Chapter 6:
Alternative Development

6.1 Alternative Development

The previous chapter presented the recommended facility requirements at BTV, this chapter explores how the airport can meet the identified facility requirements through various alternatives. Each independent facility at the airport has its own priorities, projects, and alternatives which have been evaluated either prior to or during this process. Analyzing each of the respective preferred alternatives and integrating them holistically generates an overall airport preferred alternative.

The alternatives were developed in consultation and coordination with Airport staff, Air Traffic Control, and Vermont National Guard. Additional input was provided by the Technical Advisory and Regional Advisory Committees. The alternatives were prepared in accordance with the guidelines set forth in FAA Advisory Circular 150/5300-13, *Airport Design*.

6.2 Development Constraints

Development alternatives need to be considered partly based on what will constrain them. The constraints at BTV, include the surrounding roadways, the Chamberlain neighborhood, and the proximity of the existing terminal location relative to Taxiway A and Runway 1-19; along with surrounding environmental constraints. The alternatives also consider potential impacts to the existing navigation infrastructure and to the Vermont Air National Guard.

6.3 Airport Development Plans

Based on the facility requirements chapter, this chapter examines alternatives related to the following:

- Terminal Building Expansion
- Hot Spot 1 Remediation (confluence of Runway 19/Runway 15-33 and Taxiway E)
- Hot Spot 2 Remediation (Taxiway C at Runway 1-19)
- Hot Spot 3 Remediation (Taxiway B Relocation)
- Taxiway M Relocation
- Safety Area Improvements
- Airport Maintenance Expansion
- General Aviation/Cargo Expansion
- Runway 15-33 Rehabilitation
- Ground Access Improvements

The Master Plan Technical Advisory and Regional Advisory Committees each met twice, once on February 12, 2020 and once on October 13, 2020 to discuss the development alternatives. The guidance received during these meetings helped the team determine preferred alternatives when multiple were available. The development projects and subsequent alternative analyses are detailed below.

6.4 Terminal Building Expansion

Previous sections of this Master Plan identified that an expansion to the terminal building would be restricted by the proximity of Taxiway A and Runway 1-19, as well as the surrounding roadways and residential development which constrain the site from the east and west, respectively. The existing terminal building and gates were originally designed to accommodate smaller regional jet aircraft, but as the airline industry has evolved, the desired fleet mix for the airport has as well. The existing infrastructure will not be able to accommodate the new, larger aircraft without impacting operations on

Taxiway A, which is the primary taxiway that provides access to the terminal apron from the airfield. Essentially, there is not enough available apron space between the building and Taxiway A to accommodate this fleet change without a substantial reconfiguration.

Additionally, the facility requirements chapter identified that the consolidated passenger security screening and hold room areas inside the terminal building need improvements. The consolidated passenger security screening area improvement project is underway which is expanding the terminal building to the south. The terminal will be expanded even further in the future to address the hold room space constraints that have been identified.

The following alternatives consider how to address terminal building development, which includes providing enough apron space for the change in fleet mix.

6.4.1 Alternative 1: Maintain the Terminal's Current Location

This alternative maintains the terminal building in its current location and proposes relocating Taxiway A further from the terminal building, expanding the apron to accommodate the changing aircraft fleet mix. Relocating Taxiway A would require relocating Runway 1-19 to the east as well, which impacts the Airport Surveillance Radar (ASR). There are also existing buildings in the approaches to the potential relocated Runway 1-19 ends that would impact operations and require obstruction mitigation.

Work that would need to be completed includes relocating and reconstructing the taxiway, relocating and reconstructing Runway 1-19 and its lighting components, relocating the ASR, and acquiring land to remove the existing buildings off each runway end to clear the approaches. This alternative is dismissed because it is deemed too costly to move and improve the infrastructure.

6.4.2 Alternative 2: Relocate the Terminal Building

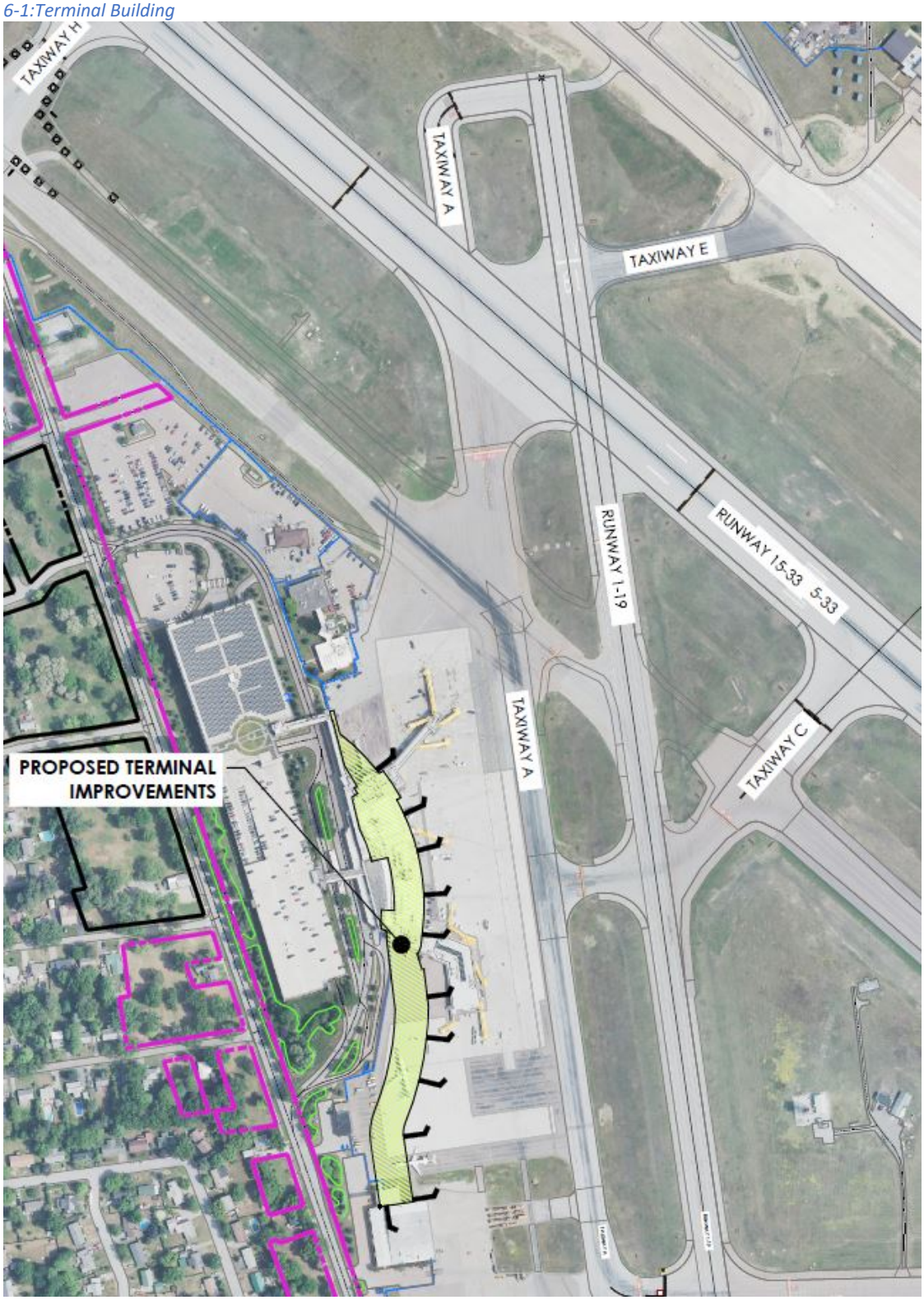
This alternative considers moving the terminal building and parking garage to the west, further from Runway 1-19 onto airport lands that were purchased under the noise program which are closer to the residential development within the Chamberlain neighborhood. This alternative was quickly dismissed because the lands that were purchased are identified to remain as a buffer to the Chamberlain neighborhood, and the costs to relocate the entire infrastructure are prohibitive.

6.4.3 Alternative 3: Create a Linear Terminal Building

This alternative, shown in **Figure 6-1,** creates a two-level linear terminal configuration through a phased development approach. The phased approach would consist of the following: creating a single consolidated security checkpoint; extending the face on the existing second floor main central terminal to the first floor, creating hold rooms and second floor jetways in the central terminal building; expanding the terminal building to the south and adding jetways onto the expansion; demolishing the existing south finger once there are sufficient new jetways constructed; extending the terminal building to the north; and demolishing the north finger. This future development accommodates the desired fleet change, provides 11-12 full size gates with flexibility for different aircraft, provides a larger apron, and fits within the constraints of Taxiway A, Runway 1-19, and of the surrounding neighborhood existing locations. The proposed lower level of the terminal is set aside for ticketing, baggage claim, passenger security, office and airline support, and equipment storage. The secured upper level will contain the gates on the airside while offering office space concessions, and bathrooms on the landside of the

terminal building. The linear configuration will also allow the building to act as a noise buffer between the airport and the Chamberlain neighborhood, with aircraft engines facing towards the airfield.

Figure 6-1:Terminal Building



Source: Passero Associates

6.4.4 Preferred Terminal Building Alternative

After discussion with the MPAC/RAC, Airport Staff and Air Traffic Control, *Alternative 3: Create a Linear Terminal Building* was chosen to be brought forward into the ALP.

6.5 Remediation of Hot Spot 1

Hot Spot 1 is located at the intersection of Runway 19, Runway 15-33, and Taxiway E. This area has a large expanse of pavement, which primarily results from the angle at which Runway 1-19 and Runway 15-33 intersect. This large area of pavement leads to confusion for aircraft operators, particularly those in the general aviation community, who mistakenly turn onto Runway 15-33 for departures as opposed to continuing to the Runway 19 end. This can be dangerous, especially if another aircraft is using Runway 15-33 at the time. This intersection has four turning options in a single location, which is not aligned with design standards, which recommend three turning options in a single location, at most. It is critically imperative that hot spots be addressed during the master planning process.

When Taxiway E was introduced for the National Guard, additional pavement was added opposite the Taxiway for aircraft maneuvering purposes. Discussions with Vermont Air National Guard indicated that Taxiway E serves two purposes: immediate access from their apron to the runway environment, especially during the winter condition because it is the quickest route; and to accommodate the C-17 which, when Taxiway E was originally built, could not use Taxiway D or F due to size constraints. The Air National Guard reconstructed Taxiways D and F in 2019 to accommodate the C-17 aircraft, therefore, the National Guard does not need the additional pavement on the west side of Runway 1-19 at Taxiway E anymore. They do, however, still need an immediate access route to the runway environment during winter conditions, preferably one that does not have direct access from the centerline of their apron to the Runway. Taking all of this into account, the additional pavement across from Taxiway E can be painted green to remove it from the vast amount of usable pavement and mitigate the confusion in this area. Discussions with the Vermont Air National Guard concluded that there is the potential to relocate Taxiway E while still providing timely access to the runway environment and quicker access to the new parallel Taxiway G. For the purposes of providing a holistic representation of the solution to this problem, the relocation of Taxiway E will be incorporated in the following alternatives even though it will be a Department of Defense project and not part of the Airport's Capital Improvement Plan. The removal of the excess pavement will, however, be part of the Airport's Capital Improvement Plan.

Taxiway A is a partial parallel taxiway to Runway 19, but primarily serves the terminal apron area. With the existing geometry, this taxiway serves both general aviation aircraft seeking to use Runway 19, as well as commercial aircraft parked at the terminal. However, commercial aircraft performing pushback maneuvers from the gates at the terminal building tend to close operations on Taxiway A due to a lack of apron space. Discussions with Air Traffic Control indicated a desire to examine a bypass to Taxiway A that would allow the terminal apron portion of Taxiway A to be used exclusively by the commercial aircraft for gate usage and provide both general aviation and commercial aircraft with a secondary route.

The general aviation aircraft that use Taxiway A to reach Runway 19 contribute to the high number of runway incursions that occur at the airport. As previously mentioned, pilots tend to make accidental right turns onto Runway 15-33, or even continue onto Taxiway E instead of Taxiway A because of the large expanse of pavement and loss of visual reference due to the width and crown of Runway 15-33 and the fact that general aviation aircraft sit low to the ground. They often have difficulty discerning

where Taxiway A continues on the north side of Runway 15-33 from the southern hold short line position.

Another significant contribution to the number of incursions occurs when aircraft continue north on Taxiway A towards the Runway 19 end after crossing Runway 15-33 and encounter the hold-short lines for Runway 15-33, oftentimes stopping short and impacting Runway 15-33 operations. This hold short marking is intended to control entry into the Runway 15-33 OFA (Object Free Area) for aircraft taxiing south from Runway 19 end but often is misconstrued as the hold short lines for Runway 19 since there are two separate hold short lines in brief succession. When corrected by Air Traffic Control, these aircraft will continue further north and encounter the proper hold short lines.

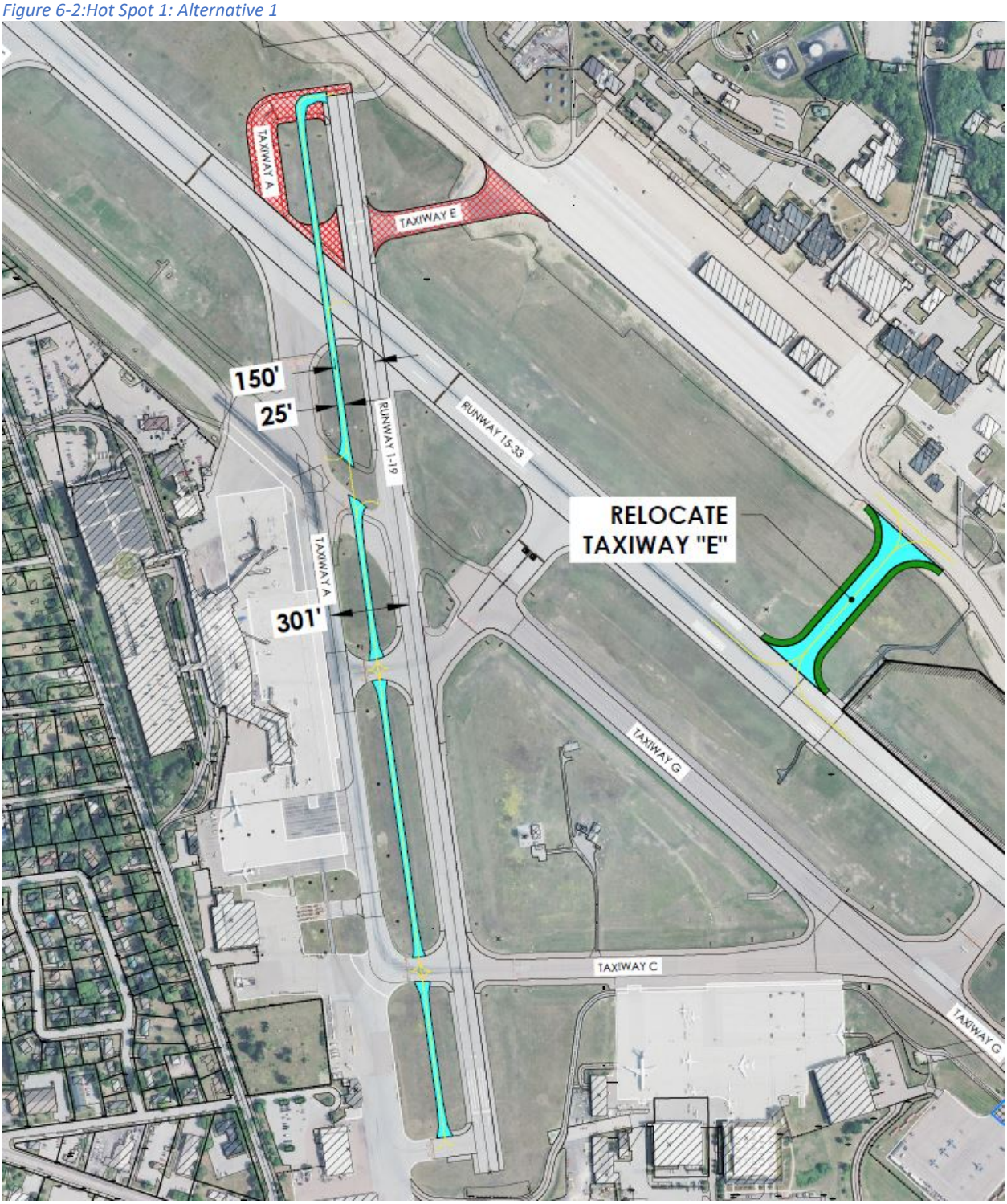
When Runway 1-19 is rehabilitated, the runway markings should be evaluated against the magnetic variation to determine if remarking the numbers to 18-36, along with signage changes, is warranted at that time.

6.5.1 Alternative 1: Provide a full-length parallel taxiway to Runway 1-19 on the west side between Runway 1-19 and Taxiway A, relocate Taxiway E and eliminate excess pavement between Runway 19 and Runway 15-33

This alternative, depicted in **Figure 6-2,** would provide a taxiway for only small aircraft taxiing between Runway 1-19 and Taxiway A. However, the taxiway object free area (TOFA) of this new taxiway overlaps with the TOFA of Taxiway A, therefore, operations on the taxiways could not occur concurrently, as there isn't ample room for both the commercial aircraft on Taxiway A and small aircraft on the new parallel taxiway.

Furthermore, Air Traffic Control raised a concern about introducing another taxiway crossing over Runway 15-33 and potential confusion to pilots of too many crossings in a small space. Additionally, if a larger aircraft were to accidently turn onto this Taxiway, which would not be designed to accommodate it, it likely would close the airport environment. After discussions, this alternative was dismissed from further considerations.

Figure 6-2:Hot Spot 1: Alternative 1



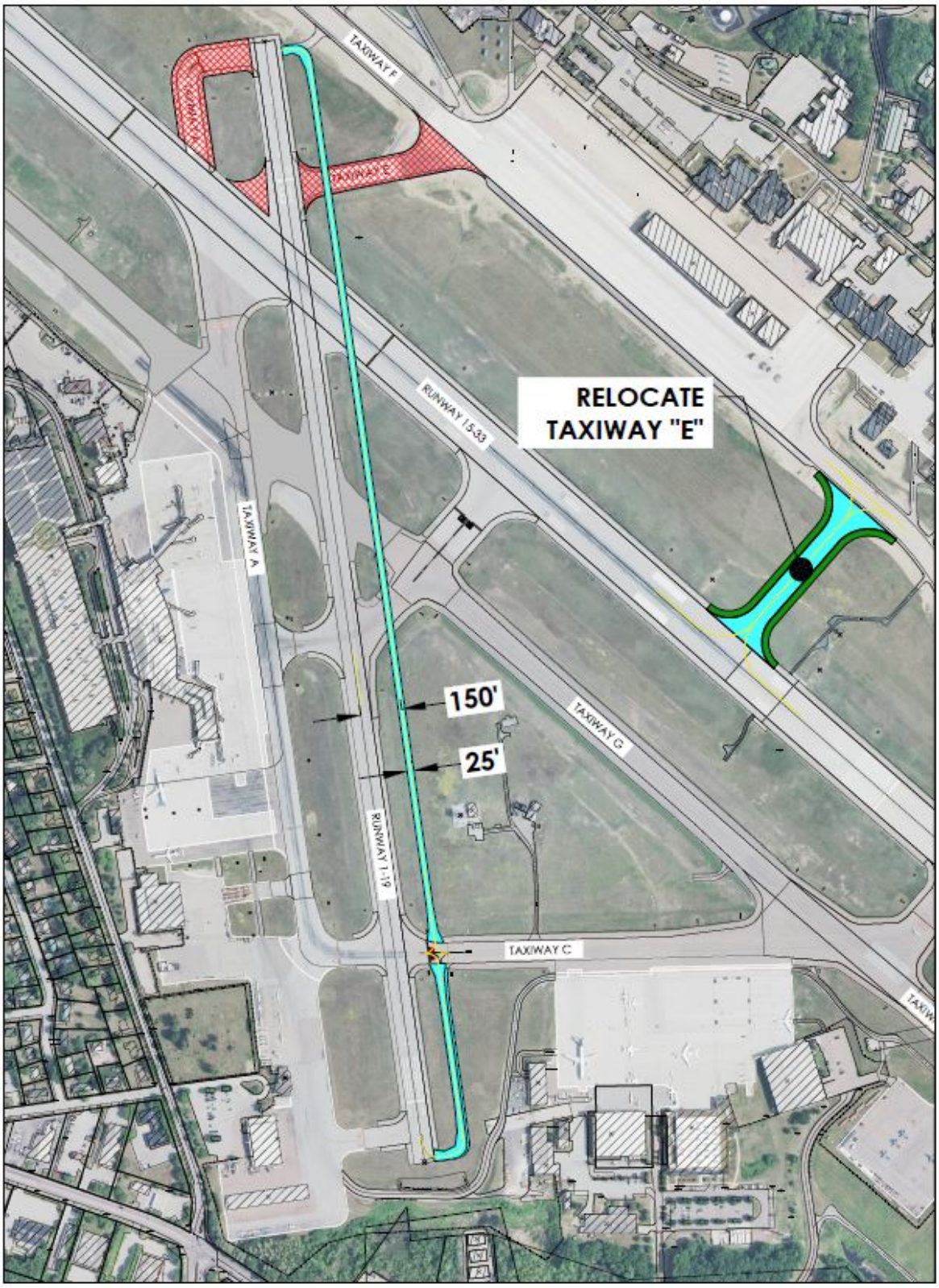
Source: Passero Associates

6.5.2 Alternative 2: Provide a full-length parallel taxiway to Runway 1-19 on the east side, relocate Taxiway E, and eliminate excess pavement between Runway 19 and Runway 15-33

This alternative, as depicted in **Figure 6-3,** would provide a full-length parallel taxiway for only small aircraft on the east side of Runway 1-19 and eliminate Taxiway A pavement north of Runway 15-33. This option generated the same concern regarding introducing additional crossings to Runway 15-33 as well as the proximity to the ASR. The parallel taxiway to Runway 19 end terminates inside the taxiway object free area of Vermont Air National Guard's Taxiway F and would have to be shortened, thus not providing full length to the runway end.

The TAC expressed concern regarding the amount of actual use the proposed parallel taxiway between Taxiway C and Taxiway G would receive. Aircraft currently use other existing taxiway routes that air traffic personnel consider appropriate to access Runway 19. A partial parallel taxiway from Taxiway C to the Runway 1 end would eliminate the need for general aviation aircraft from the Valley area (east side of airport) to cross Runway 1-19 to get to Runway 1. This would limit the aircraft crossing Runway 1-19 to mostly commercial service aircraft that access the terminal and beacon hangar areas, therefore, achieving a volume reduction at a lower cost. While Figure 6-3 shows the entire parallel taxiway, discussions within the TAC indicated that only the extension from Taxiway "C" south toward the Runway 1 end be carried forward.

Figure 6-3:Hot Spot 1: Alternative 2



Source: Passero Associates

6.5.3 Alternative 3: Shorten Runway 19, relocate Taxiway E, and provide partial parallel to Runway 1 from Taxiway C

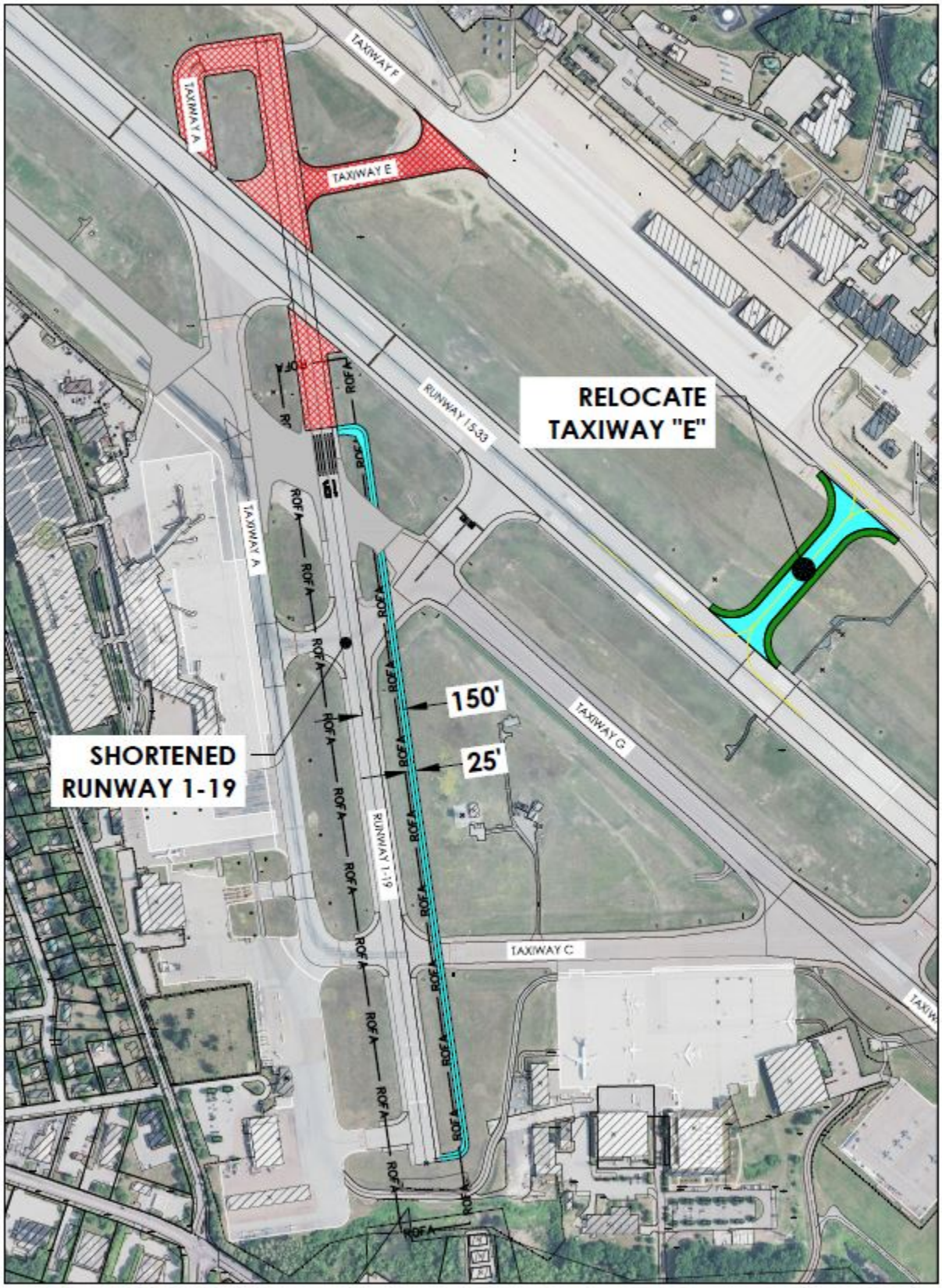
This alternative, depicted in **Figure 6-4**, shortens Runway 1-19 to meet design standards and eligibility requirements for future funding. As most of the general aviation activity is on the east side of Runway 1-19, this alternative provides a taxiway on the east side of Runway 1-19 from Runway 1 to Taxiway C, which reduces the need for runway crossings. A full-length parallel taxiway was considered, but most aircraft coming from the east will access Runway 19 via Taxiway G and can access Runway 1 from Taxiway C. Discussions with the Technical Advisory Committee members concluded that the additional taxiway section between Taxiway C to Taxiway G likely would not receive much use, but the taxiway from Taxiway C to Runway 1 would be extremely beneficial in eliminating the runway crossover to access Runway 1 (see Section 6.5 for Remediation of Hot Spot 1).

By decoupling Runway 1-19 and 15-33 and eliminating the excess pavement for Taxiway A north of Runway 15-33, the entire Hot Spot 1 issue would be resolved. Decoupling the runways does not, however, create two runways that operate independently of each other. Since the two runway safety areas overlap, the operation of each runway depends on the other and only one can be active at a time.

During the Technical Advisory Committee meeting, the general aviation community expressed a concern about shortening Runway 1-19. Based on an analysis using guidance in the Runway Length Advisory Circular for small aircraft operating in 80°F at an elevation of 334 feet, the recommended runway length for light general aviation aircraft is about 3,000 feet This alternative provides 2,692 feet in length, which is greater than the minimum 2,500 feet of runway required by the Vermont Flight Academy. A review of FAA data from January 2015 to June 2020 shows that Runway 1-19 is used for 20.1 percent of the total departures and 29.8 percent of arrivals, compared to 78.1 and 68.2 percent, respectively, on Runway 15-33.

This alternative will be carried forward into future development of the ALP.

Figure 6-4:Hot Spot 1: Alternative 3



Source: Passero Associates

6.6 Remediation of Hot Spot 2

The intersection of Runway 1-19 and Taxiway C is denoted by the FAA as a Runway Incursion Mitigation (RIM) hot spot, meaning there have been sufficient incidents in a specific timeframe that calls for immediate attention to the root problem. Sometimes, aircraft fail to hold short of Runway 1-19 and continue into the runway environment, even though the pavement is marked accurately.

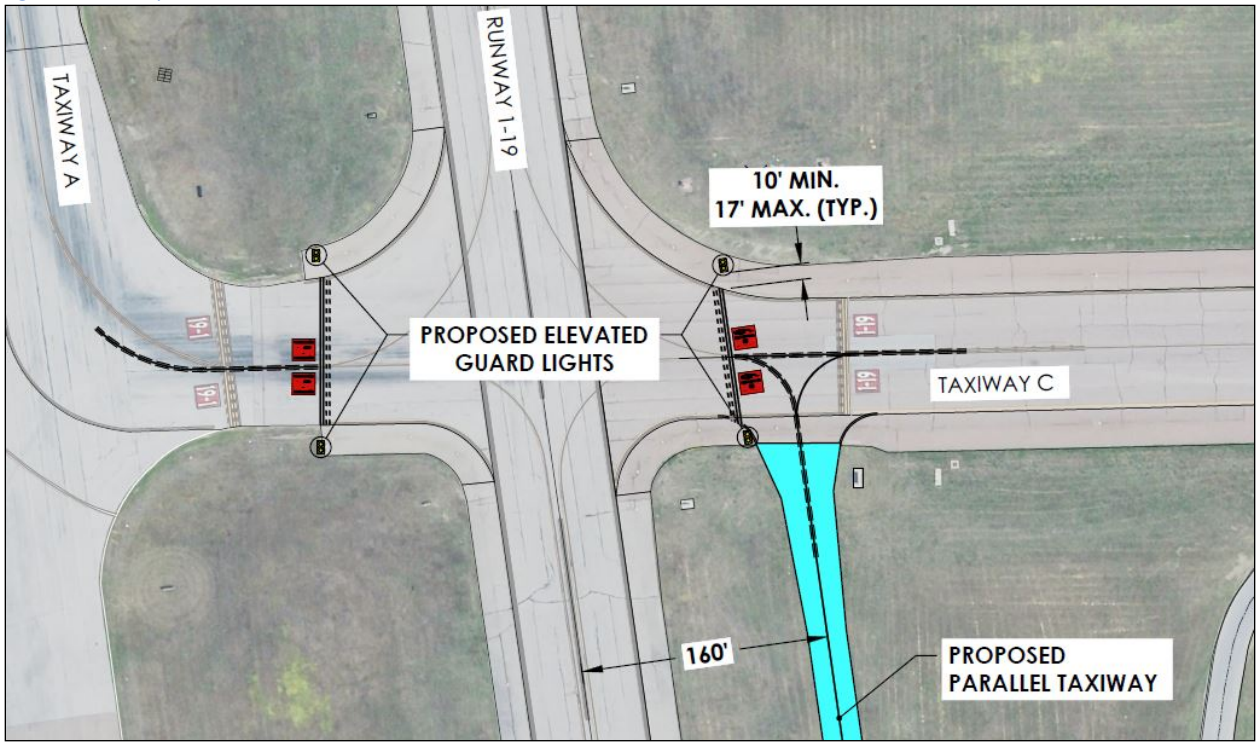
Discussions with Air Traffic Control identified that the location of the hold line on the westside of Taxiway C is too close to Taxiway A and the striping geometry is challenging to follow, causing aircraft taxiing from the terminal to overshoot the hold line before they can align with the centerline, creating a potential incursion with Runway 1-19.

6.6.1 Alternative 1: Install Guard Lights on Taxiway C

This alternative, displayed in **Figure 6-5**, includes installing two guard lights on either side of the hold line at Taxiway C, outside of the Runway 1-19 OFA. Guard lights increase the visibility of the hold short markings and the pilot's awareness to indicate that they are approaching a runway. The guard lights would tie into the existing lighting infrastructure that already exists in this area. This project is critical to airport safety and is carried forward for immediate attention.

As the partial parallel taxiway from Taxiway C south to Runway 1 was determined to be progressed, the existing hold line on Taxiway C needs to be relocated to hold aircraft prior to entering the Runway 1-19 environment. The hold line will be relocated along with installation of guard lights, to increase visual acuity.

Figure 6-5:Hot Spot 2: Alternative 1



Source: Passero Associates

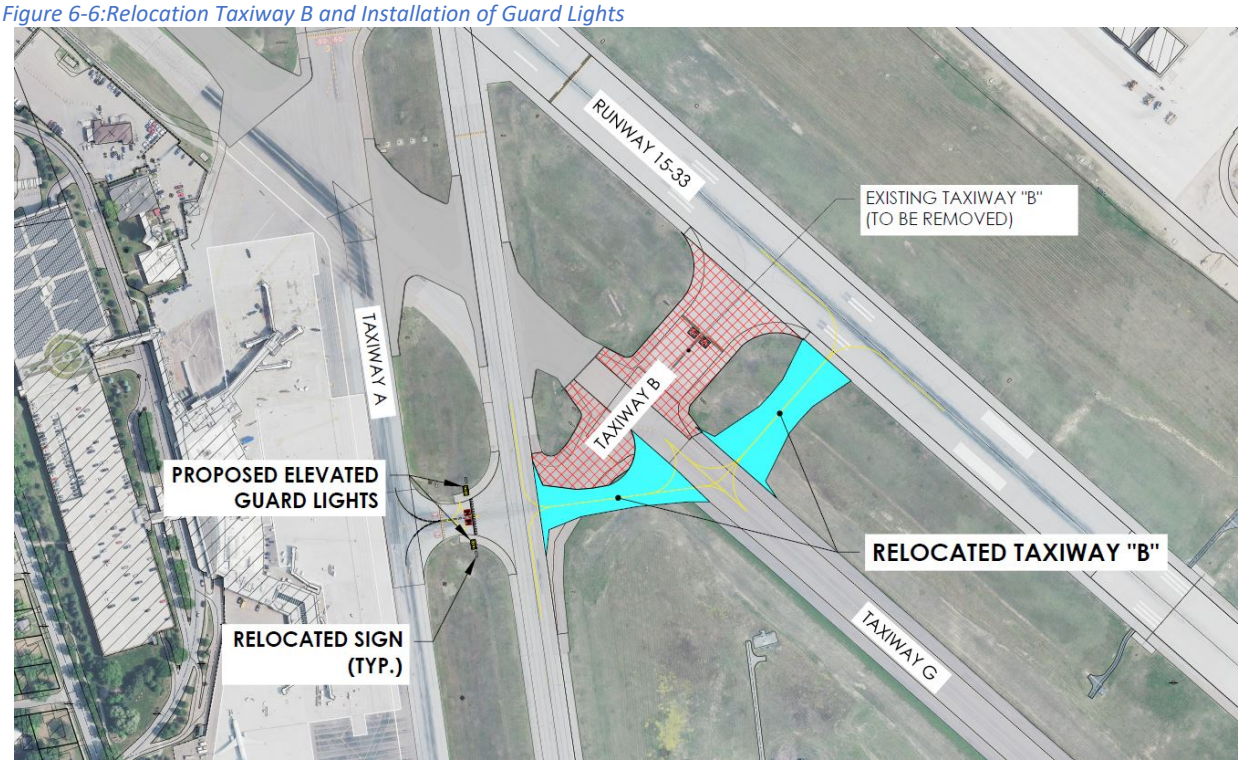
6.7 Remediation of Hot Spot 3

Hot spot 3 is located at Taxiway B and Runway 1-19. Taxiway B is very frequently used by commercial aircraft exiting Runway 15 to access the terminal apron. The current location of the Taxiway and angle between Runway 1-19 and Taxiway G causes a hold short dilemma on Taxiway B at Runway 1-19, in which larger aircraft holding cause a backup onto Taxiway K and the Runway 15-33 environment because of limited space between the Taxiway B and Taxiway K hold lines. Shifting the location of Taxiway B and associated hold line would provide additional space to hold aircraft. Discussions with Air Traffic Control indicated that these operations are critical to the flow of the airport. Providing additional taxiway length and relocating the hold line provides additional room and would improve the flow of aircraft on the airfield. Taxiway K will be renamed to Taxiway G with the completion of the parallel Taxiway.

There is a separate issue on the west side of Taxiway B at the terminal apron where commercial service aircraft are failing to hold short of Runway 1-19 because of the limited space between the hold line on Taxiway B, the Taxiway A centerline geometry and the terminal ramp. The following point was raised during an RSAT meeting with several branches of the FAA: with Runway 1-19 being right-sized to small criteria, the hold lines on Taxiway B can be moved closer to the Runway, allowing additional space for commercial service aircraft to align with the taxiway centerline. The FAA suggested that guard lights be installed to help raise the visual acuity of the hold short line and install hold line signage on the south side of the taxiway.

Maintaining the Taxiway B connection to the main terminal apron is critical to terminal operations. When the terminal is reconfigured, the alignment of the gates, or a painted island, will need to be considered in the future to avoid a direct apron to runway connection. This alternative is shown in **Figure 6-6.**

Figure 6-6:Relocation Taxiway B and Installation of Guard Lights



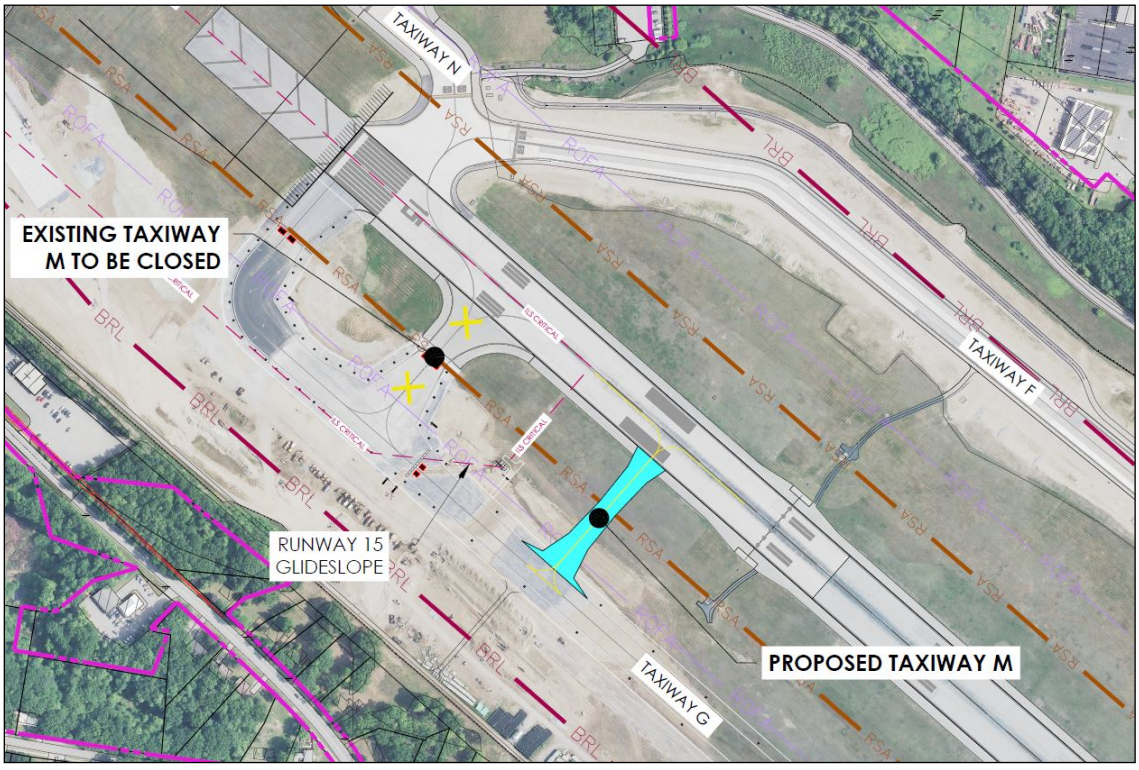
Source: Passero Associates

6.8 Relocation of Taxiway M

Taxiway M was located at the original end of Taxiway G before Runway 15 was extended. Taxiway M, which acts as a bypass taxiway to the Runway 15 end, is located within the glideslope critical area. Aircraft holding on Taxiway M are too close to the glideslope antenna and interrupt the signal.

The Technical Advisory Committee provided additional information furthering the need for this relocation. From a commercial aircraft standpoint, BTV is a single runway airport due to the size constraints of Runway 1-19. According to OPSNET data, ATC experienced ground delays of 78,237 minutes during 2019, the following issues related to Taxiway M are a contributing factor to these delays. Since there is no holding bay available at the Runway 15 end, if aircraft are required to ground hold, Air Traffic will send them to hold on taxiways M and H, which provides bypass for other aircraft that are cleared for takeoff to access the Runway 15 end. To make this work, aircraft will back taxi on Runway 15-33 and nose into the connector taxiway M or H to either hold or continue on Taxiway G. Those back taxi operations are occurring on a primary runway which is a major cause for delays. During the winter condition Taxiway M is closed because of its location within the critical area which leads to more issues, aircraft landing on Runway 33 with a 3.2° approach slope may miss Taxiway H and must taxi to the end of the Runway before exiting, thereby occupying more runway time. Also, during plowing operations starting on the Runway 15 end, snow removal equipment must drive all the way to Taxiway H to exit the runway, which occupies more runway time and may cause operational delays. Relocating Taxiway M will allow it to remain open during the winter and give the snow removal equipment operations a quicker exit from the runway during snow removal, and aircraft on ground hold could utilize it without interfering with the ILS signal. All these factors would contribute to a decrease in ground delay time at the airport. This alternative is shown in **Figure 6-7.**

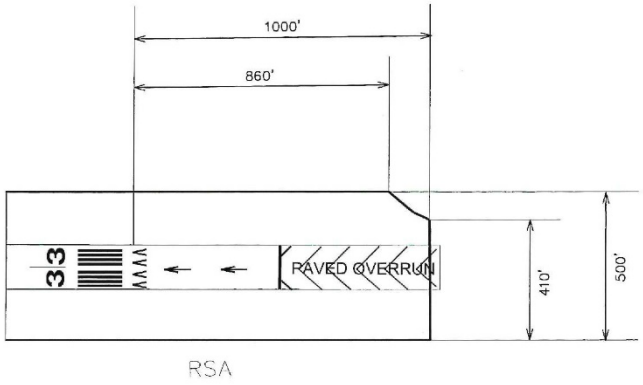
Figure 6-7:Relocation of Taxiway M



Source: Passero Associates

6.9 Safety Area Improvements

Safety areas are design standards that the FAA is unable to issue waivers on, therefore, the Master Plan must examine ways the safety areas can be improved. The Runway 15 departure safety area, located beyond to the Runway 33 end, was constructed in 2004 and does not meet the design standards. As stated in the Airport's Certification Manual (ACM), "*The Runway 33 threshold is displaced 500' and has an extended runway safety area that is 860' long on the east side and 410' wide (90 feet short on the southeastern corner)*." This safety area operates under a runway safety area determination, as shown in the ACM excerpt below dated December 2014. The reason for the runway safety area determination is due to the topography of the land to the east of Runway 33 end. The terrain adjacent to the safety area dips drastically, significantly exceeding terrain slope requirements within the safety area. A portion of the land required to create a standard safety area is beyond airport property and could not be acquired at the time.



BURLINGTON INTERNATION AIRPORT
Runway Safety Map 33 End

BTV–ACM Tab 5
Revised November 1, 2014

5–4

FAA APPROVED
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6.9.1 Alternative 1: Permanent Safety Area Determination

A Runway Safety Area determination exists for the existing RSA deficiency due to the adverse topography adjacent to Runway 33 end. A retaining wall is already in place to stabilize the slope and mitigate the risk of a failure, as shown above. This assume safety area determinations can continue.

6.9.2 Alternative 2: Purchase property create a standard RSA

With the new guidance in FAA Advisory Circular 5300-13A and Order 5300.1G, modification to standards are no longer issued for runway safety areas dimensions. This alternative addresses the topographical constraints and provides a standard RSA at Runway 33 end. The airport would purchase approximately 0.1± acres of land from the adjacent landowner and construct a retaining wall to support fill necessary to create a standard safety area. This alternative would satisfy the design standards and remove the modification of standards to the RSA.

6.9.3 Preferred Safety Area Alternative

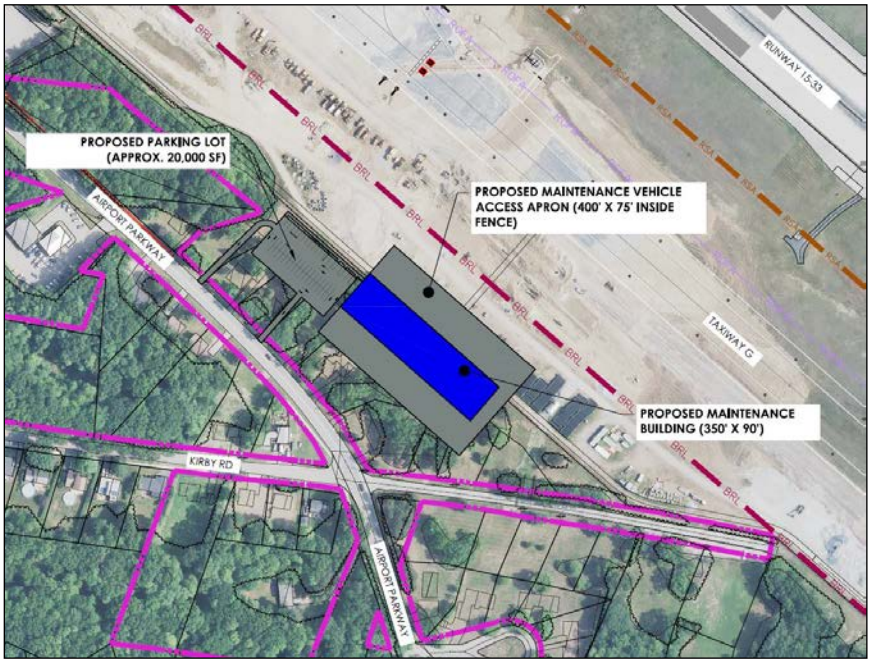
Discussions with airport staff indicated the need to maintain a standard safety area and, as such, Alternative 2 is brought forward into the ALP and Capital Development Plan. This project should be coordinated further with the New England Region of the FAA.

6.10 SRE Building

The airport owns several pieces of snow equipment to clear their Priority 1 area: Runway 15-33, Taxiways A, C, G, J, air carrier apron (adjacent to Taxiway A), ARFF access via Taxiway E and mutual aid gate (Gate 2). The existing location of airport snow removal equipment storage is not conducive to airfield operations and the existing building is undersized to accommodate the AIP funded snow removal equipment (listed earlier in Table 2-9). The AIP Handbook outlines that an airport needs a SRE building sufficiently sized to accommodate all AIP funded snow removal equipment. The building should also be located such that it provides the equipment easy access to the airfield. Many of these pieces of equipment are currently stored outside, or in other areas of the airport which does not satisfy the AIP requirements.

The airport purchased lands under the noise program that can be used to support aviation development. Two potential sites exist that were considered for this development, both along Kirby Road. The site on the east side of Kirby Road is not conducive for development because of terrain and wetland issues. The site on the west of Kirby Road is flat, has no wetlands, and was chosen for a potential SRE Building. A facility constructed in this location would provide immediate access to the airside, ample room for development of a garage, make use of existing curb cuts, and would have ample space to provide a landscaping buffer along Airport Parkway. The snow removal equipment would also be able to access internal service roads easily from this location. This alternative is shown in **Figure 6-8.**

Figure 6-8:Airport Maintenance/SRE Expansion



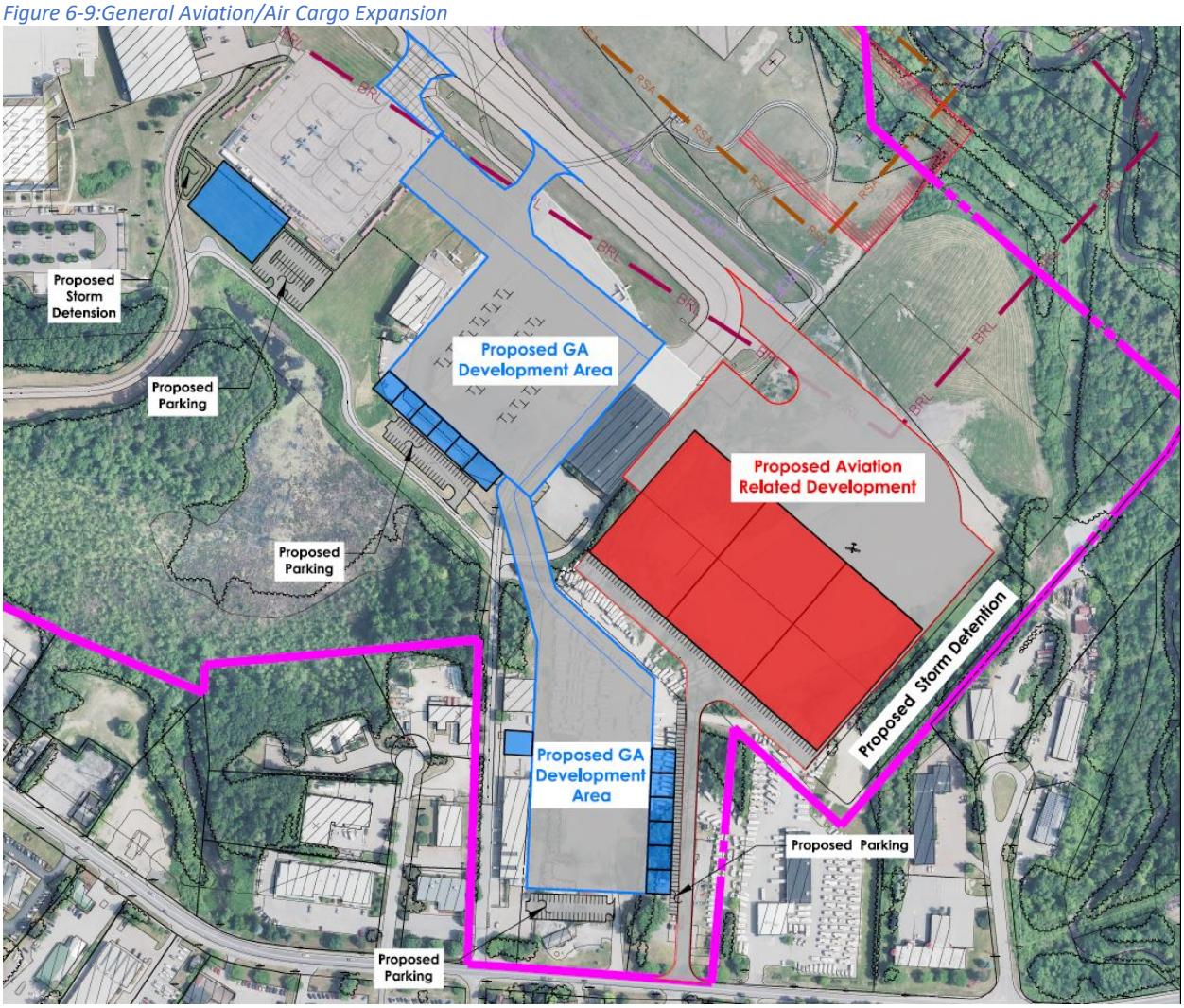
Source: Passero Associates

6.11 General Aviation/Aviation Related Development

The facilities requirements indicate a need for additional hangars and apron space for general aviation. Ideally, general aviation should be kept separate from commercial service. To address future facility demand, the general aviation and aviation related development area will be located in the southeast area of the airport where the majority of the GA activity currently takes place. These additional facilities, buildings and an apron, would be constructed on an as-needed basis. Development of the general aviation area includes removing the existing "Ready" hangars-old military hangars which are structurally compromised- and the octagon hangars to open the area for aircraft parking space and conventional box hangars. The area would be constructed using existing curb-cuts along Willison Road and properly offsetting any development to allow for the landscaping necessary to meet South Burlington's landscape requirements. Because of the increased impervious surface, storm detention is also proposed. This alternative is shown in **Figure 6-9.**

It is noted that hangars are constructed on an as needed basis and are usually funded by private funding sources. As such, hangars will not be included in the Airport's Capital Improvement Plan.

Figure 6-9:General Aviation/Air Cargo Expansion



Source: Passero Associates

6.12 Rehabilitation of Runway 15-33

According to the Pavement Management Study that was completed in 2017, this runway should be considered for a rehabilitation around the year 2025. At the time of rehabilitation, the magnetic declination will need to be assessed to determine if the runway markings and associated signage will need to be changed to Runway 14-32.

Two of the primary factors limiting the longevity of a bituminous runway, such as this one, are the amount and locations of cold pavement joints. Cold pavement joints are established when production stops for an extended period and the newly placed asphalt is allowed to cool prior to production continuing, usually at the end of production for a day. In an ideal situation, the Runway would be paved in just a few days using tandem 25' wide pavers to keep cold joints to a minimum.

The challenge with paving an active airfield surface at any airport is determining a construction schedule that all stakeholders are amenable to. During any paving operation, the construction area is required to be closed long enough for the existing pavement to be removed and the new asphalt placed and cooled prior to opening. BTV is a commercial service airport with activity typically scheduled on the Runway from 6:00 AM to about 11:00 PM daily, which presents unique challenges to the constructability and success of the project. A staged approach will be employed to complete the rehabilitation of Runway 15-33, which is outlined below.

The first 1700 feet of each runway is Portland Concrete (PCC). The repair of spalls and joints are expected on the concrete pavement that can be accomplished at the same time with asphalt paving operations. Each alternative below for rehabilitating the runway shares a key component: temporarily displacing the runway ends in stages, 2,022 feet at a time for each, to establish a construction area, leaving 6,300 feet of active usable pavement in each phase. After displacing one end 2,022 feet, the first 1,022 feet, which is concrete pavement, beginning from the runway end, can be repaired over the course of two or three days while the runway remains open and active. The remaining 1,000 feet is required as RSA during the day when there are operations but can be repaired, milled and paved in a few nights while the runway is closed.

This approach is beneficial for several reasons. Closing the runway at night gives the contractor time and space to rehab the 1,000 feet but provides the airport flexibility, with advanced notice, to request that the contractor remove their equipment if there happens to be a flight arriving during the runway closure. Also, since the 1,000 feet is only RSA for the active runway, the contractor can maximize night work and avoid the need to stop the paving operation early to allow the asphalt to cool, pavement cores to be taken, pavement to be cleaned, and markings to be installed, all of which are required prior to operations commencing on an active runway environment.

Once the first phase is completed, the other end can be displaced 2,022 feet, leaving 6,300 feet of usable pavement to follow the same order of operations as the initial stage. Following the successful completion of the second runway end, the middle 4,278-foot section would remain to be rehabilitated, the approach to milling and paving this section is where the alternatives differ.

After all the paving is complete, grooving and adding final markings need to be finished, which would take between 8-15 nights depending on how many hours of work are available each night.

Below are the alternatives for rehabilitating the middle 4,278 feet of runway.

6.12.1 Alternative 1: 24 Hour Rehabilitation

The whole runway will be closed so milling and paving can happen for approximately 6 days straight, 24 hours a day. Though this alternative shuts down all operations on the runway, it provides the fewest cold joints and allows for longer pavement placement lanes, resulting in a smoother, longer lasting, and most economical product.

6.12.2 Alternative 2: Only Night Rehabilitation, Keep Airline Schedule

The remaining section will be milled and overlaid at night with the Runway remaining open during the day. If all flights continued to arrive and depart on their normal schedule, this would allow rehab work to be completed between 1:00 AM and 5:30 AM, providing the contractor with less than 4.5 hours to work when accounting for preparation and clean-up. This scenario would result in the contractor only being able to mill and overlay approximately 250 linear feet of Runway per night, which would take at least 25 nights.

This alternative would result in the largest frequency of cold joints and shortest pavement placement lanes, leading to a segmented feel, shortened pavement life, and highest cost. The inefficiency of this concept would result in very high pricing for material and labor. Fees to run an asphalt plant for a short duration at night would significantly increase the project costs. This approach also would not allow for improvements to the runway profile, cross slope, or potential modifications to standards. With such a short time at night to accomplish any milling or paving work, the contractor may find it challenging to adhere to the closure schedule agreed upon in the contract.
This would increase the likelihood that the Runway would not be open at the scheduled time in the morning thus impacting operations, causing potential delays to commercial service, creating an adversarial relationship with the contractor, and liquidated damages litigation.

6.12.3 Alternative 3: Only Night Rehabilitation; Modify Airline Schedule

The remaining section will be milled and overlaid with an extended nighttime closure for two weeks. The Runway would remain open during the day with only a slight modification to the normal commercial service schedule. A Runway closure window from 10:00 PM to 6:00 AM would afford the contractor a full shift each night and allow them to mill and overlay approximately 575 linear feet of Runway per night, which would require approximately 11 nights to complete the work. This alternative would result in less than ½ the number of cold joints and night shifts as expected with Alternative 2. The longer pavement placement lanes would provide a smoother feel, increased pavement life, and a more reasonable economic option. The amount of production at night would offset the costs to produce the material In addition, small improvements to the Runway profile, cross slope, or potential modifications to standards could be made. The potential schedule risks of not being able to open the Runway in the morning are also reduced.

6.12.4 Runway 15-33 Rehabilitation Preferred Alternative

As the primary commercial service airport in the State of Vermont and the home to the Vermont Air National Guard, it is critically important that Runway 15-33 remains usable. As such, when Runway 15-33 is to be rehabilitated, Alternative 3 should progress forward. The choice will be contingent upon airport management's negotiations with the airlines and cooperation of a local material supplier.

6.13 Ground Access Improvements

Ground access to the airport has been included in many studies for and about the airport. Although passengers did not specifically express a traffic concern during the passenger survey that was conducted as part of this Master Plan, it has been considered during other discussions. There is no direct linkage from I-89 to the airport, though a common route that passengers use is from I-89 via Exit 14, which includes a two-mile stretch of Williston Road that is densely populated and contains numerous traffic lights. The high volume of traffic on Williston Road causes locals to use backroads as an attempt to avoid delays, which raises concerns from the local communities. There have been multiple corridor studies that examined many alternatives to provide more direct access from I-89 to the Williston/Airport Drive/Parkway area. Presently, the Chittenden County Regional Planning Council (CCRPC) is conducting an *Interstate 89 2050 Study*.

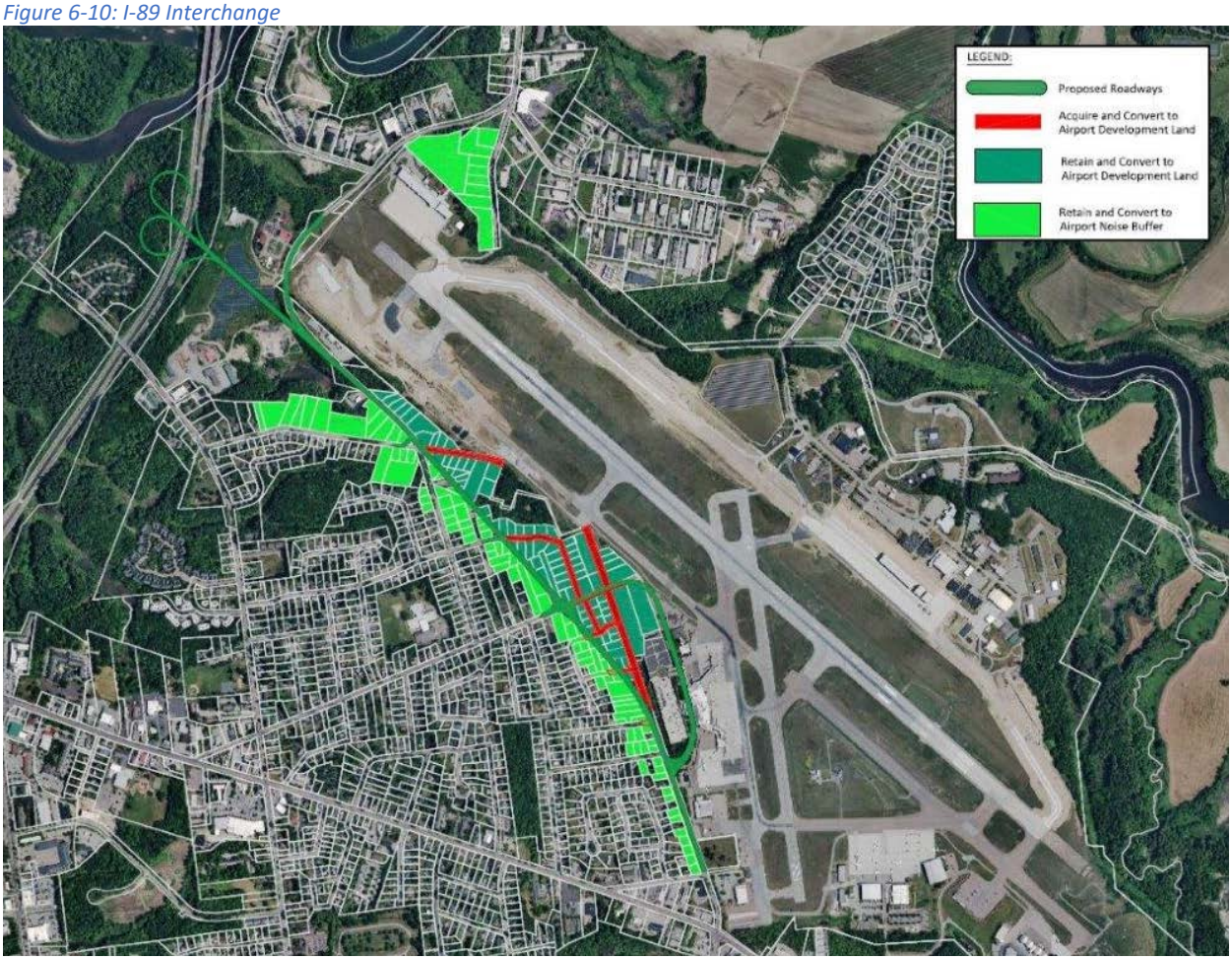
A ground access study is only eligible for FAA funding if the project is solely on airport property or if the project is beyond airport property but exclusively serves airport traffic. The Ground Access Improvements in this Master Plan do not fit the FAA funding criteria and are not included in the Airport's Capital Improvement Plan. Still, the following Ground Access alternatives are presented here because the airport supports regional transportation studies, such as the *Interstate 89 2050 Study*.

Two alternatives are depicted in this section: an I-89 Interchange that has been examined for many years at the airport, and a newer concept occurring at the intersection of I-89 and Kennedy Drive.

6.13.1 Alternative 1: I-89 Interchange to Airport Parkway

This interchange has appeared in many corridor studies, is often referred to as Exit 14N, and would be a full interchange that connects I-89 to Airport Parkway. Similarly, the roadway realignments in the Chamberlin neighborhood which tie into Airport Parkway have appeared in the *Vision 2030 Airport Master Plan* (January 2012), *Chamberlin Neighborhood and Land Use Plan* (June 2016) and the Airport's *Land Use/Re-Use Plan* (December 2017). The airport supports the Chittenden County Regional Planning Commission (CCRPC) in continuing to examine the viability of such a roadway improvement, such as the one shown in **Figure 6-10**,for example purposes only. This interchange is shown on the ALP for planning purposes only, should a regional study identify its need.

Figure 6-10: I-89 Interchange

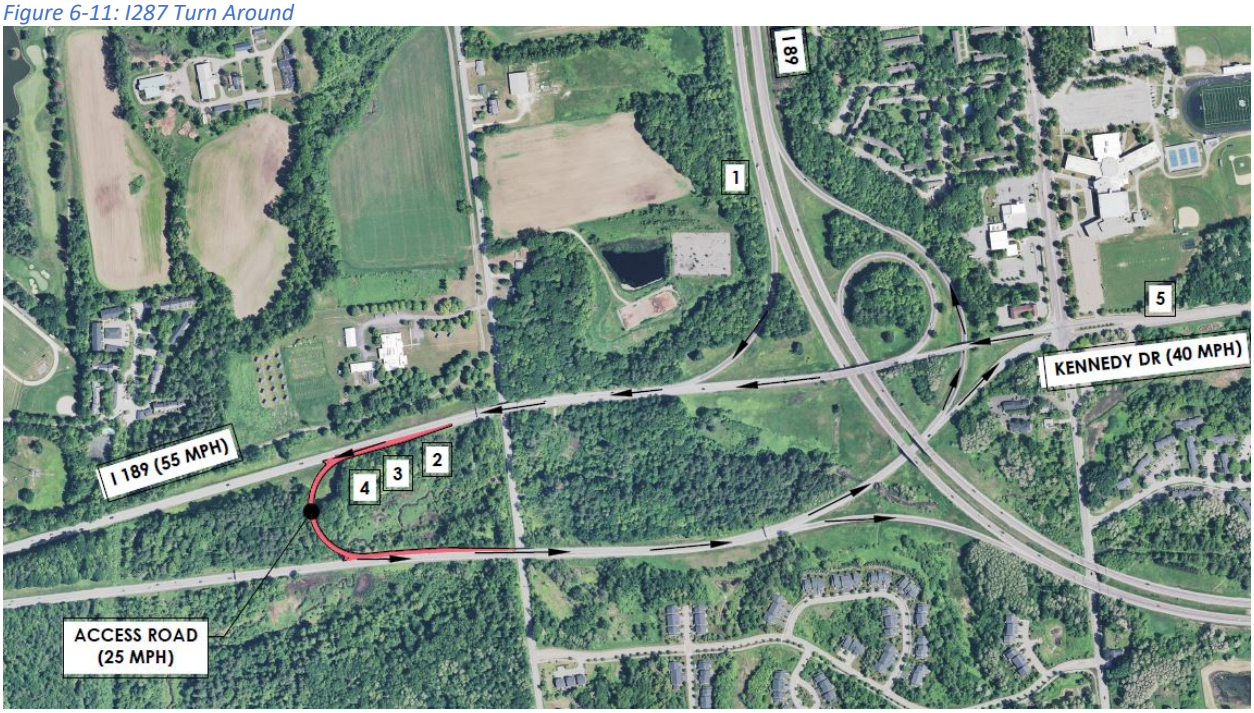


Source: BTV Land Use/Re-Use Plan, 2016

6.13.2 Alternative 2: Potential U-Turn on I-189

This alternative, which is included in the *CCRPC I-89 2050* Study, provides a connection to I-89 south via a left turn U-turn on I-189. This alternative would connect vehicles southbound on I-89 to Kennedy Drive or to back to I-89 north and south. Kennedy drive is less populated, experiences less traffic saturation than Williston Road, and could potentially provide quicker access to the airport. The airport supports the CCRPC in assessing the viability of an improved access route to the airport as an alternative to Williston Road, such as the one shown in **Figure 6-11** for example purposes only**.**

Figure 6-11: I287 Turn Around

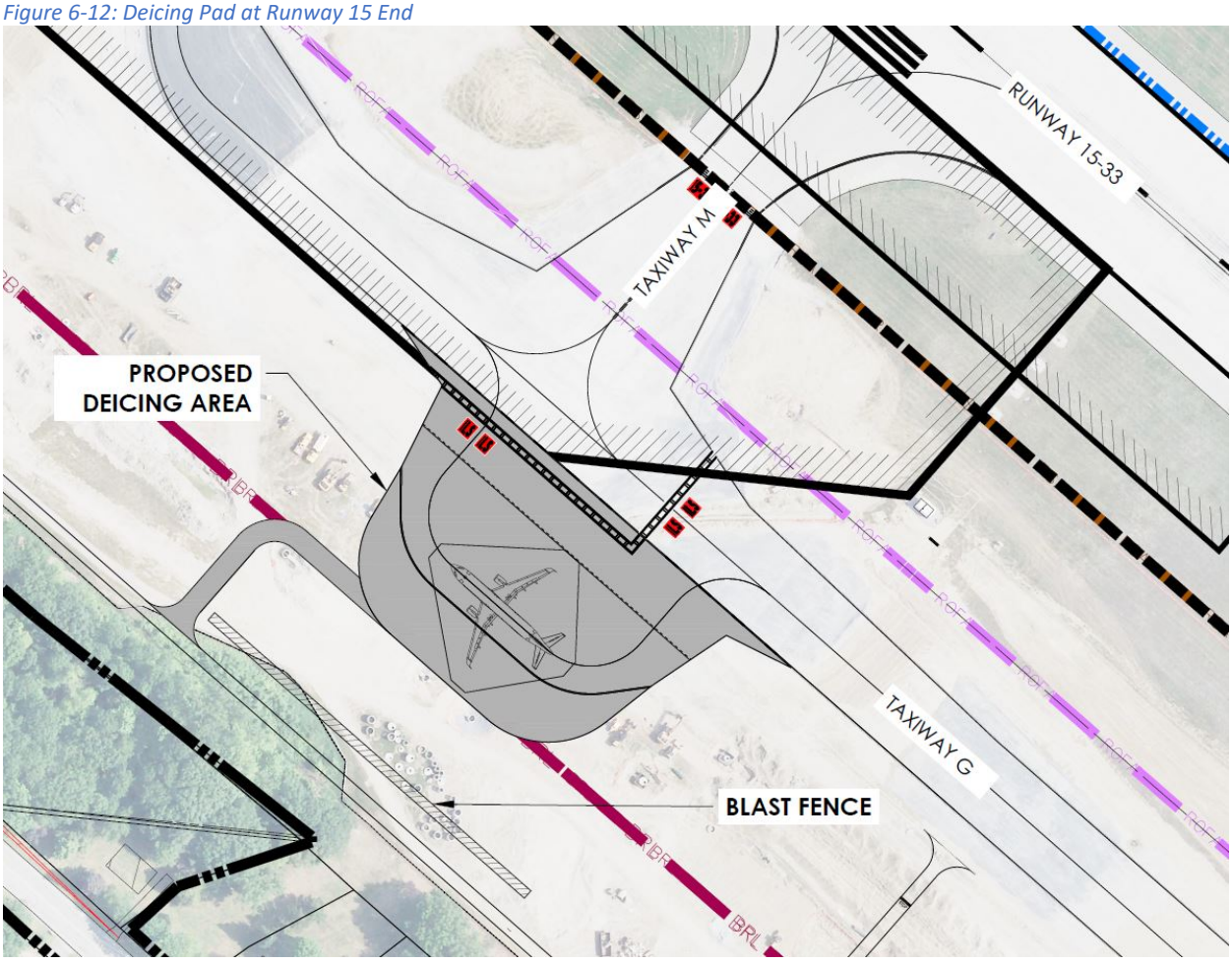


Source: Passero Associates

6.14 Deicing Pad/Blast Fence

During winter months, Air Traffic Control holds aircraft on Taxiway H when they do not have ground clearance to depart to their destination. As identified earlier, from operational records, Air Traffic Control held aircraft for 78,237 minutes in 2019 during the winter. When aircraft are held for too long, the effectiveness of the deicing treatment may be compromised and aircraft would have to return to the terminal building to be deiced again. To expedite departures and prevent aircraft from having to return to the terminal building, the airport seeks to construct a separate deicing pad at the Runway 15 end, as shown in **Figure 6-12**. This pad would have ground access from the perimeter road for the deicing equipment to access the apron and would have a single collector point that would tie into the existing deicing system. Because this location is closer to residential development, a blast fence would be constructed along the airport property line to mitigate noise and exhaust. It is noted that additional operational data will be needed to justify this infrastructure.

Figure 6-12: Deicing Pad at Runway 15 End



Source: Passero Associates

6.15 Additional Projects

Additional studies have been completed that outline other improvements needed at the facility. A Pavement Management Plan identified several sections of airfield pavement that require rehabilitation outside of the runways. Similarly, a Parking Garage Maintenance Study was completed that identified rehabilitation requirements to the parking garage. Pavement rehabilitation projects that do not have a footprint change do not have alternatives but are included in the proposed Airport Layout Plan and Capital Improvement Plan. These projects include:

- South Apron Rehabilitation
- Rehabilitation of Customs/Cargo (890) Apron
- Taxiway A Rehabilitation
- Taxiway C Rehabilitation
- South Apron Rehabilitation
- Taxiway K (renamed Twy G), east Rehabilitation
- Taxiway J Rehabilitation
- Taxiway H Rehabilitation
- Perimeter Road Rehabilitation
- Blast pads Rehabilitation (overrun – Runway 15-33)
- Parking Garage Rehabilitation
- Valley West Apron Rehabilitation

6.16 Summary

Based on the information presented throughout this chapter and conversations with Airport staff, Air Traffic Control, and the Technical and Regional Advisory committees, the following airside elements (**Table 6-1**) and landside elements (**Table 6-2**) will be carried forward onto the ALP:

Table 6-1: Summary of Airside Development

Airside
Install Guard Lights Taxiway C, relocate hold lines and install signage
South Apron Rehabilitation
Install Guard Lights and Signs Taxiway B (west side), relocate hold lines
Cargo/Customs (890 Ramp) Rehabilitation
Relocate Taxiway E, Remove excess pavement between Runway 19 and Taxiway A
Relocate Taxiway B (east side)
New SRE Building
Expand New Cargo Apron
Expand east apron from Taxiway C to Runway 1, Relocate Taxiway L
Runway 15-33 Rehabilitation
Shorten Runway 1-19, pave partial parallel taxiway to Runway 19 end
Taxiway A Rehabilitation (Taxiway G to Taxiway C)
Taxiway C Rehabilitation
South Apron (general aviation) Rehabilitation
Relocate Taxiway connector near Runway 33/Valley West Apron, Expand Apron
Taxiway K Rehabilitation
Taxiway J Rehabilitation
Taxiway H Rehabilitation
Expand general aviation (Valley West) apron
Relocate Taxiway M
Rehabilitate blast pads (overrun 15-33)
Remove excess pavement north of Runway 19
Expand Apron and relocate Taxiway Connector Valley east ramp

Table 6-2: Summary of Landside Development

Landside
Expand Terminal Building (linear 2 story with 11-12 gates, including interior – outgoing and inbound baggage, holdroom expansion, jet bridges)
Parking Garage Rehabilitation
Remove existing hangars Valley East Apron
Expand Hangars (Valley West/Valley East)
Perimeter Road Rehabilitation/Fence Replacement
Curbside Improvements
Remove south and north terminal concourses