COMPARATIVE REPORT *of*

RUNWAY APPROACH LIGHTING SYSTEMS

for **BBTCA**

In North American, and around the world, there are long-established best practices safety standards for jet airports. This report compares airports on one critical and essential requirement: precision approach lighting systems. Any expansion at Toronto Island's Billy Bishop Airport (CYTZ) to accommodate jet aircraft must implement approach lighting to meet current safety standards. This report examines various Canadian and international airports to see how they use precision approach lighting systems. These lighting systems provide the basic means to transition from instrument flight to visual flight for landing. This is a safety measure for which Transport Canada has very specific requirements.

Given that Billy Bishop's runways 08 and 26 are marine based, we look at the implications by examining other marine based runways.

Billy Bishop Airport is full of safety exemptions in its current configuration even for a **Code 2** runways. With expanded runways and allowing jets to fly from there, it will need to be certified as a **Code 3**. The questions that Transport Canada needs to answer are:

Will Billy Bishop be required to install a precision approach lighting system as other Canadian and international airports have?

If not, what is the safety rationale for exempting this airport and not others?

In the words of the Flight Safety Foundation "The transition from instrument references to external visual references is an important element of any type of instrument approach." [1]

[1] http://www.skybrary.aero/bookshelf/books/814.pdf

The next two pages are excerpts from Transport Canada document TP 312e - *Aerodromes Standards and Recommended Practices (4th Edition March 1993 - revised 03/2005)*, Chapter 5 Visual Aids for Navigation, which discusses lighting systems for airports. The section quoted below is for precision approach runways. Pressures on the airport to be fully functional under most conditions, and the fact that the runway is short for jets, means that the demand for upgraded lighting systems to support the runway will be high. Currently, BBTCA's marine nature impacts airport operations frequently, and a full lighting system would be need to improve operational efficiency and **safety** at the facility.

After the excerpts from TP-312e there are images of lighting systems at marine airports from around the world, some of which are marine examples and some our from airports with characteristics similar to BBTCA.

Download the entire TP312e document at:
http://www.tc.gc.ca/eng/civilaviation/publications/tp312-menu-4765.htm

PRECISION APPROACH CATEGORY I

Description and location

* **5.3.5.1 Standard.** — Where physically practicable, a precision approach category I lighting system as specified in 5.3.5.14 to 5.3.5.26 shall be provided to serve a precision approach runway category I. (*From Transport Canada TP312e*)

5.3.5.14 Standard. — A precision approach category I lighting system shall be installed on the extended centre line of the runway extending over a distance of 720...

5.3.5.30 Standard. — The system light centres shall lie as nearly as practicable in the horizontal plane passing through the threshold, provided that:

a) no lights shall be screened from an approaching aeroplane; and

b) as far as possible, no object shall protrude through the plane of the approach lights within a distance of 60 m from the centre line of the system. Where this is unavoidable, as in the case of a single isolated object protruding through the plane of the lights, the object shall be treated as an obstacle and marked and lighted accordingly .

5.3.5.31 Standard. — Any transportation corridor passing through the approach light area shall be considered as an object. As a minimum, 4.3 m shall be allowed above the crown of a road and for a railway, 6 m above the top of the rails. The height to be allowed above a waterway, river, canal, etc. shall be established by Aeronautical Study.
(*From Transport Canada TP312e*)

* Please Note: Installing such a system is phisically practicable (space in the water is available)

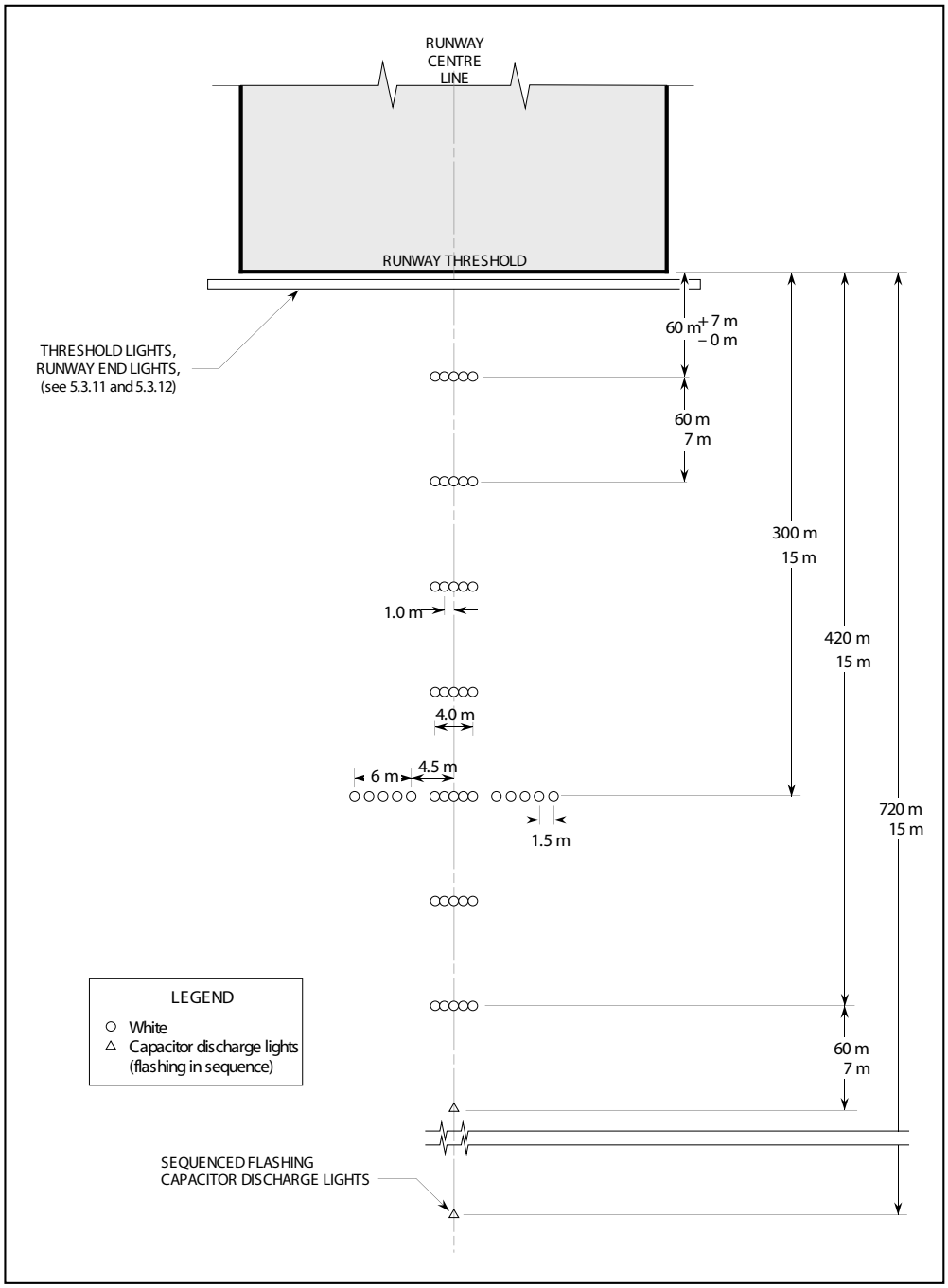


Figure 5-10. Precision Approach Category I lighting system

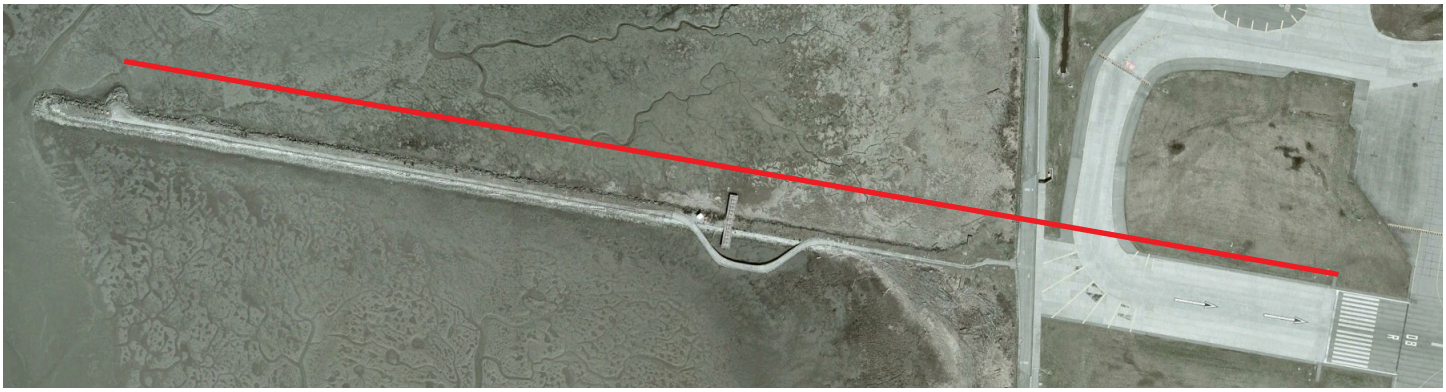
Canadian Airports & Approach Lighting Systems Used

AIRPORT	RUNWAY #	LENGTH OF LIGHTING (m)	RUNWAY LENGTH (m)	AT WATER
Toronto CYYZ	05	720	3,389	
	23	720	3,389	
	15 R	720	2,590	
	33 L	730	2,590	
	15 L	720	3,368	
	33 R	800	3,368	
	06 L	900	2,896	
	24 R	730	2,896	
	06 R	780	2,740	
	24 L	730	2,740	
Vancouver CYVR	08 L	720	3,030	Yes
	26 R	720	3,030	
	08 R	1,065	3,505	Yes
	26 L	730	3,505	
Montreal CYUL	06 L	730	3,353	
	24 R	730	3,353	
	06 R	730	2,926	
	24 L	730	2,926	
	10	730	2,134	
	28	?	2,134	
Calgary CYYC	28	720	2,235	
	10	450	2,235	
	34	730	3,367	
	16	720	3,367	
Edmonton CYEG	30	720	3,109	
	12	730	3,109	
	02	730	3,353	
	20	435	3,353	
Ottawa CYOW	25	450	2,438	
	07	730	2,438	
	32	730	3,050	
	14	about 590	3,050	
Halifax CYHZ	05	450	3,200	
	23	450	3,200	
	14	720	2,347	
	32	450	2,347	
Winnipeg CYWG	36	720	3,353	
	18	700	3,353	
	31	700	2,652	
	13	720	2,652	
Billy Bishop CYTZ	**08**	**-**	**1,216**	**Yes**
	26	**-**	**1,216**	**Yes**

Please Note: Billy Bishop is the only airport on the list that lacks an approach lighting system.

Vancouver CYVR - Runway 08 L & 08 R

Runway 08 L / 26 R - 3,030 meters in length.
08 L has an approach lighting structure out into the water to a distance of 720 meters from the threshold.
26 R has land based approach lighting at 720 meters from the threshold.



Runway 08 R / 26 L - 3,505 meters in length.
08 R has an approach lighting structure out into the water to a distance of 1,065 meters from the threshold.
26 L has land based approach lighting at 730 meters from the threshold.

Marine Based Airports & Approach Lighting Systems Used

AIRPORT	RUNWAY #	LENGTH OF LIGHTING (m)	RUNWAY LENGTH (m)	AT WATER
Vancouver CYVR	08 L	720	3,030	Yes
	08 R	1,065	3,505	Yes
San Francisco KSFO	19 L	340	2,635	Yes
	28 L	1,065	3,469	Yes
	28 R	1,000	3,618	Yes
Oakland KOAK	29	985	3,206	Yes
La Guardia KLGA	22	1,000	2,134	Yes
	13	915	2,135	Yes
New York KJFK	04 R	800	2,560	Yes
				Yes
Washington KDCA	01	820	2,094	Yes
Boston KBOS	4 R	715	3,050	Yes
	33 L	730	3,073	Yes
New Orleans KNEW	18 R	730	2,097	Yes
Liverpool LPL	09	915	2,285	Yes
Kobe, Japan	09	900	2,500	Yes
	27	900	2,500	Yes
Kansai RJBB	06 L	900	4,000	Yes
	24 R	900	4,000	Yes
	06 R	900	3,500	Yes
	24 L	900	3,500	Yes
Haneda RJTT	23	880	2,500	Yes
	22	915	2,500	Yes
	34 L	900	3,000	Yes
	34 R	900	3,000	Yes
Bali DPS	27	900	3,000	Yes
Kingston, Jamaika	12	420	2,716	Yes
Hong Kong VHHH	07 R	900	3,800	Yes
	25 L	900	3,800	Yes
	07 L	900	3,800	Yes
	25 R	900	3,800	Yes
Billy Bishop CYTZ	08	-	1,216	Yes
	26	-	1,216	Yes

Please Note: Billy Bishop is the only airport on the list that lacks an approach lighting system.

Three Referenced & Approach Lighting Systems Used

The AIRBIZ Final Report makes reference to three airports:

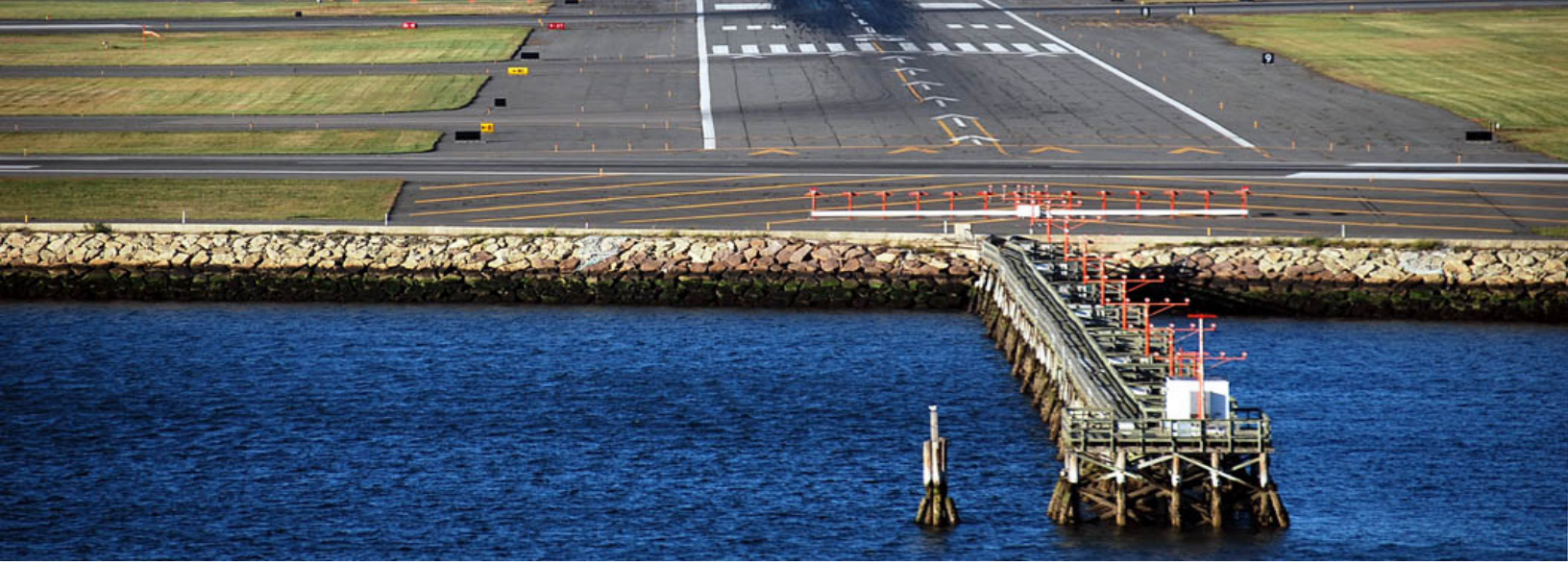
This section discusses examples of airports currently operating within an urban and/or waterfront area around the world in a manner similar to BBTCA. Benefits, constraints and impacts are described. Comparable examples of waterfront airports around the world include the London City Airport (United Kingdom) and the George Best Belfast City Airport (Ireland). Other significant urban airports include the Bromma Stockholm Airport (Sweden).

Download AIRBIZ Report here:
http://www.toronto.ca/legdocs/mmis/2013/ex/bgrd/backgroundfile-64300.pdf

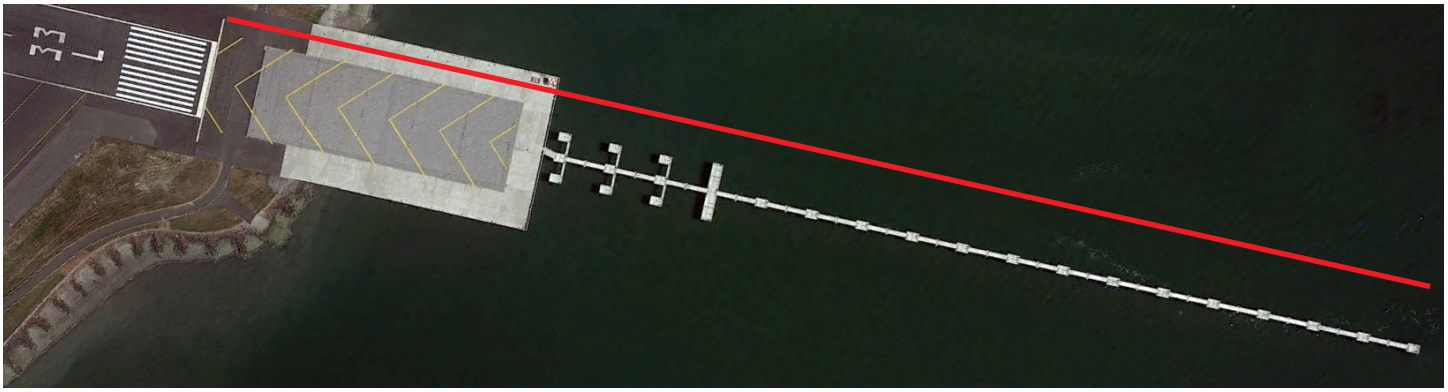
These three airports are included for comparison below.

AIRPORT	RUNWAY #	LENGTH OF LIGHTING (m)	RUNWAY LENGTH (m)
Belfast EGAC	22	800	1,829
	04	400	1,829
London City EGLC	27	460	1,508
	09	400	1,508
Stockholm ESSB	12	900	1,668
	30	Approx 370	1,668
Billy Bishop CYTZ	08	-	1,216
	26	-	1,216

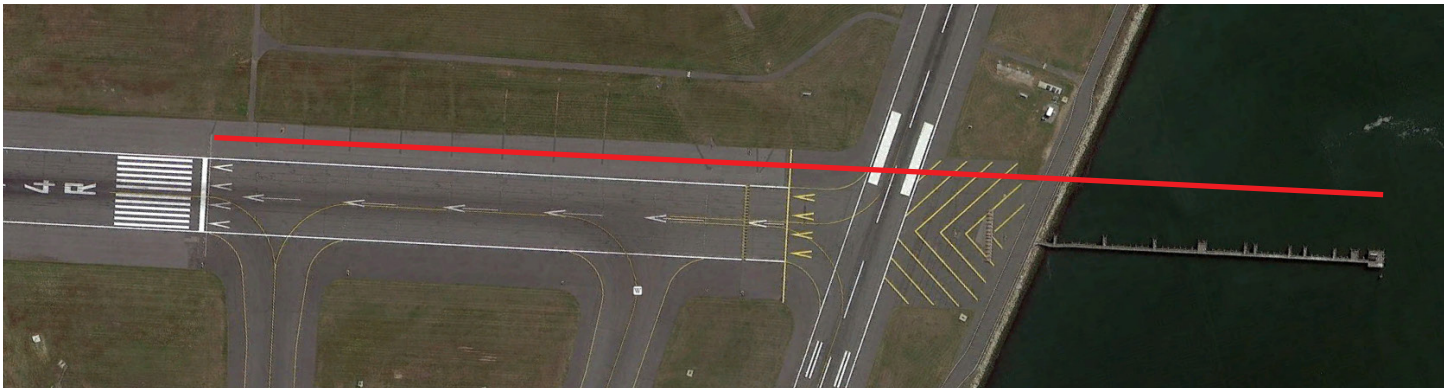
Please Note: Billy Bishop is the only airport on the list that lacks an approach lighting system.



Boston KBOS - Runway 33 L & 04 R

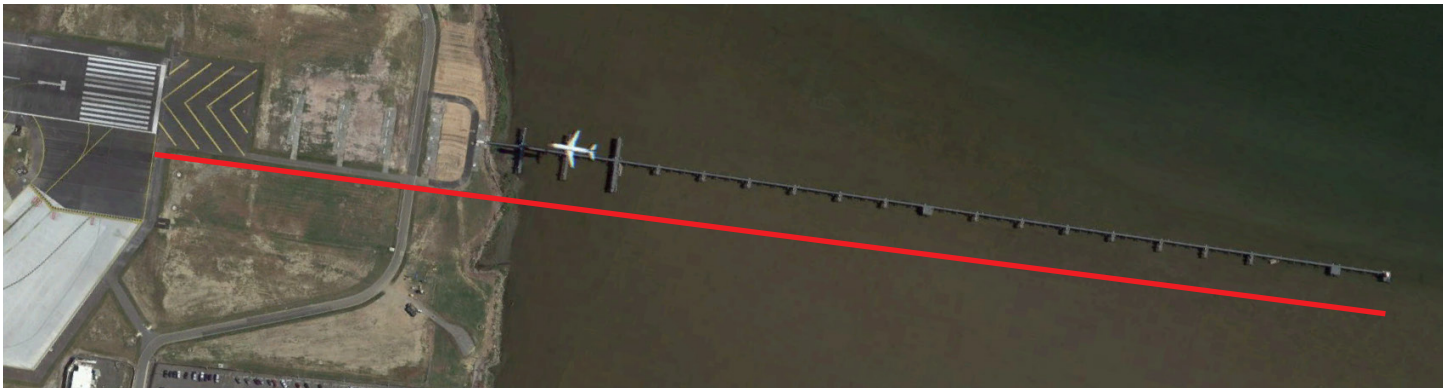


Runway 33L / 15 R - 3,073 meters in length.
33 L has an approach lighting structure out into the water to a distance of 730 meters from the threshold.
15 R has land based approach lighting at 730 meters from the threshold.



Runway 04 R / 26 L - 3,050 meters in length.
04 R has an approach lighting structure out into the water to a distance of 715 meters from the threshold.

Washington KDCA - Runway 01

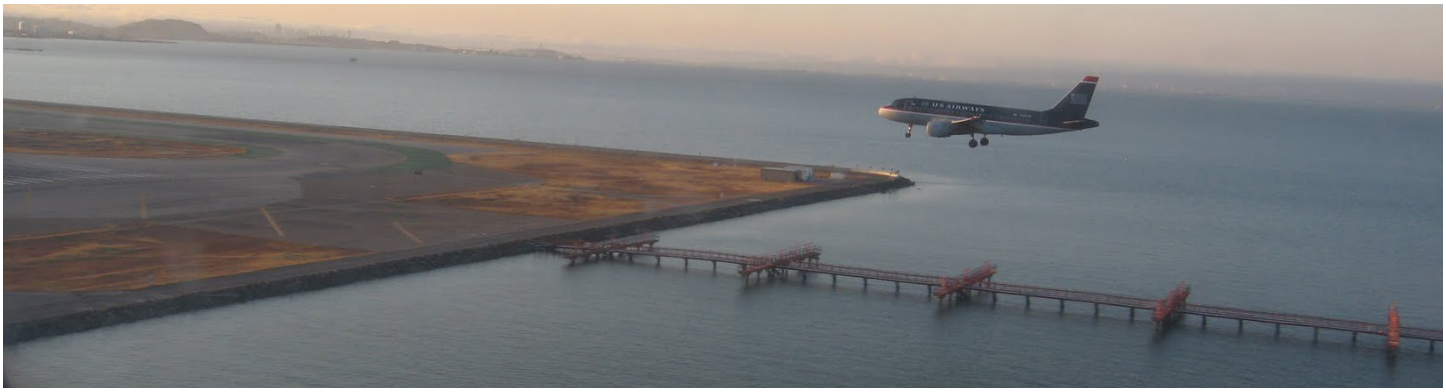


Runway 01 / 19 - 2,094 meters in length.
01 has an approach lighting structure out into the water to a distance of 820 meters from the threshold.

Runway 04 R / 19 - 2,094 meters in length.
19 has land based approach lighting at 410 meters from the threshold.

San Francisco KSFO - Runway 28 L & 28 R

Runway 28 L / 10 R - 3,469 meters in length.
28 L has an approach lighting structure out into the water to a distance of 1,065 meters from the threshold.



Runway 28 R / 10 L - 3,618 meters in length.
28 R has an approach lighting structure out into the water to a distance of 1,000 meters from the threshold.

Haneda JTT - Runway 23, 22, 34 L & 34 R

Runway 22 - 2,500 meters in length.
22 has an approach lighting structure out into the water to a distance of 915 meters from the threshold.

34 L - 3,000 meters in length (*not shown*).
Has an approach lighting structure out into the water to a distance of 900 meters from the threshold.

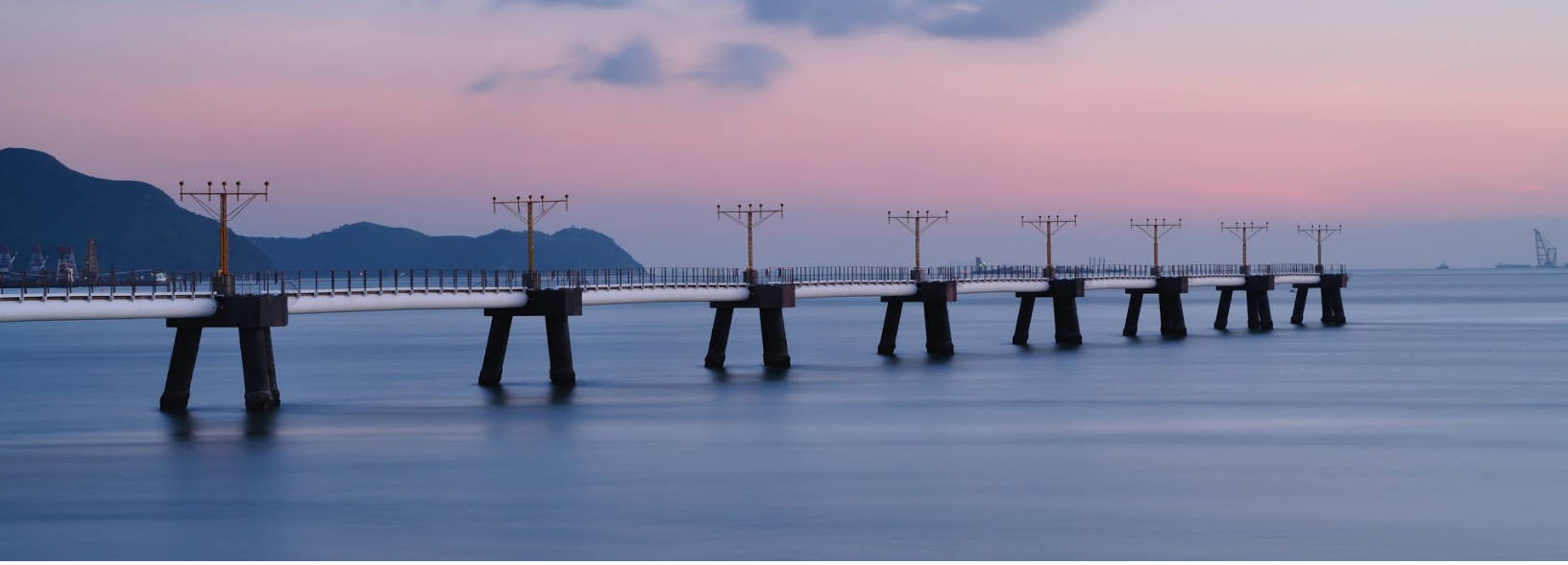
Runway 23 - 2,500 meters in length.
23 has an approach lighting structure out into the water to a distance of 880 meters from the threshold.

34 R - 3,000 meters in length (*not shown*).
Has an approach lighting structure out into the water to a distance of 900 meters from the threshold.

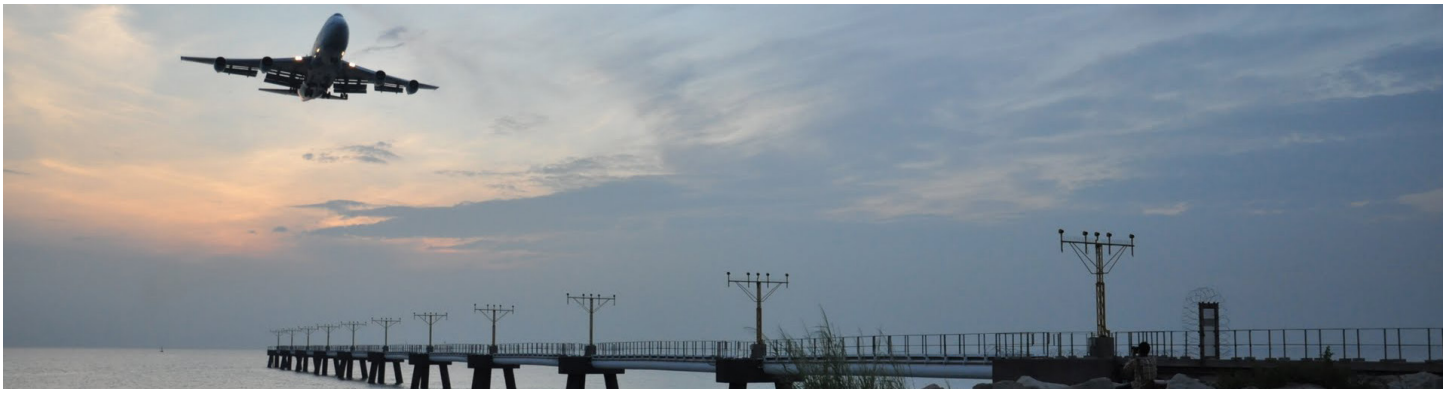
Kansai RJBB - Runway 06 R / 24 L, 06 L / 24 R

Runway 06 R 24 L - 3,500 meters in length.
06 R has an approach lighting structure out into the water to a distance of 900 meters from the threshold.
24 L has an approach lighting structure out into the water to a distance of 900 meters from the threshold.

Runway 06 R 24 L - 4,000 meters in length.
06 L has an approach lighting structure out into the water to a distance of 900 meters from the threshold.
24 R has an approach lighting structure out into the water to a distance of 900 meters from the threshold.



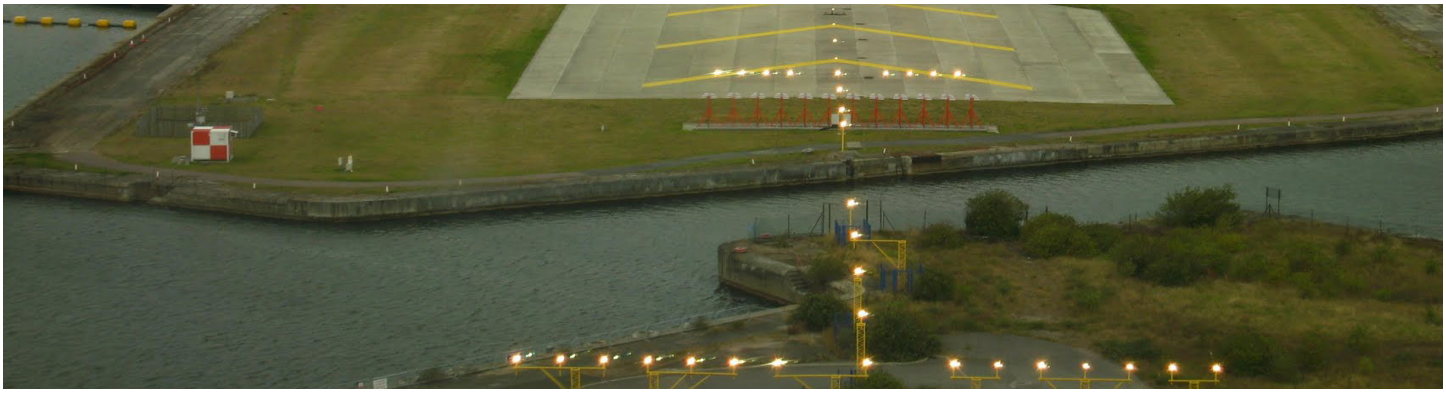
Hong Kong HHH - Runway 07 R / 25 L, 07 L / 25 R



Runway 06 R 24 L - 3,800 meters in length.
07 R has an approach lighting structure out into the water to a distance of 900 meters from the threshold.
25 L has an approach lighting structure out into the water to a distance of 900 meters from the threshold.

Runway 06 R 24 L - 3,800 meters in length.
07 L has an approach lighting structure out into the water to a distance of 900 meters from the threshold.
25 R has an approach lighting structure out into the water to a distance of 900 meters from the threshold.

London City EGLC - Runway 09 / 27

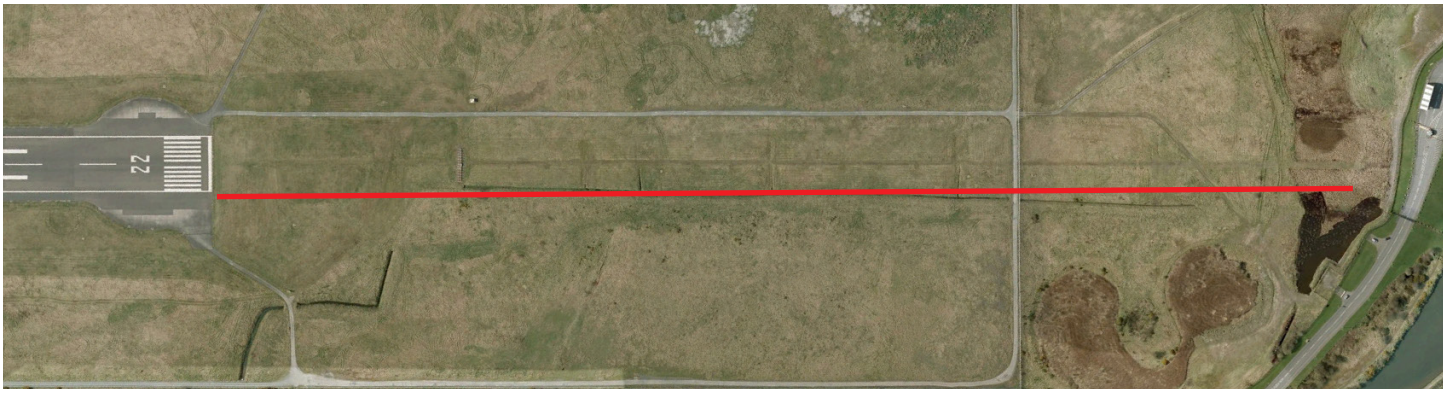


Runway 09 27 - 1,508 meters in length.
09 has land based approach lighting to a distance of 400 meters from the threshold.
27 has land based approach lighting to a distance of 460 meters from the threshold.

Liverpool LPL - Runway 09 / 27

Runway 09 / 27 - 2,285 meters in length.
09 has an approach lighting structure out into the water to a distance of 915 meters from the threshold.

Belfast EGAC - Runway 22 / 04



Runway 22 - 1,829 meters in length.
22 has land based approach lighting to a distance of 800 meters from the threshold.

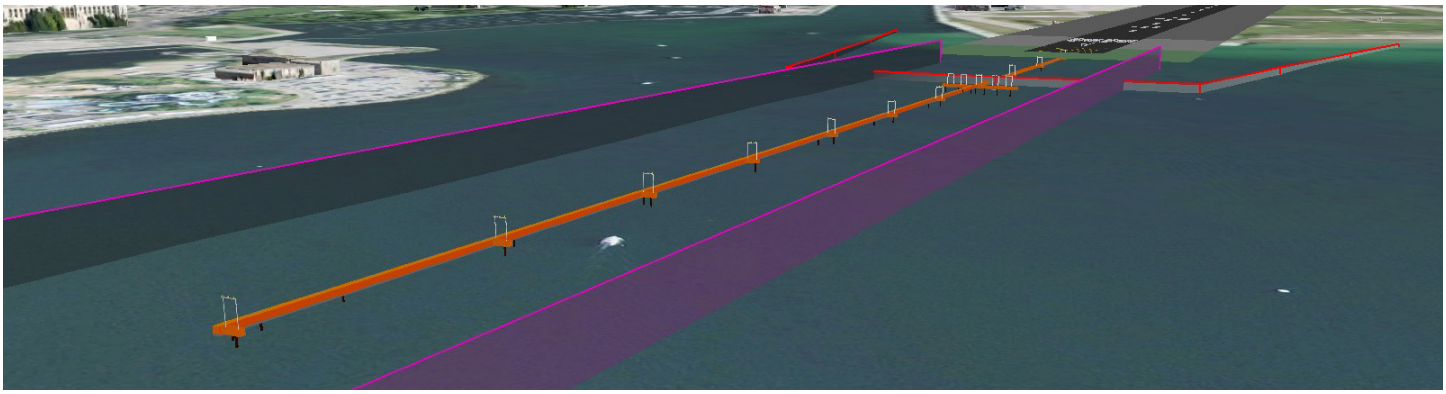
Runway 04 - 1,829 meters in length.
04 has land based approach lighting to a distance of 440 meters from the threshold.

Billy Bishop CYTZ - Runway 08 / 26 (current)

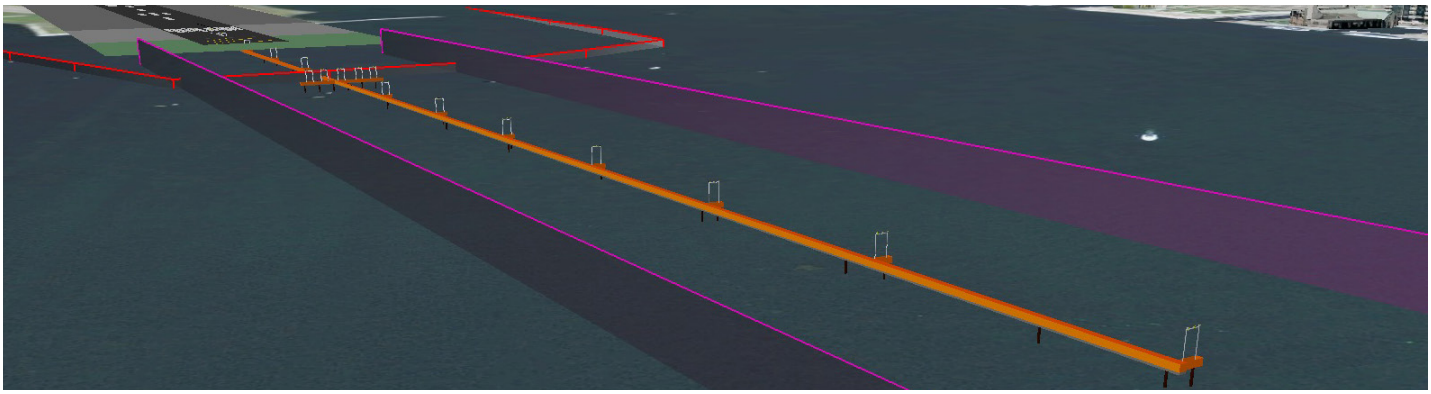
Runway 08 - 1,216 meters in length. **No runway approach lighting system.**
Red is current MEZ

Runway 26 - 1,216 meters in length. **No runway approach lighting system.**
Red is current MEZ

Billy Bishop CYTZ - Runway 08 / 26 (likely)



Runway 08 - More than 1,500 meters in length.
08 with an approach lighting structure out into the water to a distance of 720 meters from the threshold.
(*Transport Canada TP312 - Precision approach category I lighting system*)
Purple is the required 60m buffer / MEZ would be beyond this area.



Runway 26 - More than 1,500 meters in length.
26 with an approach lighting structure out into the water to a distance of 720 meters from the threshold.
(*Transport Canada TP312 - Precision approach category I lighting system*)
Purple is the required 60m buffer / MEZ would be beyond this area.

UNTIL Transport Canada hands over a COMPLETED APPROVED design for the public and politicians to review, NO DECISION should be made about expansion. We are waiting for Transport Canada to make a decision on what is required for this airport and what rationale they have for not implementing known safety measures like runway approach lighting as other airports have.

The Toronto Port Authority and Porter Airlines need to also explain why they would intentionally avoid applying for a Code 3 Category 1 designation. This designation would automatically mandate approach lighting and would drastically improve the safety of landings at night and under adverse weather conditions. Perhaps their plan is to do this once the approval is granted, citing the need for greater safety.