5.1 Introduction

This chapter presents discussion and analyses of the taxiways, runways, and remain overnight (RON) aircraft parking facilities at OAK. Airfield simulation modeling was used to identify congested areas on the airfield (taxiways and runways) and test potential improvements to minimize congestion and delay. This chapter also analyzes (1) potential congestion caused by aircraft transiting between North Field and South Field, (2) the need for a new taxiway at North Field, parallel to and south of Runway 9R-27L, (3) the need for a new air carrier runway at South Field, and (4) the need for additional remain overnight (RON) aircraft parking.

As described in Chapter 4, FAA AC No. 150/5070-6A, Chapter 6, discusses requirements, analysis, and concepts development. Although Chapter 6 of the AC does not directly address the airfield, it does provide planning principles and guidance. This chapter of the master plan is based on the planning principles and guidance contained in FAA AC No. 150/5070-6A.

5.2 Airfield Simulation, Potential Improvements, and Results

This section provides the background on the airfield simulation undertaken for this master plan, describes potential airfield improvements that minimize congestion identified in the simulations (assuming the aircraft operations anticipated in 2010, as developed in Chapter 3), and finally presents the anticipated reduction in delay and congestion that would follow if the potential airfield improvements were implemented.

5.2.1 Background

A detailed airfield simulation model was prepared using the 2010 aircraft operations forecasts presented in Chapter 3. ATAC Corporation prepared the simulation using Simmod PRO, which is an ATAC Corporation deriv-ative of the FAA’s Airport and Airspace Simulation Model or SIMMODTM. Simmod PRO simulates the movement of each individual aircraft on the airfield and in the airspace over a 24-hour day. For each aircraft in the flight schedule, Simmod PRO can track almost any measurement of interest, such as runway occupancy time, delay in queue, taxi-in time, taxi-out time, taxi routes, etc.

The following summarizes the key assumptions used in the airfield simulation model:

1. A new 21-gate unit terminal (for 50 total gates at OAK) would be constructed parallel to Taxiway B (generally between Taxiway B2 and Taxiway S) and would be used exclusively by Southwest Airlines (all other airlines would operate from Terminals 1 and 2);
2. The cargo building (now housing UPS and belly cargo) would be relocated to the northern part of the Oakland Maintenance Center site;
3. A new taxiway parallel to Taxiway B between Taxiway B2 and Taxiway T would be constructed;
4. Air cargo and general aviation aircraft would taxi to/from and park at existing air cargo and general aviation facilities, as appropriate, except for the relocated cargo building described above (i.e., no new air cargo or general aviation facilities are assumed);
5. General aviation touch and go operations would occur on Runway 27L (as most do today);
6. Between 12 and 15 daily departures on Runway 29 would start from Taxiway U, as opposed to using the full-length of Runway 29 as accessed from Taxiway W (similar to the percent that use Taxiway U today);
7. Helicopter operations are not included in the simulation model because they have virtually no impact on taxiway and runway capacity and delay at OAK;
8. Only west plan (landings and take-offs to the west on Runways 27L, 27R, 29, and 33) and visual flight rule (VFR) weather conditions are modeled (i.e., southeast plan and instrument flight rule (IFR) weather conditions are not simulated);
9. Only OAK’s airspace is modeled (i.e., interactions with San Francisco International Airport’s airspace are not modeled); and
10. Aircraft comply with all noise abatement procedures at OAK (i.e., large turboprops and corporate jets must taxi to South Field for take-off, except those that are capable of departing on Runway 33), similar to today with a 98% compliance rate.

Additional background on Simmod PRO and discussions of other key modeling assumptions are presented in Appendix I, which contains a technical report prepared by ATAC Corporation.

Although the entire airfield was simulated (including North Field), all congestion points in 2010 occurred at South Field (Runway 11-29 and associated taxiways). Figure 5.1 shows the total number of operations (take-offs and landings) on Runway 11-29 by time rolling throughout the 2010 planning day (purple line). It also shows the number of take-offs / departures (blue line) and landings / arrivals (green line). Runway 11-29 accommodated these aircraft operations with an increase in delay, particularly in the morning departures peak between 7 AM and 9 AM. In the morning departures peak, the average queue delay per aircraft exceeded 20 minutes. For the remainder of the day, the average queue delay per aircraft was less than 10 minutes. Queue delay is the delay experienced while waiting in line to depart Runway 29. The queue extended from Runway 29, back along Taxiway W, up Taxiway U, almost to the east apron near the Terminal 2 extension. For comparison purposes, the average queue delay per aircraft was estimated to be less than 10 minutes during the morning departures peak, with only occasional queue delays averaging less than a few minutes for the remainder of the day, in August 2005. The potential airfield improvements described in the next section are designed to minimize this congestion and reduce the queue accessing Runway 29 and the associated delay.
5.2.2 Potential Airfield Improvements

Two potential improvements to minimize the queue delay accessing Runway 29 in the morning departure peak were examined. The first potential improvement would be a new taxiway parallel to Taxiway W between Runway 29 and Taxiway U and parallel to Taxiway U between Taxiway Y and Taxiway W, as shown in green on Figure 5.2. The facilities shown in blue on Figure 5.2 (a new taxiway parallel to and east of Taxiway B, potential terminal development Concept 2C, and relocation of the cargo building) are assumed for the purposes of the simulation modeling. These new access taxiways would allow for additional aircraft queuing distance and minimize the possibility that the morning departure queue would extend to the east apron. More importantly, dual taxiways feeding Runway 29 would allow air traffic control to optimize departure sequencing to take full advantage of existing runway capacity. Generally, aircraft turning in the same direction after takeoff (e.g., two aircraft heading to Southern California) require more spacing between consecutive departures than aircraft turning in different directions (e.g., one aircraft going to Southern California and a second aircraft going to the east coast). Therefore, these taxiways would allow ATC to queue aircraft with different departure turns in two distinct queues and allow them to depart alternately, minimizing delay. Today, the only opportunity to “jump” the queue to achieve improved sequencing is for an aircraft to access Runway 29 from Taxiway U (resulting in a shorter runway length).

The second potential improvement would be a new high-speed exit from Runway 29, between existing high-speed exits at Taxiways V and Y, as shown as Taxiway Z on Figure 5.3. As with Figure 5.2, the facilities shown in blue on Figure 5.3 are assumed for the purposes of the simulation modeling. Based on aircraft breaking performance estimates, only about 13% of the 2010 aircraft fleet mix would be able to exit Runway 29 at Taxiway V (i.e., the aircraft, after landing, is going too fast to exit here). Meanwhile, the high-speed exit at Taxiway Y is too far down the runway (i.e., aircraft are going quite slow by the time they arrive at Taxiway Y and then because of its geometry, it takes aircraft farther away from the terminal area increasing taxi times). Port staff and airfield consultants simulated a new high-speed exit between Taxiways Y and V, about 700 feet east of Taxiway Y.

Figures 5.2 and 5.3 contain relevant planning considerations associated with each potential airfield improvement. It is important to note that these two taxiway improvements are independent of one another and a potential future terminal. That is, each one individually (without the other one) would reduce airfield congestion and delay, as summarized below. Moreover, these two improvements (either one or both) would also reduce airfield congestion and delay, even if a new terminal is not pursued.

5.2.3 Airfield Simulation Results

The purple line on Figure 5.4 shows the average queue delay per aircraft by time of day in 2010 on the existing airfield (i.e., with no airfield improvements), assuming the master plan flight schedule developed in Chapter 3 and contained in Appendix H. Queue delay is experienced while waiting in line on Taxiways W and U to access Runway 29 (during west plan). In August 2005, the average queue delay per aircraft was estimated to be less than 10 minutes during the morning departures peak (between about 7 and 9 AM), with only occasional queue delays averaging less than a few minutes each for the remainder of the day. In 2010, the average queue delay per aircraft jumps to about 20 minutes during the morning departures peak. Although a 20-minute average delay during the peak hour in 2010 may not cause the airlines serving OAK to change their flight schedules, it is severe enough to consider improvements to minimize it.

First, the potential Runway 29 access improvements (Figure 5.2) were simulated in the airfield simulation model. If this improvement was implemented, it is estimated that the average queue delay per aircraft would be reduced by up to 23% (over the entire planning day), and the average queue delay per aircraft in the morning peak hour drops from about 20 minutes to about 12 minutes (see the blue line on Figure 5.4).

Second, the new high-speed taxiway was simulated (Taxiway Z on Figure 5.3). Approximately 79% of the 2010 aircraft fleet mix would be able to exit here, as opposed to only 13% being able to exit at Taxiway V, reducing runway occupancy time upon landing by about 15% (because aircraft do not have to taxi all the way to Taxiway Y to exit Runway 29). Taxi time and distance is reduced by approximately 9%, saving the airlines fuel and providing a potential air quality benefit. Moreover, because landing aircraft would be able to exit the runway sooner, aircraft queued for departure can depart sooner. It is estimated that the average departure queue delay per aircraft would be reduced by up to 21% over the entire planning day, and the average queue delay per aircraft in the morning peak hour drops from about 20 minutes to just over 15 minutes (see the green line on Figure 5.4).

Taken together, these two potential taxiway improvements allow Runway 11-29 to operate more efficiently during the morning departures peak period. The average queue delay per aircraft in 2010 with both improvements is plotted by time of day on Figure 5.4 in red. The average queue delay per aircraft during the morning departures peak drops to about 10 minutes (from about 20 minutes with no improvements).

These potential improvements were discussed with the Stakeholder Advisory Committee. Although there were no strong objections to either potential improvement, the Committee did ask several questions about whether
these potential improvements increase the capacity of Runway 11-29. These types of improvements reduce delay during the peak period and allow the runway to operate more efficiently, closer to its maximum potential capacity (i.e., capacity limited by required FAA aircraft separation standards). Without these potential airfield improvements, the airlines would simply accept the delay, and some aircraft would not depart in the peak hour, but be delayed to the subsequent hour. Delay costs the airlines money and is inconvenient for airline passengers. The capacity of a single runway is fixed, given a fleet mix, arrival/departure schedule, and weather. In other words, in 2010, it is unlikely that the airlines would choose to add or cancel a flight or even change their flight schedule due to these potential improvements. Runway 11-29 can accommodate the anticipated 2010 flight schedule (with the associated assumptions, such as 21 additional aircraft gates) with some increase in delay (less with the two airfield improvements described above). Finally, it should be noted that these potential airfield improvements may improve air quality because aircraft would be idling in queue for a shorter duration on average.

Therefore, it is recommended that the Port further study both of these potential airfield improvements, including additional engineering, environmental, and economic feasibility studies.

5.3 Potential North Field Taxiway Improvement

Shown in Figure 5.5, a potential new taxiway at North Field, parallel to Runway 9R-27L, was also evaluated (but not simulated) as part of the overall airfield evaluation. This taxiway would improve safety by minimizing the number of runway crossings required for an aircraft that lands on Runway 27L (the longest runway at North Field) that needs to taxi to South Field (e.g., passenger airlines that land at North Field when Runway 11-29 is closed). For example, if an aircraft landed on Runway 27L and needed to taxi to South Field today, it would exit Runway 27L to the right at Taxiway J, cross Runway 9L-27R, taxi eastbound on Taxiway C, cross Runway 9L-27R, and then cross Runway 9R-27L, before proceeding southbound on Taxiway B to South Field, for a total of three runway crossings. With the potential new taxiway shown on Figure 5.5, aircraft landing on Runway 27L could make a left turn off the runway, taxi eastbound on the new taxiway to Taxiway B, and proceed to South Field without crossing any runways. It also provides a shorter taxi route for these aircraft. Although this taxiway does provide some benefits, it is not required and its benefits may not outweigh its costs (construction costs may be substantial due to poor soil conditions and drainage issues in this area).

Several members of the Stakeholder Advisory Committee from the City of San Leandro expressed concern that this potential new taxiway at North Field would make North Field more convenient for use by passenger and cargo airline aircraft parking at South Field. Because of the likely marginal benefit to cost comparison and because of concerns raised by the Stakeholder Advisory Committee, this potential taxiway improvement is not recommended for further study and development.

5.4 Potential North Field–South Field Taxiway Connector

A potential new North Field–South Field taxiway connection was analyzed to reduce taxi time and delays. The only existing connection is Taxiway B, which runs between Taxiway W at South Field and Taxiway C at North Field, and crosses Ron Cowan Parkway on a bridge. Taxiway B currently only allows one-way taxi flow (southbound or northbound) at any one time, with two bypasses provided on Taxiway R and Taxiway V. For example, if a FedEx aircraft landed on Runway 29 and received permission to taxi to the Metroplex, then a corporate jet taxiing southbound on Taxiway B to depart on Runway 29 would have to wait (e.g., north of Taxiway R) until the FedEx aircraft pulls into the Metroplex (clear of Taxiway B) before proceeding southbound on Taxiway B. Alternately, the northbound FedEx aircraft might have to hold on Taxiway V to allow the southbound corporate jet to bypass. Once the corporate jet is past Taxiway T, the FedEx aircraft could then taxi to the Metroplex on Taxiway B. All aircraft movements, including the use of Taxiway B and bypass issues, are directed by air traffic control tower personnel.

Figure 5.6 shows five potential new North Field–South Field taxiway connections, T0 through T4. Potential Taxiways T1 through T4 require a new bridge to be constructed over Ron Cowan Parkway (i.e., Ron Cowan Parkway would need to be depressed under any new taxiway connection between North Field and South Field). Other planning considerations are shown for each option on Figure 5.6.

Several members of the Stakeholder Advisory Committee expressed interest in minimizing taxi time and delays in order to encourage compliance with voluntary noise abatement procedures, which require corporate jets and large turboprops, which land and park at North Field, to depart from Runway 29 (taxing from North Field to South Field southbound on Taxiway B). Some Committee members were interested in minimizing head-to-head taxi events on Taxiway B, which require one aircraft to hold so another one can safely bypass it, which could discourage the use of Runway 29 if excessive delay is incurred due to this holding / bypassing. Further, some Committee members were interested in studying if any of these taxiways shorten the taxi distance and time between North Field and South Field (Runway 29), thereby encouraging compliance with the voluntary noise abatement procedures described above.

Using the airfield simulation for 2010 described above, it was determined that most head-to-head taxi events on Taxiway B occur south of Taxiway B1 (south of Ron...
Cowan Parkway) on South Field. These occur, for example, when a FedEx aircraft is traveling northbound on Taxiway B (after landing) to the FedEx Metroplex, while a cargo jet is taxiing from North Field to South Field for departure. The potential new taxiway parallel to Taxiway B between Taxiway B2 and Taxiway T, which would be required to support a new terminal in this vicinity (as simulated), solves the head-to-head taxi issues on Taxiway B, without the need for a new connection between North Field and South Field (and crossing Ron Cowan Parkway). For additional details on the airfield simulation results, see ATAC Corporation’s technical memorandum contained in Appendix I.

The second study was to determine if any of the potential North Field–South Field taxiway alternatives (T0 through T4) significantly shorten the taxi distance and time, up to about one minute (on average) on an otherwise almost 10 minute taxi (over almost 3 miles), or about a 10% reduction in taxi distance and time. Although this taxiway alignment would provide a slightly shorter taxi distance and time, it is unlikely that a time savings of just one minute over an otherwise 10 minute taxi would encourage additional compliance with noise abatement procedures. It was pointed out to the Stakeholder Advisory Committee that almost 98% of the corporate jets and large turboprops comply with the voluntary noise abatement procedures already, and those that do not are typically daytime flights.

In summary, a new taxiway parallel to Taxiway B between Taxiway B2 (i.e., south of Ron Cowan Parkway) and Taxiway T would reduce most head-to-head taxi events on Taxiway B, minimizing delay for aircraft taxiing between North Field and South Field. This taxiway also would be required to support a new terminal in this vicinity, if such a terminal is proposed and approved. However, a full new connection between North Field and South Field, as shown on Figure 5.6, does not appear to be warranted, at least in the near-term, as it does not significantly shorten taxi distance or time, and the head-to-head taxi events are solved with a new taxiway parallel to Taxiway B, as described above.

### 5.5 Potential New South Field Runway

Beyond 2010, Runway 11-29 will continue to experience increases in delay (although less if the two taxiway improvements described in Section 5.2.2 are implemented), as the morning departures peak continues longer into the morning and at other peak activity periods. Detailed simulation analyses were not performed beyond 2010; however, it is anticipated that delay on Runway 11-29 will increase so as to warrant additional runway capacity at South Field between 2015 and 2025.\(^{(1)}\) A high-level approximation of runway capacity and delay was prepared using the Annual Service Volume (ASV) methodology outlined in FAA AC No. 150/5060-5, Airport Capacity and Delay (see Appendix J). Because additional runway capacity at South Field will likely be required before the end of the long-term planning horizon in the master plan (2025), Figure 5.7 was prepared showing five potential new runways at South Field, one inboard (north) of existing Runway 11-29 (Runway I1) and four outboard (south) of existing Runway 11-29 (Runways O1, O2, O3, and O4). The graphic presents planning considerations outlining the benefits and issues associated with each runway. All of the potential new runways have considerable environmental issues associated with filling wetlands and San Francisco Bay, as well as financial issues (e.g., the outboard options are expected to cost several billion dollars).

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\(^{(1)}\) In accordance with various settlement agreements with the surrounding communities, the Port has agreed not to construct any new runways on any portion of North Field. The Port has also agreed not to realign, lengthen, widen, or strengthen the runways of accommodating larger or heavier aircraft on the existing runways at North Field; unless such improvements are necessary to maintain Runway 9R-27 as an alternate runway to Runway 11-29 or such improvements are necessary to comply with FAA standards. For details, please refer to the relevant settlement agreements.
Therefore, it is recommended that the Port not pursue a new South Field runway at this time due to environmental and financial constraints. However, it is recommended that the Port work with its regional partners (e.g., the Regional Airport Planning Committee, the San Francisco Bay Water Transit Authority) to continue discussions about the future demand and capacity of runways at Bay Area airports and possible alternatives. Providing additional runway capacity for the Bay Area should be discussed and decided by the entire region. For example, other options for providing additional Bay Area runway capacity could include air service development at other regional or military airports, or exploring the possibility of linking OAK and San Francisco International Airport with passenger ferry service (see discussion of ferry service in Section 4.6.5, which highlights some of the challenges associated with ferry service at OAK).

The Stakeholder Advisory Committee discussion about new runway capacity at South Field was mixed. Most members preferred not to discuss the need for new runway capacity in the long-term; others saw some potential aircraft noise reduction with the outboard runway options (Runways O1, O2, O3, and O4 in Figure 5.7).

5.6 Remote Remain Overnight (RON) Aircraft Parking

The need for future remote (off-gate, on-Airport) RON aircraft parking apron was evaluated. Remote RON aircraft parking demand at OAK is considerable. Because OAK is a west coast spoke (as opposed to hub) airport, many airlines want to park their aircraft overnight so that they can start the next day at OAK with an early morning departure (typically between 6 and 8 AM). Further, the largest airline at OAK, Southwest Airlines, has a crew base at OAK, increasing the number of aircraft needing to be parked overnight for early morning departures. It should also be noted that currently, Southwest Airlines does not fly their aircraft through the night (i.e., on red-eye flights), but parks them for maintenance and servicing. For the purposes of the master plan, remote RON aircraft parking apron is described in terms of area (acres), as opposed to the number of aircraft parking positions.

In February 2005, there were 26 acres of apron dedicated to RON aircraft parking, of which 21 acres was in use on any given night. After the Terminal 2 renovation/extension project is complete, there will be approximately 33 acres of apron dedicated to RON aircraft parking, of which 23 to 26 acres is anticipated to be required on any given night. As new aircraft gates are constructed at OAK, RON aircraft parking will continue to be required. However, less apron area per gate may need to be dedicated to RON, as more aircraft will be able to park overnight at aircraft gates (rather than on remote RON aprons). It is anticipated that additional gate construction would allow the gate-use intensity to decrease such that it will not be required to push an aircraft off a gate for a subsequent arrival (i.e., it can remain parked on the gate until its morning departure and the later arrival can use its own gate and also remain there until morning).

The first step to estimate future remote RON aircraft parking requirements is to develop appropriate planning factors. As of February 2005, between 0.8 and 0.9 acres of remote RON aircraft parking apron per aircraft gate is required depending on the number of aircraft gates that are also used for RON aircraft parking (90% vs. 70%, respectively). Based on RON aircraft parking data from McCarran (Las Vegas) International Airport (a large, west-coast airport with Southwest Airlines operations), the anticipated reduction in remote RON aircraft parking demand due to the availability of aircraft gates could result in requirements closer to 0.5 acres of remote RON aircraft parking apron per aircraft gate. Using this data, low (0.5 acres per aircraft gate), medium (0.8 acres per aircraft gate), and high (0.9 acres per aircraft gate) requirements are then calculated for the 2010 to 2012 timeframe (with 46 to 50 total aircraft gates) and 2025 timeframe (with 65 to 75 total aircraft gates). As shown in Table 5.2, the required area for remote RON aircraft parking apron ranges from about 23 acres to 46 acres in the 2010 to 2012 timeframe and from about 33 to 68 acres in the 2025 timeframe. The calculations summarized above are contained in detail in Appendix G.

Providing the required amount of remote RON aircraft parking will be challenging, as shown in Figure 5.8. All areas except Area 1 require wetlands to be filled/impacted. Providing remote RON aircraft parking in Area 1 will be challenging, because potential future terminal concepts in this area likely eliminate existing remote RON aircraft parking aprons. Planning considerations for each potential area are shown on Figure 5.8.

### Table 5.2

<table>
<thead>
<tr>
<th>Total RON Aircraft Parking (Acres)</th>
<th>Total Aircraft Gates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low¹</td>
</tr>
<tr>
<td>2010 to 2012</td>
<td>46</td>
</tr>
<tr>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>2025</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>

¹ Assumes the gate to remote RON aircraft parking area ratio will decrease in the future; ² Assumes existing gate to remote RON aircraft parking area ratio with 10% of gates not used for RON aircraft parking; ³ Assumes existing gate to remote RON aircraft parking area ratio with 30% of gates not used for RON aircraft parking.
Note: This graphic was prepared by the Port of Oakland as part of a master plan for Oakland International Airport. The master plan examined many possible ideas and planning concepts. This graphic is conceptual in nature and for planning purposes only (i) does not propose any particular course of action (it might represent an idea or concept that was discarded), and must be interpreted in the context of the entire master plan document.

Figure 5.1

Master Plan 2010 Forecast — Runway 29 Operations

Legend:
- Blue: Total Runway 29 Operations
- Green: Runway 29 Arrivals
- Red: Runway 29 Departures

Number of Take-offs and Landings

Time of Day (hr)
Planning Considerations

- Provides additional aircraft queuing area for Runway 29
- Provides greater aircraft sequencing capabilities
- Negates the need for midfield take-offs
- Impacts wetlands (approximately 1.6 Acres)
- Reduces Runway 29 queuing by 23% (39% with new high-speed exit taxiway)

Note: This graphic was prepared by the Port of Oakland as part of a master plan for Oakland International Airport. The master plan examined many possible ideas and planning concepts. This graphic is conceptual in nature and for planning purposes only. It does not represent any particular course of action (or all potential designs considered). It must be interpreted in the context of the entire master plan document.
Planning Considerations

- Reduces Runway Occupancy Time (ROT) (approximately 13%)
- Impacts wetlands (approximately 1.2 Acres)
- Decreases taxi distances and time (approximately 9%)
- Reduces airfield congestion
- Reduces Runway 29 queue delay by 21% (39% with new Runway 29 access)

Note: This graphic was prepared by the Port of Oakland as part of a master plan for Oakland International Airport. The master plan examined many possible ideas and planning concepts. This graphic is conceptual in nature and for planning purposes only. It does not represent any particular course of action. It might represent an idea or concept that was discarded, and must be interpreted in the context of the entire master plan document.
Airfield Queue Delay Comparison

Figure 5.4

Master Plan 2010 Forecast — Runway 29 Queue Delay Comparison

Note: This graphic was prepared by the Port of Oakland as part of a master plan for Oakland International Airport. The master plan examined many possible ideas and planning concepts. This graphic is conceptual in nature and for planning purposes only. It does not represent any particular course of action (it might represent an idea or concept that was discarded), and must be interpreted in the context of the entire master plan document.
Planning Considerations

- Minimizes runway crossings (improves safety) for aircraft landing at North Field that need to taxi to South Field (e.g., passenger airlines that land at North Field when Runway 11-29 is closed).
- Provides a shorter taxi route (distance and time) for aircraft landing at North Field that need to taxi to South Field (Runway 9R-27L is a designated air carrier alternate runway and used when Runway 11-29 is closed).
- Allows for more taxiway redundancy for extended maintenance activities (e.g., when Runway 11-29 needs to be overlaid in the future).
- Provides a more standard airfield layout for North Field.
- Difficult/expensive construction (e.g., poor soil and drainage conditions).

Note: This graphic was prepared by the Port of Oakland as part of a master plan for Oakland International Airport. The master plan examined many possible ideas and planning concepts. This graphic is conceptual in nature and for planning purposes only. It does not represent any particular course of action (it might represent an idea or concept that was discarded) and must be interpreted in the context of the entire master plan document.
This graphic was prepared by the Port of Oakland as part of a master plan for Oakland International Airport. The master plan assessed many possible ideas and planning concepts. This graphic is conceptual in nature and serves as a planning reference only. It does not propose any particular course of action (it might represent an idea or concept that was discarded), and must be interpreted in the context of the entire master plan document.

**Note:**

**San Francisco Bay**

Taxiway B is constructed south of the Oakland Maintenance Center site (to Taxiway T)

- May not be required if a new taxiway parallel to and east of Taxiway B is constructed south of the Oakland Maintenance Center site (to Taxiway T)

**Taxiway 0**

- Allows aircraft taxiing to South Field to bypass the departure queue for Runways 27L and 27R. (Improves airfield flow)
- Merges with Taxiway B north of the bridge over Ron Cowan Parkway, negating the need to construct a new (second) taxiway bridge over Ron Cowan Parkway
- Does not impact wetlands
- Provides a more standard airfield layout (compared to existing Taxiway A)
- May not be required if a new taxiway parallel to and east of Taxiway B is constructed south of the Oakland Maintenance Center site (to Taxiway T)

**Taxiway 1**

- Provides additional taxiway connection between North Field and South Field
- Improves airfield flow and minimizes head-to-head aircraft operations on Taxiway B
- Provides taxiway access to Central Basin
- Of Central Basin options (T1, T2, and T4), minimizes impact to wetlands (13 acres of wetland impact)
- Requires a portion of Ron Cowan Parkway to be reconstructed below grade with a difficult connection to Harbor Bay Parkway
- Provides relatively long taxi distances for corporate jets taxiing from North Field to depart South Field on Runway 29
- Moves taxiing aircraft closer to the City of Alameda
- Expansive construction (i.e., large amount of fill, grading, soil preparation, environmental/wetlands mitigation)
- May not be required if a new taxiway parallel to and east of Taxiway B is constructed south of the Oakland Maintenance Center site (to Taxiway T)

**Taxiway 2**

- Provides additional taxiway connection between North Field and South Field
- Improves airfield flow and minimizes head-to-head aircraft operations on Taxiway B
- Provides taxiway access to Central Basin
- Requires large wetlands impact (10 acres ±)
- Expansive construction (i.e., large amount of fill, grading, soil preparation, environmental/wetlands mitigation)
- May not be required if a new taxiway parallel to and east of Taxiway B is constructed south of the Oakland Maintenance Center site (to Taxiway T)

**Taxiway 3**

- Provides additional taxiway connection between North Field and South Field, connecting to Taxiway B and a new taxiway parallel to and east of Taxiway B
- Improves airfield flow and minimizes head-to-head aircraft operations on Taxiway B
- Requires minor wetlands impact (2 acres ±)
- Requires a portion of Ron Cowan Parkway to be reconstructed below grade with a difficult connection to Harbor Bay Parkway
- Provides relatively long taxi distances for corporate jets taxiing from North Field to depart South Field on Runway 29
- Merges with Taxiway B north of the bridge over Ron Cowan Parkway
- Does not impact wetlands
- Provides a more standard airfield layout (compared to existing Taxiway A)
- Requires a portion of Ron Cowan Parkway to be reconstructed below grade with a difficult connection to Harbor Bay Parkway
- Requires a portion of Ron Cowan Parkway to be reconstructed below grade with a difficult connection to Harbor Bay Parkway
- May not be required if a new taxiway parallel to and east of Taxiway B is constructed south of the Oakland Maintenance Center site (to Taxiway T)

**Taxiway 4**

- Provides additional taxiway connection between North Field and South Field
- Improves airfield flow and minimizes head-to-head aircraft operations on Taxiway B
- Provides taxiway access to Central Basin
- Requires large wetlands impact (27 acres ±)
- Expansive construction (i.e., large amount of fill, grading, soil preparation, environmental/wetlands mitigation)
- May not be required if a new taxiway parallel to and east of Taxiway B is constructed south of the Oakland Maintenance Center site (to Taxiway T)

**Potential North Field–South Field Taxiways**

- Provides taxiway access to Central Basin
- Of Central Basin options (T1, T2, and T4), minimizes impact to wetlands (13 acres ± of wetland impact)
- Requires a portion of Ron Cowan Parkway to be reconstructed below grade with a difficult connection to Harbor Bay Parkway
- Provides relatively long taxi distances for corporate jets taxiing from North Field to depart South Field on Runway 29
- Merges with Taxiway B north of the bridge over Ron Cowan Parkway
- Does not impact wetlands
- Provides a more standard airfield layout (compared to existing Taxiway A)
- Requires a portion of Ron Cowan Parkway to be reconstructed below grade with a difficult connection to Harbor Bay Parkway
- Requires a portion of Ron Cowan Parkway to be reconstructed below grade with a difficult connection to Harbor Bay Parkway
- May not be required if a new taxiway parallel to and east of Taxiway B is constructed south of the Oakland Maintenance Center site (to Taxiway T)
Planning Considerations

Runway 21 (700 ft. Inboard of Runway 11–29)
- Provides an increase in runway capacity during visual meteorological conditions (VMC)
- Allows for parallel, simultaneous operations if (1) divergent headings (15 degrees or more) are available and (2) the two departing aircraft do not need to turn in the same direction
- Allows one runway to be used for departing aircraft and the other runway to be used for departing aircraft, eliminating the need to preserve gaps for disparate operations
- Moves aircraft arriving or departing Runway 21 closer to residential areas in San Leandro or Alameda (respectively, in West Plan)
- Minimizes aircraft queuing distance available between terminal area and Runway 25, further congesting the terminal area
- Requires demolition or relocation of the Ground Run-up Enclosure (GRE)
- Possible wake turbulence concerns may limit simultaneous operations even in VMC
- Slightly easier/less expensive construction over existing Taxiway W (formerly temporary Runway 12–30)
- Does not require Bay fill
- Impacts wetlands (over 100 acres)

Runway O1 (800 ft. Outboard of Runway 11–29)
- Operates similar to potential Runway 11, without impacting aircraft queuing
- Moves aircraft arriving or departing Runway O1 farther away from residential areas in San Leandro or Alameda (respectively, in West Plan)
- Impacts Bay waters (over 150 acres in total impacted footprint)
- Impacts wetlands (over 40 acres)
- Expensive/difficult construction

Runway O2 (2,500 ft. Outboard of Runway 11–29)
- Allows independent (paired, simultaneous) operations (take-offs and landings) without wake turbulence concerns in VMC
- Allows for independent (simultaneous) arrivals to one runway and departures from the other runway in instrument meteorological conditions (IMC)
- Allows for staggered (not simultaneous) paired arrivals in IMC
- Provides a moderate increase in runway capacity in VMC and IMC conditions (and associated reduction in delay)
- May be able to use new GPS-based technologies to further improve runway capacity (e.g., allowing for paired, simultaneous arrivals)
- Possible airspace interaction issues with arrivals to San Francisco International Airport (SFO)
- Moves aircraft arriving or departing Runway O2 farther away from residential areas in San Leandro or Alameda (respectively, in West Plan)
- Impacts Bay waters (over 550 acres in total impacted footprint)
- Impacts wetlands (over 4 acres for taxiway connections)
- Expensive/difficult construction

Runway O3 (4,300 ft. Outboard of Runway 11–29)
- Allows for independent (paired) simultaneous operations in VMC and IMC with special radar equipment to monitor arriving and departing aircraft
- Provides a substantial increase in runway capacity in VMC and IMC conditions (and associated reduction in delay)
- Moves aircraft arriving or departing Runway O3 farther away from residential areas in San Leandro or Alameda (respectively, in West Plan)
- Possible airspace interaction issues with arrivals to SFO
- Impacts Bay waters (over 1,000 acres in total impacted footprint)
- Impacts wetlands (over 4 acres for taxiway connections)
- Expensive/difficult construction

Runway O4 (6,300 ft. Outboard of Runway 11–29)
- Operates similar to Runway O3, without special radar equipment
- Impacts Bay waters (over 1,000 acres in total impacted footprint)
- Impacts wetlands (over 2 acres for taxiway connections)
- Expensive/difficult construction

Runway 11–29 Extension
- Extends Runway 11–29 by 1,000 feet for a total length of 11,600 feet, including runway safety areas
- Would require associated taxiway extensions
- May require the runway be shifted 500 feet farther west to provide a full runway safety area on approach to Runway 29 (not shown)
- Does not increase runway capacity
- Allows large air cargo aircraft to depart with heavier loads on longer flights (e.g., air cargo flights to Asia)
- Provides limited or no benefit to passenger airline operations
- Somewhat expensive/difficult construction
- Likely does not provide enough benefit compared to probable costs

Note: This graphic was prepared by the Port of Oakland as part of a master plan for Oakland International Airport. The master plan examined many possible ideas and planning concepts. This graphic is conceptual in nature and for planning purposes only. It does not project any particular course of action. It might represent an idea or concept that was discarded, and must be interpreted in the context of the entire master plan document.
Planning Considerations

Area 1 (Terminal Area)
- Provides RON aircraft parking around the perimeter of taxiways, terminus, roadways, buildings, etc. (areas not used for other terminal area functions)
- Provides RON aircraft parking in proximity to gates, with no taxiway crossings
- Competes for area for other terminal area functions, such as automobile parking
- Area available for RON aircraft parking depends on future terminal concept (some concepts allow for more RON aircraft parking area, and some less)

Area 2
- Provides approximately 1.1 acres for RON aircraft parking
- Impacts wetlands
- Must use/cross active taxiways when repositioning aircraft between RON parking positions and gates
- May be affected by more development in future runway footprint and associated taxiway system

Area 3
- Provides approximately 20 acres for RON aircraft parking
- Impacts wetlands
- Must use/cross active taxiways when repositioning aircraft between RON parking positions and gates
- May be affected by longer-term need for new South Field runway and associated taxiway system

Area 4
- Provides approximately 28 acres for RON aircraft parking
- Impacts wetlands
- Impacts a major storm water drainage basin
- May allow the need to use/cross active taxiways when repositioning aircraft between RON parking positions and gates
- May be affected by need for new taxiways to improve access to Runway 29
- May not be feasible due to airspace height restrictions

Area 5
- Provides approximately 9 acres for RON aircraft parking
- Possible impacts to wetlands (depending on the exact size and shape of the area)
- Must use/cross active taxiways when repositioning aircraft between RON parking positions and gates
- May impact/limit possible future expansion of Federal Express (Area 3 from graphic showing Potential Air Cargo Development Areas)
- North Field (not shown)
- Significant area available to develop RON aircraft parking
- Long reposition distances on taxiways between North Field and gates (inefficient for airline operations)
- May lead to excessive delay on Taxiway B

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