# PERFORMANCE AUDIT OF TRANSIT

# TECHNICAL REPORT F: RIDERSHIP DATA & EMERGENCY COMMUNICATION

King County

Presented to
the Metropolitan King County Council
Government Accountability & Oversight Committee
by the
County Auditor's Office

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# EXECUTIVE SUMMARY

This technical report discusses the tools that Transit uses to collect and process data about ridership and Transit's communication with customers during emergency events such as severe weather. These topics are quite discrete, but both involve analysis of technology and its interface with users, whether the users are Transit analysts or Transit customers. Ensuring that the right technology tools and approaches are used and that the outputs of the technology achieve Transit's goals is key to the organization's success.

**Transit Is Upgrading Major Systems**

Transit is currently upgrading its technology to better communicate with customers during emergencies, to process rider fares, to count passenger boardings and alightings,[1] and to track the physical location of the buses. Individually, this information is important, but when combined it provides critical information to Transit's service development analysts that can help them to provide the best service to the riding public. During the process of transitioning to new technology, Transit must ensure that service development staff have the resources to provide the most efficient and effective service. This will include ensuring that they have the best data to process and that systems are integrated to allow them to process it quickly.

Transit is actively working on initiatives to improve customer communications during emergencies; however, there are opportunities for Transit to develop and implement improved strategy, plans, and communication tools that will result in improved customer communication during emergencies and severe weather. If our recommendations are implemented, Transit will be in a position to achieve its emergency communication objectives in a more cost-effective manner and

[1] The act of exiting a bus is called an "alighting."

customers will have better access to information where and when they need it.

# 1 INTRODUCTION

## Chapter Summary

This chapter provides background on Transit's data and customer communication during emergencies. We describe the objectives and the methodology used in analyzing these areas and conclude with a summary of the findings and recommendations.

## Objectives And Methodology

The entire Transit audit spanned multiple areas of work, including Transit's service design practices, financial and capital planning, technology and information management, vehicle maintenance, operator and transit police staffing, and paratransit. The objectives of this portion of the Transit audit were to evaluate Transit's access to ridership data; determine how effectively Transit communicates accurate and timely schedule information to customers during emergencies or other events that alter transit schedules; determine how their communication methods compare with best practices; and review if their near-term communication strategy is on schedule for winter 2009-2010.

To achieve this objective, the office and its consultants:

- Interviewed Transit leadership, management, and line staff
- Interviewed transit researchers at the University of Washington's Washington State Transportation Research Center (TRAC), various telecommunication/technology industry officials, and members of Transit's Transit Advisory Committee
- Surveyed relevant industry literature and best practices
- Reviewed Transit documents and agreements

- Conducted a peer review including at five peer transit agencies: CTA, Chicago, IL; MBTA, Boston, MA; MTA, Los Angeles, CA; Tri-Met, Portland, OR; and WAMTA, Washington D.C.

## Summary of Findings

### Transit Is Currently Upgrading Ridership and Communication Technology

Transit is currently transitioning from older ridership data systems to the new ORCA (One Regional Card for All) smart card and to On-Board Systems and Communications Center System (OBS/CCS), onboard data collection systems that update vehicle location and passenger counting technology. In general, we found that Transit's use of this data is timely and automated and will likely become more so with the full implementation of the new systems. However, Transit has not yet developed detailed plans for integrating new sources of data with their existing data processing tools or data streams.

Although Transit completed a snow after-action report and received a significant amount of customer feedback during the snow event, Transit's strategic plan does not currently include objectives, standards, or metrics related to effective communication with customers during emergencies. There is little feedback specifically solicited from customers on this issue. Transit has been developing a prioritized plan of customer communication applications but, according to agency managers, other priorities have diverted planning and analytical resources. While progress in implementing new communication methods or processes has occurred at Transit, effectively communicating with customers will increasingly require them to provide information that is better aligned with fast-changing public demands for easily accessible and real-time information delivered via e-mail, text messages, or through a Web site.

## Summary of Recommendations

Transit should develop a detailed implementation plan and timeline for integrating new sources of data in OBS/CCS with their existing data processing tools and data streams.

Transit should continue to improve its customer communications during emergencies. Their efforts should include:

- Transit's update to their strategic plan should include objectives related to effective customer communication, goals for Transit's communication of changes in bus schedules or reroutes to customers, and metrics for measuring Transit's performance that include customer feedback.
- Transit should ensure that it is implementing effective and economical approaches to improving customer communication during emergencies by completing analysis of the communications options and developing a prioritized implementation plan. The analysis should assess how each option would meet Transit's communications goals and the potential costs and benefits of each option.
- Transit should redesign the means they use to communicate with customers during emergencies and adverse weather to better serve their customers. This includes updating the Web site so applications customers use during adverse weather are accessible and easy to use; implementing a route specific e-mail notification system; and finally, implementing alert information via text messaging to rider cell phones and making key Web site pages available to customers in a format compatible with mobile devices.

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# 2 RIDERSHIP DATA SYSTEMS

**New Technologies Provide Opportunities for Better Data Analysis**

## Chapter Summary

Transit is currently transitioning from older ridership data systems to the new ORCA (One Regional Card for All) smart card and On-Board Systems and Communications Center System (OBS/CCS), onboard data collection systems that update vehicle location and passenger counting technology. In general, we found that Transit's use of this data is timely and automated and will likely become more so with the full implementation of the new systems. Transit has begun some integration planning; however, Transit should develop a detailed implementation plan for integrating new OBS/CCS data into their new data streams and data processing tools.

## Background

Ridership data has many uses in a transit agency. It is used by service planners to determine the demand for transit services and how efficiently the agency's current and historical service has met this demand. Ridership data is used to provide reporting to management, the County Council, and the federal government. The Transit Cooperative Research Program (TCRP)[2] describes the types of data that transit agencies typically use in planning and reporting:

**Boardings.** Boardings is the count of the number of passengers who get on a transit vehicle, it can be gathered using Automatic Passenger Counter (APCs) or fare collection systems. Boardings are used for economic and performance analysis of routes in addition to planning for service changes.

[2] TCRP is a cooperative effort of the Federal Transit Administration, the Transportation Research Board, and the Transit Development Corporation, Inc.

**Linked Trips.** Linked trips is a count of trips made by passengers including transfers. It can be gathered using rider surveys or electronic fare collection systems. Linked trips can be used for some federal reporting and is also useful for demand analysis.

**Passenger Load.** Passenger load is the number of passengers on board a vehicle for a given route segment. Passenger load helps planners determine service frequency and help plan for service changes. Passenger load can be gathered using APCs.

**On-Time Performance.** On-time performance is a measure of how often buses arrived at various points on schedule. On-time performance is used to give a general indication of performance and to help identify needs for better control or service changes. On-time performance can be gathered using Automated Vehicle Location (AVL) systems or APCs.

**Running Time.** Running time is a measure of how long vehicles take to complete certain tasks, including traveling between points and stops. It is useful as detailed operational data and for service planning. Running time can be gathered using AVL or APCs.

### On the Whole, Transit's Use and Distribution of Data Is Timely and Automated

On the whole, Transit's current distribution and use of data is timely and automated and provides a comprehensive tool for agency staff use for planning and reporting. Using the systems currently in place, Transit has developed processes for gathering data from a number of sources and making it available to service planners and reporting staff. Transit is currently in a transition process from older ridership data collection tools to new ones. The ORCA card, which can provide information about passenger trips and overall demand, is phasing into use now and OBS/CCS, a new onboard system for collecting vehicle location and passenger data, has a target roll-out date of 2010-2011.

**ORCA**

ORCA or One Regional Card for All is the new smart card system that riders will use for fare payment, in addition to cash and other payment media. According to Transit's ORCA project manager, "although ORCA data can provide a view into transfer behavior, it was never intended as a source of ridership data." In the current, early ORCA implementation, Service Development staff have two options for receiving ORCA reports, ad hoc queries and ORCA's standard ridership reports. The ad hoc reports can cover any element required by Service Development but there are not currently any reports developed specifically for their use. Transit states that they are continuing to research the quality and value of the ORCA data and determine the best methods to make the information available to service development staff.

**OBS/CCS**

A new Automatic Passenger Counter (APC) and Automated Vehicle Location (AVL) system are in the development process for Transit by a vendor, INIT. This system is planned for roll out beginning 2010 and completion by the end of 2011. The new system, described as OBS/CCS, will be required to provide replacements for all current computer aided dispatch and vehicle location reporting capabilities at Transit.

**New Ridership Systems Will Ensure That All Current Capabilities Continue**

The new OBS/CCS system will ensure that the new APC data and AVL systems will be integrated on-board the buses and create a single integrated data stream. Although Transit notes that they intend to use the OBS/CCS system to the maximum extent possible, they have not yet developed detailed plans for integrating these new sources of data with their existing data processing tools or data streams.

Integration of data will provide additional useful ridership data from multiple sources to Transit's service development staff and will reduce manual effort involved in summarizing and integrating data from multiple sources for users.

**RECOMMENDATION F1** Transit should develop a detailed implementation plan and timeline for integrating new OBS/CCS data with their existing data processing tools and data streams as the new system comes online.

# 3 EMERGENCY COMMUNICATIONS

## Chapter Summary

This chapter finds that Transit's strategic plan does not sufficiently discuss effective communication with customers during emergencies and there is little feedback solicited from customers on this issue. We recommend that Transit develop a prioritized plan of customer emergency communication projects and implement improved emergency communication with customers through user-centric information on e-mail, text messages, and their Web site.

## Customer Communications During Emergencies

**Transit Reports That the 2008 – 2009 Snow Was an Intense Learning Experience**

Over a two-week period in the winter of 2008-09, significant amounts of snow fell in King County causing dangerous road conditions throughout Transit's service area, having a severe impact on Transit operations. During this time, Transit customers expressed frustration about Transit's difficulty communicating accurate and up-to-date information about their bus service. For example, customers had difficulty finding critical weather-related information on Transit Online, information was not available on snow reroutes, and Transit's call center was only able to answer 21 percent of calls received. Transit reports that the snow event and subsequent after-action report were an intense learning process and acknowledges that there were gaps in communication and that they were not able to meet customers' communication expectations.

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**RECOMMENDATION F2** Transit should continue to improve its customer communications during emergencies. Their efforts should include activities detailed in the following sections.

## Customer Communication Strategy and Planning

Customer communication during adverse weather or other emergencies involves time and expertise from many of Transit's work groups:

- Transit's General Manager's Office is ultimately responsible for the quality of customer communication and acts as the point group for determining response to customer communication gaps. The General Manager recently assigned responsibility for coordinating the division's reworking of emergency communications to a Special Projects Manager in his office.
- The Public Information Office within the Department of Transportation Director's Office (Transit's umbrella department) plays a key role in getting information out through the press. These communications are all coordinated through the King County Executive's Office.
- The Customer Service section is responsible for responding to phone calls and updating customer communication tools such as the Web site. During emergencies they are often deployed around the clock and coordinate information flow between the Operations Control Center and other information outlets. This section also coordinates the pilot program, "Eye on your Transit Commute"[3] and email alerts.
- The Operations section includes the drivers on the street and those communicating with the drivers, the Communications Center. The drivers must often make spur-of-the-moment and independent rerouting decisions based on the conditions they face. The Communications Center collects information on field conditions from multiple sources and communicates it to

[3] 'Eye on Your Metro Commute' which is a pilot program providing service on weekdays during the peak commuting hours of 6:00 to 9:00 AM and 3:00 to 7:00 PM, where Metro staff monitor bus service and report on conditions that may impact transit service. Eye on Your Metro Commute reports posted to Metro's Web site are of a general nature but Metro is evaluating this service and is considering recommendations for future enhancements.

other sections that need it, e.g., vehicle maintenance, customer services, and the public information officer.

- The Information Technology group is responsible for technology updates/upgrades and is involved in many of the technology tools that are used for customer communication.
- The Service Development section develops snow/emergency routing plans and supports other sections during adverse weather and other emergencies.
- The Vehicle Maintenance section prepares buses for weather and responds to vehicle accidents or other maintenance needs. This includes, for example, putting chains on buses, adding steel shoes to trolleys, checking for damage, performing additional interior cleaning, and removing sand used for traction in the yards.

### Transit's Ability to Provide Real-Time Communication May Still Be Years Away

Although Transit's work groups have taken some steps to inform riders about what to expect during adverse weather, Transit has not yet set realistic expectations with the public concerning customer communication during adverse weather. According to Transit's snow after-action report, the public assumes that Transit has a fully automated infrastructure to provide information but, in fact, the equipment and processes needed for "real-time" Transit information are still years away. Transit's ability to process bus schedule changes and reroute information during a widespread adverse weather event consistent with customer expectations may be problematic during the 2009-2010, and possibly the 2010-2011, winter/snow season.

The Baldridge National Quality Program notes that organizations should have strategic plans and objectives that focus on core competencies and results that matter to customers. Neither Transit's Comprehensive Plan for Public Transportation nor Transit's Ten-Year (2007-2016) Strategic Plan for Public Transportation currently includes specific objectives or metrics related to customer emergency communication. Without specific objectives and metrics, Transit is not in a position to know whether it is successfully communicating with customers or able to prioritize potential emergency communication improvement projects to ensure that such objectives are achieved.

**Transit Received Significant Spontaneous Customer Feedback but More Formal Input Is Needed**

Having meaningful and frequent customer feedback on how Transit communicates reroutes or schedule changes during adverse weather is an important component of developing an effective strategy and providing effective customer service in the future. Compared to peer transit agencies, Transit has placed less attention on proactively seeking customer feedback on how it communicates with customers (see Exhibit A). Although Transit received a great deal of spontaneous feedback from customers during the recent snow event, recent Transit rider/non-rider surveys and other formal customer communications did not have any questions related to customer communication during emergencies. Compared to a number of the peer transit agencies we contacted, Transit has not systematically captured much customer feedback on communication issues. As a result, Transit has not redesigned their emergency communication strategy to keep pace with changing customer needs, especially the desire of transit riders to receive transit information over the Internet.

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**RECOMMENDATION F2a**

Transit should continue to improve its customer communications during emergencies by ensuring that the update to its strategic plan includes elements related to effective customer

communication, standards for Transit's communication of changes in bus schedules or reroutes to customers, and metrics for measuring Transit's performance that include customer feedback.

## Communications Applications and Partnership Opportunities

### Partnering With Third Party Developers Brings Opportunities and Risks

Opportunities exist for Transit to provide additional customer emergency communication tools economically by partnering with application developers outside the agency. Collaborating with organizations or individuals outside the agency who develop communication applications related to customer information is an area where Transit could leverage agency resources by providing transit data on schedules, routes, and other information so third party developers could build tools and applications useful to Transit's customers. A number of these applications could be very useful to customers during times of adverse weather or other circumstances which would alter regular bus schedules. Transit has expressed interest in pursuing these approaches and plans to meet with the developer community to explore options. Two examples of third party applications currently using Transit's data include:

- Google Transit – combines Transit data with Google Maps for trip planning.

  According to a Transit official, Transit was one of the first U.S. cities to provide Google with bus schedule and other data but does not publicize Google Transit Trip Planner on its' Web site, nor has it recently worked with Google or other outside developers to modify or improve the trip planning application. One peer transit agency reviewed, the Chicago Transit Authority, uses Google Trip Planner exclusively as the agency's only trip planner application.

- Onebusaway.org –allows riders to use mobile devices to get real-time bus location data.

  Transit has met with the creators and sponsors of onebusaway.org and have discussed how they might partner to enhance the onebusaway.org service or provide other forms of enhanced transit information, but no specific plans have been developed.

### Third Party Developers Have Developed Useful Applications for Peers

Although Transit does provide their data to Google and Onebusaway.org, they are in the planning stage for actively soliciting participation from a number of third party application developers who, at other transit agencies, have developed a number of applications useful to transit customers. Providing data to outside partners may decrease control over how Transit's data is used, reconfigured and distributed. However, three of the five peer transit agencies surveyed have successfully provided agency transit data to outside developers and actively promoted their use resulting in a number of creative applications (see Exhibit A). We support Transit in continuing to be proactive in publicizing and working with third party application developers to foster additional transit tools to enhance the customer experience using mass transit.

Determining an effective approach to upgrading technology that is key to effective customer emergency communication should also consider outside developers. The Bus Tracker and Trip Planner applications need updating and, according to Transit estimates, could cost up to $1 million each. Various sections within Transit have different perspectives on how best to upgrade the Bus Tracker and Trip Planner applications and whether such upgrades are best accomplished through a vendor or by partnering with a third party developer that could potentially provide a comparable application for less cost by using open source data provided by Transit.

### Transit's Plan for Customer Emergency Communication Applications Needs Further Analysis to Ensure Cost-Effective Use of Resources

Transit has been developing a prioritized plan of customer emergency communication applications but, according to agency managers, other priorities have diverted planning and analytical resources. Transit has developed a Customer Information Systems Road Map listing 12 projects, in varying stages of planning, analysis, or implementation. Only one of the 12 projects, Real-time Information Signs, is an official IT project and has a fully developed business case. Much analysis remains to be done before Transit decides what direction a number of projects will take, how much they will cost, among other variables. Principles of effective project management include first conducting analysis to determine how best and most cost-effectively to meet customer demands for improved communication during emergencies within staff and budget constraints. Transit notes that a prioritized plan is still being developed, subject to staff availability and budget constraints.

Developing this prioritized plan is important to help answer such questions as: Is upgrading Trip Planner to provide "real-time" service interruption or schedule change information a higher priority than redesigning Transit's Web site or implementing a subscription based e-mail alert system for individual bus routes? Completing a prioritized plan for customer emergency communication improvements, and substantive analysis of the various project options and costs, is an important first step towards ensuring Transit is using resources in a cost-effective manner to meet customer emergency communication needs.

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**RECOMMENDATION F2b**

Transit should ensure that it is implementing effective and economical approaches to improving customer communication by completing analysis of the communications options and developing a prioritized implementation plan. The analysis should

assess how each option would meet Transit's communications goals and the potential costs and benefits of each option.

## Specific Means to Improve Customer Emergency Communication

While progress in implementing new emergency communication methods or processes has occurred at Transit, effectively communicating with customers will increasingly require them to provide information that is more user-centric and delivered via e-mail, text messages or through a Web site. Compared to five transit peers we reviewed; however, Transit does not yet have key communication improvements in place (see Exhibit A).

### *Web site*

**Web Site Redesign Is a High Priority for Transit**

Transit's Web site is not well designed compared to peer transit agencies. In addition, unlike other transit agency Web sites we reviewed, Transit's Web pages lack a consistent configuration of interactive or dynamic menus which Transit's own analysis suggests greatly aids users in navigating a web site. A February 2009 analysis by Transit of 26 other transit Web sites found, "Failing to follow this familiar paradigm creates an unnecessary impediment for site users." Transit has acknowledged that Web site redesign is a high priority and plans to hire a webmaster to coordinate redesign efforts; however, the timeframes and connections to strategic objectives are unclear. While Transit has improved the look and usability of the main home page, several other secondary or tertiary pages are not well designed, are overly text based, and are difficult to understand, especially for those unfamiliar with transit operations. As a result, Transit has made it difficult for some customers to find the information they need and may be discouraging some potential transit riders because they are unsure or unfamiliar with how to plan their trip or obtain timely schedule information given the design

configuration of Transit's current Web site. A well designed Web site is important because it is increasingly the primary vehicle customers turn to for a variety of transit information. For example, Transit's call center answered calls from customers 160,000 times in March 2009 but had 628,581 visits to its Web site during the same month.

### *E-mail alerts*

**A Route-Specific E-Mail Alert System Would Improve Emergency Communication**

Transit's existing e-mail alert system is a positive first step, but riders would benefit from a route specific e-mail alert system during emergencies. Four of five peer transit agencies we contacted have route specific e-mail alert systems in place (see Exhibit A). Several of them found subscriptions increased when customers were offered subscription options based on their commute or individual bus route, and the number of those unsubscribing to alert systems like Transit currently has in place declined when more options were offered. In May 2009 Transit implemented a subscription-based e-mail alert system to notify riders of schedule changes, reroutes, or other changes, but this alert system sends the same information to all subscribers. This means that subscribers to the email alerts receive information on changes to all routes in the system, not just the routes the subscriber utilizes. Transit officials acknowledge the benefits of a route-based subscription e-mail alert system during emergencies but state that it is difficult to obtain reroute information in a timely enough manner to support this approach. As of June 2009, Transit is considering a pilot project during the summer to provide a more robust e-mail alert system but specific timeframes for implementation have not yet been identified.

### *Mobile devices*

There are additional options available to Transit to communicate customer emergency information via cell phone and in a format compatible with mobile devices. While Transit's current e-mail

alert system can be useful for computer users, most riders need information while waiting for their bus. At bus stops, riders cannot access their computers, but may have cell phones or mobile devices available to them. Viewing a number of Transit Web site pages without the mobile format takes a long time on a mobile device and when a Web page does load it has too much text and is simply not useable. All five of the peer transit agencies send e-alerts to customers' cell phones via text messages and have web pages available in a mobile-friendly format (see Exhibit A).

**RECOMMENDATION F2c**

Transit should update the Web site so applications customers use during adverse weather are accessible and easy to use; implement a route specific e-mail notification system; and finally, implement alert information via text messaging to rider cell phones and make key Web site pages available to customers in a format compatible with mobile devices.

### *Blog and Twitter during emergencies*

The King County News Blog and King County Twitter[4] may not be the most effective tools to communicate real-time customer information and, in fact, may run counter to Transit communication goals. Transit has started using KC News Blog and a King County Twitter to provide customers with transit information on several occasions to report on the status of bus schedule or reroutes during periods of snow or expected snow during late winter and spring 2009. Some customers using Transit's Twitter account may put out inaccurate information, as happened during an adverse weather day this spring, causing Transit staff to spend time coordinating with multiple departments

[4] Twitter is a free social networking service that enables its users to send and read each others' updates, known as "tweets." Tweets are text-based posts of up to 140 characters that are delivered to other users who have subscribed to them. Senders can restrict delivery or allow open access. Users can send and receive tweets via the Twitter Web site, text message, or external applications.

### Transit Is Reassessing the Use of Blogs and Twitter During Emergencies

to research the claim and then publicize correct bus schedule information. While Transit staff can apply resources to the Blog and Twitter communication tools when one or two bus routes are altered, the staff resources to deal with large numbers of bus schedule changes during a more widespread adverse weather event could be considerable. In an un-moderated, real-time forum like Twitter it may be difficult and staff intensive for Transit to ensure accurate information via Twitter.

Transit is reassessing the use of the King County Blog and Twitter accounts for communicating timely bus schedule and reroute information during adverse weather. Given that Transit now has other tools in place to convey timely bus schedule or reroute information, the King County News Blog and Twitter account, while valuable tools for agency feedback, among other uses, may not be the best or most authoritative tools for communicating timely bus schedule or reroute information during adverse weather.

**EXHIBIT A**

**Comparison of Transit with Peer Agencies on Selected Customer Communication Methods**

| Communication Methods: | King County Transit | Tri-Met Portland | MBTA Boston | CTA Chicago | MTA Los Angeles | WAMTA Washington DC |
|---|---|---|---|---|---|---|
| **Can view Web info on mobile devices** | Planned | Yes Bus tracker | Yes | Yes | Yes Trip planner | Yes Trip planner |
| **Obtains customer communication feedback** | Not recently | Yes | Yes | Yes | Yes | Yes |
| **Alerts via e-mail** | Yes System-level | Yes Route-level | Yes Route-level | Yes Route-level | Yes Route-level | Yes Rail only |
| **Alerts via text message** | Planned | Yes | Yes | Yes | Yes | Yes Rail only |
| **Twitter** | In use | Not used | Not used | Not used | Not used | In use-rail only |
| **Blog** | In use | Not used | Not used | In use-not for route info | In use-not for route info | In use-not for route info |
| **Encourages 3rd party developers** | Planned | Yes | Planned | Planned | Yes | Yes |

**SOURCE**: King County Auditor's Office