Burlington International Airport

Airport Master Plan Update

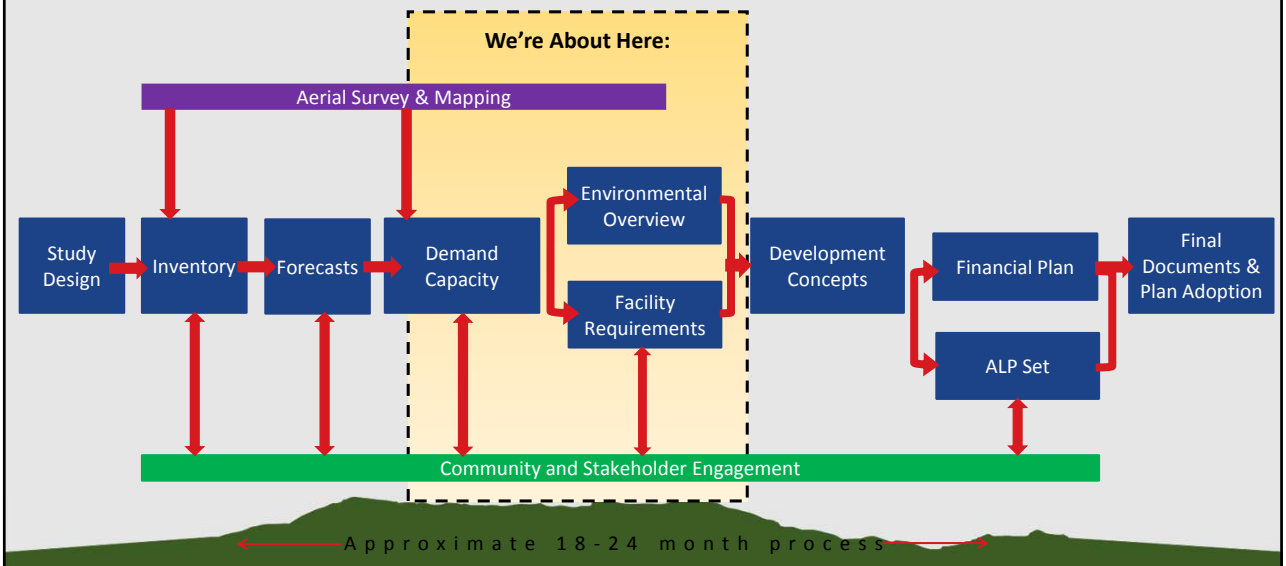
Technical and Regional Advisory Committee Meeting # 3

March 26, 2019

AGENDA

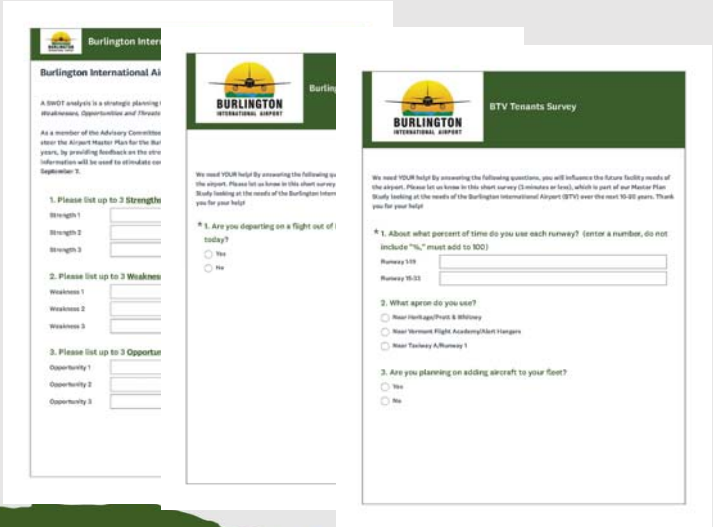
- Introductions
- Status of the Master Plan Update
- Passenger/Tenant Experience
- Forecast Summary
- Demand/Capacity Summary
- Facility Summary
- Sustainability Summary
- Next Steps

STATUS OF AIRPORT MASTER PLAN



Passenger/Tenant Experience

- TAC/RAC Input
- Passenger Experience
- Tenant Experience



FORECAST SUMMARY

AERONAUTICAL FORECASTS

- Enplaned Passengers
  - 5-, 10- and 20-year forecast
  - Load Factors
- Air Carrier Activity:
  - Operations
  - Fleet Mix
- Air Cargo Activity
  - Volume
  - Operations
- General Aviation Activity
  - Based Aircraft
  - Operations
- Military Aviation Activity
  - Based Aircraft
  - Operations
- Peak Activity
  - Passengers
  - Operations

RECOMMENDED FORECAST

Year	Enplanements	Total Operations					Based Aircraft
		Air Carrier	GA	Cargo	Military	Total	
2017	591,558	21,467	37,332	1,396	8,567	**68,762**	92
2018	674,944	24,082	37,655	1,422	8,567	**71,727**	93
2023	695,171	24,480	39,449	1,563	5,954	**71,446**	97
2028	724,528	24,899	41,263	1,717	5,954	**73,832**	102
2033	755,124	25,340	43,101	1,886	5,954	**76,281**	106
2038	787,012	25,804	45,063	2,071	5,954	**78,892**	111
AAGR 2018-2038	**0.8%**	**0.3%**	**0.9%**	**1.9%**	**-1.8%**	**0.5%**	**0.9%**
Growth 2018-2038	**18.0%**	**7.1%**	**19.7%**	**45.6%**	**-30.5%**	**10.0%**	**19.7%**

DEMAND/CAPACITY SUMMARY

Demand/Capacity Summary

Airport Activity Forecast - Summary

Category	Activity	2017	Base	2023	2028	2033	2038
Commercial	Annual	21,467	24,082	24,480	24,899	25,340	25,804
GA	Annual	37,332	37,655	39,449	41,263	43,101	45,063
Military	Annual	8,567	8,567	5,954	5,954	5,954	5,954
Cargo	Annual	1,396	1,422	1,563	1,717	1,886	2,071
TOTAL Operations	Annual	68,762	71,727	71,446	73,832	76,281	78,892
	Peak Month	6,797	7,090	7,063	7,299	7,541	7,799
	Average Day	219	229	228	235	243	252
	Peak Hour	22	23	23	23	24	25

Demand/Capacity Summary

- **Hourly Capacity** – The maximum aircraft operations that can be accommodated in a one-hour period.
  - Visual Flight Rules (VFR)
  - Instrument Flight Rules (IFR)
- **Annual Service Volume (ASV)** – The maximum aircraft operations that can be accommodate in a one-year period, based on local activity .
- **Aircraft Delay** – The average number of minutes of aircraft delay and total hours of delay over a one-year period.

Demand/Capacity Summary

Factors that Affect Capacity

- Aircraft Fleet Mix Index
- Runway-Use Configuration
- Percentage of Aircraft Arrivals
- "Touch and Go" Factor
- Parallel & Exit Taxiways
- Meteorological Conditions (Percent VFR & IFR)

Factor	2017
Aircraft Fleet Mix Index	74.0
Runway-Use Configuration	Intersecting
Percentage of Aircraft Arrivals	50%
Touch and Go Factor (VFR / IFR)	1.0/1.0
Taxiway Exit Factor (VFR / IFR)	0.92 / 1.0
Meteorological Conditions (VFR / IFR)	72.3% / 27.6%

Demand/Capacity Summary

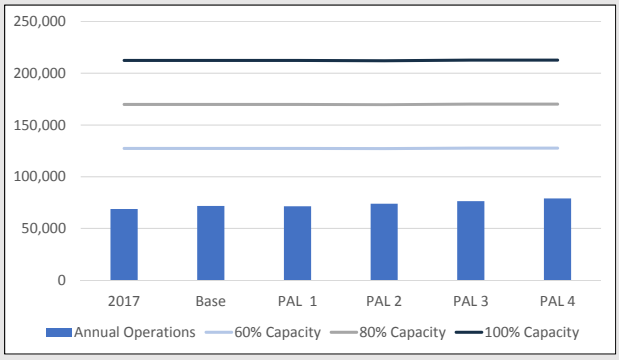
Airfield Hourly Capacity (Current Airfield Configuration)

Factors	Base VFR / IFR	10 Years VFR / IFR	20 Years VFR / IFR
Hourly Capacity Base	80.0/56.5	79.5/57.0	79.5/57.5
Touch-and-Go Factor	1.0 / 1.0	1.0 / 1.0	1.0 / 1.0
Taxiway Exit Factor	0.92 / 1.00	0.92 / 1.00	0.92 / 1.00
Calculated Hourly Capacity	73.6/56.5	73.1/57.0	73.1/57.5
Peak Hour	23	23	25

Demand/Capacity Summary

Annual Service Volume (Current Airfield Configuration)

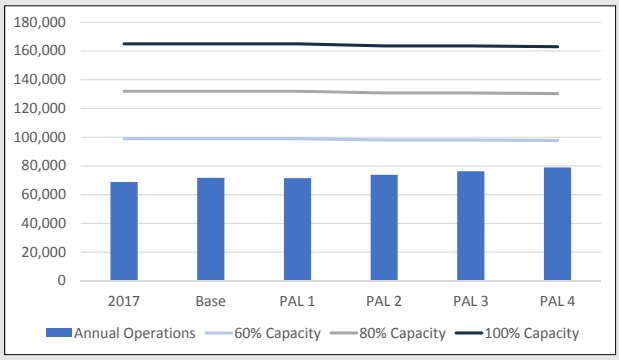
Factor	Base	10 Years	20 Years
Annual Operations	71,727	73,832	78,892
Annual Service Volume	212,345	212,073	212,691
Capacity Level	33.8%	34.8%	37.1%



Demand/Capacity Summary

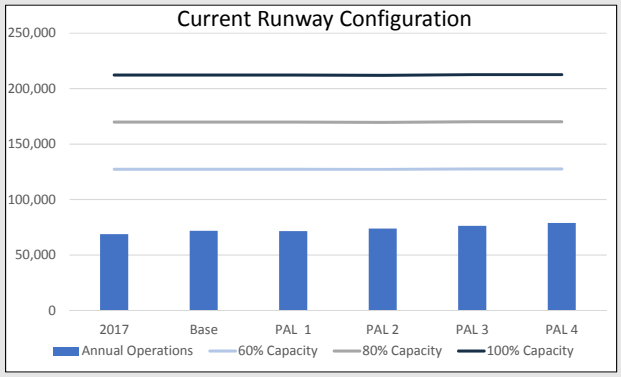
Annual Service Volume (Single Runway Configuration)

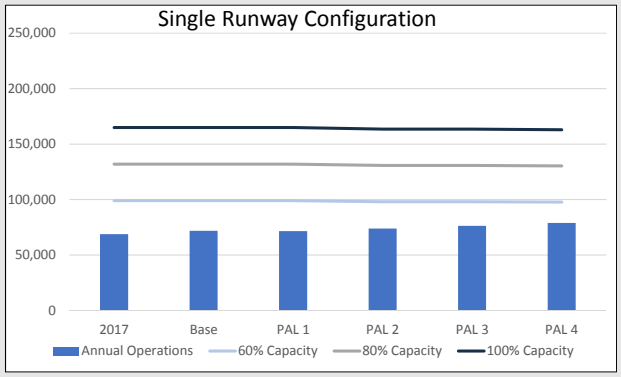
Factor	Base	10 Years	20 Years
Annual Operations	71,727	73,832	78,892
Annual Service Volume	164,943	163,499	162,937
Capacity Level	43.5%	45.2%	48.4%



Demand/Capacity Summary

Projected Demand Comparisons





AIRPORT FACILITY SUMMARY

Airport Facility Requirements

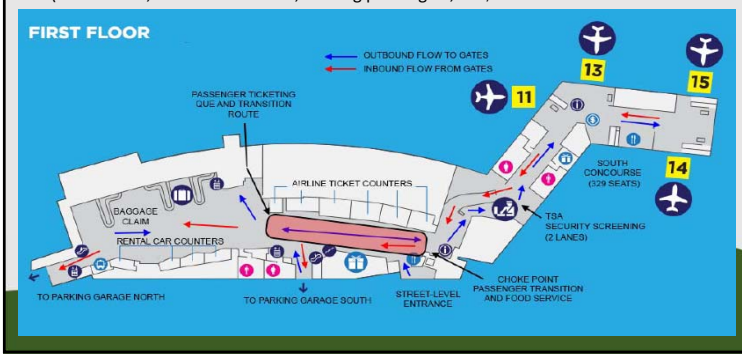
- Facility Requirements Elements:
  - Terminal, Airside, General Aviation/Support Facilities
- Derivative Forecast Scenario Considerations
  - Expanded Ultra-Low Cost Airline Service
  - New Low Cost Airline
  - Increased Canadian Demand
  - Loss of Low Cost Airline
  - Increased Upgauging (1:1)

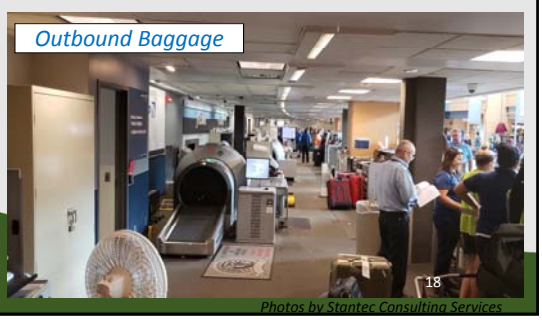
Future Facility Requirements Analysis
=
Existing Conditions + Forecast

Terminal – Ticketing & Baggage Screening

Functional Area	Existing	Baseline Forecast				Surplus (Deficit)
		Base Year	+5	+10	+20	
Check-in and Ticketing						
Check-In/Ticketing Areas	7,460	7,402/ 9,384*	7,450/ 9,445	7,348/ 9,317	7,527/ 9,544	(67)/(2,084)
Outbound Baggage Screening and Make-Up						
Baggage Screening	1,099	4,254	4,316	4,316	4,471	(3,372)
Make-up Area	5,412	4,140	4,140	4,140	4,140	1,272

*/Secondary number indicates added consideration for shared circulation among various uses (concessions, vertical circulation, arriving passengers, etc.)

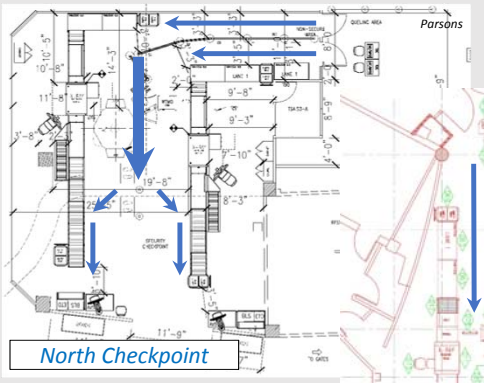




Photos by Stantec Consulting Services

Terminal - Security Checkpoint

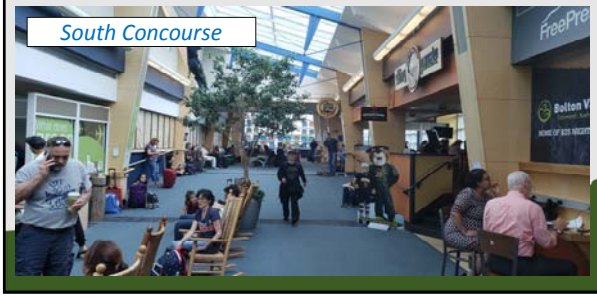
Functional Area	Existing	Baseline Forecast				Surplus (Deficit)
		Base Year	+5	+10	+20	
Passenger Screening Lanes (Including Precheck)						
North Checkpoint	2	5	5	5	5	(3)
South Checkpoint	2	3	3	3	3	(1)
Total (Existing Configuration)	4	8	8	8	8	(4)
Total Centralized Facilities	N/A	6	6	7	7	(3)
Checkpoint Area (SF)						
North Checkpoint	2,228	7,035	7,105	7,180	7,336	(5,108)
South Checkpoint	3,486	4,562	4,604	4,648	4,740	(1,254)
Total (Existing Configuration)	5,714	11,596	11,709	11,827	12,076	(6,362)
Total Centralized Configuration	N/A	9,810	9,923	10,041	10,289	(4,575)
TSA Support Space (SF)						
Total (Existing Configuration)	2,753	928	937	946	966	1,787
Total Centralized Configuration	N/A	785	794	803	823	1,930

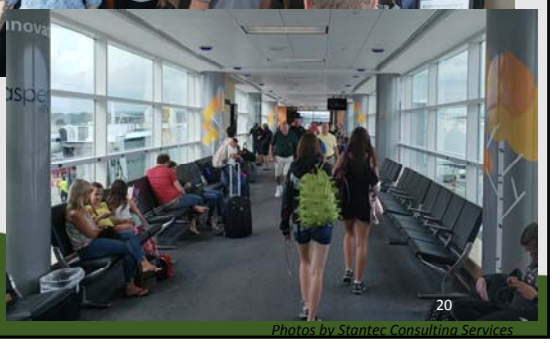


Terminal – Gates & Holdrooms

Functional Area	Existing	Baseline Forecast				Surplus (Deficit)
		Base Year	+5	+10	+20	
Passenger Gates						
Equivalent Narrowbody Gates*	10	10	10	11	11	(1)
Holdroom Space**						
North Concourse	6,124	5,553	5,670	5,794	6,052	72
South Concourse	4,174	4,418	4,487	4,820	4,947	(773)
Total	10,298	9,972	10,158	10,614	10,999	(701)

*Large Regional Position = 0.5 gate
Narrowbody Position = 1.0 gate
** Future demand based on optimal holdroom configuration

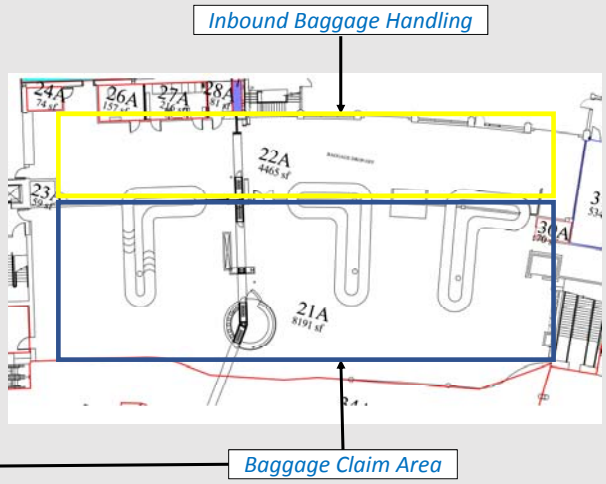




Photos by Stantec Consulting Services

Terminal - Baggage Claim

Functional Area	Existing	Baseline Forecast				Surplus (Deficit)
		Base Year	+5	+10	+20	
Baggage Claim						
Claim Linear Frontage (ft.)	249	272	284	295	321	(72)
Baggage Claim Hall Area	8,191	6,859	6,966	7,073	7,317	874
Inbound Baggage Handling Area	4,465	2,312	2,312	2,312	2,312	2,153
Total	12,656	9,171	9,278	9,385	9,629	3,027



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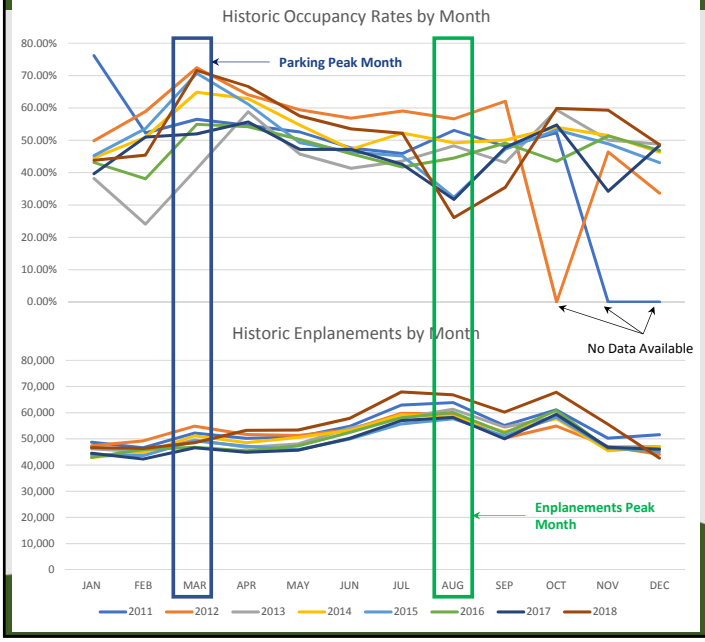
Terminal Summary – Baseline Requirements

Terminal Functional Area	Existing Terminal Area	Ultimate Requirement	Surplus (Deficit)	%
Passenger Boarding Gates	10	11	(1)	-10.7%
Terminal Curb / Drop-Off/Pick-Up	620	260	360	58.1%
Check-In / Ticketing	7,460	7,527/ 9,544	(67)/(2,084)	-0.9%/-27.9%
Outbound Baggage Screening & Makeup	1,099	8,611	(7,512)	-683.5%
Passenger Security Screening Checkpoint				
North Checkpoint	2,228	7,923	(5,695)	-255.6%
South Checkpoint	3,486	5,119	(1,633)	-46.8%
Security Total	5,714	13,042	(7,328)	-128.2%
Passenger Lounges / Holdrooms				
North Holdrooms	6,124	6,052	72	1.2%
South Holdrooms	4,174	4,947	(773)	-18.5%
Holdroom Total	10,298	10,999	(701)	-6.8%
Baggage Claim and Inbound Baggage Handling	12,656	9,629	3,027	23.9%
Concessions	9,891	14,934	(5,043)	-51.0%
Core Terminal Areas Subtotal	**47,118**	**64,743**	**(17,625)**	**-37.4%**
Other Functions/Tenants	92,482	25,648	66,834	72.3%
Total Passenger Terminal Area	**139,600**	**90,391***	**49,209***	**35.3%***

Landside – Auto Parking

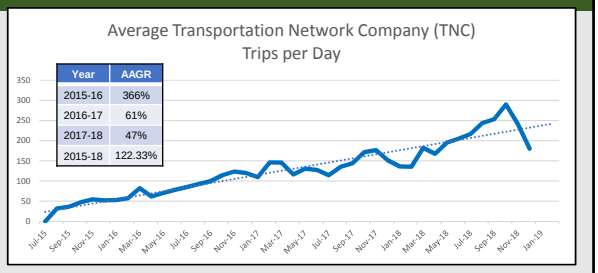


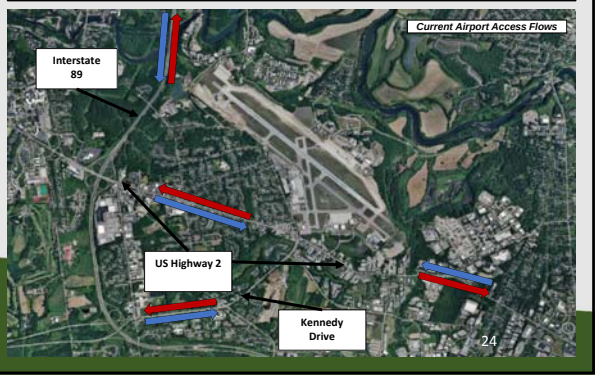
Peak Occupancy (4-day Duration)				
Forecast	2018	2023	2028	2038
Baseline	1,270	1,324	1,380	1,499
New ULCC	-	1,443	1,536	1,729
New LCC	-	1,553	1,681	1,944
Canadian	-	1,324	1,380	1,499
Loss of LCC	-	1,257	1,380	1,499
Upgauging	-	1,419	1,571	1,880

Peak Utilization Rates in Parking Garage						
Forecast	Baseline	New ULCC	New LCC	Canadian	Loss of LCC	Upgauging
2019	57%	61%	67%	57%	54%	58%
2020	58%	62%	68%	58%	55%	59%
2021	58%	63%	68%	58%	55%	61%
2022	59%	64%	69%	59%	56%	62%
2023	59%	64%	69%	59%	56%	63%
2024	60%	65%	73%	60%	60%	65%
2025	60%	66%	74%	60%	60%	66%
2026	61%	67%	74%	61%	61%	67%
2027	61%	68%	75%	61%	61%	69%
2028	62%	69%	75%	62%	62%	70%
2029	62%	69%	79%	62%	62%	72%
2030	63%	70%	79%	63%	63%	73%
2031	63%	71%	80%	63%	63%	74%
2032	64%	72%	80%	64%	64%	76%
2033	64%	73%	81%	64%	64%	77%
2034	65%	74%	85%	65%	65%	78%
2035	65%	75%	85%	65%	65%	80%
2036	66%	75%	86%	66%	66%	81%
2037	66%	76%	86%	66%	66%	83%
2038	67%	77%	87%	67%	67%	84%

Landside – Curb & Roadway

Terminal Curb Requirements (Baseline)		
Year	Length Required (LF)	Existing Length (LF)
2018	229	620
2023	230	620
2028	238	620
2028	260	620





Access Improvement Considerations

- Access Improvement Considerations
- Airport Share of Regional Traffic
- Direction of Origin (Canada and Downtown Burlington vs Points South and East)
- Airport Peak Hour vs Rush Hour
- Problems and Solutions are Off Airport, Regional Solutions Required

Airside Requirements - Runways

- Runway 15-33 – 8,319 x 150 (C/D IV)
  - Existing Length Scenario: FedEx Boeing 757 to Memphis
  - Future Length Scenario: Boeing 737/Airbus 320
    - Airbus 320 NEO 90% Range (Las Vegas/Denver): 6,500ft Hot Day, 7,475 Contaminated
  - Declared Distance Optimization
- Runway 1-19 – 4,112 x 75 (B-II)
  - Existing and Future: Embraer 110 Cargo Feeder

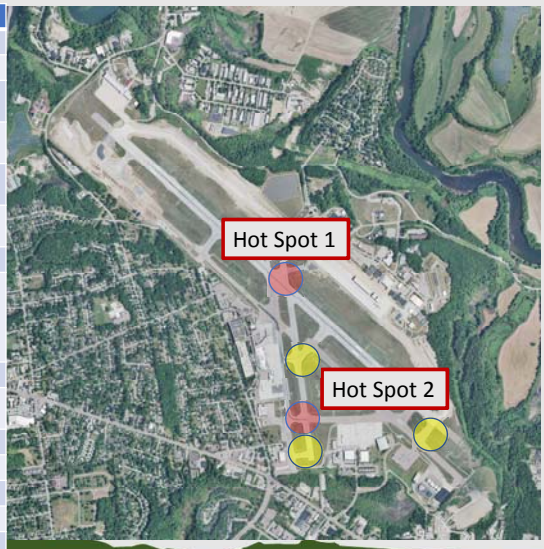
Airside Requirements - Taxiways

Name	Width	Use/Restrictions	Meets FAA Standards
Taxiway A	75’	Partial-length parallel taxiway for Runway 1-19	Yes
Taxiway B	Varies: 75’ to 130’	Connector taxiway between Taxiway A, crossing Runway 1-19 to Runway 15-33	No: Taxiway B intersects Runway 1-19 at a non-standard 42 degree angle to provide a perpendicular angle to primary Runway 15-33.
Taxiway C	Varies: 93’ to 117’	Crossover taxiway between the General Aviation (GA) parking apron and Runway 15-33, crossing Runway 1-19 and Taxiway K	Yes
Taxiway D	-	Closed to Civilian Operations	N/A
Taxiway E	-	Closed to Civilian Operations	N/A
Taxiway F	-	Closed to Civilian Operations	N/A
Taxiway G	75’	Partial-length parallel taxiway connecting Runway 15 threshold to Runway 1-19	Yes
Taxiway H	83’	Entrance/exit taxiway to Runway 15-33	Yes
Taxiway J	116’	Entrance/exit taxiway to Runway 33	Yes
Taxiway K	Varies: 75’ to 80’	Partial-length parallel taxiway to Runway 15-33 between Taxiway B and past Taxiway J to the southern-most GA parking apron	Yes
Taxiway L	75’	Entrance/exit taxiway located at Runway 1 threshold (Closed to aircraft over 60,000 pounds)	Yes
Taxiway M	89’	Seasonal entrance/exit taxiway near Runway 15 threshold	Yes
Taxiway N	-	Closed to Civilian Operations	N/A

Note: FAA Approved Modification of Standards regarding non-movement area boundary line for Taxiways A and G near the air carrier ramp.

Airside Requirements - Geometry

Geometry Requirement	Taxiway/Taxiway Int.	Runway/Taxiway Int.
Three node concept	None	Hot Spot 1
Taxiway intersection angle	None	N/A
Wide expanse of pavement	Taxiway A and G Taxiways C and K	Hot Spot 1
Runway crossings	N/A	Runway 15-33: 3 Runway 1-19: 3
High energy intersection	N/A	Runway 15-33 and Taxiway A Runway 1-19 and Taxiway B
Increase visibility	N/A	Runway 15-33 and Taxiway A Runway 1-19 and Taxiway B -42"
Dual purpose pavement	N/A	None
Direct access	N/A	Runway 33 and Taxiway J Runway 1-19 and Taxiway G Runway 15-33 and Taxiway A Runway 1-19 and Taxiway C Runway 1 and Taxiway L
Multiple taxiway crossings	Taxiways A and E	N/A
Taxiway intersecting multiple runways	N/A	Taxiway A –Hot Spot 1 Taxiway E –Hot Spot 2
Aligned taxiway	N/A	None
Y-Shaped Runway Crossing	N/A	Taxiway E –Hot Spot 1
Multiple runway thresholds in close proximity	N/A	None
Short Taxi Distance	N/A	None
Taxiway Stubs	Taxiway A	None
Unexpected Holdline	None	None
Intersection Departure	N/A	Unknown



General Aviation Requirements

GA Aircraft Storage Additional Demand Over Existing*		
Year	Conventional Hangar Space (SF)	T-Hangars/Box Units
2018	3,200	0
2023	6,400	1
2028	15,240	1
2038	25,760 (4-5 Conventional Hangars)	2

GA Aircraft Apron Requirements*			
Year	Itinerant Apron Demand (SY)	Existing FBO Ramp Space (SY)	Surplus (Deficit)
2018	11,484	5,333	(6,151)
2023	11,880	5,333	(6,547)
2028	11,880	5,333	(6,547)
2038	12,672	5,333	(7,339)

*Not including Military demand or facilities or aircraft on wait lists


Photo via Heritage Aviation, Google


Photo via Heritage Aviation, Google

Support Facility Requirements

- Fuel Storage
  - Existing: 4-25,000 gallon Jet-A tanks and 1-12,000 gallon 100LL tank
  - Jet-A Fuel Usage (5-Year Average)
    - Average Month/Average Day: 21,518 gallons
    - Peak Month/Average Day: 26,310 gallons
    - Planning Recommends Maintaining 3-Day Supply
    - Consider Inverse Relationship Between Growth & Increased Fuel Efficiency
  - **Recommendation: Consider adding an additional Jet-A fuel tank**
- ARFF
  - Vermont Air National Guard (VTANG) provides ARFF – Index B
  - **Recommendation: None**
- SRE/Airfield Maintenance
  - Equipment stored in 3 locations totaling 46,505 SF
  - **Recommendation: Consolidate Facilities Away from GA/Cargo Areas – Full Consolidated Facility?**

Vermont Business Magazine via Google

SUSTAINABILITY SUMMARY

Sustainability Focus Areas

Five Sustainability Categories:

- Energy & Greenhouse Gas Emissions
- Waste Management
- Ground Transportation
- Water Resources
- Passenger Experience

Guided by the City of Burlington's 2030 vision, as laid out in its *Legacy Action Plan*, BTV strives to make a positive contribution in shaping the region's economic, environmental, and social vitality.

Energy & Greenhouse Gas Emissions

↓ 12.4%

Reduction in utility-sourced electricity consumption between 2013 and 2017

1,183,000 kWh per year

Avoided annual electricity use as a result of recent energy-efficiency upgrades at BTV

$147,750 in annual savings

Cost savings from the approximately 1.2 million kWh saved per year

BTV actively seeks to reduce its energy consumption, even as operations at the Airport expand, and it continues to demonstrate leadership in sustainable energy performance.

Pedestrian Bridge from the Parking Garage at BTV

Energy & Greenhouse Gas Emissions

Renewable energy systems at BTV:

- 500-kW roof-mounted PV (BTV Parking Garage)
- 100-kW small wind turbine (Heritage Aviation)
- 24-kW roof-mounted PV (Heritage Aviation)
- 1.5-MW ground-mounted and roof-mounted PV (Vermont ANG)

Utility-scale solar array on the BTV parking garage

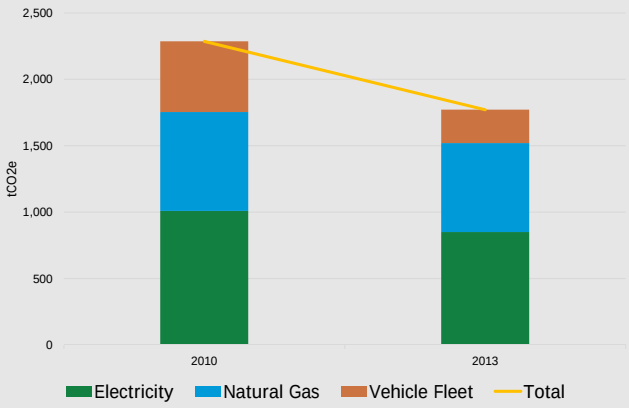
Wind turbine at Heritage Aviation

Energy & Greenhouse Gas Emissions

↓ 23%

Reduction in GHG emissions between 2010 and 2013

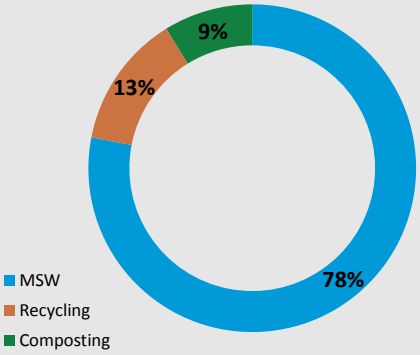
Greenhouse gas emissions derive from electricity consumption, natural gas consumption, and vehicle fleet fuel consumption.



Waste Management

22%

The Airport's diversion rate in 2017

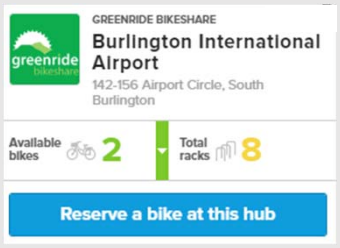


Highlights of Waste Management Practices:

- Instituted an office paper recycling program
- Co-located trash and recycling bins, with pictured-based signage, to encourage passengers to sort their waste properly
- Installed water bottle filling stations
- The Airport's waste contractor regularly works with the Airport and its tenants to reduce waste and increase the use of products that can be recycled, as well as provides training

Ground Transportation

Increasing the accessibility of sustainable transportation modes such as public transit, ride-sharing, and electric vehicles supports BTV's greenhouse gas emissions reduction efforts, while also improving local and regional air quality.



BTV is a sponsor of Greenride Bikeshare; a station, along with an e-bike terminal, are outside the Terminal

BTV provides free Green Mountain Transit Bus passes to all of its direct employees

There are 15 electric vehicle charging stations, including Tesla Superchargers, in the parking garage

Water Resources

22 Million gallons

Estimated amount of stormwater treated annually, through a new underground treatment system, to prevent contaminants from discharging into the Winooski River.

8,000 square feet

Size of the rooftop garden installed on top of the Airport's parking garage in 2011. In addition to providing a place for visitors to relax, this design feature also helps reduce and filter stormwater runoff.

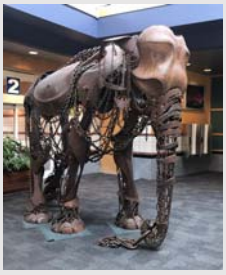
In 2010, BTV won an Engineering Excellence Award from the American Council of Engineering Companies/Vermont Section for its runoff treatment system.

Passenger Experience

674,944 passengers

Number of passengers that departed from BTV in calendar year 2018

BTV's Wellness Committee supports a healthier Airport visit with walking trails inside and outside the terminal. This Committee is always looking for ideas on how to make traveling with BTV less stressful.



Educational exhibits and art installations by local artists can be found throughout the Airport.

BTV has a yoga studio as part of its passenger amenities

Visitors can take in the views from the Airport's Observation Tower

Regional Coordination

BTV has demonstrated a commitment to working with local and regional entities to advance common sustainability goals and initiatives, and as a large facility, has leverage to demonstrate leadership.

Local and Regional Sustainability Goals:

- Deriving 90 percent of the state's energy needs from renewable energy sources by 2050 (*Vermont Comprehensive Energy Plan)*
- Reducing greenhouse gas emissions in the state by 50 percent by 2028 and 75 percent by 2050 (10. V.S.A. §578)
- Reducing solid waste sent to landfills (Burlington's *Climate Action Plan*) and achieving a zero waste future (*Vermont Materials Management Plan*)
- Improving multi-modal transportation to/from and around the Airport (*ECOS Plan*)
- Educating residents of Chittenden County on ways to reduce stormwater pollution (Regional Stormwater Education Program)

ecos
A SUSTAINABLE FUTURE FOR CHITTENDEN COUNTY

Regional Value Assessment

$1.04 Billion

Overall value of the Airport to the region

BTV's economic impact includes the asset value of the airport and the economic impact that extends beyond the boundary of the airport.

4,935

Total jobs generated from the Airport

$170,427,100

Total payroll generated from the Airport

$ 34,527,500

Total State & Local Taxes

$562,000,000

Current asset value of the Airport

$481,464,900

Total economic output

Full regional value assessment to be available soon.

NEXT STEPS

- Working Paper – Inventory through Facilities
- Public Informational Workshop #1
- Prepare Development Concepts
- Prepare Environmental Overview

QUESTIONS/COMMENTS

Any questions or comments regarding the Airport Master Plan or any of the information discussed today?

Available for contact anytime:

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