
CHAPTER FIVE - ALTERNATIVES

INTRODUCTION

This section uses conclusions and findings of previous sections of the Master Planning process for Knox County to identify and evaluate various alternatives for both the airside and landside components of the airport. The underlying objective is to meet the identified needs for both capacity and safety requirements for the entire airfield operation and infrastructure. The key elements of this process are the identification of ways to address previously identified facility requirements; an evaluation of the alternatives such that stakeholders gain a thorough understanding of the strengths, weaknesses, and other implications of each; and selection of the preferred alternative.

ASSUMPTIONS

It is important to address several key assumptions and project needs that were developed in earlier parts of this study before any alternatives can be analyzed. The assumptions are the foundation upon which the alternatives are built. Without a broad understanding and acceptance of these “building blocks,” subsequent discussion of airport alternatives is unlikely.

- The airport will remain a primary commercial service airport during the entire 20-year planning period.
- The existing type of aircraft using the airport are not expected to change significantly throughout the planning period and the existing mix of operations is forecasted to remain primarily single engine aircraft. However, increasing use of the airport by slightly larger business class turboprop and turbofan aircraft is inevitable if development and tourism in the airport service area remains strong.
- The existing Design/Critical Aircraft will change from the Dassault Falcon 900 to the Gulfstream 450 in the next 5-10 years (see Design Aircraft Forecast, page 45). This will necessitate a change in the ARC, which will increase from B-II to C-II.
- Available runway length meets the needs of a majority of the current fleet, but falls slightly short during some operational periods for the current design aircraft; a problem that will grow when the design aircraft changes.
- There is limited room for hangar development, but enough to meet demand throughout the planning period. Within the next 20 years, the airport will have to look for other development opportunities, within the airport property, but in other currently undeveloped areas.
- There is ample aircraft parking apron space to meet demand throughout the next 20 years.

FACILITY REQUIREMENTS

Only those facilities identified as requiring capacity and/or safety improvements are evaluated in this section. The evaluation includes development of alternatives as well as an operational performance assessment, and best planning tenets based on FAA airport planning and design guidelines. In addition, environmental factors that may influence these proposed changes, and a financial assessment are included. The proposed requirements are summarized below and addressed in detail in subsequent paragraphs.

AIRSIDE

- Runway length is not long enough to meet existing demand for long-haul business aircraft. As a result, the airport is not realizing its full potential.
- Runway 21 does not have any instrument approaches and a GPS approach should be developed, with appropriate lighting, including a visual glide slope system (PAPI) and REILS.
- The taxiway system is adequate for existing demand; however, the proposed parallel taxiway on Runway 3-21 is still considered an essential for long-term safety and capacity issues.

LANDSIDE

- Expand aircraft hangar availability.
- Identify on-airport areas for non-aviation use

NO-BUILD ALTERNATIVE

As the name implies, the no-build alternative includes no capital improvements or development at the airport, both airside and landside. Existing facilities at the airport would remain, with no new construction to meet demand or safety considerations. While regular preventative maintenance would occur, including pavement rehabilitation, capital projects such as a runway extension, new taxiways, aprons, hangars, etc., would not be performed under this alternative.

In general, the no-build alternative is presented and analyzed for two reasons:

- to provide a baseline comparison for the other alternatives, and
- to present the safety, capacity and financial constraints that exists with the current layout.

ALTERNATIVES ANALYSIS - AIRSIDE

This section addressed alternatives to the airport's airside (runway and taxiways and supporting infrastructure). Each recommended improvement/upgrade is addressed in the subsequent sections, followed by an assessment of each concerning several factors, including operational performance, environmental issues, cost, etc.

AIRSIDE - RUNWAY EXTENSION

Earlier in Chapter 4 – Facility Requirements (see *Runway Requirements, page 54*) a longer runway was recommended. The idea suggested that Runway 13-31 be extended from its present length of 5,007 feet to approximately 6,000 feet, or some intermediate length as circumstances permit. Extending the airports secondary runway (3-21) is not practical nor considered practical or necessary at this time for several reasons including wind coverage; higher instrument approach minimums; and inferior lighting (medium versus high intensity runway lights and no approach lighting system). For these reasons, an extension of Runway 13-31 only is addressed.

Several issues must be addressed to achieve a longer runway at any airport. There are also a number of possible options available to RKD, including the “do nothing” alternative. The “do nothing” option is always considered for two primary reasons. Obviously, by not extending the runway, the airport saves capital costs and there are no added environmental impacts associated with this alternative. On the negative side, the airport’s role and viability will stagnate and aircraft noise associated with departures from a shorter runway and negative carbon impacts of intermediate fuel stops would not be improved. In the end, the airport sponsor and users must decide if a longer runway serves the best interest of all stakeholders (users, agencies, operators, property abutters, taxpayers, etc.).

In terms of actually extending the runway, the airport must first understand that an extension could accelerate a change in the Runway Design Code from the current B-II-2400 to C-II-2400 earlier than forecast (see *Runway Design Code, page 48*). The higher and more demanding RDC would be the result of slightly larger and faster aircraft using the airport more frequently. It is also important to note that a runway extension could have a domino effect on other airport infrastructure. For instance, in extending the runway for landings, both the Part 77 and TERPS surfaces will shift as well, along with the Runway Protection Zone, and the runway safety area. With the relocation of these surfaces (outward away from the runway), additional land and roads off airport will be impacted along with the possibility that additional obstructions will penetrate the Part 77 and TERPS surfaces, and additional private property will fall within the RPZ. Other airport infrastructure will also be impacted, which is discussed below. Environmental impacts and planning costs are discussed later in this chapter.

RUNWAY ALTERNATIVE A – NO BUILD OPTION

The no-build alternative means that no runway extension is considered and that the existing runway lengths are preserved. Figure 5.1 on page 88 presents the runway as it exists today. Note the location of the Runway Safety Areas (RSA) and Runway Projection Zones (RPZ).

Environmental Impacts

This alternative would result in no measurable environmental impacts. However, current/existing impacts would not be mitigated.

Safety Impacts

There are no direct safety impacts associated with not extending the runway. However, longer runways are safer than shorter runways.

Financial Impacts

- Long-range business jet flights would remain restricted. RKD services a wide-range of business jets, many of which are destined for the west coast, Florida and Europe. Because they cannot depart fully loaded with fuel they cannot depart RKD and fly non-stop to many of their ultimate destinations; they often required to make an intermediate stop for fuel before continuing across to their destination.
- Loss of potential revenue from fuel sales, landing fees and excise tax collection. Because of restrictions on long-range flight operations, RKD does not realize the potential fuel sales from these operations. In addition, RKD may not be the intermediate stop for such flights, meaning they elect to land elsewhere to begin with and use ground transportation to the mid-coast region; this loss means less landing fee revenue. This issue applies equally to based aircraft with the added loss of excise taxes; taxes collected on the value of aircraft (similar to automobiles).
- Operating expenses go up without corresponding increase in revenue. The natural economic tendency is for operating and maintenance costs to go up. By not taking advantage of all potential revenue sources, the delta between the two will naturally increase.

RUNWAY ALTERNATIVE B - EXTEND RUNWAY 31(600 FEET)

This alternative (Figure 5.2 on page 89) would extend the Runway 31 to the northwest (toward Route 73) 600 feet, resulting in a runway that is approximately 5,600 feet long. As discussed earlier (see Airside – Runway Extension, page 68) the RDC would increase because of larger/faster aircraft, which in turn would require a larger Runway Safety Area, as well as a wider and longer Runway Object Free Area (ROFA) and Runway Obstacle Free Zone (OFZ). The biggest concern is the larger RSA because of the restrictions placed on it.

RSAs by their nature are of critical importance to aviation safety cannot be modified (altered in terms of size, grading requirements, or internal activity). RSAs must be either graded smooth turf within specific grading standards, paved (or some other hard surface), a combination of both, or an Engineered Material Arresting System (EMAS). Among other things, EMAS reduces the over size of the RSA and is used when a full conventional RSA is not possible because of land constraints. Other issues that must be considered are the approach lighting system and obstructions to the Part 77 and TERPS surfaces.

This alternative must consider the following:

- a. **Runway Length.** Extending Runway 13-31 by 600 feet would result in impacts to roads on both ends of the runway because of the increased RSA size (1,000 feet

beyond each runway end instead of the current 600 feet. While the larger RSA would have a small impact on Route 73, the larger safety area would overrun both Ash Point and Dublin Roads on the Runway 31 end. In addition, because of RSA design standards, the roads would have to be relocated.

- b. **Approach Lights.** Runway 13 is served by a MALSR, a vital lighting aid that provides a critical function to aircraft landing in inclement weather (low ceilings and reduced visibility). Because of the lighting array layout, which starts 200 feet from the end of the runway and extends outward 2,400 feet, any runway extension on this end of the runway would require the relocation of the MALSR by 600 feet. Property acquisition will likely be required to ensure the outer most MALSR structures are located on airport property. The MALSR shelter can remain in the same location.
- a. **ILS Glideslope.** The ILS glideslope antenna must be moved (approximately 600 feet) and all corresponding approach surfaces and procedures must be evaluated and redesigned.
- b. **Obstructions.** Part 77 and TERPS surfaces would move a distance equal to the runway extension. The Part 77 primary and approach surfaces must move as well as the TERPS final approach surface. The Part 77 approach surface is a 50:1 slope and the TERPS surface is 34:1. A 600-foot extension would most likely result in additional obstructions, which would potentially affect additional landowners.¹

Environmental Impacts

The implementation of this alternative result in the construction of 60,000 square-feet impervious surface (runway pavement) and approximately two acres of wetland fill impacts stemming from the construction of a RSA designed in accordance with ARC C-II standards. Wet-meadow wetlands located on airport property beyond each runway end must be filled to expand the existing safety area to a width of 500 feet and a length of 1,000 feet. Additionally, as stated above, the RSA associated with a 600-foot runway extension cannot be constructed without reconfiguring Route 73 to the west of the runway and Ash Point Drive and Dublin Road to the east of the runway. Although field verification of wetland boundaries in these locations will be required, it can be assumed that additional wetland impacts will result from constructing road relocation or reconfiguration projects. This alternative also directly affects abutting property owners, particularly those abutters located near the Ash Point Drive and Dublin Road intersection.

Furthermore, extending the Runway 13 end westward also extends designated airspace surfaces associated with the runway. This shift in protected air surfaces could lead to the identification of obstructions requiring mitigation (removal or lighting). It is possible that newly identified obstructions occur within wetlands or other protected resource area.

¹ The exact amount, if any, has not been determined at this time.

Avigation easements² or purchased (in fee simple²) may also be necessary to effectively mitigate obstructions. An airspace analysis is required to determine the extent of obstructions to protected air surfaces created because of pursuing this alternative.

Due to unavoidable impacts to wetlands in excess of regulatory guidelines, potential impacts related to the alteration of public roadways and acquiring additional property (and/or easements) to accommodate the runway extension, FAA project review within the context of an Environmental Assessment (EA) or potentially an Environmental Impact Statement (EIS) will be required in accordance with the National Environmental Policy Act of 1969 (NEPA). An amendment to the airport's existing Site Location of Development permit, administered by the Maine Department of Environmental Protection, and state and federal wetlands permits will be required. Compensatory mitigation for wetland impacts must be provided as a component of the wetland permitting process. Municipal approvals from the towns of Owls Head and South Thomaston will also be necessary.

Safety Impacts

There are no direct safety impacts associated with development of this alternative.

Financial Impacts

The cost analysis for this alternative is:

- Engineering/Design..... \$200,000
- Permitting.....\$1,000,000
- Obstruction Mitigation³ TBD
- Runway Construction.....\$1,800,000
- ILS Glideslope Relocation\$100,000.00
- MALSR Relocation\$350,000.00
- Contingency (20% of above) \$690,000
- **Total.....\$4,190,000**

RUNWAY ALTERNATIVE C - EXTEND RUNWAY 31(1,000 FEET)

This alternative (Figure 5.3, page 90) would extend the Runway 31 to the northwest (toward Route 73) by a distance of 1,000 feet, resulting in a runway that is approximately 6,000 feet long. Again, the ARC would increase from B-II to C-II because of larger/faster aircraft, which in turn would require a larger Runway Safety Area, as well as a wider and longer Runway Object Free Area (ROFA) and Runway Obstacle Free Zone (OFZ). The biggest concern is the larger RSA because of the restrictions placed on it. However, the RSA in this option would encroach on Route 73. As discussed in Alternative B, RSAs must be either graded smooth turf within specific grading standards, paved (or some other hard surface), a combination of both, or an Engineered Material Arresting System (EMAS). In this option, an EMAS must be installed in order to achieve a 1,000-foot extension, without

² See Appendix A

³ Planning, land acquisition including legal and engineering costs, and obstruction removal.

moving Route 73. In addition, EMAS is also shown on the opposite runway end to avoid affecting Ash Point Drive and Dublin Road.

This alternative must consider the following:

- a. **Runway Length.** This alternative develops a 1,000-foot extension to Runway 31 with EMAS on both ends.
- b. **Approach Lights.** The MALSR must be relocated; however, the MALSR shelter can remain in its present location.
- a. **ILS Glideslope.** The ILS glideslope antenna must be moved (about 1,000 feet) and all corresponding approach surfaces and procedures must be evaluated and redesigned.
- b. **Obstructions.** Part 77 and TERPS surfaces would move a distance equal to the runway extension. The Part 77 primary and approach surfaces must move as well as the TERPS final approach surface. The Part 77 approach surface is a 50:1 slope and the TERPS surface is 34:1. A 600-foot extension would most likely result in additional obstructions, which would potentially affect additional landowners.

ENVIRONMENTAL IMPACTS

The construction of an EMAS at each runway end supports the establishment of a C-II-compliant RSA and eliminates the need to alter public roadways. Approximately 0.6 acres of fill impact to wet-meadow wetlands will result, however, from constructing the RSA to the outer limits of the EMAS at each runway end. Approximately 160,000 square-feet of new impervious surface material will be constructed. This total includes constructing the 1,000-foot runway extension as well as 30,000 square-feet of impervious surface associated with constructing each EMAS at the runway ends. Additional wetland impacts may result from obstruction removal activities. The extent of these impacts will be determined upon completion of an airspace analysis conducted to evaluate the implications of the runway extension. Additional aviation easements or the purchase of land in fee-simple is likely required to relocate the MALSR and to mitigate obstructions identified off airport property.

An EA will be prepared to evaluate potential impacts of implementing this alternative for FAA review and approval. State and federal wetland permits and amendment to the airport's Site Location of Development permit will be required. Local approvals must also be obtained. Compensatory mitigation for unavoidable impacts to freshwater wetlands will also be required.

Safety Impacts

There are no direct safety impacts associated with development of this alternative.

Financial Impacts

The cost analysis for this alternative is:

- Engineering/Design..... \$225,000
- Permitting..... \$250,000
- Obstruction Mitigation¹..... TBD
- Runway Construction.....\$2,900,000
- ILS Glideslope Relocation \$100,000
- MALSR Relocation \$500,000
- EMAS\$1,030,000
- Contingency (20% of above)\$1,000,000
- **Total.....\$6,005,000**

RUNWAY ALTERNATIVE D - EXTEND RUNWAY ENDS 13 & 31

Alternative D (Figure 5.4, page 91) would extend both Runways 13 and 31 a sufficient distance to achieve a 1,000-foot runway extension. To accomplish this, 250 feet is added to Runway 13 (toward Ash Point Drive) end and 750 feet is added to the Runway 31 toward Route 73. Like Alternatives B and C, this extension would increase the RDC, and thus all corresponding setbacks would increase as well (RSA, ROFA, and OFZ). The larger RSA coupled with the distance between the end of the Runway 13 RSA and Ash Point Road would require the installation of EMAS on that end.

- a. **Approach Lights.** As noted in Alternatives B and C, the Runway 13 MALSR must be relocated as well with this option.
- c. **ILS Glideslope and Localizer.** Both the ILS glideslope and localizer antennas must be relocated and all corresponding approach surfaces and procedures must be evaluated and redesigned.
- d. **Obstructions.** Part 77 and TERPS surfaces would move a distance equal to the runway extension. The Part 77 primary and approach surfaces must move as well as the TERPS final approach surface. The Part 77 approach surface is a 50:1 slope and the TERPS surface is 34:1. A 600-foot extension would most likely result in additional obstructions, which would potentially affect additional landowners.

Environmental Impacts

Runway Alternative D provides a 1,000-foot extension by adding 750 feet to the Runway 13 end and 250 feet to the Runway 31 end eliminates impacts to adjacent roadways. This Alternative directly affects approximately one acre of wet-meadow wetlands resulting from the construction of a compliant RSA at the Runway 31 end. Additional impacts may be incurred if obstruction removal or lighting is required within wetlands. Approximately 160,000 square feet of new impervious surface will be constructed. Similar to the alternatives previously discussed, additional easements or the purchase of land in fee-simple will likely be required to relocate the MALSR and to mitigate obstructions identified off airport property.

An EA will be prepared to evaluate potential impacts of implementing this alternative for FAA review and approval. State and federal wetland permits and amendment to the airport's Site Location of Development permit will be required. Local approvals must also be obtained. Compensatory mitigation for unavoidable impacts to freshwater wetlands will also be required.

Financial Impacts

The cost analysis for this alternative is:

- Engineering/Design..... \$235,000
- Permitting..... \$350,000
- Obstruction Mitigation⁴..... TBD
- Runway Construction.....\$2,900,000
- ILS Relocation.....\$100,000.00
- MALSR Relocation\$425,000.00
- EMAS \$1,030,000.00
- Contingency (20% of above)\$1,000,000
- **Total.....\$6,040,000**

Safety Impacts

There are no direct safety impacts associated with development of this alternative.

RUNWAY ALTERNATIVE E – DECLARED DISTANCE OPTION

One potential method of obtaining a longer runway with minimal impact to other airport infrastructure is with declared distances.

Declared distances represent the maximum distances available and suitable for meeting takeoff, rejected takeoff, and landing distances performance requirements for turbine-powered aircraft. The declared distances are Takeoff Run Available (TORA) and Takeoff Distance Available (TODA), which apply to takeoff; Accelerate Stop Distance Available (ASDA), which applies to a rejected takeoff; and Landing Distance Available (LDA), which applies to landing. By treating these distances independently, declared distances is a design methodology that results in declaring and reporting the TORA, TODA ASDA and LDA for each operational direction.

Declared distances may be used to obtain additional RSA and/or ROFA prior to the runway's threshold (the start of the LDA) and/or beyond the stop end of the LDA and ASDA. This concept helps mitigate unacceptable incompatible land uses in the RPZ, to meet runway approach and/or departure surface clearance requirements, in accordance with airport design standards, or to mitigate environmental impacts. Declared distances may also be used as an incremental improvement technique when it is not practical in meeting

⁴ Planning, land acquisition, obstruction removal

these requirements. However, declared distances may only be used for these purposes where it is impracticable to meet the airport design standards or mitigate the environmental impacts by other means, and the use of declared distances is practical. In addition, declared distances may limit or increase runway use. The use of declared distances may result in a displaced runway threshold, and may affect the beginning and ending of the RSA, ROFA, and RPZ.

While several options are possible, one possible alternative for RKD would be the addition of 1,000 feet of pavement to the end of Runway 31. In doing so, the airport operator could declare that portion of runway available for takeoff in the opposite direction (Runway 13), providing 6,000 feet of takeoff runway. All other operations would be restricted to 5,000 feet. The restriction to other operations is because the new pavement would double as a safety area, meaning pilots cannot use it for normal operations. Under this option, 1,000 feet of addition runway to the end of Runway 31 would result in the declared distances listed in Table 5.1.

Table 5.1 – Declared Distance Application				
RUNWAY	TORA	TODA	ASDA	LDA
13	6,007	6,007	6,007	5,007
31	5,007	6,007	6,007	5,007

Figure 5.5 (page 92) shows what 1,000 feet of additional pavement added to the Runway 31 end would achieve in terms of declared distances. The available runway length for TORA, TODA, ASDA, and LDA for each direction is listed on the plan.

Environmental Impacts

Due to the Application of Declared Distances associated with Runway Alternative E, the construction of an EMAS is only required at the Runway 31 end. This alternative, therefore, results in the construction of 130,000 square---feet of new impervious surface at the airport. Similar to Runway Alternative C, approximately 0.5 acres of fill impact to wetlands located adjacent to the Runway 31 end will be incurred due to the development of a compliant RSA.

Easements or land acquisition to accommodate the MALSR will not be necessary, as the MALSR will remain in its current location. However, this would require a slight reconfiguration the first four MALSR light units (those located at the 200, 400, 600 and 800-foot stations). These lights would be remounted as semi flushes units, thus allowing aircraft to roll over them.

As stated in FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, the preparation of an EA is required when the project sponsor must acquire easements to remove obstructions located off airport property. The

FAA also uses a project's need for an Army Corps of Engineers Section 404 Individual Permit as criteria for the need to prepare an EA (one or more acres of impacts to wetlands is usually the threshold for the Army Corps permit). Runway Alternative E would typically not require the preparation of EA based solely on these threshold triggers. However, based on the scale of the project and in consideration of the cumulative impact to the local environment of past development projects, FAA may determine an EA is necessary.

State and federal wetland permits and amendment to the airport's Site Location of Development permit will be required and local approvals must be obtained. Compensatory mitigation for unavoidable impacts to freshwater wetlands will also be required.

Safety Impacts

There are no direct safety impacts associated with development of this alternative.

Financial Impacts

The cost analysis for this alternative is:

- Engineering/Design..... \$225,000
- Permitting..... \$150,000
- Obstruction Mitigation⁵ TBD
- Runway Construction.....\$2,900,000
- MALSR Relocation\$80,000
- EMAS\$1,030,000
- Contingency (20% of above) \$775,000
- **Total.....\$5,160,000**

AIRSIDE ALTERNATIVES – TAXIWAYS

The last master plan update recommended that both runways at RKD have full parallel taxiways. The ALP from that last update included both taxiways as well other minor taxiway improvements. Since that update, Taxiway D, a full-length parallel taxiway was constructed along Runway 13-31. The proposed taxiway along Runway 3-21 is still in the concept phase and is still considered a practical option as funding permits. While it will not have any impact on airport capacity, it is considered a viable plan in terms of safety.

TAXIWAY ALTERNATIVE A – NO BUILD OPTION

The no-build alternative means that no new taxiways are considered and that the existing system remains unchanged.

Environmental Impacts

- This alternative would result in no measurable environmental impacts.

⁵ Planning, land acquisition, obstruction removal

Financial Impacts

- None

Safety Impacts

The potential for runway incursions (more than one aircraft or ground vehicle operating on the runway at the same time) is a safety concern where taxiways do not extend to the runway end, such as Runway 3-21. Full-length parallel taxiways segregate taxiing aircraft from aircraft landing and taking off. In the absence of a parallel taxiway to the runway end, aircraft would be forced to back-taxi on the runway prior to takeoff or after landing. This makes the runway unavailable for longer periods and increases the risk of a runway incursion. Full-length parallel taxiways are basic components for even the smallest of general aviation airports. In addition, Runway 3-21 provides routine service to arriving and departing commercial air carrier operations.

Regardless of where they start from (main terminal or south hangar area) aircraft taking off on Runway 3 or 21 must back-taxi a considerable distance on the runway, turn around, and then take off. This is particularly true for aircraft taxing from the south hangar area to Runway 21.

TAXIWAY ALTERNATIVE B – RUNWAY 3-21 PARTIAL PARALLEL TAXIWAY

This alternative mirrors the option presented in the May 2000 master plan update⁶ where a 35-foot wide taxiway is constructed “partially” along the runway. The taxiway connects both runway ends and runs parallel to the runway (see Figure 5.6 page 93). By taking advantage of existing taxiways, the cost of constructing a full-length taxiway is eliminated. The taxiway would be built to Runway Design Standards B-II meaning the runway to taxiway separation is 240 feet and the taxiway width is 35 feet⁷.

Environmental Impacts

The construction of Taxiway Alternative B requires the construction of approximately 112,330 square-feet of new impervious surface (associated with taxiway development) and impacts roughly 0.75 acres of forested, scrub-shrub, and wet-meadow wetlands located on airport property to the east of Runway 3 and Runway 21.

Impacts associated with the development of this alternative would be addressed in an EA prepared to evaluate potential impacts related to all improvement projects proposed (e.g. runway extension). Due to unavoidable impacts to wetlands, state and federal wetlands permits and compensatory mitigation will be required. Maine State Site Location of Development permitting and Owls Head Planning Board approval (Use Permit) will also be required. Permitting efforts for this alternative will be conducted with simultaneously with those efforts necessary to permit the development of the Runway 13-31 extension.

⁶ Currently listed on the existing ALP as a future project.

⁷ While the overall Airport Reference Code as well as the primary runway (13-31) design code is forecasted to be C-II in the next 5-10 years, the Runway 3-21 Design Code will remain B-II-4000, which allows for the reduced dimensions.

Safety Impacts

While there are no direct safety impacts associated with this alternative. However, the need for aircraft to taxi through parking aprons can be an issue particularly at night, lighting of aprons and taxilanes through them is limited. Disorientation is always a factor at night and the discontinuous nature of a partial parallel taxiway adds to pilot confusion and potential safety issues.

Financial Impacts

The cost analysis for this alternative is:

- Engineering/Design..... \$400,000
- Permitting.....\$15,000
- Construction\$4,200,000
- Contingency (20% of above) \$925,000
- **Total.....\$5,540,000**

TAXIWAY ALTERNATIVE C – RUNWAY 3-21 FULL-LENGTH PARALLEL TAXIWAY

This alternative mirrors Taxiway Alternative B with one exception: it is developed as a full-length parallel taxiway (see Figure 5.7, page 94). Like Alternative B, this option would be constructed at 35 feet in width and setback from the runway by 240 feet.

Environmental Impacts

Due to the construction of a full-length parallel taxiway, this alternative requires the construction of approximately 146,100 square-feet of new impervious surface at the airport. Wetland impacts associated with this alternative mirror those impacts described in discussion of Taxiway Alternative B (0.75 acres) as construction of the taxiway within the mid-field region of the airport will not affect wetlands.

Impacts associated with the development of this alternative would be addressed in an EA prepared to evaluate potential impacts related to all improvement projects proposed (e.g. runway extension). Due to unavoidable impacts to wetlands, state and federal wetlands permits and compensatory mitigation will be required. Maine State Site Location of Development permitting and Owls Head Planning Board approval (Use Permit) will also be required. Permitting efforts for this alternative will be conducted with simultaneously with those efforts necessary to permit the development of the Runway 13-31 extension.

Safety Impacts

None

Financial Impacts

The cost analysis for this alternative is:

-
- Engineering/Design..... \$450,000
 - Permitting.....\$15,000
 - Construction\$5,200,000
 - Contingency (20% of above)\$1,150,000
 - **Total.....\$6,815,000**

ALTERNATIVES ANALYSIS - LANDSIDE

This section addressed alternatives to the airport's landside (aprons, hangars, auto parking and supporting infrastructure). Each recommended improvement/upgrade is addressed in the subsequent sections, followed by an assessment of each concerning several factors, including operational performance, environmental issues, cost, etc.

The principle landside development recommended in Chapter 4 of this report is the future construction of new aircraft hangars. As noted in Chapter 4, aircraft apron space is and will remain in surplus, and auto parking is considered adequate to meet demand throughout the next 20 years. What additional auto parking might be needed would be dealt with through development of new hangars and extra space constructed as part of their development.

LANDSIDE ALTERNATIVE – HANGARS

Hangar demand in the next 20 years will increase from the present 55 to 86 aircraft. Today (2013) there are 13 hangar units with a capacity of about 63, meaning there is space for about eight additional aircraft. However, as discussed in Chapter 2 (see *Hangars*, page 20), the capacity of a large conventional hangar is subject to the wishes of the individual owner. One large hangar might hold a single large business jet, or numerous small recreational propeller driven airplanes. In planning to meet future demand, we assume each new hangar will hold a single airplane. This means the airport should plan for the development of around 23 additional hangared aircraft over the course of the next 20 years.⁸

The majority of existing hangars are located in the airport's south quadrant or South Hangar Area (see next page). However, a quick glance at this plan shows that there is room for possibly two additional small hangars in this area without encroaching on wetland areas. The same holds true for two of the three other quadrants of the airport. Potential upland areas outside the building restriction line east and west of the approach end of Runway 13 (north and west quadrants) are restrictive in terms of available land and the distance from the airside infrastructure. The only area available for hangar development sufficient to meet the airport's long-term demand is in the existing terminal area.

⁸ Future demand (86) minus existing capacity (55) = 23.

The following paragraphs address two possible hangar concepts.

Landside Alternative – South Hangar Area Development

As shown in Figure 5.8, the South Hangar Area has room for possibly two additional hangars (either one T-style unit or two small conventional). Any additional construction would require disturbance of wetland areas.

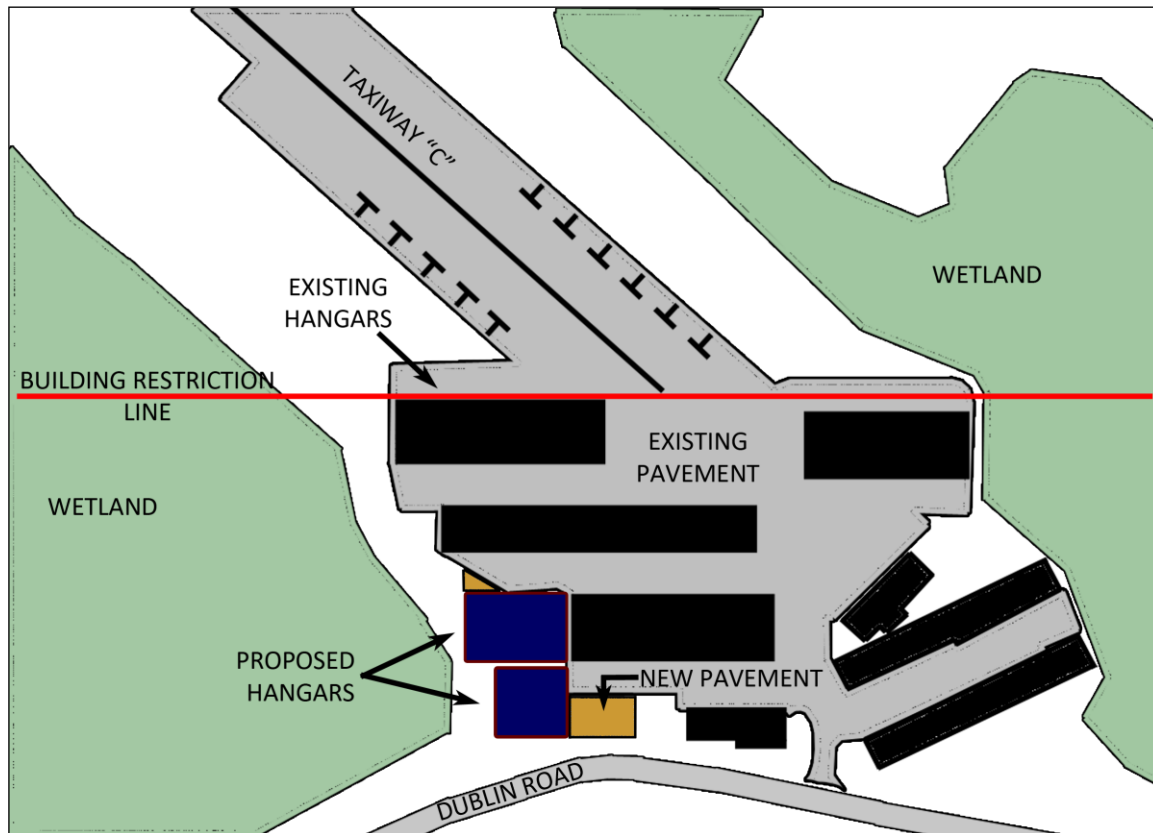


Figure 5.8 – Hangar Alternative A

Environmental Impacts

The development of two additional hangars in the South Hangar Area as proposed does not affect natural resources under the jurisdiction of state or federal regulatory agencies. Hangar development should be included in an amendment of the airport's current Site Location of Development permit to address stormwater management requirements related to the new development.

Safety Impacts

None

Financial Impacts

The cost analysis for this alternative is:

- Engineering/Design.....\$15,000
- Permitting.....\$10,000
- Construction\$85,000
- Contingency (20% of above)\$25,000
- **Total.....\$135,000**

Landside Alternative – Terminal Hangar Development

The existing terminal area has ample room for numerous new hangars, primarily conventional units. While there are a number of possible options, Figure 5.9 (next page) offers one possible example. It is important to note that in the early planning stages, the FAA only wants to know what the general land use plans are for any particular area; specific hangar or other building layouts are not necessary.

One possible plan, shown in Figure 5.9 on the next page, includes 1 large T-hangar and 13 conventional hangars. The T-hangar shown in the plan is an 8-bay standard nested style building. The conventional hangars shown on the graphic are approximately 60 x 60 feet. Ample paved taxilanes would service the entire development. This concept can be constructed in phases, as individual demand requires.

Environmental Impacts

The conceptual design of a terminal hangar plan has been included in a recent Site Location of Development permit amendment submitted to and approved by Maine DEP. This permit amendment addressed stormwater management requirements needed for development in this location. Terminal hangar development was designed to avoid impacts to wetlands. Should any revisions be made to this design, federal, state, and local regulatory requirements must be adhered to when applicable.

Safety Impacts

None

FINANCIAL IMPACTS

The cost analysis for this alternative is:

- Engineering/Design.....\$100,000
- Permitting.....\$10,000
- Construction (T-Hangar)\$450,000

- Construction (13 conventional hangars).....\$975,000
- Contingencies\$400,000
- **Total..... \$2,435,000**

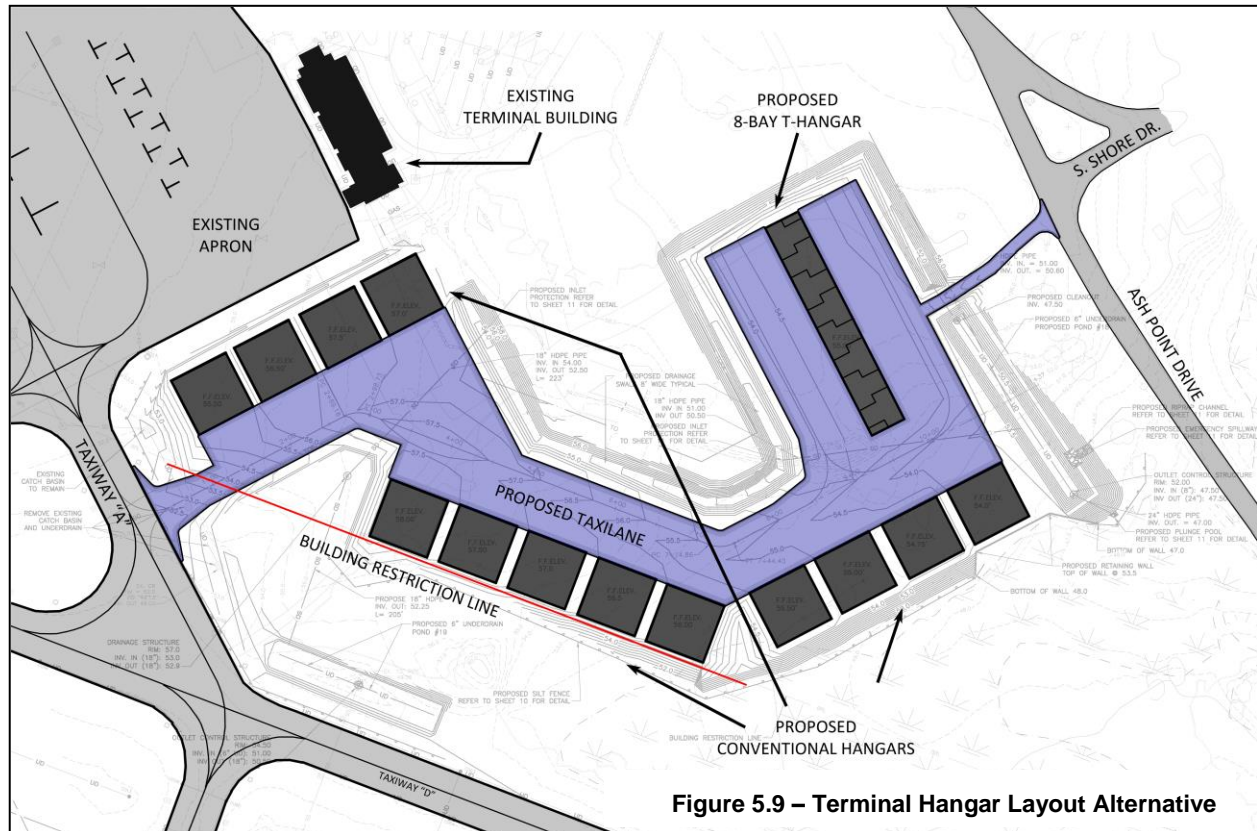


Figure 5.9 – Terminal Hangar Layout Alternative

SUMMARY

This chapter addresses alternatives as a means of meeting the airport’s long-term development needs both airside and landside. Four possible airside runway alternatives were presented as well as three taxiway options (pages 81-86). Landside development is limited to new hangar construction. In both cases, air and landside, proposed development is designed to meet both long-term capacity as well as safety needs. Table 5.2 on the next page lists each of the alternatives along with the estimated total cost of each one.

PREFERRED ALTERNATIVE

Following a series of meetings, conference calls and presentation of the alternatives to the airport manager, FAA and the Airport Planning Advisory Committee, the preferred alternative was selected. The Plan includes three primary infrastructure changes that include a short runway extension (for takeoff operations only), a partial parallel taxiway along Runway 3-21, and setting aside land for landside development. Sheet 4 the

recommended Airport Layout Plan in Chapter 6 (page 104) presents the preferred alternative.

TABLE 5.2 - Alternatives Cost Summary

AREA	ALTERNATIVE	BASIC CONCEPT	ESTIMATED COST
Runway	A	No Build	\$0.00
Runway	B	Extend Runway 31 without EMAS	\$4,190,000
Runway	C	Extend Runway 31 with EMAS	\$6,005,000
Runway	D	Extend Runways 13 400'	\$6,040,000
Runway	E	Declared Distances	\$4,630,000
Taxiway	A	No Build	\$0.00
Taxiway	B	Partial Parallel	\$5,540,000
Taxiway	C	Full Parallel	\$6,815,000
Hangar		South Hangar Area	\$120,000
Hangar		Terminal Area	\$2,435,000

RUNWAY EXTENSION

The preferred alternative is a modified version of Runway Alternative E (Declared Distance Option) discussed on Page 78. However, instead of a 1,000-foot extension to the Runway 13 end, the preferred alternative will add 400 feet of

additional useable runway to the approach end of Runway 13. Moreover, like Alternative E, this additional 400 feet of pavement would be used for Runway 13 departures, resulting in 5,407 feet of available runway. The landing threshold would not change; meaning landing aircraft on Runway 13, and both departures and arrivals on Runway 31 would have 5,007 feet. By doing this, the runway approach surfaces would not change, resulting in no change in potential obstructions because of the added pavement.

As with Alternative E, declared distances would apply. With the additional 400 feet of pavement, the declared distance application originally addressed in Table 5.1 would change to those listed above in Table 5.3.

This alternative also incorporates EMAS on the Runway 31 approach end for the same reasons as discussed in Runway Alternative C and Alternative D. However, the EMAS application would not be required until and when the Runway Design Code increases from the current B-II-2400 to C-II-2400 (see *Runway Design Code*, page 49).

Table 5.3 - Declared Distance Application with Preferred Alternative

RUNWAY	TORA	TODA	ASDA	LDA
13	5407	5407	5407	5007
31	5407	5407	5407	5007

To recap the earlier discussion, changing the Reference Code from B-II to C-II would increase the size of the Runway Safety Area from 300 x 600 (width x length beyond end of runway) to 500 x 1,000 feet. While the additional space required on the Runway 13 end can be added with no impacts, adding the additional 400 feet of safety area to the approach end of Runway 31 would encroach on both Ash Point Drive and Dublin Road. Runway Alternative B discussed earlier on Pages 68 - 72 and presented in Figure 5.2 on Page 70 illustrates this problem. Because a public road cannot be inside an RSA, either the roads would have to be moved (around or under the RSA), or an EMAS installed. The EMAS infrastructure would occupy approximately 240 linear feet versus 1,000 feet of traditional safety area.⁹

It is important to note that the additional runway pavement discussed in this preferred alternative could be constructed without changing the size of the RSA. The added cost of the EMAS could be deferred until it was determined that the type and number of operations reach and are sustained above the threshold required to increase Reference Code.

Financial Impacts

The cost analysis to extend the runway 400 feet and add an EMAS to one end is:

- Engineering/Design..... \$200,000
- Permitting..... \$500,000
- Runway Construction.....\$1,500,000
- EMAS.....\$1,030,000
- Contingencies.....\$1,000,000
- **Total.....\$4,730,000**

PARALLEL TAXIWAY RUNWAY 3-21

The partial parallel taxiway was adopted as the preferred alternative. The safety, environmental, and financial impacts discussed in that section are applicable.

HANGAR DEVELOPMENT

After discussing the potential hangar options the airport elected to go with a generic plan that does not identify specific hangar layout or design. Instead, areas on the airport accessible from existing pavement (taxiways, aprons, taxilanes, etc.) were selected and reserved for "Compatible Aviation Development). This means that the areas can be developed as the airport deems necessary for aviation use (hangars, aprons, taxilanes, etc.). Other compatible, but non-aviation development cannot take place in these areas without FAA approval.

⁹ The actual EMAS side would be determined by a more detailed engineering study.

COMPATIBLE AVIATION DEVELOPMENT

The airport has had an interest in developing alternative energy¹⁰ such as a solar light farm for the purposes of providing renewable energy to the airport while generating additional revenue. This type of airport development, while not prohibited, must meet strict FAA standards that are compatible with aircraft operations and fall within the sponsor assurance agreements. In doing so, the airport must find areas that are not needed today or anytime in the near future (typically 20 years) for aviation use. Several areas were identified and noted accordingly on the preferred alternative.

Environmental Impacts

The environmental impacts resulting from proposed actions associated with implementing the preferred alternative include impacts to wetlands resulting from the construction of the Runway 3-21 partial-parallel taxiway. As stated previously in this chapter, approximately 0.75 acres (32,670 square-feet) of fill impact to forested, scrub-shrub and wet meadow habitat located on the east side of the runway will result from the construction of the taxiway. Forested wetlands located to the east of Runway 3 likely impacted by the taxiway development have been previously cleared and consist primarily of gray birch and poplar tree species. Wetlands to the east of Runway 21 include scrub-shrub (primarily alder) and sedge/rush dominated meadow. A NRPA permit administered conjointly by Maine DEP and the Army Corps of Engineers will be required to construct the taxiway. Should final design of the design of the taxiway indicate wetlands impacts greater than 0.75 acres, an Individual Section 404 permit may be required by the Army Corps as well (Individual permits are typically required for projects resulting in an acre or more of direct fill impacts). Compensatory mitigation will be required for taxiway impacts.

Increased impervious surface material resulting from construction of the partial-parallel taxiway will also require an amendment to the airport's existing Site Location of Development permit, administered by the Maine DEP. State stormwater standards for addressing runoff quantity and quality must be met and demonstrated in the Site Location of Development application. Similarly, new impervious surface material associated with the 400' Runway 31 extension & 240' EMAS must be addressed in the Site Location of Development application. Wetland impacts are not anticipated to result from the proposed runway extension.

Finally, the preferred alternative includes the establishment of designated areas on airport property deemed suitable for either compatible aviation or non-aviation development. These locations have been chosen, in part, as the designated areas consist primarily of uplands and may be developed without affecting wetlands. Each of these areas borders wetlands, however, and it is recommended that wetland boundaries are field-verified during the design stage of developments proposed in these locations. Wetland impacts must be avoided to the greatest extent possible when considering compatible aviation and

¹⁰ Any energy source that is an alternative to fossil fuel.

non-aviation development projects. Should unavoidable wetland impacts result, compatible development projects will be subject to the state and federal permitting requirements described above in the discussion of the Runway 3-21 partial-parallel taxiway. These developments must also be considered within the context of Site Location of Development law and may require an amendment to the airport's existing permit (any project proposing new impervious surface will likely trigger the threshold for preparing an amendment).

If an Individual Section 404 Wetlands permit were required from the Army Corps of Engineers for any one or combination of preferred alternative development projects, an Environmental Assessment must be prepared in accordance with NEPA regulations. Impacts to historic/archaeological resources, endangered or threatened species, designated river, coastal zone, or other resource considered in accordance with NEPA requirements are not expected.



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Legend

	AIRPORT PROPERTY LINE
	ABUTTER PROPERTY LINE
	RUNWAY SAFETY AREA
	EXISTING TREELINE
	WETLANDS

Notes



0 200'

FIGURE 5.1



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Legend

- AIRPORT PROPERTY LINE
- ABUTTER PROPERTY LINE
- RSA RUNWAY SAFETY AREA
- EXISTING TREELINE
- PROPOSED PAVEMENT
- WETLANDS
- WETLANDS IMPACTS = ±2 AC

Notes



0 200' 400'

Revision

Issued

File Name: Fig_02_run_extn_600ext.dwg

Permit-Scale

Client/Project

KNOX COUNTY REGIONAL AIRPORT

OWLS HEAD, MAINE

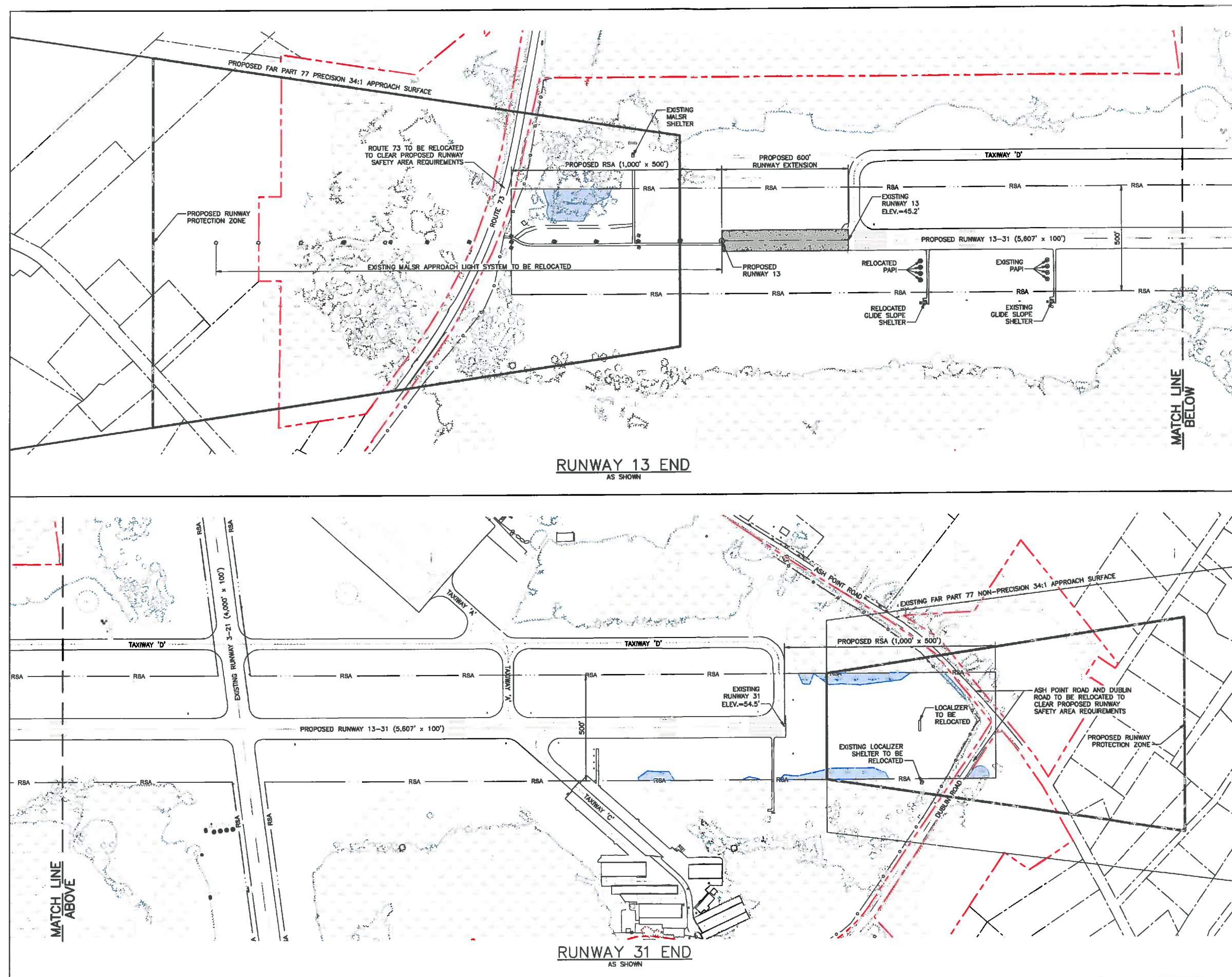
Title

ALTERNATIVE B
600' EXTENSION - R/W 13 END
1,000' x 500' RSA - R/W 13-31

FIGURE 5.2

2 of

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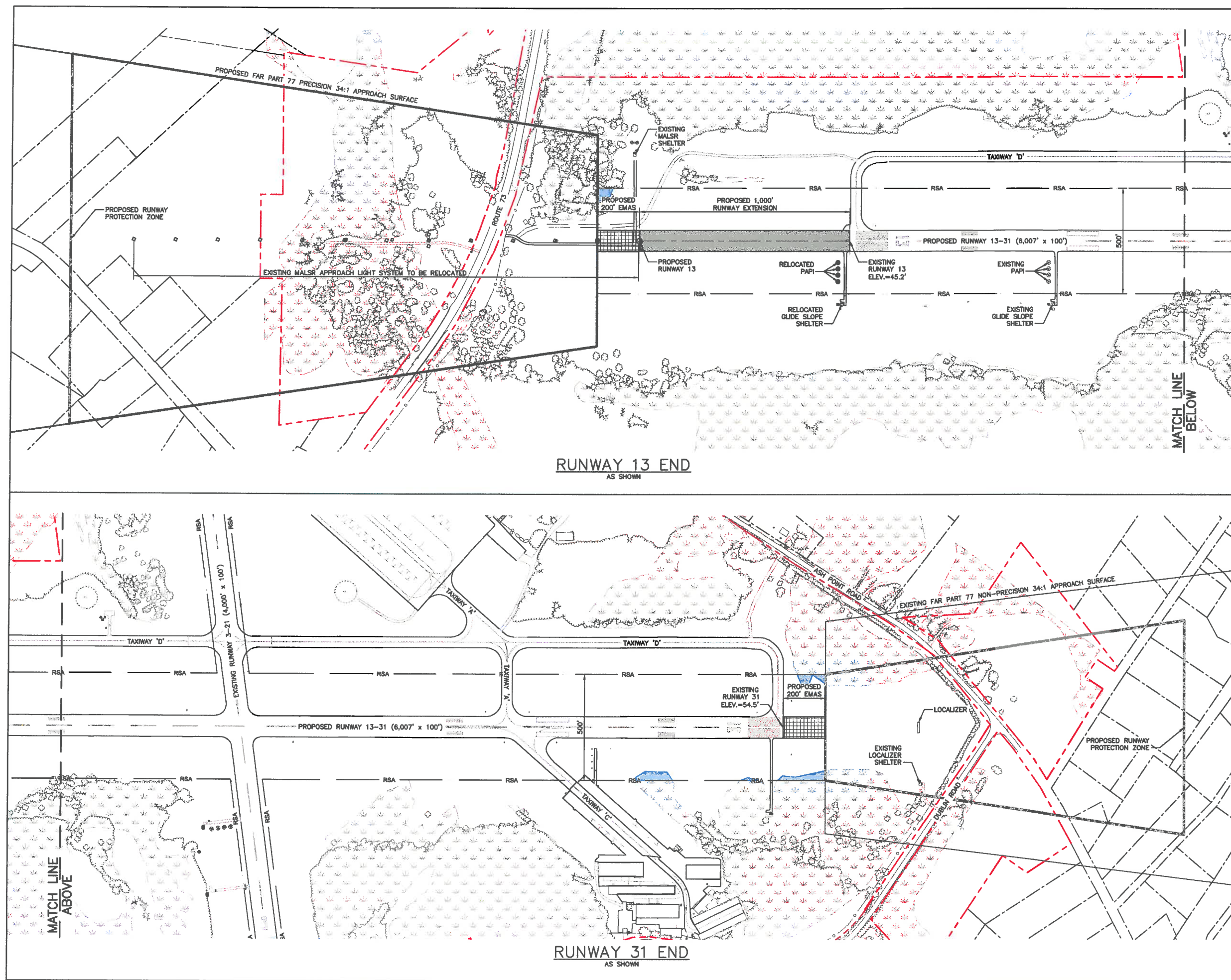


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AS NOTED

FIGURE 5-3





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Legend

- AIRPORT PROPERTY LINE
- ABUTTER PROPERTY LINE
- RSA RUNWAY SAFETY AREA
- EXISTING TREELINE
- PROPOSED PAVEMENT
- WETLANDS
- WETLANDS IMPACTS = ±1 AC
- PROPOSED EMAS

Notes



0 200' 400'

Revision _____ By _____ Appd. _____

Issued _____ By _____ Appd. _____

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Permit Seal _____

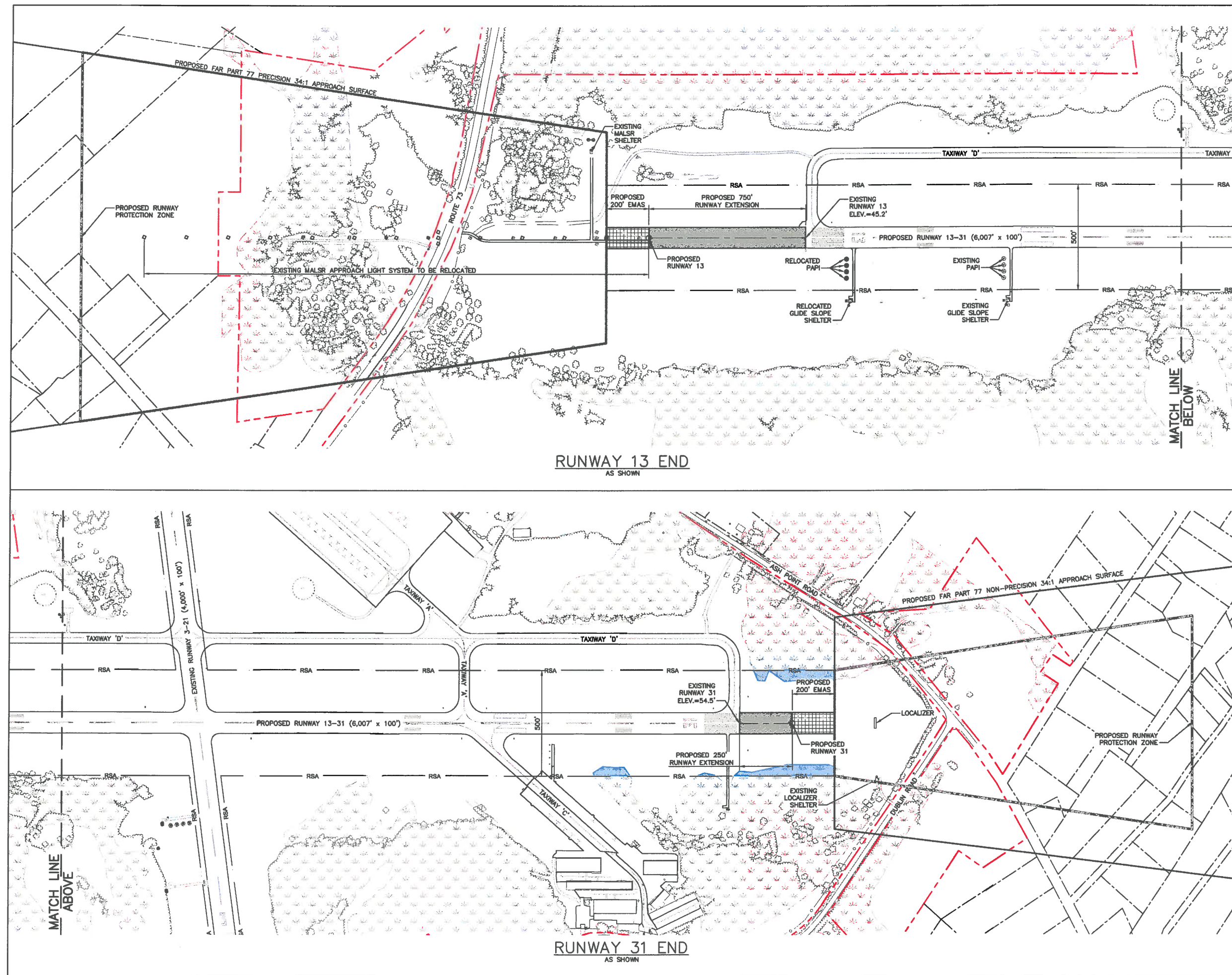
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Title
ALTERNATIVE D
750' EXTENSION & PROPOSED EMAS - R/W 13 END
250' EXTENSION & PROPOSED EMAS - R/W 31 END

Project No. 195210603 Scale AS NOTED

FIGURE 5-4











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Legend

	AIRPORT PROPERTY LINE
	ABUTTER PROPERTY LINE
	RSA RUNWAY SAFETY AREA
	EXISTING TREELINE
	PROPOSED PAVEMENT
	WETLANDS

Notes



	R/W 13	R/W 3
TODA	6,007'	6,007'
TORA	6,007'	5,007'
ASDA	6,007'	6,007'
LDA	5,007'	5,007'

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OWLS HEAD, MAINE

Title
**DECLARED DISTANCES
AVAILABLE RUNWAY**

FIGURE 5.5



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Legend

AIRPORT PROPERTY LINE
 ABUTTER PROPERTY LINE
 RSA
 RUNWAY SAFETY AREA
 TAXIWAY SAFETY AREA
 TBA
 EXISTING TREELINE
 PROPOSED PAVEMENT
 WETLANDS
 WETLANDS IMPACTS = ± 0.75 AC

Notes:



0 100' 2

[illegible]

	Client/Project
1	Client A - Project X
2	Client B - Project Y
3	Client C - Project Z
4	Client D - Project W
5	Client E - Project V
6	Client F - Project U
7	Client G - Project T
8	Client H - Project S
9	Client I - Project R
10	Client J - Project Q
11	Client K - Project P
12	Client L - Project O
13	Client M - Project N
14	Client N - Project M
15	Client O - Project L
16	Client P - Project K
17	Client Q - Project J
18	Client R - Project I
19	Client S - Project H
20	Client T - Project G
21	Client U - Project F
22	Client V - Project E
23	Client W - Project D
24	Client X - Project C
25	Client Y - Project B
26	Client Z - Project A

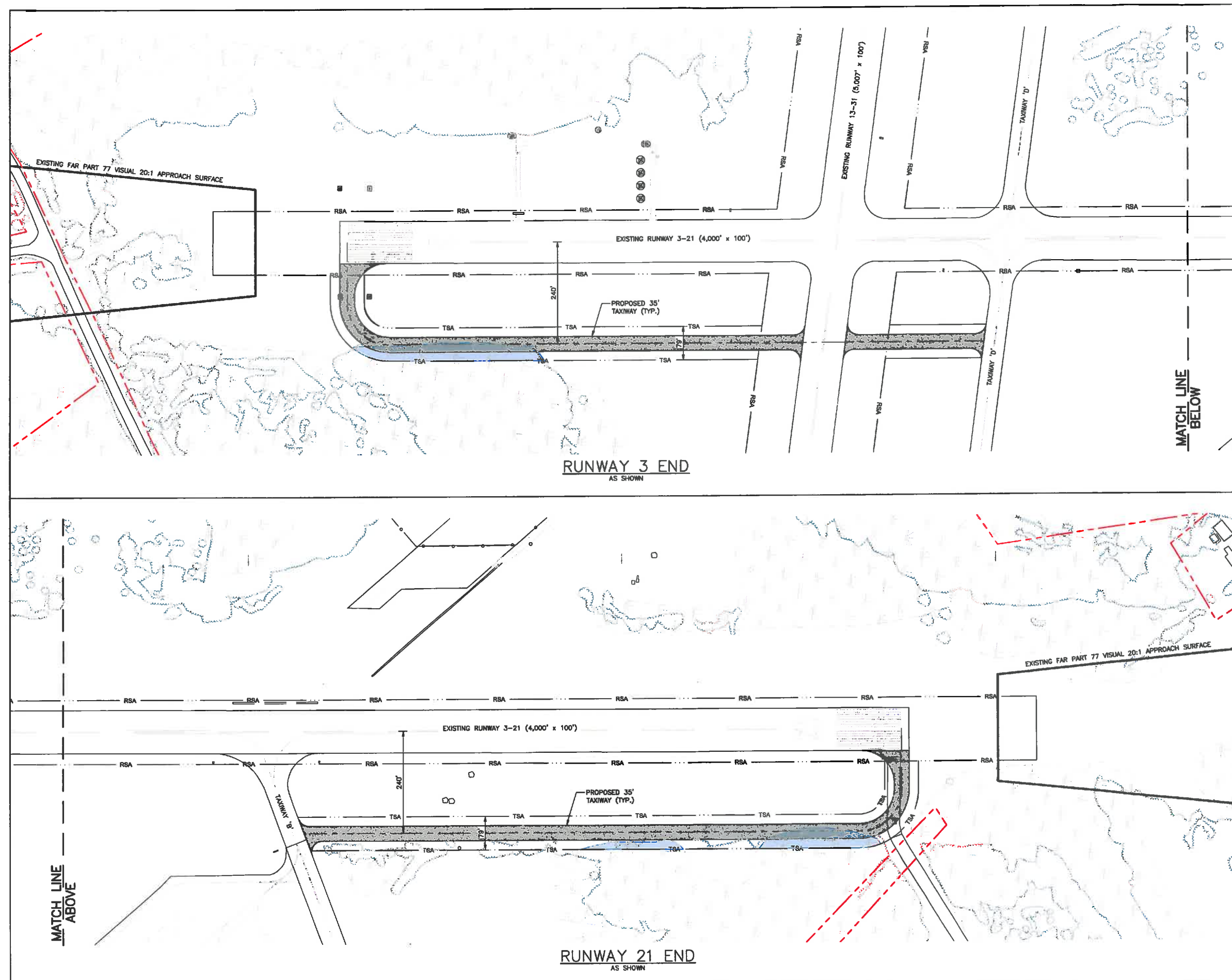
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**TAXIWAY ALTERNATIVE B
PARTIAL PARALLEL TAXIWAY**

FIGURE 5.6















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Legend

 AIRPORT PROPERTY LINE
 ABUTTER PROPERTY LINE
 RSA
 TSA
 RUNWAY SAFETY AREA
 TAXIWAY SAFETY AREA
 EXISTING TREELINE
 PROPOSED PAVEMENT
 WETLANDS
 WETLANDS IMPACTS = ± 0.75 AC

Notes

[illegible]

Client/Project
KNOX COUNTY REGIONAL AIRPORT

OVL'S HEAD, MAINE

Title
TAXIWAY ALTERNATIVE C
FULL LENGTH PARALLEL TAXIWAY

FIGURE 5.7