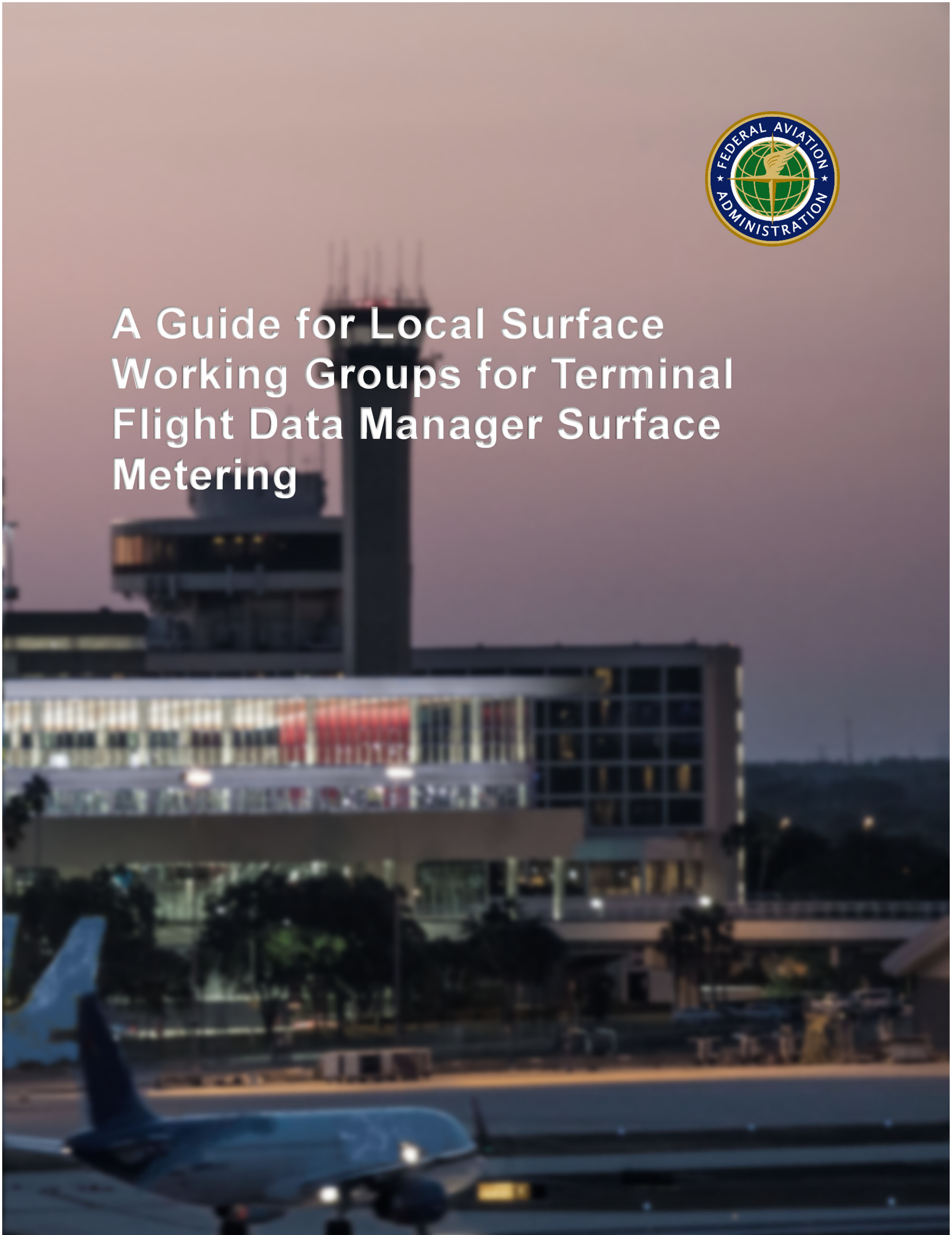
A Guide for Local Surface Working Groups for Terminal Flight Data Manager Surface Metering



Version History

Version	Date	Change Notes
1.0	04/19/2022	

Executive Summary

The Terminal Flight Data Manager (TFDM) program will roll out at airports across the National Airspace System (NAS) over the next few years. The upgrades that come with TFDM include electronic flight strips (EFSs) and systems integration in the Air Traffic Control Tower (ATCT), real-time tactical data exchange among flight operators, as well as surface scheduling and surface metering at the busiest airports. These tools are a significant opportunity to increase surface efficiency.

The improved surface efficiency has the potential to provide significant financial and environmental benefits to flight operators and airports—particularly from surface metering. However, for surface metering to be successful and for the stakeholders to achieve the benefits, participants on the local level must collaborate with the local ATCT and develop a shared understanding for how surface metering will be utilized, what the communications expectations are, and how the locally adaptable parameters will be set.

The National Aeronautics and Space Administration (NASA) and the Federal Aviation Administration (FAA) have run a surface metering prototype called ATD-2 at Charlotte Douglas International Airport (CLT) for the last few years in partnership with American Airlines. This field demonstration of surface metering, developed to operate largely how TFDM will operate, has validated the benefits the FAA predicts that TFDM will provide.

The TFDM Collaborative Site Implementation Team (CSIT) recommends local stakeholders create a group (or adapt an existing group) to establish and guide local collaboration for surface metering operations. These Surface Working Groups (SWGs) will collaborate with the ATCT both strategically about long-term plans, but also tactically during day-to-day operations and in post-metering analysis.

This Surface Working Group Guide intends to provide local stakeholders with advice and background in establishing their own groups to manage TFDM surface metering practices and parameters such as departure queue length. The local stakeholders include the ATCT, flight operators, the local airport authority, ramp operators, and anyone else that may be impacted by surface metering operations.

This guide includes suggestions for group organization and governance, and provides suggested roles and responsibilities for the participants. It also outlines suggested activities prior to, during and following TFDM implementation.

Prior to implementation, the FAA recommends forming the SWG and developing initial guidelines and communication expectations. This guide provides a comprehensive list of the locally adaptable parameters associated with TFDM, and what the expectations are for the stakeholders to provide input for each of these elements.

The “Crawl/Walk/Run” implementation approach lays out “step-by-step” guidance for how to get started with surface metering operations. This approach is based on the approach used during the NASA/FAA surface metering prototype, ATD-2.

Once TFDM Surface Metering is implemented, the FAA will produce metrics that the local SWG can use to measure performance and determine how and when to adjust the locally adaptable parameters.

Stakeholders will also be able to use this reporting to determine how and when to expand surface metering operations beyond initial periods.

Contents

1 Introduction

This Surface Working Group (SWG) Guide is intended for local stakeholders at airports in the United States that will be implementing Terminal Flight Data Manager's surface metering capability, also known as Surface Collaborative Decision Making (S-CDM).

This guide was compiled by TFDM's Collaborative Site Implementation Team (CSIT), which is the liaison between TFDM's non-FAA stakeholders and the TFDM Program Office.

The CSIT is tasked with engaging TFDM stakeholders and helping them prepare for implementation. As a part of this effort, the team provides virtual and in-person orientation briefings (when possible) to educate personnel at affected organizations about the changes that will come with TFDM implementation and how the system will work.

Since every airport has unique operational features and challenges, TFDM is specifically adapted to each facility. The CSIT also works with non-FAA stakeholders (e.g. flight operators and airport authorities) to collect operational data that will be sent to the TFDM adaptation in preparation for implementation.

To ensure each site gets off to a good start preparing for TFDM implementation, the CSIT is planning four-day site visits at each of the 27 airports scheduled to receive TFDM surface metering. These site visits serve multiple purposes:

- Collect and validate information that TFDM engineers will use to adapt the system to that airport.
- Brief the local FAA Air Traffic Control Tower about the local stakeholder engagement necessary to ensure successful implementation of TFDM.
- Provide local stakeholders with an in-depth briefing of how TFDM will work at the airport
- Prepare local stakeholders to create a local surface working group or adapt an existing surface group, provide guidelines for what falls under the group's responsibilities with TFDM surface metering.

This SWG guide is intended as a complement to the Surface Working Group discussions that occur during the CSIT site visit.

Ahead of these site visits, the team will have already conducted some data collection activities. The data from these efforts may be reviewed during the site visit. This may include:

- Conducting operational surveys from the airport authority, ramp operator(s), station operations for flight operators, and Fixed Base Operators (FBOs)
- Developing maps of the of the Aircraft Non-Movement Area/Ramp into with standardized ramp segments and nomenclature
- Collecting gate assignment data and aligning each gate with a specific ramp segment

The work that the SWG conducts will build upon the information collected, and it may influence the decisions the group will make.

Since the primary audiences for this guide should have already received TFDM briefings, the CSIT assumes that readers will already have some understanding of the system. As such, we only provide brief overview of TFDM and how surface metering will work.

If you or a member of your organization has not participated in either a virtual orientation briefing, an in-person orientation briefing, or a TFDM CSIT site visit briefing, please reach out to CSIT@faa.gov for an invitation to an upcoming orientation, or to schedule an invidivual presentation.

Additional Resources

The CSIT has created a number of reference materials to help participants prepare for TFDM implementation. This volume exists as a complement to other TFDM CSIT publications:

- **The TFDM User Guide**: an operational walk-through of how TFDM will work, with explanations based on your role in the process.
- **The TFDM Data Operational User Guide (DOUG)**: a detailed look at the new System-Wide Information Management (SWIM)data feeds that will come with TFDM: TFDM Terminal Publication (TTP) and TFDM FOS Collaboration Service (TFCS).

These guide and additional resources are available on the Collaborative Decision Making (CDM) organization’s website: https://cdm.fly.faa.gov/?page_id=3152.

2 Overview of Terminal Flight Data Manager (TFDM)

Over the next few years, the Federal Aviation Administration (FAA) will implement the Terminal Flight Data Manager (TFDM) system at numerous airports around the National Airspace System (NAS).

There are four parts to TFDM:

Improved Electronic Flight Data

TFDM will provide an improved Electronic Flight Data (EFD) exchange and EFS in the tower to replace printed flight strips. This functionality will be integrated with Flight Plans for automatic updating.

Collaborative Decision Making for the Surface

TFDM will provide a surface manager with live data provided by Air Traffic systems/controllers and Flight Operators. The system will provide a surface metering capability, runway balancing, and other surface management tools, improving surface traffic flow management.

Traffic Flow Management

TFDM will enhance traffic flow management data integration with Time Based Flow Management (TBFM) and Traffic Flow Management System (TFMS) to enable airlines, controllers and airports to share and exchange real-time data. This will result in improved surface traffic management as well as improve the products produced by TFMS and TBFM.

Systems Consolidation

TFDM will replace multiple outdated systems in the National Airspace System through integration of their functionality into TFDM. This achieves technology modernization, improved data sharing and lower maintenance costs.

While the hardware for TFDM will only be installed in ATCTs, there are two new data feeds for non-FAA stakeholders such as airports and flight operators.

TFDM will be deployed in two configurations:

Configuration A will be the full suite of TFDM capabilities including EFS and Surface Metering. This configuration will be deployed to 27 facilities.

Configuration B will be most TFDM capabilities, but this configuration will not include the use of the advanced surface scheduling and surface metering capabilities. This configuration will be installed at a further 62 facilities.

In this guide, we focus on the collaboration that will be required at the local level to successfully implement TFDM Surface Metering, so that all stakeholders can achieve the predicted benefits.

To assist local coordination and to prepare sites and flight operators for implementation, the FAA has formed a Collaborative Site Implementation Team (CSIT) to act as a liaison between the TFDM program office and external stakeholders. The team's tasks include hosting orientations for airports and flight operators on how TDFM works, providing reference materials to guide local stakeholders in setting local parameters, and solving challenges in submitting new data elements.

2.1 TFDM Benefits

The benefits all stakeholders can gain from TFDM implementation are significant, and include the following:

For Flight Operators

- Improved schedule predictability/crew utilization
- Less taxi time/fuel burn (313 million gallons over a 20-year lifecycle)[1]
- Increased reliability of connections
- Aircraft may be held at gate or in the non-movement area instead of in a long departure line on the taxiway

For Airport Operators

- Reduced CO_2 footprint (3 million metric tons over a 20-year lifecycle)[2]
- Reduce engine noise
- Improved predictability
- More balanced use of airport resources

For Air Traffic Control

- Automatically updated flight plans and electronic flight strips
- Easier rescheduling
- Fewer aircraft in the movement area and departure queue
- Improved surface situational awareness at the TRACON, ARTCC, and Command Center
- Improved safety—less heads down time

For the Flying Public

- Improved predictability
- Fewer delays
- More reliable flight schedules
- Improved passenger satisfaction

NASA and the FAA have conducted a surface metering prototype at Charlotte Douglas International Airport (CLT) for the last few years called ATD-2, in partnership with American Airlines. This field demonstration of surface metering, developed to operate largely how TFDM will operate, has validated the benefits the FAA predicts that TFDM will provide. For more information on the results from ATD-2, please reach out to the TFDM Collaborative Site Implementation Team at CSIT@faa.gov or visit https://aviationsystems.arc.nasa.gov/research/atd2/index.shtml.

[1] These data were developed for the TFDM program office and used for the FAA initial investment decision.
[2] Ibid.

2.2 About TFDM Surface Metering

TFDM will provide a departure scheduler with live data provided by Air Traffic systems/controllers and Flight Operators. The system will provide a departure metering capability, runway balancing and other surface management tools, which will improve surface traffic flow management.

Along with these capabilities, the FAA will utilize two new SWIM (System Wide Information Management) data feeds: TFDM Terminal Publication (TTP) and TFDM FOS Collaboration Service (TFCS). These feeds will provide flight operators and airports with significant flight data from the FAA. The FAA is also requesting additional data elements from both Flight Operators and airports that will enable TFDM to build surface schedules and give all stakeholders increased situational awareness.

With this additional data and tools, TFDM aims to reduce surface congestion by metering flights' arrival into the Aircraft Movement Area (AMA).

Some important terminology associated with TFDM surface metering:

EOBT (Earliest Off Block Time)
Earliest time a Flight Operator plans to push back or taxi from its parking stand for departure

TOBT (Target Off Block Time)
TFDM-provided target time to push back from a gate or taxi from parking stand for a flight to make its movement area entry time

TMAT (Target Movement Area entry Time)
TFDM-provided target time for a flight to enter the movement area, within a variable window, during a surface metering program in order to maintain the target queue length

The TFDM system will build a surface schedule, including estimated take-off time, based on surface situational data, restriction information, and intent data submitted by Flight Operators (e.g., the EOBT). TFDM's scheduler will constantly review projected traffic for potential congestion based on the predicted demand. When the projected demand exceeds target queue lengths, TFDM will recommend a surface metering program to the Traffic Management Controller (TMC) in the FAA tower.

The traffic manager will have the option to affirm, defer, or decline the proposed Surface Metering Program (SMP). Local stakeholders should receive notifications through pre-determined channels when an SMP is affirmed, deferred, or declined.

Once the TMC affirms an SMP, the TFDM system will begin issuing TMATs via SWIM. The TMATs are designed to maintain a specific departure queue length entered into TFDM.

Every flight scheduled to depart within a surface metering program will receive a TMAT. Some of those flights may receive a TMAT that would put them in the movement area slightly later than they would be if they departed without surface metering.

A flight abiding by its assigned TMAT may hold at the gate or stay in the ramp area. However, the system is designed not to impact any flight's "wheel's off" time. Any time spent holding at the gate or in the ramp area is time the aircraft is not sitting in a queue on a taxiway.

3 Getting Your Surface Working Group (SWG) Started

For surface metering to provide the benefits to users, the local stakeholders should have a general understanding of how and when surface metering will operate at their facility. Since TFDM is locally adapted, facility stakeholders have a significant role in deciding how it will work, which is why the FAA recommends the formation of a local working (or adaptation of an existing group) to be a consultative group for TFDM surface metering.

For all stakeholders to achieve the predicted benefits, each party will have roles to fill. These include:

- Participate in local agreements for surface metering governance
- Develop processes for data submission and retrieval
- Provide accurate data (EOBTs)
- Expectations for compliance with TMATs
- Participate in review of operational metrics, such as EOBT and TMAT compliance, and SMP efficiency

The FAA maintains parameters within TFDM such as departure queue length, but some we expect the ATCT will collaborate with local stakeholders to determine different parameters for different conditions, and how coordination will occur for surface metering programs.

3.1 The Purpose of the Surface Working Group (SWG)

While the FAA ATCT will operate the TFDM technology, it is the FAA's expectation that local non-FAA stakeholders will actively participate in conversations and provide operational input into how surface metering will operate.

Your facility may already have a group that meets to discuss surface issues. If so, it may be appropriate for the stakeholder responsibilities associated fall under that group's auspices.

The CSIT recommends a two-tiered SWG organization:

- An SWG Steering Group
  - Senior managers of each stakeholder
  - Signs any Letters of Agreement (LOAs) and sets policy
- An SWG Tactical Team
  - Operational leads for each stakeholder
  - Collaborates to manage SMP performance

The overall role of the SWG is to collaboratively manage surface metering performance at the airport. This can include some of the following:

- Collaborate on SMP initiation, execution, and termination guidelines
- Collaborate on key TFDM/SMP adaptable parameters, such as "Target Queue Length." See Section 3.1 of this document for the full list of adaptable parameters
- Collaborate on procedures for tactical management of SMPs

- Periodically review SMP performance and adjust guidelines, parameters, and/or procedures as necessary to improve efficiency

3.2 Recommended SWG Participants

Any party who has a role in getting a flight from the gate to the end of the runway has a role to play in the Surface Working Group. The ATCT will have overall management of the TFDM surface metering functionality and have the hardware. However, we expect the ATCT to work with other stakeholders to determine certain parameters, monitor performance, and agree on typical surface metering scenarios.

The FAA suggests including all those who may be affected by surface metering to participate in the surface working group. How each facility implements the group will be locally determined.

The FAA proposes the FAA include the following, but not necessarily limited to:

- FAA ATCT
- Flight Operators (degree of engagement may depend on facility presence)
- Ramp Operators
- Fixed Base Operators (FBOs)
- General/Business Aviation Operators
- Airport Authority

3.3 Proposed SWG Roles & Responsibilities

Below is a description of the groups that should play a role in the Surface Working Group at each facility. Organizations may find they play multiple roles, for instance flight operators or airports who also operate ramp towers.

Group	Role
Air Traffic Control Tower (ATCT)	• Operates TFDM • Initiates, executes, terminates SMPs, with input from SWG • Makes tactical SMP decisions • Participates in the SWG
Flight Operators	• Share surface and departure information with the ATCT through electronic data-sharing capabilities • Connect to TFDM SWIM feeds: TTP and TFCS • When a SMP is in effect, comply with assigned Target Movement Area-entry Times (TMATs)
Ramp Operator(s)	• Share surface and departure information with the ATCT through electronic data-sharing capabilities • Submit ramp status information via SWIM • When a SMP is in effect, comply with assigned TMATs

Fixed Base Operators (FBOs)	• As available, share applicable surface data, including departure information with the ATCT via the TTP SWIM data feed • When an SMP is in effect, comply with assigned TMATs
General/Business Aviation Operators	• As applicable, share departure information with the FAA ATCT through data sharing capabilities • When a SMP is in effect, comply with assigned TMATs
Airport Authority	• Connect to SWIM data feeds • Communicate airport operating conditions to other SMP participants as agreed upon by the SWG
All SWG Members	• Participate in post-SMP analysis, as applicable

3.4 Suggested SWG Documentation

Each facility will need to determine which type of documentation to apply to surface metering collaborative efforts.

CSIT recommends that any documentation include the following:

- Airport-specific agreement signed by members who have a stake or role in surface metering at the airport
- Agreed-upon roles and responsibilities for each Letter of Agreement (LOA) signatory organization
- A framework for SWG overall management of surface metering at the airport

Appendix C of this document contains a draft Letter of Agreement that facilities may adapt for their own use.

3.5 Recommended Communication among Local Stakeholders

Each airport will set the communication expectations that works best for SWG participants. Some factors to consider when determining communication methods and practices for your facility are:

- Expected communication when stakeholders are notified locally of upcoming SMPs via TTP
- How SMPs fit into the currently occurring strategic/tactical planning
- Any differing communication expectations for non-typical SMP activity (e.g. unusual timing)
- Acceptable communication methods
- Expected communication cadence for SMP review

At the beginning of implementation, we expect the SWG would interact frequently during the earlier stages of surface metering implementation. The group should establish routine collaboration, with frequency and participation levels determined at the local level. For reference, during the NASA ATD-2 prototype, SWG meetings occurred bi-weekly.

4 Preparing for TFDM Implementation

As TFDM implementation approaches, there are some activities that will occur at each facility in preparation:

4.1 FAA Stakeholder Activities

Prior to implementation of the TFDM system at an airport, the FAA will engage in several key activities, including **training**, **local adaptation development**, **and local procedural development**. The FAA will also perform **system and interface testing** to ensure surface metering functions and data exchange capabilities are performing as expected. Most of this activity will occur in the FAA ATCT.

4.2 Non-FAA Stakeholder Activities

Leading up to the implementation of the TFDM system, non-FAA stakeholders should determine necessary **internal business and system changes necessary for surface metering**. This includes establishing practices for determining and submitting data, expected involvement in **pre-implementation local activities**, and **utilizing available FAA interface testbeds** to ensure connectivity and data submission.

4.3 Joint Stakeholder Activities

Collaborative Site Implementation Team (CSIT): Approximately 12-18 months prior to the implementation of TFDM at an airport, the FAA will engage with the local community via CSIT meetings. These multi-day meetings are meant to bring local stakeholders, both FAA and non-FAA, together to begin discussions on the local needs and specificities for the implementation of the TFDM system and to prepare for the use of surface metering.

The CSIT will reach out to each facility to provide initial virtual orientations, begin data collection for site adaptation, and to plan the site visits.

Establish local collaboration & SWG guidelines: Collaboration between stakeholders prior to, during, and following surface metering usage is critical to the successful realization of surface metering benefits by all stakeholders.

SWG activities for TFDM implementation may include:

- SWG members become familiar with surface metering processes and procedures
    - The CSIT Site Visit and the TFDM User Guide will provide reference materials
- Tailor any documentation to local airport operational realities
    - Agree upon group membership
    - Determine roles and responsibilities to reflect current/anticipated roles
- Coordinate documentation and required signatures
- Collaborate on initial surface metering adaptable parameters (see Section 3.3.1)

4.5 Setting Expectations for Surface Metering Implementation: The Crawl/Walk/Run Approach

TFDM surface metering will function largely dependent upon how each site operates. The technology takes time to adapt to each site as it learns and builds operational history. The SWG at each facility will need to work collaboratively to understand the adaptable surface metering parameters and run various scenarios to establish the surface metering "sweet spot."

The sweet spot may vary by demand, runway configuration, and other environmental factors. TFDM and CSIT advocate for a "Crawl/Walk/Run" approach, and the practical experience gained at CLT during NASA's ATD-2 field demonstration validates that approach.

The Crawl/Walk/Run approach is a staged rollout process that begins with trial runs. Surface metering programs then increase as all stakeholders become comfortable with each stage. The form this will take will depend on each group's preferences. We anticipate it could take several months to develop surface metering protocols with increased efficiency across multiple departure banks—both as TFDM learns and adapts to the facility and as the participants become more comfortable with surface metering.

Step One: Form the Surface Working Group

While surface metering practices are ultimately the responsibility of the ATCT, successful surface metering needs active participation and collaboration from all the affected local stakeholders, FAA and non-FAA. As such, your local SWG should include a working group. CSIT advises including representatives from every organization that may be impacted by surface metering in the SWG.

Step Two: Evaluate Locally Adaptable Parameters

Once the SWG is established, meet as a group to start reviewing the adaptable TFDM parameters and how their relation to current traffic patterns. See **Section 4.4** for a full list of these parameters.

Step Three: Begin Testing Parameters

Run at least one "test" SMP to determine if the parameters the SWG has chosen are a good starting point. In the ATCT, the controllers can also use the "what if" scenario planning that is a part of the TFDM system to narrow down a starting point for your parameters.

1. Choose one departure push to run your test scenario
2. Run a test SMP
3. Meet as a group to evaluate how that scenario would have affected real-world operations
4. Adjust parameters to refine potential performance
5. Run more test scenarios

Step Four: Plan First “Live” Surface Metering Effort

Choose the scenario for the first “live” surface metering test and make an initial estimate for the adaptable parameters. Determine the notification procedures for surface metering status updates. Schedule pre- and post- metering SWG meetings to set test expectations and review performance.

Step Five: Run First “Live Surface Metering Program

Run the surface metering program during one agreed upon departure push using the parameters refined by the test scenarios. During live operations, ATC may adjust parameters such as Target Queue Length as necessary.

Step Six: Review First Live SMP Performance Data

The SWG meets to review SMP performance. Discuss adjustments to the adaptable parameters and schedule next SMP. Initially, you may only meter one departure push in a week until all parties are comfortable with all the processes.

Step Seven: Run, Evaluate, Repeat…

Repeat steps five and six, adjusting the parameters incrementally to develop increasingly favorable surface metering performance. Once the SWG and ATCT reach a level of comfort/confidence in the system, consider expanding surface metering to additional operations.

CSIT recommends expanding surface metering incrementally until the operational results are favorable across the schedule.

Assumptions: Flight and ramp operators are onboarded with SWIM and are able to send and receive TFDM and TFMS data.

5 Continuing Surface Metering Operations

Following the implementation phase, surface metering will become an expected part of operations. Each stakeholder has a role to play in ensuring improved and continuing efficiency from surface metering.

The FAA anticipates users will become more comfortable new data and new processes—leading to more efficient internal procedures.

5.1 Post-Implementation SWG Responsibilities

As recommend in the "Crawl/Walk/Run" section, when TFDM surface metering is first implemented, the FAA projects that the SWGs will be in contact on a frequent basis. We expect that each group will meet either weekly or bi-weekly as necessary to review parameters, operational use of SMPs and metrics reporting.

- SWG Tactical Team activities
  - Communications during SMP execution: phone or group chat as previously determined
  - SWG Tactical Team meets as needed during implementation, then at an agreed-upon cadence. Potential topics include:
    - Review SMP performance reports
    - Discuss areas for performance improvement
    - Adjust SMP parameters or procedures as needed
    - Share lessons learned
- SWG Steering Group activities:
  - Semi-annual meeting to review documentation
  - Strategic review of surface metering performance over time
  - Signatories on any documentation updates

5.2 Surface Metering Use Cases

The following use cases are "step-by-step" scenarios depicting how we envision surface metering will occur.

5.2.1 Surface Metering Use Case #1

It is a weekday morning at ABC International Airport. The weather is clear with light winds and the morning departure bank begins at 0745.

ABC International Airport has two ramp towers: One run by *AirXYZ* and one run by *ABC Airport Authority*.

ABC Airport Surface Working Group has agreed upon a +/- 5-minute adherence window on the TMATs. They have also agreed on a 15-minute Static Time Horizon (STH) for surface metering times to prevent last minute gate holds.

0715

Based on EOBTs provided by the flight operators and predicted queue length, TFDM recommends to the FAA ATCT that a surface metering program begin at **0800** and run until **0840**.

The target queue length for this departure bank is **11**, and the SWG has agreed that a surface metering program during the first push of the day is standard and no special notifications are required.

The TMU affirms TFDM's recommendation and the system starts assigning TMATs to affected flights. The tower notifies the local stakeholders as agreed by the SWG, and a notification is sent over the SWIM/TTP feed.

Based on the anticipated queue length, ramp tower and flight operator receives TMATs over their SWIM/TTP data feed calculated from the EOBTs provided.

AirXYZ has submitted an EOBT for flight *XYZ222* of 0803 and receives a TMAT of 0817. TFDM calculates that it will take approximately 11 minutes to transit the ramp, based on gate location. *XYZ222* receives a TOBT of 0806.

Flight #	EOBT	TOBT	TMAT
XYZ222	0803	0806	0817
XYZ717	0809	0813	0825

Flight *XYZ717* has an EOBT of 0809. TFDM assigns at TMAT of 0825 and a TOBT of 0813, with 12 minutes for ramp transit time.

0745

With the 15-minute STH, surface metering times begin locking down in a rolling window. At 0748, *XYZ222*'s TMATs are fixed.

Flight #	EOBT	TOBT	TMAT
XYZ222	0803	0806	0817
XYZ717	0820	0822	0834

At 0750, the *AirXYZ* ramp tower is notified that a couple of passengers on XYZ717 have a slightly delayed incoming flight and the airline opts to hold the flight 10 minutes to prevent a missed connection.

Via their SWIM/TTP connection, the ramp tower updates *XYZ717*'s EOBT to 0820. TFDM recalculates the TOBT and TMAT based on the updated EOBT and transmits the new times.

0800

Surface metering officially begins.

XYZ222 pushes back at 0806, meeting the TOBT. They move slightly more swiftly through the ramp than anticipated, and reach the AMA at 0816. Based on the 5-minute adherence window, they are TMAT compliant.

XYZ717's connecting passengers take slightly longer than anticipated, so the flight doesn't push back until 0824. It also takes slightly longer to cross the ramp, so they arrive at the AMA at 0838. Again, based on the buffer, they are still complying with their TMAT.

0840

The surface metering program completes.

5.3 Surface Metering Performance Reporting

Regular review of the metrics associated with surface metering is an important component of making the system work for all stakeholders. The key to successful implementation is timely and substantive review and an honest conversation of what occurred in a previous program that improve in the future.

The FAA is developing reporting specific to surface metering, but we anticipate the following metrics will be included:

- Metering Time (TMAT) compliance listed by flight operator
- Metering Ready Time compliance listed by flight operator
- Surface Metering details for the previous period, including:
  - Affirmed time
  - Start time
  - End time
  - What was metered (runway or configuration)
  - Target Queue length
  - Number of affected flights
  - Average metering hold
  - Maximum metering hold
- Historical tracking of metering holds
- Hourly traffic trends
- TMAT and TOBT changes/updates by call sign
- SMP recommendations, affirmations, deferrals, and rejections

The review schedule will largely depend on each facility's preferences, but as we indicate in the "Crawl/Walk/Run" scenario in Section 3.4, reviewing often and making adjustments as necessary.

Appendix B of this document contains a notional Surface Metering Performance Report that CSIT submitted to the FAA Performance Analysis Group charged with developing a surface metering performance data analysis tool. This guide will be updated to provide more information on surface metering performance once it is available.

6 Surface Metering in Practice

6.1 Surface Metering Data from NASA's ATD-2 Field Demonstration

In 2017, NASA and the FAA began a field demonstration of surface metering at Charlotte Douglas International Airport in North Carolina. The project, ATD-2, was developed to demonstrate the surface metering concept TFDM is based upon. In concert with American Airlines, who operate a majority of the flights into the airport and operate the two ramp towers, surface metering demonstration began in November of 2017.

The following table shows how surface metering was initiated in a phased approach by departure bank, starting in November of 2017 and evolving to include multiple banks through 2021.

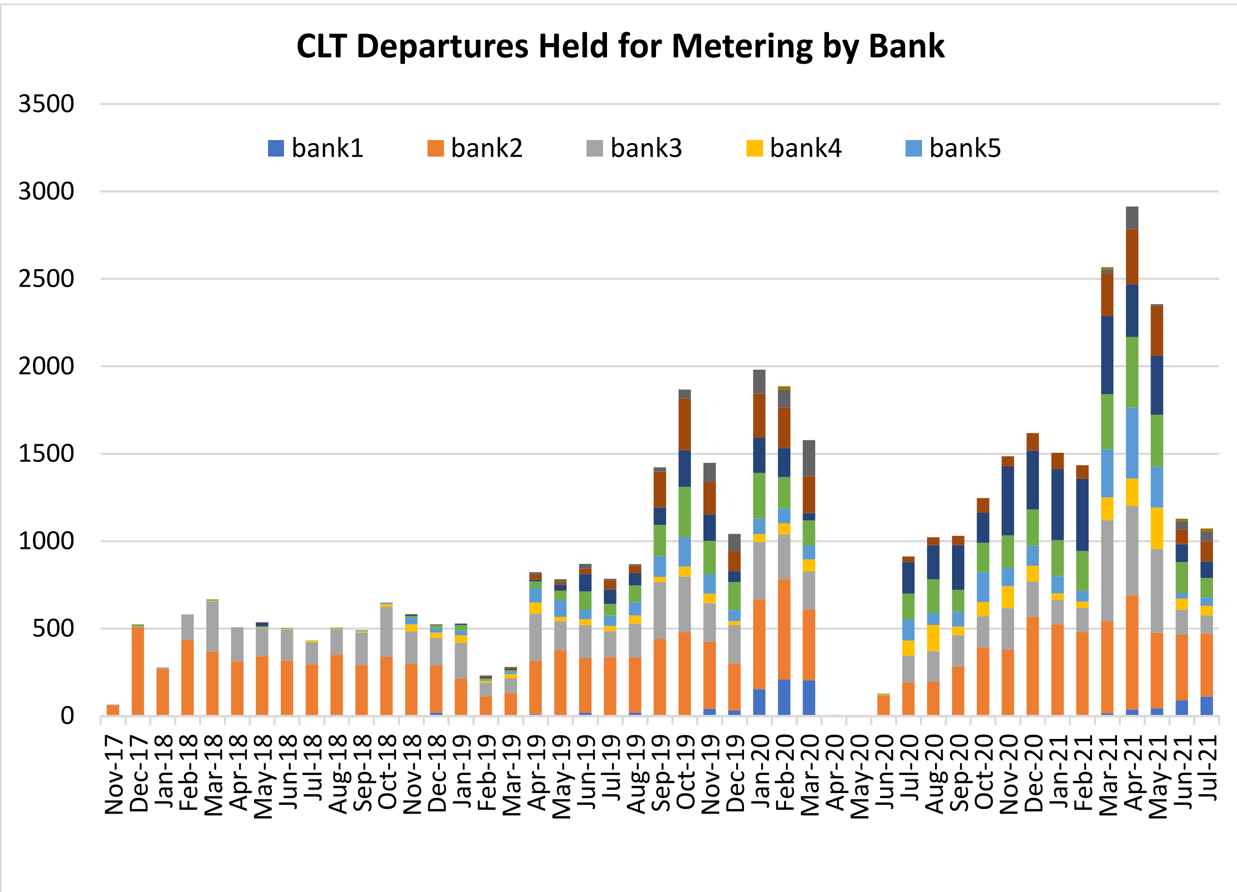


Figure 1 Courtesy of NASA

As we have described in the "Crawl/Walk/Run" scenario in Section 3.4, NASA/FAA began implementing surface metering slowly in November of 2017. American Airlines requested the effort start with "Bank 2," because that was among the busiest, and as it was early in the day was less likely to affect the rest of the flight schedule.

As shown in the graph, as the airport users (ATCT/AAL/Ramp tower) became more comfortable with metering procedures, the participants slowly increased the metering periods. First to "Bank 3," and then toward mid-2019 additional banks.

Airline schedule changes in September 2019 resulted in an increase in the number of flights assigned a metering hold. This was a result of increased demand to the runway during peak times causing longer runway queue lengths and associated queue waiting time.

As of January 2020, the system began automatically suggesting metering holds without human involvement. Essentially, this means that the system has continued to learn and understand operations well-enough to start recommending beneficial times for metering on its own.

The drop-off in metering in April of 2020 is a result of reduced flight due to the COVID-19 pandemic. As of July 2020, domestic operations recovered enough for the system to start making some metering recommendations again, and have only expanded as of then.

6.2 Lessons Learned in the Field

TFDM Surface Metering is not the first time surface metering will be implemented in the NAS. The Port Authority of New York and New Jersey (PANYNJ) has run surface metering at JFK International Airport for several years. Additionally, ATD-2 has run surface metering in a way similar to TFDM in Charlotte since 2017. We have collected these lessons learned from both JFK and CLT to provide as much guidance as possible for sites that will soon implement TFDM Surface Metering. These lessons are from a variety of stakeholders, including the PANYNJ, NASA, and the FAA.

We know that surface metering will be implemented differently at each site, so not all of the advice may apply, but hopefully the guidance will be helpful, overall.

From PANYNJ:

- Promote a collaborative environment—metering will only be successful if everyone buys-in to the process.
- Gather input from the airlines or ramp control is critical for success. Is metering creating gate conflicts?
- Meet regularly to discuss the operation and any issues that arise
- Determine if there is ramp space to meter aircraft? If not, where can they meter? Identify remote metering locations
- Large airports do not necessarily have plenty of room to meter aircraft. JFK is the perfect example large airport but they struggled to find metering location because of redevelopment work or construction
- Deicing locations are good remote metering locations
- Most airlines prefer the arrival utilizing a gate over a departure

From CLT ATCT:

- It is best if all airport stakeholders participate in the SWG. At every meeting, they should know and discuss what percentage of flights are hitting their EOBTs. Not for finger pointing, but to help identify shortfalls and figure out how to get that group up to par.

- Start with high parameters (such as a longer queue length). Just enough to trigger an SMP and see how it goes. This gets folks familiar with how surface metering behaves.
- When tweaking parameters make small changes and only change one parameter tool at a time. Example: If changing Queue Lengths, do not play with Runway Departure Rates (RDR) or Percentage in Queue rates. Make one change and run it for a while before making any other changes.
- Keep lowering the queue lengths until runways dry up, there is not enough taxiing demand to provide gate splits, or airlines say there are too many gate conflicts. One of those things should happen—which is a good sign you are getting close to good parameters. It makes sense run with those settings a few more times just to make sure the restrictive issue is still valid. It could have been bad data that day on that push that caused the initial constraint or possibly weather that caused that push to run a little differently.
- **EOBT accuracy is pivotal**. Plus or minus 5 minutes will probably be the standard. But experience shows that's not quite accurate enough. ATC gets the same window during EDCT programs when everything is crazy at the airport and we need to slow things down. Our insertion window into the overhead stream is 3 minutes total (-2 or +1 of release time). The closer they are to hitting their EOBT, the better/more accurate the decisions ATC will make, which equals better efficiency and more money saved for airlines.
- ATC will not notice the data is bad or too inaccurate beforehand. They will just notice things are not playing out how it should or how they expected based on what they are looking at in the Operations Timeline.
- For CLT, it is not a good idea to run an SMP when thunderstorms are disrupting the operation or in deicing conditions. Recommend making considerations when running SMPs during adverse conditions.
- SMP's do not typically work on pushes where the arrivals start hitting the runway threshold prior to departures taxiing out. Maybe at facilities that have vast amount of concrete to park arrivals with no gates might work. However, facilities that do not have that luxury, holding flights at the gate is the last thing anybody wants. That is the airlines scheduling their aircraft to get to that particular airport too soon.
- Local stakeholders need to know going in that this process will easily take 6 months to a year to figure out one push.

From the NASA ATD-2 Project Team

- It's important to get all the players in metering there for implementation discussions—at least give them the opportunity to participate
- Talk about how the other times/info are going to be managed across the stakeholders.
- It's important to be adaptable during implementation—be willing to try something and then change course
- When your battle plan doesn't hold up, modify
- Be prepared to do post-analysis. Regular engagement, especially early, is crucial.
- The system doesn't have to perform perfectly, but you need to be able to explain anomalies satisfactorily
- Keep expectations realistic—it will make a good day better, but a bad day is still a bad day
- Frequent exposure to the tool to help the stakeholders get comfortable

- Take baby steps—very slight gate holds at the beginning before expanding, one bank before expanding
- NASA/American/FAA chose to first meter bank 2 as it was early enough in the day that there was normally not much disruption to the airline schedule. Later in the day there are more thunderstorms that creates disruptions and so there is more uncertainty
- American drove the expansion to other banks because they became confident in the system

Appendix A—Glossary

Term	Definition
Airport Configuration	Information that includes the active runways and their use for arrivals and/or departures, nominal runway assignment rules (runway-fix mapping), airport surface holding areas, and associated nominal surface resource capacities and rates. Nominal values are stored in the adaptation and are used for planning purposes such as after a configuration change has been scheduled or during what-if modeling. Upon implementing a configuration, nominal values are updated as needed to reflect current conditions. Final "called" capacities and rates (AAR and ADR), will be provided in real-time based on demand and meteorological information and collaboration with overlying facilities (TRACON, ARTCC, Air Traffic Control System Command Center (ATCSCC).
Airport Movement Area (AMA)	Airport Movement Area. Also referred to as the Active Movement Area.
Call for Release (CFR)	Wherein the overlying ARTCC requires a terminal facility to initiate verbal coordination to secure ARTCC approval for release of a departure into the en route environment.
Compliance	An indication of whether a flight has departed within a specified time frame of the assigned departure time (EDCT, Controlled Departure Time [CDT]).
Demand	The set of flights that are scheduled to use the airport resources.
Departure Queue	When in multiple runway metering mode, all flights lined up for departure at the end of the runway or behind a flight lined up for departure at the end of the runway are in the queue for that runway. When in single airport metering mode, all flights in the movement area with intent to depart are in the departure queue.
Departure Target Queue Length	Number of departures in the departure queue considered optimal for the local airport during metering. The TMC/OS/CIC is expected to coordinate initial values with all stakeholders and maintains the authority to amend as appropriate to reflect current airport surface operations.
Earliest Off Block Time (EOBT)	Earliest Off Block Time data element provided by the Flight Operator.
Electronic Flight Data (EFD)	A TFDM capability that integrates data from multiple systems and stakeholders and provides an electronic means of coordination with Air Traffic.
Expect Departure Clearance Time (EDCT)	The runway release time assigned to an aircraft in a traffic management program and shown on the flight progress strip as an EDCT.
Flight Data	Flight data is any information related to flight. It will vary in the context such as ATCT, TRACON, ARTCC, ATCSCC, flight operator, flight operations center, and even customer service applications.

Term	Definition
Flight Operator	A person or organization responsible for operating an aircraft. Flight operator types includes airline, general aviation, military, cargo, and others. Flight operator may refer to any entity within the above types of organizations, such as a Flight Operations Center (FOC), dispatcher, or pilot-in-command.
In Queue	This is a flight state that indicates that a flight has taxied to its assigned runway and is awaiting take off clearance.
Metering Hold	Amount of time a metered flight is expected to wait before pushing back in order to meet its metering time. The difference between a flight's EOBT and TOBT.
Metering Time	TMAT.
Multiple Runway Queue Metering Mode	One of the options to model the surface scheduling and metering. In this mode, each departure runway is modeled as a single-server queue with service rate equal to each runway's RDR. Only the flights predicted to use that runway are included in the schedule.
Notification	Information provided to the user signaling the occurrence of an event or warning the user of a situation. The notification may be provided visually and/or aurally. Notifications are subdivided by urgency into alarms, alerts, and prompts.
Off Block	This is a flight state where a flight has pushed back from the stand.
Queue	The placement, integration, and segregation of departure aircraft in designated movement areas of an airport by departure fix, EDCT, and/or restriction.
Queue Length	"The number of flights in the departure queue at any given time. It applies to all kinds of metering resources such as runway or departure fix. The predicted queue length is the number of flights that are modeled to have entered the queue but not have departed the queue at any given time.
Ramp Transit Time (RTT)	The time for a flight to taxi from the stand or parking position to the spot or from spot to parking position.
Spot	A location on the airport surface at which aircraft transition between the active movement area and the non-movement area. Spots are frequently defined locations at the intersection between ramps and taxiways. In some situations, where the active movement area extends such that an aircraft immediately enters the AMA upon movement off the stand (a.k.a. parking gate), spots are not generally defined within local letters of agreement. However, for the purpose of TFDM, spots will be defined at these locations so that every aircraft transitions between the AMA and non-movement area
Static Time Horizon (STH)	Configurable amount of time from current time used to limit TMAT changes to flights. An important parameter in assigning TMATs to unscheduled flights.

Term	Definition
Surface Metering	This is a traffic flow management initiative to provide controlled pushback times in order to manage surface traffic to maintain constant pressure on runways and optimize departure queue lengths to gain efficiency for flight operators in terms of fuel consumption and time. This initiative is managed by the Terminal Flight Data Manager (TFDM) automation system.
Surface Working Group (SWG)	The group of airport surface stakeholders that comes together to collaborate about surface metering decision making and execution.
Taxi Time	Time required for an aircraft to move from one specified airport resource to another.
Taxiing	This is the flight state of an airplane that is moving under its own power on the surface of an airport.
Target Movement Area Entry Time (TMAT)	Target Movement Area entry Time. It is a metering time assigned to flights that are subject to any SMP except de-icing SMP.
Traffic Flow Management (TFM)	The regulation and organization of air traffic in order to expedite the stream of aircraft in a holistically efficient manner.
Traffic Management Initiative (TMI)	This is a generic term referring to actions taken by ATC personnel to manage air traffic, e.g., volume, spacing, routes. This term can refer to the following initiatives: Ground Stop (GS), Departure Stop (DS), Ground Delay Program (GDP), Airspace Flow Program (AFP), Collaborative Trajectory Options Program (CTOP), Miles-In-Trail (MIT), Minutes-In-Trail (MINIT), Capping, Tunneling, Metering (Departure, Arrival, and Surface), and APREQ (Call for Release). These actions are currently captured in the National Traffic Management Log (NTML).
Unscheduled Flight	A flight that becomes known to the system as a departure from current airport after a SMP is affirmed for a metering resource that the flight is predicted to use.

Appendix B—Notional Surface Metering Performance Report

The following is a notional surface metering performance report developed using actual data from the NASA ATD-2 Surface Metering prototype program at Charlotte Douglas International Airport.

Draft TFDM Surface Metering Performance Report

Charlotte (KCLT) / September 11, 2019

This draft TFDM Surface Metering Performance Report is under development using the demonstration TFDM Terminal Publication (TTP) feed published as part of the NASA Airspace Technology Demonstration 2 (ATD-2) currently occurring at Charlotte. It is being developed for eventual use with TFDM TTP and includes placeholders (grayed out fields) for data that are not published or are not published accurately in ATD-2 TTP. These fields will be included in the scorecard once TFDM TTP begins publishing data.

I. Metering Time (MT) Compliance by Carrier Group

Carrier Group	MT Compliant	MT Noncompliant	Not Metered	Total	Total (C+NC)
American	171	85	400	656	256
Cargo	0	0	10	10	0
Delta	14	6	13	33	20
Foreign	0	1	3	4	1
Frontier	0	0	7	7	0
General Aviation	2	17	28	47	19
JetBlue	0	2	3	5	2
Other	12	8	31	51	20
Southwest	0	1	8	9	1
Spirit	0	0	4	4	0
United	7	2	3	12	9
Grand Total	**206**	**122**	**510**	**838**	**328**

II. Metering Ready Time (MRT) Compliance by Carrier Group

Carrier Group	MRT Compliant	MRT Noncompliant	Not Metered	Total	Total (C+NC)
American					
Cargo					
Delta					
Foreign					
Frontier					
General Aviation					
JetBlue					
Other					
Southwest					
Spirit					
United					
Grand Total					

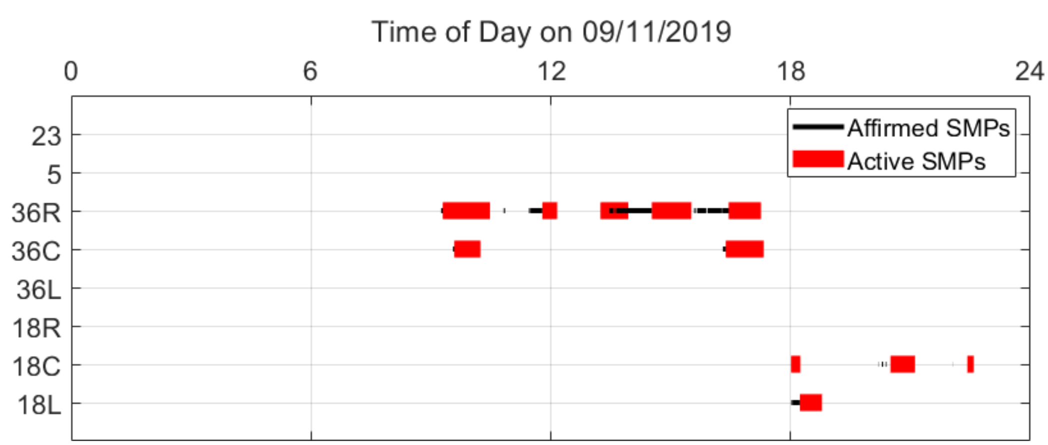
III. Surface Metering Programs

Rejected SMPs: None

SMP Affirmed Time	SMP Start Time	SMP End Time	SMP Constraint	Resource Queue Target (min)*†	Number of Flights Affected	Avg. Metering Hold With SMP (min)	Max. Metering Hold With SMP (min)
09:15	09:17	10:28	36R	12	37	4.5	17.2
09:33	09:35	10:14	36C	10	24	3.3	16.2
11:28	11:47	12:09	36R	12	10	4.5	11.2
13:14	13:14	13:56	36R	12	15	2.1	15.3
13:38	14:31	15:31	36R	12	39	2.5	36.2
16:18	16:26	17:15	36R	12	22	2.7	22.6
16:20	16:22	17:19	36C	10	32	2.2	15.7
17:53	18:00	18:14	18C	10	13	4.1	11.7
18:02	18:13	18:47	18L	12	16	3.9	16.0
20:23	20:29	21:06	18C	10	17	3.4	26.8
22:08	22:25	22:35	18C	10	13	2.7	12.1

*Appendix A provides more detail about departure queues, particularly during SMPs. It includes a visualization of time spent in queue for each individual flight that departed from a particular runway. It also shows typical time spent in queue to a particular runway and highlights typical time spent in queue relative to queue targets (as well as lower and upper thresholds) during active SMPs.

†ATD-2 at KCLT specifies queue targets in terms of minutes in queue, but TFDM will specify queue targets in terms of number in queue.

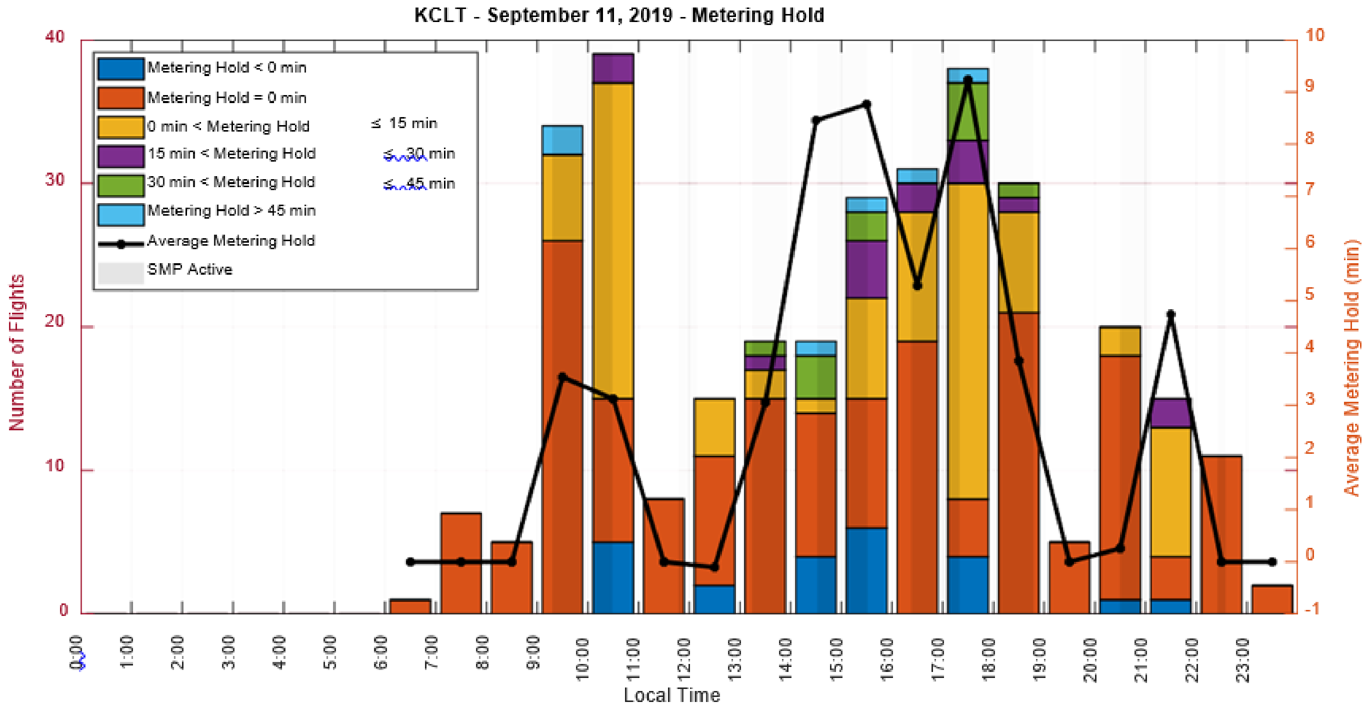


IV. Metering Hold (MH)

Average metering hold: 4.3 min

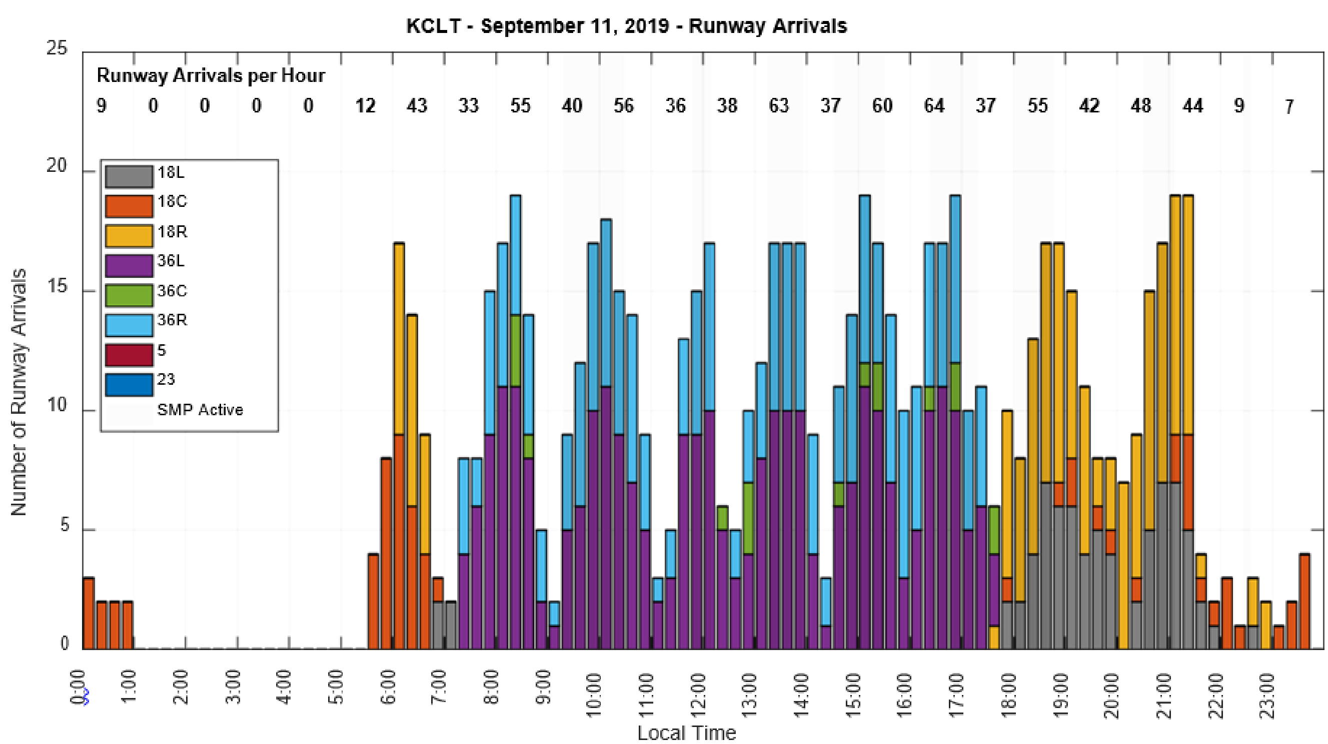
5th percentile metering hold: -0.7 min
95th percentile metering hold: 31.8 min

KCLT Local Time	Not Metered	MH < 0 min	MH = 0 min	0 min < MH ≤ 15 min	15 min < MH ≤ 30 min	30 min < MH ≤ 45 min	MH > 45 min
0:00-1:00	3	0	0	0	0	0	0
1:00-2:00	1	0	0	0	0	0	0
2:00-3:00	1	0	0	0	0	0	0
3:00-4:00	0	0	0	0	0	0	0
4:00-5:00	0	0	0	0	0	0	0
5:00-6:00	1	0	0	0	0	0	0
6:00-7:00	15	0	1	0	0	0	0
7:00-8:00	26	0	7	0	0	0	0
8:00-9:00	49	0	5	0	0	0	0
9:00-10:00	17	0	26	6	0	0	2
10:00-11:00	7	5	10	22	2	0	0
11:00-12:00	50	0	8	0	0	0	0
12:00-13:00	20	2	9	4	0	0	0
13:00-14:00	42	0	15	2	1	1	0
14:00-15:00	22	4	10	1	0	3	1
15:00-16:00	28	6	9	7	4	2	1
16:00-17:00	24	0	19	9	2	0	1
17:00-18:00	11	4	4	22	3	4	1
18:00-19:00	43	0	21	7	1	1	0
19:00-20:00	18	0	5	0	0	0	0
20:00-21:00	45	1	17	2	0	0	0
21:00-22:00	15	1	3	9	2	0	0
22:00-23:00	61	0	11	0	0	0	0
23:00-24:00	11	0	2	0	0	0	0
Totals	**510**	**23**	**182**	**91**	**15**	**11**	**6**

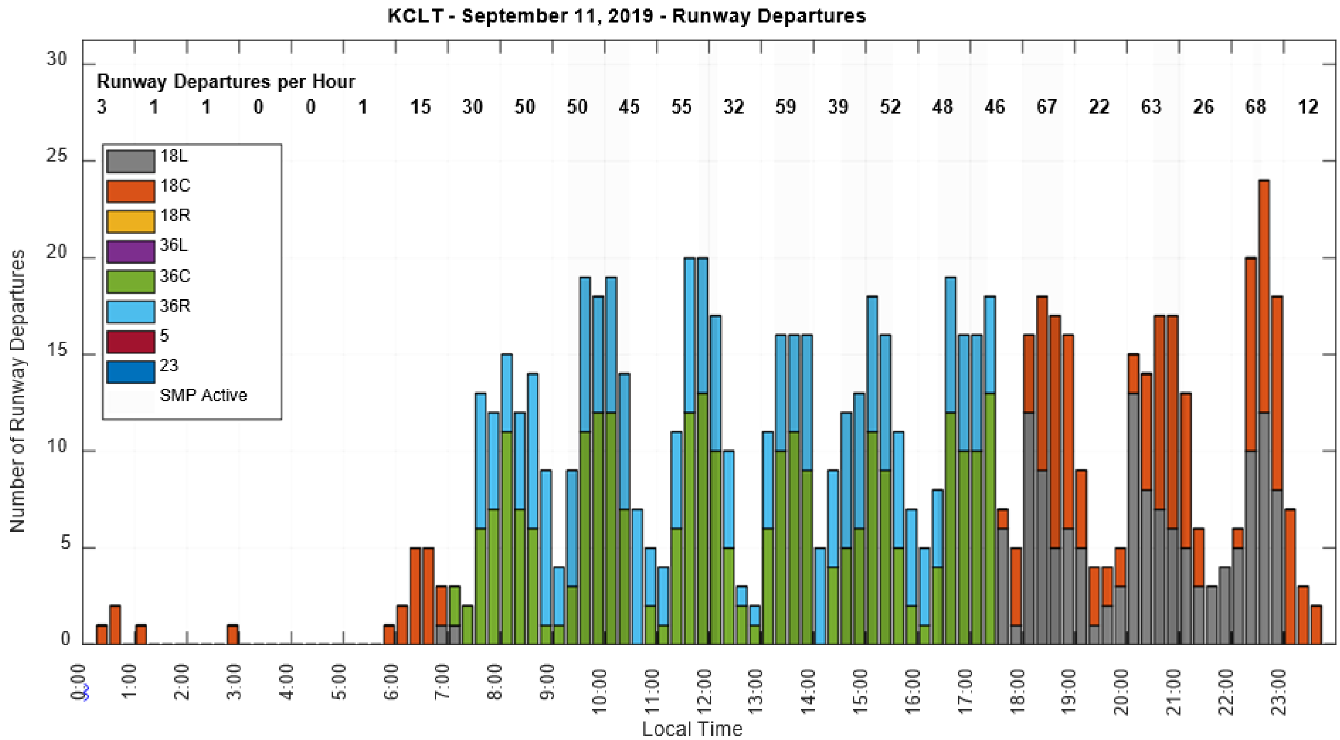


V. Hourly Trends

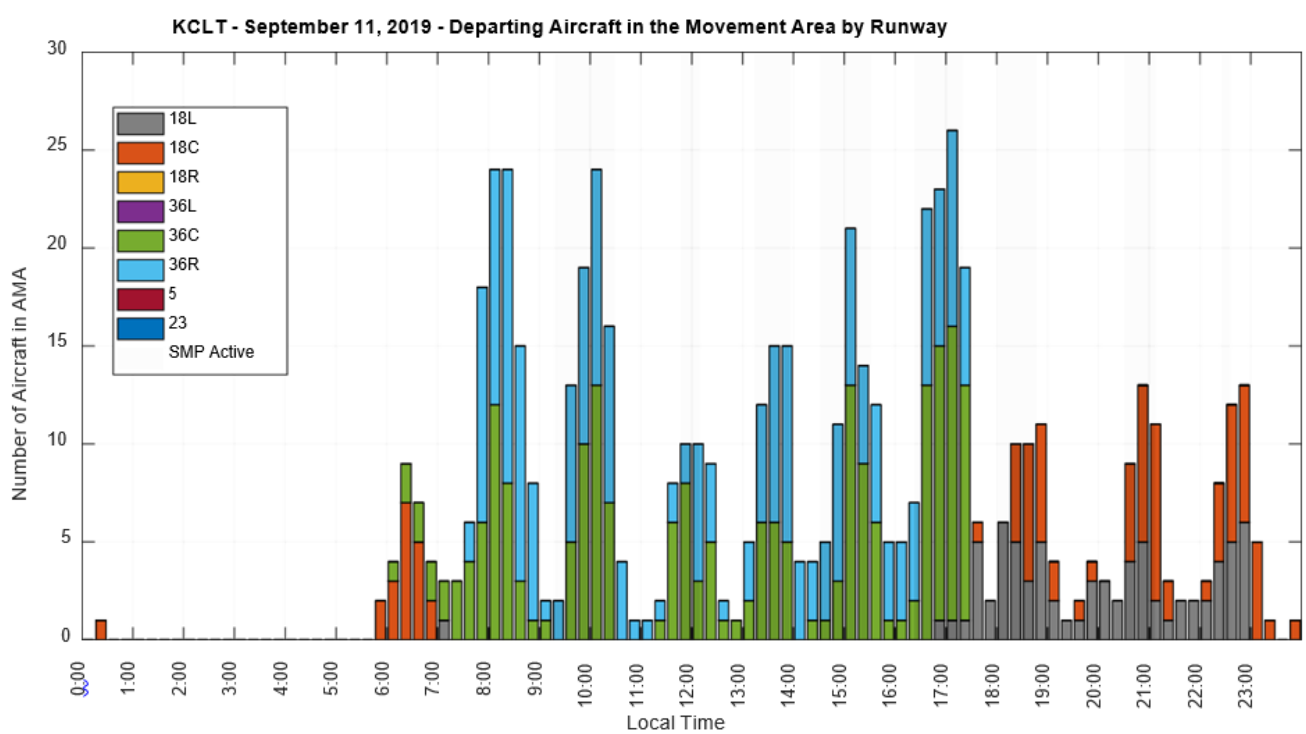
- **Arrivals by Runway**



- **Departures by Runway**

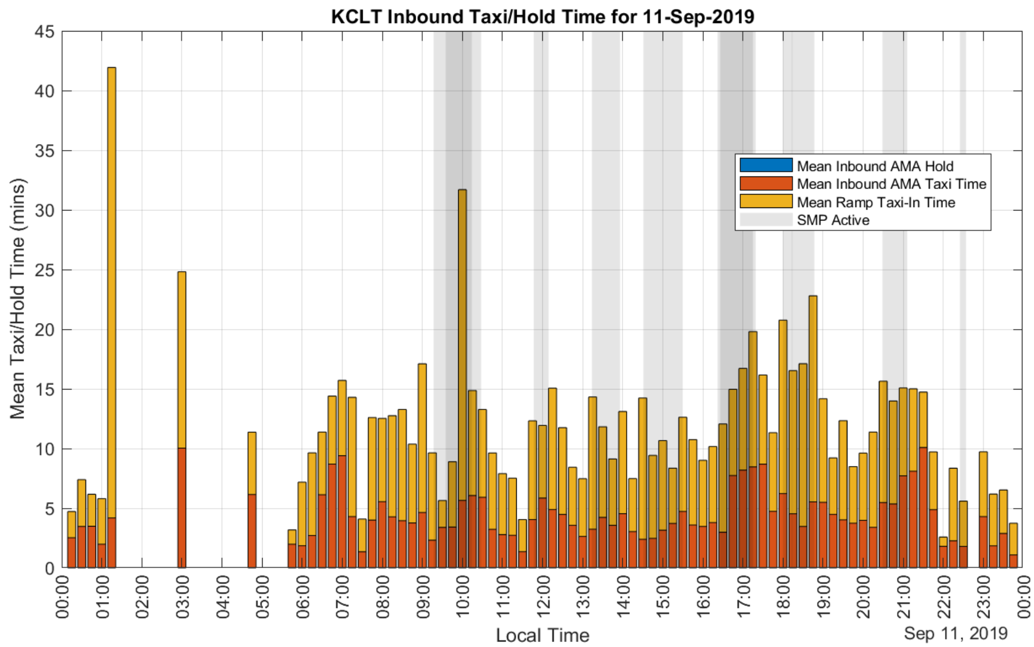


- **Departing Aircraft in the Movement Area by Runway**

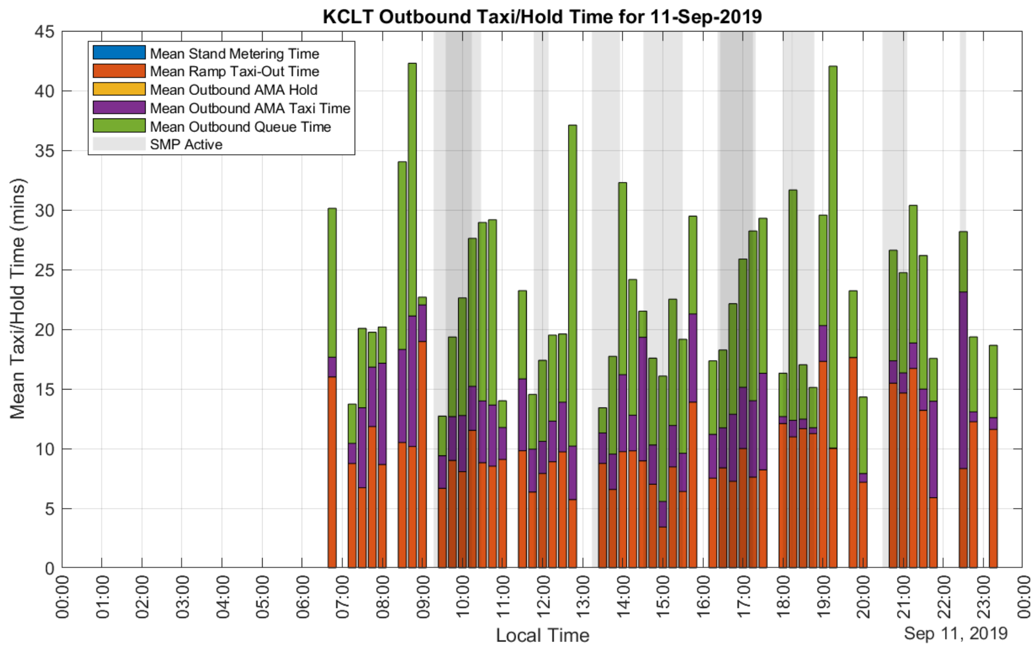


- **Average Taxi-in Time**

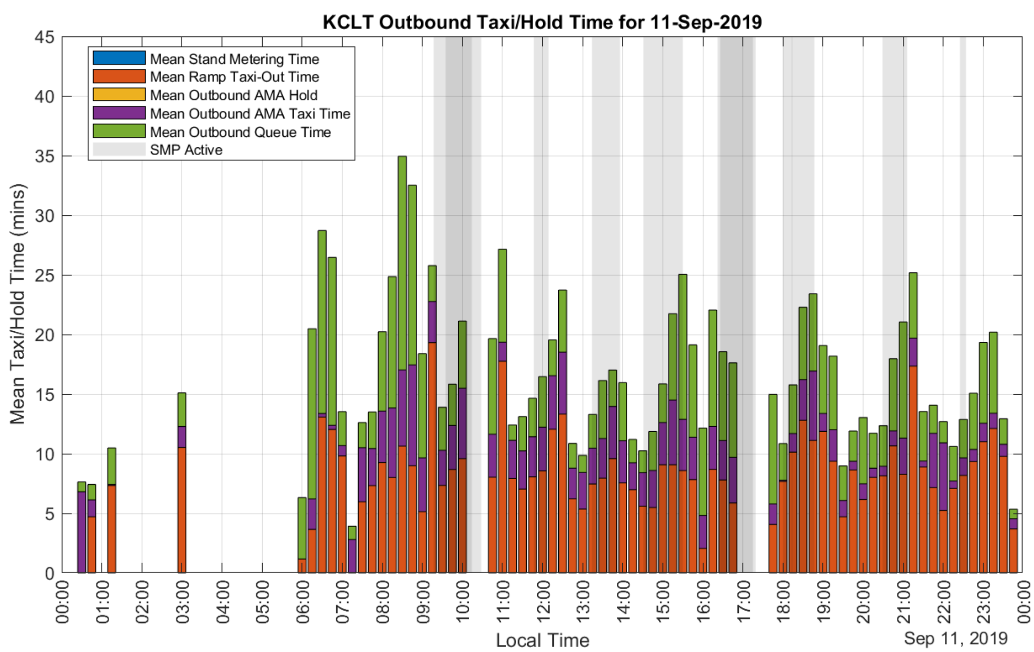
  Note: For the date this scorecard summarizes, ATD-2 TTP always publishes certain components of total inboundand outbound taxi/hold times as zero minute duration regardless of the actual duration. However, TFDM TTP will include this information. This scorecard includes all the broken-out components of total outbound and inbound taxi/hold time even where ATD-2 TTP always reports values of zero.



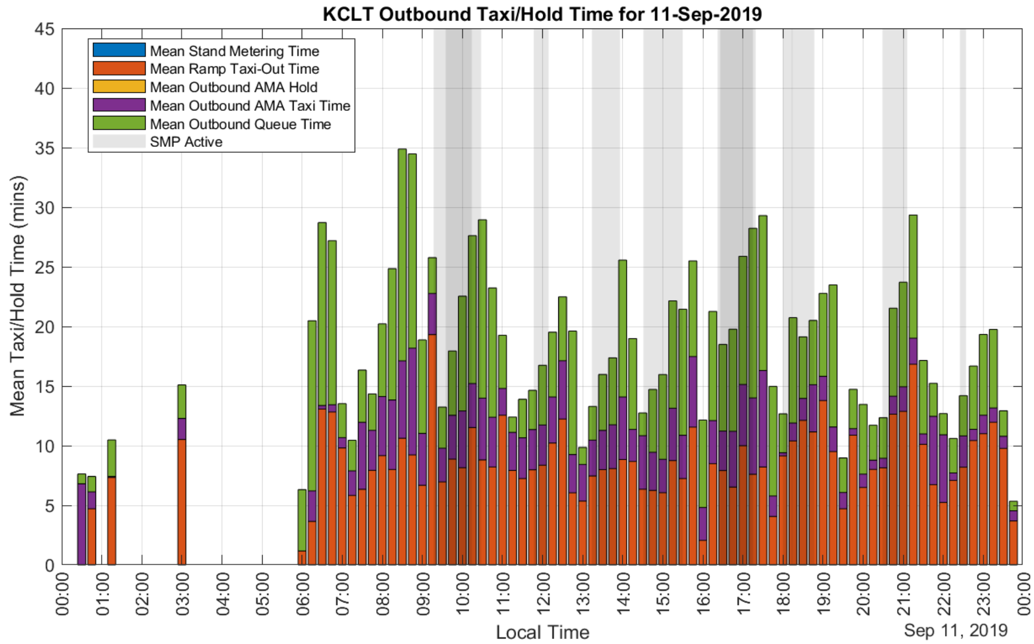
- **Average Taxi-Out Time (Metered Departures Only)**



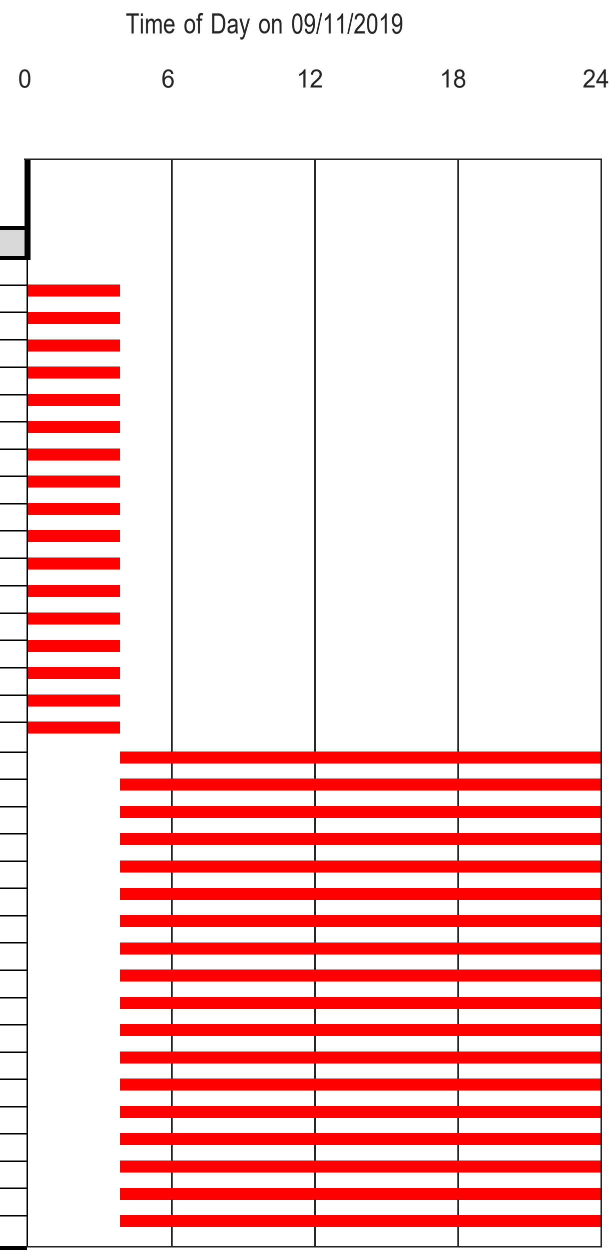
- **Average Taxi-Out Time (Non-Metered Departures Only)**



- **Average Taxi-Out Time (All Departures)**



VI. Region Closures



Resource	Closure Start	Closure End
TAXI322|TAXI72	9/10/2019 4:00	9/11/2019 3:49
TAXI105|TAXI68	9/10/2019 4:00	9/11/2019 3:49
RC-5-23-M2-NW|EXIT95	9/10/2019 4:00	9/11/2019 3:49
TAXI68|TAXI67	9/10/2019 4:00	9/11/2019 3:49
TAXI106|TAXI105	9/10/2019 4:00	9/11/2019 3:49
TAXI72|TAXI322	9/10/2019 4:00	9/11/2019 3:49
RC-5-23-M2-NW|TAXI68	9/10/2019 4:00	9/11/2019 3:49
TAXI1|TAXI148	9/10/2019 4:00	9/11/2019 3:49
TAXI67|TAXI68	9/10/2019 4:00	9/11/2019 3:49
TAXI1|TAXI322	9/10/2019 4:00	9/11/2019 3:49
TAXI105|TAXI106	9/10/2019 4:00	9/11/2019 3:49
EXIT95|RC-5-23-M2-NW	9/10/2019 4:00	9/11/2019 3:49
TAXI68|TAXI105	9/10/2019 4:00	9/11/2019 3:49
TAXI1|TAXI67	9/10/2019 4:00	9/11/2019 3:49
TAXI148|TAXI1	9/10/2019 4:00	9/11/2019 3:49
TAXI68|RC-5-23-M2-NW	9/10/2019 4:00	9/11/2019 3:49
TAXI67|TAXI1	9/10/2019 4:00	9/11/2019 3:49
TAXI322|TAXI1	9/10/2019 4:00	9/11/2019 3:49
TAXI322|TAXI72	9/11/2019 4:00	9/11/2019 23:49
TAXI105|TAXI68	9/11/2019 4:00	9/11/2019 23:49
RC-5-23-M2-NW|EXIT95	9/11/2019 4:00	9/11/2019 23:49
TAXI68|TAXI67	9/11/2019 4:00	9/11/2019 23:49
TAXI106|TAXI105	9/11/2019 4:00	9/11/2019 23:49
TAXI72|TAXI322	9/11/2019 4:00	9/11/2019 23:49
RC-5-23-M2-NW|TAXI68	9/11/2019 4:00	9/11/2019 23:49
TAXI1|TAXI148	9/11/2019 4:00	9/11/2019 23:49
TAXI67|TAXI68	9/11/2019 4:00	9/11/2019 23:49
TAXI1|TAXI322	9/11/2019 4:00	9/11/2019 23:49
TAXI105|TAXI106	9/11/2019 4:00	9/11/2019 23:49
EXIT95|RC-5-23-M2-NW	9/11/2019 4:00	9/11/2019 23:49
TAXI68|TAXI105	9/11/2019 4:00	9/11/2019 23:49
TAXI1|TAXI67	9/11/2019 4:00	9/11/2019 23:49
TAXI148|TAXI1	9/11/2019 4:00	9/11/2019 23:49
TAXI68|RC-5-23-M2-NW	9/11/2019 4:00	9/11/2019 23:49
TAXI67|TAXI1	9/11/2019 4:00	9/11/2019 23:49
TAXI322|TAXI1	9/11/2019 4:00	9/11/2019 23:49

VII. TOBT Updates

Call Sign	Carrier	Carrier Group	Number of TOBT Updates

VIII. TMAT Changes

Call Sign	Carrier	Carrier Group	Number of TMAT Changes

Terms and Definitions

Metering Time Compliance

- Compliant: Flight began its final taxi for departure from the metering control point within the TMAT window.
- Non-Compliant: Flight did not begin its final taxi for departure from the metering control point within the TMAT window.
- Not Metered: Flight appeared in data without Compliance field populated, indicating that flight was not subject to metering.
- Total: Combined count of Compliant, Non-Compliant, and Not Metered flights.
- Total (C+NC): Combined count of Compliant and Non-Compliant flights (without Not Metered flights).

Metering Ready Time Compliance

- Compliant: Flight arrived at the metering control point within the TMAT window.
- Non-Compliant: Flight either left gate after Compliance End Time or entered the movement area before Compliance Start Time.
- Not Metered: Flight appeared in data without Compliance field populated, indicating that flight was not subject to metering.
- Total: Combined count of Compliant, Non-Compliant, and Not Metered flights.
- Total (C+NC): Combined count of Compliant and Non-Compliant flights (without Not Metered flights).

Surface Metering Programs

- SMP Affirmed Time: The time when the first Affirmed SMP Status event occurs, given no Obsolete SMP Status events between the Affirmed and Active statuses.
- SMP Start Time: The time when the first Active SMP Status event occurs.
- SMP End Time: The time when the first Completed SMP Status event occurs.
- Departure Queue: When in multiple runway metering mode, all flights lined up for departure at the end of the runway or behind a flight lined up for departure at the end of the runway are in the queue for that runway.

  When in single airport metering mode, all flights in the movement area with intent to departare in the departure queue.
- Departure Queue Target: Typical time spent in queue (in min) considered optimal for the local airport during metering.
- Departure Queue Target Lower Threshold: When typical time spent in queue falls below this threshold, ATD-2 may recommend compression or termination of an SMP.
- Departure Queue Target Upper Threshold: When typical time spent in queue rises above this threshold, ATD-2 may recommend implementation of an SMP and/orreassignment of TMATs.

Metering Hold Summary

- Metering Hold: Difference between the EOBT and the TOBT.
- 5th Percentile: 95% of the flights had holds greater than this.
- 95th Percentile: 95% of the flights had holds less than this.
- Maximum Hold: Highest hold on any flight for the day.

Appendix C—Sample Surface Metering Letter of Agreement

We recommend annual review of any surface metering agreement.

(AIRPORT NAME) Surface Metering Program LETTER OF AGREEMENT

Effective Date: **(DATE)**

Subject: Surface Metering Program (SMP) Procedures, Roles, and Responsibilities for **(AIRPORT NAME)**.

1. PURPOSE

To facilitate successful Surface Metering Programs at (AIRPORT NAME) by establishing an SMP Working Group, which will establish local guidance for planning, initiation, and execution of **(AIRPORT NAME)** SMPs through the collaborative decision making process.

2. SCOPE

This agreement, notwithstanding any other agreements or documents, will be the overarching agreement concerning SMP management at **(AIRPORT NAME)**. This LOA is not intended to replace existing national Collaborative Decision Making (CDM) agreements between FAA and flight operators or airports.

3. CANCELLATION

(SPECIFY PREVIOUS LOCAL AGREEMENTS RELATED TO SMP THAT SHOULD BE CANCELLED, IN LIGHT OF THIS AGREEMENT.)

4. ROLES AND RESPONSIBILITIES:

The SMP Working Group (SWG) at **(AIRPORT NAME)** should include representatives from the FAA Air Traffic Control Tower (ATCT), the airport authority, flight operators, fixed base operators, and ground control service providers. Roles and responsibilities for each of these stakeholders include:

a) FAA ATCT: will operate the Terminal Flight Data Management (TFDM) capability to manage airport surface traffic in collaboration with the SWG. FAA ATCT will establish and manage departure queue length targets, thresholds, and other SMP-related parameters. Some parameters are determined with consideration of recommendations from the SWG. The ATCT will communicate initiation, modifications, and termination of an SMP to stakeholders with data sharing capabilities.

    i. (NAME) Air Traffic Control Tower (ATCT) will lead the SWG and assumes all responsibility for the Surface Metering function at (NAME) Airport.

    ii. (NAME) ATCT will make SMP decisions, in accordance with guidance agreed upon by the SWG to the extent practicable while providing safe, orderly and expeditious flow of traffic on the airport surface. Examples include, but are not limited to, adjusting SMP parameters as required, and affirming or not affirming a proposed SMP or proposed SMP adjustment.

iii. (NAME) FAA ATCT holds the position of final authority in the collaborative decision making process.

b) Airport Authority: Communicate airport operating conditions to other SMP participants as agreed upon by the SWG.
c) Flight Operators: Share surface and departure information with the FAA ATCT through electronic data-sharing capabilities. When a SMP is in effect, comply with assigned Target Movement Area-entry Times (TMATs).
d) Fixed Base Operators: As available, share applicable surface data, including departure information with the FAA ATCT through data sharing capabilities provided by TFDM. When an SMP is in effect, comply with assigned TMATs.
e) General/Business Aviation Operators: As applicable, share departure information with the FAA ATCT through data sharing capabilities. When a SMP is in effect, comply with assigned TMATs.
f) All SWG members: participate, where applicable, in post-SMP event analysis.

5. SWG PROCEDURES

5.1 General

The SWG will include a Steering Group made up of senior managers from all stakeholders to establish overall policies and strategic guidance. In addition, the Steering Group will appoint SWG participants for tactical management of SMPs.

5.1.1 Tactical SWG

All SWG members agree to participate in meetings, as scheduled by mutual agreement, and to set strategic and tactical SMP goals and parameters based on local conditions and desired SMP performance. See **Appendix C** for guidance.

5.1.2 Meeting Frequency

The SWG Streering Group will meet on a quarterly or semi-annual basis, while the SWG will meet on a monthly basis or as needs arise.

a) **(NAME)** compliance issues will be monitored through post-operations analysis and will be addressed in accordance with policies developed by all members.
b) **(NAME)** ATCT will make SMP decisions, in accordance with guidance agreed upon by the SWG to the extent practicable while providing safe, orderly and expeditious flow of traffic on the airport surface. Examples include, but are not limited to, adjusting SMP parameters as required, and affirming or not affirming a proposed SMP or proposed SMP adjustment.
c) **(NAME)** FAA ATCT holds the position of final authority in the collaborative decision making process.

5.2 SMP planning collaboration

The SWG will review SMP parameters as described in the TFDM User's Guide and agree upon guidelines for parameter values based on operating conditions at the airport. On a continuing basis, the SWG will adjust parameter guidelines based on review of SMP results. The following parameters should be reviewed by the SWG to set initial and subsequent guidance.

5.2.1 SMP Goal Setting

Based on the guidance within the TFDM User's Guide, the SWG will determine performance and operational goals for each SMP.

5.2.2 SMP Parameters for longer-term planning

To facilitate the matching of SMP to SMP goals the SWG will collaborate on the values to be associated with the following parameters:

a) Lead time
b) Planning horizon
c) Metering program type (e.g. by runway or airport configuration)
d) Target queue length
e) Target queue length upper tolerance threshold
f) Target queue length lower tolerance threshold
g) TMAT window
h) Current and future airport runway configuration
i) Runway and/or Airport arrival and departure rates
j) Traffic Management Initiatives
k) Designate movement area and non-movement area aircraft holding areas.

5.3 SMP Initiation, Execution and Termination

The SWG should agree on general procedures about what happens during SMP initiation, execution, and termination. The questions below are meant as examples of areas that should be documented within this LoA. Based on an individual airport's needs, additional procedures that are not addressed below may need to be included in this section as well.

a) Are there particular known nominal or off-nominal situations where SMPs would be expected? Is SMP initiation based only upon TFDM recommendation?
b) How will the SMP be announced by the ATCT? Is it through TTP alone?
c) Does ATCT need acceptance from SWG members to initiate off-nominal SMP?
d) For a particular SMP how are the SMP start and end times set and how are the specific metering parameters determined?
e) How will adjustments to SMP parameters be made during the SMP? Should the flight operators and airport operator be informed? If so how?
f) How do flight operators or the airport operator provide input during the SMP?
g) When is an SMP terminated? Only based on TFDM recommendation? Based on FAA TMI goals?
h) How are flight operators and the airport notified of SMP termination?

5.4 SMP Post Event Analysis
The SWG should establish a regular process for reviewing results of SMPs. The SWG will review SMP operational performance data from FAA Office of Performance Analysis (AJR-G) and other results, as agreed upon, to assess SMP performance and flight operator conformance. Based on SMP performance results, the SWG may update SMP parameter guidelines or procedures.

6. Partnership
This section describes the agreements made by the SWG participants in their respective roles with the following stakeholders.

6.1 ATCT
Agrees to:
a) Active management of airport configuration
b) Monitor the airport environment for potential capacity-demand imbalances, perform "what-if" modeling to assess metering options, and validate whether or not a SMP is necessary given current and predicted airport and airspace conditions. Once a SMP has been initiated, the ATCT will monitor and make adjustments to the SMP as necessary to maintain efficient operations correspondent to existing guidelines.
a) Collaborate with SWG members, when necessary, in the strategic and tactical planning of surface operations.
b) Notify SWG members about the affirmation or rejection of proposed SMPs and/or SMP adjustments.
c) Provide Terminal Flight Data Manger (TFDM) with values for the previously agreed to SMP parameters.
d) Monitor existing SMP collaboratively with SWG members including making adjustments to parameters and terminating the program effectively.

6. 2 Flight operators (including regional subsidiaries)
Agree to:
a) Maintain the ability to consume and provide timely updates of TFDM operators, and provide surface management flight intent messages.
b) Collaborate when necessary with **(NAME)** ATCT and other SWG members on the implementation of an SMP
c) Operate flights to comply with assigned TMATs.
d) Inform relevant personnel (e.g. flight crews, ramp crews) on the required procedures for complying with TMATs.
e) Provide the following data:
   a. Intent to Hold in the Non-Movement Area
   b. Intent to Hold in the Movement Area
   c. Intent for a Flight to Be De-Iced
   d. Intended Departure or Arrival Spot
   e. Intent to Return to Gate

    f. Acceptable or Unacceptable Runway(s)

f) If operating a ramp at **(AIRPORT NAME)**, provide and update:
    a. Status of ramp operations/resources, open or closed
    b. Ramp gridlock status (in ramp gridlock or not)
    c. Actively participate in SMP event post-analysis activities.

6.3 Airport operators

Agrees to provide:

a) Status of ramp operations/resources, open or closed
b) Ramp gridlock status (in ramp gridlock or not)
c) Airport conditions including runway surface information
d) Existing and forecast weather conditions including precipitation type
e) Runway and taxiway availability
f) Airport surface area constraints
g) Information concerning any planned and unplanned security issues
h) Information concerning any planned and unplanned Customs issues
i) Official deicing information
j) Share information with SWG members
k) Share and provide timely updates of surface metering related TFDM data elements where applicable
l) Maintain ability to submit data elements via third party agreements.
m) Actively participate in SMP event post analysis activities.

6.4 Fixed Based Operators

6.4.1 GA operations may provide:

a) Status of ramp operations/resources including parking availability
b) Where applicable, the ability to submit and consume relevant TFDM data
c) Inform personnel of the required procedures for complying with TMATs
d) Collaborate with other SWG members in the strategic and tactical planning involving SMP

6.5 General/Business Aviation

a) Where applicable, the ability to submit and consume relevant TFDM data
    Or
b) Coordinate with FBO information pertaining to surface management flight intent
c) Operate in compliance with provided TMATs

7. Signatures

____ ____________________

Name, Airport Managing Authority Date

____ __________________

Name, Air Traffic Manager Date

____ ____________________

Name, Airport Managing Authority Date

____ ____________________

Name, Flight Operator A Date

____ ________________
Name, Flight Operator B Date

____ ________________
Name, Ramp Operator Date

____ ________________
Name, Fixed Base Operations Participating in TFDM SMP Date

Index of Attachments

A. Definitions
B. Airport Diagrams (i.e. Movement/Non-movement areas depicted)
C. Local Airport Surface Management Work Group Plan
D. Other diagrams if needed

A. Definitions

B. Airport Diagrams (i.e. Movement/Non-movement areas depicted)

[INSERT DIAGRAMS]

C. Local Airport Surface Management Work Group Plan

Purpose
The successful implementation of a Surface Metering capability requires ongoing collaboration on a local level. Recognizing the value of collaborative decision making through information sharing is a pillar of the Airport Surface Metering capability. Such information sharing should extend to local stakeholders who participate in the day-to-day operation of all airport surface operations. Certain criteria of the Surface Metering Program (SMP) require local parameter setting that are applicable to the needs of an individual airport. The Surface Management Working Group consisting of representation by all primary stakeholders at an airport is intended to serve as a platform of local subject matter experts related to Airport Surface Management practices and criteria supporting such a capability. This group will be the single local resource for addressing airport surface activities related to Surface Metering.

Scope
The Collaborative Airport Surface Management Working Group will serve as the local resource for addressing and providing solutions to airport surface management issues related to traffic movement in the non-movement and when applicable in the movement areas of an airport. This group will work on a continuous basis of feedback and positive interaction throughout the implementation of Terminal Flight Data Management (TFDM) and, more importantly, remain active in perpetuity as a working group to address applicable surface management issues.

Strategy Prior to TFDM Implementation
As part of the FAA's Collaborative Site Implementation Team (CSIT) activities, an FAA representative will coordinate with local stakeholders (including primary flight operators), to establish a Collaborative Airport Surface Management group. The timing of standing up such a consortium will coincide with the FAA's Terminal Flight Data Manager (TFDM) implementation strategy for that airport. It is expected that the FAA lead will initiate outreach, establish familiarization and designate local co-leads to promote participation in such a working group. Collaborative Airport Surface Management Group will become thoroughly familiar with the

Surface Metering Program, including the operational benefits, prior to implementation. This will require participation from all local stakeholders directly involved with the movement of aircraft on the airport surface. When applicable, this working group will collaborate with local FAA Air Traffic Control representatives to determine applicable criteria that may influence the efficiency of surface metering at that airport.

Strategy Post TFDM Implementation

As the TFDM surface management applications mature and local stakeholders become familiar with the functionality, it is expected that some factors such as parameters or communication methods may need to be re-addressed. The objective for a local Airport Surface Management Group to continue beyond initial implementation is to act as the local subject matter experts which will focus on a collaborative resolution to on-going surface related issues. This working group will serve as the local focal point to provide input to the FAA and/or the Airport Managing Authority. Additionally, a record of lessons learned will be helpful to share with other facilities scheduled for TFDM surface management implementation. A representative of this group may be asked to represent the team on a National level should a National Information exchange be organized.

Structure

In the simplest terms, form should follow the best function for a local working group. What works at one airport may not serve the objective well at another. An existing user group may be the source for dedicating a portion of it's agenda to surface management issues. The existing group will continue to operate with it's current standards with the expectation the objectives of a Surface Management Work Group functionality can be met. On the other hand, if no such group exists, then it will be the responsibility of the FAA to designate a TFDM Surface Management subject matter expert to organize such a working group based on the FAA's Collaborative Decision Making philosophy and structure. Primarily, a local airport surface management working group should consist of a panel of representatives from primary stakeholders directly affected by surface operations at an airport. Such a group should be co-chaired with either an FAA or Airport management representative as well as a flight operation representative. Co-chairs must be willing to work in the best interests and safety of all stakeholders. Frequency of meetings can be determined by need, which may fluctuate depending on the stage of the TFDM implementation process at that airport.

FAA POC

The FAA will designate a Point of Contact (POC) who will act as the primary resource on a national level and work with local surface representatives. This person will be expected to have a strong knowledge of TFDM, it's surface management functionality as well as a familiarization with local airports and local characteristics affecting surface management efficiency. The FAA will make this POC known through the socialization of TFDM.

D. Other diagrams/graphics as needed