installed if existing conduit cannot be used. New conduit would be installed with micro-trenching or directional boring unless hand digging is necessary. The Visual APE for the undertaking is a 0.5-mile radius around the tower site.

For alternative 1, the preferred alternative, there are no direct effects to historic resources. No National Register-listed or eligible properties were identified in the direct APE. The proposed macro tower location is approximately 0.31 miles north of Minute Man National Historical Park.

Based on our evaluation, there are no effects to historic resources within the direct APE. No National Register-listed or eligible properties were identified in the project areas. Within the visual APE, the proposed macro tower location is approximately 0.31 miles north of Minute Man National Historical Park (MMNHP). Due to possible visual impacts of the proposed tower on the park, photo simulations of the proposed tower have been prepared. The simulations show that the combination of distance and existing mature trees significantly limit the visibility of the tower from within the park. After evaluating the photo simulations, we have determined that the project will have no adverse effects on historic properties.

Based on our analysis summarized above, and in accordance with Section 106 of the National Historic Preservation Act (54 United States Code 306018) and its implementing regulations at 36 CFR Part 800, the DAF has determined that there would be No Adverse Effect to historic properties. We seek your concurrence with our finding within 30 days from receipt of this letter. Please feel free to contact me via e-mail at scott.sheehan.l@us.af.mil or at (781) 367-7168 with any questions or if you need additional information. Thank you for your consideration and I look forward to hearing from you.

Sincerely,

Attachments:

1. Letter Report
2. Site Information
3. Photo Simulations

Attachment 1

Letter Report: Construct a 150-foot monopole telecommunications tower and small cell network at Hanscom Air Force Base

Introduction

The United States Air Force (USAF) and AT&T FirstNet are proposing an undertaking at Hanscom Air Force Base (AFB) in Lexington, Massachusetts. The proposed undertaking is to construct a 150-foot (155-foot with lightning rod) monopole telecommunications tower within a 75-foot x 75-foot lease area with associated ground level equipment and access drive. This tower will be located in the southeast section of Hanscom AFB. Work would also construct five small cell nodes at various locations throughout Hanscom AFB and install fiber and power in existing and new underground conduit (Figure 1).

This letter details the scope of the proposed undertaking, the Area of Potential Effects (APE), identifies historic resources, and assesses the effects of the proposed undertaking on historic resources.

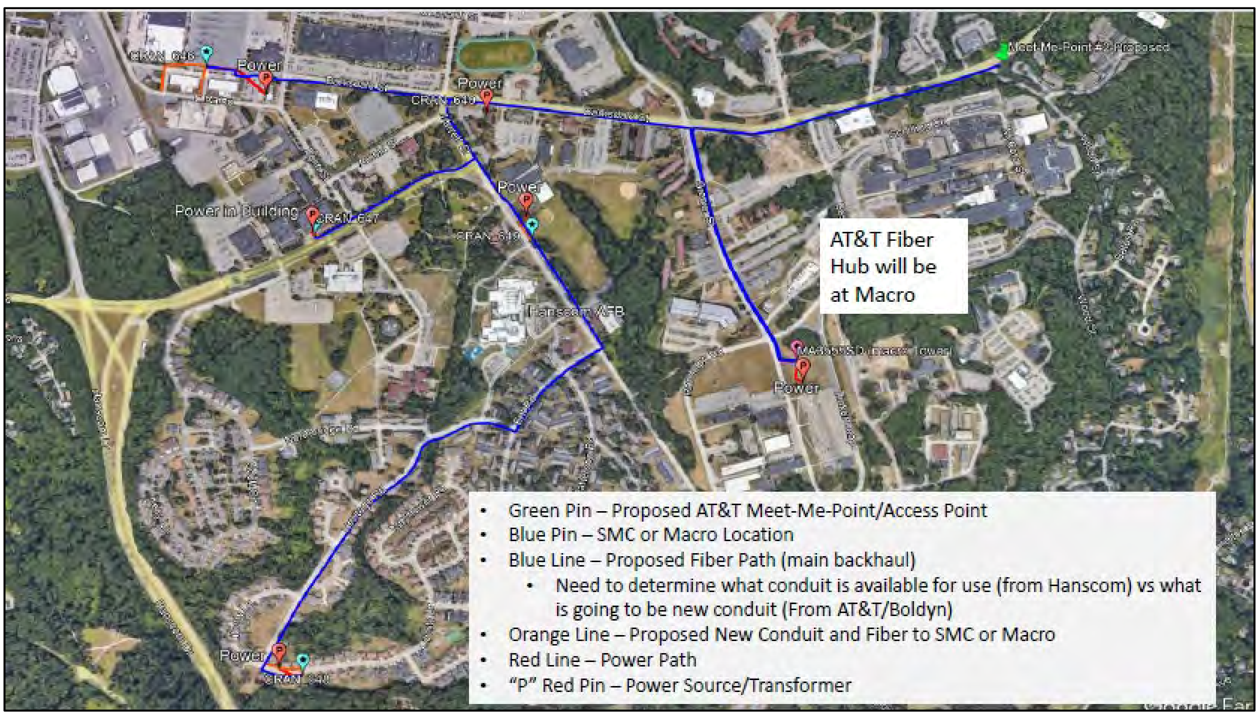


Figure 1. Project Map

Description of Undertaking

The purpose of the proposed undertaking is to expand AT&T's FirstNet network coverage and increase fiber coverage on Hanscom AFB. AT&T First Net is a nationwide broadband network for first responders. This network is intended to eliminate the thousands of different networks used by first responders and expand coverage in rural areas to help eliminate delays in response times.

The proposed undertaking would install an AT&T FirstNet Communications network tower on Hanscom Air Force Base (AFB) in order to improve wireless coverage and capacity. AT&T, in partnership with Boldyn Networks, will construct and install five small cell nodes and one macro tower. The small cell and macro tower structures would be built, owned, and maintained by Boldyn Networks with AT&T's radio and antennas installed on the infrastructure. The macro tower will be a 150-foot monopole (155-foot with lighting rod) within a 75-foot x 75-foot fenced compound. The tower will be capable of hosting three carriers. The small cell nodes will be installed at various locations on Hanscom AFB. Each node will be a metal monopole approximately 37-foot to 40-foot tall, painted to match existing light poles on Base and will have an attached equipment cabinet.

Area of Potential Effects (APE)

Section 106 regulations outlined in 36 CFR 800.16(d), the APE is defined as "…the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." Potential indirect and direct effects were considered when establishing the APEs.

The APE for direct effects is delineated in Figure 2. All areas with ground disturbance, fiber and power paths, new conduit, small cell nodes and the macro tower lease area and access drive are shown with a 10-foot buffer.

The APE for visual effects is a 0.5-mile radius around the monopole tower location (Figure 3). This radius is the required APE defined in the Federal Communications Commission's National Programmatic Agreement for new towers under 200-foot.

Identification of Historic Properties

Above Ground Resources

Minuteman National Historical Park (MMNHP), a National Historic Landmark (NRHP # 66000935, 02001445), is located within the visual APE. The northern edge of MMNHP is approximately 0.31-miles from the monopole tower location. Due to the proximity, photo simulations were produced to demonstrate the impact of the proposed undertaking on MMNHP. The results of the photo simulation were provided to MMNHP.

Archaeological Resources

In 1998, Parsons Engineering Science, Inc. completed a Phase I Archaeological Survey of Hanscom AFB. The survey found no significant historic or archaeological resources within the survey area (Simon 1998). Therefore, the areas of the proposed undertaking that include ground disturbance will not impact any archaeological resources.

Further Analysis: Effects to Historic Properties

The proposed undertaking would not directly or indirectly impact the identified historic resources. Photo simulations show that the visibility of the proposed tower is significantly reduced due to distance and mature trees.

Determination of Effect

In accordance with 54 U.S.C. § 306018 and the implementing regulations at 36 CFR Part 800, the USAF has determined that the proposed undertaking would result in No Adverse Effect to the MMNHP. The finding was determined after the photo simulations demonstrated that there will be limited visibility of the proposed tower from within MMNHP.

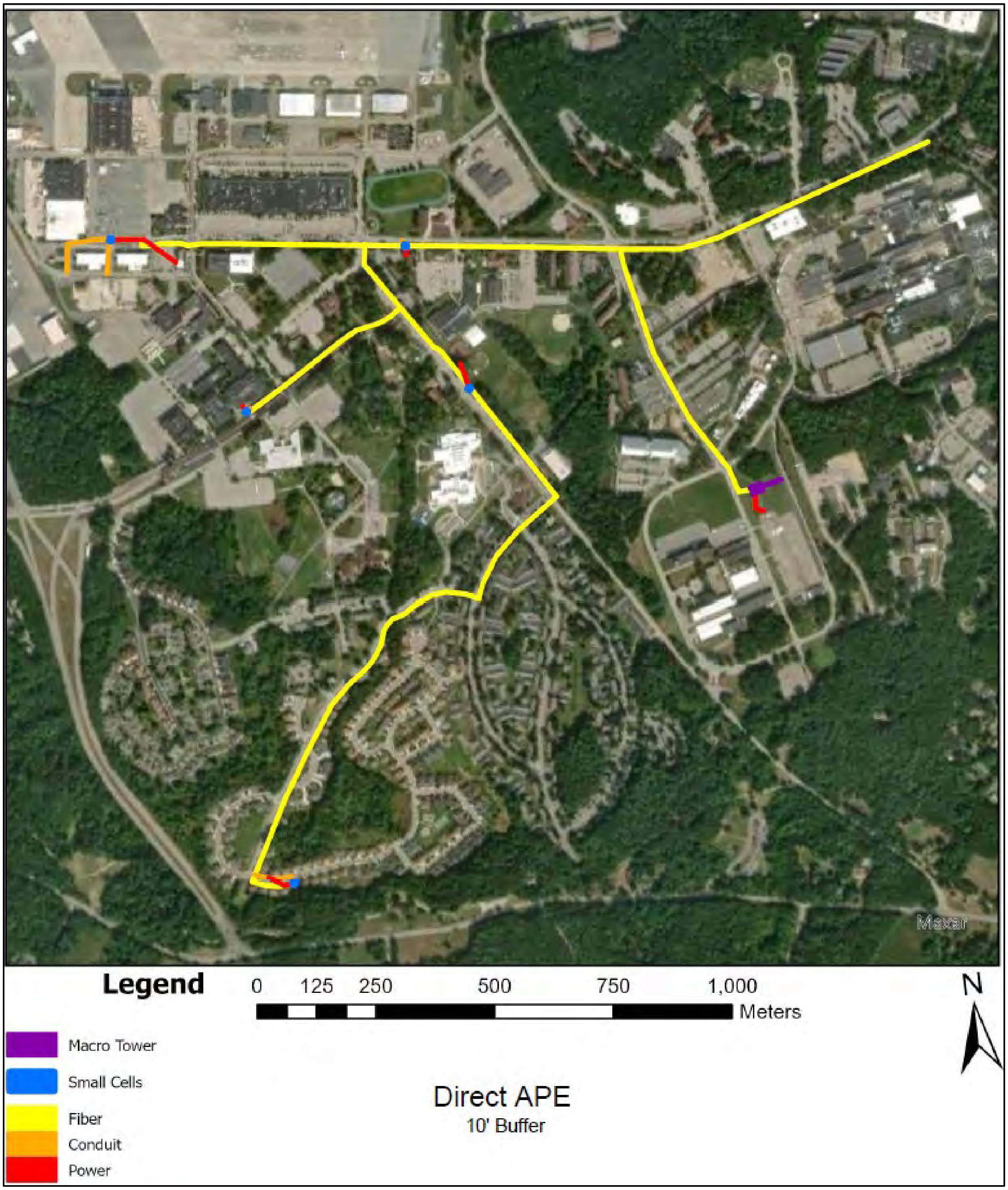


Figure 2. Map showing direct APE.

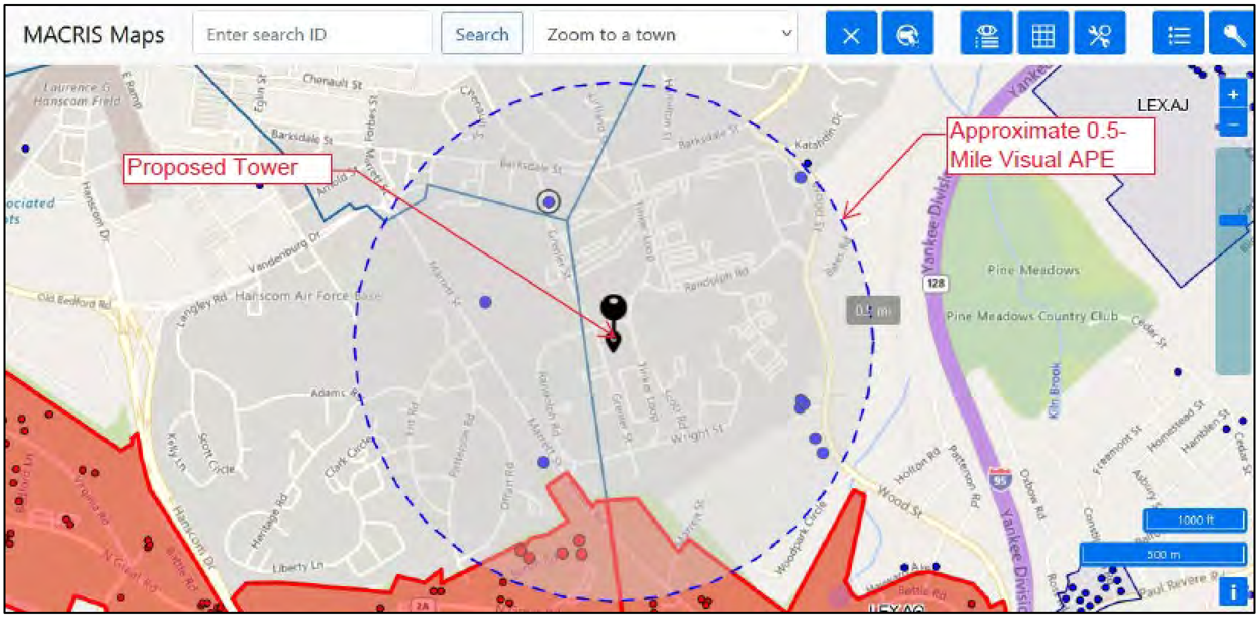


Figure 3. Map showing 0.5-Mile Visual APE and project proximity to MMNHP.

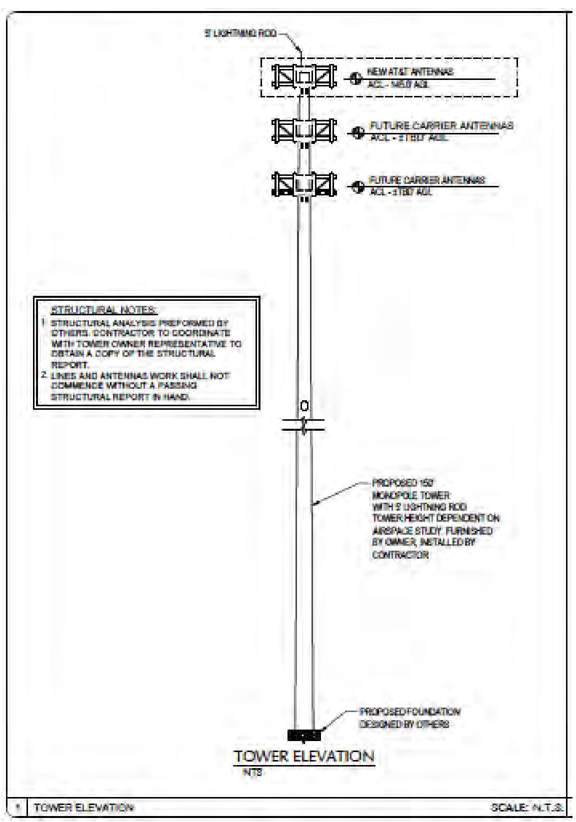


Figure 4. Proposed monopole tower elevation.

Attachment 2

SITE CANDIDATE INFORMATION PACKAGE (SCIP)

Project Name:	**AT&T Hanscom AFB**		
Candidate Name:	**MA3555SD**	**Candidate Rank:**	
Submitted by:	Signal Point Systems	Date Submitted:	April 26, 2023

SEARCH AREA COMMENTS	
Existing Structures:	**Clear area with cluster of trees to north.**
Topographic Summary:	**Tower on a small hill**
Development Restrictions / Issues:	**Location is on a Military Installation which requires coordination with base specific liaison/sponsor for access at least 1 week before site visit.**

CANDIDATE INFORMATION	
Small Cell Candidate Type:	A- ☒Raw Land B- ☐Rooftop C- ☐Pole Collo D- ☐Rooftop
Site Address:	**1149 Tinker Loop**
City, State, County, Zip:	**Hanscom AFB, MA, Middlesex co, 01731**
Owner/Lessor Name:	**Hanscom AFB (POC = Eric Lefebvre)**
Owner/Lessor Address:	**Bldg 1617, Old Bedford Rd, Hanscom AFB, MA, 01731**
Owner/Lessor Phone #:	**(774) 249-0635**
Latitude:	**42°27'21.83"N (42.456064)**
Longitude:	**71°16'14.92"W (-71.270812)**
Ground Elevation (ft AMSL):	**237.4**
Structure Height (ft. AGL):	**Tower Height 150'**
Nearest Airport and Distance:	**Boston Logan International Airport** **One Harborside Dr, East Boston, MA, 02128** **(800) 235-6426** **25 miles, 40min**
Telephone Company and #:	
Power Company and #:	**66th Civil Engineering Squadron (781) 225-2972**
Police Station Phone:	**(781) 377-3330 Emergency = 911**
Fire Station Phone:	**(781) 225-5000 Emergency = 911**
Driving Directions from nearest Switch:	

NOTE: Complete only the appropriate site type section below (A, B, C, or D) – delete other site type sections for this candidate before converting SCIP to PDF format.

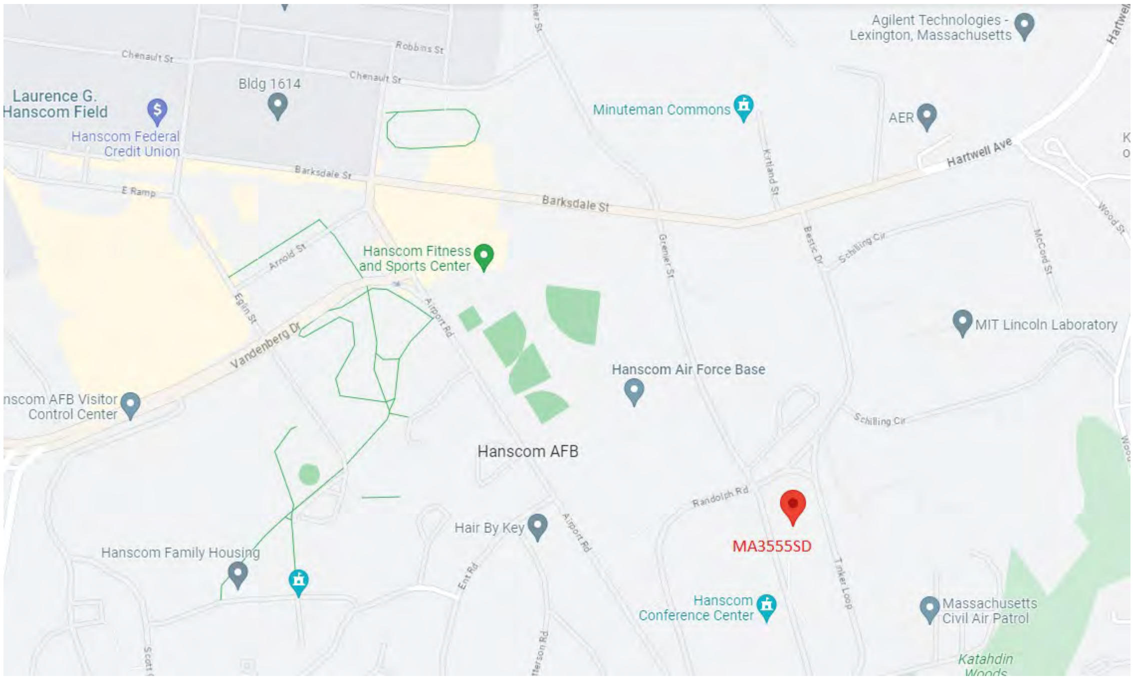
(C) POLE COLLO CANDIDATE DATA					
Type of Pole?	☐Power Utility ☐Street Light Utility ☐Traffic Light ☐Parking Lot Light ☐Other?				
Pole need replaced?	☐Yes ☐No ☐Maybe? Depends on structural				
Proposed lease area:	(ft x ft)			(SF)	
Proposed location of Small Cell equipment/shelter:	☐ on pole ☐ ground ☐ separate ground lease required				
Room for generator?	☐ yes	☒ no	Type:	☐ fixed	☐ portable
Proposed generator location:					
Generator space dimensions:	(ft x ft)			(SF)	
Other carriers on tower?	☐ yes	☒ no	Where?		
List existing carriers:					
Misc Pole Collo Candidate Comments:	**Proposed New Pole:** Grassy area on small hill between Tinker Loop & Grenier St near bldgs. 1150 & 1149. **Power:** Ground Transformer 75ft south.				

CONSTRUCTION FEASIBILITY				
Does Lessor have or know of any 3rd party reports for site?		☒ yes	☐ no	☐ N/A
Can semi-trailer easily access site?		☒ yes	☐ no	☐ N/A
Can a crane easily access site?		☒ yes	☐ no	☐ N/A
Are there truck weight/height restrictions along route to Site?		☒ yes	☐ no	☐ N/A
Must surveyor clear brush/trees to survey and stake Site?		☐ yes	☒ no	☐ N/A
Can soil boring rig get to Site without clearing brush/trees?		☒ yes	☐ no	☐ N/A
Estimated length of access road to be constructed:	(feet) n/a			
Estimated length of power / telco run:	(feet)			
Misc design or construction comments:	ALL contractors must be approved with the Assigned Military Installation.			

Add attachments including Candidate Photos to following pages, convert to PDF, and upload a SCIP for each candidate to NET workflow.

SCIP ATTACHMENTS CHECKLIST		
	Required Attachments	**Site Acq Comments**
☒	STREET MAP	
☒	AERIAL PHOTO	
☒	SITE & 360 PHOTOS	

STREET MAP



AERIAL PHOTO

Node/Pole Location

360 View

N

NE

E

SE

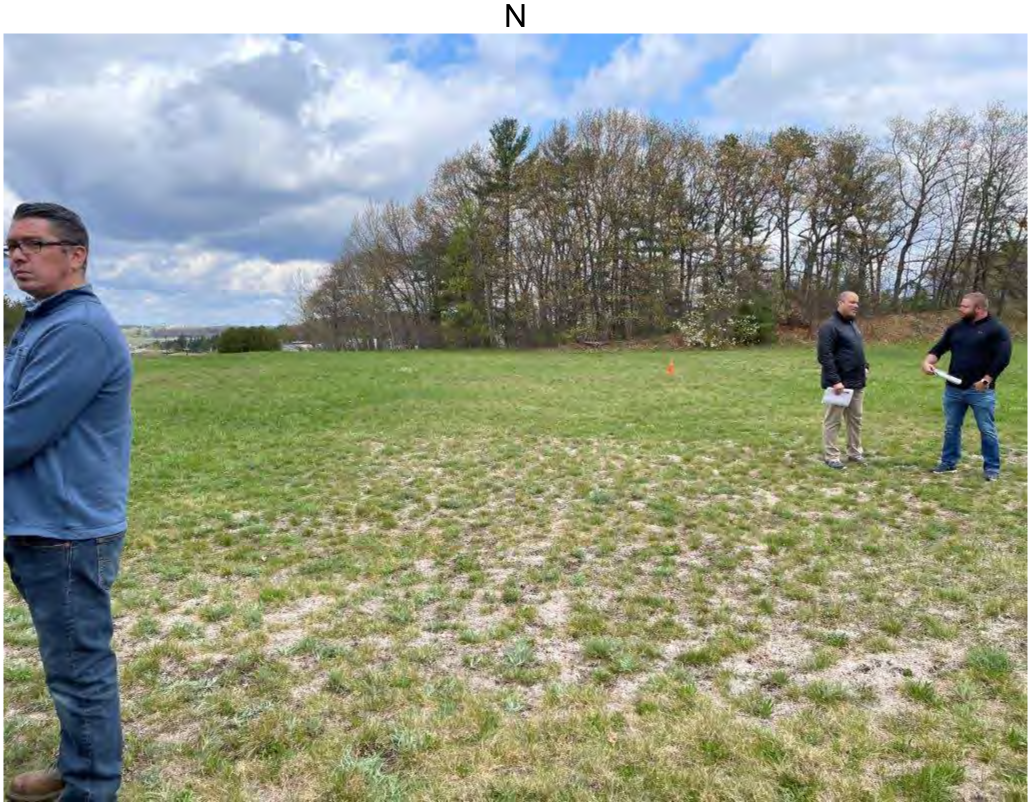
S

SW

W

NW

N



Power – Ground Transformer 75ft south

Attachment 3

12/19/23

Hanscom AFB

Photo Simulations from 4 Different Locations
Within Hanscom AFB
Photo Simulations from 10 Different Locations
In and around MMNHP

(all photos are looking at the tower site with a crane raised)

17 slides enclosed

Photo Simulations from 4 Different Locations within Hanscom AFB

- Locations per Scott Sheehan

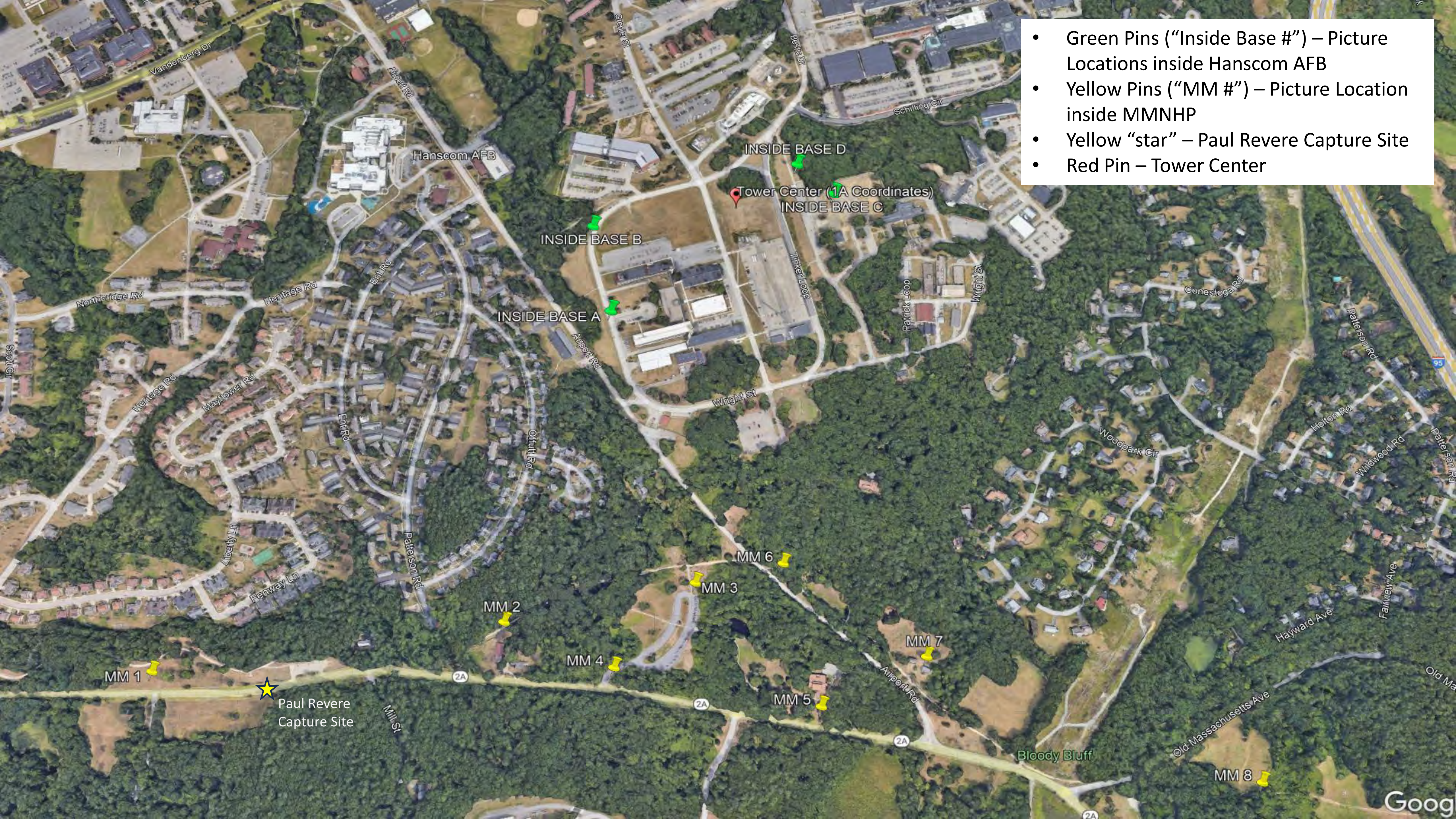
Photo Simulations from 10 Different Locations around the MMNHP

- Locations per MMNHP

1. Battle Road/Route 2A at western edge of Paul Revere Capture Site & Commemorative Marker, 180 North Great Road, Lincoln (high visitor use)
2. Battle Road Trail at Nelson Road, Lincoln (high visitor use)
3. Minute Man Visitor Center Main Parking Lot at Battle Road Trail connection, 210 North Great Road, Lincoln (high visitor use)
4. Minute Man Visitor Center Main Parking Lot Entrance, 210 North Great Road, Lincoln (high visitor use)
5. Minute Man Visitor Center Front Lawn, 2 Airport Road, Lexington (high visitor use)
6. Lawn between Hargrove Barn and Whittemore House at Accessible Ramp (a location for education programs)
7. Parker's Revenge Battle Site at Airport Road, near 8 Airport Road, Lincoln (a location for education programs)
8. Fiske Hill at top of lower field (site of current trail repairs), up trail that starts at 22 Old Mass Ave, Lexington. (high visitor use)
9. Smith House, on knoll overlooking HAFB, 1 Virginia Road, Lincoln where upcoming site clearing around house will open distant views. (high visitor use)

* Paul Revere Capture Site was added to the photo simulations

(all photos are looking at the tower site)

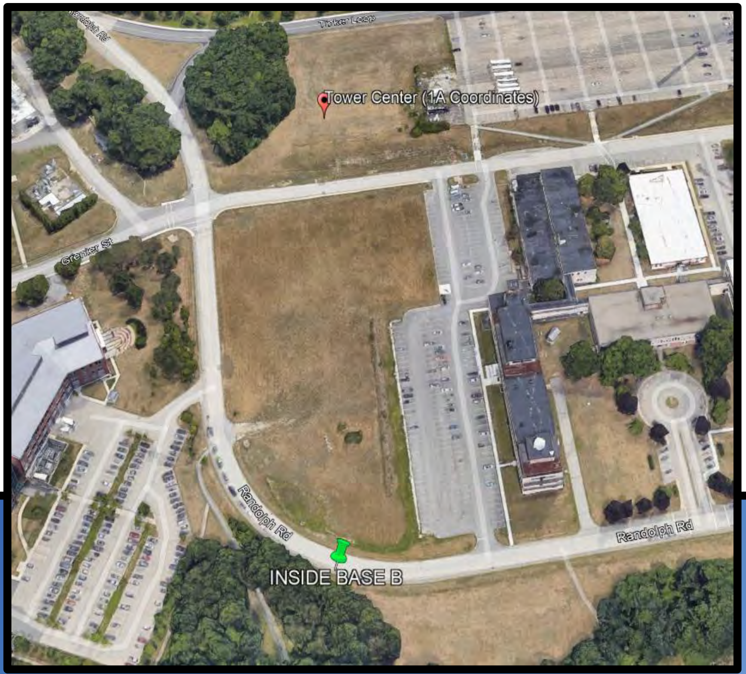

• Green Pins ("Inside Base #") – Picture Locations inside Hanscom AFB
• Yellow Pins ("MM #") – Picture Location inside MMNHP
• Yellow "star" – Paul Revere Capture Site
• Red Pin – Tower Center
Hanscom AFB
INSIDE BASE D
Tower Center (1A Coordinates)
INSIDE BASE C
INSIDE BASE B
INSIDE BASE A
MM 6
MM 3
MM 2
MM 7
MM 4
MM 1
MM 5
MM 8
Paul Revere
Capture Site
Bloody Bluff
Vandenberg Dr
Northbridge Rd
Heritage Rd
Mayflower Rd
Ent Rd
Offutt Rd
Patterson Rd
Airport Rd
Wright St
Linker Loop
Patrick Loop
Schilling Cir
Conestoga Rd
Woodpark Cir
Holton Rd
Wildwood Rd
Hayward Ave
Fairview Ave
Old Massachusetts Ave
Liberty Ln
Fenway Ln
Mill St
2A
95

Location – Inside Base A

Before

After

Location – Inside Base B



Before

After

[SEC=PROTECTED]

Location – Inside Base C

After

Before

After

Before

Location – MM 1

After

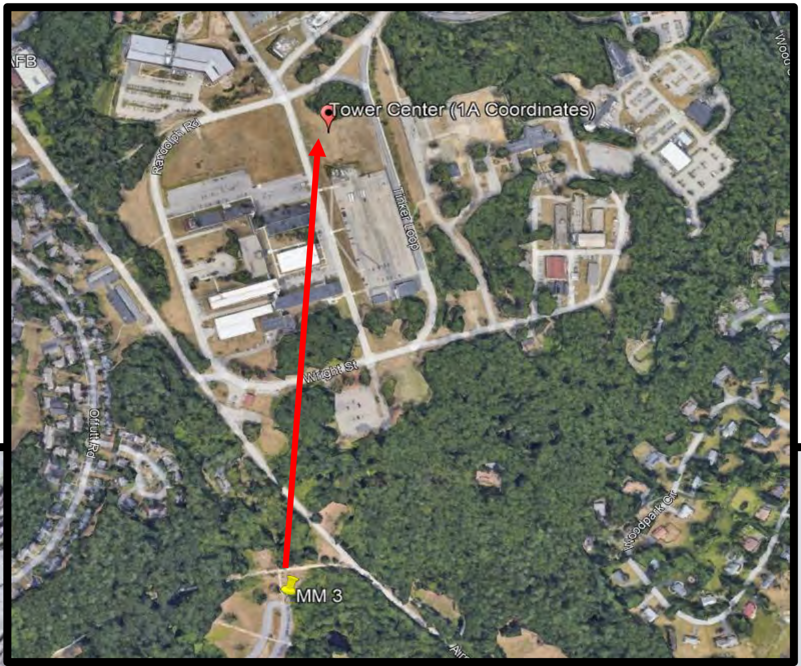
Before

Location – MM 2

Before

After

[SEC=PROTECTED]



After

Before

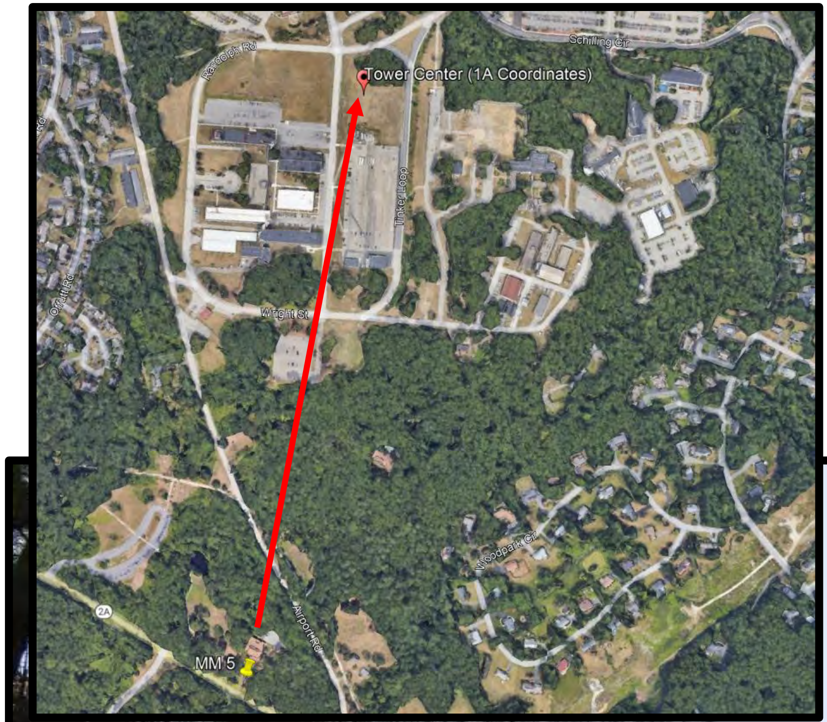
[SEC=PROTECTED]

Location – MM 4

After

Before

Location – MM 5



After

Before

[SEC=PROTECTED]

Location – MM 6

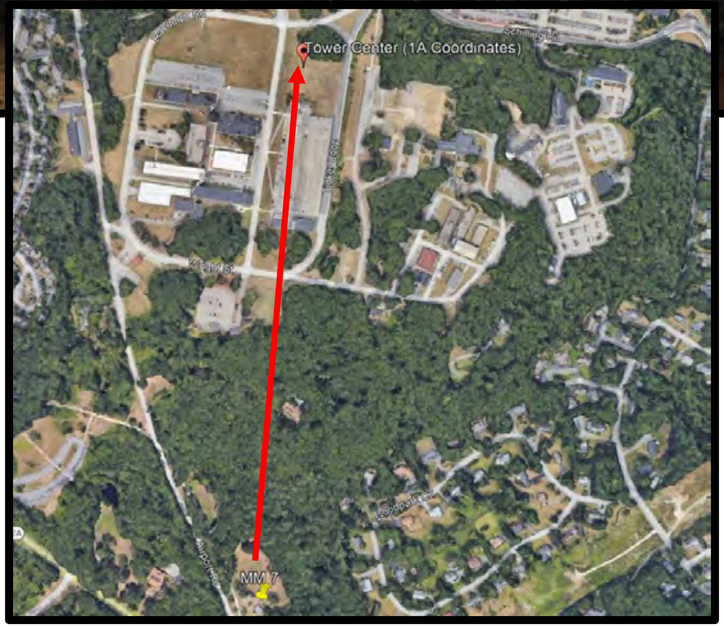
After

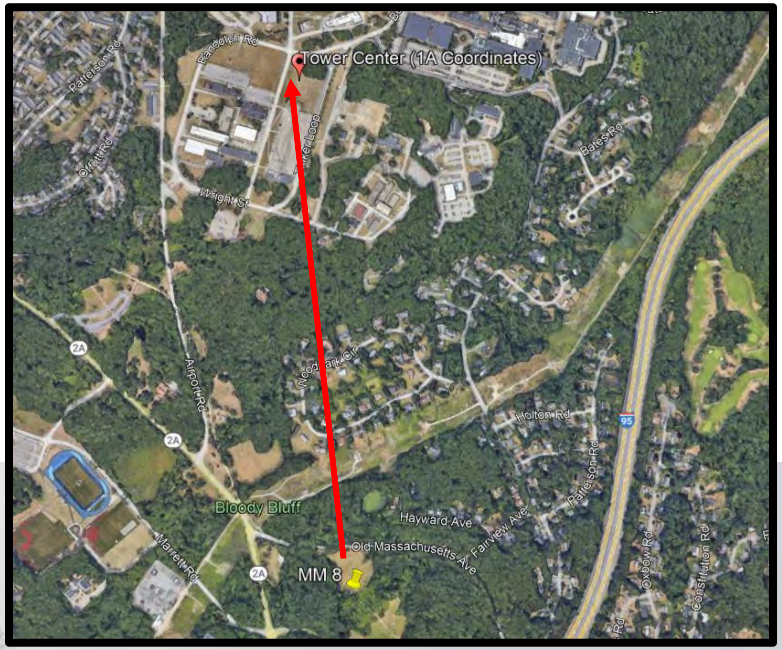
Before

Location – MM 7

After

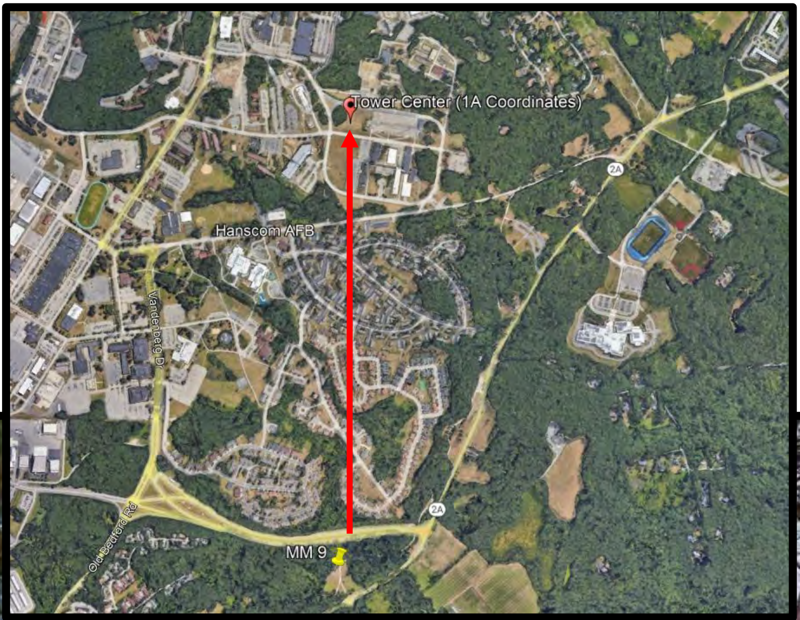
Before





After

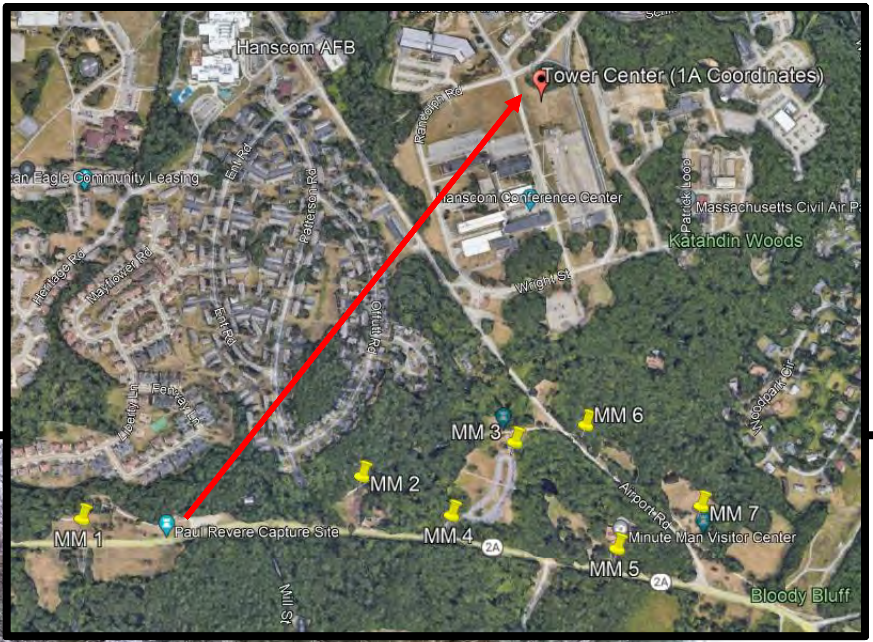
Before

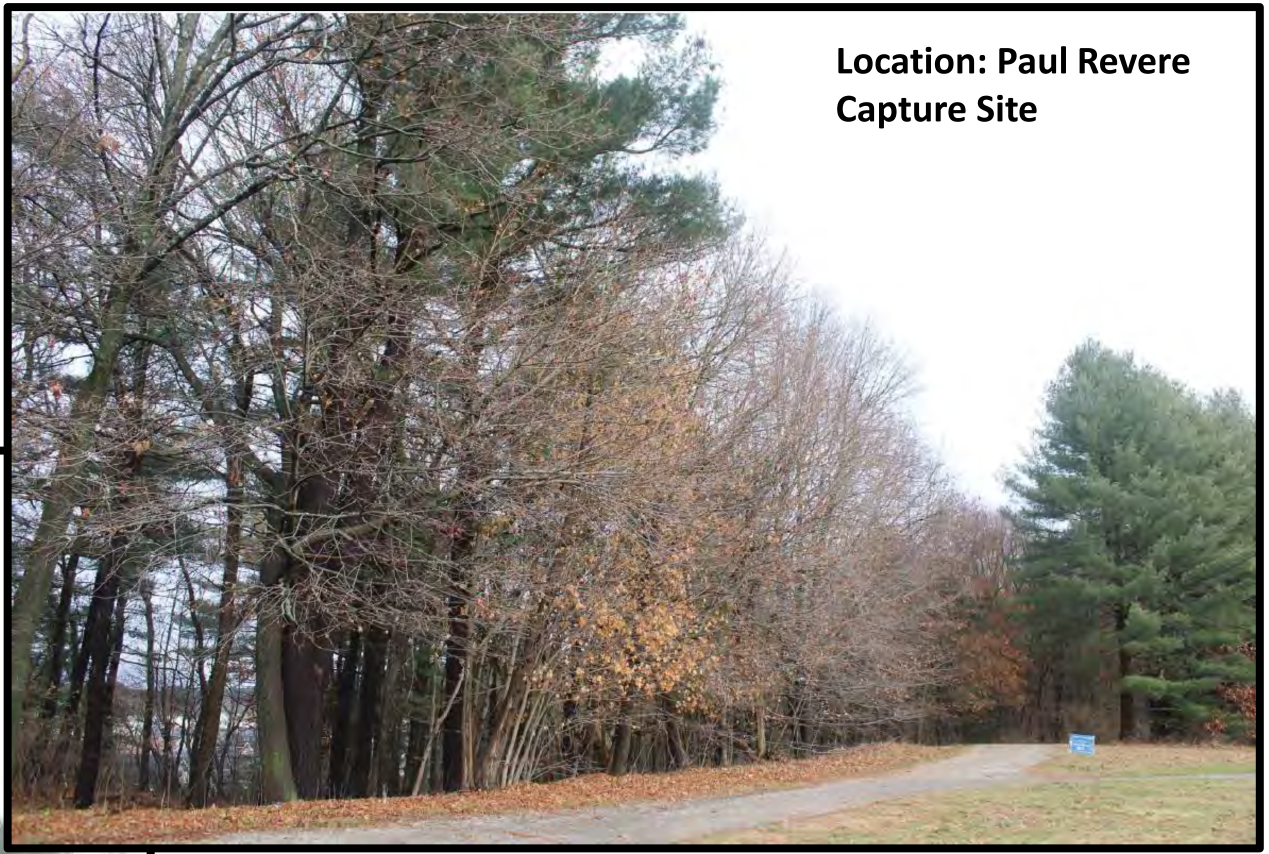


Location – MM 9

After

Before





After

Before

April 29, 2024

Mr. Scott E. Sheehan
66 ABG/CEIE
120 Grenier Street
Hanscom AFB MA 01731-1910

Ms. Bettina Washington, THPO
Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Rd.
Aquinnah, MA 02535-9701

Dear Ms. Washington

On behalf of the Hanscom Air Force Base (AFB) Installation Tribal Liaison Officer, Mr. Randy Robertson, I am informing you of a proposed undertaking by the Department of the Air Force (DAF) at Hanscom AFB in Bedford, MA. The Department of the Air Force (DAF), in partnership with AT&T FirstNet and Boldyn Networks, is proposing an undertaking at Hanscom AFB in the towns of Lexington and Lincoln, MA. The proposed undertaking would construct a 150’ high monopole telecommunications tower within a 50’ x 50’ leased area. The undertaking would include a small access road and ground support equipment at the tower, as well as five small cell nodes of telephone-pole height and supporting utility lines within existing rights-of-way on the base. The proposed project is needed to expand the AT&T FirstNet network for first responders in the rural areas surrounding the base and to increase network coverage on the base. Details are included at the attachment.

The direct Area of Potential Effect (APE) for the proposed undertaking is the proposed leased area which includes the site for the tower, the tower’s support equipment, and a small paved access; and the small cell node locations in the rights of way as shown in the attachments. The proposed tower, leased area, and access drive is located on undeveloped put previously disturbed land within the Air Force Cambridge Research Laboratory (AFCRL) Historic District, and the small cell nodes will be placed along existing road rights-of-way outside of the district throughout the installation. The Indirect APE for potential visual effects associated with the tower is defined as an area of 0.5-mile radius around the tower site.

As it relates to potential archaeological resource impacts, none of the proposed action lies within any areas identified as potentially sensitive. In 1998, Parson Engineering Science, Inc. conducted a Phase I archaeological survey of 34 previously identified areas that were considered to have moderate to high potential for archaeological resources on Hanscom AFB, inclusive of Direct APE. No cultural materials were discovered in these areas. The MA State Historic Preservation Officer, i.e., the Massachusetts Historical Commission (MHC), in its June 22, 1998 letter regarding this survey report, wrote "The report indicated that no significant historical or archaeological resources were encountered in the archaeological survey of the 34 area previously archaeological resources were encountered in the archaeological survey of the 34 area previously determined to have moderate to high potential to contain archaeological resources." MHC advised that "no further archaeological research is warranted for these surveyed areas" (MHC 1998). As we do in all ground disturbing projects, we will incorporate the provisions for inadvertent discovery of archaeological resources into the project requirements.

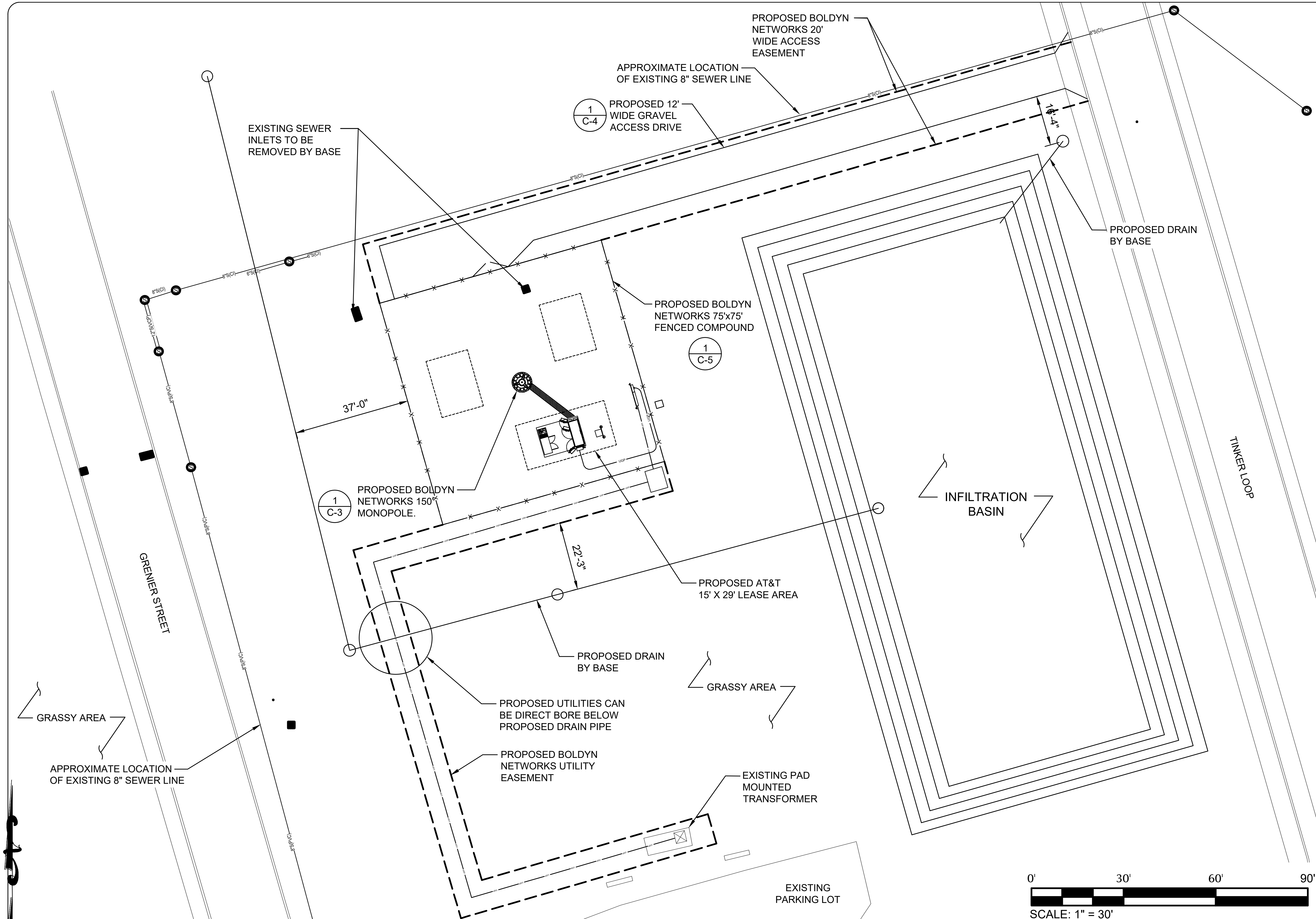
Federal agencies are required to consult with tribes when an agency action might affect historic properties of religious and cultural significance to the tribes. Hanscom AFB is unaware of any such properties on the installation, nevertheless, in order to help us fulfill that obligation, we ask for your assistance in identifying any such properties on Hanscom AFB, and particularly, within the project's APE that may be of significance to the Tribe. This would include, but not be limited to, archeological sites, burial grounds, sacred landscapes or features, ceremonial areas, traditional cultural properties and landscapes, plant and animal communities, and buildings and structures with significant tribal association. Your input will not affect the handling or disposition of human remains, funerary objects, sacred objects, or objects of cultural patrimony under the Native American Graves Protection and Repatriation Act. In the event such items are discovered, we will contact you regarding their handling and disposition.

We respectfully seek your input within 30 days from receipt of this letter. If you have any questions or if you need additional information, please feel free to contact me at (781) 367-7168 or by email at scott.sheehan.1@us.af.mil. Thank you for your consideration and I look forward to hearing from you.

Sincerely

SCOTT E. SHEEHAN, GS-12, DAF
Hanscom AFB Cultural Resources Manager

Attachments
Consultation Package Details



1 SITE LAYOUT (PROPOSED)

boldyn NETWORKS

TeleCAD Wireless

1961 NORTHPOINT BLVD, SUITE 130
HIXSON, TN 37343
PH: 423-843-9500
FAX: 423-843-9509

A&E PROJECT NAME:	MACRO - CAPACITY
DRAWN BY:	PLS
CHECKED BY:	DLS

REVISIONS

NO.	DATE	DESCRIPTION
D	01/02/24	BASE REDLINES CORRECTED
C	12/07/23	REDLINES CORRECTED
B	11/28/23	AT&T REDLINES
A	10/06/23	PRELIMINARY REVIEW

PROJECT NAME:
HANSCOM AFB MA3555SD

SITE NAME:
HANSCOM AFB MA3555SD

MTRAC ID:
M001109A-1001

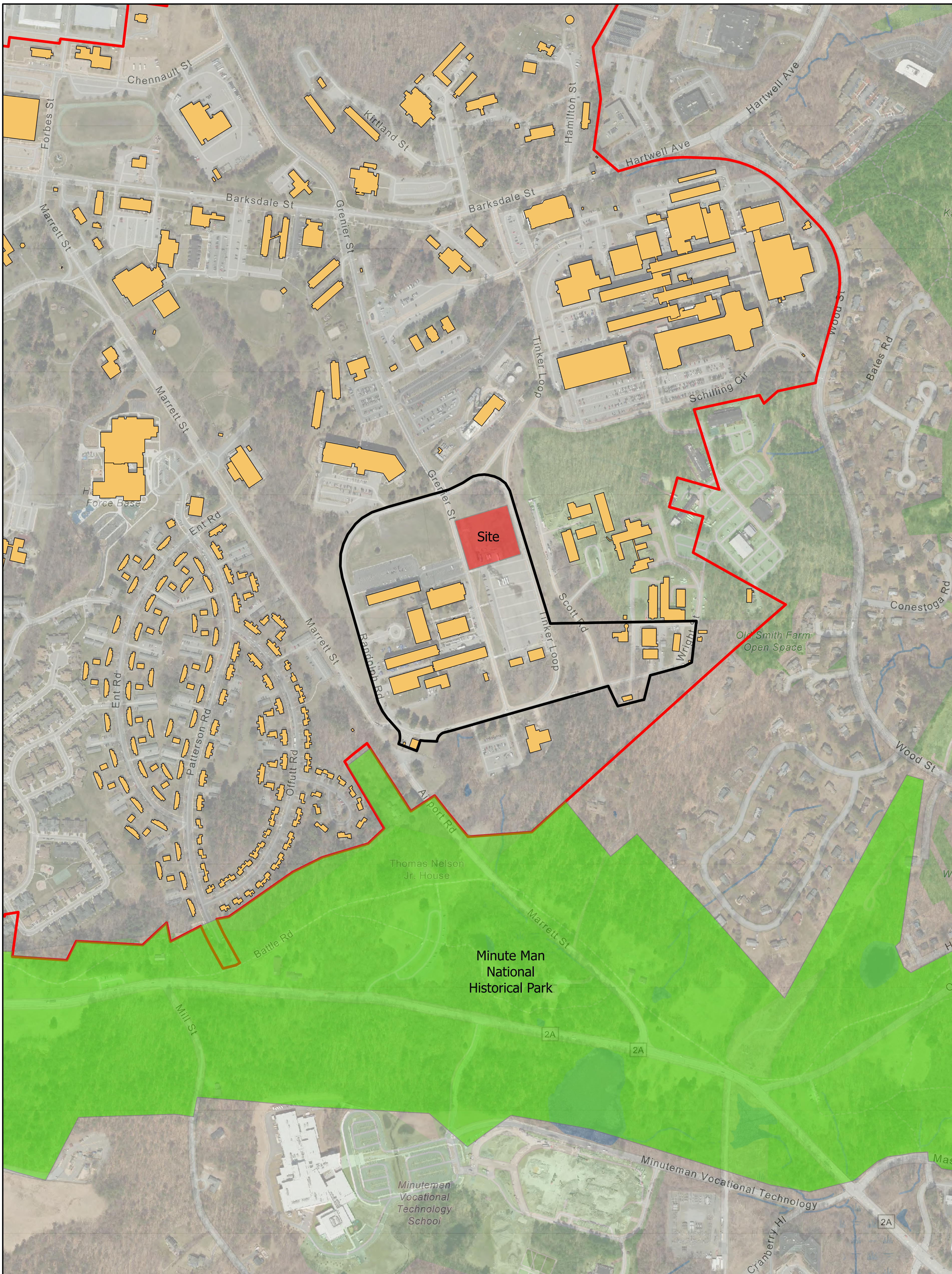
SITE ADDRESS:
TBD TINKER LOOP
LEXINGTON, MA 02421

DESIGN TYPE:
NEW BUILD

SHEET TITLE:
OVERALL SITE PLAN

DRAWING NO.: C1

REVISION: D



Legend

- HistoricDistrict_A
- CR_HistoricBuildings
- MinuteMan Ntl Hist Pk
- Installation_A

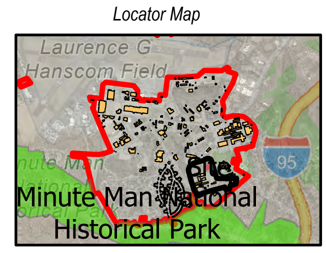
Cooperative Agreement Number:
W9126G-14-2-0018 -
W9126G-20-2-0004

Hanscom AFB
Area of Potential Effects
Direct Effects

N

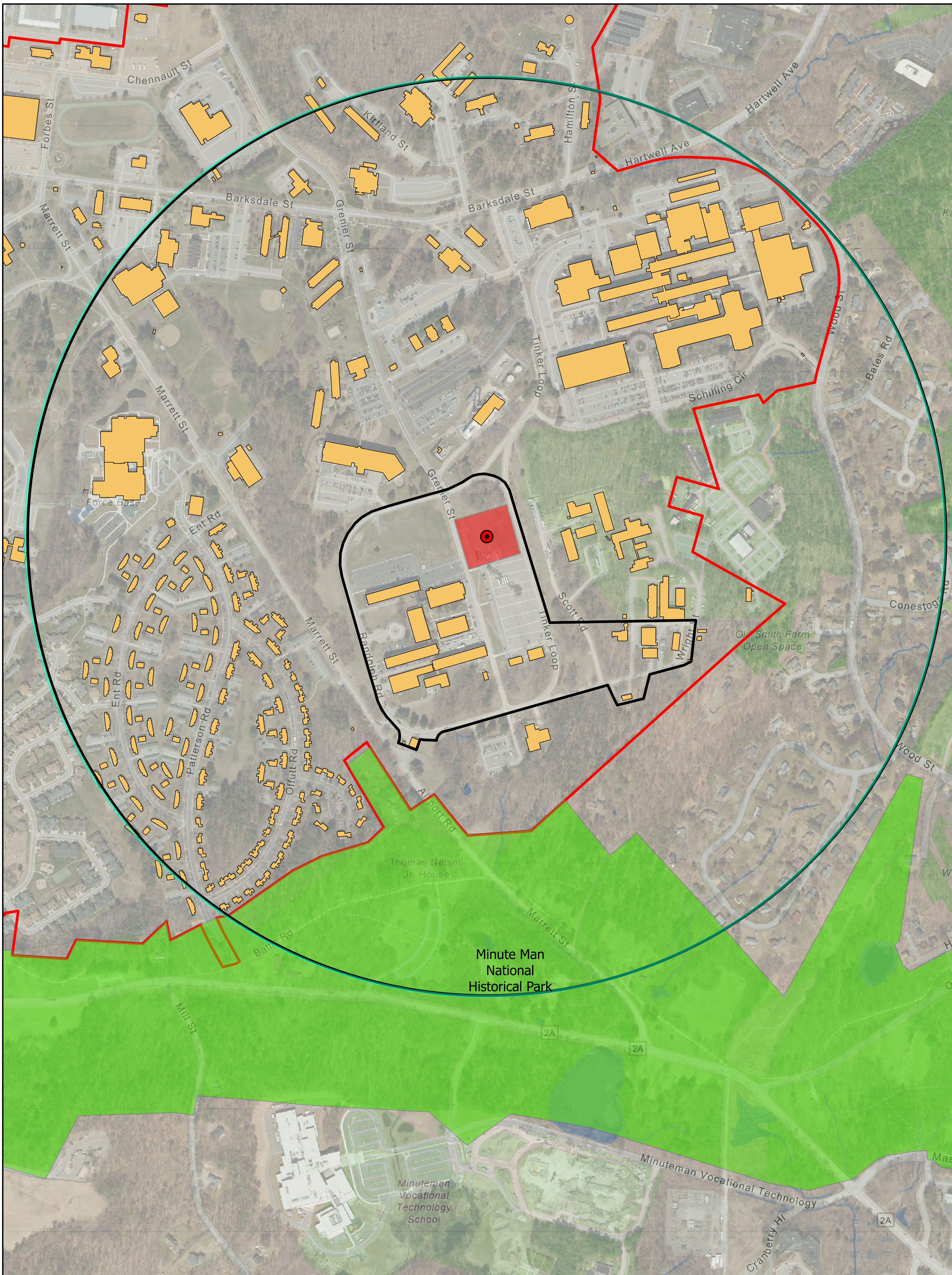
0 250 500 1,000 Feet

Locator Map



Prepared by:
Edward R. Camp
Environmental GIS Analyst
CSU-CEMML
ed.camp@colostate.edu

CUI//DCRIT



Cooperative Agreement Number:
W9126G-14-2-0018 -
W9126G-20-2-0004

Legend

Approximate Tower Location

Tower Area

Site

Half Mile Buffer

HistoricDistrict_A

CR_HistoricBuildings

MinuteMan Ntl Hist Pk

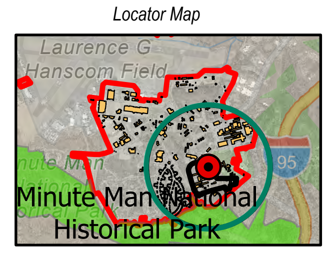
Installation_A

Hanscom AFB
Area of Potential Effects
Indirect Effects

N

0 250 500 1,000 Feet

Locator Map



Prepared by:
Edward R. Camp
Environmental GIS Analyst
CSU-CEMML
ed.camp@colostate.edu

CUI//DCRIT

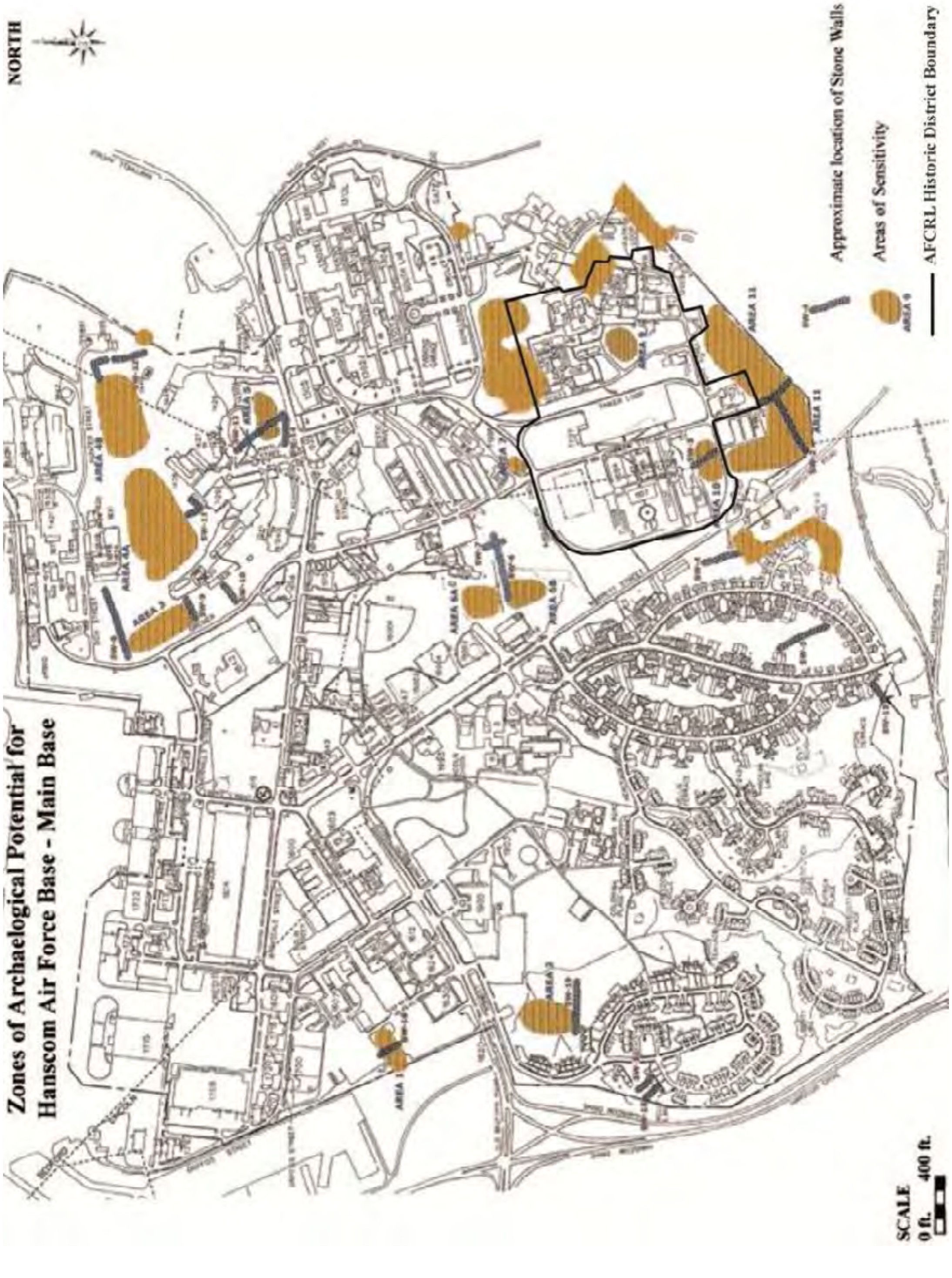
CONTROLLED BY CENTER FOR ENVIRONMENTAL MANAGEMENT OF MILITARY LANDS &
AIR FORCE CIVIL ENGINEER CENTER, ENVIRONMENTAL GIS PROGRAM OFFICE

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

ATTACHMENT

MAP OF AREAS OF ARCHAEOLOGICAL SENSITIVITY
HANSCOM AIR FORCE BASE, MA

(Source: *Hanscom AFB Integrated Cultural Resources Management Plan*, December 2010, Figure 2-46 detail)



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 66TH AIR BASE GROUP
HANSCOM AIR FORCE BASE MASSACHUSETTS

April 29, 2024

Mr. Scott E. Sheehan
66 ABG/CEIE
120 Grenier Street
Hanscom AFB MA 01731-1910

Mr. David Weeden
Tribal Historic Preservation Officer
Mashpee Wampanoag Tribe
483 Great Neck Road
Mashpee, MA 02649-3707

Dear Mr. Weeden

On behalf of the Hanscom Air Force Base (AFB) Installation Tribal Liaison Officer, Mr. Randy Robertson, I am informing you of a proposed undertaking by the Department of the Air Force (DAF) at Hanscom AFB in Bedford, MA. The Department of the Air Force (DAF), in partnership with AT&T FirstNet and Boldyn Networks, is proposing an undertaking at Hanscom AFB in the towns of Lexington and Lincoln, MA. The proposed undertaking would construct a 150' high monopole telecommunications tower within a 50' x 50' leased area. The undertaking would include a small access road and ground support equipment at the tower, as well as five small cell nodes of telephone-pole height and supporting utility lines within existing rights-of-way on the base. The proposed project is needed to expand the AT&T FirstNet network for first responders in the rural areas surrounding the base and to increase network coverage on the base. Details are included at the attachment.

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Federal agencies are required to consult with tribes when an agency action might affect historic properties of religious and cultural significance to the tribes. Hanscom AFB is unaware of any such properties on the installation, nevertheless, in order to help us fulfill that obligation, we ask for your assistance in identifying any such properties on Hanscom AFB, and particularly, within the project's APE that may be of significance to the Tribe. This would include, but not be limited to, archeological sites, burial grounds, sacred landscapes or features, ceremonial areas, traditional cultural properties and landscapes, plant and animal communities, and buildings and structures with significant tribal association. Your input will not affect the handling or disposition of human remains, funerary objects, sacred objects, or objects of cultural patrimony under the Native American Graves Protection and Repatriation Act. In the event such items are discovered, we will contact you regarding their handling and disposition.

We respectfully seek your input within 30 days from receipt of this letter. If you have any questions or if you need additional information, please feel free to contact me at (781) 367-7168 or by email at scott.sheehan.1@us.af.mil. Thank you for your consideration and I look forward to hearing from you.

Sincerely

Scott E Sheehan

SCOTT E. SHEEHAN, GS-12, DAF
Hanscom AFB Cultural Resources Manager

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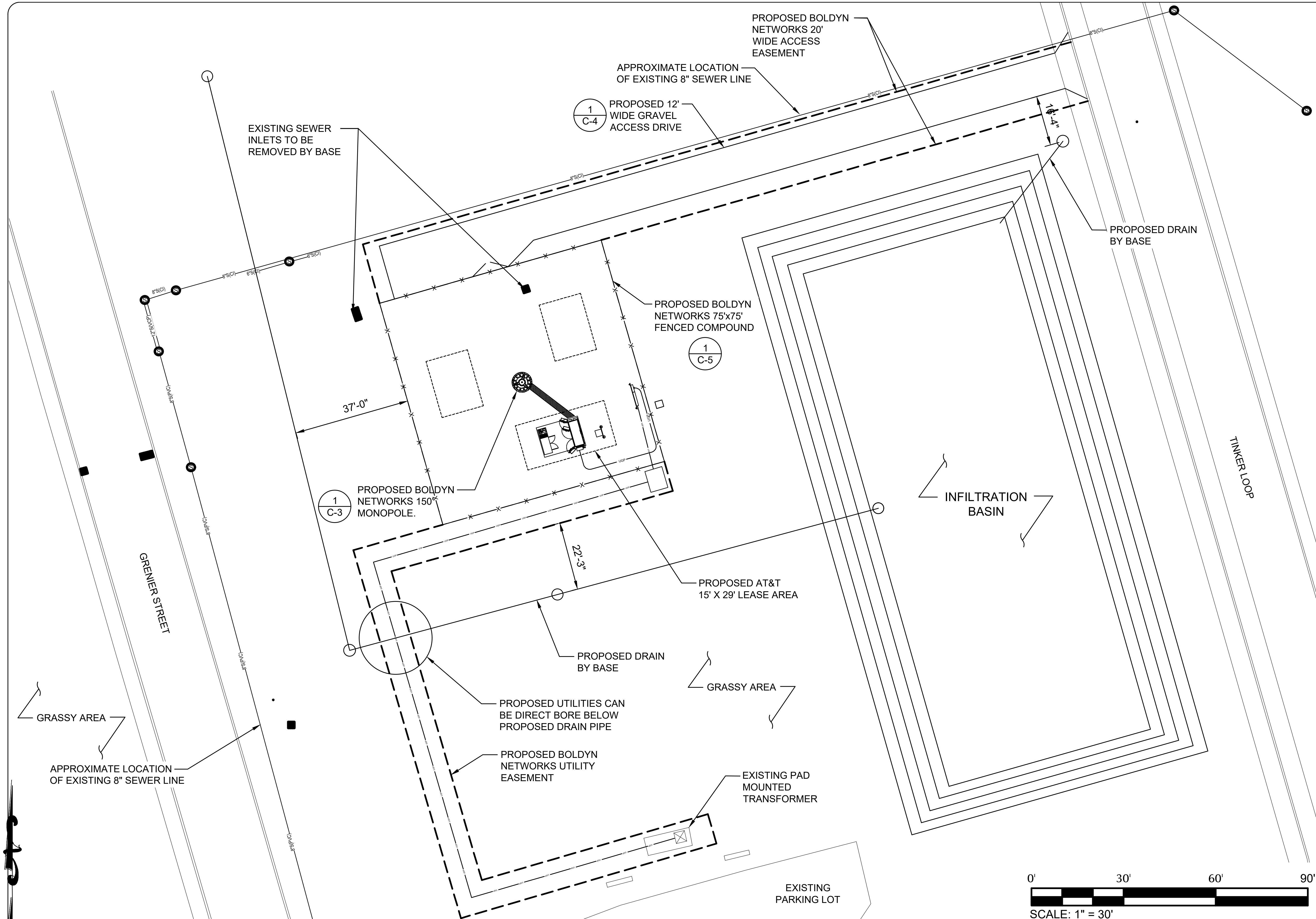
Consultation Package Details



1 SITE LAYOUT (PROPOSED)

1961 NORTHPOINT BLVD, SUITE 130
HIXSON, TN 37343
PH: 423-843-9500
FAX: 423-843-9509

A&E PROJECT NAME:	MACRO - CAPACITY
DRAWN BY:	PLS
CHECKED BY:	DLS

REVISIONS

NO.	DATE	DESCRIPTION
D	01/02/24	BASE REDLINES CORRECTED
C	12/07/23	REDLINES CORRECTED
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A	10/06/23	PRELIMINARY REVIEW

PROJECT NAME:
HANSCOM AFB MA3555SD

SITE NAME:
HANSCOM AFB MA3555SD

MTRAC ID:
M001109A-1001

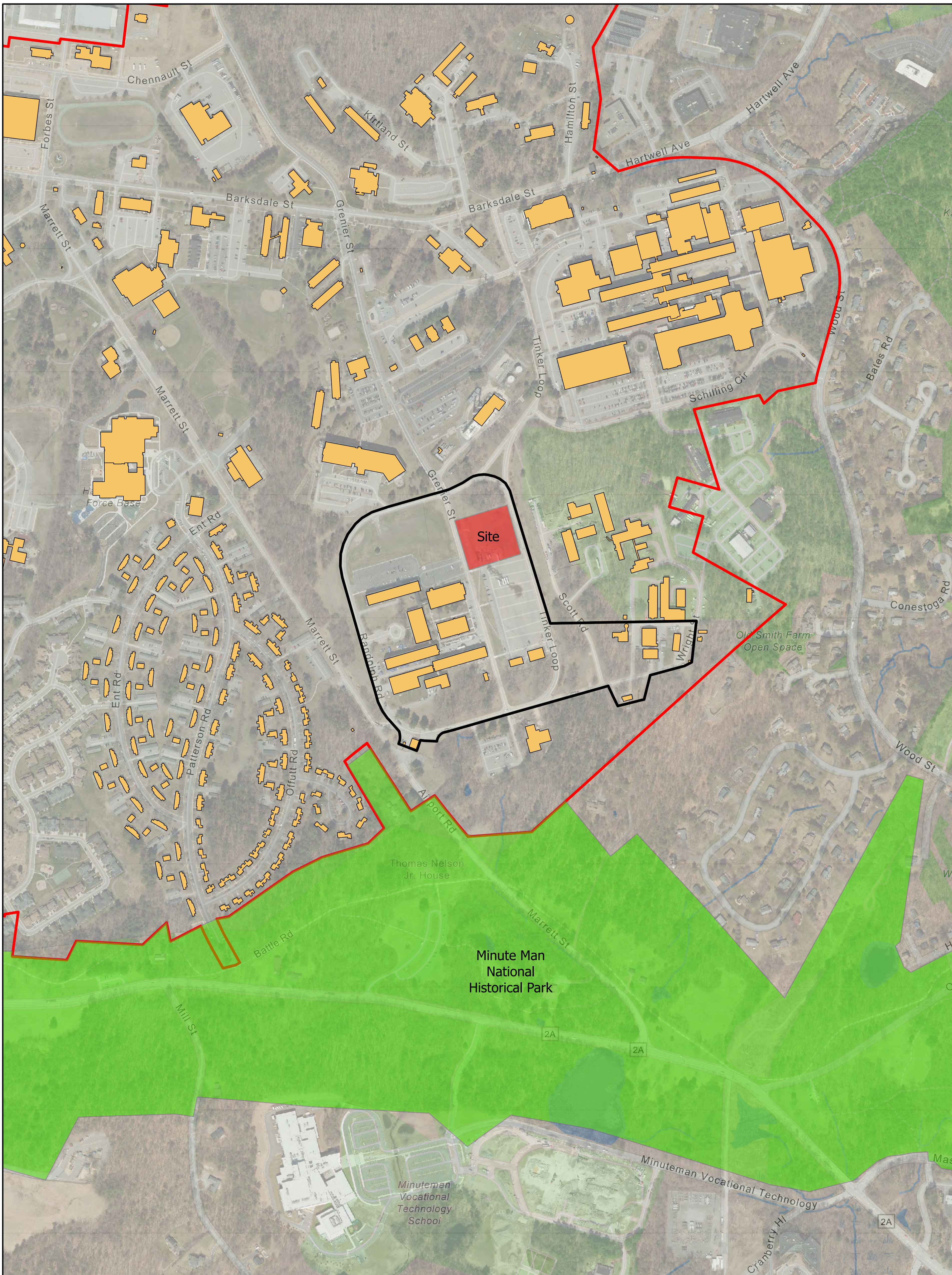
SITE ADDRESS:
TBD TINKER LOOP
LEXINGTON, MA 02421

DESIGN TYPE:
NEW BUILD

SHEET TITLE:
OVERALL SITE PLAN

DRAWING NO.: C1

REVISION: D



Legend

- HistoricDistrict_A
- CR_HistoricBuildings
- MinuteMan Ntl Hist Pk
- Installation_A

Cooperative Agreement Number:
W9126G-14-2-0018 -
W9126G-20-2-0004

Hanscom AFB
Area of Potential Effects
Direct Effects

N

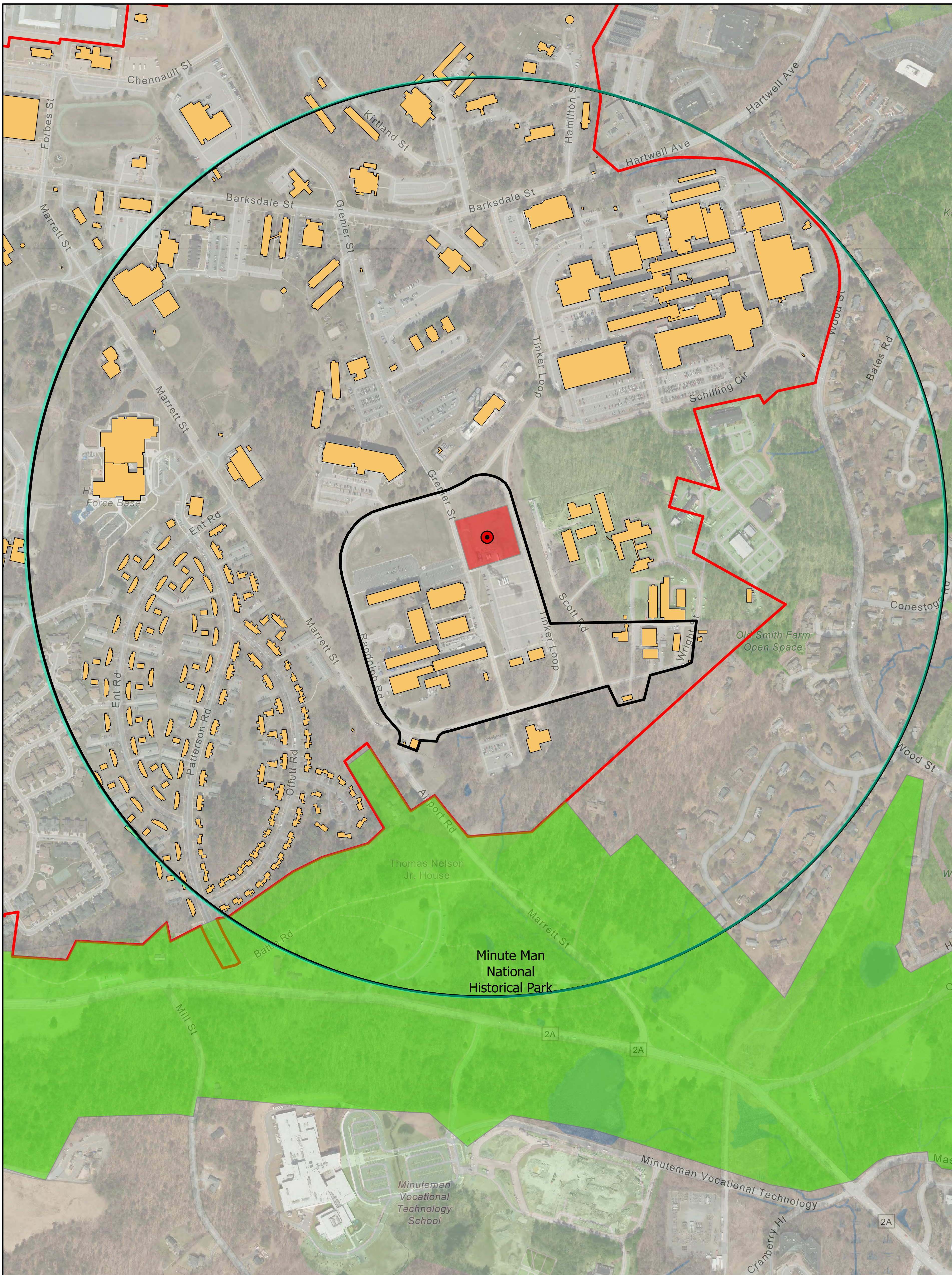
0 250 500 1,000 Feet

Locator Map

Prepared by:
Edward R. Camp
Environmental GIS Analyst
CSU-CEMML
ed.camp@colostate.edu

CUI//DCRIT

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed



Legend

Approximate Tower Location

Tower Area

Site

Half Mile Buffer

HistoricDistrict_A

CR_HistoricBuildings

MinuteMan Ntl Hist Pk

Installation_A

Cooperative Agreement Number: W9126G-14-2-0018 - W9126G-20-2-0004

Hanscom AFB
Area of Potential Effects
Indirect Effects

N

0 250 500 1,000 Feet

Locator Map

Prepared by:
Edward R. Camp
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CUI//DCRIT

CONTROLLED BY CENTER FOR ENVIRONMENTAL MANAGEMENT OF MILITARY LANDS &
AIR FORCE CIVIL ENGINEER CENTER, ENVIRONMENTAL GIS PROGRAM OFFICE

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ATTACHMENT

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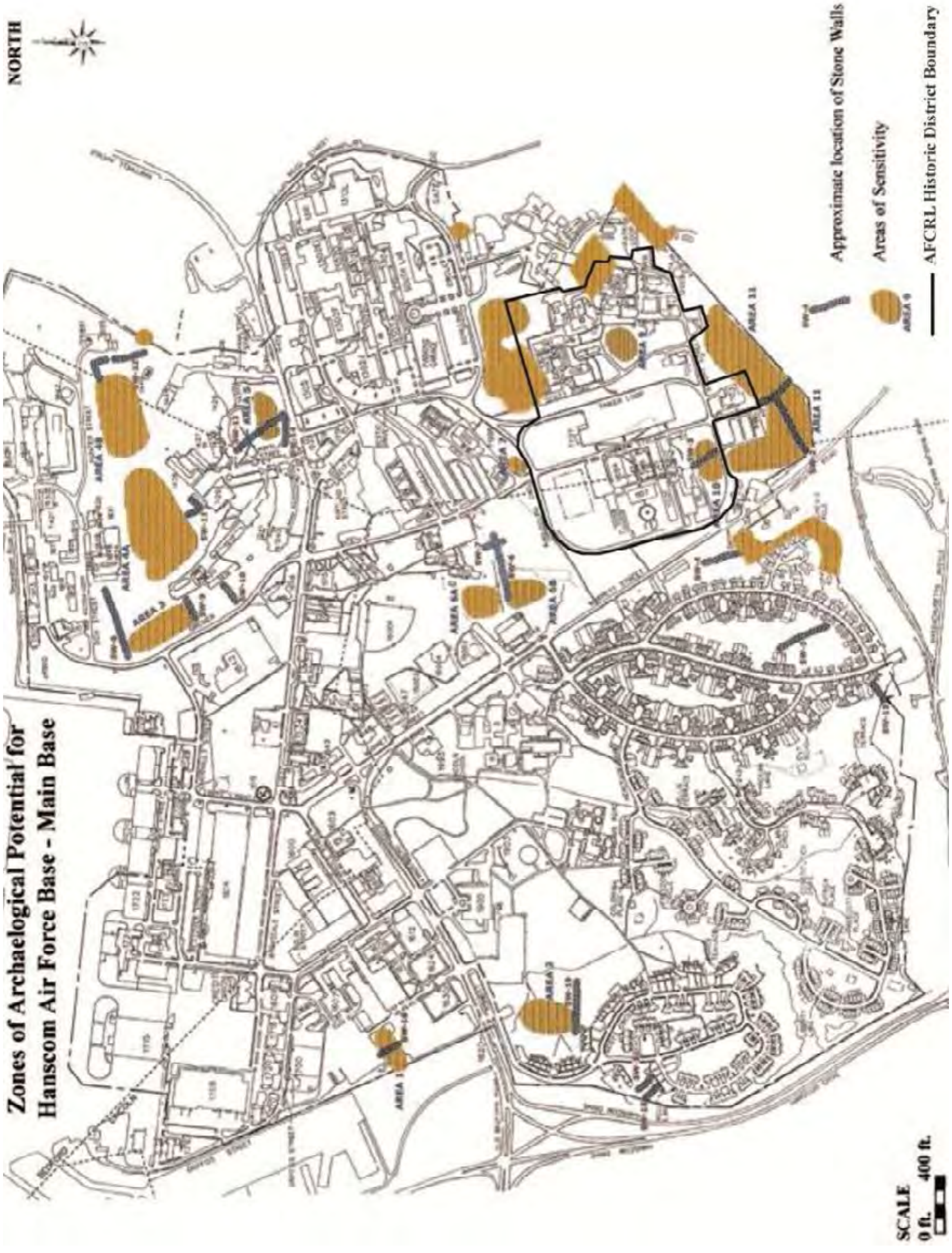
(Source: *Hanscom AFB Integrated Cultural Resources Management Plan*, December 2010, Figure 2-46 detail)



jordan.landers@rescom.org

From:	SHEEHAN, SCOTT E CIV USAF AFMC 66 ABG/CEIE <scott.sheehan.1@us.af.mil>
Sent:	Tuesday, July 16, 2024 1:11 PM
To:	jordan.landers@rescom.org
Cc:	MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE
Subject:	FW: Section 106 - Hanscom AFB - Communications Tower
Attachments:	2024-0102-09 - HAFB - Boldyn ATT Consultation.pdf

FYI

-----Original Message-----
From: SHEEHAN, SCOTT E CIV USAF AFMC 66 ABG/CEIE
Sent: Tuesday, July 16, 2024 12:03 PM
To: 'thpo@wampanoagtribe-nsn.gov' <thpo@wampanoagtribe-nsn.gov>; 'bettina@wampanoagtribe-nsn.gov' <bettina@wampanoagtribe-nsn.gov>
Cc: ROBERTSON, RANDY K CIV USAF AFMC 66 ABG/XP <randy.robertson.4@us.af.mil>; RENZONI, ANTHONY M NH-03 USAF AFMC 66 ABG/XP <anthony.renzoni@us.af.mil>; MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE <james.maravelias.1@us.af.mil>
Subject: Section 106 - Hanscom AFB - Communications Tower

Dear Ms. Washington,

In April 2024, The Department of the Air Force (DAF) informed the Tribe that they intended to pursue an undertaking that would construct a telecommunications tower on Hanscom Air Force Base in Lexington, MA. To date we have not received a response. If the Tribe is interested in consulting on this undertaking, please let us know. Our original letter is attached. Thank you!

Kind regards,
Scott Sheehan

//signed//
SCOTT E. SHEEHAN, GS-12, DAF
Hanscom AFB Cultural Resources Manager
66 ABG/CEIE
120 Grenier Street, B1825
Hanscom AFB. MA 01731-1910
Phone - 781.367.7168

jordan.landers@rescom.org

From:	MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE <james.maravelias.1@us.af.mil>
Sent:	Tuesday, July 16, 2024 12:45 PM
To:	jordan.landers@rescom.org
Subject:	FW: Section 106 - Hanscom AFB - Communications Tower
Attachments:	2024-0102-10 - HAFB - Boldyn ATT Consultation.pdf

FYSA

-----Original Message-----
From: SHEEHAN, SCOTT E CIV USAF AFMC 66 ABG/CEIE <scott.sheehan.1@us.af.mil>

Sent: Tuesday, July 16, 2024 12:06 PM
To: 106Review@mwtribe-nsn.gov; David.Weeden@mwtribe-NSN.gov
Cc: ROBERTSON, RANDY K CIV USAF AFMC 66 ABG/DD
<randy.robertson.4@us.af.mil>; RENZONI, ANTHONY M NH-03 USAF AFMC 66 ABG/XP
<anthony.renzoni@us.af.mil>; MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE
<james.maravelias.1@us.af.mil>
Subject: Section 106 - Hanscom AFB - Communications Tower

Dear Mr. Weeden,

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Kind regards,
Scott Sheehan

//signed//
SCOTT E. SHEEHAN, GS-12, DAF
Hanscom AFB Cultural Resources Manager
66 ABG/CEIE
120 Grenier Street, B1825
Hanscom AFB. MA 01731-1910
Phone - 781.367.7168

Appendix B – Public Comment Notification

jordan.landers@rescom.org

From:	MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE <james.maravelias.1@us.af.mil>
Sent:	Thursday, February 15, 2024 3:34 PM
To:	jordan.landers@rescom.org; Joseph Sisko
Cc:	SHEEHAN, SCOTT E CIV USAF AFMC 66 ABG/CEIE
Subject:	FW: Concord Response - Environmental Impact Analysis Process

Jordan,

Please see emails below.

Thanks,

Jim

From: MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE
Sent: Thursday, February 15, 2024 3:00 PM
To: 'Megan Zammuto' <mzammuto@concordma.gov>
Cc: Kerry Lafleur <klafleur@concordma.gov>
Subject: RE: Concord Response - Environmental Impact Analysis Process

Good afternoon Ms. Zammuto,

Thank you for confirming your receipt of the letter and review of the documentation.

Best,

Jim Maravelias

From: Megan Zammuto <mzammuto@concordma.gov>
Sent: Thursday, February 15, 2024 2:38 PM
To: MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE <james.maravelias.1@us.af.mil>
Cc: Kerry Lafleur <klafleur@concordma.gov>
Subject: [Non-DoD Source] Concord Response - Environmental Impact Analysis Process

> You don't often get email from mzammuto@concordma.gov. Learn why this is important

Hello Mr. Maravelias,

We received your letter dated January 25th outlining the process to evaluate impacts associated with the proposed cell nodes, tower and fiber lines within the Hanscom AFB boundaries. Our team reviewed the documentation and have no comments or concerns at this time. We sincerely appreciate you bringing this item to our attention. Thank you !

Megan J. Zammuto (she/her)
Deputy Town Manager
Town of Concord
22 Monument Square
Concord, MA 01742

978-318-3006
mzammuto@concordma.gov

From:	MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE <james.maravelias.1@us.af.mil>
Sent:	Monday, February 12, 2024 4:05 PM
To:	jordan.landers@rescom.org; Joseph Sisko
Cc:	SHEEHAN, SCOTT E CIV USAF AFMC 66 ABG/CEIE; WELCH, RENATA N CIV USAF AFMC 66 ABG/CEIE; STRICKLAND, CHARLES N III CIV USAF AFMC 66 ABG/CEI; SCHLUCKEBIER, THOMAS J CIV USAF AFMC 66 ABG/CE
Subject:	FW: Cell Nodes, Tower, Fiber Lines
Flag Status:	Flagged

Jordan,

Below is an email chain from a response from the Lexington Town Manager. Please include it in the appendix of the EA. After we receive any follow on comments, we can determine if it needs to be summarized in the EA or if the appendix is enough.

Thanks,

Jim

From: James Malloy <jmalloy@lexingtonma.gov>
Sent: Monday, February 12, 2024 3:41 PM
To: MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE <james.maravelias.1@us.af.mil>
Cc: SHEEHAN, SCOTT E CIV USAF AFMC 66 ABG/CEIE <scott.sheehan.1@us.af.mil>
Subject: [Non-DoD Source] RE: Cell Nodes, Tower, Fiber Lines

Jim – Thanks. We'll keep this internal to our Planning staff and will provide you any comments they may have. So far, the only comment I've received is that it should be painted to blend into the background (sky) as much as possible. I will forward any additional comments. Thanks.

Jim

Jim Malloy
Town Manager
Town of Lexington
1625 Massachusetts Avenue
Lexington, MA 02420
781-698-4540
www.lexingtonma.gov

Please note most emails sent to/from this account are a public record and consider the environment before printing this email. Thanks!

From: MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE <james.maravelias.1@us.af.mil>
Sent: Monday, February 12, 2024 2:26 PM
To: James Malloy <jmalloy@lexingtonma.gov>

Cc: SHEEHAN, SCOTT E CIV USAF AFMC 66 ABG/CEIE <scott.sheehan.1@us.af.mil>
Subject: RE: Cell Nodes, Tower, Fiber Lines

Mr. Malloy,

Thank you for reaching out. We have been working with the Minute Man National Historical Park (MMNHP) to determine if the proposed tower would be visible from the park and several points along Battle Road. On October 25, 2023 we visited the park and 9 locations to take photography and prepared a leaves-on photo simulation package portraying the view of the tower from each
of the 9 locations. On December 19, 2023, we visited the park and these 9 locations, plus one additional location, to take photography and prepared a leaves-off photo simulation package portraying the view of the tower from each of the 10 locations. In addition, we erected a crane at the proposed tower to a height of 148 feet (that is allowable by the Federal Aviation Administration) with a signal flag on the end. We joined members of MMNHP staff for a walkthrough of MMNHP to determine if the simulated tower (i.e. crane) could be seen from any of the identified locations, or from the larger Battle Road path. Overall, MMNHP is in agreement that the erected tower would have “no adverse effect” to the MMNHP. The simulations support that the location and elevation of the tower would not be visible to residential areas outside the installation.

Attached is the correspondence letter to MMNHP that includes a project site plan and the photo simulations with leaves on and leaves off.

Please note that this package has not been approved for public review. Please to not distribute it outside your planning department.

Let me know if you have any questions.

Best,

Jim Maravelias

MR. JIM MARAVELIAS, DAF, CSSBB, ALM, MS
66 ABG/CEIE, HANSCOM AFB
NEPA/EIAP MANAGER
POL/TANKS COMPLIANCE PROGRAM MANAGER
COMM (781) 225-6209
DSN 845-6209
CELL (781) 983-7075

From: James Malloy <jmalloy@lexingtonma.gov>
Sent: Monday, February 5, 2024 10:19 AM
To: MARAVELIAS, JAMES P CIV USAF AFMC 66 ABG/CEIE <james.maravelias.1@us.af.mil>
Subject: [Non-DoD Source] Cell Nodes, Tower, Fiber Lines

Jim – I don’t know that we’ll have substantive comments, but I have asked our Planning Department to comment and they inquired whether there are elevations or site plans, or a locus plan they can use in undertaking a review. Any additional information you can provide would be appreciated.

Thanks.

Jim

Jim Malloy
Town Manager
Town of Lexington
1625 Massachusetts Avenue
Lexington, MA 02420
781-698-4540
www.lexingtonma.gov

Please note most emails sent to/from this account are a public record and consider the environment before printing this email. Thanks!

When writing or responding, please be aware that the Massachusetts Secretary of State has determined that most email is a public record and, therefore, may not be kept confidential.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 66TH AIR BASE GROUP
HANSCOM AIR FORCE BASE MASSACHUSETTS

January 25, 2024

Mr. Jim Maravelias
66 ABG/CEIE
120 Grenier Street
Hanscom AFB, MA 01731-1910

Mr. James Malloy
Lexington Town Manager
Town Office Building, 2nd Floor
1625 Massachusetts Avenue
Lexington, MA 02420

Dear Mr. Malloy

In accordance with the National Environmental Policy Act of 1969 (NEPA) and the Air Force Environmental Impact Analysis Process (32 Code of Federal Regulations 989 et seq.), the Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate impacts associated with the Proposed Action to allow AT&T FirstNet Communications, in partnership with Boldyn Networks, to construct five small cell nodes, one macro tower, and fiber lines to each cell site within the Hanscom Air Force Base (Hanscom AFB) boundaries.

The new installation will construct five small cell nodes, approximately 37' to 40' in height and painted to match the existing light poles on Base, and a 150' monopole tower within a 75' x 75' fenced compound. The monopole tower will be able to accommodate up to three carriers. Fiber lines will be installed from an existing facility to each new structure, and from the macro tower to the Base fence line meet-me-point (MMP). The project is needed to enhance AT&T's FirstNet Communications network and improve wireless coverage and capacity within the installation. The Proposed Action includes all work required to construct the small cell nodes, macro tower and underground power and fiber. The EA will discuss the need to improve the AT&T FirstNet network, describe the affected environment and the environmental impacts of the proposed project, and present proposed mitigation.

With this letter, we seek your input on the Proposed Action to assist the Air Force in fully developing the range of issues to consider in conducting a comprehensive environmental review, particularly issues for which the DAF may be unaware. Once completed, the Draft EA will be made available for public review and comment. We currently expect this to occur sometime in Spring 2024. For the purposes of this effort, we request that you send any written input you may have at this time via e-mail to: james.maravelias.1@us.af.mil, or via US Mail to:

Mr. Jim Maravelias
66 ABG/CEIE
120 Grenier Street, B1825
Hanscom AFB, MA 01731-1910

Included with this letter are a project location map (attachment 1); and a listing of agencies we are offering an opportunity to provide input into this scoping effort (attachment 2). If you choose to provide input at this time, we respectfully request you respond within 30 days from receipt of this letter. If you have any questions, please feel free to contact me anytime at (781) 225-6209 or james.maravelias.1@us.af.mil.

Sincerely

JIM MARAVELIAS, GS-11, DAF
NEPA/EIAP Manager

2 Attachments:
1. Project Location Map

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 66TH AIR BASE GROUP
HANSCOM AIR FORCE BASE MASSACHUSETTS

January 25, 2024

Mr. Jim Maravelias
66 ABG/CEIE
120 Grenier Street
Hanscom AFB, MA 01731-1910

Ms. Suzanne Barry
Lexington Town Office Building
1625 Massachusetts Avenue
Lexington, MA 02420

Dear Ms. Barry

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Mr. Jim Maravelias
66 ABG/CEIE
120 Grenier Street, B1825
Hanscom AFB, MA 01731-1910

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Sincerely

James P Maravelias

JIM MARAVELIAS, GS-11, DAF
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66 ABG/CEIE
120 Grenier Street
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Mr. Timothy Higgins
Lincoln Town Administrator
Town Office
16 Lincoln Road
Lincoln, MA 01773

Dear Mr. Higgins

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Mr. Jim Maravelias
66 ABG/CEIE
120 Grenier Street
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Mr. Jonathan Dwyer
16 Lincoln Road
Lincoln, MA 01773

Dear Mr. Dwyer

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120 Grenier Street
Hanscom AFB, MA 01731-1910

Ms. Amber Goodspeed
MassPORT (Hanscom)
L.G. Hanscom Field, Civil Air Terminal
200 Hanscom Drive, Suite 214
Bedford, MA 01730

Dear Ms. Goodspeed

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Mr. Jim Maravelias
66 ABG/CEIE
120 Grenier Street
Hanscom AFB, MA 01731-1910

Mr. Marcos Nogueria
101 Northbridge Rd #2663.
Hanscom AFB, MA 01731

Dear Mr. Nogueria

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Ms. Kerry Lafluer
Town Manager
P.O. Box 535
Concord, MA 01742

Dear Ms. Lafluer

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Lincoln Town Administrator
Town Office
16 Lincoln Road
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Ms. Colleen Doyle
Bedford Town Manager
10 Mudge Way
Bedford, MA 01730

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10 Mudge Way
Bedford, MA 01730

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120 Grenier Street
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Ms. Colleen D'Alessandro
Regional Administrator
FAA New England Region
1200 District Avenue
Burlington, MA 01803-5299

Dear Ms. D'Alessandro

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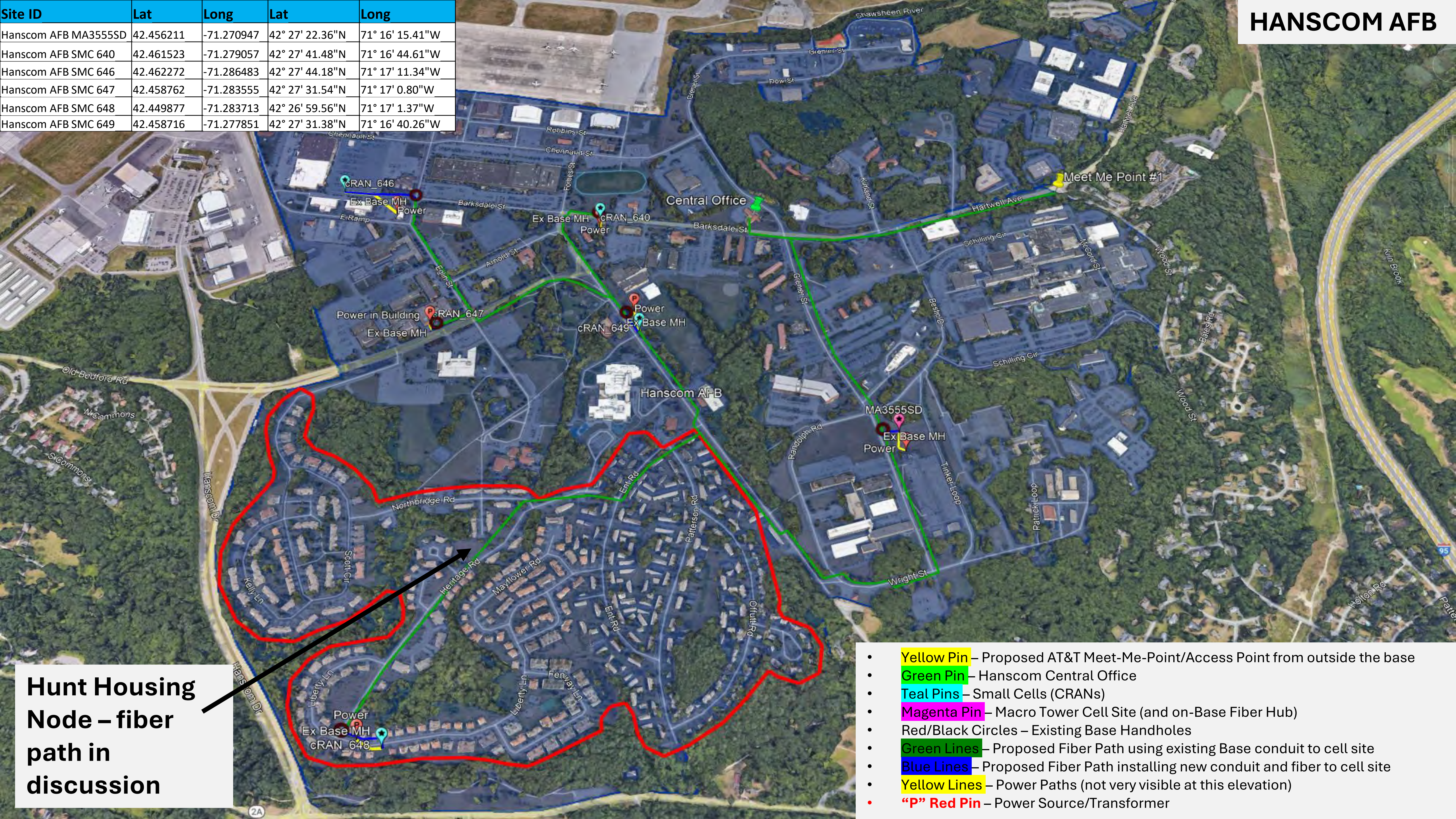
Appendix C – Site Plans

HANSCOM AFB

Site ID	Lat	Long	Lat	Long
Hanscom AFB MA3555SD	42.456211	-71.270947	42° 27' 22.36"N	71° 16' 15.41"W
Hanscom AFB SMC 640	42.461523	-71.279057	42° 27' 41.48"N	71° 16' 44.61"W
Hanscom AFB SMC 646	42.462272	-71.286483	42° 27' 44.18"N	71° 17' 11.34"W
Hanscom AFB SMC 647	42.458762	-71.283555	42° 27' 31.54"N	71° 17' 0.80"W
Hanscom AFB SMC 648	42.449877	-71.283713	42° 26' 59.56"N	71° 17' 1.37"W
Hanscom AFB SMC 649	42.458716	-71.277851	42° 27' 31.38"N	71° 16' 40.26"W



- Yellow Pin – Proposed AT&T Meet-Me-Point/Access Point from outside the base
- Green Pin – Hanscom Central Office
- Teal Pins – Small Cells (CRANs)
- Magenta Pin – Macro Tower Cell Site (and on-Base Fiber Hub)
- Red/Black Circles – Existing Base Handholes
- Green Lines – Proposed Fiber Path using existing Base conduit to cell site
- Blue Lines – Proposed Fiber Path installing new conduit and fiber to cell site
- Yellow Lines – Power Paths (not very visible at this elevation)
- **"P" Red Pin** – Power Source/Transformer

20 KW DIESEL DC GENERATOR
PART NUMBER V020DYA360TEC

All APUs include:

- Powder coated aluminum enclosure
- 8-alarm relay board
- Jump Start Kit
- OPV (Over-Fill Prevention Valve)
- IOT device for remote monitoring

Options available:

- Coastal Coating
- Oil refining kit

Standards:

- *UL STD 2200*
- *EPA Compliant*

Founded in 1979 Polar Power specialized in solar photovoltaic systems, solar air conditioning and refrigeration. We developed and provided photovoltaic charging controls for telecommunications in the 1980s along with DC generators for the military. In 1994 we were first to provideDC generators with remote control and monitoring to the telecommunications industry.

Polar's success is based on engineering generators to meet the very specific needs of each application. Telecom site optimization is best met with the DC generator technology as the loads and batteries are DC. It makes no sense to install an AC generator and convert the output to DC. The AC generators are designed for a wide range of applications and they are not specifically produced for telecom applications so there are issues with reliability, space, and fuel efficiency.

Polar can save you considerable time and cost in permitting, installing, purchasing, and maintaining a backup generator. We reduce CAPEX and OPEX costs while improving backup reliability.

SMALL FOOTPRINT, LIGHT WEIGHT. Polar’s vertical 270amp -48V DC generator is the lightest weight, most compact power source on the market for either prime or backup power applications. This 15kw model is sized to support growing telecom power needs associated with 5G or sites with multiple tenants. It fits where traditional generators won’t.

GREATLY REDUCED INSTALLATION COST. This generator is light weight and compact enough to be moved up to the roof in the elevator then up the stairs to the roof, saving the cost of a crane rental and long delays in crane permitting and street closures. The light weight also reduces or eliminates the need for structure or roof reinforcements. The Polar generator requires no ATS, saving on purchase, installation and reliability costs.

LOW ACOUSTIC NOISE. <66.0 dBA @ 7 meters (@ max load), and low vibration so as not to disturb the local residents or building landlords.

LOW MAINTENANCE COST. Serving long utility outages without maintenance breaks.

RODENT RESISTANT. Small animals can quickly destroy a generator set by gnawing on wires, fuel lines, radiator hoses, etc. Cooling air inlets and outlets have perforated aluminum screens to keep small rodents and large insects out. Stainless steel wire braid is placed over fuel and radiator lines to prevent damage.

LONG LIFE. Controls and wire harnesses are designed to exceed a 20-year life. Higher grade, longer life electrical wire (UL 3173), weather tight connectors, gold plated connector pins on signal circuits.

CORROSION RESISTANT. All-aluminum enclosure with stainless hardware for low maintenance, and long service life.

FUEL EFFICIENT. Up to 85% fuel savings due to smaller engine displacement, high efficiency alternator, and variable speed operation.

ADVANCED MONITORING. Included IoT device that provides secure real time data monitoring and remote diagnostics via CANBUS, RS232, and Edge compute abilities

OVER-FILL PREVENTION. Modified diesel fuel tank added to retrofit an Over-Fill Prevention Valve. This uses a float within the tank which increases the safety factor by closing the fuel inlet as diesel level rises. Special fill nozzle required.

SPECIFICATIONS PN V020DYA360TEC

Engine

Engine Model	Yanmar 3TNV88-BDSA
Cylinders	3 In-line
Displacement (L)	1.642
Bore (in./mm)	3.4/88
Stroke (in./mm)	3.5/90
Intake Air System	Naturally Aspirated
Engine HP	36 @ 3000RPM
Emissions Compliance	EPA and CARB Certified
Variable RPM	2300 to 3000

Engine lubrication system

Oil Filter Type	Full flow spin-on canister
Oil Capacity (L)	6.7
Oil Pressure Switch (standard)	Yes
Oil Pressure Transducer	Optional

Fuel tank

UL Rated Capacity (gal/L)	54/204
Run Time (hrs) 75% Load	30
Tank Alarms + Visual Gage	Yes
OPV (over-fill prevention valve)	Yes
Catch Basin (gal/L)	5/19
Listings	UL 142 (double wall)

Fuel tank reserve time

Load (kW)	Reserve Time (hrs.)
v3	147
6	97
9	65
10	58
11	57
12	55
13	53
14	52
15	50
20	30

Engine cooling system

Type	Pressurized Aluminum Radiator
Water Pump	Belt-driven, Pre-lubed, self-sealing
Fan Type	Electric Fans
Airflow CFM	1300
Fan Mode	Pusher
Temperature Sensor	Yes

Environmental

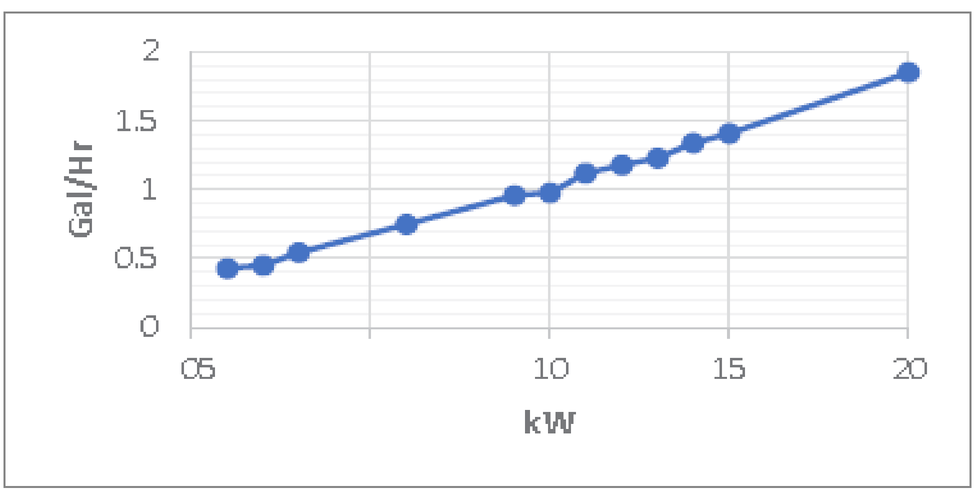
Operating Temperature (°C/°F)	-25 to +45 / -13 to 113
Operating Humidity %	100
Cold Start Aids	Required under-25°C

Power adjustment for conditions

Temperature Deration	1% derate for every 5.6 0C (10 0F) above 25 0C (77 0F)
Altitude Deration	3% derate for every 300 m (1000ft) above 91 m (300 ft)

Diesel Fuel system

Type	Diesel
Fuel Pump Type	Electrical
Injector Type	Mechanical
Fuel Filtering	Paper Element



Engine cooling

System coolant capacity (gal/L)	2.2/8.3

Alternator

Alternator Model	8220
Type	Permanent Magnets, NdFeB
Weight (lb/kg)	46.5/21
Regulation Type	Variable engine speed
Stator	3 phase/32 poles
Overcurrent Protection (A)	15 kW - 350
Disconnect Means	Pull fuse block or Circuit breaker
Voltage Range (VDC)	44 to 60
Alternator Exhaust Flow (cfm/cmm)	130 to 180 / 3.68 to 5.1
MTBF (hr)	100,000+

Enclosure

Model	88-25-0603
Type	Weather Protective
Materials	Powder coated aluminum
Door Hardware	Three Point with Padlock Hasp, and Removable Side Panels
Mounting	Secure Mounting Tabs
Dims.	L 50” x W 32” x H 72”

Weight

Dry Weight (lb/kg) Including pallet and packaging	1315/597 1425/647

Starter Supercapacitor

Model	20-16-0001
Storage Rating (Ah)	500
Voltage (VDC)	13-14.4
Weight (lb/kg)	12.1/5.5
Operating Temperature (°C/°F)	-40 to 65 / -40 to 149
Service Life (year)	10 to 15

Charger

Model	00-10-0015
Input Voltage (VDC)	37 to 62
Output Voltage (VDC)	14 to 14.4
Recharge time from 0 VDC (min)	10
Recharge time from 8 VDC (min)	2
Weight (lb/kg)	2.2/1

Standards

Certification	Intertek 400376
UL Listing	UL STD 2200
Standards	CSA STD C22.2 No. 100

Controller features

Controller Type..Supra Model 250
4-Line Plain Text OLED Display .... Simple user interface for ease of operation
Engine Run Hours Indication .... Standard
Programmable Start Delay.. Standard
Run/Alarm/Maintenance Logs .... Standard
Engine Start Sequence.. Cyclic cranking: 5 sec on, 30 sec rest (6 attempts maximum)
Starter Supercapacitor Charger.. Standard
Automatic Voltage Regulation with Over and Under Voltage Protection .... Standard
Automatic Low Oil Pressure/High Oil Temperature Shutdown .... Standard
Overcrank/Overspeed.. Standard
Automatic High Engine Temperature Shutdown... Standard
Field Upgradeable Firmware.. Standard
Glow Plug Delay .... Adjustable
Engine Start Delay.. Adjustable, Set at 30 sec
Return to Utility Delay.. Adjustable, Set at 30 sec
Engine Cool-down .... Adjustable, Set at 30 sec
Exerciser... Programmable

Monitoring

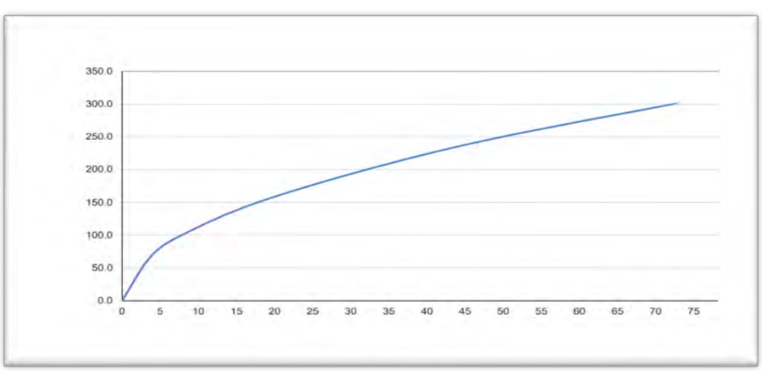
Alarm monitoring and remote control through Ethernet.

Contact closure alarm board

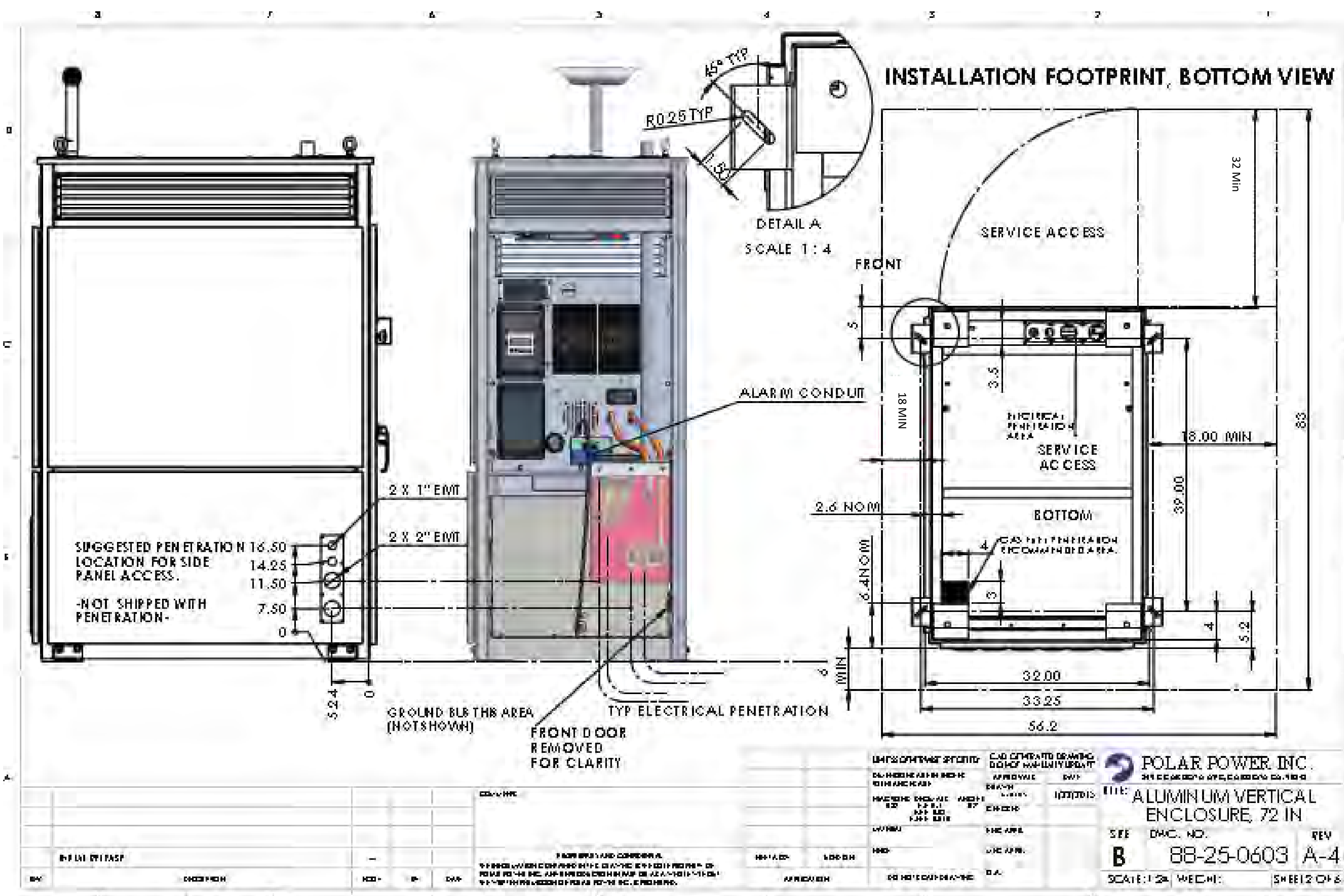
Shutdown Alarm.. Standard
Warning Alarm .... Standard
Engine Run .... Standard
E-Stop Depressed.. Standard

OPV

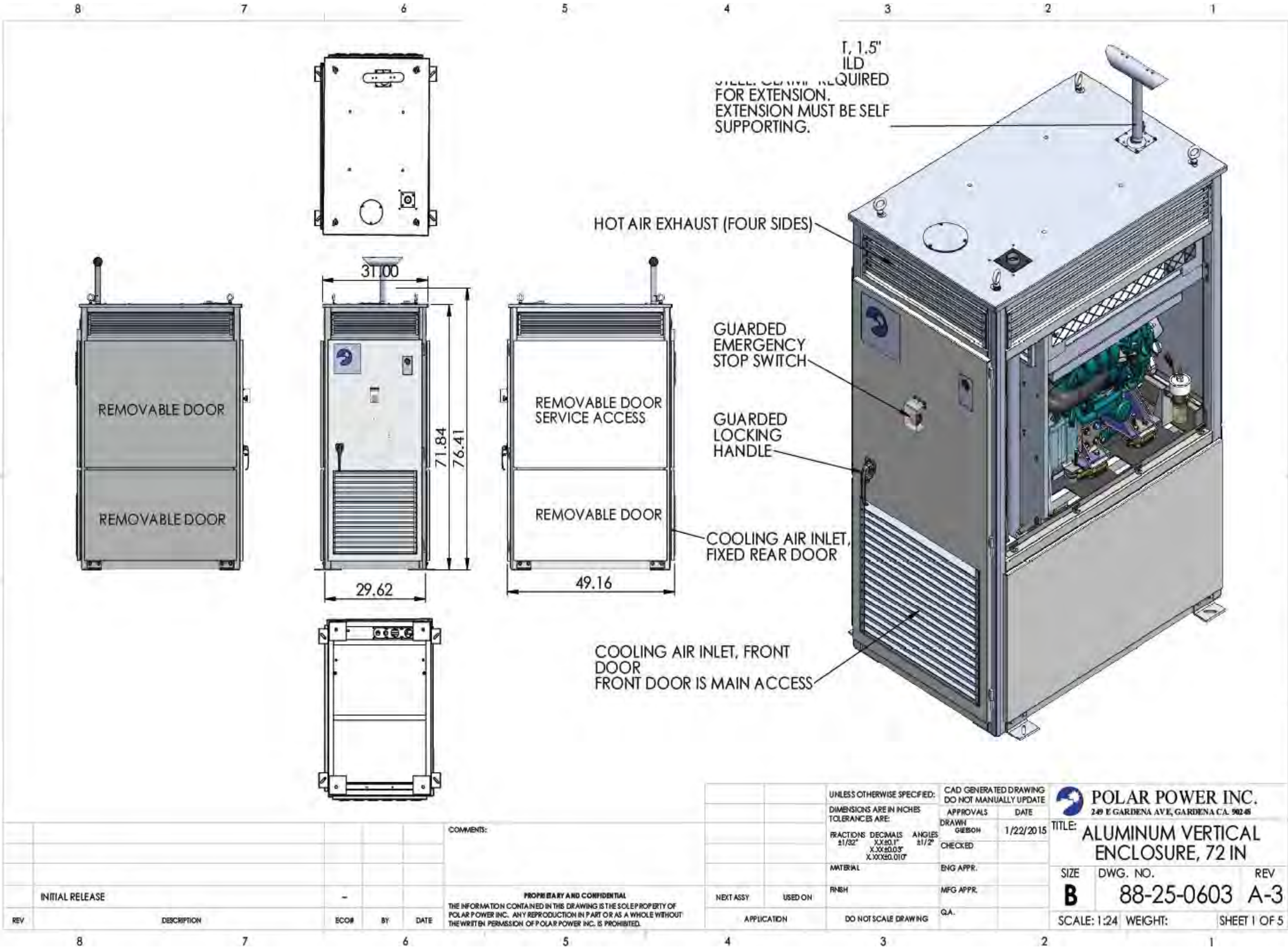
Min / Max Flow Pressure	5 PSI / 100 PSI
Connection	2” Cam Lock
Fluid Compatibility	Diesel, Biodiesel
Standards	ULC-S661-10 / NFPA 30, 30A



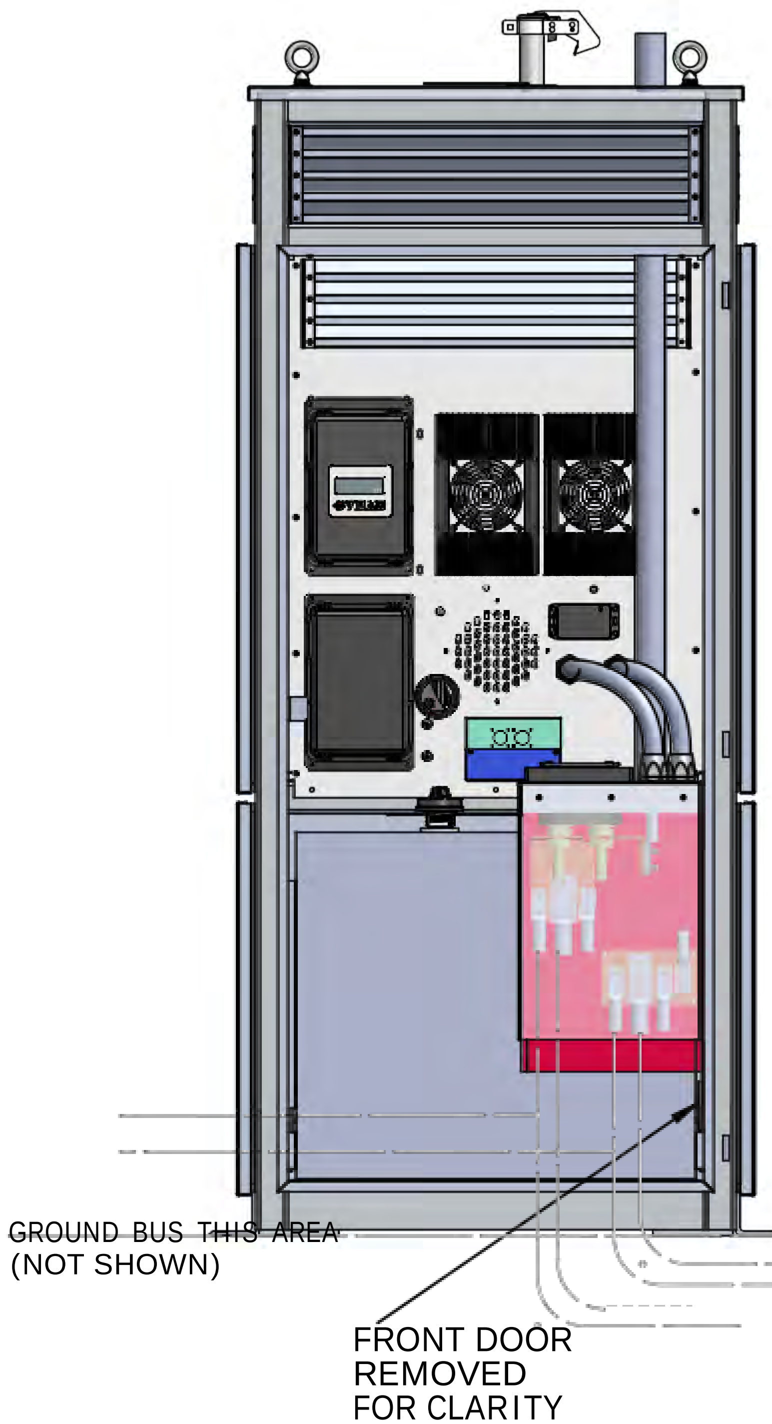
20kW DIMENSIONS V020DYA360TEC

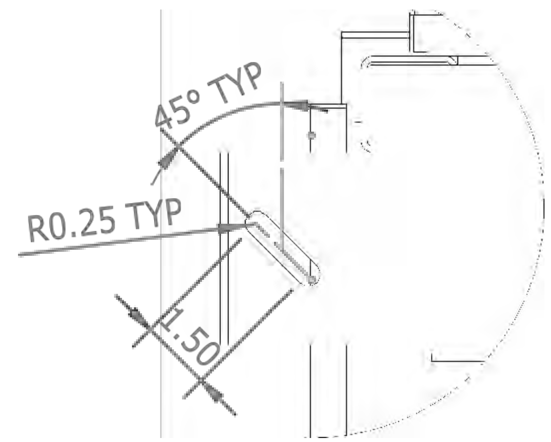


V020DYA360TEC 20kW Elevation Drawing



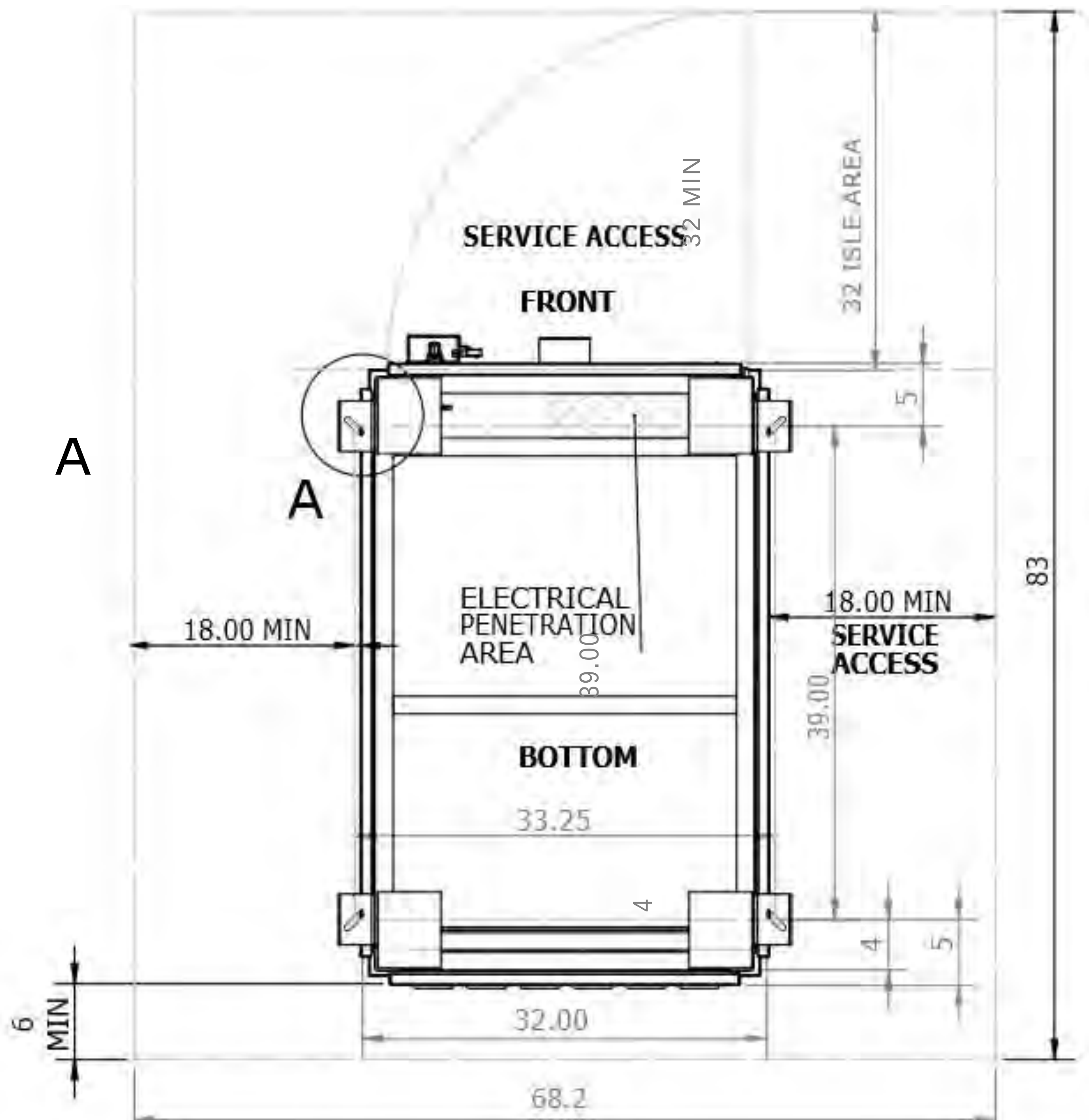
INSTALLATION FOOTPRINT





DETAIL A

SCALE 1 : 4



UNLESS OTHERWISE SPECIFIED:

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

POLAR POWER INC.

2520 AVALON BLVD, CARSON, CA 90745

DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32"
DECIMALS X.X±0.1" X.XX±0.03" X.XXX±0.010"
ANGLES ±1/2°
MATERIAL
FINISH

APPROVALS | DATE
DRAWN GLEESON 1/22/2015
CHECKED
ENG APPR.
MFG APPR.

TITLE:
ALUMINUM VERTICAL
ENCLOSURE, 72 IN

SIZE B
DWG. NO. 88-25-0603
REV

COMMENTS:

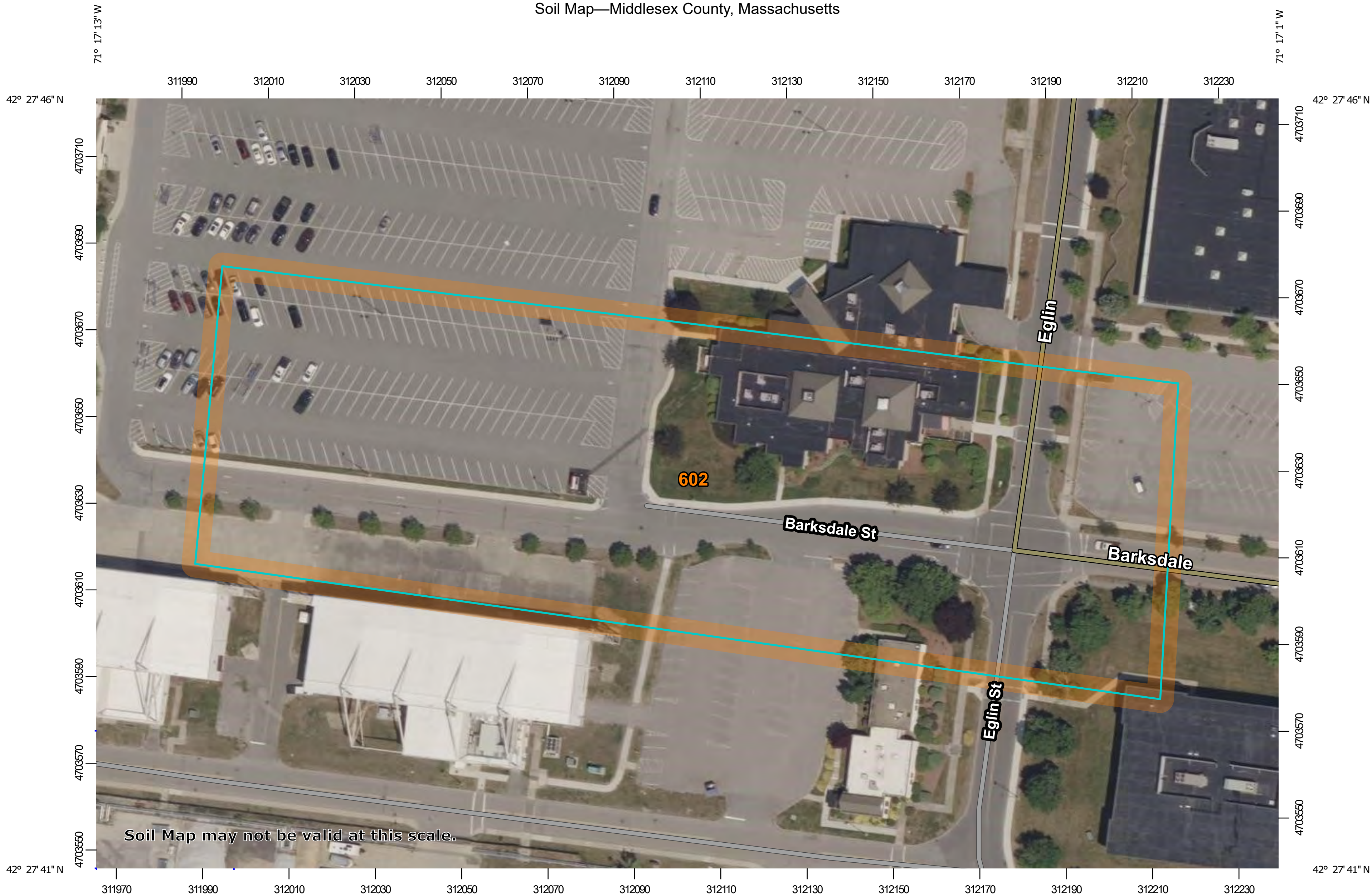
NEXT ASSY
USED ON

INITIAL RELEASE --

REV

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF

Appendix D – Soil Maps



Map Scale: 1:1,250 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	3.9	100.0%
Totals for Area of Interest		**3.9**	**100.0%**

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Middlesex County, Massachusetts

April 22, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

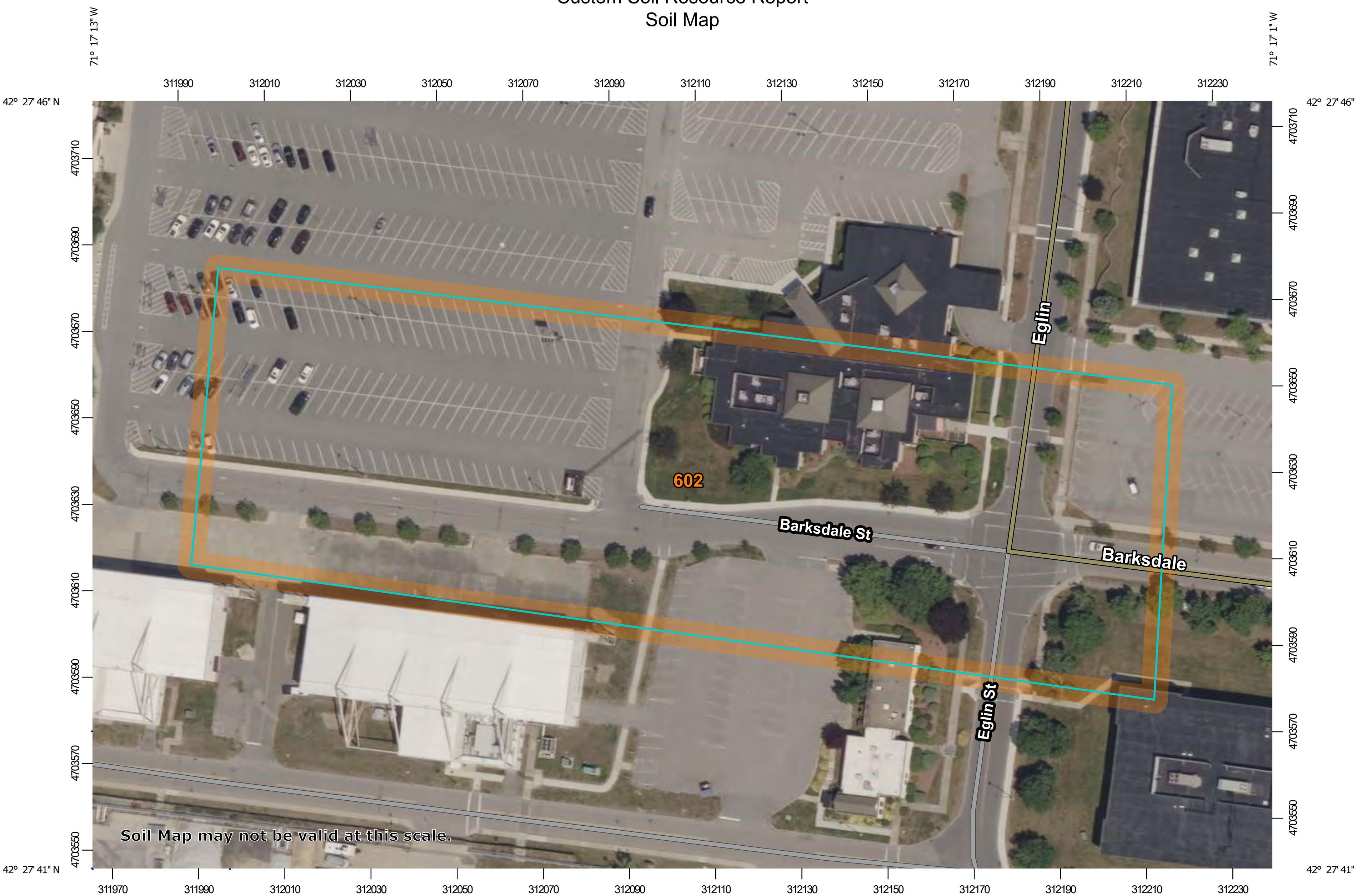
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:1,250 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Web Soil Survey URL:
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Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	3.9	100.0%
Totals for Area of Interest		**3.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 5 percent
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

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Soil Map—Middlesex County, Massachusetts

Map Scale: 1:254 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 3, 7, 14, 21

Feet: 0, 10, 20, 40, 60

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	0.3	100.0%
Totals for Area of Interest		**0.3**	**100.0%**

United States Department of Agriculture

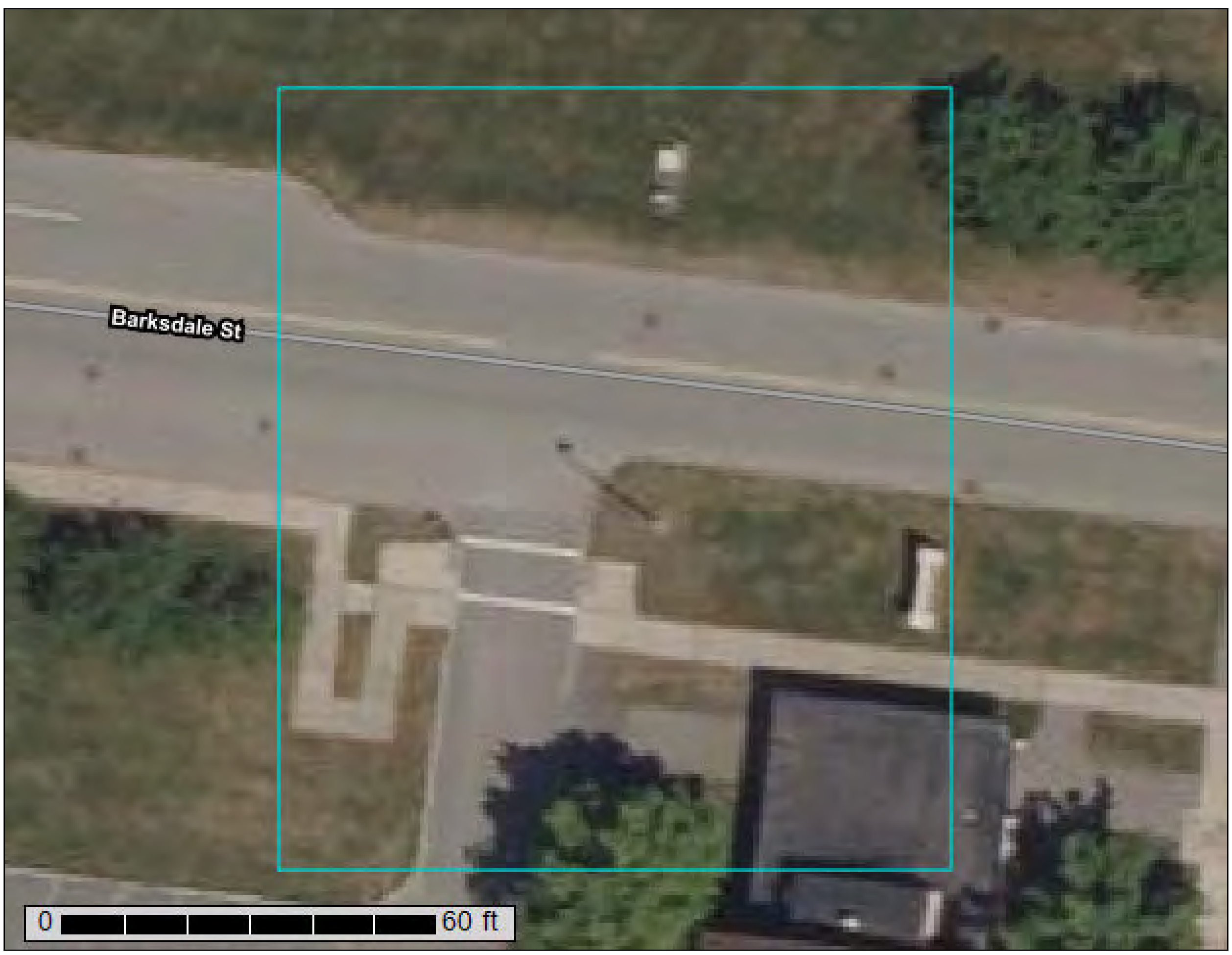
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Middlesex County, Massachusetts



April 22, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:254 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 3, 7, 14, 21

Feet: 0, 10, 20, 40, 60

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
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- Closed Depression
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- Gravelly Spot
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- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
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- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
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Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	0.3	100.0%
Totals for Area of Interest		**0.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

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Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 5 percent
Hydric soil rating: No

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United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

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Soil Map—Middlesex County, Massachusetts

Map Scale: 1:543 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 5, 10, 20, 30

Feet: 0, 25, 50, 100, 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	1.2	100.0%
Totals for Area of Interest		**1.2**	**100.0%**

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Middlesex County, Massachusetts

April 22, 2024

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Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

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Feet: 0, 25, 50, 100, 150

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MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	1.2	100.0%
Totals for Area of Interest		**1.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 5 percent
Hydric soil rating: No

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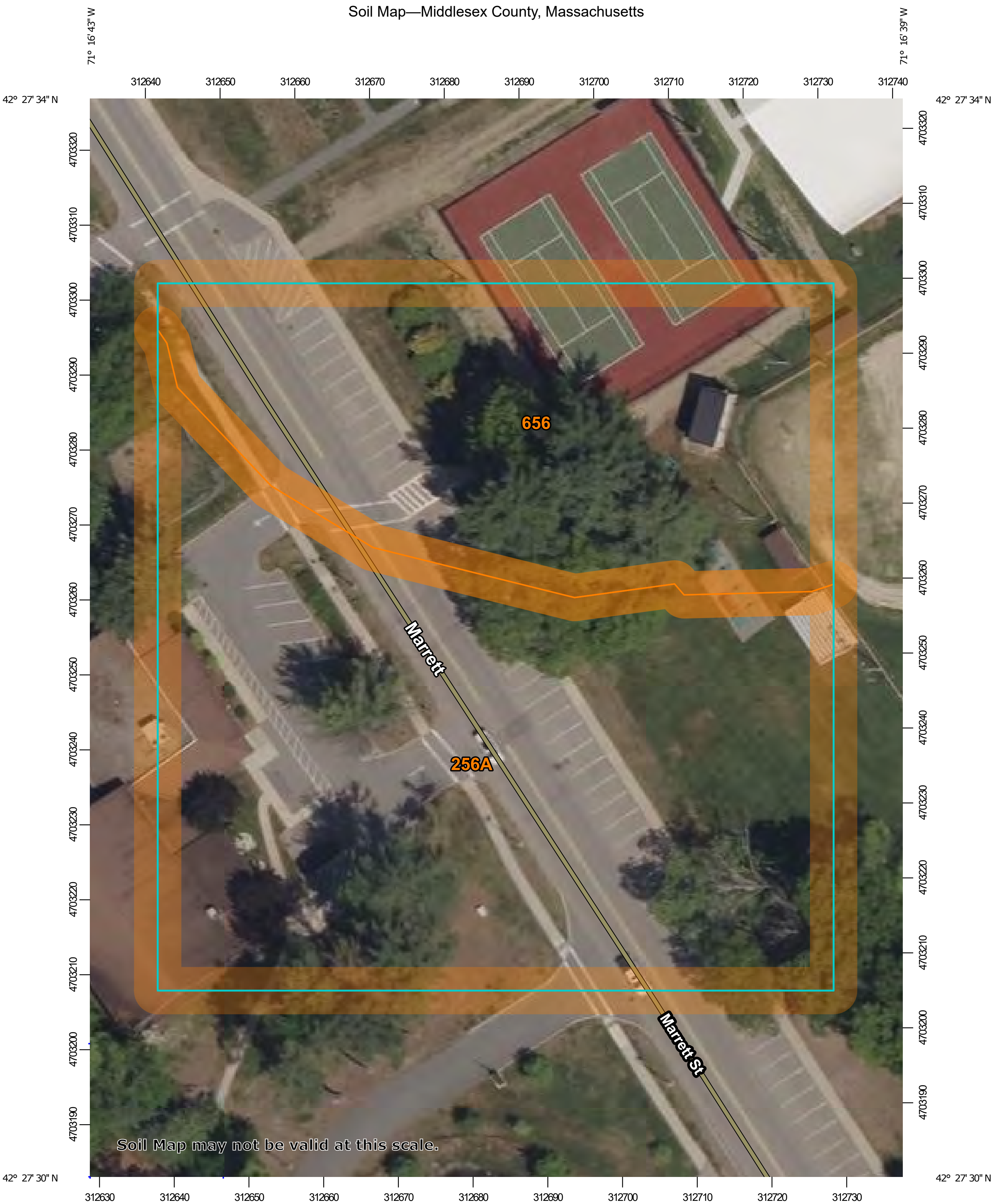
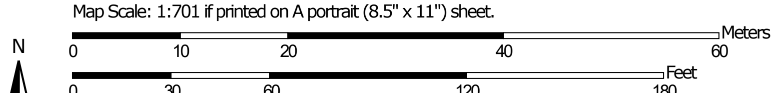


Map Scale: 1:701 if printed on A portrait (8.5" x 11") sheet.



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Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

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Map Unit Legend

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256A	Deerfield loamy fine sand, 0 to 3 percent slopes	1.3	62.8%
656	Udorthents-Urban land complex	0.8	37.2%
Totals for Area of Interest		**2.1**	**100.0%**

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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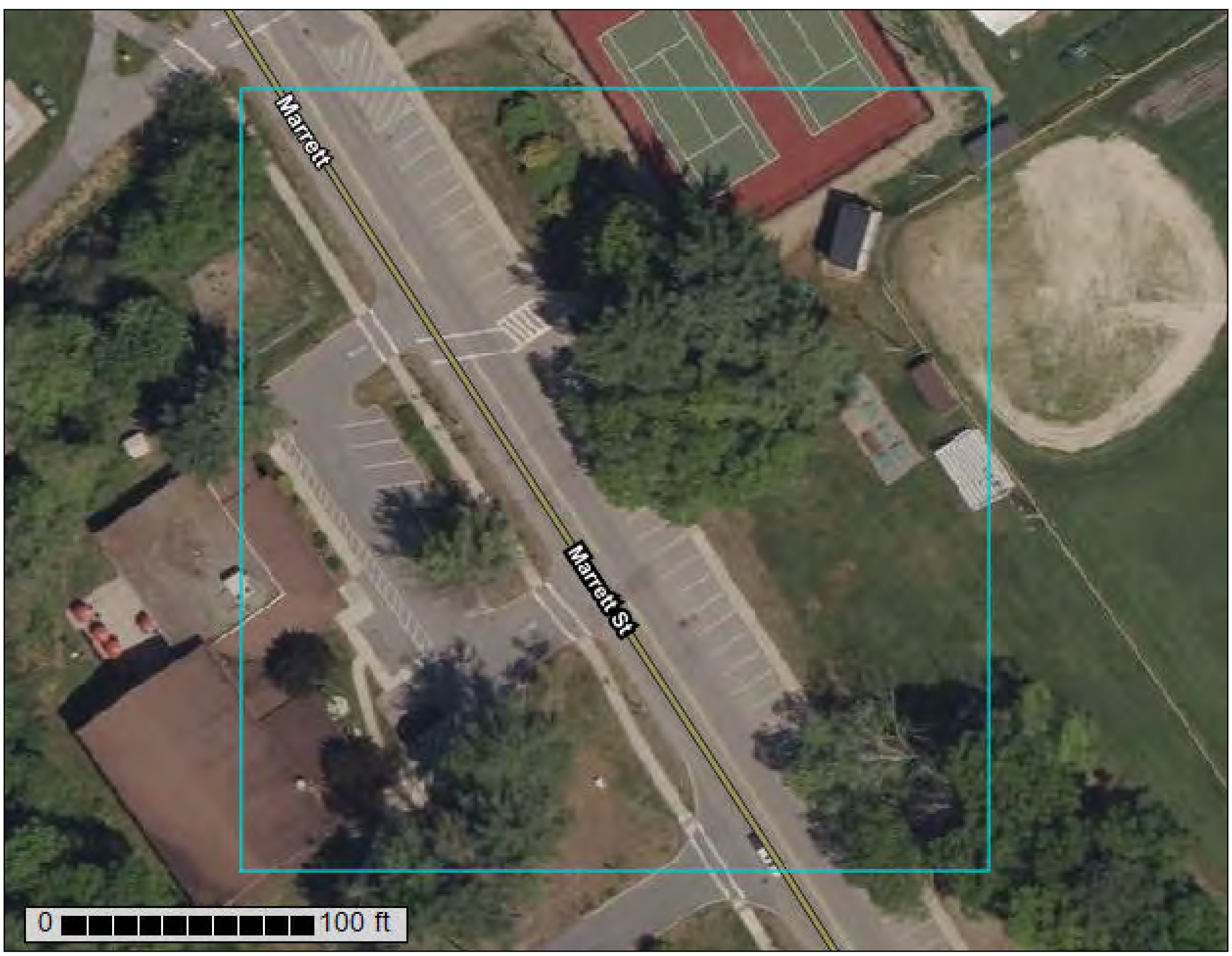
Custom Soil Resource Report for

Middlesex County, Massachusetts



April 22, 2024

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Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

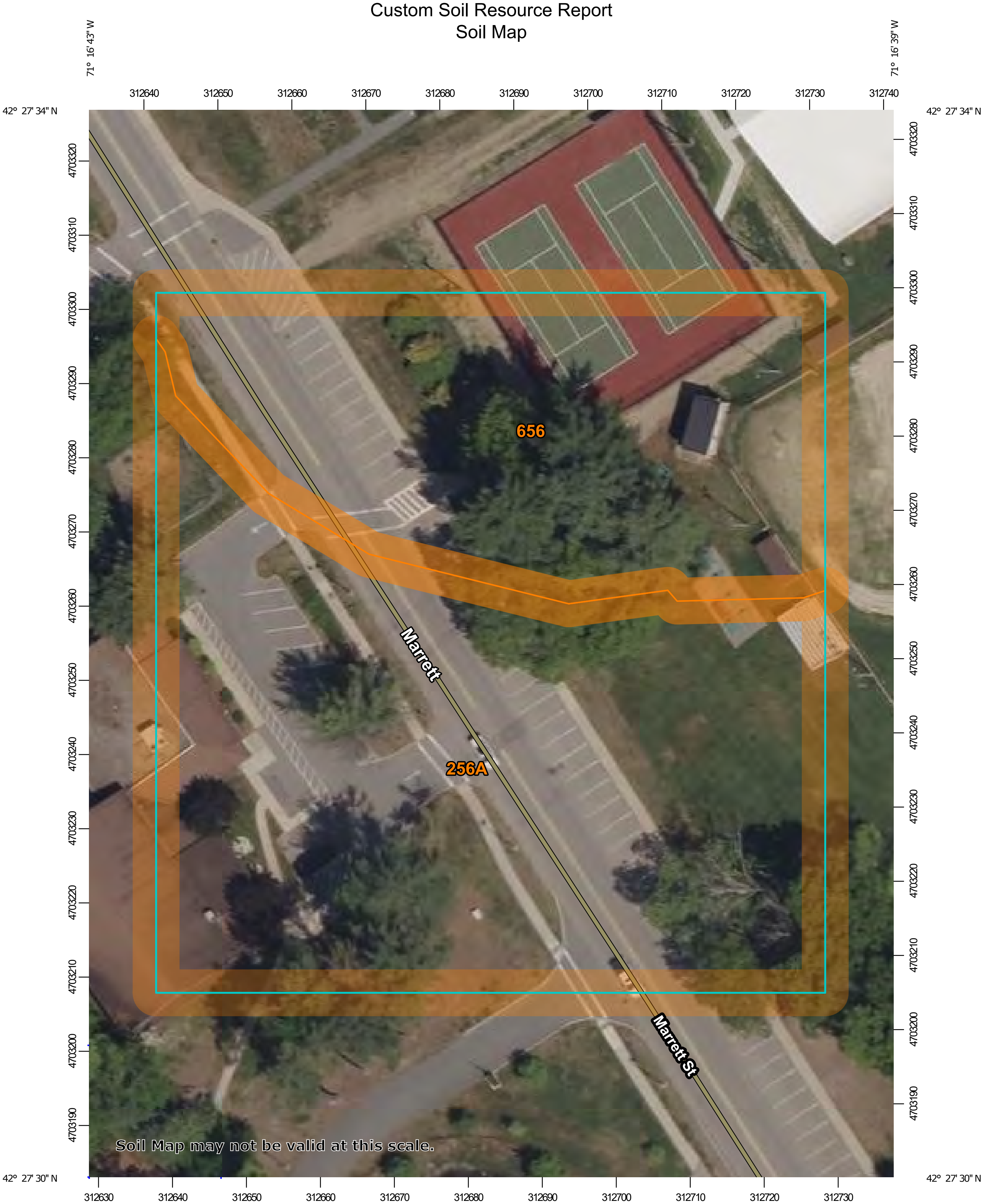
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:701 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 10, 20, 40, 60

Feet: 0, 30, 60, 120, 180

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	1.3	62.8%
656	Udorthents-Urban land complex	0.8	37.2%
Totals for Area of Interest		**2.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Deerfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Kame terraces, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

656—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 995k
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 45 percent
Urban land: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Canton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Paxton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Terraces, plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 66TH AIR BASE GROUP
HANSCOM AIR FORCE BASE MASSACHUSETTS

4 November 2024

MEMORANDUM FOR RECORD

SUBJECT: Assessment of Farmland Impact, Hanscom Cell Tower Environmental Assessment

1. The Proposed Action area includes an area meeting the definition of farmland of statewide importance, which is included in the definition of "farmland" regulated under the Farmland Protection Policy Act and implementing regulations (7 CFR 658.2(a)). As a result, the Department of the Air Force (DAF) is required to make an effects determination. Federal agencies are to assess the suitability of each proposed site or design alternative for protection as farmland along with the score from the land evaluation criterion described in 7 CFR § 658.5(a).

2. The assessment (attached) concludes that the proposed action scores 0 out of a total 160 possible points. The DAF therefore concludes that the proposed action will have No Effect to farmland as defined in the Farmland Protection Policy Act.

3. Please direct any questions to the Hanscom Natural Resources Manager, Mr. Scott Sheehan, 66 ABG/CEIE, scott.sheehan.1@us.af.mil, or (781) 225-6144.

SCOTT E. SHEEHAN, GS-12, DAF
Hanscom AFB Cultural Resources Manager

Attachment:
Farmland Protection Policy Act Assessment

Farmland Protection Policy Act Assessment

Federal agencies are (a) to use the criteria to identify and take into account the adverse effects of their programs on the preservation of farmland, (b) to consider alternative actions, as appropriate, that could lessen adverse effects, and (c) to ensure that their programs, to the extent practicable, are compatible with State and units of local government and private programs and policies to protect farmland.

Site being assessed:

Small cell locations at Marrett Rd (cRAN_649)
Soil designation 256A
Potential impact: ground disturbance consists of a single 2-foot x 2-foot auger hole for the installation of a small cell tower node on a monopole

Site Assessment Criteria:
Federal agencies are to use the following criteria to assess the suitability of each proposed site or design alternative for protection as farmland along with the score from the land evaluation criterion described in 7 CFR § 658.5(a). Each criterion will be given a score on a scale of 0 to the maximum points shown. Conditions suggesting top, intermediate and bottom scores are indicated for each criterion. The agency would make scoring decisions in the context of each proposed site or alternative action by examining the site, the surrounding area, and the programs and policies of the State or local unit of government in which the site is located. Where one given location has more than one design alternative, each design should be considered as an alternative site.

Site assessment:

(1) How much land is in nonurban use within a radius of 1.0 mile from where the project is intended?

___ More than 90 percent—15 points
___ 90 to 20 percent—14 to 1 point(s)
_X_ Less than 20 percent—0 points

(2) How much of the perimeter of the site borders on land in nonurban use?

___ More than 90 percent—10 points
___ 90 to 20 percent—9 to 1 point(s)
_X_ Less than 20 percent—0 points

(3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than 5 of the last 10 years?

___ More than 90 percent—20 points
___ 90 to 20 percent—19 to 1 points(s)
_X_ Less than 20 percent—0 points

(4) Is the site subject to State or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?

___ Site is protected—20 points
_X_ Site is not protected—0 points

(5) How close is the site to an urban built-up area?

___ The site is 2 miles or more from an urban built-up area—15 points
___ The site is more than 1 mile but less than 2 miles from an urban built-up area—10 points
___ The site is less than 1 mile from, but is not adjacent to an urban built-up area—5 points
_X_ The site is adjacent to an urban built-up area—0 points

(6) How close is the site to water lines, sewer lines and/or other local facilities and services whose capacities and design would promote nonagricultural use?

___ None of the services exist nearer than 3 miles from the site—15 points
___ Some of the services exist more than 1 but less than 3 miles from the site—10 points
_X_ All of the services exist within 1⁄2 mile of the site—0 points

(7) Is the farm unit(s) containing the site (before the project) as large as the average-size farming unit in the county? (Average farm sizes in each county are available from the NRCS field offices in each State. Data are from the latest available Census of Agriculture, Acreage of Farm Units in Operation with $1,000 or more in sales.)

___ As large or larger—10 points
_X_ Below average—deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average—9 to 0 points ***(<50%, therefore 0 points)***

(8) If this site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?

___ Acreage equal to more than 25 percent of acres directly converted by the project—10 points
___ Acreage equal to between 25 and 5 percent of the acres directly converted by the project—9 to 1 point(s)
_X_ Acreage equal to less than 5 percent of the acres directly converted by the project—0 Points ***(no land on farm exists, therefore 0% and 0 points)***

(9) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?

___ All required services are available—5 points
___ Some required services are available—4 to 1 point(s)
_X_ No required services are available—0 points

(10) Does the site have substantial and well-maintained on-farm investments such as barns, other storage buildings, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?

___ High amount of on-farm investment—20 points

___ Moderate amount of on-farm investment—19 to 1 point(s)
_X_ No on-farm investment—0 points

(11) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?

___ Substantial reduction in demand for support services if the site is converted—10 points
___ Some reduction in demand for support services if the site is converted—9 to 1 point(s)
_X_ No significant reduction in demand for support services if the site is converted—0 points

(12) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?

___ Proposed project is incompatible with existing agricultural use of surrounding farmland—10 points
___ Proposed project is tolerable to existing agricultural use of surrounding farmland—9 to 1 point(s)
_X_ Proposed project is fully compatible with existing agricultural use of surrounding farmland—0 points

Total score: 0 Points (out of potential 160 points)

Conclusion:

As the proposed action scores 0, it is assessed to have no impact to farmland as defined in the Farmland Protection Policy Act.

Soil Map—Middlesex County, Massachusetts

Map Scale: 1:1,140 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 15, 30, 60, 90

Feet: 0, 50, 100, 200, 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	1.9	47.9%
656	Udorthents-Urban land complex	2.1	52.1%
Totals for Area of Interest		**4.0**	**100.0%**

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
Middlesex County, Massachusetts

April 22, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

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Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:1,140 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 15, 30, 60, 90

Feet: 0, 50, 100, 200, 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
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- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Map Unit Legend

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602	Urban land	1.9	47.9%
656	Udorthents-Urban land complex	2.1	52.1%
Totals for Area of Interest		**4.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 5 percent
Hydric soil rating: No

656—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 995k
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 54 inches

Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 45 percent
Urban land: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Canton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Paxton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Terraces, plains
Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

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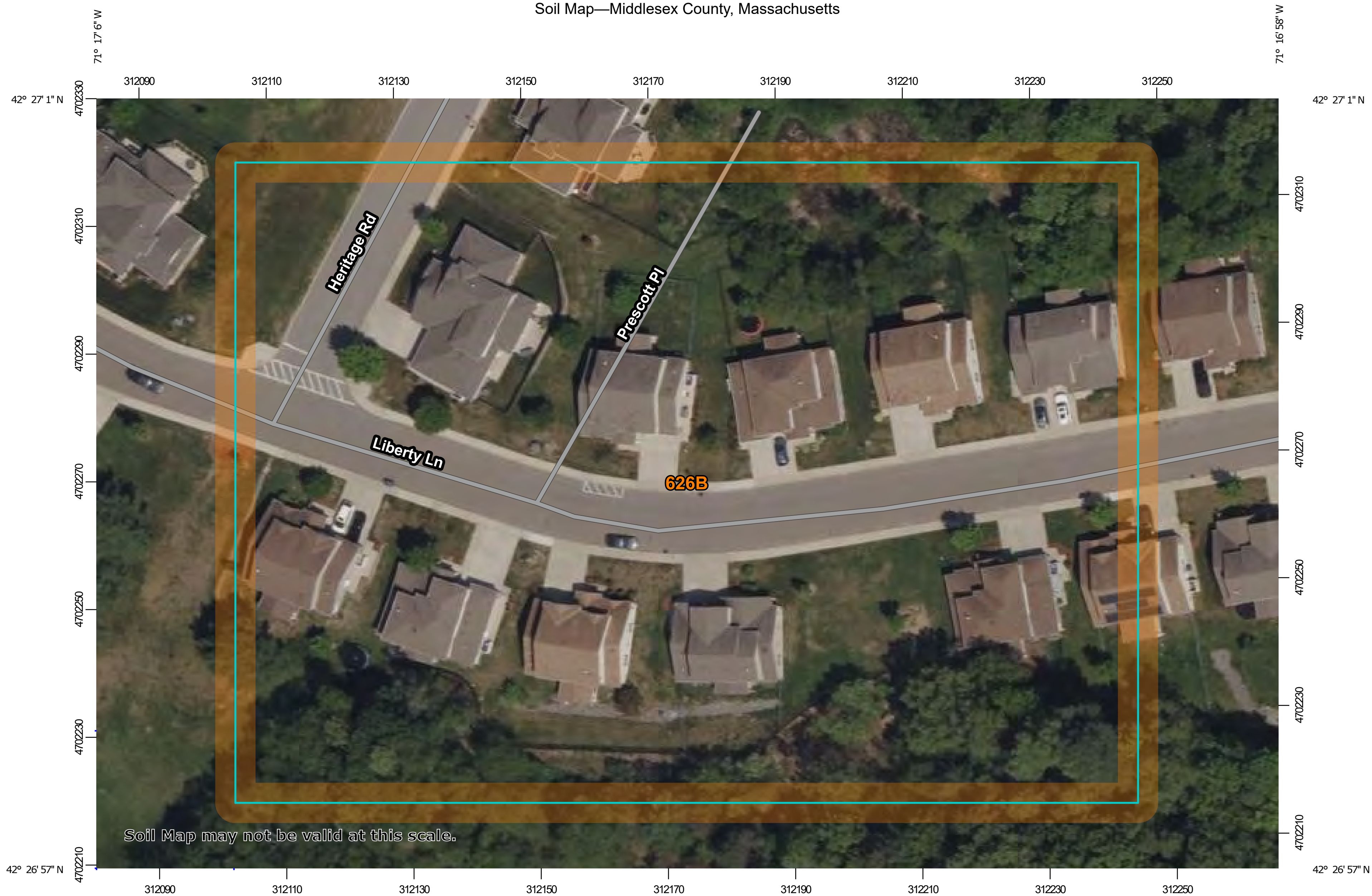
Soil Map—Middlesex County, Massachusetts



Map Scale: 1:849 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 10 20 40 60

Feet: 0 40 80 160 240

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Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:849 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 10, 20, 40, 60

Feet: 0, 40, 80, 160, 240

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	3.5	100.0%
Totals for Area of Interest		**3.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

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Appendix E – ACAM Results

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF CONFORMITY ANALYSIS (ROCA)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform a net change in emissions analysis to assess the potential air quality impact/s associated with the action. The analysis was performed in accordance with the Air Force Manual 32-7002, *Environmental Compliance and Pollution Prevention*; the *Environmental Impact Analysis Process* (EIAP, 32 CFR 989); the *General Conformity Rule* (GCR, 40 CFR 93 Subpart B); and the *USAF Air Quality Environmental Impact Analysis Process (EIAP) Guide*. This report provides a summary of the ACAM analysis.

Report generated with ACAM version: 5.0.23a

a. Action Location:
Base: HANSCOM AFB
State: Massachusetts
County(s): Middlesex
Regulatory Area(s): Boston-Lawrence-Worcester (E. MA), MA

b. Action Title: Boldyn Tower

c. Project Number/s (if applicable): NA

d. Projected Action Start Date: 8 / 2024

e. Action Description:

The Proposed Action would install an AT&T FirstNet ommunications network on Hanscom AFB to improve wireless coverage and capacity. AT&T, in partnership with Boldyn Networks, will construct and install five small cell nodes and one macro tower. The small cell and macro tower structures would be built, owned, and maintained by Boldyn Networks with AT&T's radios and antennas installed on the infrastructure. This will would allow AT&T to propagate a more robust network for its FirstNet Communications and increase improvements in wireless coverage and capacity throughout the base and surrounding communities. The macro tower will would be a 150' monopole (155' with lighting rod) within a 75' x 75' fenced compound. The tower will would be capable of hosting up to three wireless telecommunications carriers, or providers, . The small cell nodes will be installed at various locations on Hanscom AFB. Each node will be a metal monopole approximately 40' tall and painted to match existing light poles on base. Each pole will have an attached equipment cabinet.

The Proposed Action will would also include installing power and fiber lines to each node, fiber lines to existing buildings and the meet-me-point (MMP) and a gravel access drive to the macro tower compound. New underground conduit will would be installed where existing conduit is not available.

AT&T will would lease land for the macro tower and associated equipment compound from Hanscom AFB. All work to install the tower, nodes, fiber and power, and any additional tasks will would be completed by contractors hired by Boldyn Networks.

HAFB, not Bolydyn Networks, would remove and relocate existing stormwater catch basins, manholes and pipelines to allow construction of the tower. This effort includes the removal and installation of up to 300 linear feet of concrete pipe (3000 square feet (6000 cubic feet) of ground disturbance on previously disturbed land. The effort also included the removal of five existing manholes and the addition of one manhole (600 square feet (4800 cubic feet) of ground disturbance of previously disturbed land.

f. Point of Contact:
Name: James Maravelias
Title: GS-11/NEPA Program Manager
Organization: 66 ABG/CEIE

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF CONFORMITY ANALYSIS (ROCA)

2. Analysis: Total reasonably foreseeable net change in direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" (highest annual emissions) and "steady state" (no net gain/loss in emission stabilized and the action is fully implemented) emissions. General Conformity under the Clean Air Act, Section 1.76 has been evaluated for the action described above according to the requirements of 40 CFR 93, Subpart B.

All emissions estimates were derived from various sources using the methods, algorithms, and emission factors from the most current *Air Emissions Guide for Air Force Stationary Sources*, *Air Emissions Guide for Air Force Mobile Sources*, and/or *Air Emissions Guide for Air Force Transitory Sources*. For greater details of this analysis, refer to the Detail ACAM Report.

____ applicable
_X_ not applicable

Conformity Analysis Summary:

2024 – Construction

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
Boston-Lawrence-Worcester (E. MA), MA			
VOC	0.005	50	No
NOx	0.041	100	No
CO	0.062	-	No
SOx	0.000	-	No
PM 10	0.037	-	No
PM 2.5	0.001	-	No
Pb	0.000	-	No
NH3	0.000	-	No

2025 – Construction/Operating (Steady State)

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
Boston-Lawrence-Worcester (E. MA), MA			
VOC	0.059	50	No
NOx	0.523	100	No
CO	0.610	-	No
SOx	0.002	-	No
PM 10	0.193		No
PM 2.5	0.023	-	No
Pb	0.000	-	No
NH3	0.001	-	No

2026 – Operating (Steady State)

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
Boston-Lawrence-Worcester (E. MA), MA			
VOC	0.001	50	No
NOx	0.004	100	No
CO	0.003	-	No
SOx	0.001	-	No
PM 10	0.001	-	No
PM 2.5	0.001	-	No
Pb	0.000	-	No
NH3	0.000	-	No

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF CONFORMITY ANALYSIS (ROCA)

The Criteria Pollutants (or their precursors) with a General Conformity threshold listed in the table above are pollutants within one or more designated nonattainment or maintenance area/s for the associated National Ambient Air Quality Standard (NAAQS). These pollutants are driving this GCR Applicability Analysis. Pollutants exceeding the GCR thresholds must be further evaluated potentially through a GCR Determination.

The pollutants without a General Conformity threshold are pollutants only within areas designated attainment for the associated NAAQS. These pollutants have an insignificance indicator for VOC, NOx, CO, SOx, PM 10, PM 2.5, and NH3 of 250 ton/yr (Prevention of Significant Deterioration major source threshold) and 25 ton/yr for Pb (GCR de minimis value). Pollutants below their insignificance indicators are at rates so insignificant that they will not cause or contribute to an exceedance of one or more NAAQSs. These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Refer to the *Level II, Air Quality Quantitative Assessment Insignificance Indicators* for further details.

None of the annual net change in estimated emissions associated with this action are above the GCR threshold values established at 40 CFR 93.153 (b); therefore, the proposed Action has an insignificant impact on Air Quality and a General Conformity Determination is not applicable.

James Maravelias, GS-11/NEPA Program Manager	Jun 24 2024
Name, Title	**Date**

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: HANSCOM AFB
State: Massachusetts
County(s): Middlesex
Regulatory Area(s): Boston-Lawrence-Worcester (E. MA), MA

- Action Title: Boldyn Tower

- Project Number/s (if applicable):

- Projected Action Start Date: 8 / 2024

- Action Purpose and Need:
The purpose of the Proposed Action is to improve and enhance wireless coverage and capacity of AT&T FirstNet Communications within Middlesex County to include Hanscom AFB. Currently, first responders rely on thousands of different radio networks for communication with each other. This presents a major problem in times of emergency and within parts of the United States lacking adequate coverage such as Hanscom and the surrounding communities. In areas with poor coverage, attempts to respond to any emergency are often met with significant delays – which may result in otherwise preventable disasters such as death or injury of those in need. First responders have first priority of the FirstNet bandwidth while using FirstNet devices during an emergency event; however, commercial users also benefit. AT&T can use the FirstNet infrastructure to provide improved commercial cell service coverage when there is no need to utilize FirstNet first responder prioritization of the signal.

- Action Description:
The Proposed Action would install an AT&T FirstNet ommunications network on Hanscom AFB to improve wireless coverage and capacity. AT&T, in partnership with Boldyn Networks, will construct and install five small cell nodes and one macro tower. The small cell and macro tower structures would be built, owned, and maintained by Boldyn Networks with AT&T's radios and antennas installed on the infrastructure. This will would allow AT&T to propagate a more robust network for its FirstNet Communications and increase improvements in wireless coverage and capacity throughout the base and surrounding communities. The macro tower will would be a 150' monopole (155' with lighting rod) within a 75' x 75' fenced compound. The tower will would be capable of hosting up to three wireless telecommunications carriers, or providers, . The small cell nodes will be installed at various locations on Hanscom AFB. Each node will be a metal monopole approximately 40' tall and painted to match existing light poles on base. Each pole will have an attached equipment cabinet.
The Proposed Action will would also include installing power and fiber lines to each node, fiber lines to existing buildings and the meet-me-point (MMP) and a gravel access drive to the macro tower compound. New underground conduit will would be installed where existing conduit is not available.
AT&T will would lease land for the macro tower and associated equipment compound from Hanscom AFB. All work to install the tower, nodes, fiber and power, and any additional tasks will would be completed by contractors hired by Boldyn Networks.

HAFB, not Bolydyn Networks, would remove and relocate existing stormwater catch basins, manholes and pipelines to allow construction of the tower. This effort includes the removal and installation of up to 300 linear feet of concrete pipe (3000 square feet (6000 cubic feet) of ground disturbance on previously disturbed land. The effort also included the removal of five existing manholes and the addition of one manhole (600 square feet (4800 cubic feet) of ground disturbance of previously disturbed land.

- Point of Contact
Name: James Maravelias
Title: GS-11/NEPA Program Manager
Organization: 66 ABG/CEIE

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Report generated with ACAM version: 5.0.23a

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Remove and Relocate Storwater Pipeline
3.	Construction / Demolition	Tower Construction Including Site Grading
4.	Emergency Generator	Emergency Generator
5.	Tanks	Emergency generator tank

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Construction / Demolition

2.1 General Information & Timeline Assumptions

- Activity Location

County: Middlesex

Regulatory Area(s): Boston-Lawrence-Worcester (E. MA), MA

- Activity Title: Remove and Relocate Storwater Pipeline

- Activity Description:

- Activity Start Date

Start Month: 8

Start Month: 2024

- Activity End Date

Indefinite: False

End Month: 8

End Month: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.005295
SO_x	0.000075
NO_x	0.040530
CO	0.061897

Pollutant	Total Emissions (TONs)
PM 10	0.037402
PM 2.5	0.001461
Pb	0.000000
NH_3	0.000121

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.000350
N_2O	0.000077

Pollutant	Total Emissions (TONs)
CO_2	8.465277
CO_2e	8.497030

- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.000350
N_2O	0.000077

Pollutant	Total Emissions (TONs)
CO_2	8.465277
CO_2e	8.497030

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

2.1 Trenching/Excavating Phase

2.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 8
Start Quarter: 1
Start Year: 2024

- Phase Duration
Number of Month: 1
Number of Days: 0

2.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 3600
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Trenching Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	2	8
Other General Industrial Equipmen Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

2.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/hp-hour) (default)

Excavators Composite [HP: 36] [LF: 0.38]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.41507	0.00542	3.50127	4.19664	0.11916	0.10962
Other General Industrial Equipmen Composite [HP: 35] [LF: 0.34]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.54521	0.00542	3.85582	4.77621	0.16518	0.15196
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.21500	0.00489	2.19159	3.49485	0.09716	0.08939

- Construction Exhaust Greenhouse Gasses Pollutant Emission Factors (g/hp-hour) (default)

Excavators Composite [HP: 36] [LF: 0.38]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02382	0.00476	587.31685	589.33237
Other General Industrial Equipmen Composite [HP: 35] [LF: 0.34]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02386	0.00477	588.15144	590.16982
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02150	0.00430	529.93313	531.75173

- Vehicle Exhaust & Worker Trips Criteria Pollutant Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	NH_3
LDGV	0.26432	0.00181	0.15691	3.59599	0.00505	0.00447	0.05463
LDGT	0.24503	0.00225	0.21008	3.38381	0.00615	0.00544	0.04647
HDGV	0.82205	0.00495	0.71321	10.66900	0.02367	0.02094	0.09685
LDDV	0.11254	0.00128	0.14208	4.78420	0.00320	0.00294	0.01672
LDDT	0.22874	0.00148	0.47868	4.88310	0.00590	0.00543	0.01814
HDDV	0.17255	0.00428	2.84976	1.66780	0.06489	0.05970	0.06341
MC	2.49885	0.00203	0.67293	12.15409	0.02169	0.01919	0.05124

- Vehicle Exhaust & Worker Trips Greenhouse Gasses Emission Factors (grams/mile)

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01750	0.00533	338.98734	341.00715
LDGT	0.01854	0.00805	422.50359	425.35904
HDGV	0.06162	0.02930	928.03681	938.28730
LDDV	0.05672	0.00072	379.79530	381.42858
LDDT	0.04868	0.00109	437.46351	439.00495
HDDV	0.03861	0.15656	1272.12258	1319.73074
MC	0.12891	0.00334	392.85742	397.07499

2.1.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD}$ = (20 * ACRE * WD) / 2000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

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- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/hp-hour)
0.002205: Conversion Factor grams to pounds
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

3. Construction / Demolition

3.1 General Information & Timeline Assumptions

- Activity Location
County: Middlesex
Regulatory Area(s): Boston-Lawrence-Worcester (E. MA), MA

- Activity Title: Tower Construction

- Activity Description:

- Activity Start Date
Start Month: 2
Start Month: 2025

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2025

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.058180
SO_x	0.000944
NO_x	0.518554
CO	0.607479

Pollutant	Total Emissions (TONs)
PM 10	0.192136
PM 2.5	0.022321
Pb	0.000000
NH_3	0.000714

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.004272
N_2O	0.000933

Pollutant	Total Emissions (TONs)
CO_2	104.761387
CO_2e	105.146121

- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.004272
N_2O	0.000933

Pollutant	Total Emissions (TONs)
CO_2	104.761387
CO_2e	105.146121

3.1 Site Grading Phase

3.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 2
Start Quarter: 2
Start Year: 2025

- Phase Duration
Number of Month: 3
Number of Days: 0

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3.1.2 Site Grading Phase Assumptions

- General Site Grading Information

Area of Site to be Graded (ft^2): 5625
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 0

- Site Grading Default Settings

Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Graders Composite	1	6
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	6
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust

Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

3.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/hp-hour) (default)

Graders Composite [HP: 148] [LF: 0.41]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.33951	0.00490	2.85858	3.41896	0.15910	0.14637
Other Construction Equipment Composite [HP: 82] [LF: 0.42]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.29762	0.00487	2.89075	3.51214	0.17229	0.15851
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.37086	0.00491	3.50629	2.90209	0.15396	0.14165
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.19600	0.00489	2.00960	3.48168	0.07738	0.07119

- Construction Exhaust Greenhouse Gasses Pollutant Emission Factors (g/hp-hour) (default)

Graders Composite [HP: 148] [LF: 0.41]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02155	0.00431	531.19419	533.01712

Other Construction Equipment Composite [HP: 82] [LF: 0.42]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02141	0.00428	527.74261	529.55369
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02159	0.00432	532.17175	533.99803
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02149	0.00430	529.86270	531.68105

- Vehicle Exhaust & Worker Trips Criteria Pollutant Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	NH_3
LDGV	0.25719	0.00177	0.13752	3.45463	0.00492	0.00435	0.05304
LDGT	0.23318	0.00221	0.18564	3.18042	0.00597	0.00528	0.04446
HDGV	0.80844	0.00496	0.65830	10.16422	0.02378	0.02103	0.09538
LDDV	0.11627	0.00127	0.14879	5.09855	0.00347	0.00319	0.01686
LDDT	0.23355	0.00146	0.48492	4.96497	0.00572	0.00527	0.01789
HDDV	0.15633	0.00420	2.68585	1.61386	0.05549	0.05105	0.06424
MC	2.49642	0.00203	0.67083	11.99453	0.02169	0.01918	0.05165

- Vehicle Exhaust & Worker Trips Greenhouse Gasses Emission Factors (grams/mile)

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01653	0.00503	332.78521	334.69326
LDGT	0.01727	0.00755	414.24719	416.92361
HDGV	0.05967	0.02812	930.55693	940.40834
LDDV	0.05795	0.00072	377.63972	379.30363
LDDT	0.04829	0.00109	430.64109	432.17273
HDDV	0.03847	0.15842	1250.42480	1298.58429
MC	0.12701	0.00334	392.98382	397.15345

3.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/hp-hour)
0.002205: Conversion Factor grams to pounds
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

3.2 Building Construction Phase

3.2.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 2
Start Quarter: 1
Start Year: 2025

- Phase Duration
Number of Month: 3
Number of Days: 0

3.2.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Commercial or Retail
Area of Building (ft^2): 200

Height of Building (ft): 150
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

3.2.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/hp-hour) (default)

Cranes Composite [HP: 367] [LF: 0.29]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.20113	0.00487	1.94968	1.66287	0.07909	0.07277
Forklifts Composite [HP: 82] [LF: 0.2]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.26944	0.00487	2.55142	3.59881	0.13498	0.12418
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Emission Factors	0.19600	0.00489	2.00960	3.48168	0.07738	0.07119

- Construction Exhaust Greenhouse Gasses Pollutant Emission Factors (g/hp-hour) (default)

Cranes Composite [HP: 367] [LF: 0.29]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02140	0.00428	527.58451	529.39505
Forklifts Composite [HP: 82] [LF: 0.2]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02138	0.00428	527.10822	528.91712
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02149	0.00430	529.86270	531.68105

- Vehicle Exhaust & Worker Trips Criteria Pollutant Emission Factors (grams/mile)

	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**NH_3**
LDGV	0.25719	0.00177	0.13752	3.45463	0.00492	0.00435	0.05304
LDGT	0.23318	0.00221	0.18564	3.18042	0.00597	0.00528	0.04446
HDGV	0.80844	0.00496	0.65830	10.16422	0.02378	0.02103	0.09538
LDDV	0.11627	0.00127	0.14879	5.09855	0.00347	0.00319	0.01686
LDDT	0.23355	0.00146	0.48492	4.96497	0.00572	0.00527	0.01789
HDDV	0.15633	0.00420	2.68585	1.61386	0.05549	0.05105	0.06424
MC	2.49642	0.00203	0.67083	11.99453	0.02169	0.01918	0.05165

- Vehicle Exhaust & Worker Trips Greenhouse Gasses Emission Factors (grams/mile)

	CH_4	**N_2O**	**CO_2**	**CO_2e**
LDGV	0.01653	0.00503	332.78521	334.69326
LDGT	0.01727	0.00755	414.24719	416.92361
HDGV	0.05967	0.02812	930.55693	940.40834
LDDV	0.05795	0.00072	377.63972	379.30363
LDDT	0.04829	0.00109	430.64109	432.17273
HDDV	0.03847	0.15842	1250.42480	1298.58429
MC	0.12701	0.00334	392.98382	397.15345

3.2.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL}* 0.002205) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/hp-hour)
0.002205: Conversion Factor grams to pounds
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

VMT_{VE} = BA * BH * (0.32 / 1000) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.32 / 1000): Conversion Factor ft^3 to trips (0.32 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

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$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.05 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.05 / 1000): Conversion Factor ft^3 to trips (0.05 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

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4. Emergency Generator

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Middlesex
Regulatory Area(s): Boston-Lawrence-Worcester (E. MA), MA

- Activity Title: Emergency Generator

- Activity Description:

- Activity Start Date
Start Month: 2
Start Year: 2025

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	0.001088
SO_x	0.000917
NO_x	0.004485
CO	0.002995

Pollutant	Emissions Per Year (TONs)
PM 10	0.000979
PM 2.5	0.000979
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Emissions Per Year (TONs)
CH_4	0.000018
N_2O	0.000004

Pollutant	Emissions Per Year (TONs)
CO_2	0.448500
CO_2e	0.518700

4.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Diesel
Number of Emergency Generators: 1

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 26
Average Operating Hours Per Year (hours): 30

4.3 Emergency Generator Emission Factor(s)

- Emergency Generators Criteria Pollutant Emission Factor (lb/hp-hr)

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3
0.00279	0.00235	0.0115	0.00768	0.00251	0.00251		

- Emergency Generators Greenhouse Gasses Pollutant Emission Factor (lb/hp-hr)

CH_4	N_2O	CO_2	CO_2e
0.000046297	0.000009259	1.15	1.33

4.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year

AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hp-hr)

5. Tanks

5.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Middlesex
Regulatory Area(s): Boston-Lawrence-Worcester (E. MA), MA

- Activity Title: Emergency generator tank

- Activity Description:

- Activity Start Date
Start Month: 2
Start Year: 2025

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	0.000030
SO_x	0.000000
NO_x	0.000000
CO	0.000000

Pollutant	Emissions Per Year (TONs)
PM 10	0.000000
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

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Pollutant	Emissions Per Year (TONs)
CH_4	0.000000
N_2O	0.000000

Pollutant	Emissions Per Year (TONs)
CO_2	0.000000
CO_2e	0.000000

5.2 Tanks Assumptions

- Chemical

Chemical Name:	Fuel oil no. 2
Chemical Category:	Petroleum Distillates
Chemical Density:	7.1
Vapor Molecular Weight (lb/lb-mole):	130
Stock Vapor Density (lb/ft^3):	0.000129553551395334
Vapor Pressure:	0.0055
Vapor Space Expansion Factor (dimensionless):	0.068

- Tank

Type of Tank:	Horizontal Tank
Tank Length (ft):	2
Tank Diameter (ft):	4
Annual Net Throughput (gallon/year):	54

5.3 Tank Formula(s)

- Vapor Space Volume

VSV = (PI / 4) * D^2 * L / 2

VSV: Vapor Space Volume (ft^3)
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)
2: Convertion Factor (Vapor Space Volume is assumed to be one-half of the tank volume)

- Vented Vapor Saturation Factor

VVSF = 1 / (1 + (0.053 * VP * L / 2))

VVSF: Vented Vapor Saturation Factor (dimensionless)
0.053: Constant
VP: Vapor Pressure (psia)
L: Tank Length (ft)

- Standing Storage Loss per Year

SSL_{VOC} = 365 * VSV * SVD * VSEF * VVSF / 2000

SSL_{VOC}: Standing Storage Loss Emissions (TONs)
365: Number of Daily Events in a Year (Constant)
VSV: Vapor Space Volume (ft^3)
SVD: Stock Vapor Density (lb/ft^3)
VSEF: Vapor Space Expansion Factor (dimensionless)
VVSF: Vented Vapor Saturation Factor (dimensionless)
2000: Conversion Factor pounds to tons

- Number of Turnovers per Year

NT = (7.48 * ANT) / ((PI / 4.0) * D * L)

NT: Number of Turnovers per Year

7.48: Constant
ANT: Annual Net Throughput
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)

- Working Loss Turnover (Saturation) Factor per Year

WLSF = (18 + NT) / (6 * NT)

WLSF: Working Loss Turnover (Saturation) Factor per Year
18: Constant
NT: Number of Turnovers per Year
6: Constant

- Working Loss per Year

WL_{VOC} = 0.0010 * VMW * VP * ANT * WLSF / 2000

0.0010: Constant
VMW: Vapor Molecular Weight (lb/lb-mole)
VP: Vapor Pressure (psia)
ANT: Annual Net Throughput
WLSF: Working Loss Turnover (Saturation) Factor
2000: Conversion Factor pounds to tons

AIR CONFORMITY APPLICABILITY MODEL REPORT
GREENHOUSE GAS (GHG) EMISSIONS

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to estimate GHG emissions and assess the theoretical Social Cost of Greenhouse Gases (SC GHG) associated with the action. The analysis was performed in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the USAF Air Quality Environmental Impact Analysis Process (EIAP) Guide. This report provides a summary of GHG emissions and SC GHG analysis.

Report generated with ACAM version: 5.0.23a

a. Action Location:
Base: HANSCOM AFB
State: Massachusetts
County(s): Middlesex
Regulatory Area(s): Boston-Lawrence-Worcester (E. MA), MA

b. Action Title: Boldyn Tower

c. Project Number/s (if applicable):

d. Projected Action Start Date: 8 / 2024

e. Action Description:

The Proposed Action would install an AT&T FirstNet ommunications network on Hanscom AFB to improve wireless coverage and capacity. AT&T, in partnership with Boldyn Networks, will construct and install five small cell nodes and one macro tower. The small cell and macro tower structures would be built, owned, and maintained by Boldyn Networks with AT&T's radios and antennas installed on the infrastructure. This will would allow AT&T to propagate a more robust network for its FirstNet Communications and increase improvements in wireless coverage and capacity throughout the base and surrounding communities. The macro tower will would be a 150' monopole (155' with lighting rod) within a 75' x 75' fenced compound. The tower will would be capable of hosting up to three wireless telecommunications carriers, or providers, . The small cell nodes will be installed at various locations on Hanscom AFB. Each node will be a metal monopole approximately 40' tall and painted to match existing light poles on base. Each pole will have an attached equipment cabinet.
The Proposed Action will would also include installing power and fiber lines to each node, fiber lines to existing buildings and the meet-me-point (MMP) and a gravel access drive to the macro tower compound. New underground conduit will would be installed where existing conduit is not available.
AT&T will would lease land for the macro tower and associated equipment compound from Hanscom AFB. All work to install the tower, nodes, fiber and power, and any additional tasks will would be completed by contractors hired by Boldyn Networks.

HAFB, not Bolydyn Networks, would remove and relocate existing stormwater catch basins, manholes and pipelines to allow construction of the tower. This effort includes the removal and installation of up to 300 linear feet of concrete pipe (3000 square feet (6000 cubic feet) of ground disturbance on previously disturbed land. The effort also included the removal of five existing manholes and the addition of one manhole (600 square feet (4800 cubic feet) of ground disturbance of previously disturbed land.

f. Point of Contact:
Name: James Maravelias
Title: GS-11/NEPA Program Manager
Organization: 66 ABG/CEIE

AIR CONFORMITY APPLICABILITY MODEL REPORT
GREENHOUSE GAS (GHG) EMISSIONS

2. Analysis: Total combined direct and indirect GHG emissions associated with the action were estimated through ACAM on a calendar-year basis from the action start through the expected life cycle of the action. The life cycle for Air Force actions with "steady state" emissions (SS, net gain/loss in emission stabilized and the action is fully implemented) is assumed to be 10 years beyond the SS emissions year or 20 years beyond SS emissions year for aircraft operations related actions.

GHG Emissions Analysis Summary:

GHGs produced by fossil-fuel combustion are primarily carbon dioxide (CO2), methane (CH4), and nitrous oxide (NO2). These three GHGs represent more than 97 percent of all U.S. GHG emissions. Emissions of GHGs are typically quantified and regulated in units of CO2 equivalents (CO2e). The CO2e takes into account the global warming potential (GWP) of each GHG. The GWP is the measure of a particular GHG's ability to absorb solar radiation as well as its residence time within the atmosphere. The GWP allows comparison of global warming impacts between different gases; the higher the GWP, the more that gas contributes to climate change in comparison to CO2. All GHG emissions estimates were derived from various emission sources using the methods, algorithms, emission factors, and GWPs from the most current Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and/or Air Emissions Guide for Air Force Transitory Sources.

The Air Force has adopted the Prevention of Significant Deterioration (PSD) threshold for GHG of 75,000 ton per year (ton/yr) of CO2e (or 68,039 metric ton per year, mton/yr) as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; however, it provides a threshold to identify actions that are insignificant (de minimis, too trivial or minor to merit consideration). Actions with a net change in GHG (CO2e) emissions below the insignificance indicator (threshold) are considered too insignificant on a global scale to warrant any further analysis. Note that actions with a net change in GHG (CO2e) emissions above the insignificance indicator (threshold) are only considered potentially significant and require further assessment to determine if the action poses a significant impact. For further detail on insignificance indicators see Level II, Air Quality Quantitative Assessment, Insignificance Indicators (April 2023).

The following table summarizes the action-related GHG emissions on a calendar-year basis through the projected life cycle of the action.

Action-Related Annual GHG Emissions (mton/yr)						
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**	**Threshold**	**Exceedance**
2024	8	0.0003171	0.00007008	8	68,039	No
2025	95	0.00389028	0.00084955	96	68,039	No
2026 [SS Year]	0	0.00001638	0.00000328	0	68,039	No
2027	0	0.00001638	0.00000328	0	68,039	No
2028	0	0.00001638	0.00000328	0	68,039	No
2029	0	0.00001638	0.00000328	0	68,039	No
2030	0	0.00001638	0.00000328	0	68,039	No
2031	0	0.00001638	0.00000328	0	68,039	No
2032	0	0.00001638	0.00000328	0	68,039	No
2033	0	0.00001638	0.00000328	0	68,039	No
2034	0	0.00001638	0.00000328	0	68,039	No
2035	0	0.00001638	0.00000328	0	68,039	No
2036	0	0.00001638	0.00000328	0	68,039	No

The following U.S. and State's GHG emissions estimates (next two tables) are based on a five-year average (2016 through 2020) of individual state-reported GHG emissions (Reference: State Climate Summaries 2022, NOAA National Centers for Environmental Information, National Oceanic and Atmospheric Administration. https://statesummaries.ncics.org/downloads/).

AIR CONFORMITY APPLICABILITY MODEL REPORT
GREENHOUSE GAS (GHG) EMISSIONS

State's Annual GHG Emissions (mton/yr)				
YEAR	CO2	CH4	N2O	CO2e
2024	61,353,322	77,406	4,277	61,435,005
2025	61,353,322	77,406	4,277	61,435,005
2026 [SS Year]	61,353,322	77,406	4,277	61,435,005
2027	61,353,322	77,406	4,277	61,435,005
2028	61,353,322	77,406	4,277	61,435,005
2029	61,353,322	77,406	4,277	61,435,005
2030	61,353,322	77,406	4,277	61,435,005
2031	61,353,322	77,406	4,277	61,435,005
2032	61,353,322	77,406	4,277	61,435,005
2033	61,353,322	77,406	4,277	61,435,005
2034	61,353,322	77,406	4,277	61,435,005
2035	61,353,322	77,406	4,277	61,435,005
2036	61,353,322	77,406	4,277	61,435,005

U.S. Annual GHG Emissions (mton/yr)				
YEAR	CO2	CH4	N2O	CO2e
2024	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2025	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2026 [SS Year]	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2027	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2028	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2029	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2030	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2031	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2032	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2033	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2034	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2035	5,136,454,179	25,626,912	1,500,708	5,163,581,798
2036	5,136,454,179	25,626,912	1,500,708	5,163,581,798

GHG Relative Significance Assessment:

A Relative Significance Assessment uses the rule of reason and the concept of proportionality along with the consideration of the affected area (yGba.e., global, national, and regional) and the degree (intensity) of the proposed action's effects. The Relative Significance Assessment provides real-world context and allows for a reasoned choice against alternatives through a relative comparison analysis. The analysis weighs each alternative's annual net change in GHG emissions proportionally against (or relative to) global, national, and regional emissions.

The action's surroundings, circumstances, environment, and background (context associated with an action) provide the setting for evaluating the GHG intensity (impact significance). From an air quality perspective, context of an action is the local area's ambient air quality relative to meeting the NAAQSs, expressed as attainment, nonattainment, or maintenance areas (this designation is considered the attainment status). GHGs are non-hazardous to health at normal ambient concentrations and, at a cumulative global scale, action-related GHG emissions can only potentially cause warming of the climatic system. Therefore, the action-related GHGs generally have an insignificant impact to local air quality.

However, the affected area (context) of GHG/climate change is global. Therefore, the intensity or degree of the proposed action's GHG/climate change effects are gauged through the quantity of GHG associated with the action as compared to a baseline of the state, U.S., and global GHG inventories. Each action (or alternative) has significance, based on their annual net change in GHG emissions, in relation to or proportionally to the global, national, and regional annual GHG emissions.

AIR CONFORMITY APPLICABILITY MODEL REPORT
GREENHOUSE GAS (GHG) EMISSIONS

To provide real-world context to the GHG and climate change effects on a global scale, an action's net change in GHG emissions is compared relative to the state (where action will occur) and U.S. annual emissions. The following table provides a relative comparison of an action's net change in GHG emissions vs. state and U.S. projected GHG emissions for the same time period.

Total GHG Relative Significance (mton)					
		CO2	**CH4**	**N2O**	**CO2e**
2024-2036	State Total	797,593,191	1,006,282	55,598	798,655,071
2024-2036	U.S. Total	66,773,904,327	333,149,852	19,509,199	67,126,563,378
2024-2036	Action	108	0.004388	0.000956	109
Percent of State Totals		0.00001349%	0.00000044%	0.00000172%	0.00001361%
Percent of U.S. Totals		0.00000016%	0.00000000%	0.00000000%	0.00000016%

From a global context, the action's total GHG percentage of total global GHG for the same time period is: 0.00000002%.*

* Global value based on the U.S. emits 13.4% of all global GHG annual emissions (2018 Emissions Data, Center for Climate and Energy Solutions, accessed 7-6-2023, https://www.c2es.org/content/international-emissions).

Climate Change Assessment (as SC GHG):

On a global scale, the potential climate change effects of an action are indirectly addressed and put into context through providing the theoretical SC GHG associated with an action. The SC GHG is an administrative and theoretical tool intended to provide additional context to a GHG's potential impacts through approximating the long-term monetary damage that may result from GHG emissions affect on climate change. It is important to note that the SC GHG is a monetary quantification, in 2020 U.S. dollars, of the theoretical economic damages that could result from emitting GHGs into the atmosphere.

The SC GHG estimates are derived using the methodology and discount factors in the "Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990," released by the Interagency Working Group on Social Cost of Greenhouse Gases (IWG SC GHGs) in February 2021.

The speciated IWG Annual SC GHG Emission associated with an action (or alternative) are first estimated as annual unit cost (cost per metric ton, $/mton). Results of the annual IWG Annual SC GHG Emission Assessments are tabulated in the IWG Annual SC GHG Cost per Metric Ton Table below:

IWG SC GHG Discount Factor: 2.5%

AIR CONFORMITY APPLICABILITY MODEL REPORT
GREENHOUSE GAS (GHG) EMISSIONS

IWG Annual SC GHG Cost per Metric Ton ($/mton [In 2020 $])			
YEAR	CO2	CH4	N2O
2024	$82.00	$2,200.00	$29,000.00
2025	$83.00	$2,200.00	$30,000.00
2026 [SS Year]	$84.00	$2,300.00	$30,000.00
2027	$86.00	$2,300.00	$31,000.00
2028	$87.00	$2,400.00	$32,000.00
2029	$88.00	$2,500.00	$32,000.00
2030	$89.00	$2,500.00	$33,000.00
2031	$91.00	$2,600.00	$33,000.00
2032	$92.00	$2,600.00	$34,000.00
2033	$94.00	$2,700.00	$35,000.00
2034	$95.00	$2,800.00	$35,000.00
2035	$96.00	$2,800.00	$36,000.00
2036	$98.00	$2,900.00	$36,000.00

Action-related SC GHG were estimated by calendar-year for the projected action's lifecycle. Annual estimates were found by multiplying the annual emission for a given year by the corresponding IWG Annual SC GHG Emission value (see table above).

Action-Related Annual SC GHG ($K/yr [In 2020 $])				
YEAR	CO2	CH4	N2O	GHG
2024	$0.63	$0.00	$0.00	$0.63
2025	$7.92	$0.01	$0.03	$7.95
2026 [SS Year]	$0.03	$0.00	$0.00	$0.03
2027	$0.03	$0.00	$0.00	$0.04
2028	$0.04	$0.00	$0.00	$0.04
2029	$0.04	$0.00	$0.00	$0.04
2030	$0.04	$0.00	$0.00	$0.04
2031	$0.04	$0.00	$0.00	$0.04
2032	$0.04	$0.00	$0.00	$0.04
2033	$0.04	$0.00	$0.00	$0.04
2034	$0.04	$0.00	$0.00	$0.04
2035	$0.04	$0.00	$0.00	$0.04
2036	$0.04	$0.00	$0.00	$0.04

The following two tables summarize the U.S. and State's Annual SC GHG by calendar-year. The U.S. and State's Annual SC GHG are in 2020 dollars and were estimated by each year for the projected action lifecycle. Annual SC GHG estimates were found by multiplying the U.S. and State's annual five-year average GHG emissions for a given year by the corresponding IWG Annual SC GHG Cost per Metric Ton value.

State's Annual SC GHG ($K/yr [In 2020 $])				
YEAR	CO2	CH4	N2O	GHG
2024	$5,030,972.44	$170,293.87	$124,026.49	$5,325,292.80
2025	$5,092,325.76	$170,293.87	$128,303.27	$5,390,922.90
2026 [SS Year]	$5,153,679.08	$178,034.50	$128,303.27	$5,460,016.85
2027	$5,276,385.73	$178,034.50	$132,580.04	$5,587,000.27
2028	$5,337,739.05	$185,775.13	$136,856.82	$5,660,371.00
2029	$5,399,092.37	$193,515.76	$136,856.82	$5,729,464.95
2030	$5,460,445.69	$193,515.76	$141,133.60	$5,795,095.05
2031	$5,583,152.34	$201,256.40	$141,133.60	$5,925,542.33
2032	$5,644,505.66	$201,256.40	$145,410.37	$5,991,172.43
2033	$5,767,212.30	$208,997.03	$149,687.15	$6,125,896.48
2034	$5,828,565.63	$216,737.66	$149,687.15	$6,194,990.43

2035	$5,889,918.95	$216,737.66	$153,963.92	$6,260,620.53
2036	$6,012,625.59	$224,478.29	$153,963.92	$6,391,067.80

U.S. Annual SC GHG ($K/yr [In 2020 $])				
YEAR	**CO2**	**CH4**	**N2O**	**GHG**
2024	$421,189,242.68	$56,379,205.70	$43,520,521.44	$521,088,969.82
2025	$426,325,696.86	$56,379,205.70	$45,021,229.08	$527,726,131.63
2026 [SS Year]	$431,462,151.04	$58,941,896.86	$45,021,229.08	$535,425,276.98
2027	$441,735,059.39	$58,941,896.86	$46,521,936.72	$547,198,892.97
2028	$446,871,513.57	$61,504,588.03	$48,022,644.35	$556,398,745.96
2029	$452,007,967.75	$64,067,279.20	$48,022,644.35	$564,097,891.30
2030	$457,144,421.93	$64,067,279.20	$49,523,351.99	$570,735,053.12
2031	$467,417,330.29	$66,629,970.37	$49,523,351.99	$583,570,652.65
2032	$472,553,784.47	$66,629,970.37	$51,024,059.62	$590,207,814.46
2033	$482,826,692.83	$69,192,661.54	$52,524,767.26	$604,544,121.62
2034	$487,963,147.01	$71,755,352.70	$52,524,767.26	$612,243,266.97
2035	$493,099,601.18	$71,755,352.70	$54,025,474.90	$618,880,428.78
2036	$503,372,509.54	$74,318,043.87	$54,025,474.90	$631,716,028.31

Relative Comparison of SC GHG:

To provide additional real-world context to the potential climate change impact associate with an action, a Relative Comparison of SC GHG Assessment is also performed. While the SC GHG estimates capture an indirect approximation of global climate damages, the Relative Comparison of SC GHG Assessment provides a better perspective from a regional and global scale.

The Relative Comparison of SC GHG Assessment uses the rule of reason and the concept of proportionality along with the consideration of the affected area (yGba.e., global, national, and regional) and the SC GHG as the degree (intensity) of the proposed action's effects. The Relative Comparison Assessment provides real-world context and allows for a reasoned choice among alternatives through a relative contrast analysis which weighs each alternative's SC GHG proportionally against (or relative to) existing global, national, and regional SC GHG. The below table provides a relative comparison between an action's SC GHG vs. state and U.S. projected SC GHG for the same time period:

Total SC-GHG ($K [In 2020 $])					
		CO2	**CH4**	**N2O**	**GHG**
2024-2036	State Total	$71,476,620.58	$2,538,926.83	$1,821,906.42	$75,837,453.83
2024-2036	U.S. Total	$5,983,969,118.54	$840,562,703.10	$639,301,452.94	$7,463,833,274.58
2024-2036	Action	$8.96	$0.01	$0.03	$8.99
Percent of State Totals		0.00001253%	0.00000038%	0.00000158%	0.00001186%
Percent of U.S. Totals		0.00000015%	0.00000000%	0.00000000%	0.00000012%

From a global context, the action's total SC GHG percentage of total global SC GHG for the same time period is: 0.00000002%.*

* Global value based on the U.S. emits 13.4% of all global GHG annual emissions (2018 Emissions Data, Center for Climate and Energy Solutions, accessed 7-6-2023, https://www.c2es.org/content/international-emissions).

James Maravelias, GS-11/NEPA Program Manager Jun 24 2024

Name, Title **Date**