



Building a Better World
for All of Us®



MEMORANDUM

TO: Air Traffic Control Tower Technical Advisory Committee Members

FROM: Kaci Nowicki, Sr. Project Manager

DATE: November 16, 2020

RE: Air Traffic Control Tower Siting Study
SEH No. 150733 14.00

As part of the Duluth International Airport Master Plan, a preliminary siting study for an Air Traffic Control Tower (ATCT) was conducted to document possible locations on the airfield that should be preserved for the ultimate development of a future ATCT. Once funding is secured, the Federal Aviation Administration (FAA) will complete a siting study to determine the final selected location of the ATCT. This memo documents the process the project team took to identify and evaluate these preliminary alternatives for a new ATCT.

AIR TRAFFIC CONTROL TOWER SITING REQUIREMENTS

FAA Job Order 6480.4B, *Airport Traffic Control Tower Siting Process*, defines the process to site a new ATCT to ensure a safe, efficient, and secure aviation system. The job order was used to find and evaluate alternatives as part of the Airport Master Plan. As mentioned above, the FAA will ultimately determine the final location of the control tower; however, completing this process in the Master Plan will ensure that areas of the airport are developed and redeveloped in a way that ensures the highest and best use of airport land.

JO 6480.4B lists several factors that should be considered while siting a new Air Traffic Control Tower. The factors below, with greater emphasis in descending order, were considered while evaluating sites.

1. Limit impacts on instrument approach procedures
 - All runways have several imaginary surfaces that protect aircraft on approach and departure to the runway. Consideration should be given to these protected surfaces to ensure aircraft safely operate in all weather conditions.
2. Limit impacts on communication, navigation and surveillance equipment
3. Visibility performance
 - The ATCT must have an unobstructed view of all runways, landing areas and air traffic in the vicinity of the airport
 - The probability of an observer (controller) can detect an object on all airport surfaces must be at least 95.5%.
 - The minimum line of sight angle of incidence is equal to or greater than 0.80 degrees
4. Operational requirement
 - Orientation – Orientation of the ATCT should have the primary view facing north, or alternatively east, west and then south. Where snow often accumulates in the northern hemisphere, a southern orientation should be avoided.

- Visibility of all airport surface areas should be considered. Priority should be given to taxiways in non-movement areas.
5. Economic considerations
- Economic considerations should be used to determine an ultimate site including the height of the tower, land use, utilities and cabling, site access and security.

PRELIMINARY AIR TRAFFIC CONTROL TOWER SITING ALTERNATIVES

DLH can be separated into four quadrants using Runway 9/27 and Runway 3/21 as borders. The Northwest, Northeast, Southeast and Southwest quadrants were all evaluated at a high-level for an ATCT.

Proposed controller tower heights are the estimated minimum heights able to meet FAA JO 6480.B, these heights may have potential impacts on future development and redevelopment areas and the height of future hangars and buildings. The approximate maximum heights in these areas are listed in each figure referenced for the alternative. Below is a list of existing buildings at DLH and their approximate heights for your reference:

- Monaco Air FBO Building – 30'
- SRE – 30'
- MRO Facility – 100'
- Ranch Hangars south of the existing control tower – 15'
- T-Hangars south of the existing tower – 15'

Northeast Quadrant – 148th Air National Guard Base Area

This quadrant was not evaluated for an Air Traffic Control Tower due to the 148th Air National Guard Base, existing environmental features, and the distance to the Runway 9 end. Using the FAA's ATC Visibility Tool, the minimum height for a control tower in this quadrant would need to be approximately 220' AGL.

Southeast Quadrant – Commercial Service Terminal Area

This quadrant was not evaluated for an Air Traffic Control Tower due to the existing development of the commercial service terminal and the distance to the Runway 9 end. Similar to the Northeast Quadrant, the minimum height for a control tower in this quadrant would need to be approximately 200' AGL.

Southwest Quadrant

Alternative 1A – Alternative 1A evaluates a control tower in a location between the SRE and existing Vault Building; however shifted south away from the apron area to allow for aeronautical development with airfield access along the future apron pavement connecting the midfield ramp to the Monaco ramp. This tower would need to be approximately 100 feet tall. A 100-foot tall tower would allow for hangars approximately 30 to 35 feet tall to be developed along the southern tower ramp, just north of the cargo (FedEx) ramp. See **Figure 1A**.

This alternative is the same proposed site as shown on the conditionally approved Airport Layout Plan (ALP) with considerations given to future development and redevelopment sites. Alternative 1E evaluates the ALP proposed site and height.

Alternative 1A1 evaluates the ATCT location that was proposed in the previous Master Plan. The most recent Master Plan completed for DLH recommended a proposed tower in the southwest quadrant near the existing Snow Removal Equipment (SRE) building. The tower cab height proposed was between 38 and 54 feet. Reviewing this site and proposed height, the current analysis identified

potential visibility challenges along the tower ramp and near the existing cargo (FedEx) ramp for a tower at this height. See **Figure 1A1**.

Alternative 1B – Alternative 1B is similar to Alternative 1A; however, it evaluates a control tower located along the apron in a line parallel to the Monaco Building. This alternative allows for unobstructed views along the Monaco and Midfield ramps. The control tower in this location is estimated to be approximately 100 feet tall. This height allows for development and redevelopment in the area around the southern existing tower ramp. This location would greatly limit, or potentially eliminate, any aeronautical development with apron access in between the Monaco and SRE buildings. See **Figure 1B**.

Alternative 1C – Alternative 1C evaluates a control tower located south of the Monaco ramp and just east of the existing fuel farm. An analysis of this location estimates the tower cab height to be approximately 85 feet. This height would allow for development and redevelopment along the existing tower ramp. Monaco Air currently has the development rights for this area. This site is space constrained due to the existing taxiway to the west and Airport Approach Road to the east. See **Figure 1C**.

Alternative 1D – Alternative 1D evaluates a control tower at the site of the existing control tower. This site was evaluated due to the infrastructure in place at the existing tower site. Construction phasing may pose a challenge in this location to ensure controllers have a continuous unobstructed view of movement area surfaces during the construction of the new tower. An estimated tower cab height of 85 feet would give an unobstructed view of all movement area surfaces and meet the minimum LOS angle of incidence requirements. See **Figure 1D**.

Alternative 1E – This alternative evaluates an ATCT location where the existing ranch and T-Hangars are located. The proposed tower height would need to be approximately 110'. Building height restrictions would need to be in place for future development and redevelopment between the SRE and Monaco's Hangar. The siting study indicated future buildings between 35 and 40 feet tall would not negatively impact the line of sight to all aircraft movement areas. See **Figure 1E**

Alternative 1F – Alternative 1F evaluates a control tower located north of the FedEx hangar. This site has been identified as a redevelopment area and therefore was explored for air traffic control tower use. An estimated tower cab height of 120 feet would provide an unobstructed view of all movement area surfaces and meet the minimum LOS angle of incidence requirements. This alternative results in minimal building area height restrictions. See **Figure 1F**

Alternative 1G – Alternative 1G evaluates a control tower located south of the cargo (FedEx) ramp. The control tower in this location is estimated to be approximately 180 feet tall to allow for an unobstructed view of non-movement boundary lines along the Monaco and Midfield ramps. This height also allows for development and redevelopment along the existing tower ramp and area between the SRE and Monaco buildings. See **Figure 1G**

Alternative 1H – Alternative 1H evaluates a control tower located directly south of the fuel farm in the area currently designated for future general aviation hangars. The control tower in this location is estimated to be approximately 130 feet tall to allow for an unobstructed view of non-movement boundary lines along the Monaco and Midfield ramps. This height also allows for development and redevelopment along the existing tower and southern portion of the tower ramps. See **Figure 1H**

Alternative 1I – Alternative 1I evaluates a control tower located at the existing site of the Hydrosolutions' building. The control tower in this location is estimated to be approximately 110 feet tall to allow for an unobstructed view of non-movement boundary lines along the Monaco and Midfield

ramps. This height also allows for development and redevelopment along the existing tower and southern portion of the tower ramps. See **Figure 1I**

Alternative 1J – Alternative 1J evaluates a control tower located directly west of the existing Hydrosolutions building and southeast of the SRE building (in the location of an existing DAA owned building). The control tower in this location is estimated to be approximately 110 feet to allow for an unobstructed view of all movement areas. This height also allows for development and redevelopment along the existing tower ramp, southern tower ramp and the area between the SRE and Monaco buildings. See **Figure 1J**

Alternative 1K – This alternative evaluates an ATCT situated on top of the SRE building. The proposed tower in this location would need to be 130' from the ground. The SRE building is approximately 30' tall. This location presents visibility challenges along the cargo (FedEx) ramp. A tower at 130' tall would allow for development in this area if the buildings were 25' tall or less. See **Figure 1K**.

Northwest Quadrant – North Business Development Area

Alternative 2 – An area was evaluated to the west of the existing MRO apron as seen in **Figure 2**. FAA software estimates that a control tower in this location would meet minimum FAA requirements. Additionally, this site is located approximately midfield giving almost equidistance line of sight to all runway ends. This site would require additional airspace evaluation to determine if there would be any interference with the Airport Surveillance Radar (ASR). See **Figures 2A and 2B**.

The following sites were suggested by stakeholders at the ATCT TAC Meeting on November 12, 2020. A preliminary analysis of the recommended sites was completed and is summarized below.

Alternative 1L – Alternative 1L evaluates a control tower located in the location of Hangar 101 (the former CAF hangar). A tower in this site would need to be approximately 125 feet tall to have an unobstructed view of all non-movement areas. This alternative would not meet minimum FAA standards for the probability of being able to identify a vehicle on the north end of Taxiway C and Runway 3/21. See **Figure 1L**

Alternative 1M – Alternative 1M evaluates at a site west of Cirrus' existing facility located within the DRMO site. This area posed challenges including the distance from the site to the proposed end of Runway 21. The distance to the runway 21 end is over 10,000 feet and would not meet minimum FAA requirements. Another challenge in this location is the tower height needed to see over the MRO hangar to the north end of Taxiway C. It is estimated that the tower cab would need to be over 300 feet tall to have an unobstructed view of the northern limits of Taxiway C and the runway 21 end. No figure was created for this alternative.

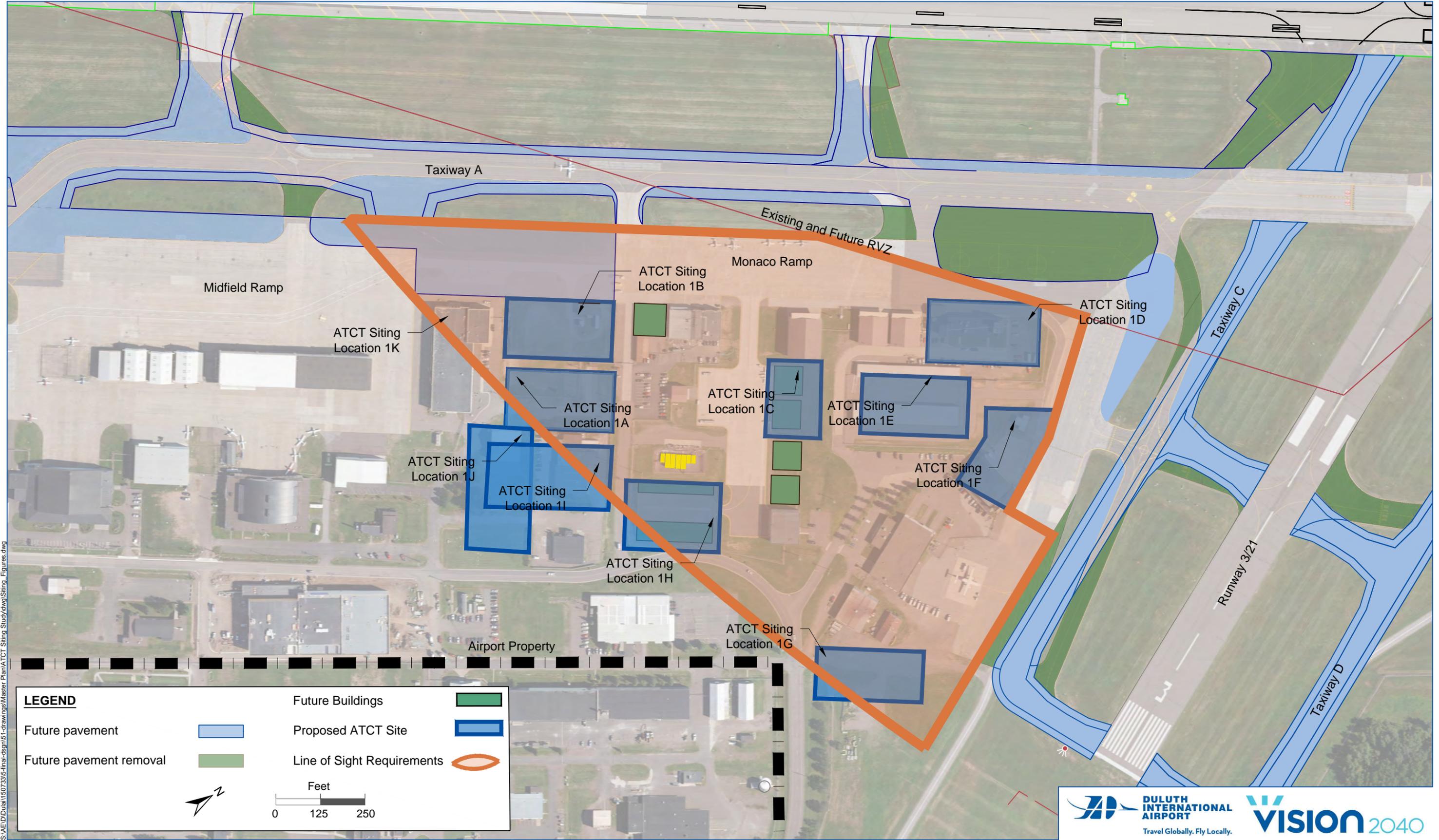
Alternative 1N – Alternative 1N evaluates a control tower located at the existing Hydrosolutions site with an overall facility layout extending to the south towards airport road. This alternative would meet minimum FAA requirements if the tower height was approximately 110 feet tall. Building area restrictions would exist; however, they would be similar to that of Alternative 1I. See **Figure 1I** for height restrictions.

Table 1 – Air Traffic Control Tower Siting Comparison

		Location	Approximate Cab Height (AGL)	Infrastructure	Building Area Restrictions ¹	Meets minimum FAA standards
Southwest Quadrant	Alternative 1A	South of the existing Vault	100'	Yes	Yes	Yes
	Alternative 1B	Align with the existing Vault	85'	Yes	Yes	Yes
	Alternative 1C	South of Monaco ramp along taxilane to Fuel Farm	85'	Yes	Yes	Yes
	Alternative 1D	Existing Tower Location	85'	Yes	No	Yes
	Alternative 1E	Existing Ranch and T-Hangar area location	110'	Yes	Yes	Yes
	Alternative 1F	North of Hangar 2, along the tower ramp	120'	Yes	Yes	Yes
	Alternative 1G	South of the Cargo (FedEx) Ramp	180'	Yes	Yes	Potential instrument approach and departure impacts to Runway 3/21
	Alternative 1H	South of the fuel farm	130'	Yes	Yes	Yes
	Alternative 1I	Hydrosolutions Site	110'	Yes	Yes	Yes
	Alternative 1J	West of Hydrosolutions and Southeast of the SRE	110'	Yes	Yes	The probability of identifying operations and maintenance vehicles at the approach end of Runway 21 is below the minimum requirement
	Alternative 1K	Located on top of the SRE building	130'	Yes	Yes	Yes
	Alternative 1L	Old CAF Hangar site	125'	Yes	Yes	The probability of identifying operations and maintenance vehicles at the approach end of Runway 21 is below the minimum requirement
		Alternative 1N	Hydrosolutions site	110'	Yes	Yes
Northwest Quadrant	Alternative 2	West of the MRO apron	Minimum of 100'	Minimal	Minimal	A southern orientated tower is least preferred in climates where snow accumulates

Note:¹ Building height restrictions are possible for the proposed tower height in certain alternatives and are listed on each alternative's figure. The preferred control tower alternative will be analyzed with the preferred future building area and taxiway and taxilane to ensure future aeronautical development and redevelopment areas are not negatively impacted by the proposed ATCT height.

c: file



S:\AE\ID\150733\15-final-dsgm\51-drawings\Master Plan\ATCT Siting_Study\dwg\Siting_Figures.dwg



Path: S:\AE\DLAI\150733\5-final-dsgn\15-drawings\Master Plan\ATCT Siting Study\DLH ATCT Siting Study.aprx



Path: S:\AE\DLAI\150733\5-final-dgn\15-drawings\Master Plan\ATCT Siting Study\DLH ATCT Siting Study.aprx



Path: S:\AE\IDul\150733B-final-ds\151-drawings\Master Plan\ATCT Siting Study\DXD\DLH_ATCT Siting Study.aprx

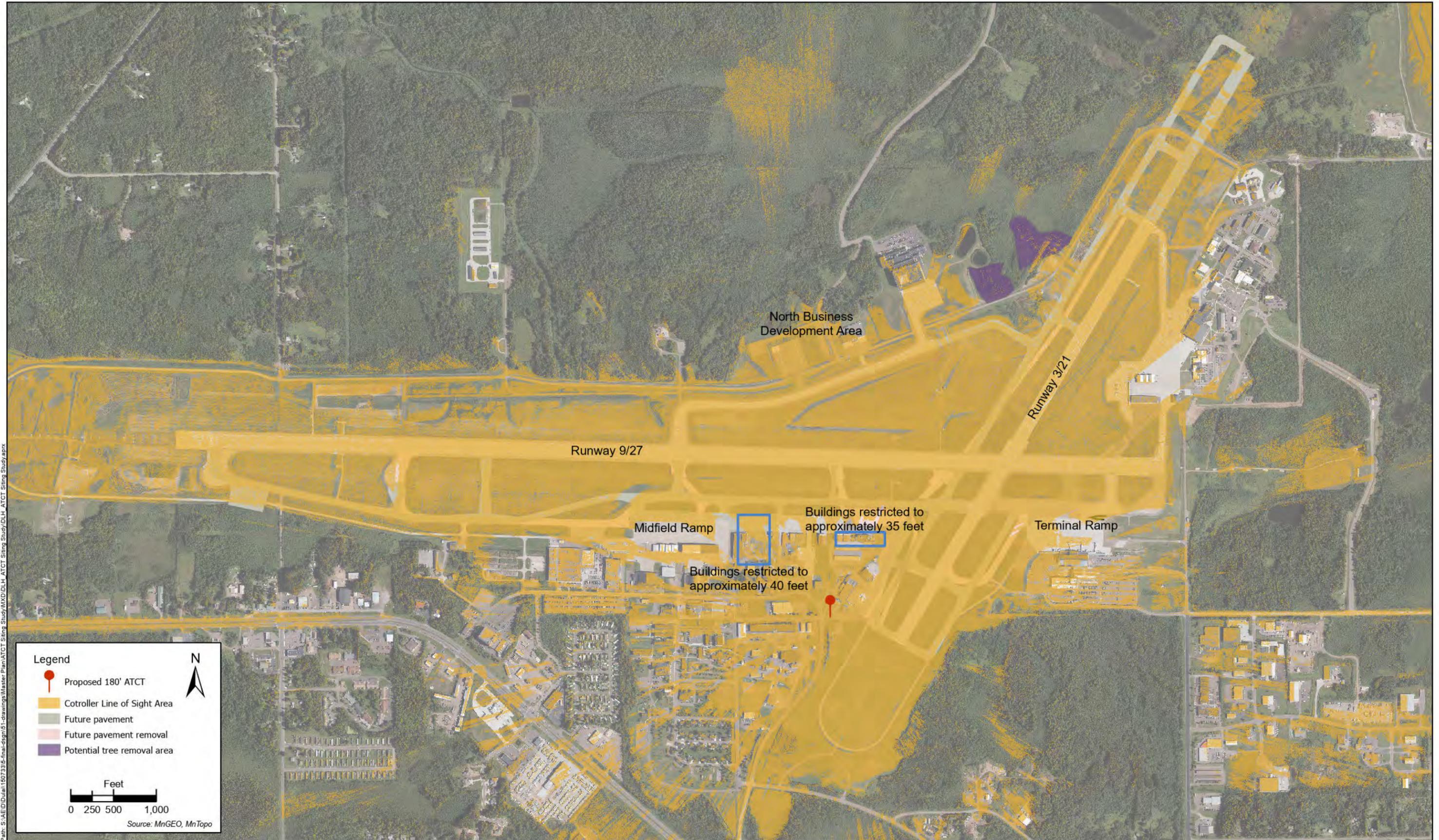


Path: S:\AE\Dul\150733\5-final-dgn\15-drawings\Master Plan\ATCT Siting Study\DLH_ATCT Siting Study.aprx



Path: S:\AE\Dul\150733\5-final-dgn\15-drawings\Master Plan\ATCT Siting Study\DXD\DLH_ATCT Siting Study\DLH_ATCT Siting Study.aprx





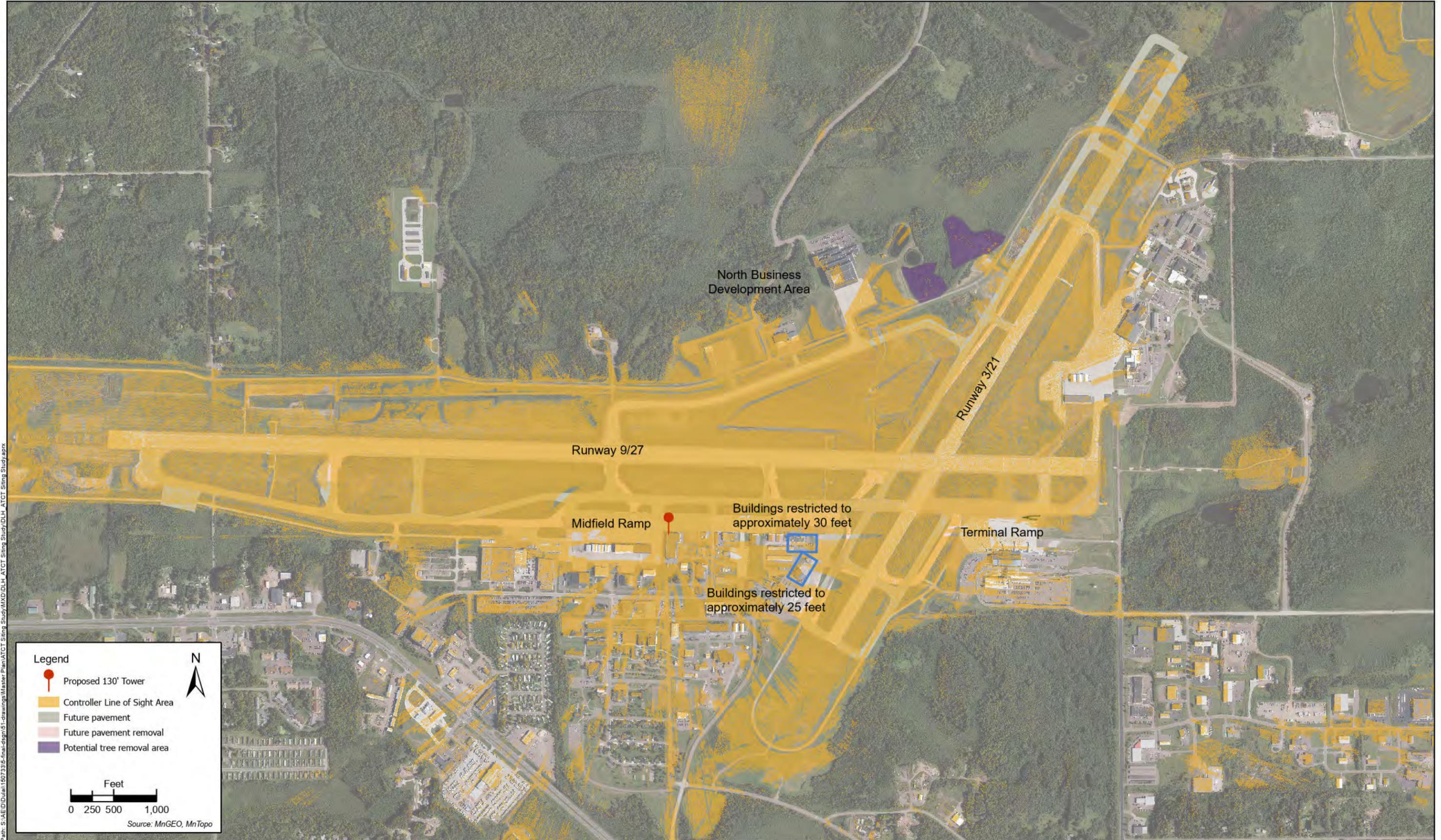
Path: S:\AE\Dul\150733\5-final-dsgn\5-drawings\Master Plan\ATCT Siting Study\DXD\DLH_ATCT Siting Study\DLH_ATCT Siting Study.aprx



Path: S:\AE\DL\150733\5-final-dsgn\15-drawings\Master Plan\ATCT Siting Study\DLH ATCT Siting Study.aprx



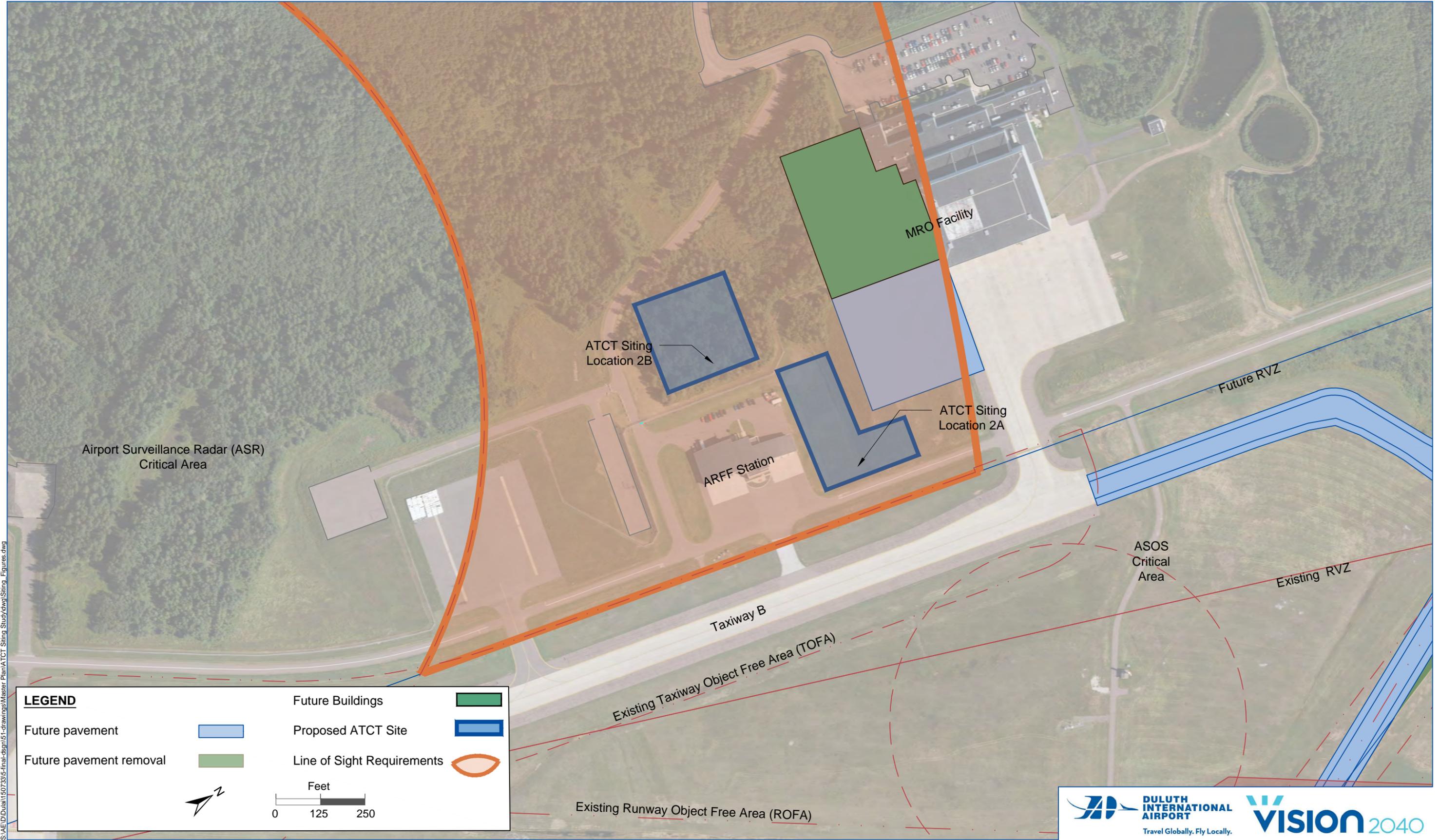
Path: S:\AE\Dul\150733\5-final-dsgn\15-drawings\Master Plan\ATCT Siting Study\DLH_ATCT Siting Study.aprx



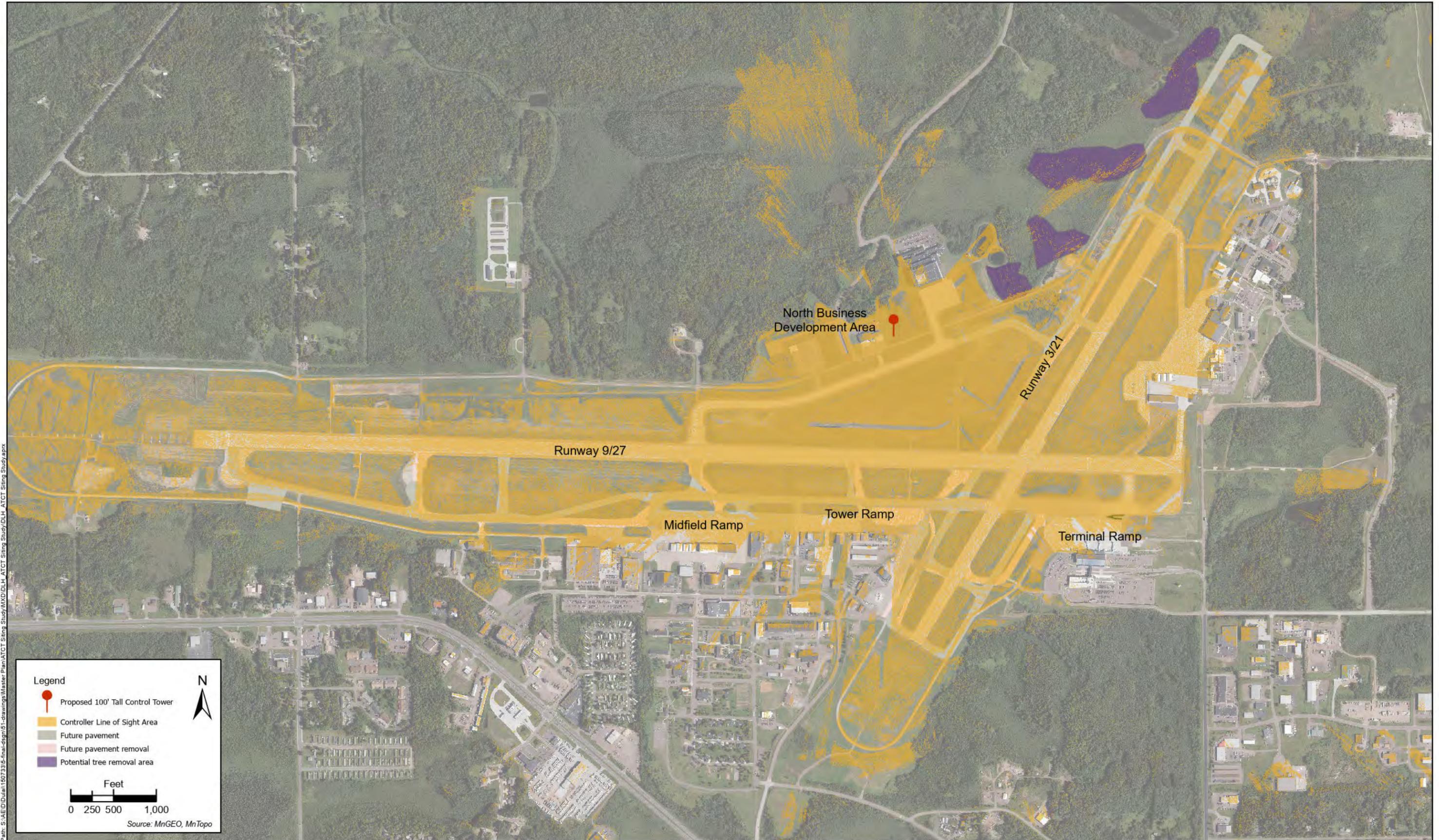
Path: S:\AE\Dul\150733E-final-dsgn\15-drawings\Master Plan\ATCT Siting Study\DLH ATCT Siting Study.aprx



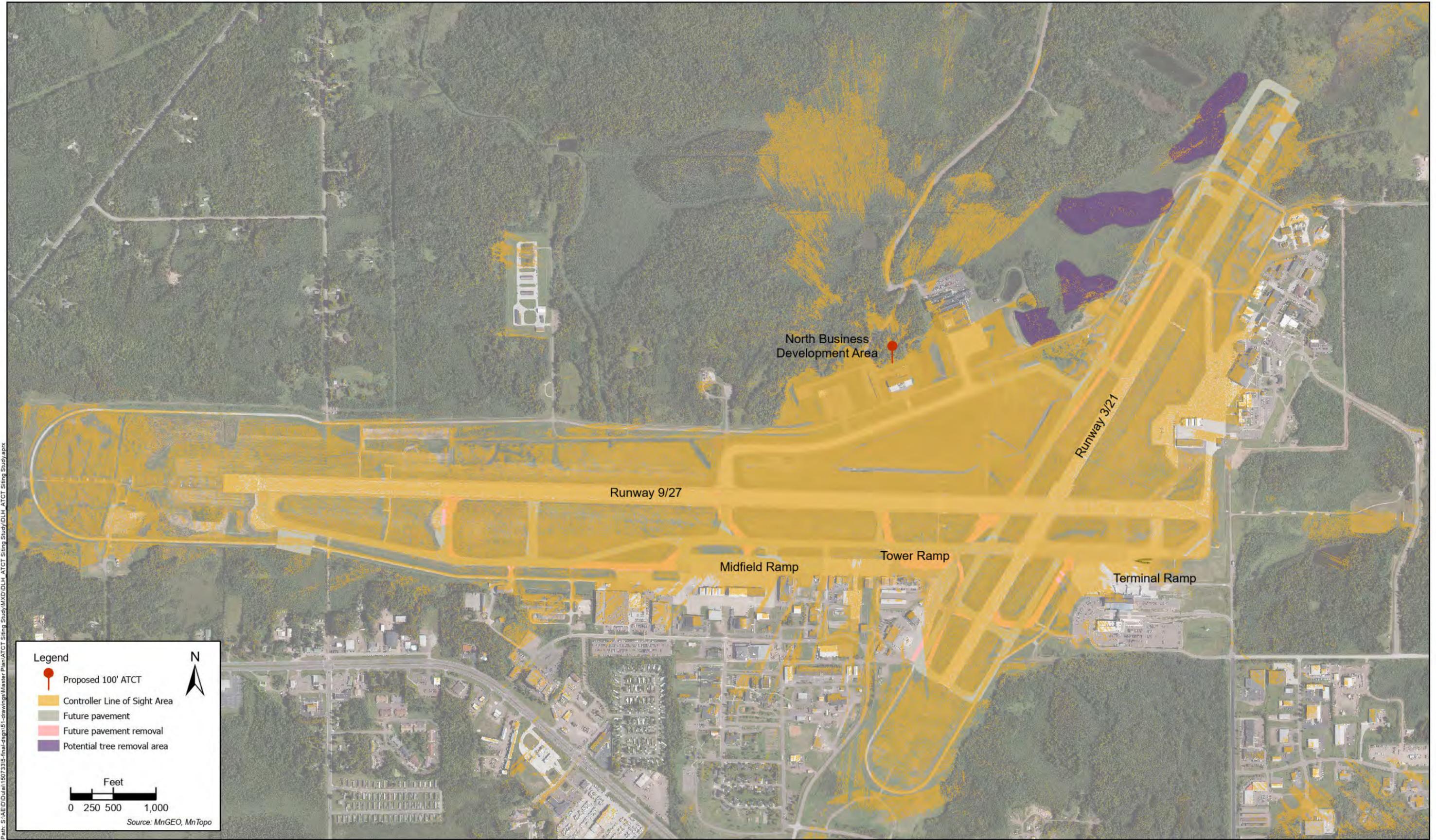
Path: S:\AE\Dul\150733\5-final-dsgn\5-drawings\Master Plan\ATCT Siting Study\DLH ATCT Siting Study.aprx



S:\AE\ID\150733\15-final-dsgn\51-drawings\Master Plan\ATCT Siting_Study\dwg\Siting_Figures.dwg



Path: S:\AE\DLAI\150733\5-final-dgn\15-drawings\Master Plan\ATCT Siting Study\DLH ATCT Siting Study.aprx



Path: S:\AE\Dul\150733\5-final-dsgn\5-drawings\Master Plan\ATCT Siting Study\DXD\DLH_ATCT Siting Study\DLH_ATCT Siting Study.aprx