

Hartford-Brainard Airport Potential Runway 11-29 Closure White Paper



August 2012



In recent years there has been discussion regarding the necessity of Runway 11-29 to the Hartford-Brainard Airport (HFD) and its potential closure. As part of the recent Master Plan Update (MPU), the potential runway closure was evaluated. It is not the intention of the State of Connecticut, Department of Transportation (CTDOT), or Connecticut Airport Authority (CAA) to close HFD in its entirety. This standalone document discusses the following topics related to the closure of Runway 11-29:

- Airport Background
- User Consultation
- Wind Coverage
- Runway Use
- Airfield Capacity
- Benefits of Closure
- Future Use of Property
- Facility Relocation
- Summary

Airport Background

Hartford-Brainard Airport (HFD), owned by the State of Connecticut, is a general aviation (GA) airport located near downtown Hartford, Connecticut. Corporate travel, flight training, recreational flights, and many other aviation activities take place at HFD. Across the airport's 201 acres, there are two paved runways, one turf runway, and two helipads, with parking for over 200 aircraft. Air traffic is controlled by staff in the Air Traffic Control Tower (ATCT) from 6AM to midnight each day.

Runway 2-20 is the primary runway and is 4,417 feet long and 150 feet wide. The runway thresholds have been displaced on both ends to meet approach clearance requirements, as the runway is surrounded by the Clark Dike – a Connecticut River flood control dike approximately 25 to 30 feet tall. The runway is equipped with High Intensity Runway Lights (HIRL), Visual Glide Slope Indicators (VGSI), and Runway End Identifier Lights (REIL). Runway 2 has two non-precision approaches, a Localizer Directional Aid and a GPS-RNAV approach. The airport also has a VOR approach (circling only) and a published visual approach for noise abatement. The runway markings are non-precision and in good condition. Runway 2-20 serves the vast majority of the needs of the users of HFD.

Runway 11-29 is 2,314 feet long by 71 feet wide and is used exclusively for smaller GA aircraft (Airport Reference Code B-I). The pavement strength allows for regular use by aircraft up to 10,000 pounds. The runway has visual markings, which are in good condition. Runway 29 has a displaced threshold of 265 feet due to the Clark Dike. Runway 11-29 is served by a full-length, parallel taxiway.

User Consultation

As part of this study, the airport stakeholders have been consulted prior to the submission of the 7480 Form to the FAA. The airport sponsor, the CTDOT, made a previous version of this whitepaper available to the public via the study website along with a request for comments. A letter was email to the Advisory Committee and the airport tenants.

Based on the comments received, this whitepaper was slightly revised to include additional evaluation. The sponsor, airport manager, and consultant staff attended a local Experimental Aircraft Association (EAA) chapter meeting on August 10th, 2012. The meeting minutes of which are attached to this whitepaper.

The comments received from stakeholders and responses from the CTDOT and consultant staff are also attached. Based on the stakeholders input, the CTDOT will decide whether they wish to proceed with closing Runway 11-29. It should be noted that there is no intention to close HFD in its entirety. If the CTDOT decides to pursue closure of Runway 11-29, a 7480-1 Form will be submitted to the FAA. The website is located at www.brainardplanning.com

Wind Coverage

The ideal orientation of a runway is based on a function of wind speed and direction, and the ability of aircraft to operate under crosswind conditions. As a general principle, runways should be oriented as closely as practical to the direction of the prevailing winds. This enables aircraft to take off and land in the direction of the wind, which improves the safety and efficiency of operations. The most ideal runway alignment provides the highest wind coverage percentage. The desired wind coverage for an airport has been set by the FAA at 95 percent. In cases where a single runway cannot provide adequate wind coverage, a crosswind runway may be considered, but is not an FAA requirement. The FAA assumes that small, ARC B-I aircraft can safely handle crosswinds of no greater than 10.5 knots (12 mph), and is referred to as the crosswind component. ARC B-II aircraft can handle crosswinds of up to 13.0 knots (15 mph).

The current runway system at HFD with Runway 2-20 (true azimuth 9 degrees) and Runway 11-29 (true azimuth of 099 degrees) can adequately accommodate both ARC B-I and B-II aircraft (10.5-knots and 13-knots). The wind coverage during both all-weather and poor weather conditions is 99 percent. This information was calculated by the FAA’s Airport Design Software using 10 years of recorded wind data from the weather station located at HFD from 2000 to 2009.

| Table 1 – Wind Coverage | | | | | | |
|--------------------------------|----------------|--------------|----------------|--------------|----------------|--------------|
| | Runway | | | | | |
| | 2-20 | | 11-29 | | Both | |
| | 10.5kts | 13kts | 10.5kts | 13kts | 10.5kts | 13kts |
| All-Weather | 95.24 | 97.64 | 93.18 | N/A | 99.56 | N/A |
| VFR (good weather) | 94.79 | 97.42 | 93.25 | N/A | 99.53 | N/A |
| IFR (poor weather) | 99.38 | 99.7 | N/A | N/A | N/A | N/A |

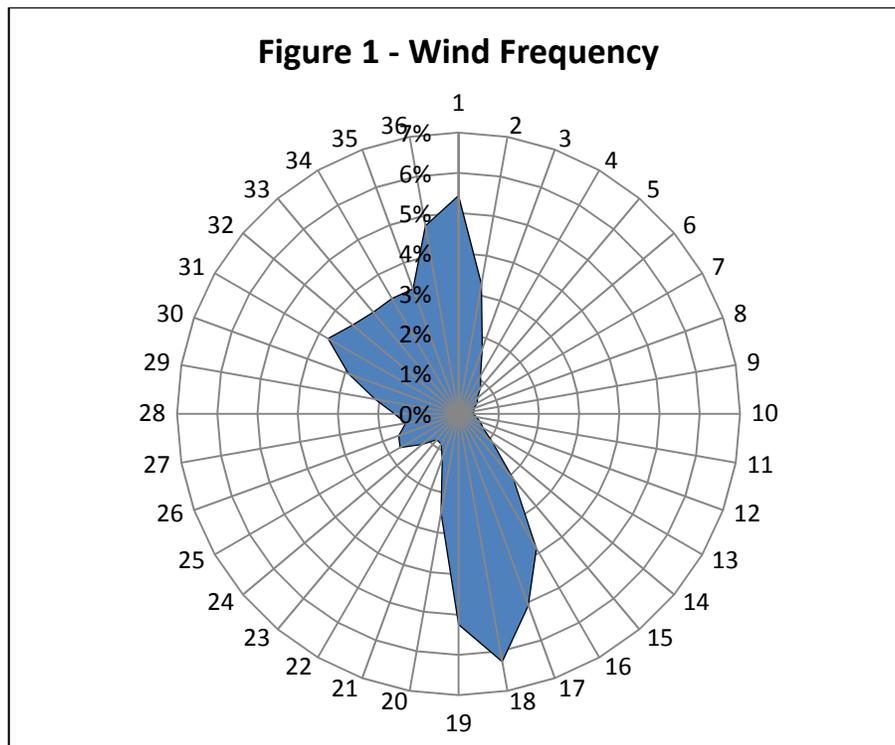
Table 1 also identifies that if Runway 11-29 were to be closed, HFD would still provide over 95 percent wind coverage with only Runway 2-20, with 95 to 99 percent coverage in all conditions for ARC B-I.

Seasonal variations were also reviewed to identify any acute differences between the winter and summer seasons in Connecticut. The month of January has an average high of 36 degrees, with the average high temperature in July of 84 degrees. Table 2 shows the wind coverage based on the season. As is typical, average wind speed is greater in winter, which reduces the wind coverage of the single-runway coverage. However, training and recreational activity by light aircraft is also reduced

in winter due to weather conditions. The seasonal evaluation identifies that in January, the 10.5 knot coverage for Runway 2-20 is 94 percent, slightly below the desired level, but can still be considered reasonable.

| Table 2 - Seasonal Wind Coverage | | | | | | |
|---|----------------|--------------|----------------|--------------|----------------|--------------|
| | Runway | | | | | |
| | 2-20 | | 11-29 | | Both | |
| | 10.5kts | 13kts | 10.5kts | 13kts | 10.5kts | 13kts |
| January All-Weather | 93.9 | 96.83 | 92.36 | N/A | 99.13 | N/A |
| January IFR | 98.97 | 99.62 | N/A | N/A | N/A | N/A |
| July All-Weather | 98.51 | 99.36 | 95.11 | N/A | 99.91 | N/A |
| July IFR | 99.66 | 99.86 | N/A | N/A | N/A | N/A |

Figure 1 displays the frequency of the wind based on direction. This graph displays the strong dominance of both north and south winds by percentage at HFD, with winds from the northwest as a distant third in frequency.



In summary, the wind data analysis determined that if Runway 11-29 were closed, HFD would be able to operate safely from a wind coverage standpoint (i.e., Runway 2-20 provides 95% all weather wind coverage with a 10.5 knot crosswind component)

Runway Use

Table 3 displays the expected runway usage based exclusively on the recorded wind data, and demonstrates that Runway 11-29 would be used 25 percent of the time. However, several other

factors affect the runway end of use, mainly runway length. Most twin-engine and corporate aircraft cannot land on Runway 11-29 due to the reasons discussed in the Airport Master Plan (Section 3.4.2 - Runway Length) and discussed below. Runway 11-29 is only 2,314 feet long. Although, light aircraft can often operate from this length, there is little margin for error.

Insurance underwriters for corporate jets typically prefer a 5,000 foot or greater runway length for safety purposes, and a runway of this length allows aircraft owners to avoid higher premiums or reduced coverage. Aircraft operating under the Federal Aviation Regulations (FAR) Part 135 are more commonly known as charter operations. They are flights that are conducted by a hired pilot, typically for business purposes. Charter operations represent a large share of the activity at HFD. These operators have additional runway length requirements for safety reasons. For example, every corporate jet aircraft has a certain runway length requirement for takeoff, which varies based on the passenger and fuel load and meteorological conditions (i.e. takeoff run distance). When operating under Part 135, the runway must also be long enough for the aircraft to accelerate to takeoff speed, decelerate, and stop prior to the end of the runway (i.e. accelerate to stop distance). This required length is always longer than the takeoff run length.

Furthermore, the Clark Dike and trees currently obstruct the landing approach; making the use of the short runway more challenging.

| Table 3 – Estimated Runway Use Based on Recorded Historical Wind Data | | |
|---|-------------------|-----|
| Runway End | Percentage | |
| 2 | 27% | 55% |
| 20 | 28% | |
| 11 | 5% | 25% |
| 29 | 20% | |
| Calm | 20% | |
| Total | 100% | |
| Please note that these percentages are not based on actual use of the runway, only estimates based on the recorded wind data. | | |

During calm winds, an aircraft can safely land in any direction. During these conditions, pilots review other factors beyond runway length to determine the ideal landing, such as the displaced thresholds, potential obstructions to the runway, the amount of fuel onboard, and runway conditions. Another consideration is the location of the aircraft’s amenities; if an aircraft is parking on the north side of the airport, they will not want to land on Runway 29 and taxi the longer distance when they could land on Runway 2 and exit the runway near their hangar or destination on the Airport. On a daily basis, this reduction in taxiing can result in savings for an aircraft owner on fuel expenditures.

Table 4 displays the runway usage that typically occurs at HFD on an annual basis based on historical activity. Table 3 shows that 20 percent of wind observations are considered calm. As Runway 2 is designated as the calm wind runway, operations during those conditions utilize Runway 2. Table 4 shows that Runway 2-20 is utilized 98 percent of the time. Thus, Runway 11-29 can be expected to be used only up to two percent of the time.

| Table 4 – Observed Runway Use | |
|--------------------------------------|-------------------|
| Runway | Percentage |
| 2- 20 | 98% |
| 11- 29 | 2% |
| Total | 100% |

Based on the wind coverage discussed previously, if Runway 11-29 were to close, the majority of the operations are that currently estimated to use Runway 11-29 could safely use Runway 2-20. Runway 2-20's width of 150 feet is an added advantage as it will allow for a greater margin of error for pilots of light aircraft during high wind conditions.

Airfield Capacity

This section reviews the airfield capacity of HFD, evaluates any capacity surpluses or deficiencies, and identifies airfield improvements that may be required during the 20-year planning period. Airfield capacity is defined as the maximum rate that aircraft can arrive at, or depart from, an airfield with an acceptable level of delay. It is a measure of the number of operations that can be accommodated at an airport during a given time period, which is determined based on the available airfield system (runways, taxiways, nav aids, etc.) and airport activity characteristics.

The current procedure employed by the FAA to evaluate airfield capacity is described in Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*.

- **Annual Service Volume (ASV)** – A reasonable estimate of the airport's annual maximum capacity, accounting for annual changes in weather, runway use, aircraft fleet mix, and other conditions.
- **Hourly Airfield Capacity** – The maximum number of aircraft operations that can take place on the runway system in one hour. As airport activity occurs in certain peaks throughout the day, accommodating the peak hour activity is most critical.

For airports that have multiple runways, multiple operating procedures can be used (e.g., landing on one runway with departures on another). The AC provides tables of estimated capacity based on specific airport characteristics. For HFD, three capacity scenarios were evaluated:

- Current Airfield Configuration
- Elimination of Runway 11-29
- Elimination of Runway 11-29 and Taxiway J

The following characteristics and assumptions were applied to all three scenarios:

- Operations of aircraft over 12,500 pounds are set at seven percent¹ throughout the forecast

¹ This assumption is based on a review of the forecast data completed as part of airport master plan (Chapter 2).

- period
- No aircraft over 300,000 pounds
 - No scheduled commercial service
 - No airspace limitations
 - Landings generally equal takeoffs during peak periods
 - There are full-length parallel taxiways and ample exit taxiways for each runway
 - No precision approaches (ILS) are in place
 - The turf runway is not used in the estimation of runway capacity

Annual Service Volume (ASV)

Table 5 displays the ASV for the three scenarios based on the assumptions described above: ASV is 230,000 flights per year under each scenario. As only one runway can be in operation at a time, the elimination of Runway 11-29 will not affect the ASV of HFD. As Taxiway J is a dual-parallel taxiway, its elimination will not affect the ASV of HFD.

The current airfield configuration currently provides ample capacity to accommodate existing and future operations of 80,000 and 85,600 flights per year, respectively. HFD would still be below 60% of the ASV if the 127,000 annual operations in the potential growth scenario in the airport master plan were to occur; thus, annual capacity is not an issue.

| Table 5 – Annual Service Volume | | | | |
|---|---------------|------------|--------------------------|------------|
| Scenario | 2010 | | 2030 | |
| | Demand | ASV | Forecasted Demand | ASV |
| Current Airfield Configuration | 80,000 | 230,000 | 85,600 | 230,000 |
| Elimination of Runway 11-29 | | 230,000 | | 230,000 |
| Elimination of Runway 11-29 and Taxiway J | | 230,000 | | 230,000 |

Hourly Capacity

Table 6 displays the estimated VFR and IFR hourly capacities of HFD based on the assumptions described above. VFR capacity is estimated at 98 flights per hour and IFR capacity is estimated at 59 flights per hour for both 2010 and 2030. As only one runway can be in operation at a time, the elimination of Runway 11-29 will not affect the hourly capacity of HFD. As Taxiway J is a dual-parallel taxiway, its elimination will not affect the hourly capacity of HFD.

The current airfield configuration currently provides ample capacity to accommodate existing and future operations with peak hour operations of 37 and 39 flights per hour respectively.

| Table 6 – Hourly Capacity | | | | | | |
|----------------------------------|------------------|------------|------------|------------------|------------|------------|
| Scenario | 2010 | | | 2030 | | |
| | Peak Hour | VFR | IFR | Peak Hour | VFR | IFR |
| | | | | | | |

| | Operations | Capacity | Capacity | Operations | Capacity | Capacity |
|---|------------|----------|----------|------------|----------|----------|
| Current Airfield Configuration | 37 | 98 | 59 | 39 | 98 | 59 |
| Elimination of Runway 11-29 | | 98 | 59 | | 98 | 59 |
| Elimination of Runway 11-29 and Taxiway J | | 98 | 59 | | 98 | 59 |

Benefits of Closure

While Runway 11-29 does provide a benefit to users, there is also a benefit to closing the runway related to the Metropolitan District Commission (MDC) adjacent waste water processing facility. The MDC has managed the region’s water and sewer systems since 1929. One of their largest waste water processing facilities is located adjacent to the airport along the southern border. The MDC is moving forward with a one billion dollar investment to improve the area’s water quality and protect health and safety of the local community during high water events such as storms. This project will expand the capacity and capabilities of the facility, including upgrading to more modern technologies. Figure 2 shows a concept to reuse approximately 10 acres of the Runway 11-29 property for MDC facilities. It is recommended that as part of the acquisition, a deed restriction and avigation easement be placed on the property being sold to MDC to ensure all FAA design standards, including Part 77 Imaginary Surfaces, are adhered to indefinitely. This would ensure that the MDC would not be allowed to construct any facilities that would interfere with the airport operations.

In exchange, the airport would gain a similar amount of property for Runway 2-20 safety improvements. The main benefit is the ability to provide standard Runway Safety Areas (RSA) and Object Free Areas (ROFA) to Runway 2-20. Table 7 displays the Federal Aviation Administration (FAA) design standards for Runway 2-20, and the existing deficiency for that standard.

- **Runway Safety Area (RSA)** – A defined surface surrounding a runway prepared for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. This area must also support snow removal, aircraft rescue, and firefighting equipment. The RSA should be free of objects, except for objects that must be located in the area because of their function.
- **Runway Object Free Area (ROFA)** – A ground area surrounding runways that should be clear of objects (e.g., roads, buildings, etc.), except for objects that need to be within the area due to their function.

| |
|---|
| Table 7 – ARC Airfield Design Standards for Runway 2-20 (ARC B-II) |
|---|

| <i>Airfield Facility</i> | Existing | <i>Requirement</i> | Deficit |
|--|-----------------|--------------------|----------------|
| Runway Safety Area (RSA): Length (beyond Runway 2) Width | 93' 150' | 300' 150' | 207' None |
| Object Free Area (OFA): Length (beyond Runway 2) Width | 93' 329' | 300' 500' | 207' 171' |

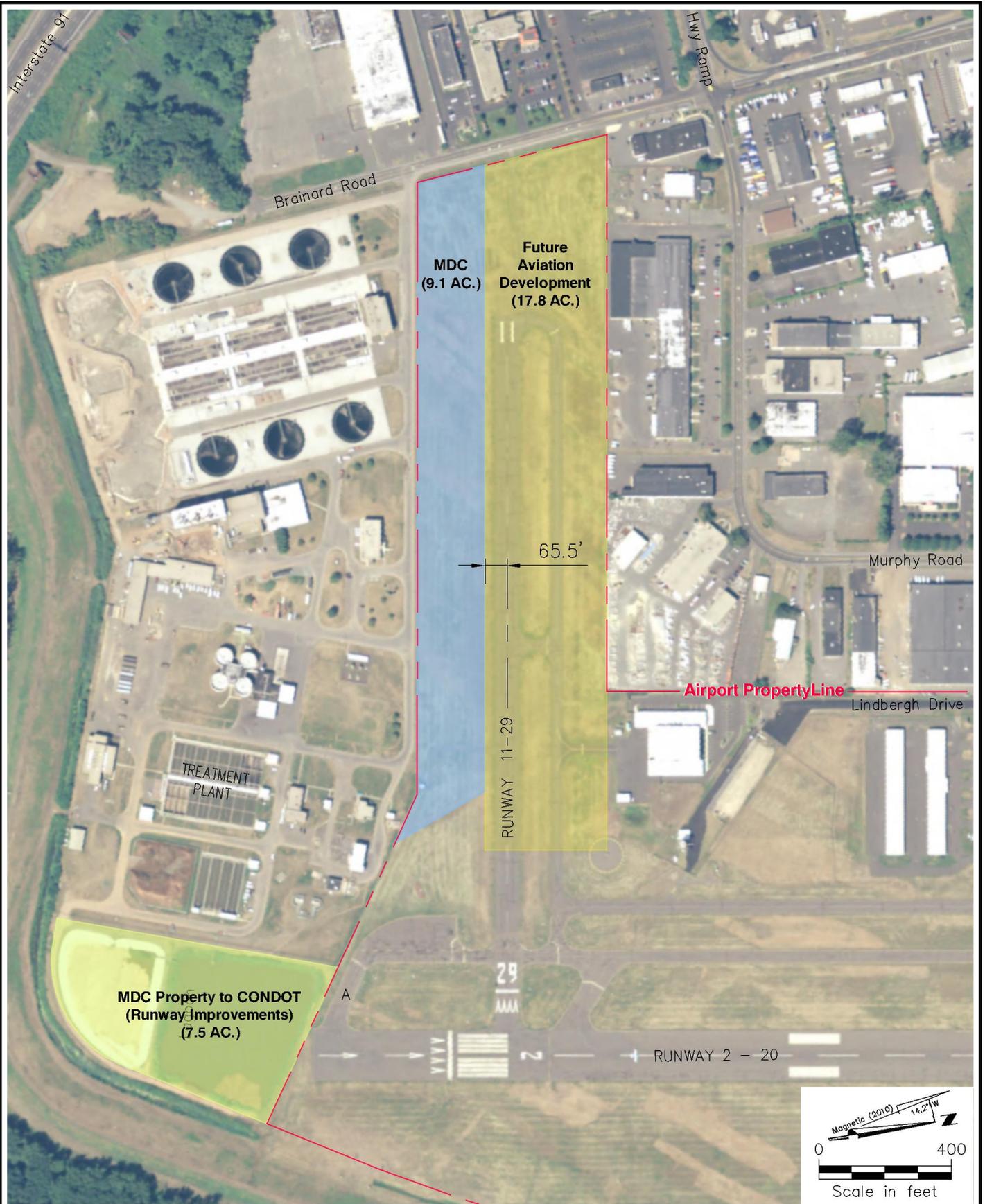
As shown in Figures 3 and 4, two sewage treatment lagoons owned by the MDC are located beyond the Runway 2 end, approximately 20 feet below the runway elevation, which create a non-standard RSA and OFA. By allowing the MDC to utilize a portion of the Runway 11-29 property for their operations, they are willing to deed the State of Connecticut the property where the lagoons are located. This property would then be used for improved RSA and OFA for Runway 2-20. Any necessary environmental remediation of the lagoons will need to be completed prior to the transfer of the property to the State.

If the property containing the lagoons cannot be acquired by the CTDOT to provide a standard OFA and RSA on the southern end of the Runway, the runway would have to be physically shortened or declared distances implemented until the standards could be met. Table 8 displays the impact to Runway 2-20 if declared distances were implemented. Specifically, the lagoons will reduce the Accelerate-Stop Distance Available (ASDA) and Landing Distance Available (LDA) for Runway 20 by 300 feet, significantly affecting the ability for the runway to be utilized by corporate aircraft. As HFD serves downtown Hartford, one of its main roles is to provide a safe airport for corporate traffic. Implementing declared distances or physically shortening the runway will severely impact this role. Furthermore, regardless of runway length requirements, existence of the lagoons within the OFA and RSA is a safety concern for all aircraft and all operations at the airport.

It should be noted that the cost to maintain Runway 11-29 was not factored into this evaluation.

| Table 8 – Declared Distances (Feet) | | |
|--|-----------------|------------------|
| Item | Runway 2 | Runway 20 |
| Takeoff Run Available (TORA) | 4,417 | 4,417 |
| Takeoff Distance Available (TODA) | 4,417 | 4,417 |
| Accelerated-Stop Distance Available (ASDA) | 4,017 | 4,117 |
| Landing Distance Available (LDA) | 3,607 | 3,557 |
| Displaced Threshold | 410 | 560 |

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2139 Silas Deane Highway, Suite 212 • Rocky Hill, CT 06067-2099
Main: (860) 257-4557 • www.chacompanies.com

RUNWAY 11-29 PROPOSED LAND USE

Hartford-Brainard Airport (HFD) Master Plan Update

PROJECT NO.
21099

DATE: MAY 2012

FIGURE 2



Figure 3 – Clark Dike and MDC Lagoons

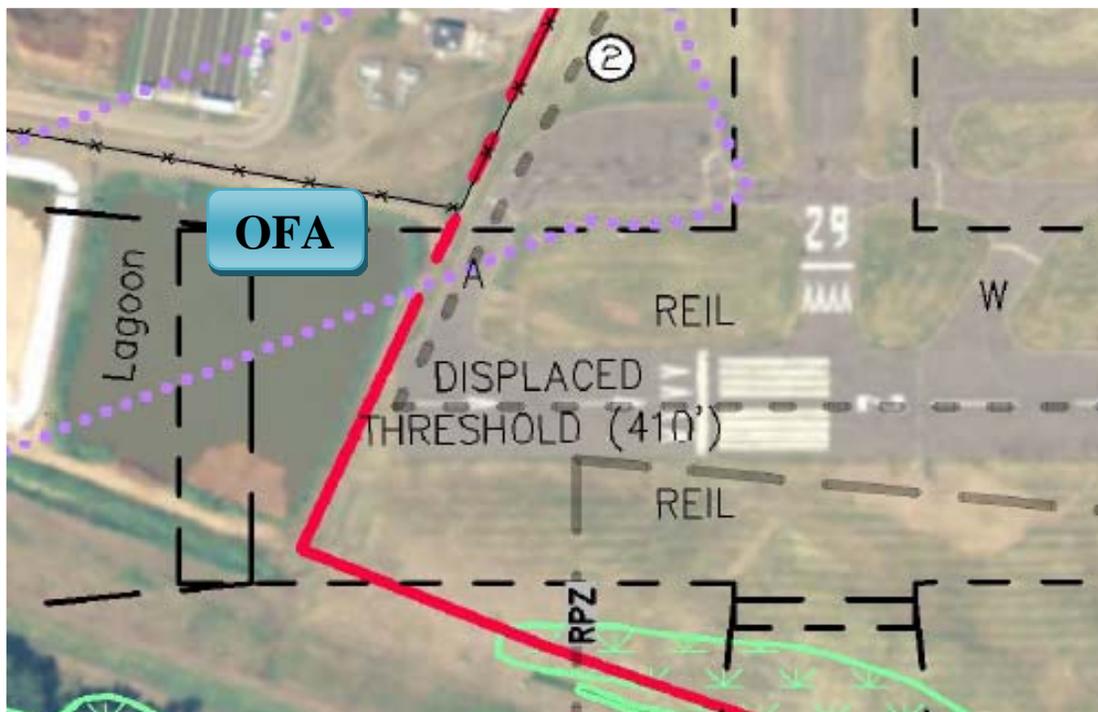


Figure 4 – Runway 2 Object Free Area

Future Use of Property

The remaining area of the former Runway 11-29 property would be reserved for future aircraft storage and associated infrastructure such as a taxiway and taxiway safety areas to access Runway 2-

20, aprons, and a vehicle access road. The access road would allow access from both Brainard Road and Lindbergh Drive to the airport.

As this property was not acquired using Federal Aviation Administration (FAA) Airport Improvement Program (AIP) funds, the CTDOT is not required to financially reimburse the FAA for the sale or transfer of this property. Additionally, the Runway 11-29 pavement is towards the end of its useful life as it was last repaved in 1997. It is anticipated that the FAA would consider the grant assurances associated with accepting an AIP rehabilitation grant satisfied for this runway. Any funds derived from the sale of the property to MDC would be utilized solely at HFD for future airport projects.

Facility Relocation

There are currently no facilities that will need to be relocated if Runway 11-29 is closed. There are no navigational aids or aircraft storage associated with this runway. Runway and taxiway lighting and signage will need to be removed.

Suggested Alternatives

Based on comments and meetings, a series of alternatives to closing Runway 11-29 were suggested:

- **MDC acquire other properties located west of Brainard Road** – The property adjacent to the existing plant that has not already been purchased by MDC is designated as wetlands. It is highly unlikely the Connecticut Department of Energy and Environmental Protection (DEEP) would allow the MDC to construct any facility on this property.
- **Switch the runway and parallel taxiway** – As Taxiway B is only 30 feet wide and the FAA requirement for a runway for light aircraft is 60 feet, the taxiway would need to be widened and Runway 11-29 shifted and narrowed. This extensive cost is highly unlikely to be funded by the FAA as HFD would meet FAA standards with only Runway 2-20 in operation.
- **Shift Runway 11-29 100' to the North with no parallel taxiway** – This would require pilots to back taxi along the runway for takeoffs, which the FAA does not support. The FAA has made an effort in recent years to ensure all runways have parallel taxiways to remove the necessity of back taxiing. Additionally, the extensive cost is highly unlikely to be funded by the FAA as HFD would meet FAA standards with only Runway 2-20 in operation.
- **Shorten Runway 11-29 and give property along Brainard Road to MDC** – MDC would not be allowed to construct any facility within the RPZ of Runway 11-29 even if the runway was shorten per FAA design standards.
- **Allow MDC to utilize Turf Runway property** – There is very limited vehicle access along the Clark Dike to reach the turf runway. Any vehicle would need to pass through the Runway 2-20 ROFA, which would negatively impact any operations on Runway 2-20.

Summary

While there are some airport stakeholders that oppose the closure of Runway 11-29, it is anticipated that the closure of Runway 11-29 would not adversely impact overall operations at HFD. Runway 2-

20 is considered adequate to supply the current and future demand of HFD. Although, the closure would impact light aircraft activity during certain wind conditions (strong westerly winds), the closure could have a net safety benefit by allow for improvements to the Runway 2-20 Safety Area and Object Free Area.