# *APPENDIX D. NO ACTION ANALYSIS SUMMARY*

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**MEMORANDUM**

Date: June 2023

To: Joan Zatopek
Oakland International Airport – Port of Oakland

From: Christen Hemphill

Subject: <u>OAK TERMINAL MODERNIZATION AND DEVELOPMENT PROJECT: NO-ACTION ANALYSIS SUMMARY</u>

The Port of Oakland (Port) is proposing to modernize existing Terminals 1 and 2 and to construct a new terminal at Oakland International Airport (OAK or Airport). The objectives of the project are to provide terminal facilities to efficiently accommodate the market-based demand at industry standard levels of service, improve the passenger experience, and optimize safety and security for passengers and employees. Pursuant to the National Environmental Policy Act and the California Environmental Quality Act, the Port is required to analyze alternatives for the Oakland International Airport Terminal Modernization and Development Project (Proposed Project), including "No-Action."[1]

The analysis of the No-Action scenario demonstrates that it is physically and operationally feasible for OAK to accommodate forecast future activity for passengers and associated aircraft operations in existing facilities with minor improvements, although resulting conditions would not meet Port standards for passenger experience and operational efficiency. The purpose of this memo is to summarize the assumptions and results of a No-Action scenario analysis.

# Background and Methodology

The Port requested Ricondo & Associates, Inc., to evaluate a No-Action scenario through Planning Activity Level (PAL) 2, which represents 24.7 million annual passengers (MAP) as shown in **Table 1** below. The demand levels for PAL 2 are consistent with the aviation activity forecast for OAK, which is an unconstrained forecast, approved by the FAA in December 2022. The analysis of the No-Action scenario tested the ability of existing terminal facilities to accommodate PAL 2 activity using a design day flight schedule (DDFS) representing PAL 2 demand levels during the peak month at OAK. This memo includes a gating chart showing where and for how long each flight could be accommodated for the enplaning[2] and deplaning[3] of passengers and a discussion of ground operations required to support that activity. A critical factor included in this analysis is the large number of remote hardstands[4] at OAK currently used to accommodate the

1 The term "No-Action" herein, refers to the No-Action Alternative for the purposes of the National Environmental Policy Act documentation and the No Project Alternative for the purposes of the California Environmental Quality Act documentation.

2 Enplaning refers to loading passengers onto an aircraft before departing.

3 Deplaning refers to unloading passengers from an arriving aircraft.

4 A hardstand is an aircraft parking position that does not have equipment that connects it to a building. The existing hardstands at OAK have historically been needed for multiple uses, including overnight parking of aircraft, light aircraft maintenance, and accommodation of diverted or otherwise irregular operations. The hardstands at OAK have also been used for loading and unloading passenger flights.

morning peak of activity, as is typical for a west coast airport. Without additional contact gates[5] at OAK, use of the existing hardstands would increase for passenger flights and, when combined with the use of OAK's existing contact gates, would be able to serve the forecast activity levels through PAL 2. The resultant conditions, however, would include crowded terminals, new airfield busing operations, and increased ground loading[6] operations, none of which are consistent with the Port's objectives regarding passenger experience and efficiency of operations.

TABLE 1 EXISTING (2019) AVIATION ACTIVITY AND PAL 2 FORECAST COMPARISON

| ACTIVITY | EXISTING (2019) | PAL 2 |
|---|---|---|
| **Passenger Activity** | | |
| Passenger Enplanements | 6,689,457 | 12,342,518 |
| Million Annual Passengers (MAP) | 13.4 | 24.7 |
| **Aircraft Operations** | | |
| Passenger Airlines | 113,272 | 181,270 |
| Freighters | 20,698 | 24,800 |
| Business / General Aviation | 107,861 | 116,431 |
| Military | 926 | 1,000 |
| **Total Aircraft Operations** | **242,757** | **323,501** |

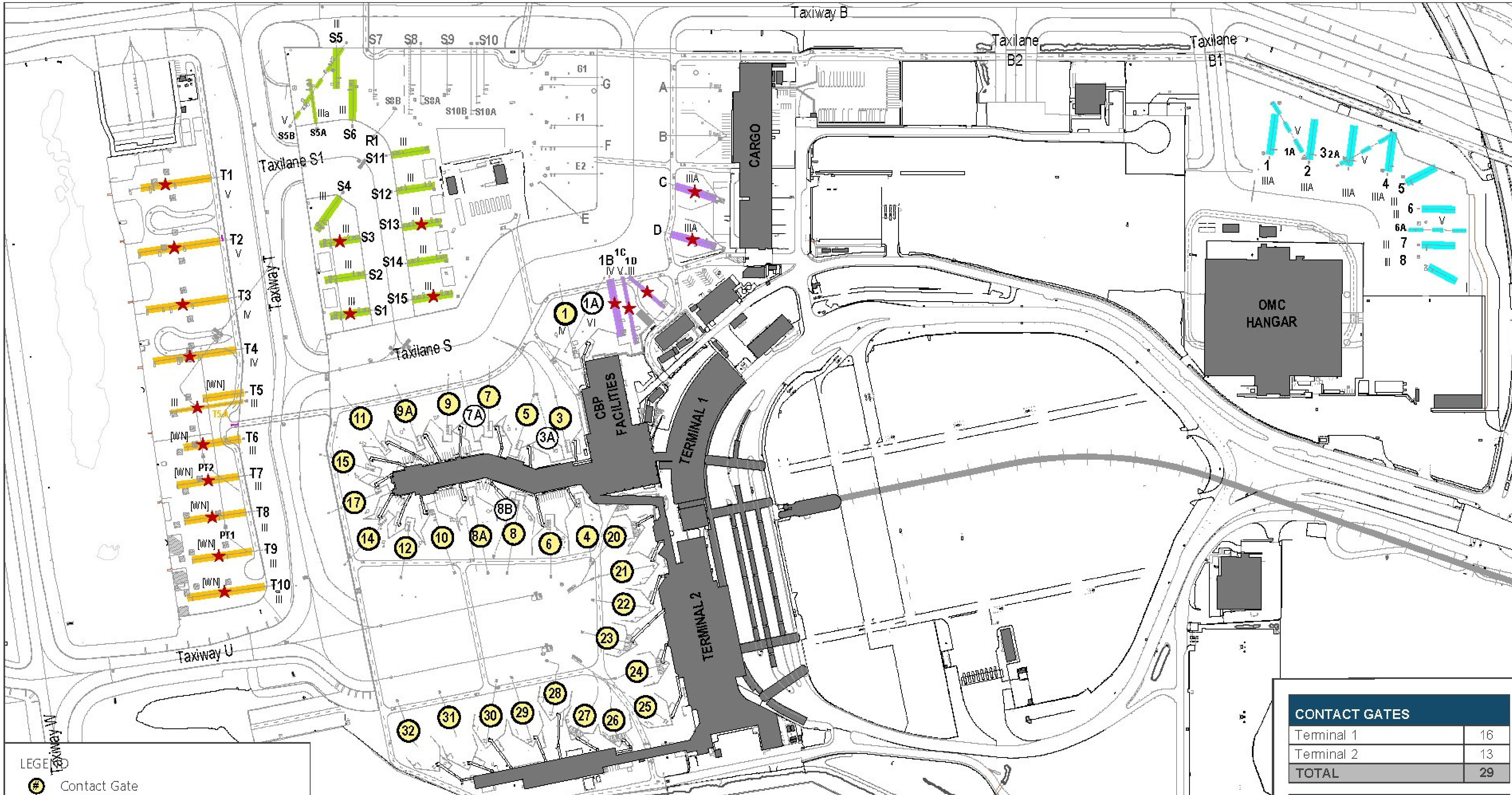
NOTES:
PAL – Planning Activity Level
SOURCES: InterVISTAS, *Oakland International Airport Comprehensive Aviation Activity Forecast Report (2019-2038)*, July 2020 – updated June 2021

The analysis considered the operational feasibility of accommodating PAL 2 aircraft operations at the 29 existing contact gates at the terminal complex and the 34 existing remote hardstands located at the Apron Remote, Tango Remote, Stadium Remote, and OMC/Midfield Remote areas at OAK as shown on **Exhibit 1**. This was accomplished by "gating" the DDFS by assigning each flight to an available contact gate or remote hardstand as further described below. Arrival or departure operations that could not be accommodated at the existing contact gates were assigned to remote hardstands. Aircraft at hardstands would be accessed either directly by traversing the apron via protected paths and ramps to access the terminal,[7] or by busing for those that cannot be accessed via the apron due to their distance from the terminal and the need to cross active taxiways or taxilanes. For those remote hardstands requiring busing, this analysis determined the number of busing hardstands needed, the number of passengers served by those hardstands, and the resulting number of bus trips required to serve those passengers, and then tested the feasibility of the operation.

5 A contact gate is an aircraft parking position that has a passenger boarding bridge connected to (in contact with) the passenger terminal building.

6 Ground loading refers to passengers being loaded from the ground to the aircraft and/or unloaded from the aircraft to the ground, using equipment like stairs or a movable ramp. Ground loading is required for a passenger flight that does not have access to a contact gate with a passenger boarding bridge.

7 The farthest hardstand from the terminal considered accessible without busing, Apron Remote hardstand C, is approximately 1,000 feet from the terminal. Access to and from any of the Apron Remote hardstands does not require crossing any active taxilanes or taxiways.




LEGEND

- Contact Gate
- Apron Remote Hardstand
- Tango Remote Hardstand
- Stadium Remote Hardstand
- OMC/Midfield Remote Hardstand
- ★ Remote Hardstand with Fuel Pit Access

NOTES:
CBP - Customs and Border Protection
OMC - Oakland Maintenance Center

1/ T7 through T10 can accommodate an additional aircraft nose to tail, but this tandem use is only effective when used by a single airline. Given a multi-airline common-use remote operations scenario, these are each counted as one position for this analysis.
2/ Stadium Remote hardstands do not include the RJ position designated as R1.

| CONTACT GATES | |
|---|---|
| Terminal 1 | 16 |
| Terminal 2 | 13 |
| TOTAL | 29 |

| REMOTE HARDSTANDS | |
|---|---|
| Apron Remote | 4 |
| Tango Remote | 10 1/ |
| Stadium Remote | 12 2/ |
| OMC/Midfield Remote | 8 |
| TOTAL | 34 |

SOURCES: Port of Oakland, 2023.

NORTH

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## EXHIBIT 1

## EXISTING (2019) GATES AND REMOTE HARDSTANDS

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The analysis of the No-Action scenario was based on a full day of operations, as well as peak period conditions at PAL 2.

The following sections provide further detail and results of the analysis.

# Analysis of No-Action Scenario – Key Findings

Key findings of the analysis demonstrate that PAL 2 activity can be accommodated at the existing facilities using contact gates and remote hardstands. However, the resulting conditions would not meet the Port's objectives to efficiently accommodate the market-based passenger demand (passenger aircraft operations and passenger enplanements and deplanements[8]) at industry standard levels of service, improve the passenger experience, and optimize safety and security for passengers and workers. The No-Action scenario would require ground loading of aircraft and a busing operation, which would add travel time and inconvenience for passengers. It would also result in increased vehicular traffic on the apron for passenger buses and ground handling equipment and would introduce additional complexities and inefficiencies to airline operations at the Airport.

**Table 2** identifies the number of operations at remote hardstands requiring busing, and at the Apron Remote area not requiring busing that would occur during the PAL 2 90-minute peak period, and the total number of remote hardstands required to support those operations. The use of a 90-minute peak for busing operations is described below. The 90-minute peak period occurs between 8:45 a.m. and 10:15 a.m. and includes a total of 12 operations comprising 5 arrivals and 7 departures at remote hardstands served by busing, and an additional 6 operations comprising 3 arrivals and 3 departures served at the Apron Remote hardstands. Operations served at the Apron Remote hardstands are directly accessible from the terminal using ramps and pathways and do not require busing. A total of 12 remote hardstands (8 that require busing and 4 that are accessible without busing) are required for PAL 2.

TABLE 2 NO-ACTION SCENARIO PEAK PERIOD REMOTE HARDSTAND REQUIREMENT

| HARDSTAND AREA AND ACCESS TYPE | OPERATIONS (ARRIVALS AND DEPARTURES) | REMOTE HARDSTANDS REQUIRED |
|---|---|---|
| Tango Remote and Stadium Remote (busing) | 12 | 8 |
| Apron Remote (no busing) | 6 | 4 |
| **Total** | **18** | **12** |

SOURCES: Oakland International Airport Comprehensive Aviation Activity Forecast Report (2019-2038), InterVISTAS, July 2020 – updated June 2021; InterVISTAS, Design Day Flight Schedule, July 2020.

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8 An enplanement is defined as a passenger boarding an aircraft. A deplanement is a passenger disembarking from an aircraft. Passengers are considered enplanements/deplanements whether they are revenue or non-revenue and if they are origin/destination or transfer passengers.

The key findings of the analysis are presented below, followed by a discussion of the main components of this analysis.

**Operational Impacts - Remote Hardstands and Busing**

- Review of peak activity at the remote hardstands indicated that analyzing only a peak hour would not adequately reflect peak busing conditions, because it would not account for the extended length of time some aircraft occupy a remote hardstand between an arrival and subsequent departure, and also would not account for additional bus trips that would occur just before and just after the peak hour. Therefore, a 90-minute peak period was used to assess bus operations supporting arrivals and departures at remote hardstands requiring busing. Note that the identification of a 90-minute peak period in this memorandum relates specifically to the peak time for busing operations, not total aircraft operations or total operations at busing hardstands.
- The eight OMC/Midfield Remote hardstands, which do not have fuel pits,[9] would not be needed to support PAL 2 passenger aircraft operations and could otherwise accommodate electric bus charging, storage, and maintenance functions. These hardstands could also be used for RON parking, parking seasonal cargo aircraft, or other uses.[10] Therefore, all PAL 2 remote operations could be accommodated at remote hardstands with fuel pits.[11]
- Existing facilities (i.e., 29 contact gates and the 26 remote hardstands at Apron Remote, Tango Remote, and Stadium Remote areas) would be able to accommodate all passenger aircraft operations at PAL 2.
- During the PAL 2 peak period, passenger aircraft operations that could not be accommodated at existing contact gates could be accommodated at the 4 Apron Remote hardstands and 8 of the Tango Remote hardstands (the latter requiring busing), for a total of 12 remote hardstands.
- Twenty remain overnight (RON) hardstands would be required at PAL 2 based on the gating analysis. Similar to existing conditions, the maximum number of remote hardstands occupied by aircraft at PAL 2 would occur overnight due to the number of RON aircraft. The existing remote hardstands can accommodate all RON aircraft in addition to all aircraft in the DDFS requiring a remote hardstand.
- International arrival operations during the peak period could all be accommodated at contact gates or Apron Remote hardstands (i.e., Gates 1B, 1C, 1D, C, and D[12]) with an accessible connection to Customs

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9 Fuel pits are hydrants placed in the apron pavement and connected to a fuel line, allowing aircraft to be fueled directly from the fueling system rather than using fuel trucks.

10 Areas at the OMC/Midfield Remote apron not accommodating bus charging, storage and maintenance could be used for seasonal cargo operations, irregular operations, and RON parking, among other uses.

11 HNTB, *Comprehensive Civil and Utility Asset Mapping*, Draft June 2020. Fuel pits are available at all Apron Remote and Tango Remote hardstands and at four of the Stadium Remote hardstands (specifically S1, S3, S13 and S15).

12 Although five hardstands are available for aircraft parking, only four of the five can be used simultaneously due to dependencies associated with the size of the aircraft parked at Gates 1A, 1B and 1C.

and Border Protection (CBP) facilities without busing. Therefore, no international arrival operations would require busing operations during the peak period through PAL 2.[13]

- At PAL 2 conditions, contact gates would require an average of approximately 7.9 daily turns per gate, whereas the remote hardstands would require an average of approximately 4.1 daily turns per hardstand.[14,15] Airlines can typically maintain efficient operations up to an average of 8-10 turns per gate depending on their specific air service profile at the airport. This number of turns allows adequate time for servicing of aircraft, accommodation of minor system delays, and periodic emergency maintenance at a gate without affecting the overall operation. For comparison, based on gating the existing (2019) DDFS, the existing average daily turns per gate at OAK was 5.8 for all airlines; however, Southwest operated at approximately an average of 7.8 daily turns per gate.[16]
- The existing Tango Remote hardstands would require apron striping and demarcation of passenger waiting zones to accommodate busing operations.
- Two existing contact gates would need to be converted to bus gates to accommodate passenger busing operations to and from remote hardstands. The loss of these two contact gates was accounted for in the analysis.
- Minor modifications and reconfiguration of existing concourse facilities would be needed at the two contact gates that would need to be converted to bus gates. Modifications are anticipated to include installation of external vertical circulation cores covered by canopies, interior renovation, striping for bus circulation, installation of nonpermanent barriers, and pavement striping to delineate passenger loading/unloading areas. These modifications are not anticipated to require a federal action or an Airport Layout Plan (ALP) update.

**Operational Impacts - Passenger Experience**

- Passengers departing from or arriving at a remote hardstand requiring busing would likely experience unfamiliar operations during the departure and arrival processes in the No-Action scenario.
  - Passengers departing from a remote hardstand would transition from the upper level of the concourse to a dedicated holdroom area located within the existing lower level. Passengers would

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13 Busing operations for international arrivals require additional bus downtime associated with security clearance and cleaning. Three international arrival operations would need to be accommodated at remote hardstands supported by busing operations during the day at PAL 2. These international arrival operations are not concurrent and do not fall within the peak period, thus, no additional buses (daily or peak period) were added to the requirement for international operations.

14 Each arrival deplaned at a remote hardstand and each departure enplaned at a remote hardstand is counted as one remote operation (e.g., an aircraft arriving at a remote hardstand and departing from the same hardstand is counted as two remote operations; an aircraft with an arrival operation at a remote hardstand that is then towed to an available contact gate for departure is counted as one remote operation).

15 Turns per gate at both contact gates and remote hardstands were counted as one full turn equals both an arrival and a departure operation. Therefore, if a flight is towed and only one operation (an arrival or a departure) is on a particular gate or remote hardstand, it counts as 0.5 of a turn.

16 Existing turns per gate were calculated with the same methodology as the PAL 2 turns per gate.

then move through an unconditioned area on the gate apron, board a bus for transport to the remote hardstand, deboard the bus and board their aircraft using a portable ramp or stairs.

- Passengers arriving at a remote hardstand would deplane the aircraft using a portable ramp or stairs and board a bus for transport to the arrival bus gate. Passengers would then alight the bus and traverse to the second level to access the baggage claim area or the terminal exit.

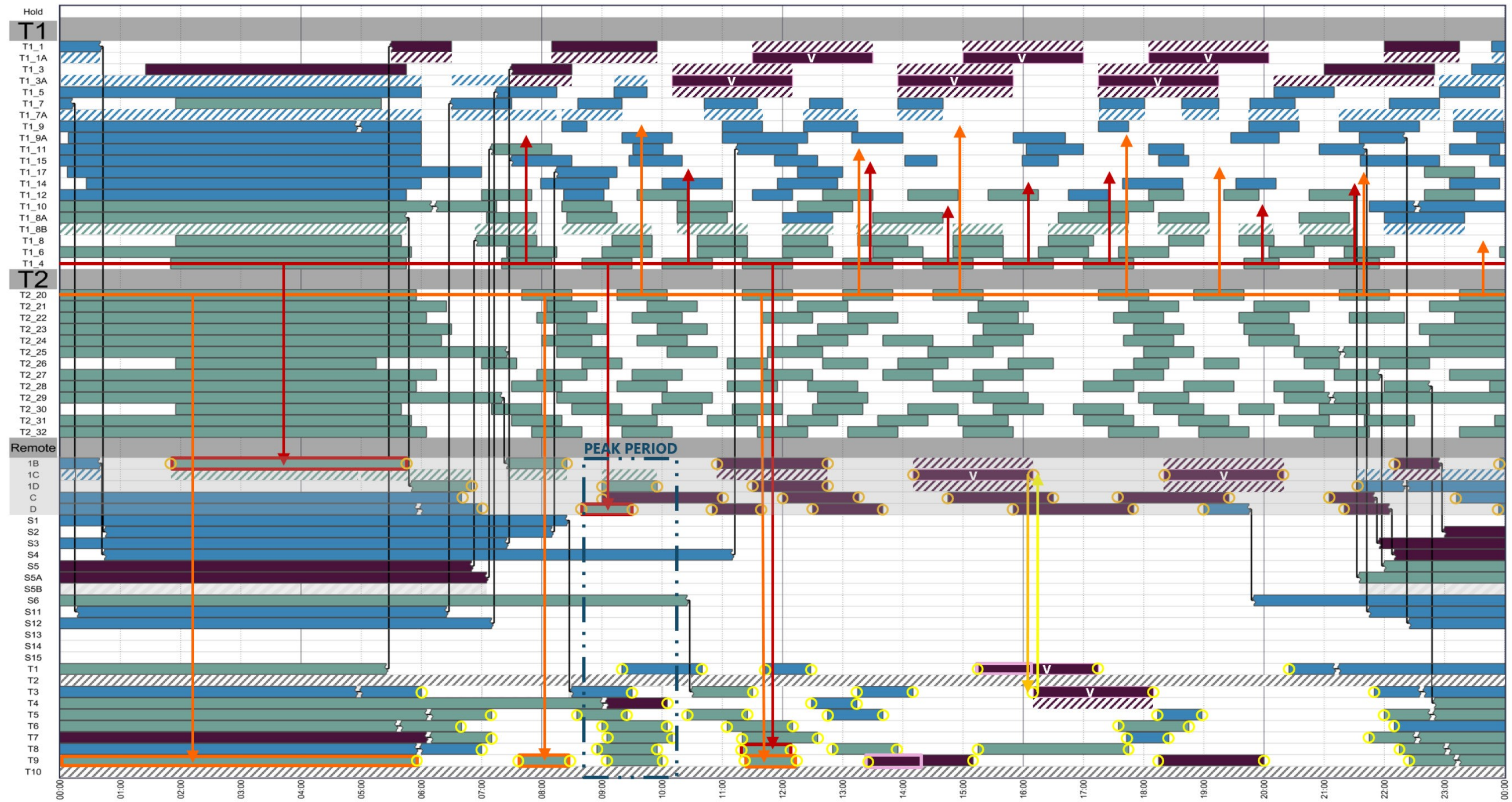
- Passengers arriving at or departing from an Apron Remote hardstand would be required to traverse a maximum distance of approximately 1,000 feet on the apron, averaging approximately five minutes of travel time along a designated passenger pathway between the terminal and the farthest Apron Remote hardstand. Minor improvements, such as pathway pavement striping and new nonpermanent barriers to extend the existing passenger pathway at hardstands 1B, 1C, and 1D, would be needed to provide safe and secure passenger movement between the terminal complex and the Apron Remote hardstands.

- All proposed configurations and equipment along the paths of passenger travel would conform to provisions set forth in the Americans with Disabilities Act and California building codes. Examples include use of code-compliant ramps to enplane and deplane the aircraft, use of accessible buses, and provision of communication tools such as visual paging. Operational measures might include consolidated wheelchair management across multiple airlines.

# Analysis of No-Action Scenario – Design Day Flight Schedule Gating

A gating chart is used to illustrate the results of a gating analysis, depicting the number of aircraft operations that are accommodated at each contact gate or remote hardstand over a 24-hour period, as well as the durations aircraft are parked at each gate or hardstand. **Exhibit 2** presents the gating chart for the PAL 2 DDFS. The operational assumptions used for the gating analysis are presented below. The gating chart includes all contact gates at Terminal 1 (T1) and Terminal 2 (T2) and all remote hardstands at Apron Remote, Stadium Remote and Tango Remote areas. All flights from the PAL 2 DDFS were assigned to an available contact gate or an available remote hardstand. Due to the conversion of Gates 4 and 20 from contact gates to dedicated bus gates, flights displaced from these two gates were reassigned to other available contact gates or to remote hardstands, as indicated by arrows on Exhibit 2. Yellow circles indicate when an arrival or departure operation at a remote hardstand must be served by busing.

As noted above in the key findings, and as depicted on Exhibit 2, contact gates would accommodate an average of approximately 7.9 daily turns per gate, and remote hardstands would accommodate an average of approximately 4.1 daily turns per gate at PAL 2. These averages are considered achievable and are a result of using reasonable buffers between flights in the gating assumptions.




**LEGEND**

- International Operation
- International Arrival Bus Operation
- V ADG-V Aircraft Operation
- Southwest Airlines Domestic Flight
- Other Airlines Domestic Flight
- Towed Operation
- Potential Towed Operation
- Blocked Gate / Hardstand
- Remote Operation (Apron)
- Remote Operation (Bus)
- Displaced Gate 4 Operation
- Displaced Gate 20 Operation
- Operation Relocated to Apron Remote Hardstand
- Operation Relocated to Remote Hardstand Served by Bus

NOTES:

1/ Airplane Design Group (ADG) V operations are noted in the gating chart because they represent larger aircraft that may restrict the ability for another aircraft to occupy an adjacent gate, resulting in a blocked gate. Two ADG-V aircraft require simultaneous accommodation at T1 and T3 to utilize the existing bus loops in PAL 2. This requires T4 to be blocked, and may require new apron striping as the existing T3 is ADG-IV.

2/ Domestic flights are designated as Southwest Airlines and other airlines to track operational needs associated with Southwest's operations.

3/ Blocked hardstands at the Tango Remote gates are existing remote aircraft hardstands that would no longer accommodate an aircraft and would be reconfigured to support busing operations. Blocked hardstands at all other remote hardstands and contact gates occur when a dependency between two adjacent gates requires one gate to remain unused to allow the other gate to accommodate a larger aircraft.

4/ Apron Remote operations and bus remote operations are noted separately due to the assumption that Apron Remote hardstands are directly accessible from the terminal using ramps and pathways, and therefore do not require busing operations. Bus remote hardstands are not directly accessible from the terminal, and therefore require busing operations.

5/ With the designation of Gates 4 and 20 to support busing operations, aircraft operations that would have used those gates are displaced and shifted to other contact and remote gates.

SOURCES: Ricondo & Associates, Inc., October 2022; InterVISTAS, *Forecast Flight Schedules*, July 2020 (Updated June 2021).

**EXHIBIT 2**

GATING CHART FOR THE DESIGN DAY FLIGHT SCHEDULE
FOR THE NO-ACTION SCENARIO

Drawing: P:\Project-Denver\OAK\03-Working\08-No Action Scenario\XX CAD\Bus Gates 4 and 20.dwgLayout: Gating Titleblock Plotted: Jul 7, 2023, 01:18PM

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The gating assumptions for contact gates and remote hardstands are described below.

**Contact Gate Assumptions**

- Existing Contact Gate Capability. Assignment of PAL 2 DDFS operations were limited to the maximum aircraft category (referred to as Airplane Design Group [ADG][17]) that could be accommodated at the existing contact gates. The contact gates would not be improved to increase or change ADG capabilities.
- Gate Assignments. The use of contact gates was prioritized in the gated PAL 2 DDFS; an aircraft operation was only assigned to a remote hardstand when there was not an available contact gate capable of accommodating the aircraft.
- Operations per Gate. A daily "turns-per-gate" limit was not used when assigning contact gates and remote hardstands. The availability of a gate was based on block time (i.e., the time the gate is occupied by an aircraft between arrival and departure) and assumed buffer times between operations (i.e., the time between a departure and the subsequent arrival at a gate). The following buffer times were maintained:
  - 30 minutes between two domestic operations
  - 45 minutes between an international and a domestic operation or between two international operations
- Gate Dependencies. Certain contact gates were periodically unused in the DDFS gating analysis when a dependency between two adjacent gates would require one to remain unused to allow a larger aircraft to be accommodated at the other contact gate.

**Remote Hardstand Assumptions**

- Existing Remote Hardstand Capability. Assignment of PAL 2 DDFS operations were limited to the maximum aircraft category (referred to as ADG) that could be accommodated at the existing remote hardstands. The remote hardstands would not be improved to increase or change ADG capabilities.
- Apron Remote Priority. The five Apron Remote hardstands (Gates 1B, 1C, 1D, C, and D[18]) were considered accessible to the existing terminal complex without busing. These hardstands were prioritized over other remote hardstands, particularly for international arrivals, due to the accessibility to CBP facilities without busing. To access the Apron Remote hardstands, minor improvements, such as dedicated walkways and barriers, would be needed to provide safe and secure passenger movement across the apron between the terminal complex and the parked aircraft.
- Bus Gate Requirements and Operations. The need to convert two contact gates to bus gates was identified to accommodate the PAL 2 DDFS peak period operations. Gate 4 and Gate 20 were identified

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17 The Airplane Design Group (ADG) is an FAA-defined grouping of aircraft related to aircraft wingspan or tail height. These groups are defined in *Table 1-2* in FAA Advisory Circular 150/5300-13B.

18 Although five hardstands are available for aircraft parking, only four of the five can be used simultaneously due to dependencies associated with the size of the aircraft parked at Gates 1A, 1B and 1C.

as best suited for conversion to bus gates due to existing facility layouts. Operations originally assigned to these gates were reassigned to other available contact gates or remote hardstands.

- Fuel Pit Accessibility. Assignment of remote operations was prioritized at remote hardstands with existing fuel pits to minimize the need for fuel tanker truck operations.
- Towed Operations. Due to preference for loading or unloading at contact gates, some aircraft operations were split between a contact gate and a remote hardstand. In other words, an arrival or departure could be accommodated at a contact gate with the corresponding departure or arrival accommodated at a remote hardstand. The aircraft would be towed between the contact gate and remote hardstand.[19]
- Remote Hardstand Buffer Minimums. Buffer times between operations at remote hardstands were doubled to account for the additional complexity and time requirements associated with a remote hardstand and busing operations.
- Blocked Hardstands. Two remote hardstands (T2 and T10) were blocked in the gated DDFS to support busing operations associated with the adjacent hardstands.

# Analysis of No-Action Scenario – Bus Requirements

Bus requirements were identified assuming a bus fleet of electric COBUS 3000 or equivalent buses,[20] each accommodating approximately 75 passengers and their luggage. The requirements analysis considered the number of peak period and daily bus trips between Gates 4 and 20 and the remote hardstands, the number of buses needed to support remote hardstand operations at PAL 2, and the availability of a staging area to support the number of buses required at PAL 2.

A summary of the 90-minute peak period operations and passengers at remote hardstands requiring busing is shown in **Table 3**. This table does not include the operations accommodated at the Apron Remote hardstands as they were assumed to be accessible from the terminal without busing.

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19 Buffer minimums were applied to towed operations dependent on where the arrival or departure operations occur. For example, contact gate buffer time minimums were use for contact gate operations, and remote hardstand buffer times were used remote hardstand operations. Additional time was also assumed to tow an aircraft to or from the remote hardstands.

20 The Port of Oakland will be required to comply with the California Air Resources Board Zero-Emission Airport Shuttle Regulation which requires airport shuttle buses to convert to 100 percent zero emissions by 2035 (with phased in plan approach of 33 percent by 2027 and 66 percent by 2031).

TABLE 3 NO-ACTION SCENARIO REMOTE OPERATIONS SUMMARY AND BUSING REQUIREMENTS (DAILY AND PEAK PERIOD)

| TYPE OF ACTIVITY | DAILY | PEAK PERIOD [1] |
|---|---|---|
| **Remote Operations – Aircraft** | | |
| Arrivals | 31 | 5 |
| *Domestic* | *28* | *5* |
| *International* | *3* | *0* |
| Departures | 35 | 7 |
| *Domestic* | *29* | *6* |
| *International* | *6* | *1* |
| **Total Remote Aircraft Operations** | **66** | **12** |
| **Remote Operations – Passengers** | | |
| Arriving Passengers | 4,352 | 720 |
| Departing Passengers | 5,193 | 1,005 |
| **Total Remote Passengers** | **9,545** | **1,725** |
| **Remote Operations – Bus Requirements** | | |
| **Number of Buses Required** [2] | **20** [3, 4] | **20** |
| **Number of Bus Trips** | **143** | **29** |

NOTES:
1 The PAL 2 peak period for busing for remote operations is 8:45 a.m. to 10:15 a.m.
2 This analysis assumed use of electric COBUS 3000s, which have the capacity to accommodate approximately 75 passengers and their luggage.
3 The total number of buses required to support PAL 2 operations is defined by the peak period requirement.
4 A 10 percent contingency was added to accommodate maintenance issues and irregular operations to ensure an adequate number of buses would be available at all times.
SOURCES: Oakland International Airport Comprehensive Aviation Activity Forecast Report (2019-2038), InterVISTAS, July 2020 – updated June 2021; InterVISTAS, Design Day Flight Schedule, July 2020.

The daily bus requirement and the peak period bus requirement were calculated based on the number of passengers accommodated on remote operations requiring busing and the corresponding number of buses required. As illustrated in the example below, the number of buses needed to serve each remote operation was found by dividing the number of forecast passengers per operation by the maximum number of passengers that can be accommodated on a COBUS 3000. The result was then rounded up to the nearest whole number to represent the total number of buses required to support each peak period remote operation at a remote hardstand requiring busing.

BUS REQUIREMENT CALCULATION EXAMPLES:

**140** (arriving passengers) ÷ **75** (passengers/bus) = **1.87** buses, rounded up = **2 buses**

**175** (departing passengers) ÷ **75** (passengers/bus) = **2.33** buses, rounded up = **3 buses**

Using this methodology, the passengers accommodated on the 12 peak period remote operations requiring busing, 5 arrivals and 7 departures, would require a total of 18 buses. A 10 percent contingency was added to the total number of buses to provide for resiliency of bus operations in the event of issues such as unexpected maintenance, need for charging or fueling, or to support irregular operations. As a result, the total peak period bus requirement is 20 buses.

The daily bus requirement is the same as the peak period bus requirement, as the peak period requires the maximum number of buses to accommodate all remote operations considering aircraft size and the number of passengers requiring buses simultaneously.

The number of bus trips (i.e., a one-direction bus movement between a remote hardstand and the bus gate at the terminal complex) was also calculated in the same manner as above for the 12 operations at remote hardstands requiring busing during the peak period. In other words, although the same bus would be used to serve an arrival and then the corresponding departure of an aircraft, that bus would take two trips, first to transport arriving passengers from the remote hardstand to the bus gate and then to transport departing passengers from the bus gate to the remote hardstand for departure.

Based on this analysis, 29 bus trips (one way between the terminal bus gates and the remote hardstand) would be needed to accommodate remote aircraft operations during the PAL 2 peak period.

Daily bus trips (midnight to midnight) were also calculated applying the same methodology. A total of 143 daily bus trips would be required to serve the 66 daily remote aircraft operations requiring busing.

The time for a full charge for COBUS 3000 buses or equivalent at stationary fast chargers is typically up to two hours.[21] A completely recharged battery provides an operating range of approximately 14 hours or 62 miles.[22] As the first remote departure would occur at roughly 6:00 a.m., it is assumed that the buses would need to operate from 5:00 a.m. until 12:00 a.m. Buses would be able to be recharged during the evening and during non-peak periods without disrupting busing operations. An overnight recharge with intermittent charging during the day would allow the 20 buses to service all daily operations at remote hardstands requiring busing, considering contingencies.

A staging area would be needed to support bus recharging, storage when not in use, and bus maintenance for the 20 electric COBUS 3000 buses, or equivalent, required at PAL 2. Criteria for identifying a feasible staging area included: (1) space must be near and accessible to the bus operations area, and (2) electricity supply lines and capacity must be available nearby to support charging infrastructure for electric buses. An area adjacent to the OMC Hangar was identified as the preferred area to support bus staging. The site has an existing electric supply system and is accessible to the bus operations area.

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21 https://www.cobus-industries.de/produkte/e-cobus-3000/
22 https://caetanobus.pt/wp-content/uploads/2018/01/e.COBUS_.pdf

# Analysis of No-Action Scenario – Minor Modifications Required to Accommodate Bus Operations

A busing analysis demonstrated that PAL 2 remote operations could be accommodated at existing facilities with busing operations. Minor improvements at the terminal complex and the remote hardstands would be required. The operational parameters and minor improvements needed to support the bus operation are described in more detail below. **Exhibit 3** illustrates the proposed changes to the existing pavement at Gates 4 and 20, as well as the existing pavement at the eight Tango Remote hardstands necessary to support a busing operation under the No-Action Scenario in PAL 2.

Gates 4 and 20 were identified as viable options for future bus gates to accommodate PAL 2 busing operations as these gates are adjacent to one another. This adjacency provides operational efficiency as it allows for use of the same buses to serve both an arrival and a corresponding departure for an aircraft at a remote hardstand. Using this adjacency allows for adequate bus trips to accommodate the 12 peak period operations, comprising 5 arrivals and 7 departures. **Table 4** presents the PAL 2 peak period bus requirement based on the number of passengers accommodated on each remote flight during the peak period.

TABLE 4 NO-ACTION SCENARIO PEAK PERIOD BUS REQUIREMENT BY REMOTE FLIGHT

| PEAK PERIOD OPERATIONS | ARRIVING PASSENGERS | DEPARTING PASSENGERS | NUMBER OF BUSES REQUIRED[1] | TOTAL BUS TRIPS REQUIRED[2] |
|---|---|---|---|---|
| Flight 1 | 140 | 140 | 2 | 4 |
| Flight 2 | 140 | 140 | 2 | 4 |
| Flight 3 | 140 | 140 | 2 | 4 |
| Flight 4 | 140 | 140 | 2 | 4 |
| Flight 5 (Arrival Only) | 160 | -- | 3 | 3 |
| Flight 6 (Departure Only) | -- | 125 | 2 | 2 |
| Flight 7 (Departure Only) | -- | 175 | 3 | 3 |
| Flight 8 (Departure Only) | -- | 140 | 2 | 2 |
| **Peak Period Bus Requirement** | | | | |
| Requirement | -- | -- | 18 | 26 |
| Contingency[3] | -- | -- | 2 | 3 |
| **Total Requirement** | **--** | **--** | **20** | **29** |

NOTES:
-- Not Applicable
1 The bus requirement is based on use of the 75-passenger COBUS 3000 and is rounded up to calculate the number of buses. It is assumed that the same bus would serve an arrival and subsequent departure of the same aircraft, so for flights with two peak period operations (an arrival and a departure), the number of buses is calculated based for the arrival operation only and would also serve the departure operation.
2 Bus trips are a one-direction movement between a remote hardstand and the terminal bus gate. For aircraft at a remote hardstand with an arrival and a departure within the peak period, it is assumed the bus would make two trips—one trip to transport the arriving passengers from the remote hardstand to Bus Gate 20 and a second trip to transportation departing passengers from Bus Gate 4 to the remote hardstand. For aircraft at a remote hardstand that only accommodates an arrival or a departure within the peak period, it is assumed the bus would only make one trip during the peak period between the remote hardstand and the bus gate.
3 A 10 percent contingency was added to the total bus requirement to account for bus unavailable due to maintenance, charging/fueling, or supporting irregular operations.
SOURCE: Ricondo & Associates, Inc., October 2022.

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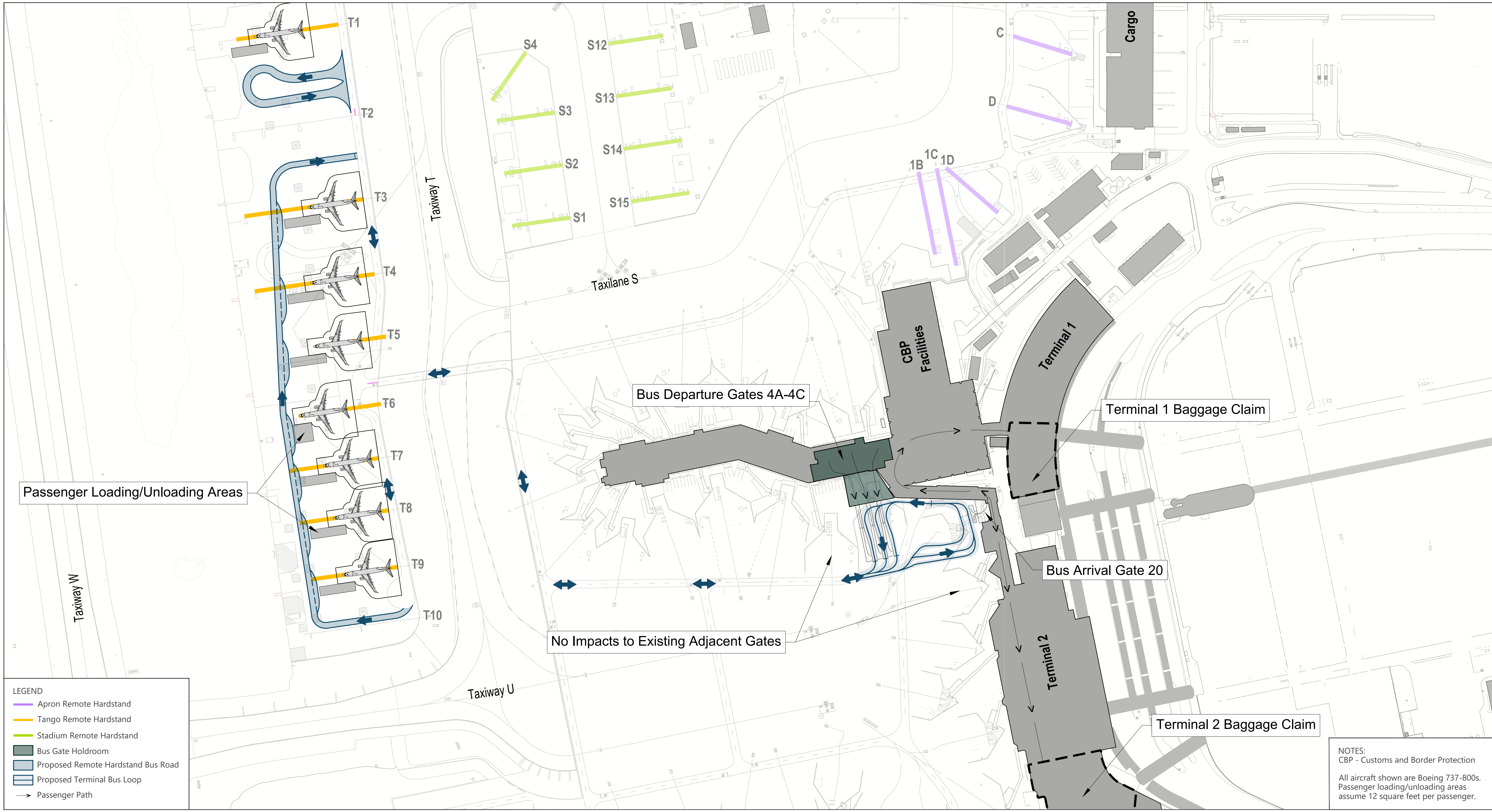


SOURCES: Port of Oakland, 2023; HNTB, *Hardstand Analysis*, February 22, 2018; Ricondo & Associates, Inc., October 2022.

NORTH 0 250 ft

**EXHIBIT 3**

FUTURE OPERATIONAL LAYOUT
FOR THE NO-ACTION SCENARIO

Drawing: P:\Project-Denver\OAK\03-Working\08-No Action Scenario\XX CAD\Bus Gates 4 and 20.dwgLayout: Ex-03 Plotted: Jul 7, 2023, 01:16PM

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## DEPARTURE BUS GATE 4 AND ARRIVAL BUS GATE 20

As described below, departures and arrivals requiring busing would be assigned to Gates 4 and 20, respectively, to maximize efficiency of the busing operation and reduce the number of buses required. Minor adjustments in busing schedules may be required to better accommodate bus operations for concurrent operations.

- Gate 4, which is accessible from Terminals 1 and 2, would be used as the departure bus gate. To accommodate the seven peak period departures, existing space on the lower level within the footprint of the existing concourse would be reconfigured to create a consolidated holdroom for passengers awaiting transport to a remote hardstand to board the aircraft. This apron-level holdroom would be one level below the departures level. A new vertical circulation area would be provided near Gate 4 to provide access to the holdroom from the departures level. As shown in Table 3, approximately 1,000 passengers depart during the PAL 2 peak period. Approximately 15,000 square feet have been identified on the existing lower level adjacent to Gate 4 to accommodate a passenger staging area for the three maximum simultaneous passenger loading operations identified during the peak period. The passenger departures would be accommodated using three new doors (Gates 4A, 4B, and 4C) that would provide controlled access to the exterior bus loading areas. Three exterior bus loading areas would be delineated and controlled, with the placement of k-rails or other nonpermanent barriers and pavement striping, to support passenger bus loading safely and securely.
- Gate 20, adjacent to Gate 4 on the apron, and accessible to both the Terminal 1 and Terminal 2 baggage claim areas, would be used as the arrival bus gate. A passenger unloading area on the apron would be delineated and controlled, with the placement of k-rails or other nonpermanent barriers and pavement striping. Passengers would use vertical circulation such as a portable ramp or exterior escalators to ascend to the second level near the existing Gate 20 holdroom. Additional signage would be required in the existing Gate 20 holdroom area to direct passengers from the exit of the new vertical circulation to the baggage claim area in Terminal 1 or Terminal 2.

All proposed configurations and operations at both Gates 4 and 20 would conform to provisions set forth in the Americans with Disabilities Act.

## BUS LOOP AT DEPARTURE BUS GATE 4 AND ARRIVAL BUS GATE 20

A bus loop would be added at Gate 4 and Gate 20 to accommodate the loading and unloading of passengers at the converted bus gates. The existing vehicle service road (VSR) would provide access to the arrival bus gate (Gate 20) for the unloading of arriving passengers. Two bus waiting lanes, each accommodating up to three electric COBUS 3000s buses or equivalent, would be provided for buses waiting to drop off passengers at Gate 20. A drop-off zone identified by k-rails or other nonpermanent barriers and pavement striping would be provided at Gate 20 for the safe unloading of passengers. Passengers would exit the bus at the drop-off area and use the new exterior vertical circulation to reach the arrivals level of the terminal facilities. A bypass lane would provide buses direct access to the departures loading area at Gate 4 if they did not have arriving passengers to drop off at Gate 20. This bypass lane could also be used during irregular operations or for buses experiencing maintenance issues.

Once a bus has unloaded passengers at Gate 20, it would continue to a hold area, where it would be checked and cleared for access to the departure bus gate (Gate 4). Buses would be assigned to one of three passenger pick-up zones (4A, 4B, or 4C) to load passengers and transport them to the Tango Remote area for their departure. A maximum of three flights during the peak period would require simultaneous passenger loading. Buses would exit the bus loop and use the existing VSR for movement across Taxiway T to the remote hardstands.

### BUS LOOPS AT TANGO REMOTE HARDSTANDS

Exhibit 3 also depicts the proposed striping for existing paved areas at the Tango Remote hardstands to support a busing operation under the No-Action scenario.

Tango Remote hardstand 1 has an existing bus loop accessed via existing vehicle service roads. A second bus loop would be provided to support bus operations at Tango Remote hardstands 3 through 9. This new bus loop would include individual bus parking areas demarcated by striping at each aircraft parking hardstand as well as dedicated passenger loading zones. The bus loop would be accommodated within the existing apron pavement, so minimal changes would be required. Changes would include striping of passenger waiting areas and bus parking areas and the closure of Tango Remote hardstands 2 and 10.

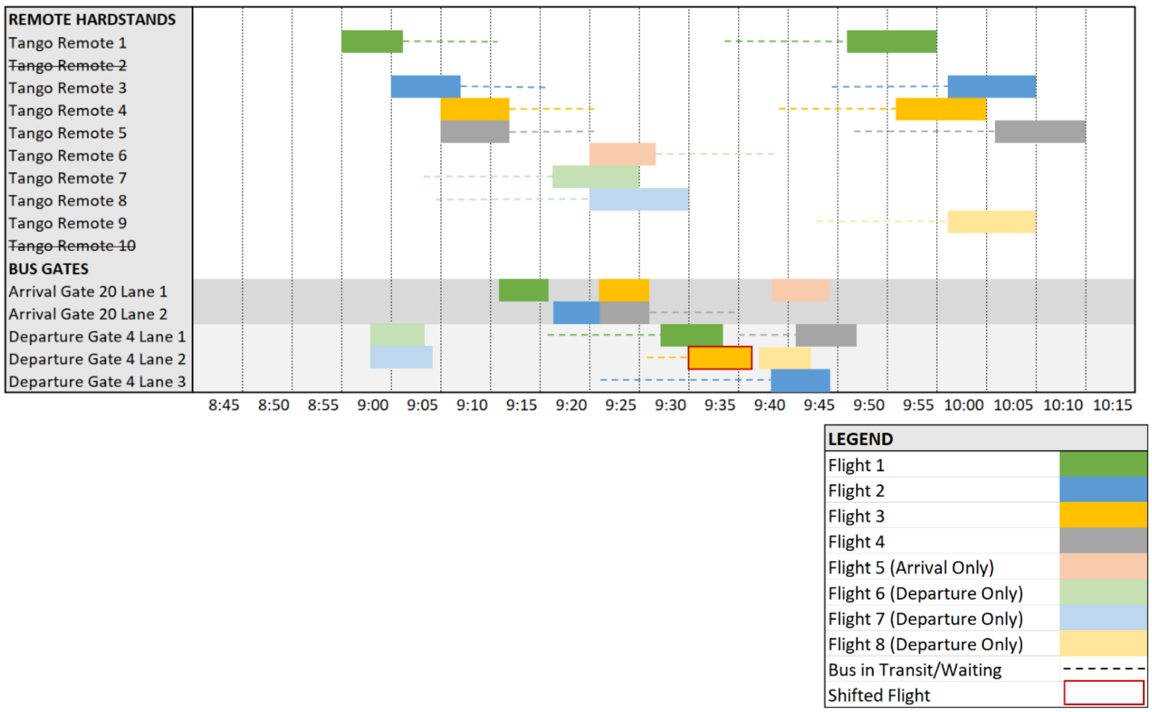
After closure of the two hardstands, eight hardstands would remain in the Tango Remote area. These eight remote hardstands would accommodate the eight remote aircraft and 12 PAL 2 peak period operations as shown on **Exhibit 4**. As noted, it is assumed the same buses would serve a remote arrival and subsequent remote departure.

Exhibit 4 highlights the eight flights at remote hardstands requiring busing that occur within the peak period and corresponds with the flights shown in Table 4. Each color delineates the movements of a different bus operation assigned to a specific flight. For example, Flight 1 requires two buses to accommodate all passengers as shown in Table 4 above. At 8:55 a.m., two buses, depicted as a green block, would arrive at Tango Remote 1 to pick up arriving passengers from the Flight 1 arrival operation. The two buses would then travel to Arrival Gate 20 (Lane 1) to drop those passengers off at approximately 9:11 a.m. At that point, to accommodate other buses that would need to drop arriving passengers off at Gate 20, the two buses assigned to Flight 1 would then move to Departure Gate 4 (Lane 1) to wait until approximately 9:24 a.m. to pick up the departing passengers for the Flight 1 departure operation. The two buses would then travel back to Tango Remote 1 to drop off the passengers at approximately 9:46 a.m. for the departure of Flight 1.

## Conclusion

The analysis of the No-Action scenario demonstrates that it is physically and operationally feasible for OAK to accommodate PAL 2 level of activity for passengers and associated aircraft operations in existing facilities with minor improvements that do not require a change to the ALP, or any other federal action. However, the No-Action scenario does not meet the Port's objectives to efficiently accommodate the market-based demand for passenger and aircraft operations at industry standard levels of service, to improve the passenger experience, or to optimize safety and security for passengers and workers. The No-Action scenario would require a busing operation and ground loading of aircraft, which would add time and inconvenience for Airport passengers, increase traffic on the apron for passenger buses and ground handling equipment, and introduce additional complexities and inefficiencies to airline operations at the Airport.

EXHIBIT 4 PEAK PERIOD BUS OPERATIONS FOR THE NO-ACTION SCENARIO




NOTES:
Colors for flight operations correspond to color coding in Table 4.
1 Bus pickup for Flight 3 was shifted two minutes earlier.
2 Flights 3 and 4 drop off arrival passengers at the same scheduled time, flight 3 would drop off passengers first as there is only one dedicated dropoff zone and Flight 3 has an earlier departure time than Flight 4.
3 Tango Remote hardstands 2 and 10 would be closed to accommodate the existing Tango Remote Hardstand 1 bus loop and the new bus loop for the Tango Remote Hardstands 3-9.
4 Bus loading takes a total of 4.38 minutes (HNTB).
5 Bus alighting takes a total of 3.75 minutes (HNTB).
6 Bus speed assumed to be 12 miles per hour on average (HNTB).
7 All aircraft board times based upon Airbus-techdata-AC_A321_0322 and assume use of ground loading stairways.
SOURCES: Ricondo & Associates, Inc., October 2022; HNTB, *Hardstand Analysis*, February 2018; Airbus, A321 *Aircraft Characteristics Airport and Maintenance Planning AC*, September 1992 (Revised March 2022).

cc: 18-06-1058

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