Honolulu High Capacity Transit Corridor Project

Introduction

This memo updates the revenue fleet requirement for the Honolulu High Capacity Transit Corridor Project (HHCTCP) to incorporate the Airport Alignment (see Figure 1). Train performance was determined by combining the simulations performed for the previous Locally Preferred Alternative Salt Lake Alignment with manual calculations for the Airport Segment to determine station-to-station travel times and overall roundtrip time. Fleet size was then estimated for the projected 2030 ridership, for a variety of different parameters, including a possible short-turn at Leeward Community College to reduce the fleet size. Station dwells were based upon the analysis performed by Tom Parkinson in his memorandum dated January 30, 2009, attached.

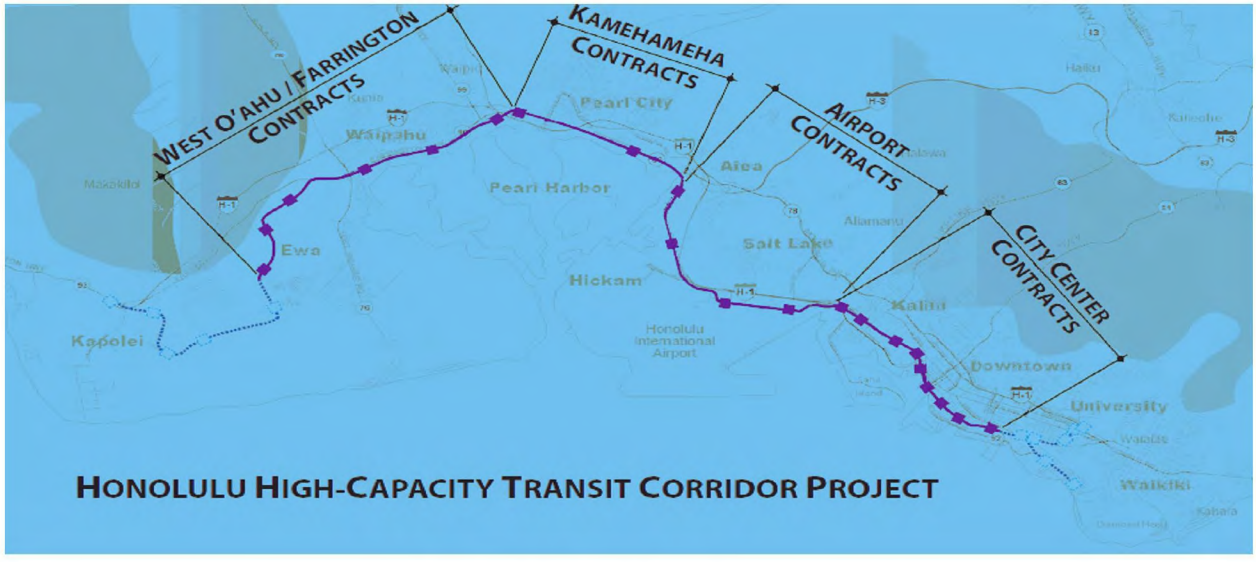

Figure 1 – Route Map

Round Trip Time

Due to the recent change in the preferred alignment to the Airport Route, end-to-end runtimes for the Airport – LPA route has not been simulated using advance train operations modeling solftware. For this update the round trip times from the earlier model simulations for the West O`ahu, Farrington Highway, Kamehameha, and City Center Segments from the Salt Lake LPA alignement were incorporated with a manual trip time calculations for the Airport Segment.

Added to the runtime between stations:

- Dwell at stations: Mr. Tom Parkinson (refer to Mr. Parkinson's January 30, 2009 memorandum attached) proposed station specific dwell time based upon a detailed analysis of ridership and passenger flow rate. For the Airport Route stations, dwells were added in accordance with Mr. Parkinson's methodology.
- The facing crossover move added 15 seconds.
- An additional 7% of total runtime was added for Terminal dwell and layover time.

See Table 1, Runtime Schedule Airport Route, for station trip times and overall end-to-end runtime.

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Station to Station Trip Time - Airport Alignment

Station	Distance (ft)	Dwell (s)	Segment Trip Time (s)	Avg Speed (mph)
East Kapolei		25		
	6115.5		99	
UH West O'ahu		15		
	4650.2		100	32
Ho'opili		20		
	10041.2		143	48
West Loch		20		
	5925.8		112	36
Waipahu Transit Center		20		
	7234.6		122	40
Leeward Community College		15		
	2526.7		64	27
Pearl Highlands		35		
	12288.1		182	46
Pearlridge		30		
	7300.8		123	40
Aloha Stadium		15		
	6757		112	41
Pearl Harbor Naval Base		20		
	9374		180	36
Honolulu Int. Airport		25		
	6247		101	42
Lagoon Dr.		15		
	5803		104	38
Middle St.		20		
	2451.18		63	27
Kalihi Station Option		20		
	4264		77	38
Honolulu Community College		15		
	2638		66	27
Iwilei		15		
	1580		64	17
Chinatown		15		
	2478		62	27
Downtown		25		
	2304		56	28
Civic Center		20		
	2502		72	24
Kaka'ako		20		
	4004		90	30
Ala Moana Center		0		
TOTAL 20.2 miles		**40.0 Minutes Trip Time**		
Turnback time for facing Crossover		15 seconds		
Terminal Dwell and Layover time (7% of runtime)		167.79 seconds		

ROUND TRIP TIME 82.9 Minutes

Table 1. Runtime Schedule Airport Route

Fleet Size

Factors controlling fleet size:

- Ridership during Peak Hour: The DEIS (Chapter 3, Figure 3-11) indicates the Airport Route adds to the overall peak hour ridership demand by 6.25% (6600 versus 6200) over the Salt Lake Route. The peak demand occurs near the proposed Pearl Harbor Naval Base Station, however demand remains high from the Pearl Highlands Station into downtown Honolulu requiring a uniform fleet distribution during peak periods.
- Roundtrip time: Table 1 indicates an overall roundtrip time of 83 minutes~~seconds~~.
- Headway between trains: 3 minutes headways are assumed.
- Car Capacity: 162 persons per car[1]
- Diversity Factor: Factor of 0.9 was used. While this factor is slightly higher than recommended by TCRP 100, it is appropriate when considering the frequency of service being provided, and the observed factor for TheBus is 0.97.
- Spare Ratio: 15% Spare ratio was applied to the service demand total. This percentage is consistent with modern transit system with high reliability. Refer to Mr. Parkinson's memorandum for further justification.

Fleet Calculation

Runtime (min)	83		
Trains required for service	28		
Peak hour trains	20		
Peak Hour Demand (passengers)	6600		
Peark Hour Demand with Deversity Factor (90%)	7333		
Car Capacity	162		
Peak Cars Peak Hour - Demand	**45**		
Train Consist - Peak Hour - 20 Trains		End Cars	Middle Cars
2 Car Trains	15	30	
3 Car Trains	5	10	5
Total Cars for Peak Hour Service	45		
Train Consist for Roundtrip - Demand - 28 Trains			
2 Car Trains	21	42	
3 Car Trains	7	14	7
Total Cars for Service		56	7
Spare Ratio (15%)		8	2
Subtotal		64	9
Fleet Requirement	**73 Cars**		

[1] Refer to John Swanson's email dated October 14, in which he indicates the 4 persons/square meter capacity is 190 person for the proposed HHCTCP vehicle. TCRP 100 recommends loading closer to 3 persons/square meter, therefore this analysis 162 person capacity was used.

Short Turn – Impact on Fleet Size

HHCTCP has designed the Leeward Community to facilitate a short turn movement by providing a center platform station with an adjacent crossover. During normal operations turning back selected trains is an efficient means to provide service with less fleet and energy consumption.

The ridership demand in the peak hour between Leeward Community College and East Kapolei is 4100 riders. This demand would be easily served by 3 of every 4 trains in circulation allowing for a turn back of every fourth train. This will result in a savings of 2 train consists or 4 cars reducing the **Fleet Requirement to 69 vehicles.**

Conclusion:

The HHCTCP fleet demand is still in the early phase of development. However, based upon conceptual engineering and standard industry practice a **fleet of 69 to 73 vehicles will be required to provide service in 2030.**