



5.03-5 Alternative 5: Runway 24 Shift to East (Relocate Bishop Road)

Alternative 5, as illustrated in **Figure 5-5**, would maintain the existing runway length. This alternative involves shifting the Runway 24 end to the east. Although the runway pavement would not extend across Bishop Road, the area needed to provide standard extended RSAs and ROFAs would require realigning Bishop Road to a T-intersection with White Road.

Alternative 5 is generally described as follows:

- RSA grading improvements to meet standards
- Remove stopway
- Extend Runway 24 end 100 feet to east
- Relocate Runway 6 100 feet to east (remove stopway and 100 feet of runway)
- Reroute Bishop Road and Curtiss Wright Parkway
- Standard RSA and ROFA beyond both runway thresholds
- 5,102-foot runway length available for takeoffs on Runway 6
- 5,102-foot runway length available for takeoffs on Runway 24

Usable runway length:

	Runway 6	Runway 24
Landing length	5,102'	5,102'
Takeoff length	5,102'	5,102'

Overall length: 5,102'

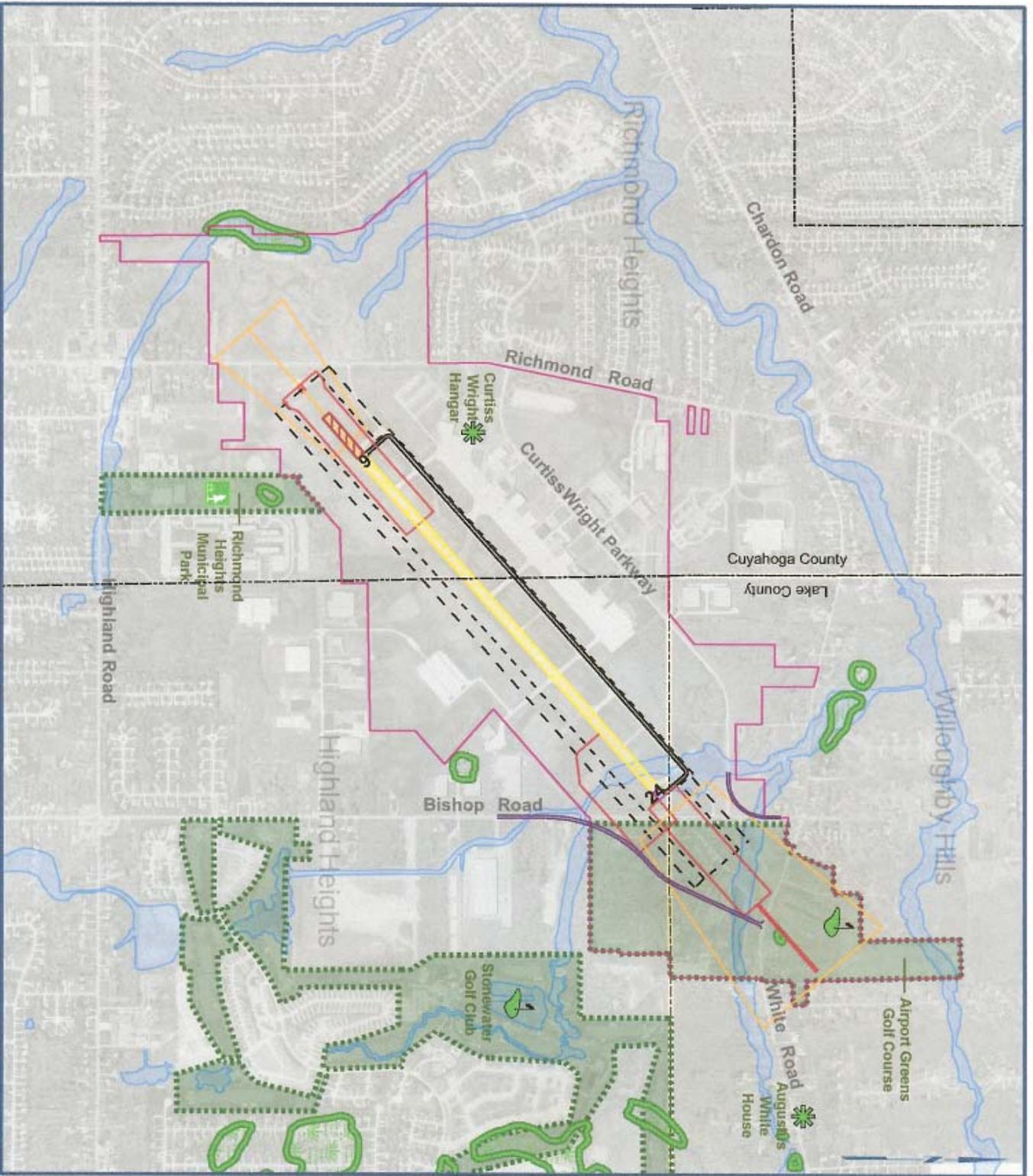
Does Alternative 5

Comply with FAA airport design standards? Yes

Satisfy Airport user needs (provide sufficient runway length)? No

Should Alternative 5 be considered for further study? No

Alternative 5 fails to meet the demonstrated runway length requirements, as discussed above. It requires a significant change to current vehicle traffic patterns with the Bishop Road realignment. This alternative would not avoid impacts to the Airport Greens Golf Course, a public recreation area which requires special consideration as a Section 4(f) resource. (The golf course, located on airport property off the Runway 24 end, is depicted on **Figure 5-38**.) Alternative 5 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.



Cuyahoga County Airport

LEGEND

- Existing runway to remain
- Existing pavement to be removed
- New runway or runway extension
- Site requirements for NAVAIDS
- Runway safety area
- Runway object free area
- Runway protection zone
- Airport property line
- Tunnelled road
- Relocated road
- Wetlands
- Floodplains
- 4(f) Resource
- Golf Course
- Park
- Historical Resources

SUMMARY

- Extend Runway 24 end 100 feet to east
- Relocate Runway 6 100 feet to east (remove stopway and 100 feet of runway)
- Renote Bishop Road and Curtiss Wright Parkway
- Standard RSA and ROFA beyond both runway thresholds
- 5,102-foot runway length available for takeoffs on Runway 6
- 5,102-foot runway length available for takeoffs on Runway 24

Usable Runway Length

Runway	6	24
Landing Length 5,102'	5,102'	5,102'
Departure Length 5,102'	5,102'	5,102'
Overall Length 5,102'	5,102'	5,102'



Figure 5-5

Alternative 5
Runway 24 Shift to East
(Relocate Bishop Road)





5.03-6 Alternative 6: Runway 24 Shift to East (Tunnel Bishop Road)

Alternative 6, as illustrated in **Figure 5-6**, would maintain the existing runway length. This alternative involves shifting the Runway 24 end to the east. Although the runway pavement would not extend across Bishop Road, the area needed to provide standard extended RSAs and ROFAs would require realigning this road. In this case, tunneling a section of Bishop Road is proposed to avoid disrupting normal traffic flow on this well traveled route.

Alternative 6 is generally described as follows:

- RSA grading improvements to meet standards
- Remove stopway
- Extend Runway 24 end 100 feet to east
- Relocate Runway 6 end 100 feet to east (remove stopway and 100 feet of runway)
- Tunnel Bishop Road and relocate Curtiss Wright Parkway
- Standard RSA and ROFA beyond both runway thresholds
- 5,102-foot runway length available for takeoffs on Runway 6
- 5,102-foot runway length available for takeoffs on Runway 24

Usable runway length:

	Runway 6	Runway 24
Landing length	5,102'	5,102'
Takeoff length	5,102'	5,102'

Overall length: 5,102'

Does Alternative 6

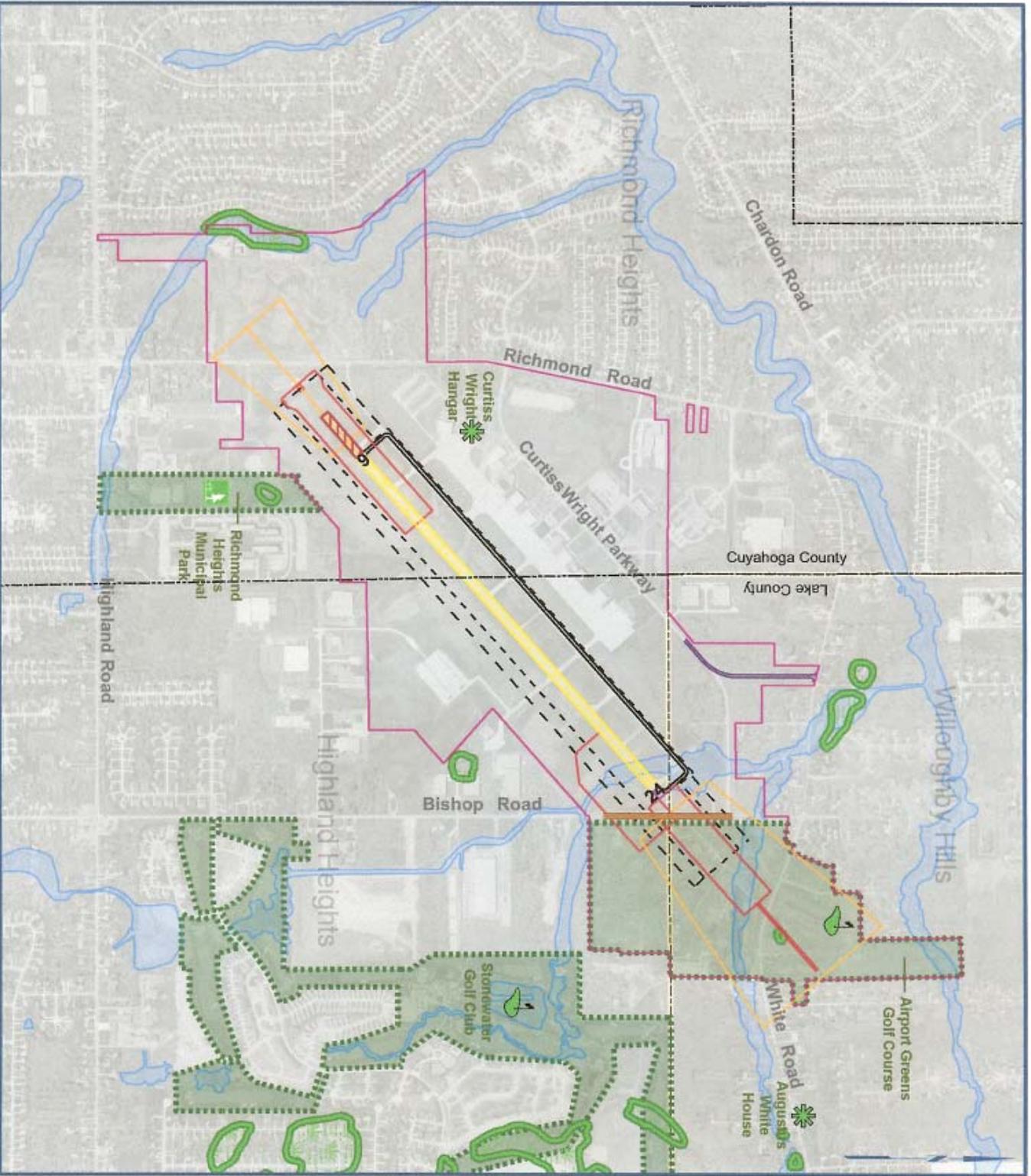
Comply with FAA airport design standards? Yes

Satisfy Airport user needs (provide sufficient runway length)? No

Should Alternative 6 be considered for further study? No

Alternative 6 fails to meet the demonstrated runway length requirements, as discussed above. Costs for construction of a tunnel on Bishop Road would be greater than for an at-grade road realignment. This alternative would not avoid impacts to the Airport Greens Golf Course, a public recreation area which requires special consideration as a Section 4(f) resource. Impacts to the golf course are a result of areas of excavation and fill to construct the tunnel for Bishop Road and grading of the RSA. Alternative 6 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.





Cuyahoga County Airport

LEGEND

- Existing runway to remain
- Existing pavement to be removed
- New runway or runway extension
- Site requirements for NAVAIDS
- Runway safety area
- Runway object free area
- Runway protection zone
- Airport property line
- Tunnelled road
- Relocated road
- Wetlands
- Floodplains
- 410' Resource
- Golf Course
- Park
- Historical Resources

SUMMARY

- Extend Runway 24 end 100 feet to east
- Relocate Runway 6 100 feet to east (remove stopway and 100 feet of runway)
- Tunnel Bishop Road and reroute Curliess Wright Parkway
- Standard RSA and RCFA beyond both runway thresholds
- 5,102-foot runway length available for takeoffs on Runway 6
- 5,102-foot runway length available for takeoffs on Runway 24

Usable Runway Length

Runway	6	24
Landing Length	5,102'	5,102'
Departure Length	5,102'	5,102'
Overall Length	5,102'	



Figure 5-6
Alternative 6
Runway 24 Shift to East
(Tunnel Bishop Road)





5.03-7 Alternative 7: Road Relocations at Both Runway Ends

Alternative 7, as illustrated in **Figure 5-7**, would maintain the existing runway length. This alternative would involve a 500-foot runway extension at the Runway 6 end, converting the paved stopway to be used as runway. An equal length of runway pavement would be closed and removed at the Runway 24 end. Curved road realignments would be required for both Richmond and Bishop Roads to clear the RSAs and ROFAs at both runway ends.

Alternative 7 is generally described as follows:

- RSA grading improvements to meet standards
- Close 500 feet at Runway 24 end
- Convert stopway to runway at Runway 6 end (and move threshold to new Runway 6 end)
- Reroute roads to clear RSAs and ROFAs at both runway ends
- Standard RSA and ROFA beyond both runway thresholds
- 5,102-foot runway length available for takeoffs on Runway 6
- 5,102-foot runway length available for takeoffs on Runway 24

Usable runway length:

	Runway 6	Runway 24
Landing length	5,102'	5,102'
Takeoff length	5,102'	5,102'

Overall length: 5,102'

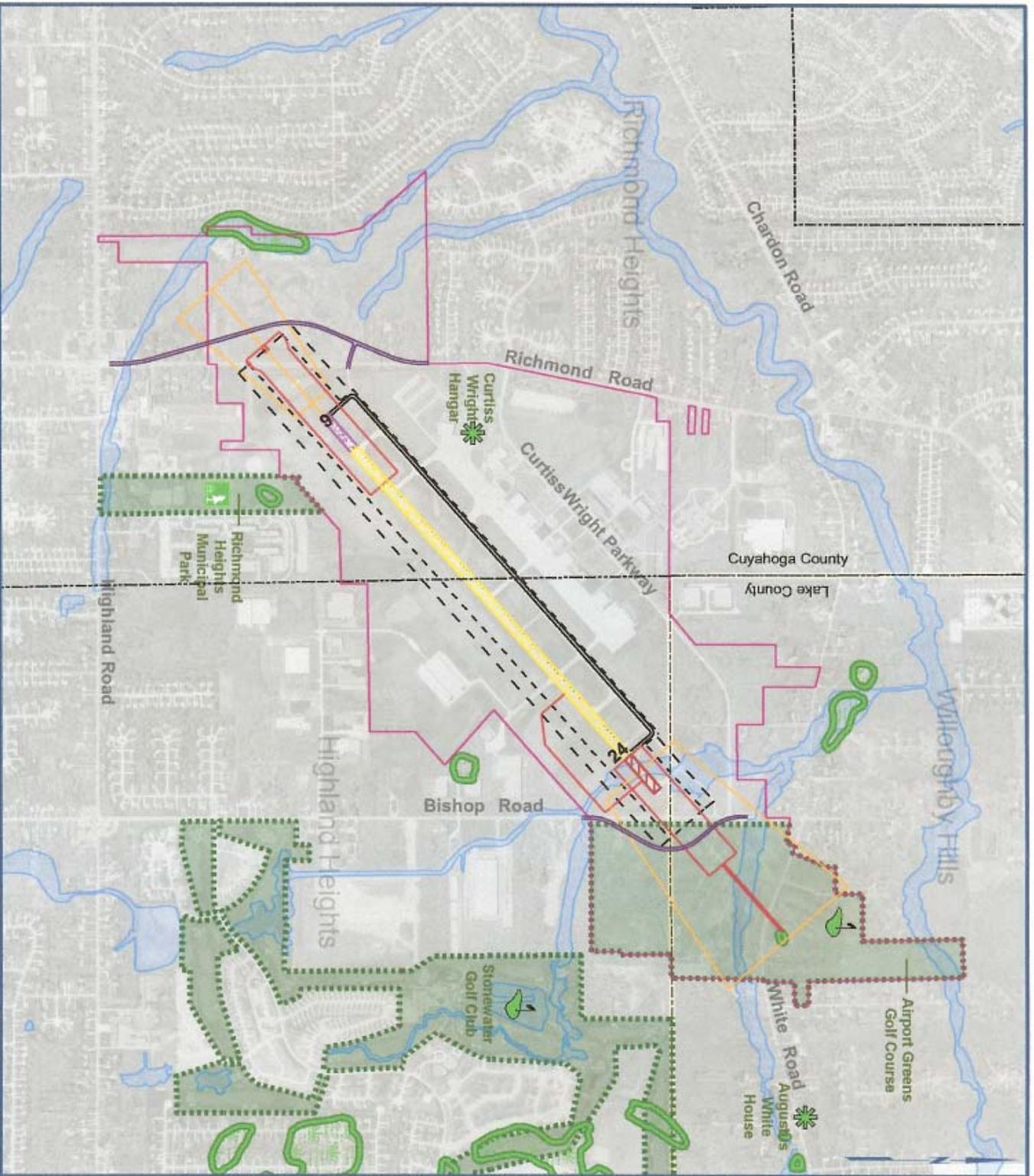
Does Alternative 7

<i>Comply with FAA airport design standards?</i>	Yes
<i>Satisfy Airport user needs (provide sufficient runway length)?</i>	No

<i>Should Alternative 7 be considered for further study?</i>	No
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Alternative 7 fails to meet the demonstrated runway length requirements, as discussed above. The realignment of Richmond Road would dislocate four residential properties. This alternative, which reroutes Bishop Road through the Airport Greens Golf Course, would not avoid impacts to this public recreation area which requires special consideration as a Section 4(f) resource. Impacts to the golf course are a result of areas of excavation and fill to construct the road realignment for Bishop Road and grading of the RSA. Alternative 7 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.





Cuyahoga County Airport

LEGEND

- Existing runway to remain
- Existing pavement to be removed
- New runway or runway extension
- Site requirements for NAVAIDS
- Runway safety area
- Runway object free area
- Runway protection zone
- Airport property line
- Turned road
- Recolored road
- Wetlands
- Floodplains
- 4(f) Resource
- Golf Course
- Park
- Historical Resources

SUMMARY

- * Close 500 feet at Runway 24 end
- * Convert stopway to runway at Runway 6 end
- * Reroute roads to clear RSAs and ROFAs at both runway ends
- * Standard RSA and ROFA beyond both runway thresholds
- * 5,102-foot runway length available for takeoffs on Runway 6
- * 5,102-foot runway length available for takeoffs on Runway 24

Usable Runway Length

Runway	6	24
Starting Length	5,102'	5,102'
Departure Length	5,102'	5,102'
Overall Length	5,102'	5,102'



Figure 5-7
Alternative 7
Road Relocations
at Both Runway Ends





5.03-8 Alternative 8: Declared Distances

Alternative 8, as illustrated in **Figure 5-8**, would maintain the existing runway length. This alternative would involve the implementation of Declared Distances, a special application that the FAA defines in Appendix 14 of Advisory Circular 150/5300-13. This guidance notes that the use of declared distances for airport design shall be limited to cases of existing constrained airports where it is impracticable to provide the runway safety area (RSA), the runway object free area (ROFA), or the runway protection zone (RPZ) in accordance with design standards. Declared distances uses an alternative airport design methodology that treats airplane performance characteristics independently for takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements. The declared distances are takeoff run available (TORA), takeoff distance available (TODA), accelerate-stop distance available (ASDA), and landing distance available (LDA). Use of this methodology may affect dimensions at the beginning and ending of the RSA, ROFA, and RPZ.

Alternative 8 is generally described as follows:

- RSA grading improvements to meet standards
- Overall runway length is 5,102 feet (500-foot stopway length is included in calculations for declared distances)
- Runway 6 TORA/TODA = 5,102'
- Runway 6 ASDA/LDA = 4,207'
- Displace threshold 495 feet at Runway 24 end
- Runway 24 TORA = 5,102'
- Runway 24 TODA = 5,602'
- Runway 24 ASDA = 5,112'
- Runway 24 LDA = 4,607'

Usable runway length:

	Runway 6	Runway 24
Landing length	4,207'	4,607'
Takeoff length	4,207'	5,112'

Overall length: 5,102'

Does Alternative 8

Comply with FAA airport design standards?

Yes

Satisfy Airport user needs (provide sufficient runway length)?

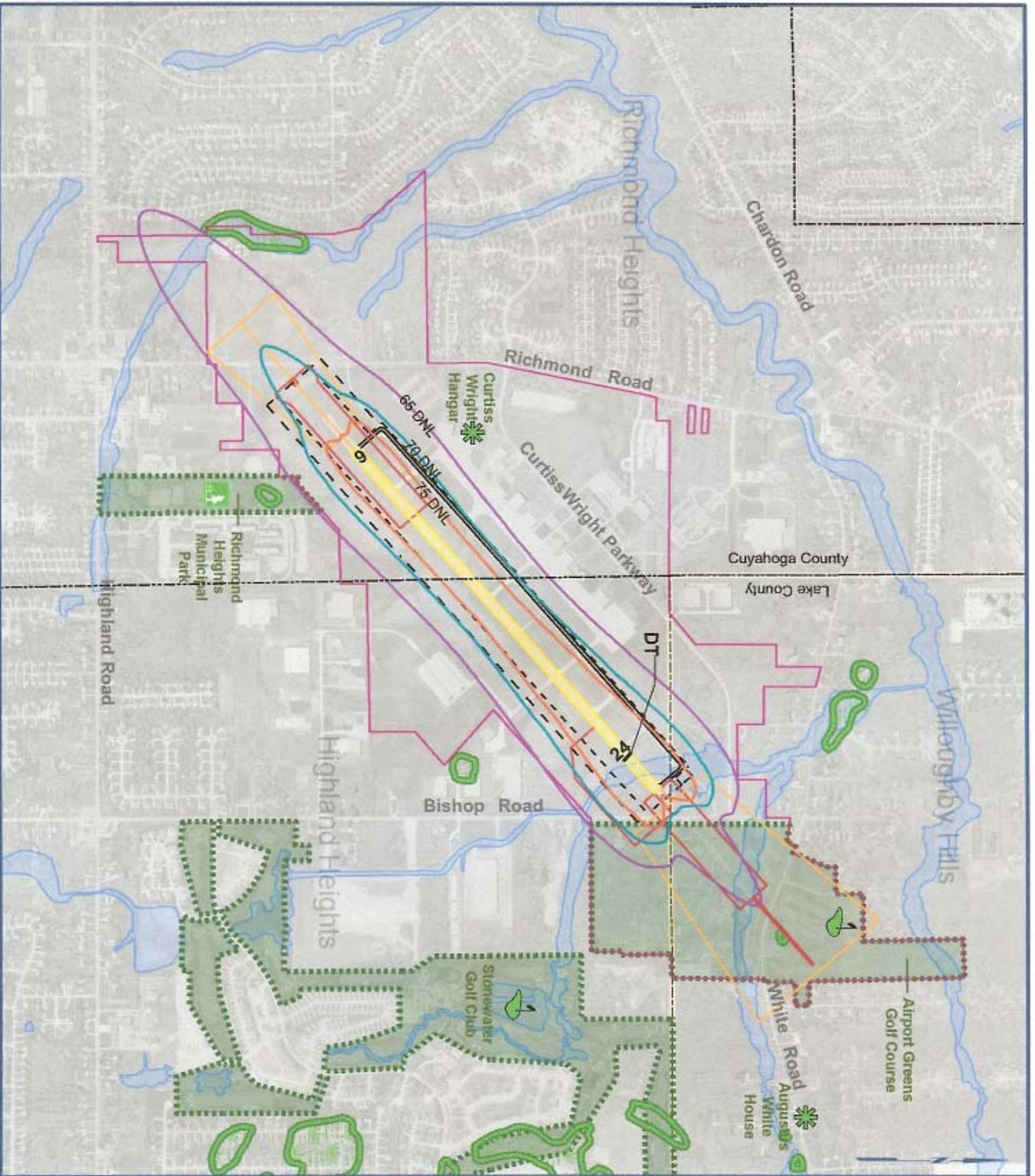
No

Should Alternative 8 be considered for further study?

No

Alternative 8 fails to meet the demonstrated runway length requirements, as discussed above. Alternative 8 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.





Cuyahoga County Airport

LEGEND

- Existing runway to remain
- Existing pavement to be removed
- New runway or runway extension
- Site requirements for NAVAIDS
- Runway safety area
- Runway object free area
- Runway protection zone
- Airport property line
- Tunnelled road
- Relocated road
- Wetlands
- Floodplains
- 4(f) Resource
- Golf Course
- Park
- Historical Resources

SUMMARY

- RSA grading improvements to meet standards
- Displace threshold 495 feet at Runway 24 end
- Runway 6 TORA/TODA = 5,102'
- Runway 6 ASDA/LDA = 4,207'
- Runway 24 TORA = 5,102'
- Runway 24 TODA = 5,602'
- Runway 24 ASDA = 5,112'
- Runway 24 LDA = 4,607'

• Noise Contours shown are for year 2025

Usable Runway Length	
Runway 6	24
Landing Length 4,207'	4,607'
Departure Length 4,207'	5,112'
Overall Length 5,102'	



Figure 5-8
Alternative 8
Declared Distances





5.03-9 Alternative 9: EMAS at Runway 6 End

Alternative 9, as illustrated in **Figure 5-9**, would maintain the existing runway length. This alternative would involve the installation of an engineered materials arresting system (EMAS) at the Runway 6 end. FAA Advisory Circular 150/5220-22A, *Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*, provides guidance for the use and design of an EMAS which consists of “high energy absorbing materials of selected strength, which will reliably and predictably crush under the weight of an aircraft.” The installation of an EMAS at the end of a runway provides a means of minimizing hazards of overrunning aircraft and enhancing safety where a standard RSA may not be possible. Without any road realignments and with the installation of an EMAS, the airport is able to maintain the existing runway length for departures on Runway 24 only.

Alternative 9 is generally described as follows:

- RSA grading improvements to meet standards
- Remove stopway
- Install EMAS at Runway 6 end
- Displace threshold 600 feet at Runway 24 end to have full undershoot protection for ROFA
- Standard RSA and ROFA beyond both runway thresholds
- 4,102-foot runway length available for takeoffs on Runway 6
- 5,102-foot runway length available for takeoffs on Runway 24

Usable runway length:

	Runway 6	Runway 24
Landing length	4,102'	4,502'
Takeoff length	4,102'	5,102'

Overall length: 5,102'

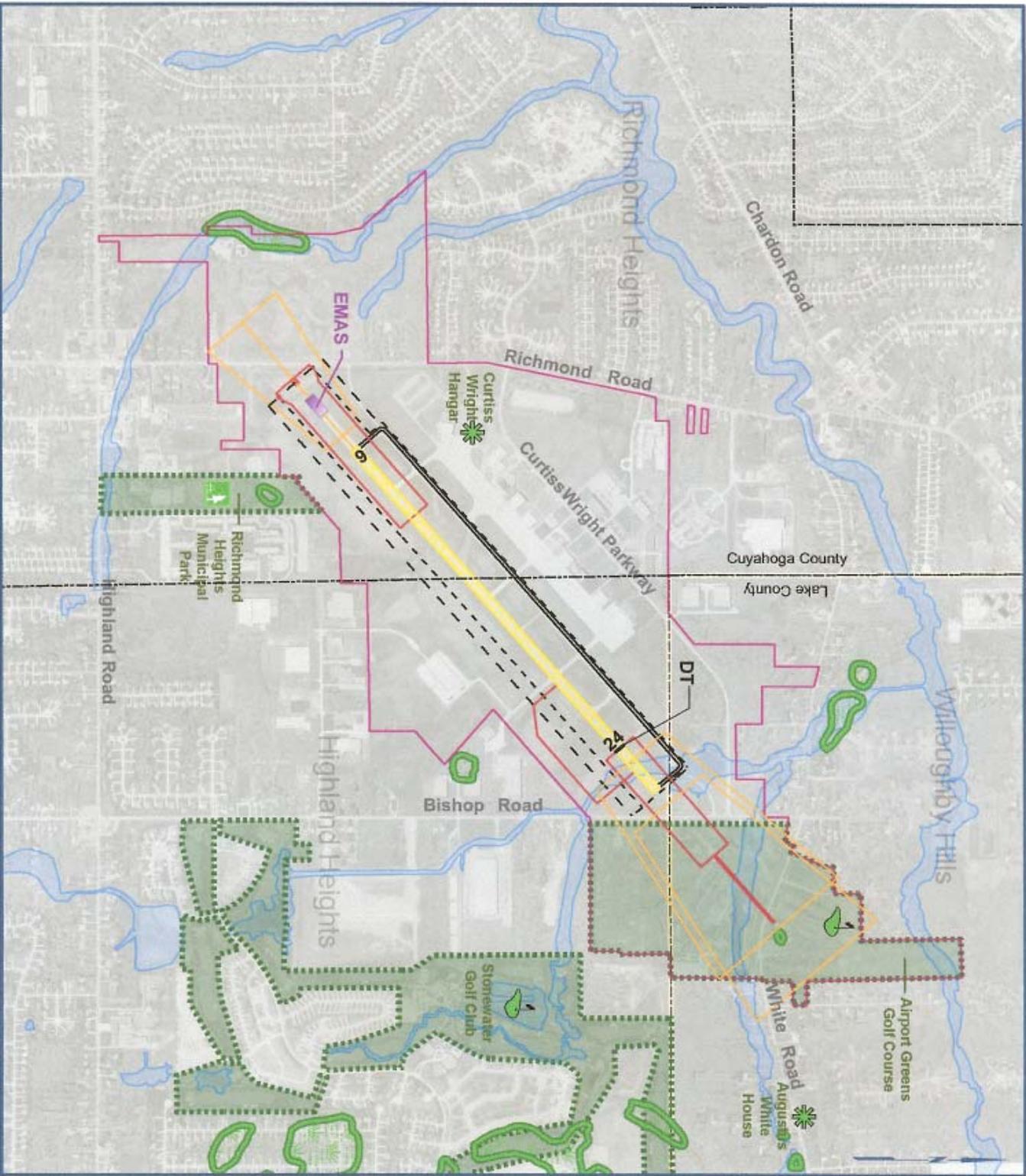
Does Alternative 9

Comply with FAA airport design standards? Yes

Satisfy Airport user needs (provide sufficient runway length)? No

Should Alternative 9 be considered for further study? No

A standard EMAS installation is estimated to cost \$2.5 million. When an EMAS is damaged due to an overrun, repair/replacement of materials is estimated at \$1.25 million. Most importantly, Alternative 9 fails to meet the demonstrated runway length requirements, as discussed above. Alternative 9 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.



Cuyahoga County Airport

LEGEND

- Existing runway to remain
- Existing pavement to be removed
- New runway or runway extension
- Site requirements for NAVAIDS
- Runway safety area
- Runway object free area
- Runway protection zone
- Airport property line
- Turned road
- Relocated road
- Wetlands
- Floodplains
- 4(f) Resource
- Golf Course
- Park
- Historical Resources

SUMMARY

- Install EMAS at Runway 6 end
- Displace threshold 800 feet at Runway 24 end to have full undershoot protection for ROFA
- Standard RSA and ROFA beyond both runway thresholds
- 4,102-foot runway thresholds available for takeoffs on Runway 6
- 5,102-foot runway length available for takeoffs on Runway 24

Usable Runway Length

Runway	6	24
Landing Length	4,102'	4,502'
Departure Length	4,102'	5,102'
Overall Length	5,102'	



Figure 5-9
Alternative 9
EMAS at Runway 6 End



5.03-10 Alternative 10: EMAS at Runway 24 End

Alternative 10, as illustrated in **Figure 5-10**, would maintain the existing runway length. This alternative would involve the installation of an engineered materials arresting system (EMAS) at the Runway 24 end. Without any road realignments and with the installation of an EMAS, the airport is limited to 4,952 feet for departures on Runway 6 and 4,852 feet for departures on Runway 24, less than the existing runway length of 5,102 feet.

Alternative 10 is generally described as follows:

- RSA grading improvements to meet standards
- Remove stopway
- Close/move Runway 24 end 150 feet in order to fit standard EMAS
- Install EMAS at Runway 24 end
- Displace Runway 24 threshold another 450 feet (600 feet from existing runway end) to have full 600 feet for undershoot protection
- Extend runway 6 end 150 feet to make up for 150 feet lost at Runway 24 end
- With this alternative, the 150-foot extension at the Runway 6 end is not available at the rollout end for operations on Runway 24 and, in fact, an additional 100 feet is unusable in order to provide the standard 1,000-foot ROFA length at rollout

Usable runway length:

	Runway 6	Runway 24
Landing length	4,952'	4,402'
Takeoff length	4,952'	4,852'

Overall length: 5,102'

Does Alternative 10

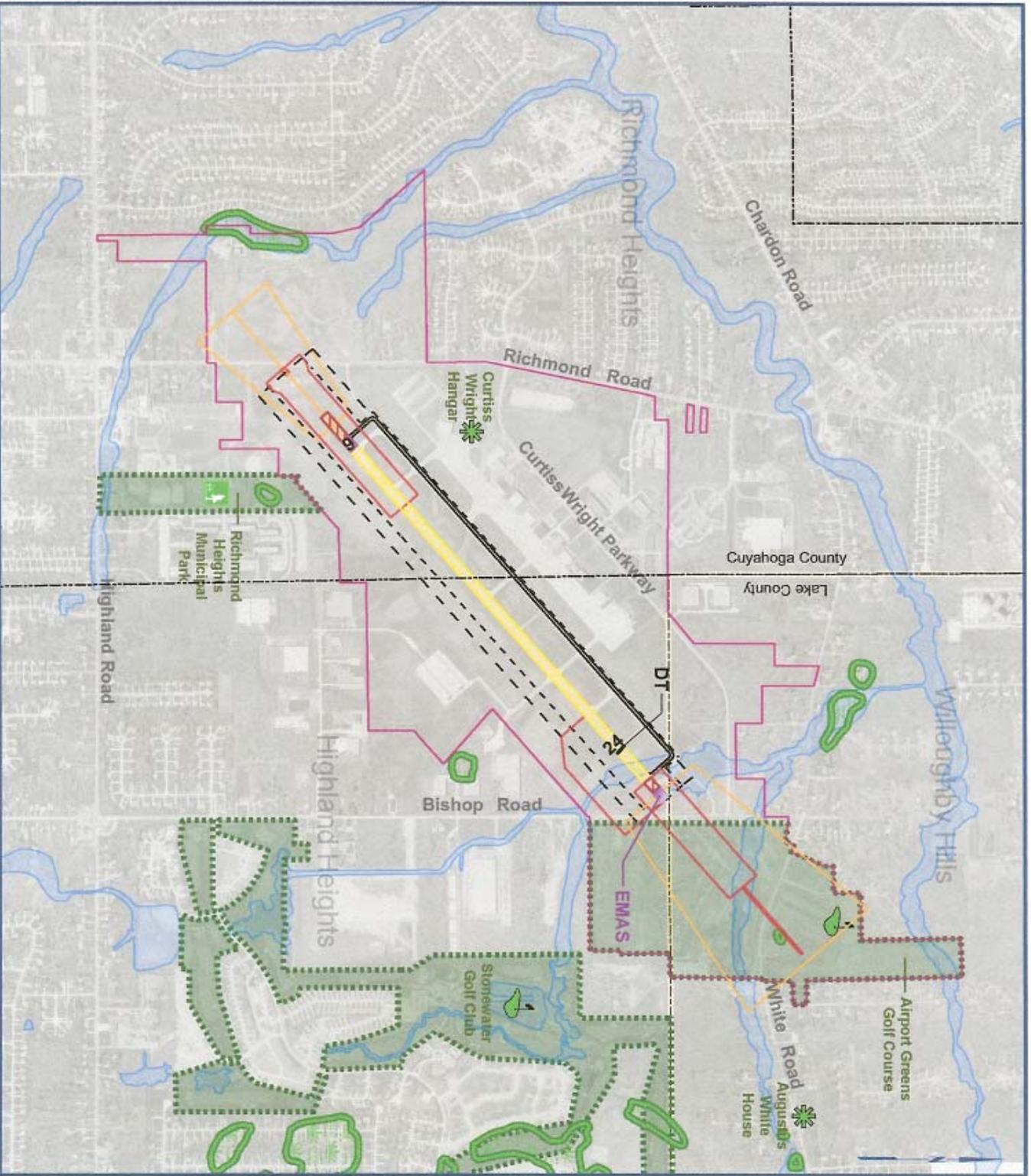
Comply with FAA airport design standards? Yes

Satisfy Airport user needs (provide sufficient runway length)? No

Should Alternative 10 be considered for further study? No

A standard EMAS installation is estimated to cost \$2.5 million. When an EMAS is damaged due to an overrun, repair/replacement of materials is estimated at \$1.25 million. Most importantly, Alternative 10 fails to meet the demonstrated runway length requirements, as discussed above. Alternative 10 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.





Cuyahoga County Airport

LEGEND

- Existing runway to remain
- Existing pavement to be removed
- New runway or runway extension
- Site requirements for NAVAIDS
- Runway safety area
- Runway object free area
- Runway protection zone
- Airport property line
- Turned road
- Relocated road
- Wetlands
- Floodplains
- 4(f) Resource
- Golf Course
- Park
- Historical Resources

SUMMARY

- Close/move Runway 24 end 150' in order to fit standard EMAS
- Install EMAS at Runway 24 end
- Displace Runway 24 threshold another 450' to provide 600' undershoot protection
- Extend runway 6 end 150' to make up for 150' lost at Runway 24 end

Usable Runway Length

Runway	6	24
Landing Length	4,952'	4,402'
Departure Length	4,952'	4,652'
Overall Length	5,102'	



Figure 5-10

Alternative 10

EMAS at Runway 24 End





5.03-11 Alternative 11: EMAS at Both Runway Ends

Alternative 11, as illustrated in **Figure 5-11**, would maintain the existing runway length. This alternative would involve the installation of engineered materials arresting systems (EMAS) at both runway ends. It would also require displaced thresholds for landing aircraft at both runway ends. Without any road realignments and with the installation of an EMAS at each runway end, the airport is able to achieve a departure length of 5,502 feet for operations on both runways but is more limited for landing distance on each runway due to the displaced thresholds. The landing length available on Runway 6 is 5,252 feet; the landing length available on Runway 24 is 5,052 feet, which is fifty feet short of the existing runway length.

Alternative 11 is generally described as follows:

- RSA grading improvements to meet standards
- Remove stopway
- Extend runway 6 end 550 feet (including 500 feet of the former stopway)
- Install EMAS at Runway 6 end
- Displace threshold 250 feet from new Runway 6 end (which is 300 feet out from existing Runway 6 end) to have full undershoot protection for ROFA
- Close/move Runway 24 end 150 feet in order to fit standard EMAS
- Install EMAS at Runway 24 end
- Displace Runway 24 threshold another 450 feet (600 feet from existing runway end) to provide 600 feet undershoot protection

Usable runway length:

	Runway 6	Runway 24
Landing length	5,252'	5,052'
Takeoff length	5,502'	5,502'

Overall length: 5,502'

Does Alternative 11

Comply with FAA airport design standards? Yes

Satisfy Airport user needs (provide sufficient runway length)? No

Should Alternative 11 be considered for further study? No

A standard EMAS installation is estimated to cost \$2.5 million. When an EMAS is damaged due to an overrun, repair/replacement of materials is estimated at \$1.25 million. Most importantly, Alternative 11 fails to meet the demonstrated runway length requirements, as discussed above. Alternative 11 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.



5.03-12 Alternative 12: Runway 24 Shift to East & Runway 6 EMAS

Alternative 12, as illustrated in **Figure 5-12**, would maintain the existing runway length. This alternative would involve the installation of an EMAS at the Runway 6 end and a realignment of Bishop Road encroaching on the golf course. It would require a displaced threshold for landing aircraft at the Runway 6 end. With a road realignment at one runway end, the airport is able to maintain the 5,102-foot departure length for both runways and also achieves a landing length of 5,502 feet for operations on Runway 24.

Alternative 12 is generally described as follows:

- RSA grading improvements to meet standards
- Remove stopway
- Extend runway 6 end 550 feet (converting 500-foot stopway to runway and adding 50 feet)
- Install EMAS at Runway 6 end
- Displace threshold 250 feet from new Runway 6 end (which is 300 feet out from existing Runway 6 end) to have full undershoot protection for ROFA
- Close 550 feet at Runway 24 end
- Relocate Bishop Road to get standard RSA and ROFA length

Usable runway length:

	Runway 6	Runway 24
Landing length	4,852'	5,502'
Takeoff length	5,102'	5,102'

Overall length: 5,102'

Does Alternative 12

- Comply with FAA airport design standards?* Yes
- Satisfy Airport user needs (provide sufficient runway length)?* No

Should Alternative 12 be considered for further study? No

A standard EMAS installation is estimated to cost \$2.5 million. When an EMAS is damaged due to an overrun, repair/replacement of materials is estimated at \$1.25 million. The Bishop Road realignment does not displace any residences. However, this alternative would not avoid impacts to the Airport Greens Golf Course, a public recreation area which requires special consideration as a Section 4(f) resource. In addition, Alternative 12 fails to meet the demonstrated runway length requirements, as discussed above. Alternative 12 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.





5.03-13 Alternative 13: Runway 6 Shift to West & Runway 24 EMAS

Alternative 13, as illustrated in **Figure 5-13**, would maintain the existing runway length. This alternative would involve the installation of an EMAS at the Runway 24 end and a realignment of Richmond Road. It would require a displaced threshold for landing aircraft at the Runway 24 end. With a road realignment at one runway end, the airport is able to maintain the 5,102-foot departure length for both runways but only achieves a landing length of 4,652 feet for operations on Runway 24, the primary direction for aircraft operations at the airport.

Alternative 13 is generally described as follows:

- RSA grading improvements to meet standards
- Remove stopway
- Close/move Runway 24 end 150 feet in order to fit standard EMAS
- Install EMAS at Runway 24 end
- Displace Runway 24 threshold another 450 feet (600 feet from existing runway end) to provide 600-foot undershoot protection
- Extend Runway 6 end 150 feet to make up for 150 feet lost at Runway 24 end
- Relocate Richmond Road to accommodate standard RSA and ROFA length

Usable runway length:

	Runway 6	Runway 24
Landing length	5,102'	4,652'
Takeoff length	5,102'	5,102'

Overall length: 5,102'

Does Alternative 13

Comply with FAA airport design standards? Yes

Satisfy Airport user needs (provide sufficient runway length)? No

Should Alternative 13 be considered for further study? No

Cost of installing and maintaining an EMAS needs to be considered. The Richmond Road realignment does not displace any residences or businesses; however it may affect traffic flow negatively on this busy route. Alternative 12 fails to meet the demonstrated runway length requirements, as discussed above. Alternative 12 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.



5.03-14 Alternative 14: Combination with Displaced Threshold

Alternative 14, as illustrated in **Figure 5-14**, would maintain the existing runway length. This alternative would involve removal of the stopway and extending the Runway 6 end 300 feet. It would require a displaced threshold for landing aircraft at the Runway 24 end. The overall runway length is 5,402 feet; however, because the site is constrained, takeoff distance is limited to 5,002 feet on Runway 24 and 4,402 feet on Runway 6.

Alternative 14 is generally described as follows:

- RSA grading improvements to meet standards
- Remove stopway at Runway 6 end
- Extend runway 6 end 300 feet (converting part of 500-foot stopway to runway)
- Displace threshold 600 feet from Runway 24 end to have full undershoot protection for ROFA

Usable runway length:

	Runway 6	Runway 24
Landing length	4,402'	4,402'
Takeoff length	4,402'	5,002'

Overall length: 5,402'

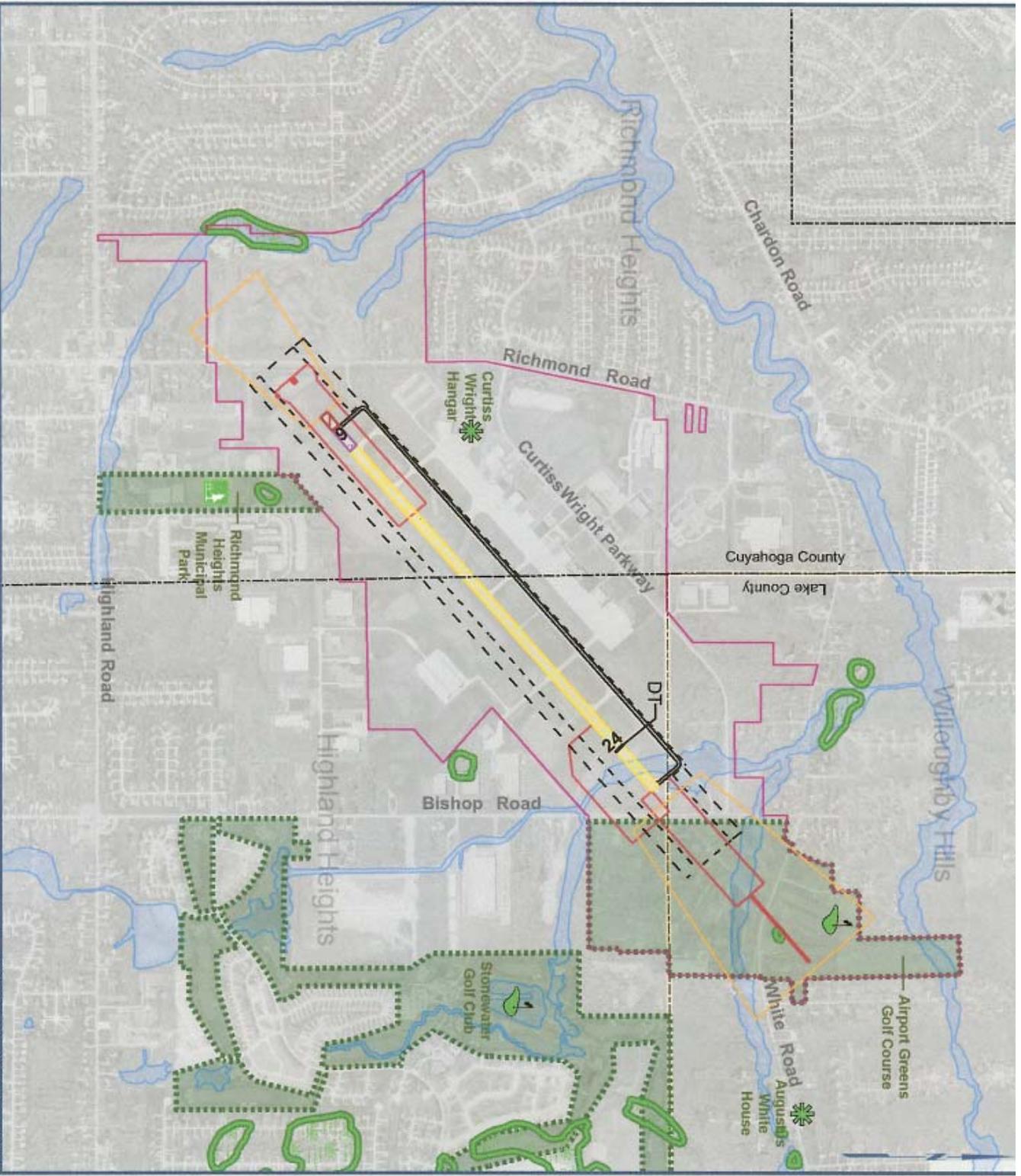
Does Alternative 14

Comply with FAA airport design standards? Yes

Satisfy Airport user needs (provide sufficient runway length)? No

Should Alternative 14 be considered for further study? No

Although Alternative 14 provides 5,402 feet of runway pavement, its use is limited by site constraints. This alternative fails to meet the demonstrated runway length requirements, as discussed above. Alternative 14 is considered to be an alternative that cannot be justified from a planning perspective and will be dismissed from further consideration.



Cuyahoga County Airport

LEGEND

- Existing runway to remain
- Existing pavement to be removed
- New runway or runway extension
- Site requirements for NAVAIDS
- Runway safety area
- Runway object free area
- Runway protection zone
- Airport property line
- Tunnelled road
- Relocated road
- Wetlands
- Floodplains
- 4(f) Resource
- Golf Course
- Park
- Historical Resources

SUMMARY

- Remove stopway at Runway 6 end
- Extend runway 6 end 300 feet (converting part of 500-foot stopway to runway)
- Displace threshold 600 feet from Runway 24 end to have full undershoot protection for ROFA
- 4,402-foot runway length available for takeoffs on Runway 6
- 5,002-foot runway length available for takeoffs on Runway 24

Usable Runway Length

Runway	6	24
Landing Length	4,402'	4,402'
Departure Length	4,402'	5,002'
Overall Length	5,402'	



Figure 5-14
Alternative 14
Combination with
Displaced Threshold

