

Tempe Entertainment District (TED) Construction Crane Impacts - PHX Capacity/Delay Assessment

May 5, 2022



TED Development Site Overview & OEI Impacts

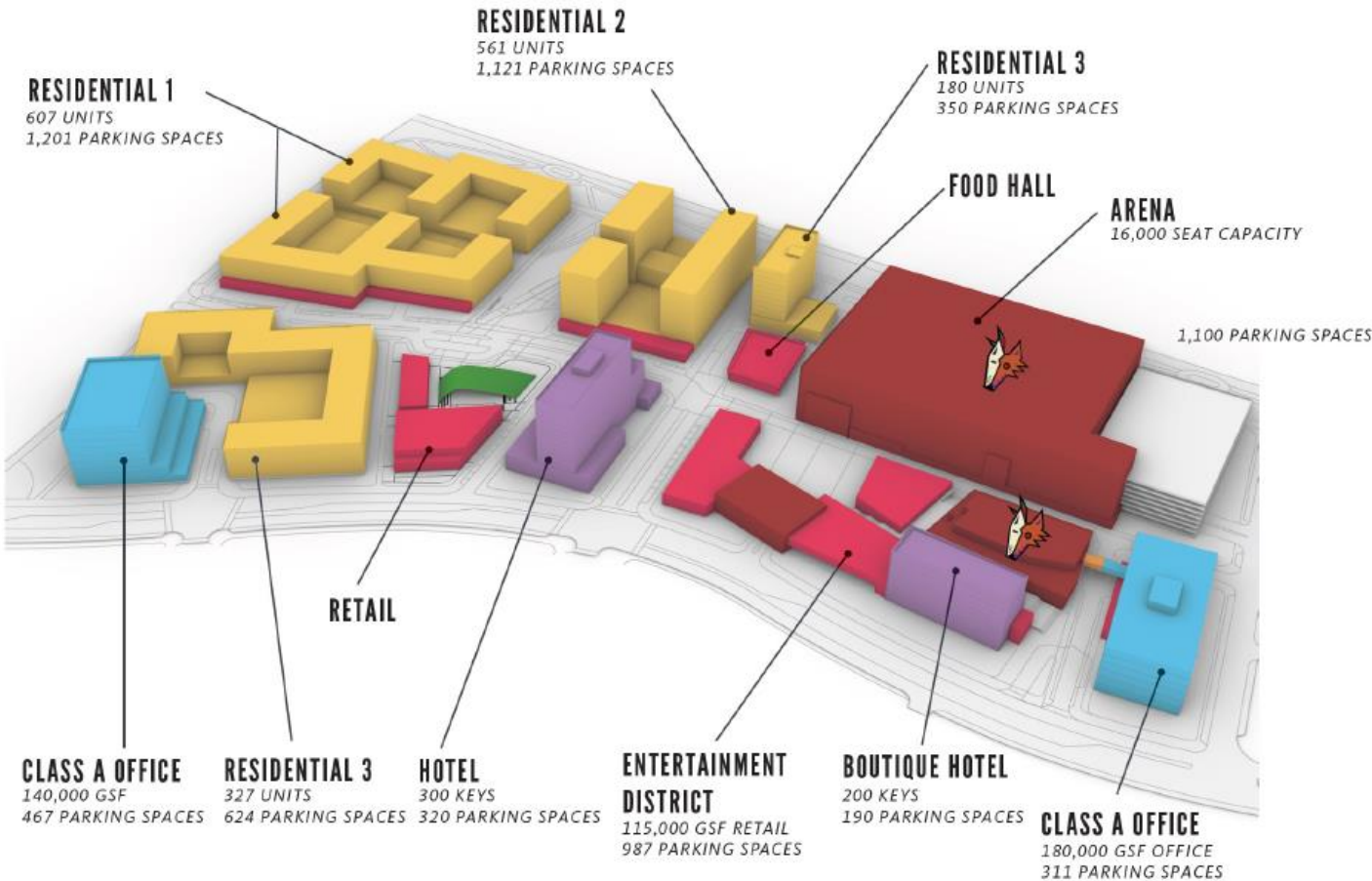


TED Development Site in Relation to PHX



Note: Runway 7L ICAO OEI surface begins at the existing departure end of the runway as depicted above.

TED Building & Crane Height Assumptions

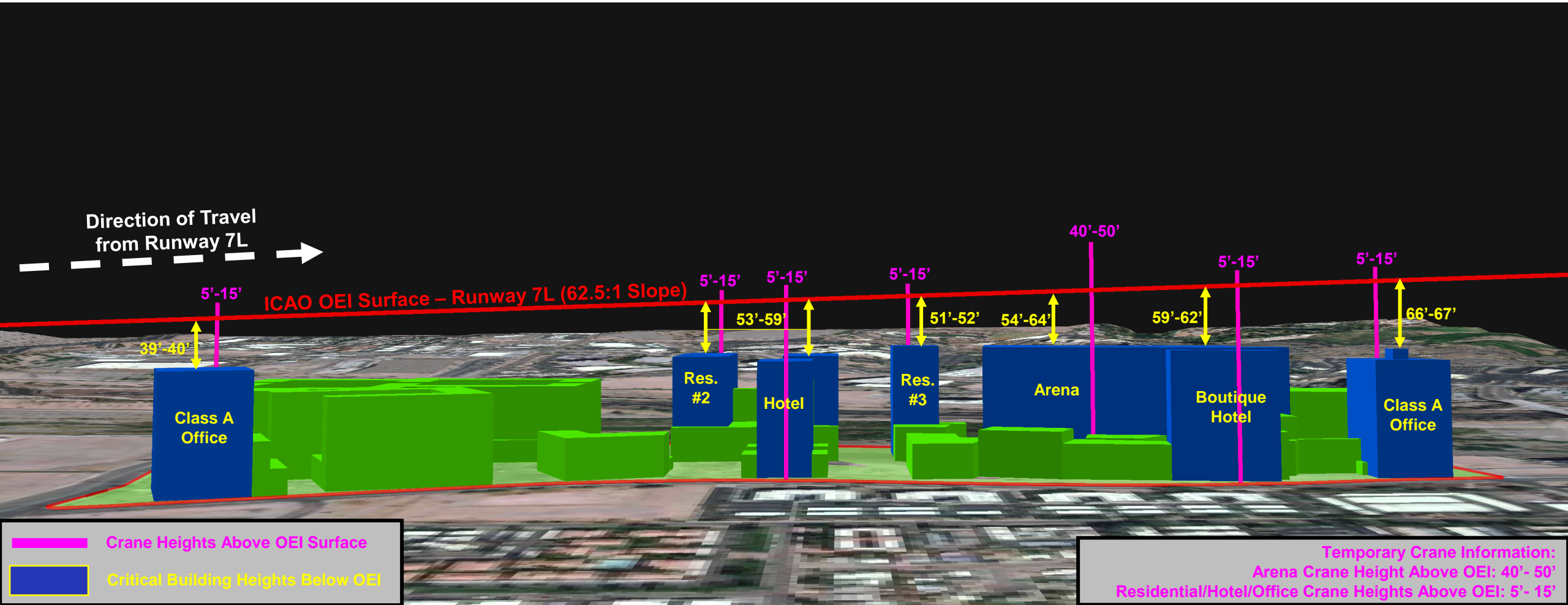


TED CRANE TYPES & DURATIONS ABOVE OEI SURFACE*

	Arena Crane	Other 110-120 Foot Structures	80 Foot Structure	< 40 Foot Structure
Phase I (East Parcel)				
Building Height	120 Feet	120 Feet	80 Feet	< 40 Feet
Building Use	Arena	Residential, Hotel, Office	Residential	Retail
OEI Height Above Structure	150-163'	150-163'	150-163'	150-163'
Crane Type	Liebherr 1800	Tower Crane	Tower Crane	Crawler Crane
Crane Max Height	200'	165'	125'	80' -100'
Temporary Height above OEI Surface	40' -50'	5' - 15'	0	0
Cumulative Days above OEI Surface	~21 Days	3 months	0	0
Crane Duration below OEI Surface	3 months	4 Months	6 months	TBD
Phase II (West Parcel)				
Building Height		110 Feet	80 Feet	< 40 Feet
Building Use		Residential, Hotel, Office	Residential	Retail
OEI Height Above Structure		140-150'	140-150'	140-150'
Crane Type		Tower Crane	Tower Crane	Crawler Crane
Crane Max Height		155'	125'	80' -100'
Temporary Height above OEI Surface		5' - 15'	0	0
Cumulative Days above OEI Surface		3 months	0	0
Crane Duration below OEI Surface		4 Months	6 months	TBD

* - Crane summary details above assume TED draft siteplan submitted as part of RFP submission process. The siteplan has not been reviewed and commented on by the City of Tempe and is subject to Developer changes. Changes to the siteplan may require changes to the above crane plan.

TED Critical Building Heights Compared to ICAO OEI Surface



Note: Runway 7L ICAO OEI surface begins at the existing departure end of the runway as depicted in Slide 3.

TED Crane Capacity/Delay Impacts Assessment



Background

- Analysis conducted by airlines concluded that the deployment of construction cranes during the TED project will likely impact the operation of Runway 07L departures
- Airlines indicated they would want to minimize weight penalty and potential issues with overflying the TED project
- Likely increase in shift of long-range Runway 07L departures to Runway 08 in East Flow

Airline Obstacle Analysis Findings

- American Airlines, Southwest Airlines, and Alaska Airlines performed aircraft obstacle analysis to assess One-Engine Inoperative (OEI) aircraft payload impacts of a crane at 15 feet above the OEI surface (or 1,310 feet MSL)
 - Analyzed regional, narrowbody, and widebody jets to domestic and international destinations
 - Temperature range of 91 to 115 F
- The airlines found that the construction crane would result in a significant reduction in payload including passenger restrictions
 - Primary impact on narrowbody flights with range beyond about 1,750 statute miles

Capacity/Delay Assessment Overview

- L&B analyzed the effect of the payload reduction on departure runway usage
- 2019 chosen as the base year for assessment
 - Last full year of operations before pandemic
 - 1,316 average weekday, peak month operations*
- Assessed annual impact on operations for a range of periods up until 2036
 - 1,974 daily operations in 2036 based on the 2021 FAA Terminal Area Forecast (TAF)**
- Monthly impacts can be determined once construction schedule has been developed

* March was the peak month in 2019 at PHX

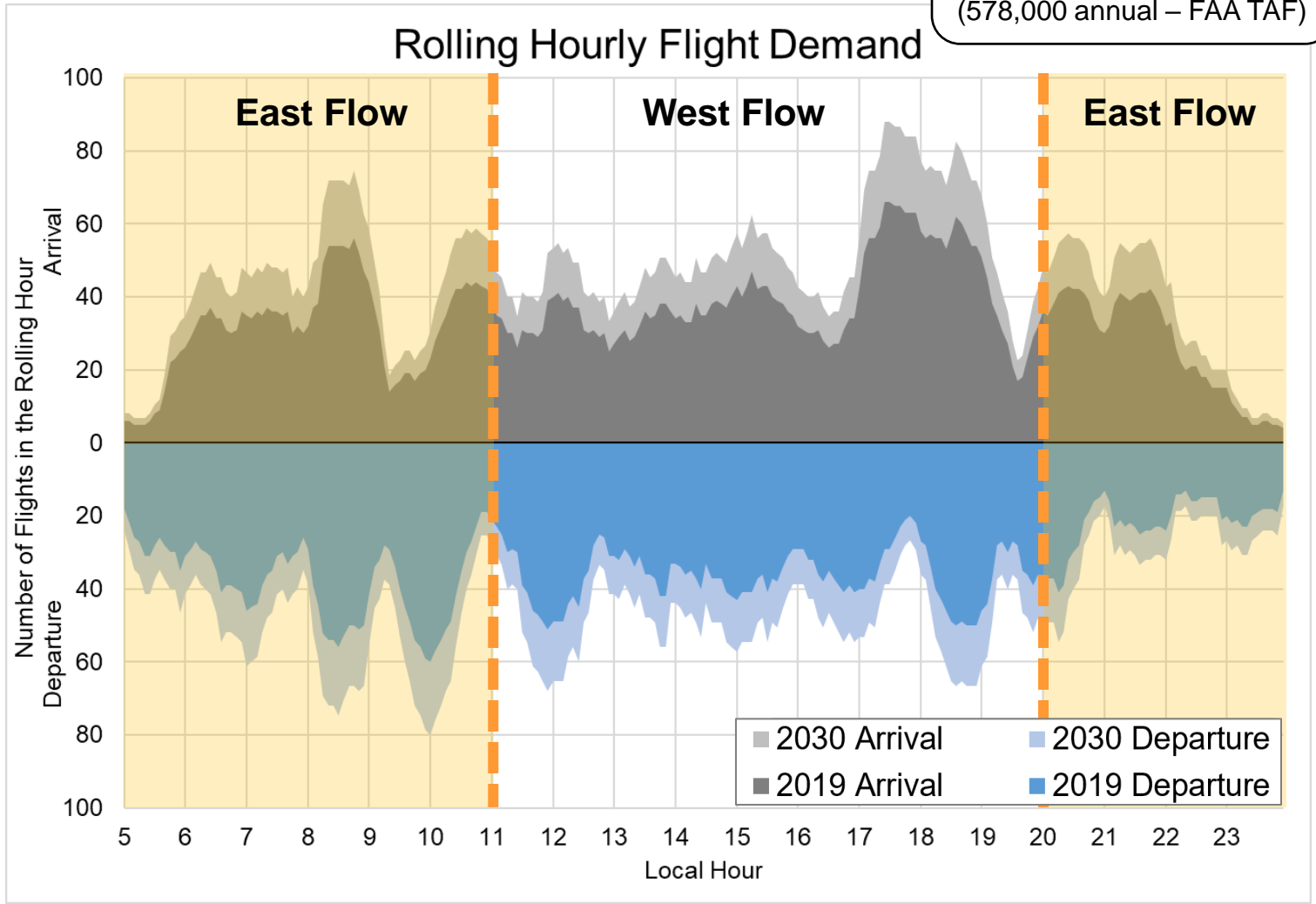
Source: FAA Aviation System Performance Metrics (ASPM) Individual Flights Flight Data Report and FAA Air Traffic Activity System (ATADS) data

** Source: FAA Terminal Area Forecast (TAF) Summary Report for PHX, issued May 2021

Flight Demand and Flow

2019: 1,316 daily operations
(434,000 annual)
2030: 1,752 daily operations
(578,000 annual – FAA TAF)

- East Flow typically occurs in the morning until about 11 AM and in the evening after around 8 PM
- Impact of the construction cranes only applied to flights operating during East Flow hours



The rolling hour counts the demand in 60-minute periods throughout the day for every 5 minutes. E.g., the demand at 9:00 AM counts the number of flights scheduled from 9:00 to 10:00 AM, the demand at 9:05 AM counts the number of flights scheduled from 9:05 to 10:05 AM, etc.

East Flow Runway Usage

- In 2019, when the Airport is in East Flow during the summer months*
 - 25% of long-haul flights departed on Runway 08
 - 2% of shorter-range flights departed on Runway 08
 - Long-haul flights were defined as greater than 1,750 statute miles: east coast, Alaska, Hawaii, Europe and Asia
- With the presence of a crane 5 to 15 feet above the OEI surface, long-haul flights that experience a payload penalty on Runway 07L (with or without the extension) will shift to Runway 08
- Based on the payload impacts provided by the airlines
 - Estimated 50% to 75% of long-haul flights will depart on Runway 08
 - Estimated 2% of shorter-range flights will depart on Runway 08

* Based on L&B analysis of FAA Aviation System Performance Metrics (ASPM) Individual Flights Flight Data Report for summer of 2019

Capacity and Delay

- FAA published figures for PHX capacity*
 - East Flow: 72 arrivals and 60 departures per hour
 - West Flow: 76 arrivals and 60 departures per hour
- Shifting departures from Runway 07L to Runway 08 reduces the arrival capacity on Runway 08, resulting in delay
 - No capacity loss is assumed during West Flow hours
- A capacity/delay spreadsheet runway queue model was used to quantify the delay caused by the runway capacity reduction
 - Other sources of delay, such as those caused by airfield congestion or upstream airspace bottlenecks, are excluded

* Source: FAA Operational Information System (OIS)

Runway Delay

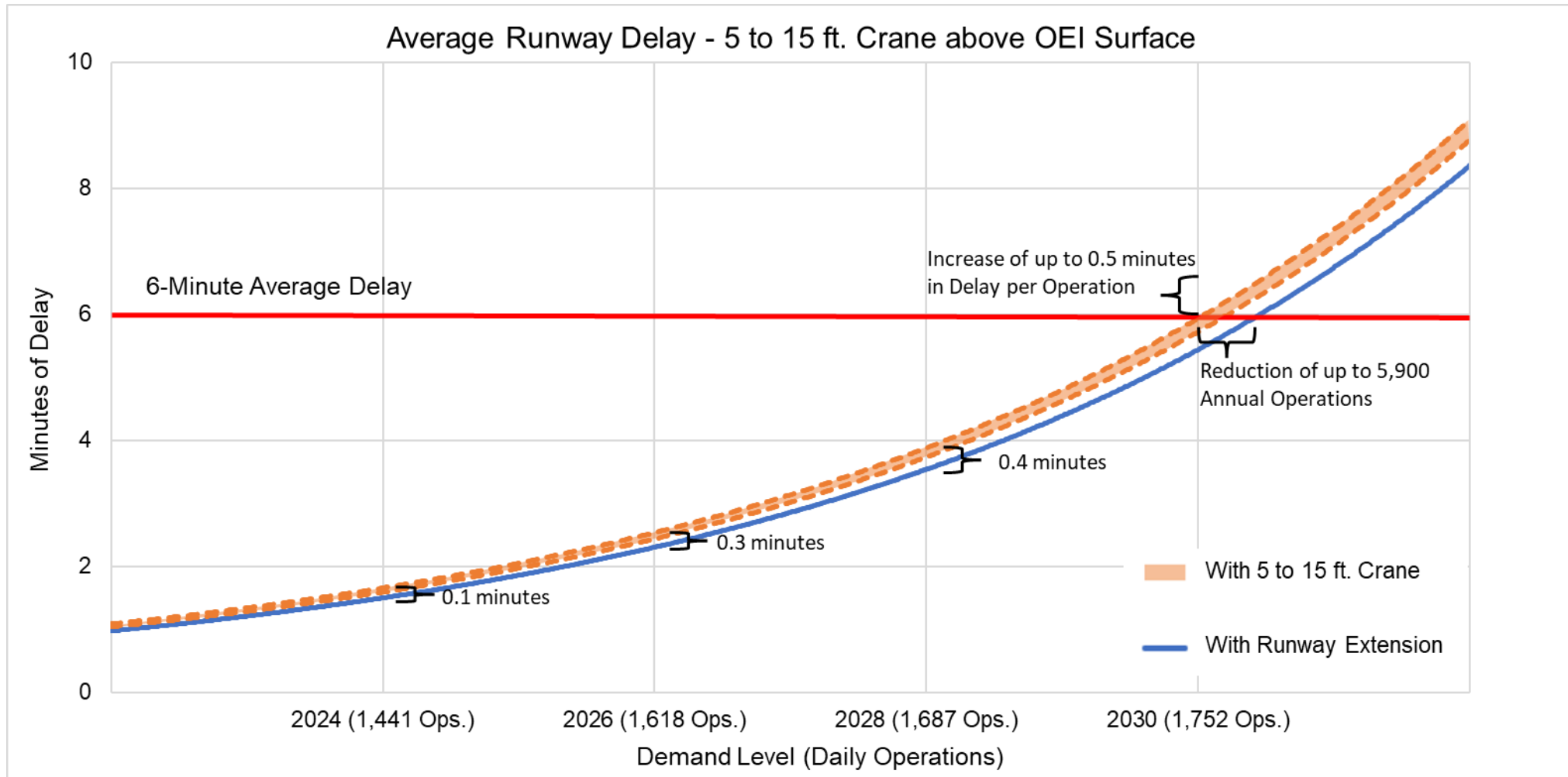
- The runway queue model estimates delay by examining the flights in 5-minute periods throughout the day
 - If the demand in a period exceeds the capacity, then flights are delayed into the next period
- The estimated runway capacity delay in 2019

	Arrival		Departure	
	Daily Average Delay	Peak Delay	Daily Average Delay	Peak Delay
East Flow (before 11 AM, after 8 PM)	0.5 minutes	2 minutes 9 AM	1.5 minutes	7 minutes 9 AM
West Flow (11 AM – 8PM)		3 minutes 6 PM		2 minutes 7 PM

- Runway capacity delay is evaluated for future demand levels up to 2036

Runway Delay Impact

- As the flight level demand increases at PHX, the incremental impact of construction cranes on delay increases over time



Runway Delay Impact

- Large development projects of this type typically take around 7 to 12 years to complete
 - No information has been provided by the developer on the on the construction crane timeline
 - 2030 will likely be a mid point year during the construction with crane impact
- Once delay reaches around 6 minutes per operation, projected to occur around 2030 or 578,000 annual operations, a 5 to 15-foot crane height above the OEI surface could:
 - Increase delays by 0.3 to 0.5 minutes per operation OR
 - Reduce the overall capacity of the Airport by around 3,300 to 5,900 annual operations
- The annual estimates can be refined to determine monthly impacts once a construction schedule for the site has been developed

Increasing delay reduces PHX's ultimate capability to accommodate future demand levels