# WIDE-AREA AUGMENTATION SYSTEM PERFORMANCE ANALYSIS REPORT

**Report #50**

**Reporting Period: July 1 to September 30, 2014**

**October 2014**

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## Executive Summary

Since 1999 the WAAS Test Team at the William J. Hughes Technical Center has reported GPS performance as measured against the GPS Standard Positioning Service (SPS) Signal Specification. These quarterly reports are known as the PAN (Performance Analysis Network) Report. In addition to the GPS PAN report, the WAAS Test Team also reports on the performance of the Wide-Area Augmentation System (WAAS). This WAAS PAN report, Report #50, covers WAAS performance during the period from June 1, 2014 to September 30, 2014.

The report shows results in accuracy, availability, coverage, safety index, range accuracy, WAAS broadcast message rates, GEO ranging availability, WAAS airport availability, WAAS CNMP analysis, WAAS reference station survey validation, and SQM.

A section on G3 receiver performance is included in this report. Twelve Novatel WAAS G3 receivers were setup at six existing WAAS reference sites with two receivers at each site in October 2013. The WAAS system will be upgraded to G3 receivers in preparation for a full constellation of dual civil frequency GPS satellites (L1/L5). This is the third report showing results on G3 receiver performance.

The following table shows observations for accuracy and availability made during the reporting period for CONUS and Alaska sites. The international sites are excluded from this table, but are included in the body of the report. LP service is available when the calculated Horizontal Protection Level (HPL) is less than 40 meters. LPV service is available when the calculated HPL is less than 40 meters and the Vertical Protection Level (VPL) is less than 50 meters. LPV 200 service is available when the calculated HPL is less than 40 meters, and the VPL is less than 35 meters. The NSTB sites, Grand Forks, Atlantic City, and Arcata, are outliers due to receiver quality issues, not the WAAS signal in space quality.

| Parameter | CONUS Site/Maximum | CONUS Site/Minimum | Alaska Site/Maximum | Alaska Site/Minimum |
|---|---|---|---|---|
| 95% Horizontal Accuracy (HPL <= 40 meters) | Atlantic City 1.298 meters | Denver 0.617 meters | Kotzebue 0.74 meters | Bethel 0.60 meters |
| 95% Vertical Accuracy (VPL <= 50 meters) | Atlantic City 1.947 meters | Salt Lake City 0.891 meters | Barrow 1.359 meters | Bethel 1.013 meters |
| LP Availability (HPL <= 40 meters) | Multiple Sites 100% | Kansas City 99.99% | Multiple Sites 100% | Multiple Sites 100% |
| LPV Availability (HPL <= 40 meters & VPL <= 50 meters) | Multiple Sites 100% | Oakland 99.97% | Multiple Sites 100% | Barrow 99.98% |
| LPV 200 Availability (HPL <= 40 meters & VPL < =35 meters) | Multiple Sites 100% | Oakland 99.14% | Multiple Sites 100% | Cold Bay 91.32% |
| 99% HPL | Miami 18.286 meters | Memphis 12.209 meters | Cold Bay 30.555meters | Fairbanks 13.478 meters |
| 99% VPL | Oakland 32.535 meters | Memphis 20.087 meters | Cold Bay 40.143 meters | Anchorage 23.373 meters |

**TABLE OF CONTENTS**

**LIST OF FIGURES**

## LIST OF TABLES

**APPENDIX**

## 1.0 INTRODUCTION

The FAA monitors WAAS and GPS SPS performance in order to ensure the safe and effective use of the satellite navigation system in the National Airspace System (NAS). The Wide Area Augmentation System (WAAS) adds more timely integrity monitoring of GPS and improves position accuracy and availability of GPS within the WAAS coverage area.

Objectives of this report are:

a. To evaluate and monitor the ability of WAAS to augment GPS by characterizing important performance parameters.
b. To analyze the effects of GPS satellite operation and maintenance, and ionospheric activity on the WAAS performance.
c. To investigate any GPS and WAAS anomalies and determine their impact on potential users.
d. To archive performance of GPS and WAAS for future evaluations.

The WAAS data transmitted from Geostationary satellites (GEO) PRN#135 (CRW), PRN#138 (CRE) and PRN#133 (AMR) are used in the evaluation. CRE and CRW GEOs provide a precision approach (PA) ranging capability that supports all levels of WAAS service. AMR GEO provides only non-precision approach (NPA) ranging service.

The terms "PA" and "NPA" are used in this report to refer to the two modes of user equipment operation. PA and NPA are terms used in the original WAAS specification, FAA-E-2892. See Table 1-1 for a mapping of these terms to the user service levels.

Receivers in PA mode are required to: use all WAAS corrections, use only corrected satellites, not mix corrections from multiple GEOs, only use the designated Space Based Augmentation System (SBAS) for the published approach procedure, and not use ranging from a GPS or GEO satellite having a User Differential Range Error (UDRE) status of greater than 15 meters. Receiver in NPA mode may: mix corrected and uncorrected satellites, mix corrections from different GEOs or SBASs, use either the WAAS ionosphere corrections or the GPS Klobachar model for ionosphere corrections, and use ranging from a GPS or GEO satellite that have a UDRE status of greater than 15 meters. NPA mode receivers may also operate using Fault Detection / Fault Detection Exclusion (FD/FDE) in the absence of a SBAS. The data presented in this report does not take credit for the additional NPA mode availability and continuity provided by the use of FD/FDE, whether full FD/FDE or partial FD/FDE used to allow the mixing of corrected and uncorrected satellites. The NPA accuracy data presented in this report uses Klobachar ionosphere corrections in order to be conservative.

The results in this report are based on the application of the WAAS corrections to receiver data from the WAAS receiver network and receivers of the FAA's National Satellite Test Bed (NSTB) network and from analysis based on the correction data broadcast by WAAS. Table 1-2 lists the receivers used in the PA analyses. Table 1-3 lists the receivers used in the NPA analyses.

**Table 1-1 WAAS Service Levels**

| User Service | NPA or PA | WAAS Protection Levels |
|---|---|---|
| RNP 0.3 | NPA | HPL <= 0.3 nmi |
| RNP 0.1 | NPA | HPL <= 0.1 nmi |
| LNAV | NPA | HPL <= 556 m |
| LNAV/VNAV | PA | HPL <= 556 m<br>VPL <= 50 m |
| LP | PA | HPL <= 40 m |
| LPV | PA | HPL <= 40 m<br>VPL <= 50 m |
| LPV200 | PA | HPL <= 40 m<br>VPL <= 35 m |

**Table 1-2 PA Evaluation Sites**

| | Number of Days Evaluated | Number of Samples |
|---|---|---|
| **NSTB:** | | |
| Atlantic City | 91 | 7894931 |
| Grand Forks | 90 | 7751776 |
| Oklahoma City | 85 | 7380660 |
| **WAAS:** | | |
| Albuquerque | 92 | 7946731 |
| Anchorage | 92 | 7948033 |
| Atlanta | 92 | 7948559 |
| Barrow | 92 | 7948029 |
| Bethel | 92 | 7946850 |
| Billings | 92 | 7948475 |
| Boston | 92 | 7948498 |
| Chicago | 87 | 7516565 |
| Cleveland | 92 | 7941962 |
| Cold Bay | 92 | 7948480 |
| Dallas | 92 | 7943171 |
| Denver | 92 | 7945903 |
| Fairbanks | 92 | 7948470 |
| Gander | 92 | 7944987 |
| Goose Bay | 92 | 7948351 |
| Houston | 92 | 7929088 |
| Iqaluit | 92 | 7939785 |
| Jacksonville | 92 | 7948562 |
| Juneau | 92 | 7947090 |
| Kansas City | 92 | 7948417 |
| Kotzebue | 92 | 7948115 |
| Los Angeles | 92 | 7948031 |
| Memphis | 92 | 7948565 |
| Merida | 92 | 7948297 |
| Mexico City | 92 | 7943932 |
| Miami | 92 | 7948548 |
| Minneapolis | 92 | 7948417 |
| New York | 92 | 7948564 |
| Oakland | 92 | 7947257 |
| Puerto Vallarta | 92 | 7947738 |
| Salt Lake City | 92 | 7947543 |
| San Jose Del Cabo | 84 | 7237622 |
| Seattle | 92 | 7946353 |
| Washington DC | 92 | 7948565 |
| Winnipeg | 92 | 7948559 |

**Table 1-3 NPA Evaluation Sites**

| Location | Number of Days Evaluated | Number of Samples |
|---|---|---|
| Albuquerque | 92 | 7948053 |
| Anchorage | 92 | 7944670 |
| Atlanta | 92 | 7948019 |
| Barrow | 92 | 7947769 |
| Bethel | 92 | 7945688 |
| Billings | 92 | 7947944 |
| Boston | 92 | 7947961 |
| Cleveland | 92 | 7947959 |
| Cold Bay | 92 | 7947923 |
| Fairbanks | 92 | 7947931 |
| Gander | 92 | 7936750 |
| Honolulu | 92 | 7923219 |
| Houston | 92 | 7946421 |
| Iqaluit | 92 | 7942352 |
| Juneau | 92 | 7939483 |
| Kansas City | 92 | 7944820 |
| Kotzebue | 92 | 7947759 |
| Los Angeles | 92 | 7947839 |
| Merida | 92 | 7942022 |
| Miami | 92 | 7948036 |
| Minneapolis | 92 | 7947950 |
| Oakland | 92 | 7946854 |
| Salt Lake City | 92 | 7947067 |
| San Jose Del Cabo | 84 | 7237445 |
| San Juan | 92 | 7946624 |
| Seattle | 92 | 7945919 |
| Tapachula | 90 | 7802110 |
| Washington DC | 92 | 7946290 |

The report is divided in the performance categories listed below.

1. WAAS Position Accuracy
2. WAAS Operational Service Availability
3. WAAS Coverage
4. WAAS Integrity
5. WAAS Range Domain Accuracy
6. WAAS GEO Ranging Performance
7. WAAS Airport Availability
8. WAAS CNMP Analysis
9. WAAS Antenna Survey Validation
10. WAAS SQM Analysis
11. WAAS G3 Receiver Analysis

Table 1-4 lists the performance parameters evaluated for the WAAS in this report. Please note that these are the performance parameters associated with the WAAS system. These requirements are extracted from the FAA Specification FAA-E-2892C and FAA Specification FAA-E-2976, as applicable.

**Table 1-4 WAAS Performance Parameters**

| Performance Parameter | Expected WAAS Performance |
|---|---|
| LPV Accuracy Horizontal | ≤ 1.5m error 95% of the time |
| LPV Accuracy Vertical | ≤ 2m error 95% of the time |
| LNAV Accuracy Horizontal | ≤ 36m error 95% of the time |
| Availability LPV CONUS | 99% availability of 100% of CONUS |
| Availability LPV Alaska | 95% availability of 75% of Alaska |
| Availability LNAV CONUS | 99.99% availability with HPL < 556m |
| Availability LNAV Alaska | 99.9% availability with HPL < 556m |
| Availability En route OCONUS | 99.9% availability with HPL < 2nmi |
| Probability of Hazardously Misleading Information (HMI) | < 10e-7 per approach |

## 1.1 Event Summary

Table 1-5 lists events that affected WAAS performance or the ability to determine the WAAS performance during the reporting period. These events include GPS or WAAS anomalies, relevant receiver malfunctions, and receiver maintenance conducted. Detailed analyses of particular events are documented in the Discrepancy Reports (DR). The DRs are posted on the website http://www.nstb.tc.faa.gov under 'WAAS Technical Reports' and can also be accessed via hyperlink from Table 1-5 below. Please note "TOW" is the time of GPS week, which is the cumulative number of seconds since 00:00:00 Sunday (GMT without leap seconds).

Table 1-6 lists events related to WAAS upgrades that happened this quarter. Table 1-7 lists events related to GUS switchovers. A GUS switchover is the transition from one uplink site to the other uplink site for a GEO.

**Table 1-5 Events**

| Start Date | End Date | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|
| 7/1/2014 | 7/1/2014 | Kansas City (ZKC1), Kansas City (ZKC2) | Local | Local RFI degraded reception at the ZKC (Kansas City) and caused a brief (91 sec.) reported outage of the LPV200 service for the A and B threads of receivers. LPV service was no impacted. |
| 7/10/2014 | 7/10/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV200_Canada | Geomagnetic activity (Kp = 3) mildly disturbed the ionosphere causing elevated GIVE values which degraded LPV200 service availability in northern Canada for about 30 minutes starting at about 02:15. Please see plot(s): LPV200_7/10/2014 |
| 7/11/2014 | 7/11/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV200_Canada | Geomagnetic activity (Kp = 2) mildly disturbed the ionosphere causing elevated GIVE values which degraded LPV200 service availability in northern Canada for about 90 minutes starting at about 01:50. Please see plot(s): LPV200_7/11/2014 |

| Start Date | End Date | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|
| 7/12/2014 | 7/12/2014 | PRN21 | LPV200_CONUS, LPV200_Alaska | Probable carrier phase instability on PRN-21 caused the WAAS carrier smoothing algorithm to reinitialize, resulting in WAAS alarming PRN-21 to the "Not Monitored" status at about 03:17. This caused a very short loss of LPV200 service for coastal southern California (~3 min) and the brief loss of LPV200 service in north eastern Alaska and north western Canada (~10 min). Please see plot(s): LPV200_7/12/2014 |
| 7/17/2014 | 7/17/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV200_Canada | Geomagnetic activity (Kp = 2) mildly disturbed the ionosphere causing elevated GIVE values which degraded LPV200 service availability in north eastern Canada for about 75 minutes starting at about 12:00. Please see plot(s): LPV200_7/17/2014 |
| 7/17/2014 | 7/17/2014 | PRN6 | None | NANU 2014057 |
| 7/18/2014 | 7/18/2014 | Oklahoma City (OKC1) | Local | Local RFI degraded reception at the OKC (Oklahoma City) and caused a brief reported outage of the LPV200 service, although LPV service was maintained. |
| 7/18/2014 | 7/18/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV), PRN24 | LPV200_Alaska | WAAS set the UDRE for PRN-24 to "Not Monitored" for a short interval. This resulted in a 10 to 12 second LPV200 outage to be observed in north western Alaska. (20:12:10 to 20:12:21) LPV service was not impacted. |
| 7/20/2014 | 7/20/2014 | GEO133 | None | A fault at the Santa Paula CA uplink site fro the AMR GEO, PRN-133 resulted in a 36 minute outage (13:20:05 to 13:56:10) of the signal in space from AMR. The alternate uplink for AMR, Paumalu HI was unavailable to a prior fault. User service was not impacted because the signal in space from the CRE and CRW GEOs was not effected. |
| 7/22/2014 | 7/22/2014 | Iqaluit (YFB1), Iqaluit (YFB2), Iqaluit (YFB3) | LPV_Canada, LPV200_Canada | Simultaneous outages on both communications circuits to the Iqaluit Canada reference station caused the temporary loss of observations from that site resulting in degradation to the LPV and LPV200 services in north eastern Canada. The impact varied in time and location over an approximate 3 hour period from 12:30 to 15:30. Please see plot(s): LPV_7/22/2014 LPV200_7/22/2014 |
| 7/25/2014 | 7/25/2014 | PRN21 | LPV200_CONUS, LPV200_Canada, LPV200_Mexico | Probable carrier phase instability on PRN-21 caused the WAAS carrier smoothing algorithm to reinitialize twice over a short period, resulting in WAAS alarming PRN-21 to the "Not Monitored" status at 01:55:21 and 01:15:44. This caused a very short loss of LPV200 service for coastal southern California and Mexico. A 38 second outage observed at ZLA (Palmdale CA) and a 884 second outage observed at MSD (San Jose Del Cabo MX). Normal (daily event) high GIVE |

| Start Date | End Date | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|
| | | | | values off of the coast of California also impacted LPV200 in coastal California from about 8:25 to 9:15. LPV service was not impacted. Please see plot(s): LPV200_7/25/2014 |
| 7/30/2014 | 7/30/2014 | Iqaluit (YFB1), Iqaluit (YFB2), Iqaluit (YFB3) | LPV200_Canada | Simultaneous outages on both communications circuits to the Iqaluit Canada reference station resulted in the temporary loss of observations from that site resulting in degradation to the LPV and LPV200 services in north central Canada from about 21:30 to 21:50. Please see plot(s): LPV200_7/30/2014 |
| 8/1/2014 | 8/1/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV_Canada, LPV200_Canada | Geomagnetic activity (Kp = 4) mildly disturbed the ionosphere causing elevated GIVE values which degraded LPV200 and LPV service availability in northern and eastern Canada. Location and duration of the LPV200 service impacts varied with time. The LPV outage was limited to eastern tip of Canada from about 7:15 to 7:50. Please see plot(s): LPV_8/1/2014 LPV200_8/1/2014 |
| 8/2/2014 | 8/2/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV200_Alaska, LPV200_Canada | Geomagnetic activity (Kp = 4) mildly disturbed the ionosphere causing elevated GIVE values which degraded LPV200 service availability in northern Alaska and northern Canada. Quantity, location and duration of the LPV200 service outages varied with time. The LPV service was not impacted. Please see plot(s): LPV200_8/2/2014 |
| 8/3/2014 | 8/3/2014 | PRN3 | LPV_CONUS, LPV200_CONUS | SVN33 (PRN-3) was decommissioned so that PRN-3 could be reused for an upcoming IIF launch, see NANU 2014063. This change in constellation worsened the daily LPV200 outage in coastal California such that the daily 2 five minute outages at ZOA (Oakland CA) merged into a single 25 minute outage, and a new 70 second outage is being observed on subsequent days. Please see plot(s): LPV_8/3/2014 LPV200_8/3/2014 |
| 8/4/2014 | 8/5/2014 | GEO135, Littleton (APA) | LPV_Alaska, LPV200_Alaska, LPV200_Canada | Operator directed switchover for the CRW GEO, PRN-135 from the Littleton CO uplink to the Napa CA uplink resulted in the reinitialization of the WAAS carrier smoothing algorithm for PRN-135 resulting in elevated UDRE values for PRN-135 for the next 36 hours. The elevated UDRE values on PRN-135 and high GIVEs from a mildly disturbed ionosphere (Kp = 3 both days) caused LPV-200 service outages to northern Alaska and northern Canada on 8/4/14 and 8/5/14, and caused an LPV outage in northern Alaska on 8/5/14. Please see plot(s): LPV200_8/4/2014 LPV_8/5/2014 LPV200_8/5/2014 |
| 8/4/2014 | 8/6/2014 | Washington D.C. | None | Selected master station sources for the to be |

| Start Date | End Date | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|
| | | (CnV),<br>Atlanta (CnV) | | broadcast user messages was manually updated on 8/4/14 and 8/6/14 to prepare for software upgrades to the master stations. Some of those source selection changes caused message type 2 (MT-2) alarms where the UDREi's remained unchanged. There was no impact on user service. The times of the selected source changes and whether or not there was MT-2 alarm are as follows: 8/4/14 CRW GEO, PRN-135, selected master station changed from ZLA to ZDC at 06:01:25, no MT-2 alarm CRE GEO, PRN-138, selected master station changed from ZLA to ZDC at 05:59:54, MT-2 alarm AMR GEO, PRN-133, selected master station changed from ZTL to ZDC at 06:17:09, MT-2 alarm 8/6/14 AMR GEO, PRN-133, selected master station changed from ZDC to ZTL at 06:48:20, MT-2 alarm |
| 8/12/2014 | 8/12/2014 | Washington D.C. (CnV),<br>Los Angeles (CnV),<br>Atlanta (CnV) | LPV_Canada,<br>LPV200_Alaska,<br>LPV200_Canada | High GIVEs caused by the ionosphere being disturbed by mild geomagnetic activity (Kp = 4) caused LPV200 service outages in northern Alaska and northern Canada and may have combined with the Iqaluit outages to cause the LPV service outage in Canada.<br>Please see plot(s): LPV_8/12/2014<br>LPV200_8/12/2014 |
| 8/12/2014 | 8/12/2014 | Iqaluit (YFB1),<br>Iqaluit (YFB2),<br>Iqaluit (YFB3) | LPV_Canada,<br>LPV200_Canada | Simultaneous outages on both communications circuits to the Iqaluit Canada reference station resulted in the temporary loss of observations from that site resulting in degradation to the LPV and LPV200 services in north central Canada from about 01:30 to 03:00. High GIVEs caused by the ionosphere being disturbed by mild geomagnetic activity (Kp = 4) may have also contributed to the outages.<br>Please see plot(s): LPV_8/12/2014<br>LPV200_8/12/2014 |
| 8/12/2014 | 8/12/2014 | PRN4 | LPV_Canada,<br>LPV200_Canada | Planned maintenance on PRN-4, NANU 2014067, resulted in an unusual number of alarms (8ea). The extra alarms were from the "Not Monitored" condition to the "Do Not Use" condition. This indicates that the L1 signal from PRN-4 was turned off (or in an untrackable state) and then turned back on multiple times while the satellite health was set to "unhealthy". PRN-4 being out of service for the NANU may have combined with the high GIVE values to contribute to the LPV-200 outages in north eastern Canada during the final quarter of the day.<br>Please see plot(s): LPV200_8/12/2014 |
| 8/14/2014 | 8/14/2014 | PRN13 | LPV200_CONUS,<br>LPV200_Canada | Planned delta V maneuver (see NANU 2014068) caused PRN-13 to be temporarily unavailable. The absence of PRN-13 for that time caused LPV200 service outages in CONUS and south central Canada. LPV200 outage in CONUS was two |

| Start Date | End Date | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|
| | | | | events, the first was from south central Canada / Wisconsin to Oklahoma from about 10:36 to 11:00 and the second was from Ohio to North Carolina from about 13:15 to 13:36. The PRN-13 outage may have also contributed to reduced LPV-200 service along the northern edge of Canada. Please see plot(s): LPV200_8/14/2014 |
| 8/17/2014 | 8/17/2014 | Los Angeles (ZLA1), Los Angeles (ZLA2), Los Angeles (ZLA3) | Local | Localized RFI caused degraded tracking at the ZLA reference station resulting in 200 second LPV and LPV200 outages being observed for that receiver in this report (02:29:55 to 02:33:14). |
| 8/19/2014 | 8/19/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV_Canada, LPV200_Alaska, LPV200_Canada | Geomagnetic activity (Kp = 6) mildly disturbed the ionosphere causing elevated GIVE values which degraded LPV200 service availability in northern Alaska and Canada and LPV service in north east Canada. The location and duration of the outages varied with time, but the worst impact was for LPV200 service in north east Canada for the last 2 hours of the day. Please see plot(s): LPV_8/19/2014 LPV200_8/19/2014 |
| 8/28/2014 | 8/28/2014 | PRN21 | LPV_Canada, LPV200_CONUS, LPV200_Canada | A carrier phase instability on PRN-21 caused the WAAS carrier smoothing algorithm to reinitialize, resulting in WAAS alarming PRN-21 to the "Not Monitored" status at 12:23. This caused a short loss of LPV200 service for the New England region of CONUS form 12:23 to 12:30, and a slightly longer LPV200 outage to eastern Canada from 12:23 to about 13:00. There was also a short LPV service outage for the eastern tip of Canada, also from 12:23 to 12:30. Please see plot(s): LPV_8/28/2014 LPV200_8/28/2014 |
| 8/28/2014 | 8/28/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV200_CONUS | Geomagnetic activity (Kp = 5) mildly disturbed the ionosphere causing elevated GIVE values which caused a brief LPV200 service outage for the north western coast of CONUS. The observed outage at ZSE was 43 seconds from 06:10:52 to 06:11:34. The VPL at ZSE only reached 35.8 meters (normal for that time is ~ 33 meters). Please see plot(s): LPV200_8/28/2014 |
| 8/30/2014 | 8/30/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV_Canada, LPV200_Canada | Geomagnetic activity (Kp = 4) mildly disturbed the ionosphere causing elevated GIVE values which caused a degraded LPV200 service along the northern edge of Canada and brief (< 3 minutes) LPV service outage in north western Canada near the boarder with Alaska. Please see plot(s): LPV_8/30/2014 LPV200_8/30/2014 |
| 9/12/2014 | 9/13/2014 | Washington D.C. (CnV), | LPV_Canada, LPV200_CONUS, | Geomagnetic activity (Kp = 7 on 9/12/14 and Kp = 4 on 9/13/14) caused a significant LPV200 service |

| Start Date | End Date | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|
| | | Los Angeles (CnV), Atlanta (CnV) | LPV200_Canada | outage in eastern Canada, extending into the great lakes region of CONUS on 9/12. There was also a LPV service outage in eastern Canada on 9/12/14. There was also some brief LPV200 service outages in northern Canada on 9/13/14. A more detailed description of this event can be found in DR-125. See http://www.nstb.tc.faa.gov/Discrepancy%20Reports%20PDF/DR%20125%20Effect%20on%20WAAS%20from%20Iono%20Activity%20September%2012-13%202014.pdf Please see plot(s): LPV_9/12/2014 LPV200_9/12/2014 LPV200_9/13/2014 |
| 9/15/2014 | 9/15/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV_CONUS, LPV_Mexico, LPV200_CONUS, LPV200_Mexico | Elevated ionosphere delays south of Mexico caused elevated GIVE values which caused LPV and LPV200 outages in Mexico extending in to the Brownsville area of Texas. The Brownsville area impact was from about 02:27 to 03:00. Please see plot(s): LPV_9/15/2014 LPV200_9/15/2014 |
| 9/15/2014 | 9/15/2014 | Miami (ZMA1), Miami (ZMA2), Miami (ZMA3) | Local | Localized RFI caused degraded tracking at the ZMA reference station resulting in 36 second LPV200 outage to be observed for that receiver in this report (06:16:58 to 06:17:33. Observed LPV service was not impacted. |
| 9/17/2014 | 9/17/2014 | PRN9 | None | SVN 68 (PRN 9) became initially usable NANU 2014071. |
| 9/19/2014 | 9/19/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV_Canada, LPV200_Canada | Geomagnetic activity (Kp = 5) mildly disturbed the ionosphere causing elevated GIVE values which caused a significant LPV200 outage in north central Canada for about the first 3 hours of the day. There was also a lesser LPV service impact from about 01:45 until 02:45. Please see plot(s): LPV_9/19/2014 LPV200_9/19/2014 |
| 9/19/2014 | 9/19/2014 | PRN13 | LPV200_CONUS | Planned delta V maneuver (see NANU 2014072) caused PRN-13 to be temporarily unavailable. The absence of PRN-13 for that time caused a brief LPV200 service outage in North Carolina. That outage was less than 2 minutes at about 10:54. Please see plot(s): LPV200_9/19/2014 |
| 9/24/2014 | 9/24/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV200_Canada | Geomagnetic activity (Kp = 4) mildly disturbed the ionosphere causing elevated GIVE values which caused a minor LPV200 outage along the northern edges of the Canada service area. Please see plot(s): LPV200_9/24/2014 |
| 9/25/2014 | 9/28/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV200_Canada | Geomagnetic activity over the three days (Kp = 4, 3, 4, and 3) mildly disturbed the ionosphere causing elevated GIVE values which caused a minor LPV200 outages all three days in northern Canada. Please see plot(s): LPV200_9/25/2014 LPV200_9/26/2014 LPV200_9/27/2014 |

| Start Date | End Date | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|
| | | | | LPV200_9/28/2014 |
| 9/26/2014 | 9/26/2014 | Iqaluit (YFB1), Iqaluit (YFB2), Iqaluit (YFB3) | LPV_Canada, LPV200_Canada | Simultaneous outages on both communications circuits to the Iqaluit Canada reference station resulted in the sporadic loss of observations from that site contributing to the degradation of the LPV200 service in northern Canada on 9/26/14 that was mainly caused by the disturbed ionosphere causing increased GIVE values. Please see plot(s): LPV200_9/26/2014 |
| 9/26/2014 | 10/9/2014 | Chicago (ZAU1), Chicago (ZAU2), Chicago (ZAU3) | None | Fire at Chicago ARTCC (ZAU) resulted in the WAAS equipment at ZAU being powered down and the disruption of the communications circuits used by WAAS at ZAU. The impacted equipment were two backbone concentrator network node routers and the 3 sets of receiving equipment of the ZAU WRS. WAAS system level performance was not impacted by the event due to the WAAS redundancy architecture. |
| 9/28/2014 | 9/28/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV200_CONUS | High GIVE values associated with the ongoing ionosphere activity caused a 19 minute LPV200 service outage in southern Florida starting at about 01:05. Please see plot(s): LPV200_9/28/2014 |
| 9/29/2014 | 10/1/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV_Canada, LPV200_Canada | Geomagnetic activity over the three days (Kp = 4 all three days) mildly disturbed the ionosphere causing elevated GIVE values which caused a minor LPV200 outages all three days in northern Canada and LPV service in northern Canada on 9/30/14. Please see plot(s): LPV200_9/29/2014 LPV_9/30/2014 LPV200_9/30/2014 LPV200_10/1/2014 |
| 9/30/2014 | 9/30/2014 | Washington D.C. (CnV), Los Angeles (CnV), Atlanta (CnV) | LPV_CONUS, LPV200_CONUS | High GIVE values associated with the ongoing ionosphere activity caused a 21 minute LPV200 service outage in southern Florida starting at about 00:55. Please see plot(s): LPV200_9/30/2014 |

**Table 1-6 WAAS Upgrades**

There were no WAAS upgrades for this reporting period.

**Table 1-7 GUS Switchovers**

| Start Date | End Date | GUS Switch | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|---|
| 7/72014 | 7/8/2014 | Faulted | GEO138, Brewster | LPV200_Alaska, LPV200_Canada | Uplink for the CRE GEO, PRN-138, switched from the Brewster WA uplink to |

| Start Date | End Date | GUS Switch | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|---|
| | | | (BRE-B) | | the Woodbine MD uplink due to a fault at Brewster. The switchover started at 15:56:50 and completed at 15:15:02 resulting in 14 missed user messages. The 14 count is slightly more than normal. All GEO uplink switchovers cause the WAAS carrier smoothing algorithm to reinitialize. After reinitialization it takes about 14 hours for the CRE ranging signal UDRE to reach the level where it supports precision approach operations and about 36 hours before the full level of UDRE performance is achieved. |
| 7/11/2014 | 7/11/2014 | Manual | Santa Paula (SZP) | None | Manually initiated switchover of the uplink for the AMR GEO, PRN-133 from the Santa Paula uplink site to the Paumalu HW uplink site at 08:01:32. Transmission of 2 user messages were missed during the switchover. The AMR ranging signal only supports LNAV operations. Full UDRE performance for AMR UDRE was achieved in about 9.5 hours. |
| 7/20/2014 | 7/20/2014 | Faulted | GEO133, Paumalu (HDH) | None | Uplink for the AMR GEO, PRN-133, switched from the Paumalu HW uplink to the Santa Paula CA uplink due to a fault at Paumalu. The switchover started at 11:49:58 and completed at 11:50:06 resulting in 8 missed user messages. The AMR ranging signal only supports LNAV operations. Full UDRE performance for AMR UDRE was achieved in about 20.5 hours. Orbit estimation appears to have been reinitialized by the switchover in addition to the normal carrier smoothing reinitialization. |
| 7/28//2014 | 7/28/2014 | Faulted | GEO133, Santa_Paula (SZP) | None | The operators directed a manual switch back to Santa Paula at 07:27:40 after the site was restored, resulting in 2 missed user messages. The AMR ranging signal only supports LNAV operations. Full UDRE performance for AMR UDRE was achieved about 12.5 hours after the first switchover. |
| 7/28/2014 | 7/28/2014 | Manual | GEO133, Paumalu (HDH) | None | Uplink for the AMR GEO, PRN-133, switched from the Santa Paula CA uplink to the Paumalu HW uplink due to a C5 HPA fault at Santa Paula. The switchover started at 06:11:00 and completed at 06:11:07 resulting in 7 missed user messages. |

| Start Date | End Date | GUS Switch | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|---|
| 8/4/2014 | 8/5/2014 | Manual | GEO135, Littleton (APA) | LPV_Alaska, LPV200_Alaska, LPV200_Canada | Operator directed switchover for the CRW GEO, PRN-135 from the Littleton CO uplink to the Napa CA uplink resulted in the reinitialization of the WAAS carrier smoothing algorithm for PRN-135 resulting in elevated UDRE values for PRN-135 for the next 36 hours. The elevated UDRE values on PRN-135 and high GIVEs from a mildly disturbed ionosphere (Kp = 3 both days) caused LPV-200 service outages to northern Alaska and northern Canada on 8/4/14 and 8/5/14, and caused an LPV outage in northern Alaska on 8/5/14. Please see plot(s): LPV200_8/4/2014 LPV_8/5/2014 LPV200_8/5/2014 |
| 8/11/2014 | 8/11/2014 | Manual | GEO138, Woodbine (QWE) | None | Manually initiated switchover of the uplink for the CRE GEO, PRN-138 from the Woodbine MD uplink site to the Brewster WA uplink. The switchover started at 08:00:05 and completed at 08:00:07 resulting in 2 missed user messages.. The CRE ranging signal UDRE began supporting precision approach about 5.5 hours after the switchover and reached full UDRE performance at about 29 hours after the switchover. |
| 8/15/2014 | 8/16/2014 | Manual | GEO138, Brewster (BRE-B) | LPV200_Canada | Manually initiated switchover of the uplink for the CRE GEO, PRN-138 from the Brewster WA uplink site to the Woodbine MD uplink site. The switchover started at 05:00:52 and completed at 05:00:54 resulting in 2 missed user messages.. The CRE ranging signal UDRE began supporting precision approach about 5.5 hours after the switchover and reached full UDRE performance at about 28 hours after the switchover. The higher UDREs on CRE may have contributed to enlarging the daily LPV200 service outage on the north east edge of coverage in Canada during the first 1/4 of the day on 8/16/14. |
| 8/16/2014 | 8/17/2014 | Manual | GEO135, NAPA (APC) | LPV200_Alaska | Manually initiated switchover of the uplink for the CRW GEO, PRN-135 from the Napa Ca uplink site to the Littleton CO uplink site. The switchover started at 06:00:26 and completed at 06:00:28 resulting in 2 missed user messages The CRW ranging signal UDRE began supporting precision approach about 6.5 |

| Start Date | End Date | GUS Switch | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|---|
| | | | | | hours after the switchover and reached full UDRE performance at about 37.5 hours after the switchover. The higher UDREs on CRW may have contributed to enlarging the daily LPV200 service outage on the north central edge of Alaska coverage at about 00:48 on 8/17/14. |
| 8/17/2014 | 8/17/2014 | Faulted | GEO133, Santa Paula (SZP) | None | Uplink for the AMR GEO, PRN-133, switched from the Santa Paula CA uplink to the Paumalu HW uplink due to a receiver fault at Santa Paula. The switchover started at 10:59:45 and completed at 10:59:53 resulting in 8 missed user messages. The AMR ranging signal only supports LNAV operations. Full UDRE performance for AMR UDRE was not stable until about 42.5 hours after the switchover. The switchover appears to have perturbed the orbit estimation, but not enough to cause a reinitialization. |
| 8/21/2014 | 8/21/2014 | Manual | GEO133, Paumalu (HDH) | None | Manually initiated switchover of the uplink for the AMR GEO, PRN-133 from the Paumalu HW uplink site to the Santa Paula CA uplink site due to 14 intermittently corrupted user messages between 12:56:37 and 15:03:13 and L1 frequency spikes. The frequency spikes reset the WAAS carrier smoothing algorithm causing the UDRE for AMR to be set to "Not Monitored". The switchover started at 18:25:49 and completed at 18:25:51 resulting in 2 missed user messages. The AMR ranging signal only supports LNAV operations. Full UDRE performance for AMR UDRE was not stably achieved until about 40 hours after the events started. |
| 8/24/2014 | 8/24/2014 | Faulted | GEO133, Santa Paula (SZP) | None | Uplink for the AMR GEO, PRN-133, switched from the Santa Paula CA uplink to the Paumalu HW uplink due to a C5 uplink EIRP fault at Santa Paula. The switchover started at 06:32:08 and completed at 06:32:16 resulting in 8 missed user messages. The AMR ranging signal only supports LNAV operations. Full UDRE performance for AMR UDRE was not stable until abbot 44.5 hours after the switchover. The switchover appears to have perturbed the orbit estimation, but not enough to cause a reinitialization. |
| 8/29/2014 | 8/29/2014 | Manual | GEO138, | LPV_Canada, | Manually initiated switchover of the uplink |

| Start Date | End Date | GUS Switch | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|---|
| | | | Woodbine (QWE) | LPV200_Canada | for the CRE GEO, PRN-138 from the Woodbine MD uplink site to the Brewster WA uplink. The switchover started at 08:00:37 and completed at 08:00:39 resulting in 2 missed user messages. The CRE ranging signal UDRE began supporting precision approach about 5.5 hours after the switchover and reached full UDRE performance at about 30 hours after the switchover. The degraded UDRE on CRE may have worsened the LPV and LPV-200 service outages in Canada that were mainly caused by enlarged GIVE valued due to the disturbed ionosphere. |
| 9/6/2014 | 9/7/2014 | Faulted | GEO138, Brewster (BRE-B) | LPV_Canada, LPV200_Alaska, LPV200_Canada | Uplink for the CRE GEO, PRN-138, switched from the Brewster WA uplink to the Woodbine MD uplink due to a C5 KPA fault at Brewster. The switchover started at 08:50:09 and completed at 08:50:17 resulting in 8 missed user messages. The CRE ranging signal UDRE began supporting precision approach about 5.5 hours after the switchover and reached full UDRE performance at about 29 hours after the switchover. The degraded UDRE on CRE may have worsened the LPV and LPV-200 service outages in Canada that were mainly caused by enlarged GIVE valued due to the disturbed ionosphere. |
| 9/15/2014 | 9/15/2014 | Manual | GEO133, Paumalu (HDH) | None | Manually initiated switchover of the uplink for the AMR GEO, PRN-133 from the Paumalu HW uplink site to the Santa Paula CA uplink site. The switchover started at 22:00:10 and completed at 22:00:12 resulting in 2 missed user messages. The AMR ranging signal only supports LNAV operations. Time until full UDRE performance for AMR UDRE was stably achieved after the switch is indeterminate due to other issue impacting AMR UDRE. |
| 9/15/2014 | 9/15/2014 | Manual | GEO133, Santa Paula (SZP) | None | GEO 133, manual switchover from Santa_Paula to Paumalu. GEO 133, manual switchover from Santa_Paula to Paumalu. GEO 133, manual switchover from Santa_Paula to Paumalu. GEO 133, manual switchover from Santa_Paula to Paumalu. TOW 167177-167184 |
| 9/24/2014 | 9/24/2014 | Manual | GEO133, Paumalu (HDH) | None | Manually initiated switchover of the uplink for the AMR GEO, PRN-133 from the Paumalu HW uplink site to the Santa Paula |

| Start Date | End Date | GUS Switch | Location/ Satellite | Service Affected | Event Description |
|---|---|---|---|---|---|
| | | | | | CA uplink site. The switchover started at 22:12:15 and completed at 22:12:17 resulting in 2 missed user messages. The AMR ranging signal only supports LNAV operations. Time until full UDRE performance for AMR UDRE was stably achieved after the switch is indeterminate due to other issue impacting AMR UDRE. |
| 9/30//2014 | 9/30/2014 | Faulted | GEO133, Santa Paula (SZP) | None | Uplink for the AMR GEO, PRN-133, switched from the Santa Paula CA uplink to the Paumalu HW uplink due to a C5 uplink EIRP fault at Santa Paula. The switchover started at 01:09:44 and completed at 01:09:52 resulting in 8 missed user messages. The AMR ranging signal only supports LNAV operations. Time until full UDRE performance for AMR UDRE was stably achieved after the switch is indeterminate due to other issue impacting AMR UDRE. |

### 1.2 Report Overview

Section 2 documents the LPV and NPA performance observed for the indicated receiver locations (see Tables 1-2 and 1-3). The 95% accuracy index and the maximum inaccuracy for the reporting period are tabulated. The daily 95% accuracy index is plotted for each receiver. Histograms of the vertical and horizontal error distribution using the data from all the evaluated receivers are provided..

Section 3 summarizes the WAAS instantaneous availability performance, at each receiver, for three operational service levels during the reporting period. Daily availability is also plotted for each receiver evaluated. The number of outages and outage rate for each site is reported.

Section 4 provides geographic plots of the availability of the WAAS services rolled up for the quarter. Plots of the percent of the CONUS and Alaska service areas covered by various levels of service availability are provided.

Section 5 summarizes the number of HMI events detected during the reporting period and presents a safety margin index for each receiver. The safety margin index reflects the amount of over bounding of position error by WAAS protection levels. This section also includes update rates of WAAS messages transmitted from CRE, CRW, and AMR.

Section 6 provides the UDRE and GIVE bounding percentage and the 95% index of the range and ionospheric accuracy for each satellite tracked by the WAAS receiver at 12 locations.

Section 7 provides the GEO ranging performance for CRE and CRW.

Section 8 provides WAAS LPV availability and outages at selected airports.

Section 9 provides the assessment of WAAS CNMP bounding for the 114 WAAS receivers.

Section 10 provides the surveyed positions of all WREs and the difference between the WRE survey positions in the current operational software and the survey positions in this report.

Section 11 provides the daily and quarterly average of SQM PRN type biases and PRN biases.

Section 12 provides the WAAS G3 Novatel receiver performance.

## 2.0 WAAS POSITION ACCURACY

Navigation error data, collected from WAAS and NSTB reference stations, was processed to determine position accuracy at each location. This was accomplished by utilizing the GPS/WAAS position solution tool to compute a RTCA DO-229D weighted least squares user navigation solution, and WAAS horizontal and vertical protection levels (HPL & VPL), once every second. The user position calculated for each receiver was compared to the surveyed position of the antenna to assess position error associated with the WAAS SIS over time. The position errors were analyzed and statistics were generated for the operational service levels shown in Table 1-1.

Table 2-1 shows PA horizontal and vertical position accuracy maintained for 95% of the time at LP, LPV and LNAV/VNAV operational service levels for the quarter. The table also includes 95% SPS accuracy for certain locations. Figures 2-1 to 2-6 show the daily horizontal and vertical 95% accuracy for LPV operational service level for the period. Note that WAAS accuracy statistics presented are compiled only when all WAAS corrections (fast, long term, and ionospheric) for at least 4 satellites are available. This is referred to as PA navigation mode. The percentage of time that PA navigation mode was supported by WAAS at each receiver is also shown in Table 2-1. A user is considered to be in NPA navigation mode if only WAAS fast and long term corrections are available to a user (i.e. no ionospheric corrections). Table 2-2 shows NPA horizontal position accuracy for 95% and 99.999% of the time. This table also shows the maximum NPA horizontal position error for the quarter. Figures 2-7 to 2-8 show the daily horizontal 95% accuracy for NPA.

Table 2-3 shows the maximum LPV error statistics. The column marked ‘Horizontal Error’ shows the maximum position errors while the calculated HPL meets the LPV service level defined in Table 1-1. The column marked ‘Vertical Error’ shows the maximum position errors while the calculated VPL meets the LPV service level. The columns marked ‘Horizontal Error/HPL’ and ‘Vertical Error/VPL’ show the ratio of position error to protection level at the time the maximum error occurred. The columns marked ‘Horizontal Maximum Ratio’ and ‘Vertical Maximum Ratio’ show the maximum position error to protection level ratio for the quarter.

During this reporting period, the maximum 95% CONUS horizontal and vertical LPV errors were 1.298 meters and 1.957 meters, both at Atlantic City, respectively. The minimum 95% CONUS horizontal and vertical LPV errors were 0.617 meters and 0.891 meters at Denver and Salt Lake City, respectively. The maximum 95% and 99.999% NPA horizontal errors were 4.499 meters and 16.490 meters, at Honolulu and San Juan, respectively. The minimum 95% and 99.999% horizontal errors were 1.180 meters and 2.716 meters at Kansas City and Seattle, respectively.

The increases in 95% PA position errors in Figure 2-1 to 2-6 on the following days were due to geomagnetic activity: On 08/28/2014, 08/29/2014, 09/23/2014, and 09/24/14 position errors in CONUS, Alaska, and Canada were elevated. On 09/12/2014 and 09/13/2014 position errors in CONUS and Canada were elevated. On 08/19/2014 and 09/25/2014 to 09/30/2014 position errors in Alaska and Canada were elevated. On 09/19/2014 position errors in Alaska only were elevated. The increases in 95% NPA position errors on 07/09/2014, 07/10/2014, 08/19/2014, 08/27/2014, 08/28/2014, 09/11/2014, and 09/23/2014 to 09/30/2014 in Figure 2.7 to 2.8 were due to geomagnetic activity as well.

Figures 2-9 to 2-12 show the distributions of the vertical and horizontal errors at all 38 WAAS receiver locations combined in triangle charts and 2-D histogram plots for the quarter. The triangle charts in Figures 2-9 and 2-10 show the distributions of vertical position errors (VPE) versus vertical protection levels (VPL) and horizontal position errors (HPE) versus horizontal protection levels (HPL). The horizontal axis is the position error and the vertical axis is the WAAS protection levels. Lower protection levels equate to better availability. The diagonal line shows the point where error equals protection level. Above and to the left of the diagonal line in the chart, errors are bounded (WAAS is providing integrity in the position domain); below and to the right, errors are not bounded (HMI could be present). The 2-D histogram plots in Figures 2-11 to 2-12 show the distributions of vertical and horizontal position errors and normalized position errors. The blue trace shows the distributions of the actual vertical and horizontal errors. The horizontal axis is the position errors and the vertical axis is the total count of data samples

(log scale) in each 0.1-meter bin. The magenta trace show the distributions of the actual vertical and horizontal errors normalized by one-sigma value of the protection level; vertical - (VPL/5.33) and horizontal - (HPL/6.0). The horizontal axis is the standard units and vertical axis is the observed distribution of normalized errors data samples in each 0.1-sigma bin. Narrowness of the normalized error distributions shows very good observed safety performance.

**Table 2-1 PA 95% Horizontal and Vertical Accuracy**

| Location | Horizontal (HAL=40m) (Meters) | Horizontal (HAL=556m) (Meters) | Vertical (VAL=50m) (Meters) | Percentage in PA mode (%) | SPS Accuracy | |
|---|---|---|---|---|---|---|
| | | | | | 95% Horizontal (Meters) | 95% Vertical (Meters) |
| Atlantic City | 1.298 | 1.298 | 1.947 | 100 | * | * |
| Grand Forks | 1.183 | 1.183 | 1.507 | 100 | * | * |
| Oklahoma City | 0.729 | 0.729 | 1.228 | 100 | * | * |
| Albuquerque | 0.709 | 0.709 | 0.926 | 100 | 2.632 | 4.427 |
| Anchorage | 0.703 | 0.703 | 1.284 | 100 | * | * |
| Atlanta | 0.664 | 0.664 | 1.004 | 100 | 2.622 | 4.327 |
| Barrow | 0.635 | 0.635 | 1.359 | 100 | * | * |
| Bethel | 0.600 | 0.600 | 1.013 | 100 | 2.501 | 4.521 |
| Billings | 0.714 | 0.714 | 0.947 | 100 | 1.945 | 3.983 |
| Boston | 0.763 | 0.763 | 1.131 | 100 | 2.201 | 3.750 |
| Chicago | 0.874 | 0.874 | 1.050 | 100 | * | * |
| Cleveland | 0.755 | 0.755 | 1.110 | 100 | 2.189 | 3.859 |
| Cold Bay | 0.636 | 0.636 | 1.016 | 100 | * | * |
| Dallas | 0.707 | 0.707 | 1.147 | 100 | * | * |
| Denver | 0.617 | 0.617 | 0.906 | 100 | * | * |
| Fairbanks | 0.731 | 0.731 | 1.353 | 100 | 2.576 | 4.244 |
| Gander | 0.823 | 0.823 | 1.185 | 100 | * | * |
| Goose Bay | 0.891 | 0.891 | 1.165 | 100 | * | * |
| Houston | 0.840 | 0.840 | 1.116 | 100 | 3.785 | 5.133 |
| Iqaluit | 0.836 | 0.836 | 1.507 | 100 | * | * |
| Jacksonville | 0.727 | 0.727 | 1.119 | 100 | * | * |
| Juneau | 0.669 | 0.669 | 1.147 | 100 | * | * |
| Kansas City | 0.619 | 0.619 | 1.011 | 100 | 2.200 | 4.111 |
| Kotzebue | 0.740 | 0.740 | 1.212 | 100 | 2.763 | 4.484 |
| Los Angeles | 0.728 | 0.728 | 1.311 | 100 | 2.956 | 4.389 |
| Memphis | 0.645 | 0.645 | 1.006 | 100 | * | * |
| Merida | 0.949 | 0.949 | 1.530 | 100 | * | * |
| Mexico City | 0.995 | 0.996 | 2.466 | 100 | * | * |
| Miami | 0.991 | 0.991 | 1.214 | 100 | 3.792 | 4.601 |
| Minneapolis | 0.770 | 0.770 | 1.030 | 100 | 2.010 | 3.993 |
| New York | 0.781 | 0.781 | 1.030 | 100 | * | * |
| Oakland | 0.725 | 0.725 | 1.483 | 100 | 2.575 | 4.282 |
| Puerto Vallarta | 1.042 | 1.043 | 1.628 | 100 | * | * |
| Salt Lake City | 0.658 | 0.658 | 0.891 | 100 | 2.080 | 4.102 |
| San Jose Del Cabo | 1.039 | 1.039 | 1.624 | 100 | * | * |
| Seattle | 0.722 | 0.722 | 0.964 | 100 | 1.862 | 4.187 |
| Washington DC | 0.766 | 0.766 | 1.085 | 100 | 2.214 | 3.806 |
| Winnipeg | 0.743 | 0.743 | 1.152 | 100 | * | * |

* = SPS Data not processed.

**Table 2-2 NPA 95% and 99.999% Horizontal Accuracy**

| Location | 95% Horizontal (meters) | 99.999% Horizontal (meters) | Percentage in NPA mode (%) | Maximum Horizontal Error |
|---|---|---|---|---|
| Albuquerque | 1.457 | 3.762 | 100 | 3.942 |
| Anchorage | 2.644 | 6.333 | 100 | 6.506 |
| Atlanta | 1.741 | 3.955 | 100 | 4.140 |
| Barrow | 2.314 | 4.963 | 100 | 5.153 |
| Bethel | 2.320 | 6.403 | 100 | 6.709 |
| Billings | 1.526 | 3.683 | 100 | 4.002 |
| Boston | 1.596 | 3.938 | 100 | 4.176 |
| Cleveland | 1.423 | 2.991 | 100 | 3.169 |
| Cold Bay | 1.687 | 4.324 | 100 | 4.493 |
| Fairbanks | 2.866 | 5.966 | 100 | 6.150 |
| Gander | 1.743 | 4.130 | 100 | 4.414 |
| Honolulu | 4.499 | 13.466 | 100 | 13.688 |
| Houston | 2.628 | 5.258 | 100 | 5.639 |
| Iqaluit | 1.849 | 4.093 | 100 | 4.229 |
| Juneau | 2.059 | 4.525 | 100 | 4.692 |
| Kansas City | 1.180 | 2.840 | 100 | 3.045 |
| Kotzebue | 2.627 | 5.541 | 100 | 5.752 |
| Los Angeles | 2.095 | 4.708 | 100 | 4.885 |
| Merida | 3.226 | 9.934 | 100 | 10.218 |
| Miami | 2.775 | 6.164 | 100 | 6.384 |
| Minneapolis | 1.519 | 2.971 | 100 | 3.302 |
| Oakland | 1.652 | 4.392 | 100 | 4.623 |
| Salt Lake City | 1.355 | 3.221 | 100 | 3.423 |
| San Jose Del Cabo | 3.402 | 9.227 | 100 | 9.717 |
| San Juan | 2.854 | 16.490 | 100 | 16.843 |
| Seattle | 1.400 | 2.716 | 100 | 2.895 |
| Tapachula | 4.090 | 12.406 | 100 | 12.583 |
| Washington DC | 1.629 | 3.369 | 100 | 3.528 |

**Table 2-3 Maximum LPV Error Statistics**

| Location | Horizontal Error (m) | Horizontal Error/HPL | Horizontal Maximum Ratio | Vertical Error (m) | Vertical Error/VPL | Vertical Maximum Ratio |
|---|---|---|---|---|---|---|
| Atlantic City-a | 2.451 | 0.214 | 0.232 | 4.138 | 0.205 | 0.221 |
| Grand Forks | 3.501 | 0.186 | 0.209 | 4.062 | 0.128 | 0.194 |
| Oklahoma City | 2.048 | 0.089 | 0.194 | 4.094 | 0.159 | 0.179 |
| Atlantic City-a | 2.451 | 0.214 | 0.232 | 4.138 | 0.205 | 0.221 |
| Albuquerque | 1.539 | 0.156 | 0.177 | 2.910 | 0.120 | 0.149 |
| Anchorage | 1.810 | 0.163 | 0.174 | 2.948 | 0.143 | 0.175 |
| Atlanta | 1.573 | 0.134 | 0.157 | 2.925 | 0.186 | 0.186 |
| Barrow | 2.041 | 0.119 | 0.143 | 6.627 | 0.134 | 0.208 |
| Bethel | 1.545 | 0.091 | 0.124 | 2.828 | 0.119 | 0.120 |
| Billings | 1.817 | 0.159 | 0.171 | 2.724 | 0.144 | 0.166 |
| Boston | 2.573 | 0.172 | 0.178 | 5.097 | 0.239 | 0.265 |
| Chicago | 1.845 | 0.154 | 0.179 | 3.618 | 0.198 | 0.198 |
| Cleveland | 1.837 | 0.163 | 0.173 | 3.247 | 0.163 | 0.170 |
| Cold Bay | 1.979 | 0.084 | 0.093 | 2.965 | 0.104 | 0.114 |
| Dallas | 1.682 | 0.175 | 0.205 | 3.708 | 0.127 | 0.209 |
| Denver | 1.504 | 0.151 | 0.177 | 2.980 | 0.148 | 0.185 |
| Fairbanks | 2.224 | 0.159 | 0.159 | 4.334 | 0.206 | 0.218 |
| Gander | 3.527 | 0.180 | 0.180 | 3.952 | 0.160 | 0.161 |
| Goose Bay | 3.612 | 0.110 | 0.206 | 4.633 | 0.132 | 0.173 |
| Houston | 2.044 | 0.166 | 0.218 | 3.035 | 0.235 | 0.235 |
| Iqaluit | 2.677 | 0.182 | 0.182 | 8.242 | 0.246 | 0.246 |
| Jacksonville | 1.818 | 0.152 | 0.167 | 3.270 | 0.137 | 0.201 |
| Juneau | 1.940 | 0.143 | 0.187 | 3.387 | 0.161 | 0.173 |
| Kansas City | 1.702 | 0.154 | 0.174 | 3.402 | 0.130 | 0.183 |
| Kotzebue | 1.949 | 0.098 | 0.142 | 3.911 | 0.141 | 0.141 |
| Los Angeles | 2.009 | 0.164 | 0.165 | 3.296 | 0.125 | 0.170 |
| Memphis | 1.508 | 0.139 | 0.171 | 2.462 | 0.135 | 0.178 |
| Merida | 2.491 | 0.097 | 0.202 | 4.450 | 0.132 | 0.191 |
| Mexico City | 2.778 | 0.082 | 0.154 | 4.996 | 0.210 | 0.210 |
| Miami | 2.325 | 0.182 | 0.196 | 2.967 | 0.117 | 0.161 |
| Minneapolis | 2.374 | 0.202 | 0.204 | 4.661 | 0.233 | 0.262 |
| New York | 1.876 | 0.146 | 0.170 | 4.467 | 0.229 | 0.234 |
| Oakland | 1.996 | 0.156 | 0.162 | 4.077 | 0.110 | 0.166 |
| Puerto Vallarta | 2.659 | 0.121 | 0.151 | 4.603 | 0.167 | 0.167 |
| Salt Lake City | 1.590 | 0.147 | 0.155 | 2.994 | 0.156 | 0.156 |
| San Jose Del Cabo | 2.897 | 0.105 | 0.153 | 4.742 | 0.126 | 0.169 |
| Seattle | 1.727 | 0.151 | 0.158 | 3.185 | 0.163 | 0.165 |
| Washington DC | 1.509 | 0.161 | 0.161 | 2.807 | 0.141 | 0.161 |
| Winnipeg | 2.197 | 0.175 | 0.175 | 6.525 | 0.236 | 0.236 |

**Figure 2-1 LPV 95% Horizontal Accuracy**

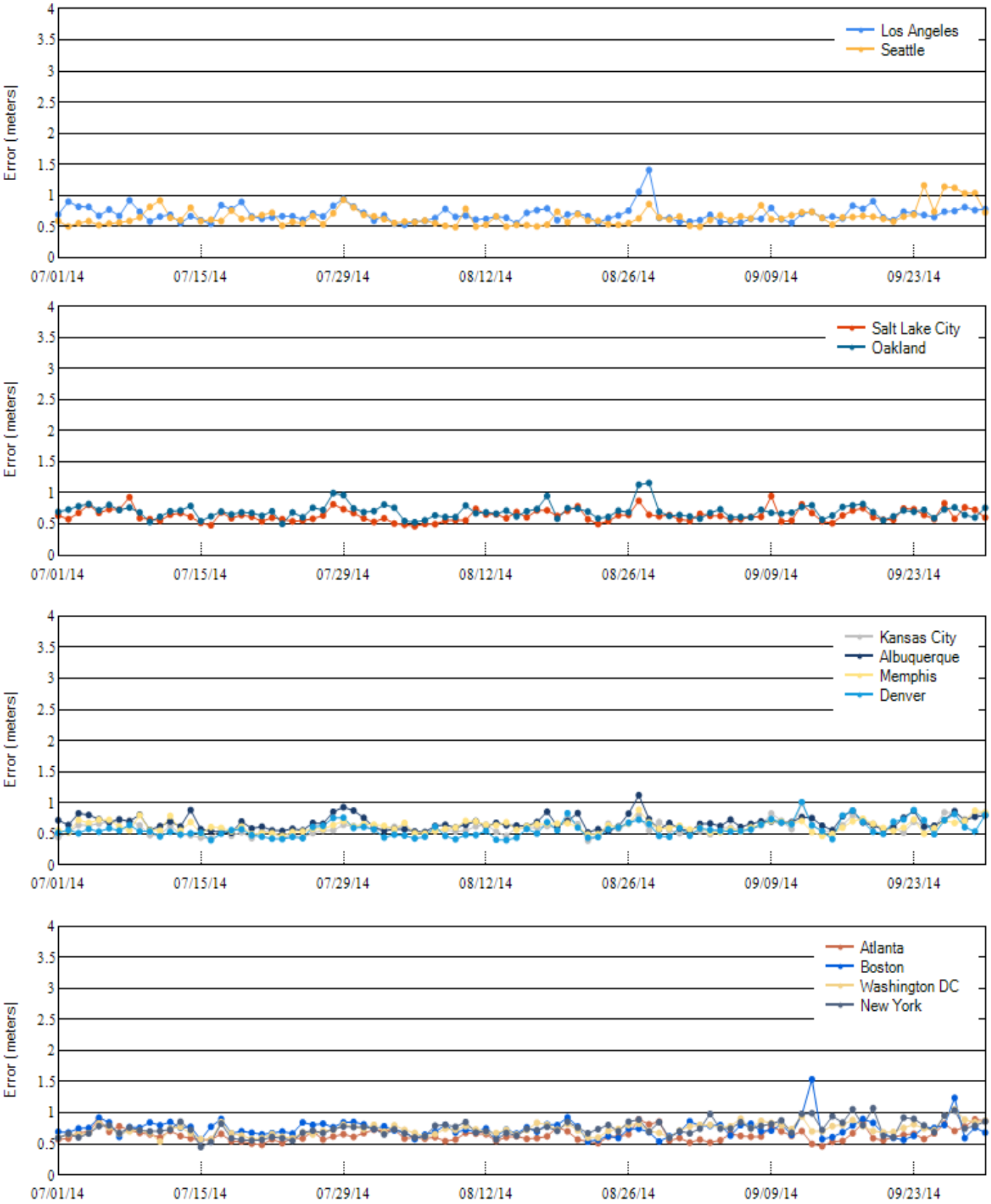


**Figure 2-2 LPV 95% Horizontal Accuracy**

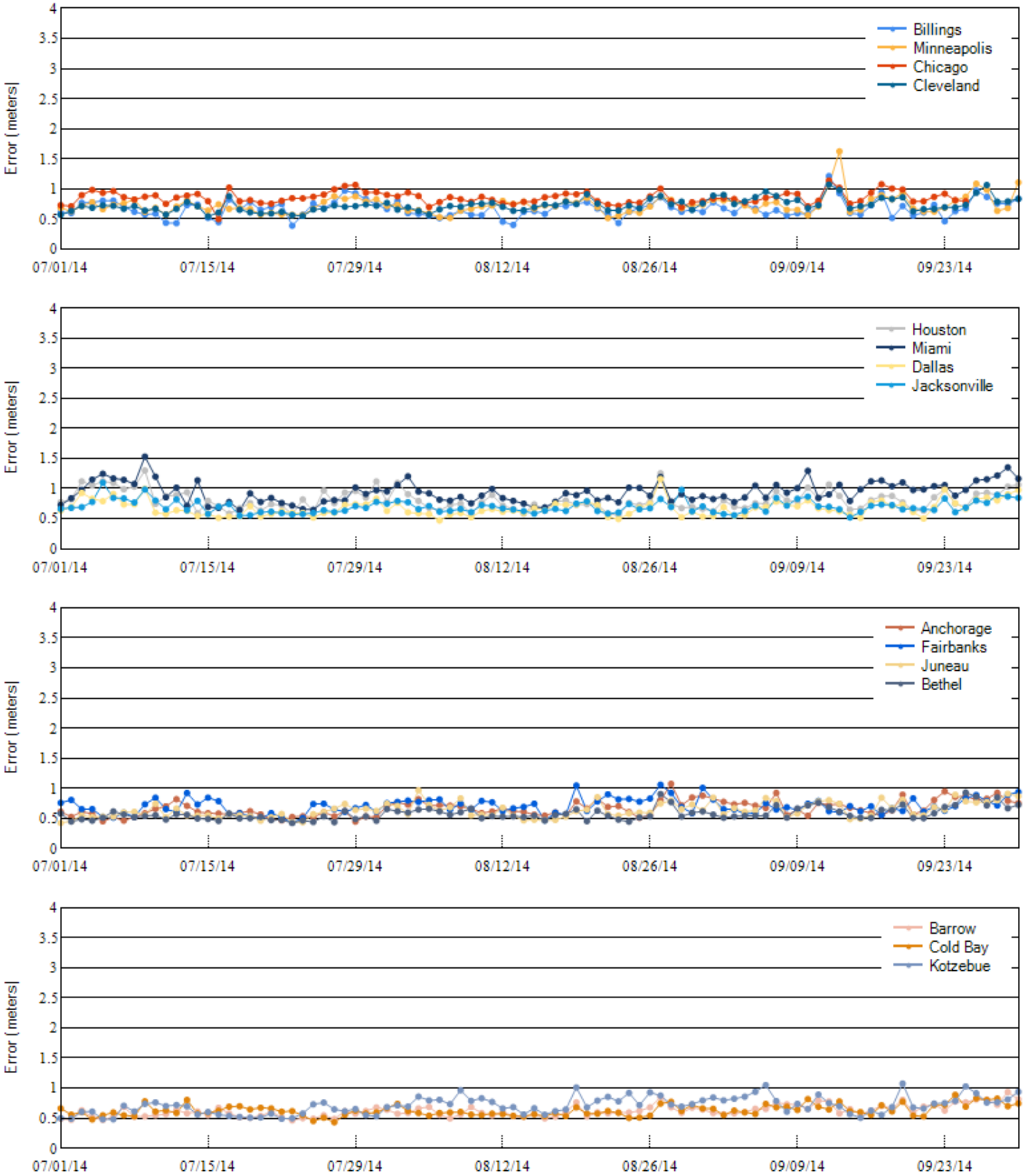


**Figure 2-3 LPV 95% Horizontal Accuracy**

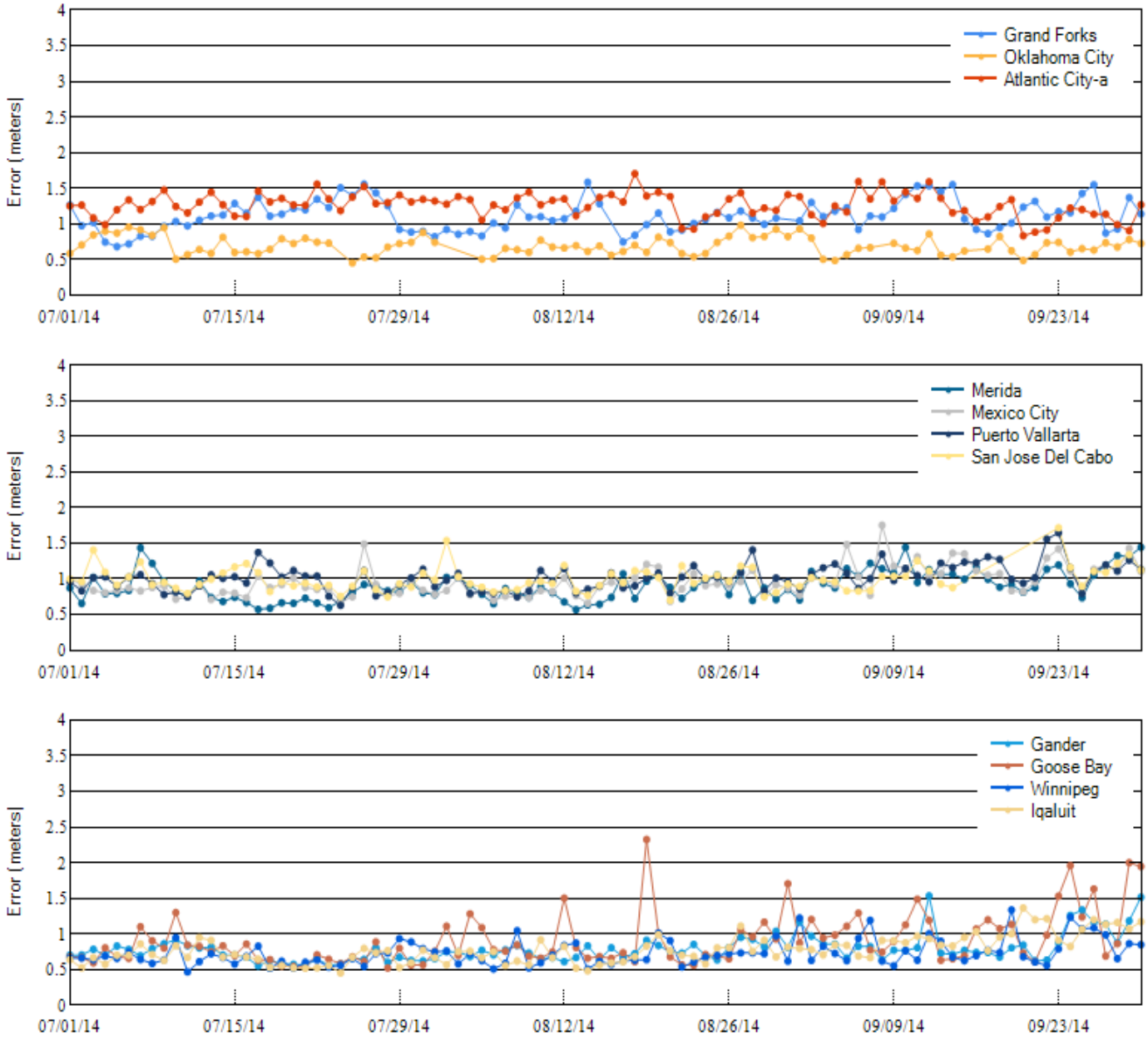


**Figure 2-4 LPV 95% Vertical Accuracy**

**Figure 2-5 LPV 95% Vertical Accuracy**

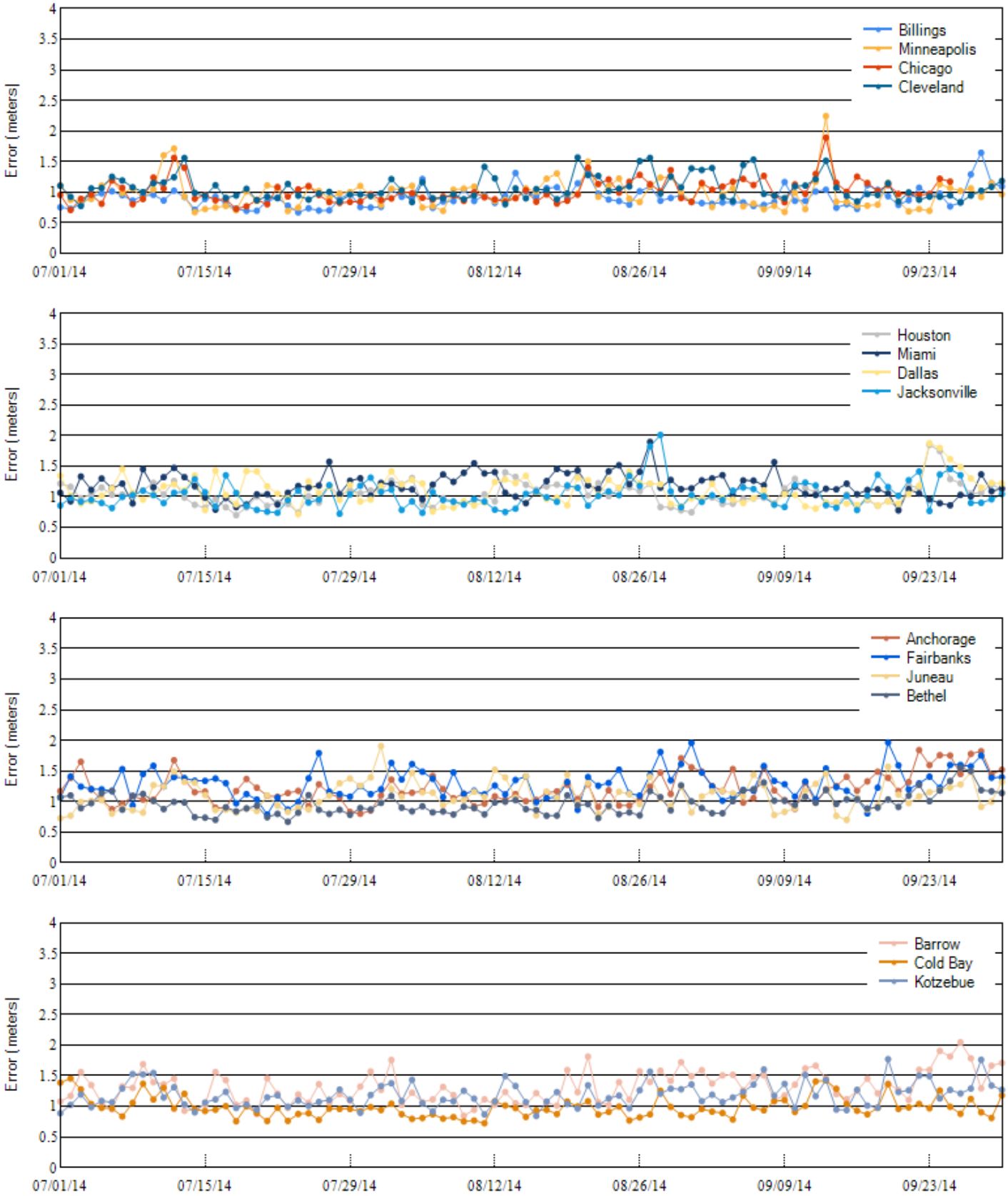


**Figure 2-6 LPV 95% Vertical Accuracy**

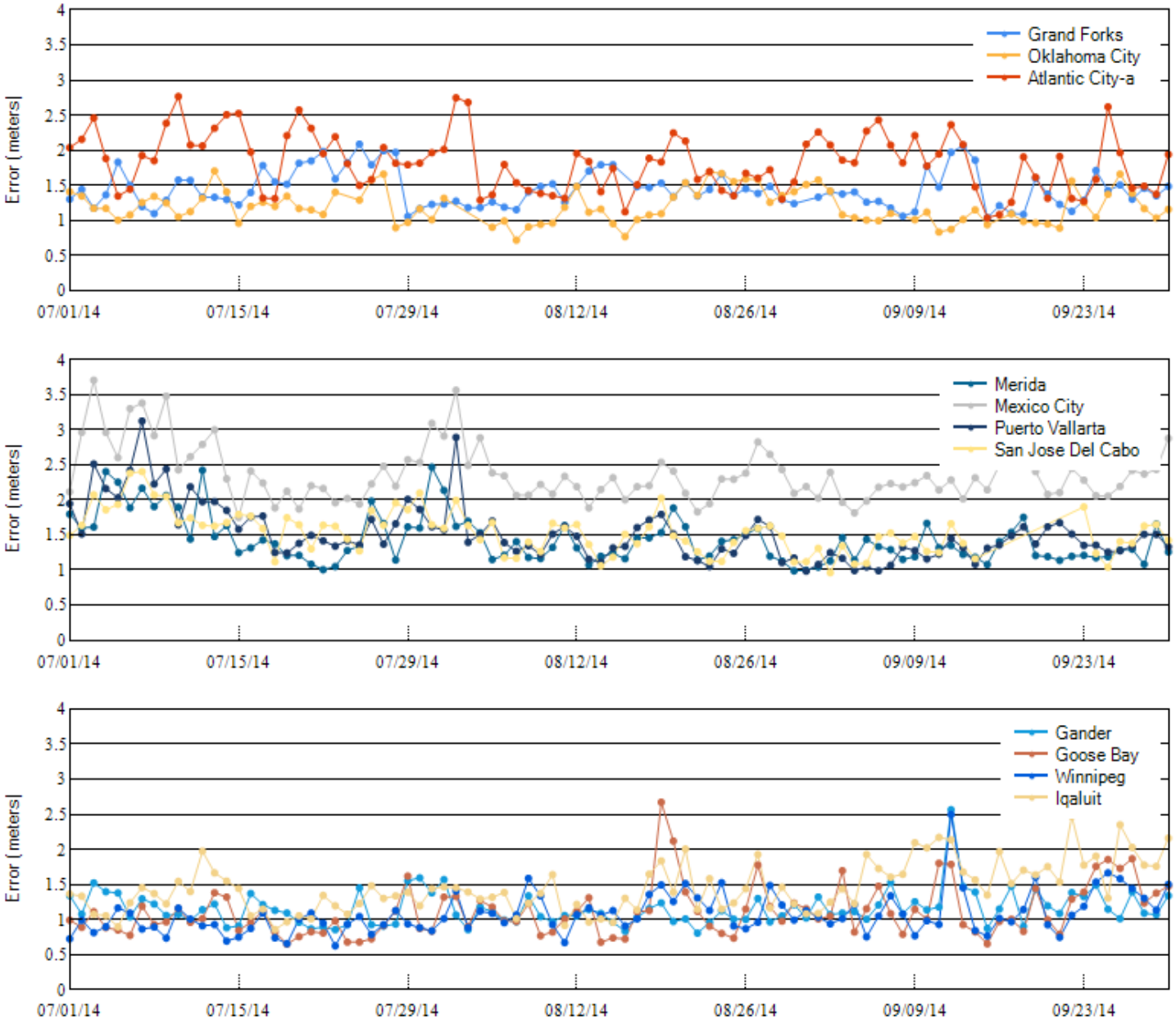


**Figure 2-7 NPA 95% Horizontal Accuracy**

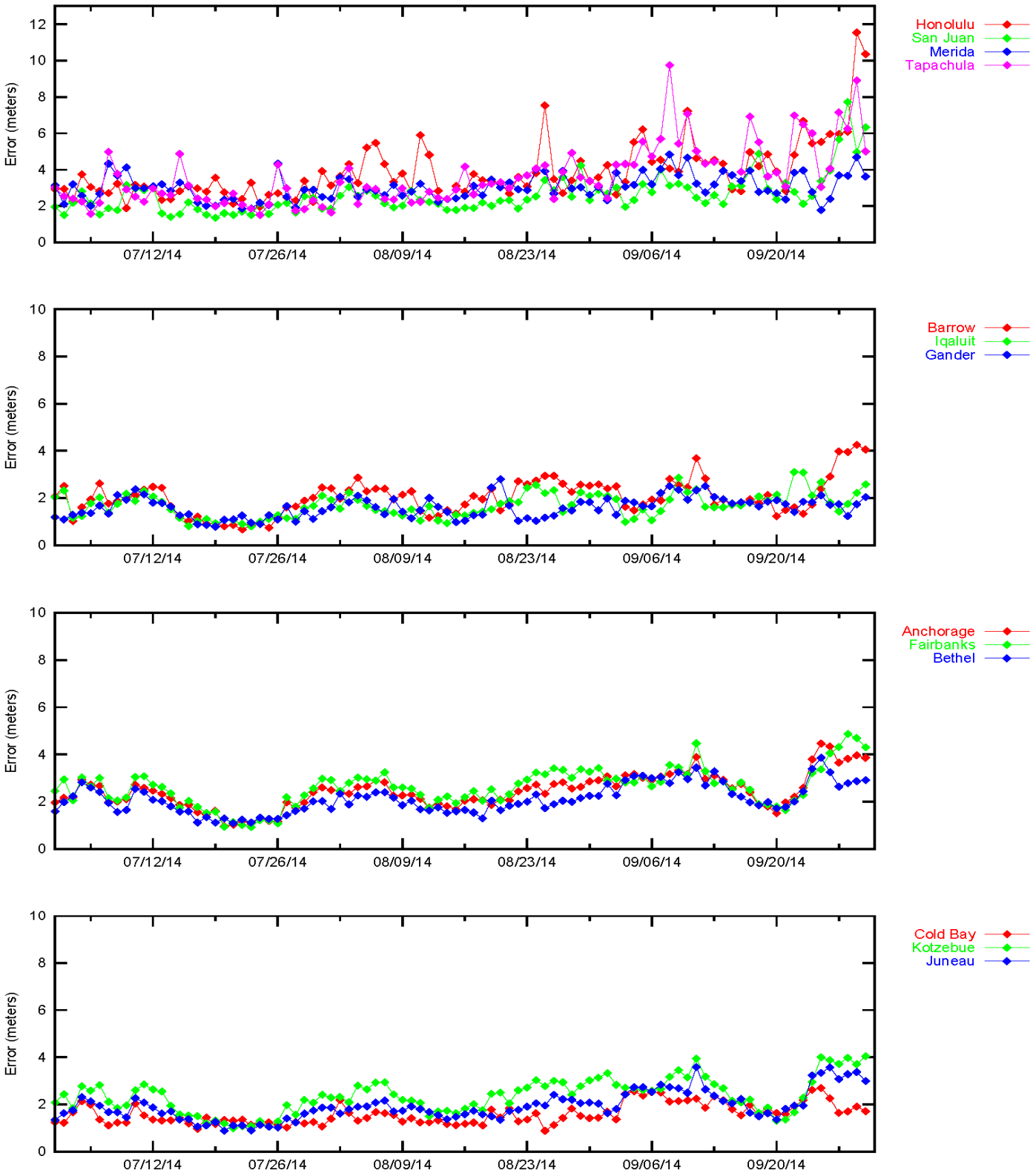


**Figure 2-8 NPA 95% Horizontal Accuracy**

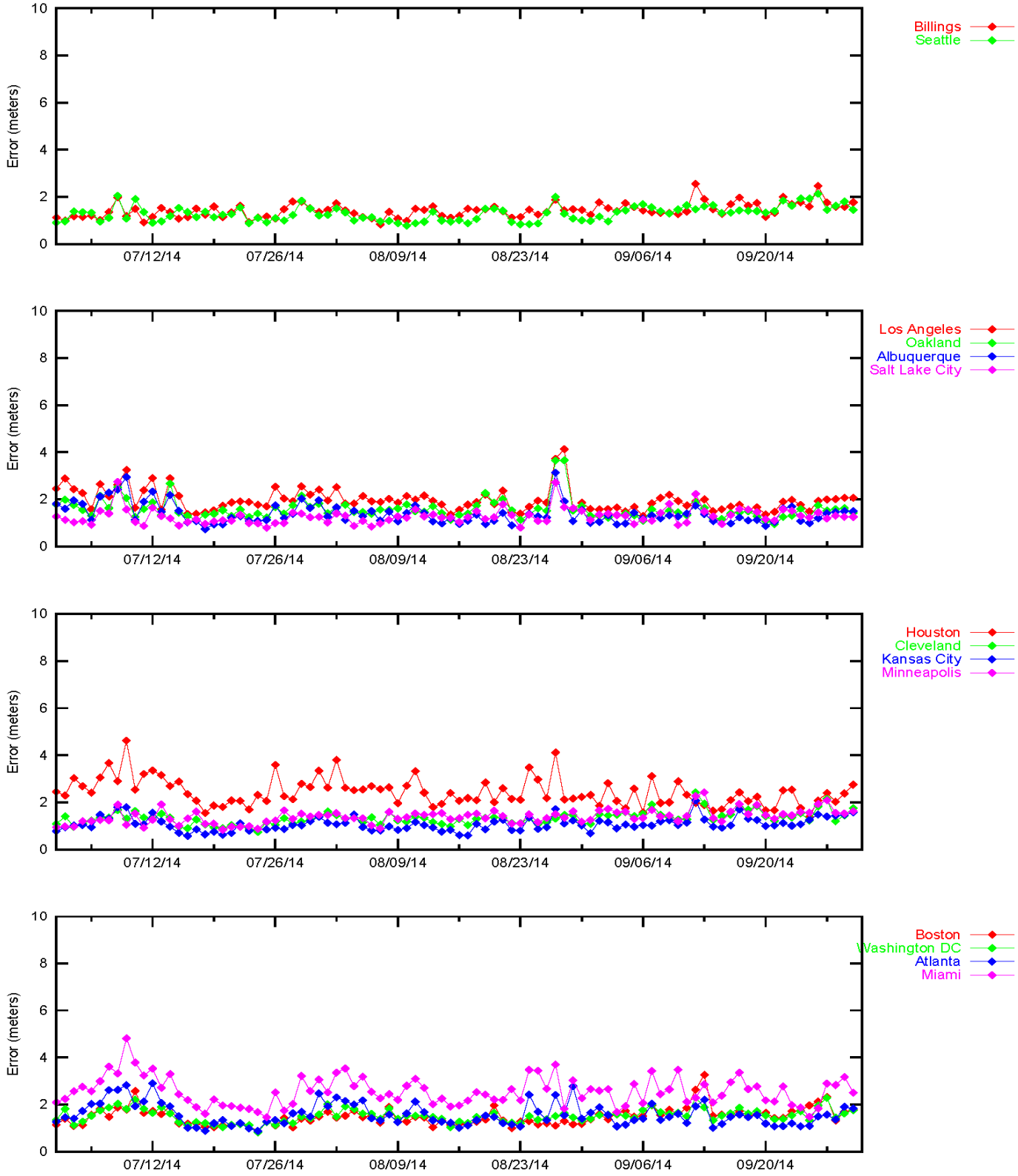


**Figure 2-9 LPV Horizontal Error Bounding Triangle Chart**

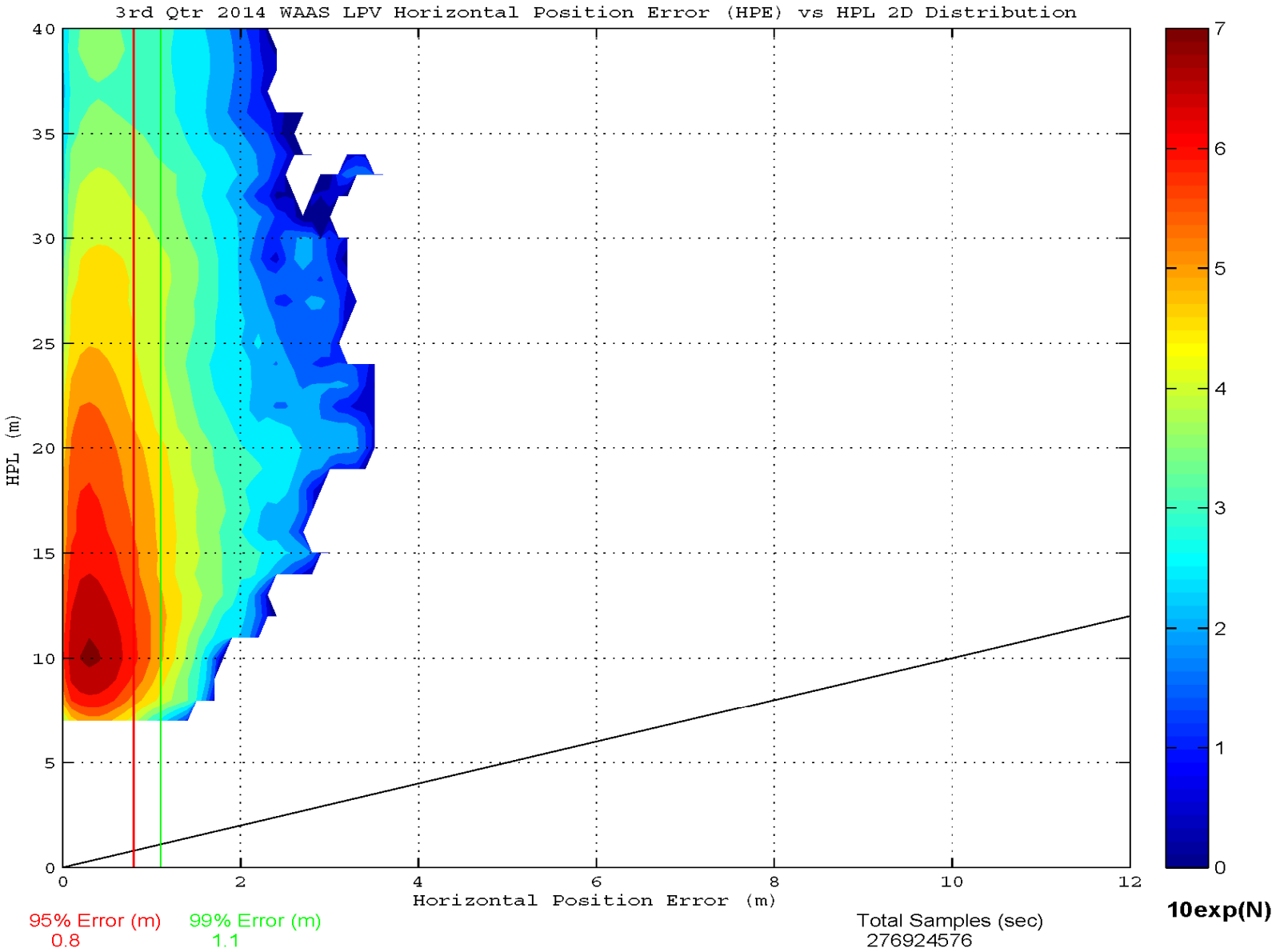


**Figure 2-10 LPV Vertical Error Bounding Triangle Chart**

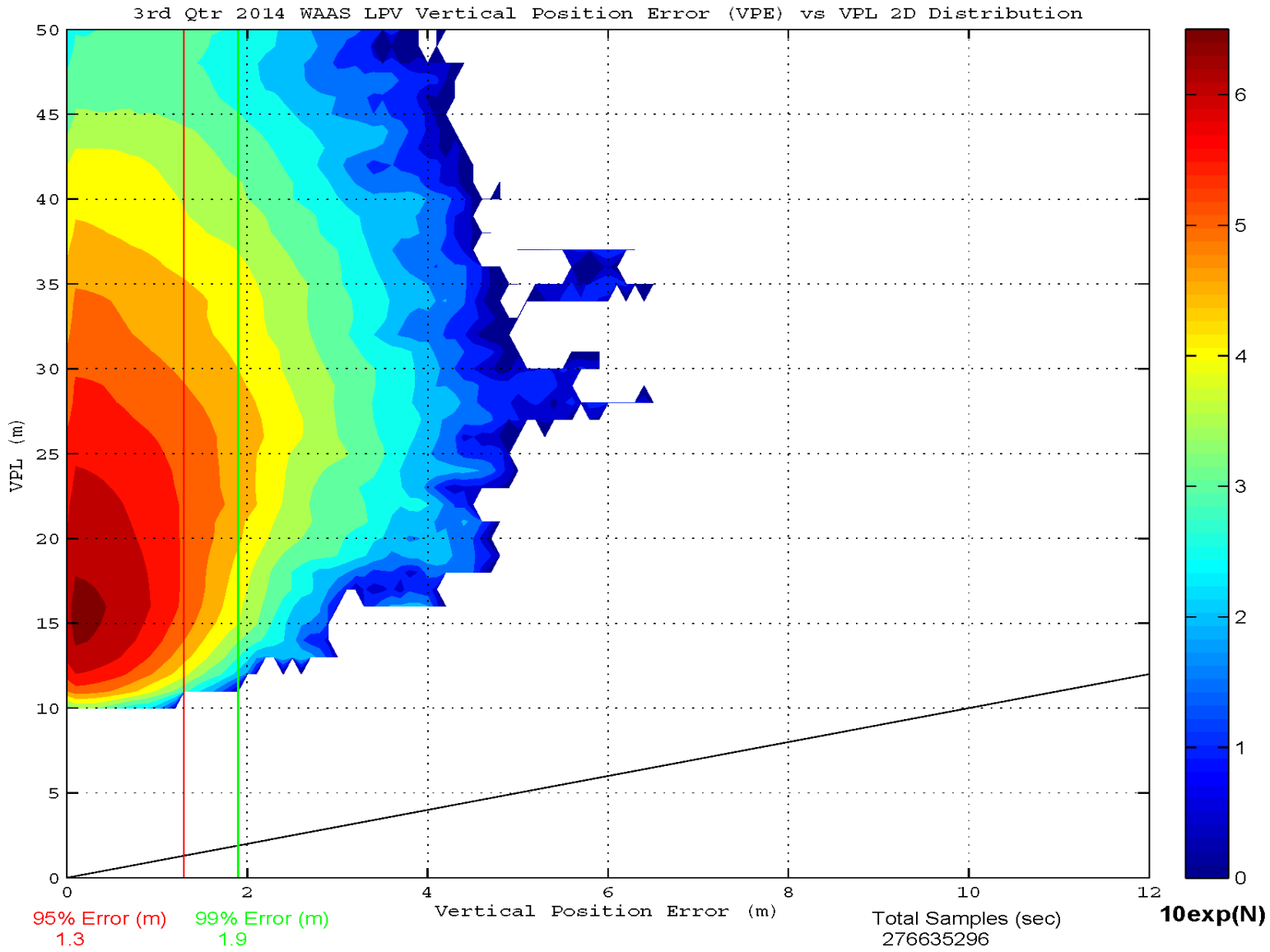


**Figure 2-11 LPV 2-D Horizontal Error Distribution Histogram**

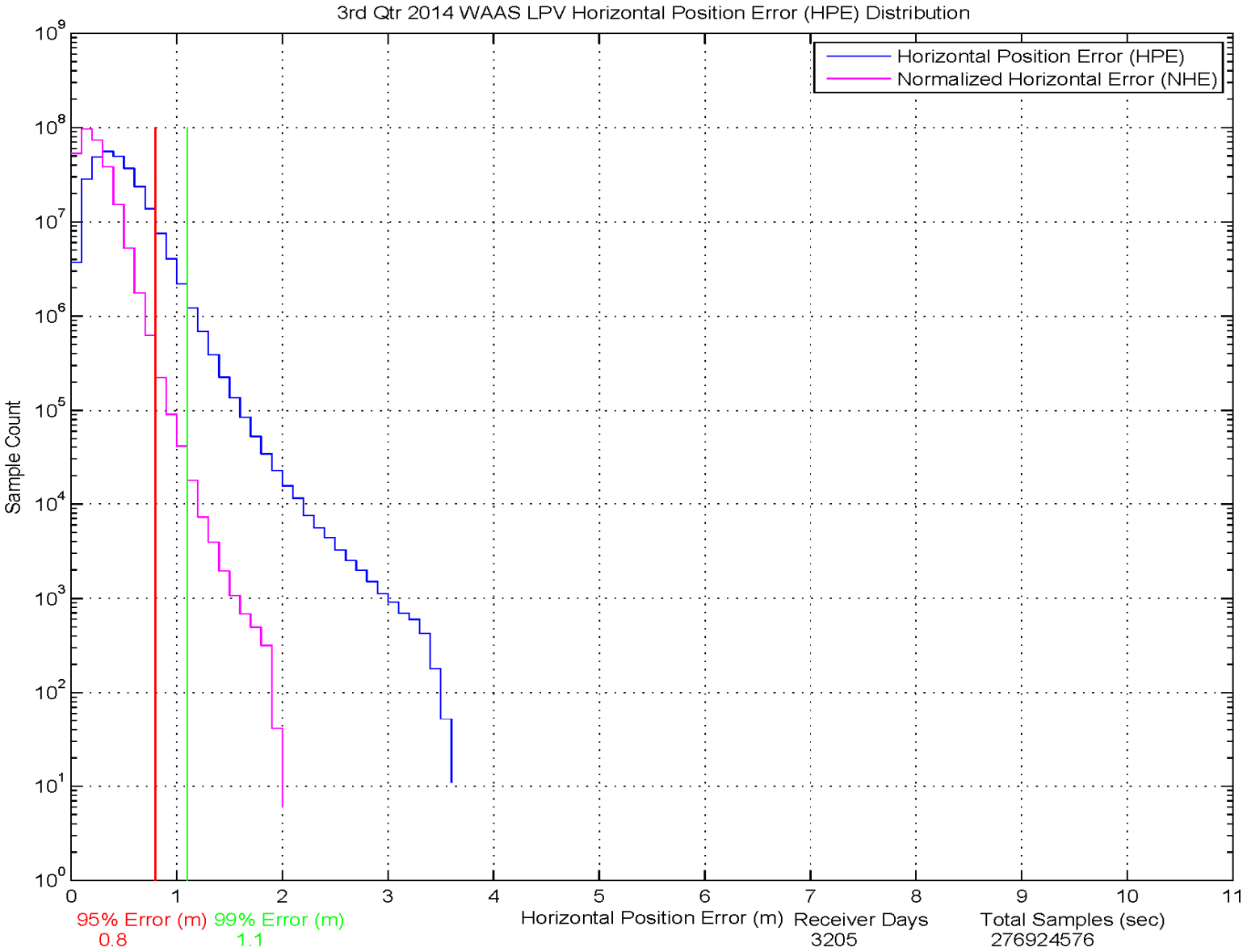
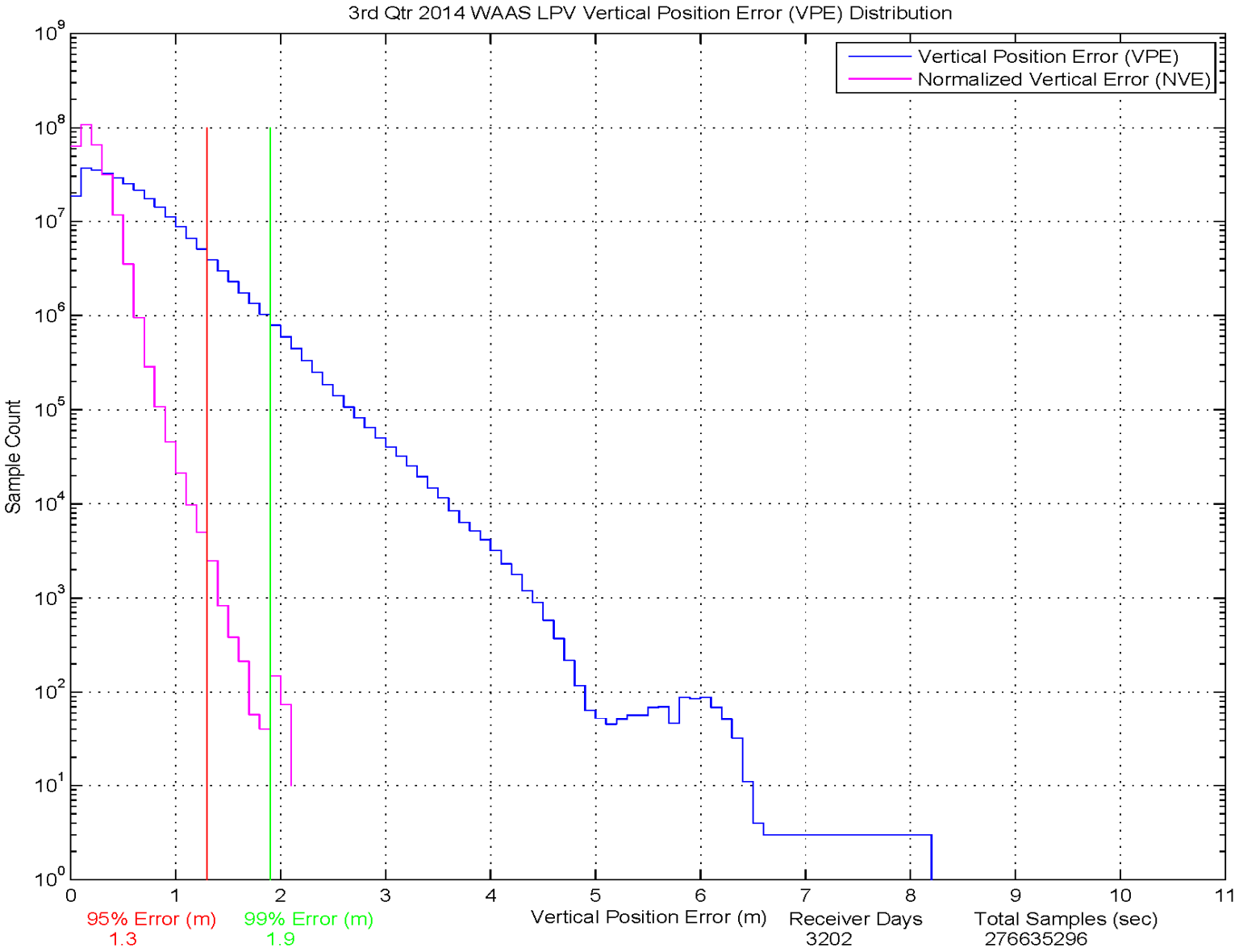


**Figure 2-12 LPV 2-D Vertical Error Distribution Histogram**



## 3.0 AVAILABILITY

The WAAS availability evaluation documents the percentage of time that the WAAS provided service for the operational service levels defined in Table 1-1. RTCA DO-229D Vertical and Horizontal Protection Levels were computed for each receiver being evaluated. Table 3-1 shows the protection levels that were maintained for 99% of the time for each receiver location for the quarter. The table also included the percentage in PA mode as described in section 2.0.

For this reporting period, the maximum 99% CONUS HPL and VPL are 18.286 meters at Miami and 32.535 meters at Oakland, respectively. The minimum 99% CONUS HPL and VPL are 12.209 meters and 20.087 meters, both at Memphis, respectively. The maximum 99% Alaska HPL and VPL are 30.555 meters and 40.143 meters, both at Cold Bay, respectively. The minimum 99% Alaska HPL and VPL are 13.478 meters at Fairbanks and 23.373 meters at Anchorage, respectively.

Availability of LP, LPV and LPV 200 service are evaluated by monitoring the WAAS protection levels at receiver locations throughout the test period. If both the vertical and horizontal protection levels are not greater than their respective alert limits (VAL and HAL) then the service is available. If either of the protection levels exceeds the required alert limit then the operational service at that location is considered unavailable and an outage in service is recorded with its duration. The operational service is not considered available again until the protection levels are both within the alert limits for at least 15 minutes. Although this will reduce operational service availability minimally, it substantially reduces the number of service outages and prevents excessive switching in and out of service availability. The percent of time that LP, LPV, and LPV 200 service is available using the fifteen-minute window criteria is presented in Table 3-2. The LP, LPV, and LPV 200 service outages and associated outage rate for the reporting period is presented in Table 3-4. The outage rate is the percent of approaches that theoretically would be interrupted by a loss of operational service once the approach had started. Figures 3-1 to 3-6 show the daily availability of LPV and LPV 200 service levels. Figures 3-7 to 3-12 show the daily interruptions of LPV and LPV 200 service levels for the evaluation period.

Availability of NPA service is evaluated by monitoring the WAAS horizontal protection level at receiver locations throughout the test period. If the horizontal protection level is not greater than the horizontal alert limit (HAL = 556m) then the service is available. If the horizontal protection level exceeds the required alert level or if WAAS navigation message is not received then the NPA service at that location is considered unavailable and an outage in service is recorded with its duration. The NPA service is not considered available again until the horizontal protection level is within the alert limit for at least 15 minutes. The percent of time that NPA service is available using the fifteen-minute window criteria is presented in Table 3-3. The NPA service outages and associated outage rate for this period is presented in Table 3-5. The outage rate is the percent of NPA approaches that theoretically would be interrupted by a loss of operational service once the approach had started.

Low PA and NPA availability for this reporting period were due to GPS satellite outages, carrier phase anomalies, communication outages, GUS switchovers, geomagnetic activity, and elevated GIVE and UDRE values. The major events are discussed below. Please refer to Table 1-5 for all the events that affected availability.

Geomagnetic activity on September 12-13 elevated GIVE values and reduced LPV200 availability in CONUS and LPV/LPV200 availability in Canada; see DR #125 Effects on WAAS from Iono Activity on September 12-13, 2014.

Significant events that reduced CONUS availability were observed on the following days: On August 2, geomagnetic activity elevated GIVE values resulting in a slight reduction in LPV200 availability. On August 14, planned maintenance on PRN-13 caused minor LPV200 availability loss. On August 28, elevated GIVE values due to geomagnetic activity affected LPV200 availability; in addition, that day carrier phase spike on PRN-21 caused minor degradation in LPV200 availability. On September 15, geomagnetic activity increased GIVE values resulting in LPV/LPV200 CONUS and Mexico availability reduction. On September 28 through September 30, high GIVE values caused slight loss of LPV200 availability.

Significant events that reduced Alaska availability were observed on the following days: On July 7, faulted GUS switchover on CRE GEO (PRN-138) elevated UDRE values and caused minor degradation in LPV200 Alaska availability. On August 2, geomagnetic activity elevated GIVE values resulting in a slight reduction in LPV200

availability. On August 4, manual switchover on CRW GEO (PRN-135) affected LPV200 Alaska availability. On August 5, high GIVE values due to geomagnetic activity along with elevated UDRE after the GUS switchover reduced LPV200 Alaska availability. On August 16, manual switchover on CRW GEO (PRN-135) affected LPV200 availability. On August 19, high GIVE values caused minor LPV200 availability reduction.

Significant events that reduced Canada availability were observed on the following days: On July 22, communication outages at Iqaluit reduced LPV/LPV200 Canada availability. On August 12, geomagnetic activity in combination with planned maintenance on PRN-4 affected LPV/LPV200 availability. Iqaluit communication outages also contributed to LPV/LPV200 Canada availability reduction. On August 19, geomagnetic activity increased GIVE values and affected LPV/LPV200 Canada availability. On September 19, geomagnetic activity affected LPV/LPV200 Canada availability.

Radio frequency interference (RFI) caused localized loss of LPV/LPV200 availability at Kansas City on July 1, LPV200 availability at Oklahoma City on July 18, LPV200 availability at Salt Lake City on August 3, LPV/LPV200 availability at Los Angeles on August 17, and LPV200 availability at Miami on September 15, but had no effect on WAAS service.

**Table 3-1 99% Protection Level**

| Location | 99% HPL (meters) | 99% VPL (meters) | Percentage in PA mode (%) |
|---|---|---|---|
| Atlantic City | 14.033 | 24.539 | 100 |
| Grand Forks | 15.557 | 26.328 | 100 |
| Oklahoma City | 12.915 | 24.032 | 100 |
| Albuquerque | 12.768 | 25.802 | 100 |
| Anchorage | 14.004 | 23.373 | 100 |
| Atlanta | 12.784 | 22.035 | 100 |
| Barrow | 18.958 | 36.485 | 100 |
| Bethel | 18.067 | 30.607 | 100 |
| Billings | 14.002 | 23.653 | 100 |
| Boston | 15.645 | 23.075 | 100 |
| Chicago | 12.531 | 22.650 | 100 |
| Cleveland | 13.762 | 23.220 | 100 |
| Cold Bay | 30.555 | 40.143 | 100 |
| Dallas | 13.883 | 23.702 | 100 |
| Denver | 12.380 | 22.884 | 100 |
| Fairbanks | 13.478 | 24.226 | 100 |
| Gander | 27.906 | 42.780 | 100 |
| Goose Bay | 22.653 | 31.068 | 100 |
| Houston | 12.943 | 23.538 | 100 |
| Iqaluit | 28.901 | 40.455 | 100 |
| Jacksonville | 14.268 | 23.081 | 100 |
| Juneau | 14.282 | 23.789 | 100 |
| Kansas City | 12.386 | 25.614 | 100 |
| Kotzebue | 16.992 | 33.406 | 100 |
| Los Angeles | 15.262 | 28.977 | 100 |
| Memphis | 12.209 | 20.087 | 100 |
| Merida | 21.158 | 33.412 | 100 |
| Mexico City | 33.994 | 44.212 | 100 |
| Miami | 18.286 | 25.922 | 100 |
| Minneapolis | 12.557 | 27.917 | 100 |
| New York | 14.692 | 23.545 | 100 |
| Oakland | 17.555 | 32.535 | 100 |
| Puerto Vallarta | 38.304 | 61.059 | 100 |
| Salt Lake City | 13.487 | 21.548 | 100 |
| San Jose Del Cabo | 29.087 | 40.926 | 100 |
| Seattle | 13.775 | 24.529 | 100 |
| Washington DC | 13.181 | 24.006 | 100 |
| Winnipeg | 16.285 | 25.196 | 100 |

**Table 3-2 Quarterly Availability Statistics**

| Location | LP WAAS Availability (%) With 15 minute window | LPV WAAS Availability (%) With 15 minute window | LPV 200 WAAS Availability (%) With 15 minute window |
|---|---|---|---|
| Atlantic City | 100% | 100% | 100% |
| Grand Forks | 100% | 100% | 100% |
| Oklahoma City | 100% | 100% | 100% |
| Albuquerque | 100% | 100% | 100% |
| Anchorage | 100% | 100% | 100% |
| Atlanta | 100% | 100% | 100% |
| Barrow | 100% | 99.99% | 97.81% |
| Bethel | 100% | 100% | 100% |
| Billings | 100% | 100% | 100% |
| Boston | 100% | 100% | 100% |
| Chicago | 100% | 100% | 100% |
| Cleveland | 100% | 100% | 100% |
| Cold Bay | 100% | 100% | 91.33% |
| Dallas | 100% | 100% | 100% |
| Denver | 100% | 100% | 100% |
| Fairbanks | 100% | 100% | 100% |
| Gander | 100% | 99.86% | 86.84% |
| Goose Bay | 100% | 100% | 99.90% |
| Houston | 100% | 100% | 100% |
| Iqaluit | 99.96% | 99.83% | 95.17% |
| Jacksonville | 100% | 100% | 100% |
| Juneau | 100% | 100% | 100% |
| Kansas City | 100% | 100% | 100% |
| Kotzebue | 100% | 100% | 99.65% |
| Los Angeles | 100% | 100% | 100% |
| Memphis | 100% | 100% | 100% |
| Merida | 99.97% | 99.44% | 99.19% |
| Mexico City | 99.60% | 99.30% | 90.48% |
| Miami | 100% | 100% | 99.97% |
| Minneapolis | 100% | 100% | 99.99% |
| New York | 100% | 100% | 100% |
| Oakland | 100% | 99.97% | 99.14% |
| Puerto Vallarta | 99.45% | 97.24% | 86.15% |
| Salt Lake City | 100% | 100% | 100% |
| San Jose Del Cabo | 100% | 99.55% | 92.52% |
| Seattle | 100% | 100% | 100% |
| Washington DC | 100% | 100% | 100% |
| Winnipeg | 100% | 100% | 99.99% |

**Table 3-3 NPA Availability**

| Location | NPA Availability (%) (Excluding RAIM/FDE) |
|---|---|
| Albuquerque | 100% |
| Anchorage | 100% |
| Atlanta | 100% |
| Barrow | 100% |
| Bethel | 100% |
| Billings | 100% |
| Boston | 100% |
| Cleveland | 100% |
| Cold Bay | 100% |
| Fairbanks | 100% |
| Gander | 100% |
| Honolulu | 100% |
| Houston | 100% |
| Iqaluit | 100% |
| Juneau | 100% |
| Kansas City | 100% |
| Kotzebue | 100% |
| Los Angeles | 100% |
| Merida | 100% |
| Miami | 100% |
| Minneapolis | 100% |
| Oakland | 100% |
| Salt Lake City | 100% |
| San Jose Del Cabo | 100% |
| San Juan | 100% |
| Seattle | 100% |
| Tapachula | 100% |
| Washington DC | 100% |

**Table 3-4 LPV and LPV 200 Outage Rate (Per 150 sec approach)**

| Location | LP Outages | LP Outage Rates | LPV Outages | LPV Outage Rates | LPV 200 Outages | LPV 200 Outage Rates |
|---|---|---|---|---|---|---|
| Atlantic City | 0 | 0 | 0 | 0 | 0 | 0 |
| Grand Forks | 0 | 0 | 0 | 0 | 0 | 0 |
| Oklahoma City | 0 | 0 | 0 | 0 | 1 | 0.000020 |
| Albuquerque | 0 | 0 | 0 | 0 | 0 | 0 |
| Anchorage | 0 | 0 | 0 | 0 | 0 | 0 |
| Atlanta | 0 | 0 | 0 | 0 | 0 | 0 |
| Barrow | 0 | 0 | 3 | 0.000057 | 235 | 0.004534 |
| Bethel | 0 | 0 | 0 | 0 | 1 | 0.000019 |
| Billings | 0 | 0 | 0 | 0 | 0 | 0 |
| Boston | 0 | 0 | 0 | 0 | 1 | 0.000019 |
| Chicago | 0 | 0 | 0 | 0 | 0 | 0 |
| Cleveland | 0 | 0 | 0 | 0 | 0 | 0 |
| Cold Bay | 0 | 0 | 0 | 0 | 462 | 0.009547 |
| Dallas | 0 | 0 | 0 | 0 | 0 | 0 |
| Denver | 0 | 0 | 0 | 0 | 0 | 0 |
| Fairbanks | 0 | 0 | 0 | 0 | 1 | 0.000019 |
| Gander | 0 | 0 | 16 | 0.000303 | 506 | 0.011001 |
| Goose Bay | 1 | 0.000019 | 2 | 0.000038 | 21 | 0.000397 |
| Houston | 0 | 0 | 0 | 0 | 0 | 0 |
| Iqaluit | 12 | 0.000227 | 36 | 0.000681 | 520 | 0.010322 |
| Jacksonville | 0 | 0 | 0 | 0 | 0 | 0 |
| Juneau | 0 | 0 | 0 | 0 | 0 | 0 |
| Kansas City | 1 | 0.000019 | 1 | 0.000019 | 1 | 0.000019 |
| Kotzebue | 0 | 0 | 0 | 0 | 128 | 0.002424 |
| Los Angeles | 0 | 0 | 1 | 0.000019 | 2 | 0.000038 |
| Memphis | 0 | 0 | 0 | 0 | 0 | 0 |
| Merida | 1 | 0.000019 | 79 | 0.001499 | 139 | 0.002645 |
| Mexico City | 98 | 0.001858 | 110 | 0.002092 | 725 | 0.015130 |
| Miami | 0 | 0 | 0 | 0 | 4 | 0.000076 |
| Minneapolis | 0 | 0 | 0 | 0 | 1 | 0.000019 |
| New York | 0 | 0 | 0 | 0 | 1 | 0.000019 |
| Oakland | 0 | 0 | 33 | 0.000623 | 103 | 0.001961 |
| Puerto Vallarta | 80 | 0.001518 | 132 | 0.002562 | 721 | 0.015796 |
| Salt Lake City | 0 | 0 | 0 | 0 | 0 | 0 |
| San Jose Del Cabo | 0 | 0 | 147 | 0.00306 | 456 | 0.010215 |
| Seattle | 0 | 0 | 0 | 0 | 1 | 0.000019 |
| Washington DC | 0 | 0 | 0 | 0 | 0 | 0 |
| Winnipeg | 0 | 0 | 0 | 0 | 2 | 0.000038 |

**Table 3-5 NPA Outage Rates (Excluding FD/FDE)**

| Location | NPA Outages | NPA Outage Rate |
|---|---|---|
| Albuquerque | 0 | 0 |
| Anchorage | 0 | 0 |
| Atlanta | 0 | 0 |
| Barrow | 0 | 0 |
| Bethel | 0 | 0 |
| Billings | 0 | 0 |
| Boston | 0 | 0 |
| Cleveland | 0 | 0 |
| Cold Bay | 0 | 0 |
| Fairbanks | 0 | 0 |
| Gander | 0 | 0 |
| Honolulu | 0 | 0 |
| Houston | 0 | 0 |
| Iqaluit | 0 | 0 |
| Juneau | 0 | 0 |
| Kansas City | 0 | 0 |
| Kotzebue | 0 | 0 |
| Los Angeles | 0 | 0 |
| Merida | 0 | 0 |
| Miami | 0 | 0 |
| Minneapolis | 0 | 0 |
| Oakland | 0 | 0 |
| Salt Lake City | 0 | 0 |
| San Jose Del Cabo | 0 | 0 |
| San Juan | 0 | 0 |
| Seattle | 0 | 0 |
| Tapachula | 0 | 0 |
| Washington DC | 0 | 0 |

**Figure 3-1 LPV Instantaneous Availability**

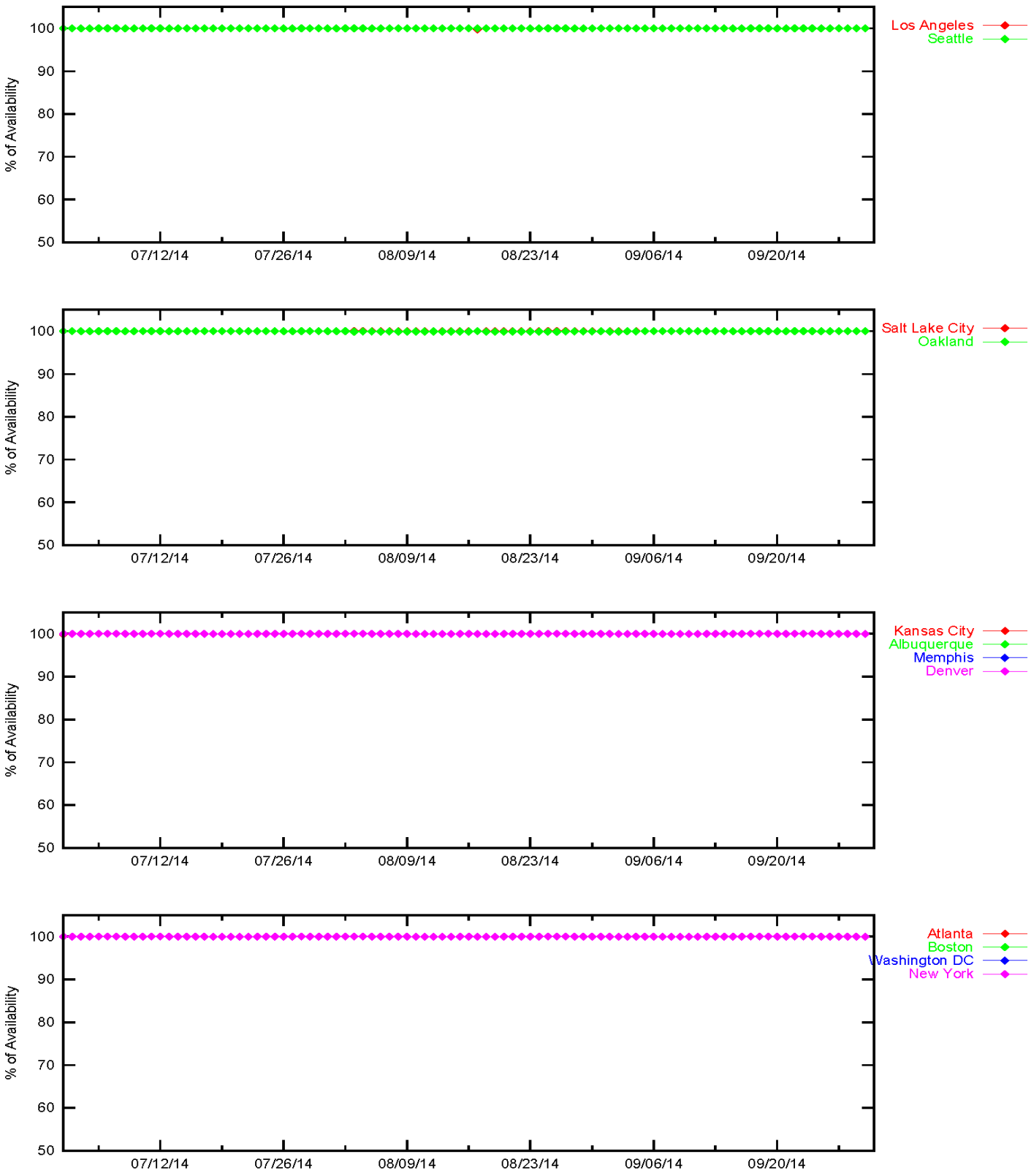


**Figure 3-2 LPV Instantaneous Availability**

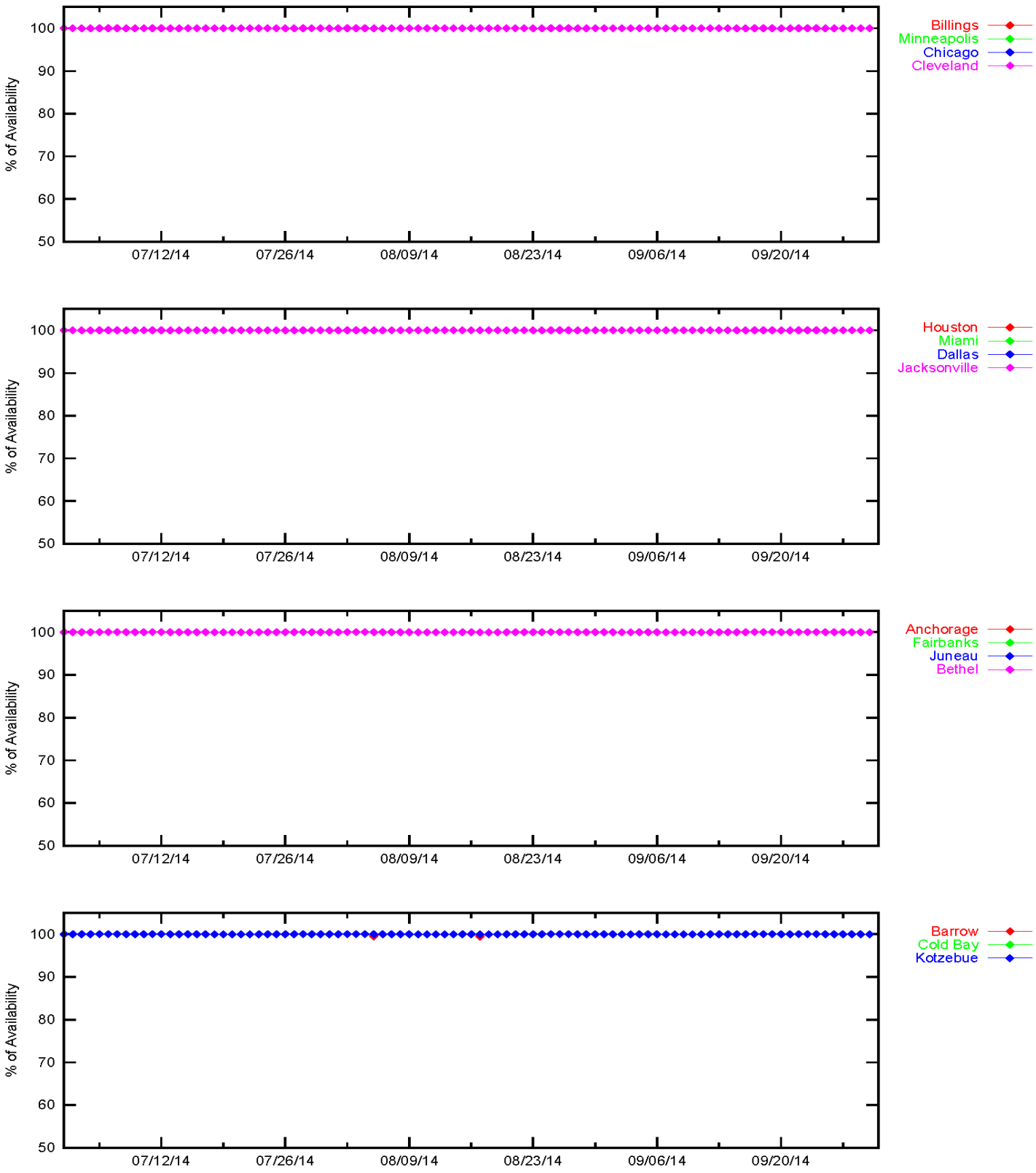


**Figure 3-3 LPV Instantaneous Availability**

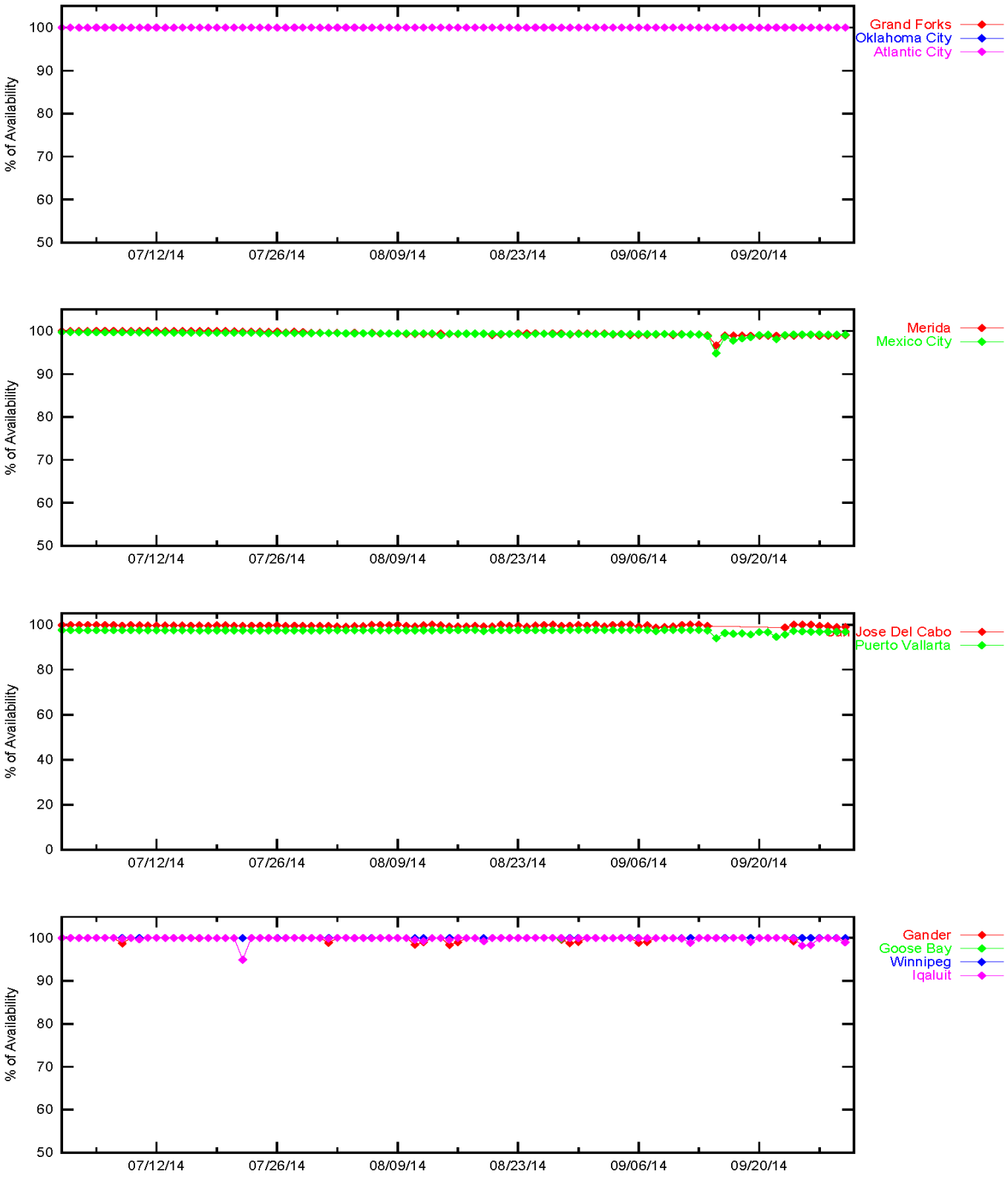


**Figure 3-4 LPV 200 Instantaneous Availability**

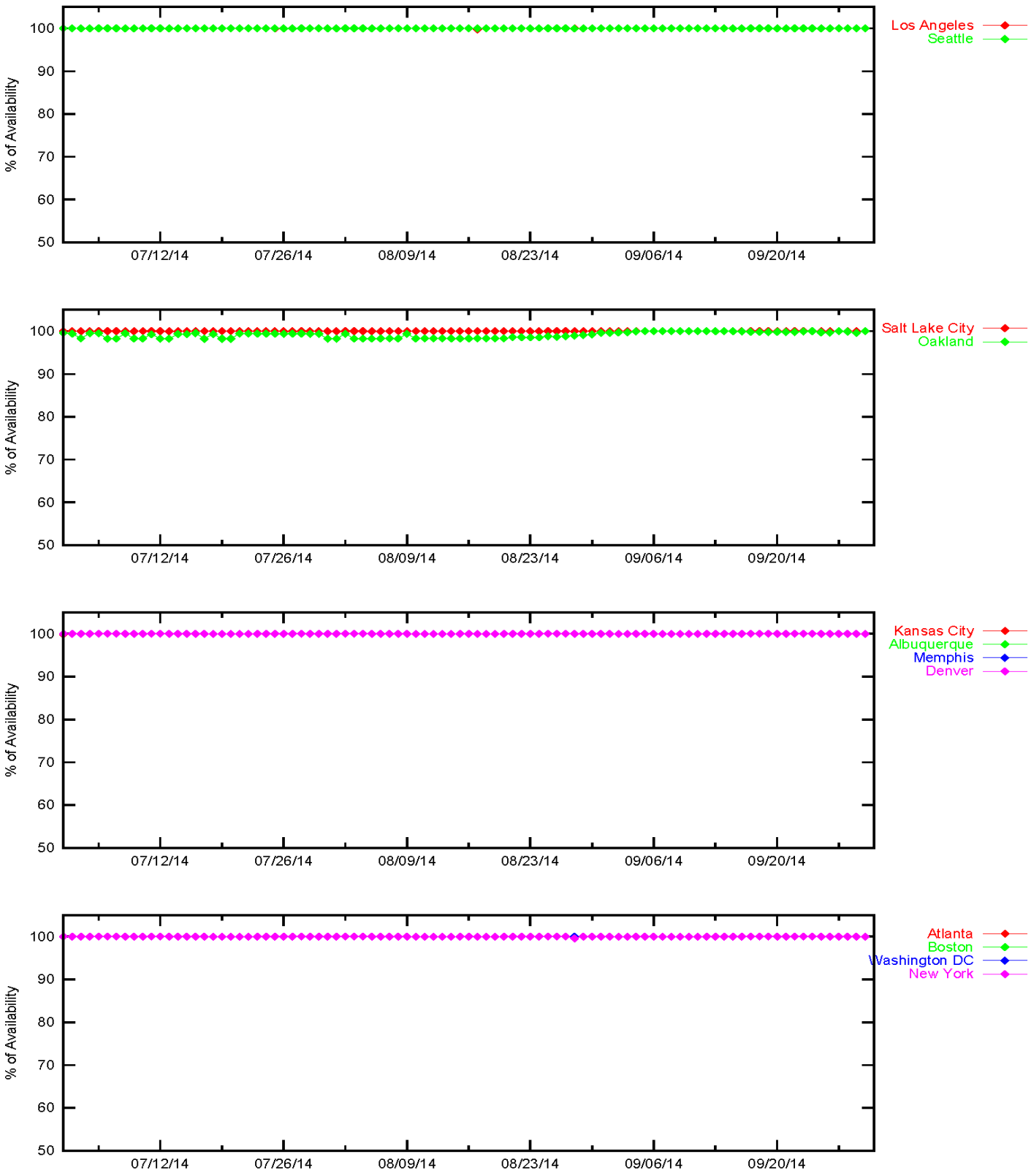


**Figure 3-5 LPV 200 Instantaneous Availability**

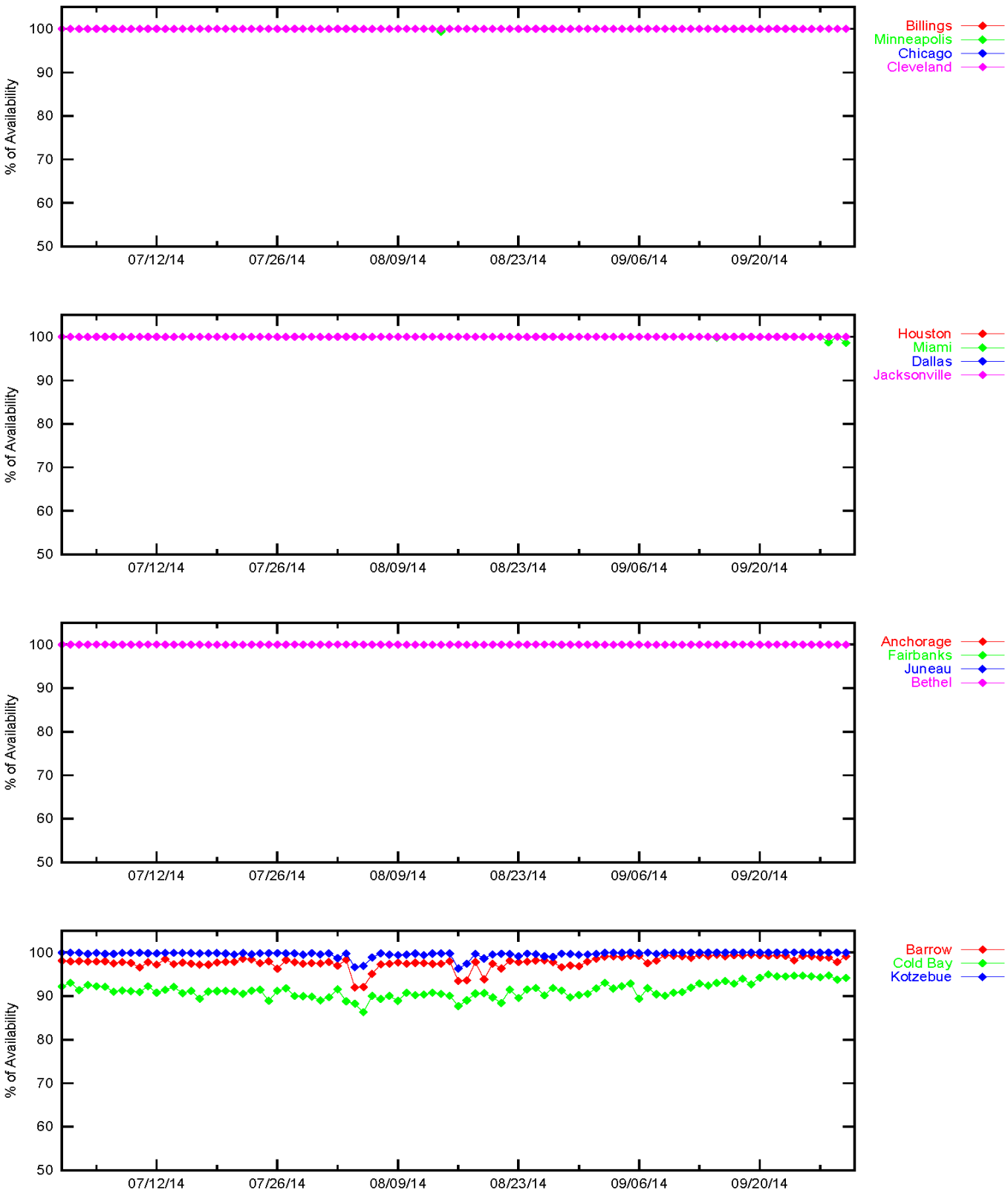


**Figure 3-6 LPV 200 Instantaneous Availability**

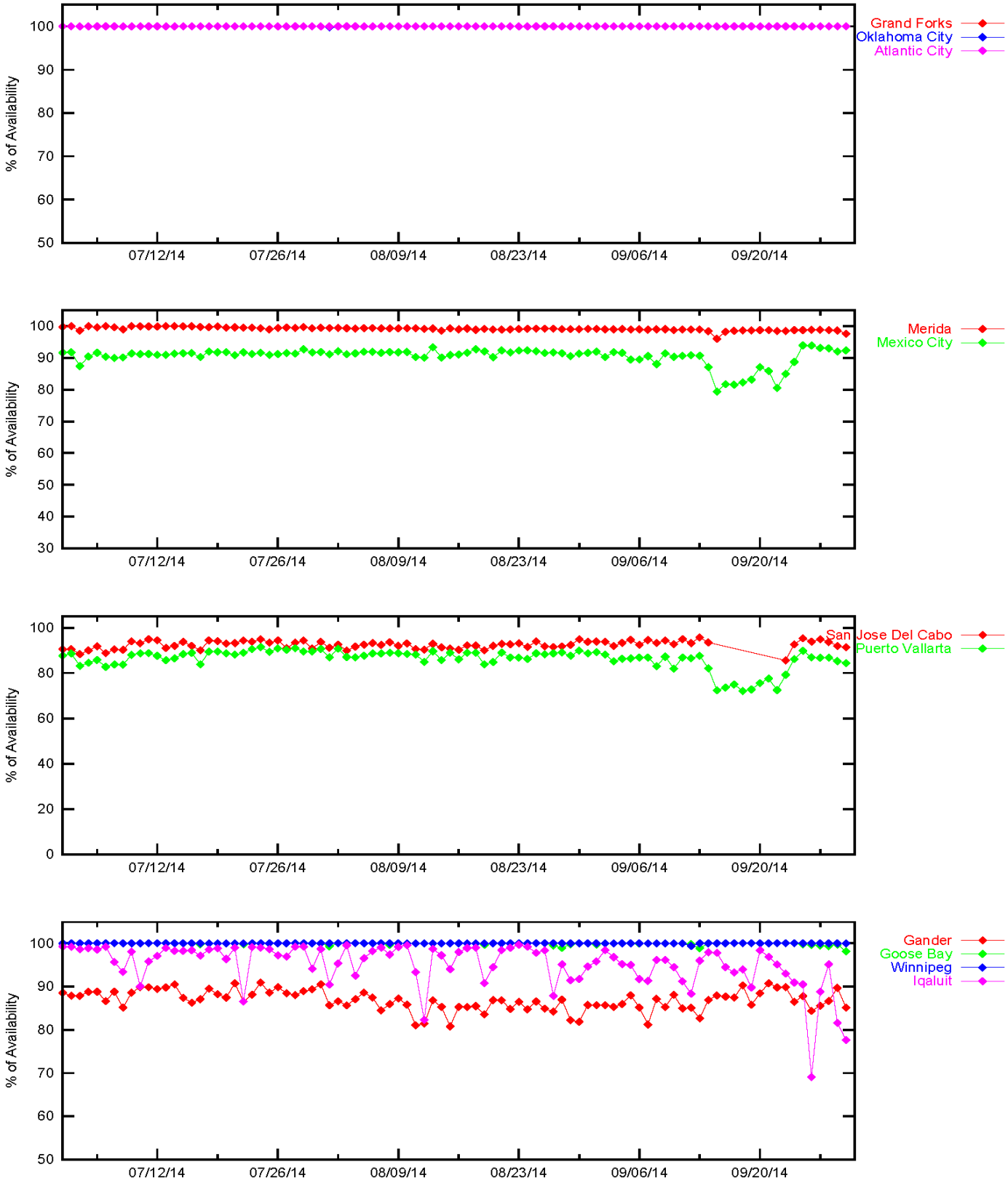


**Figure 3-7 LPV Outages**

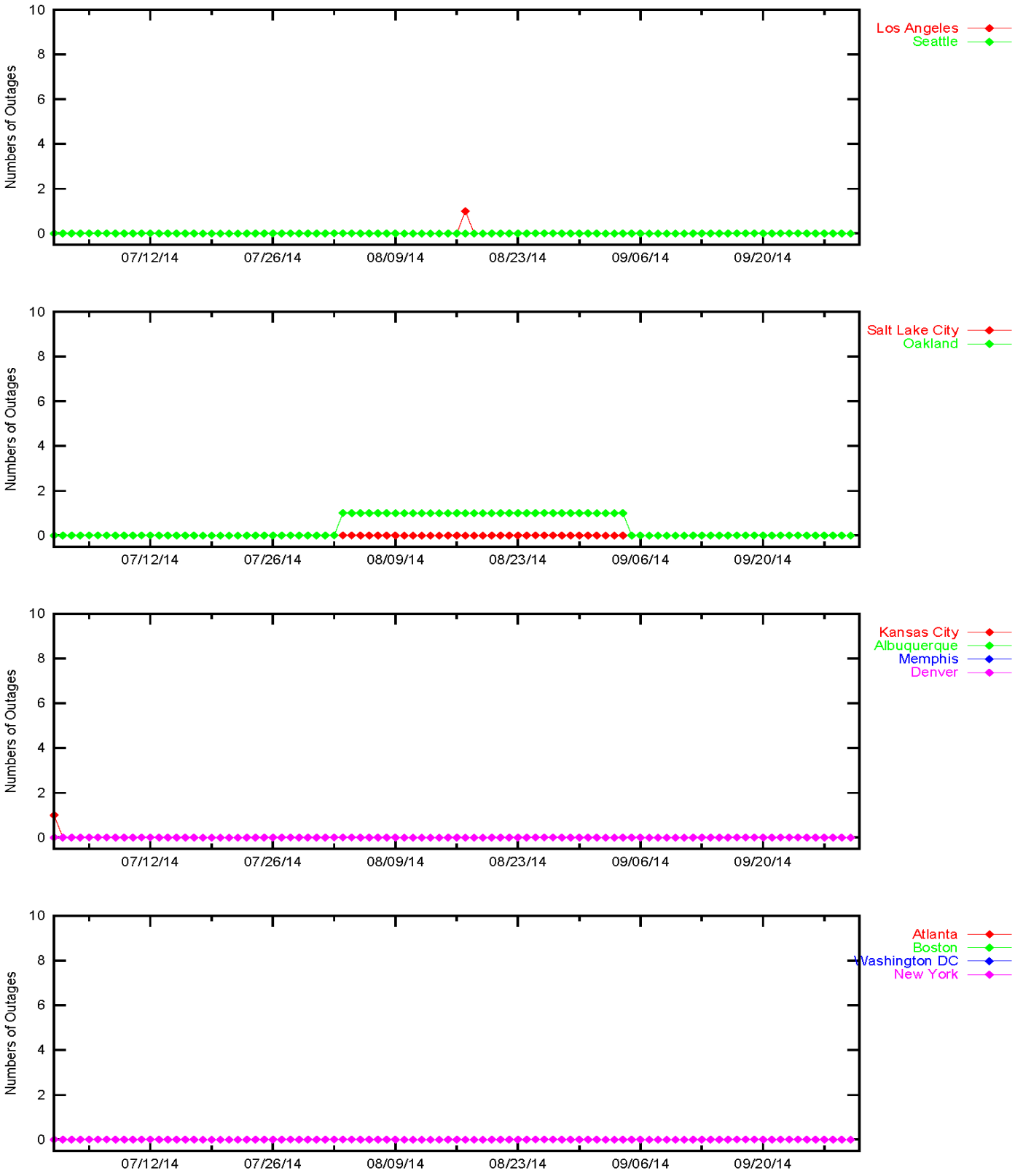


**Figure 3-8 LPV Outages**

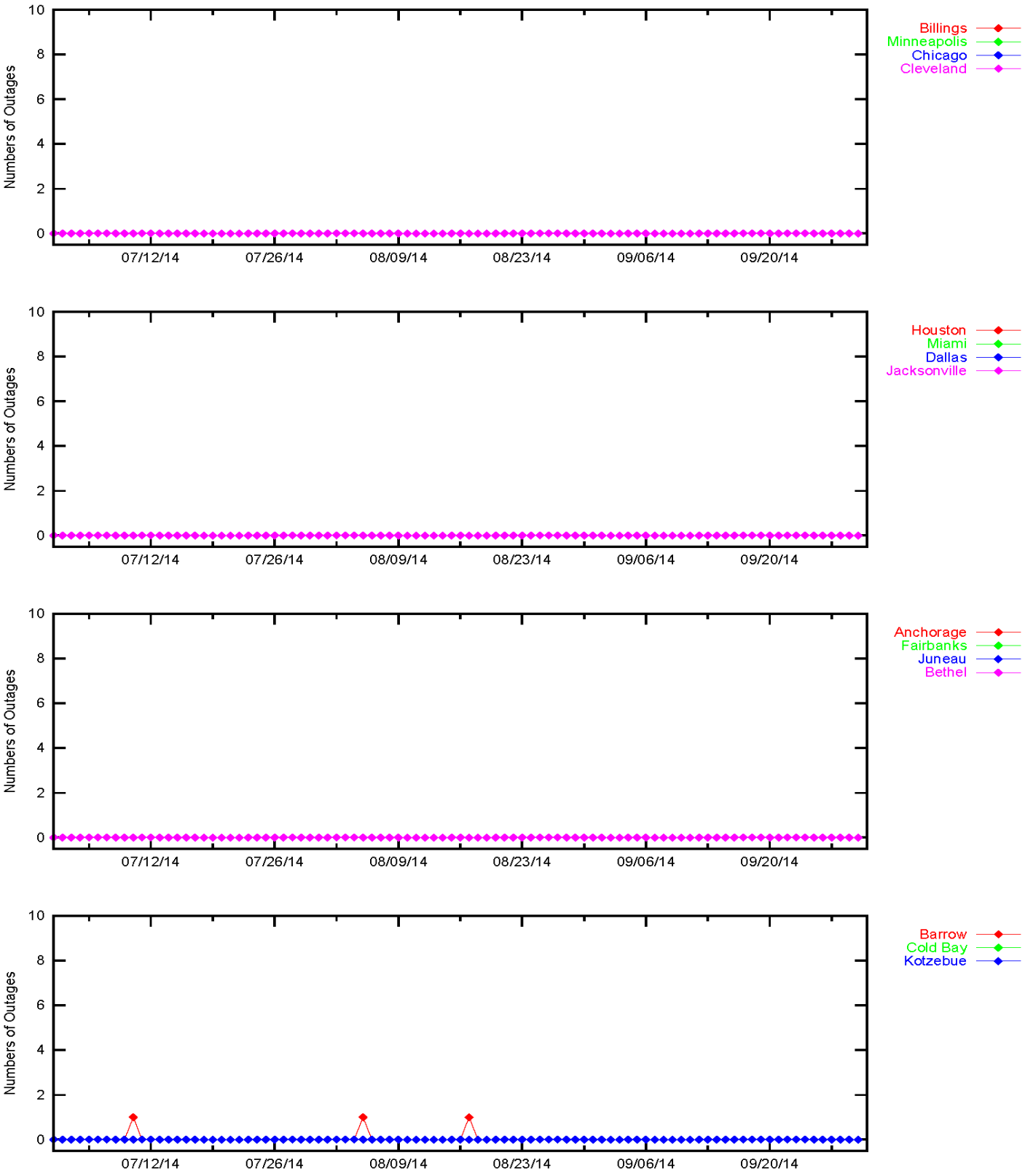


**Figure 3-9 LPV Outages**

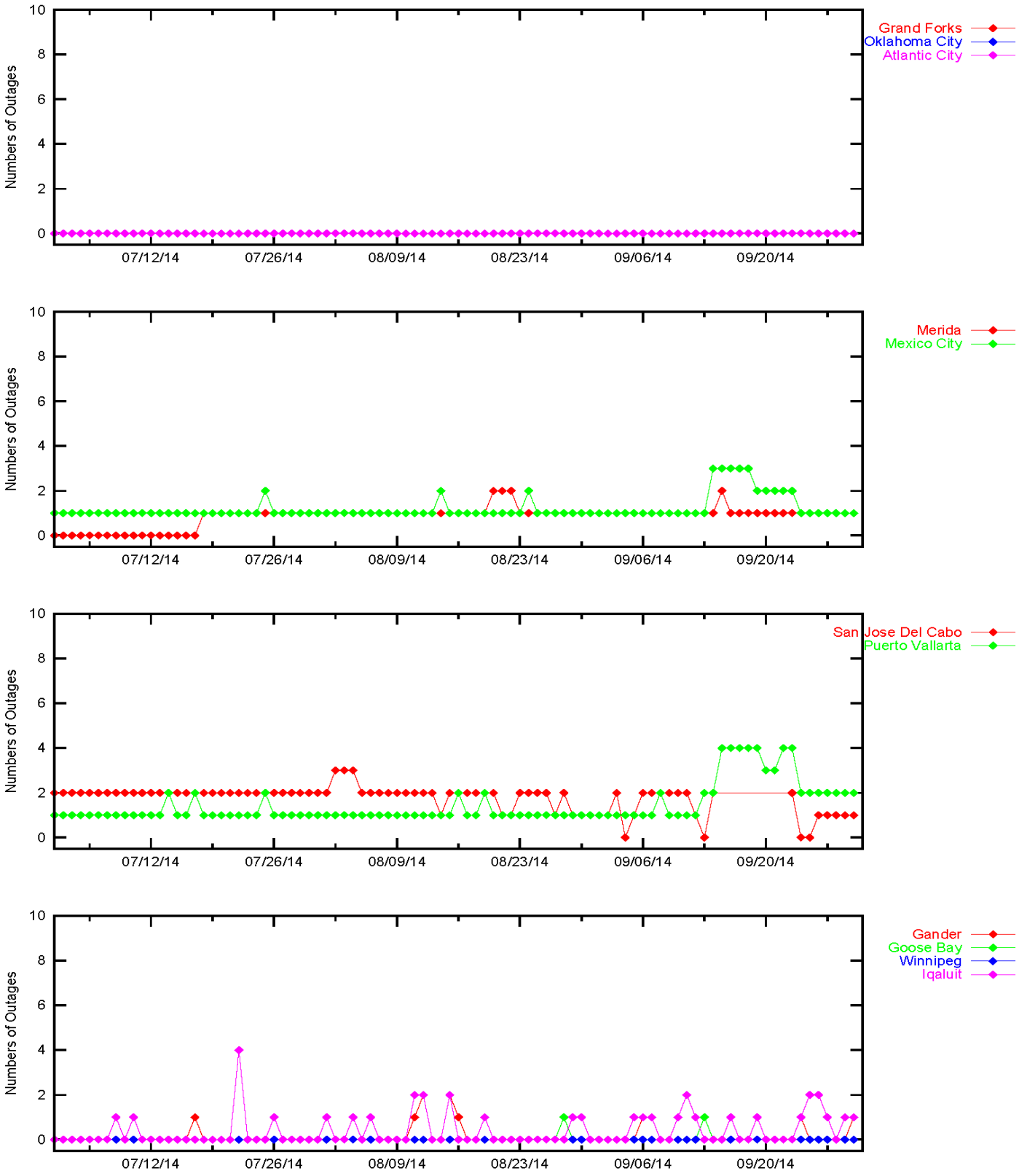


**Figure 3-10 LPV 200 Outages**

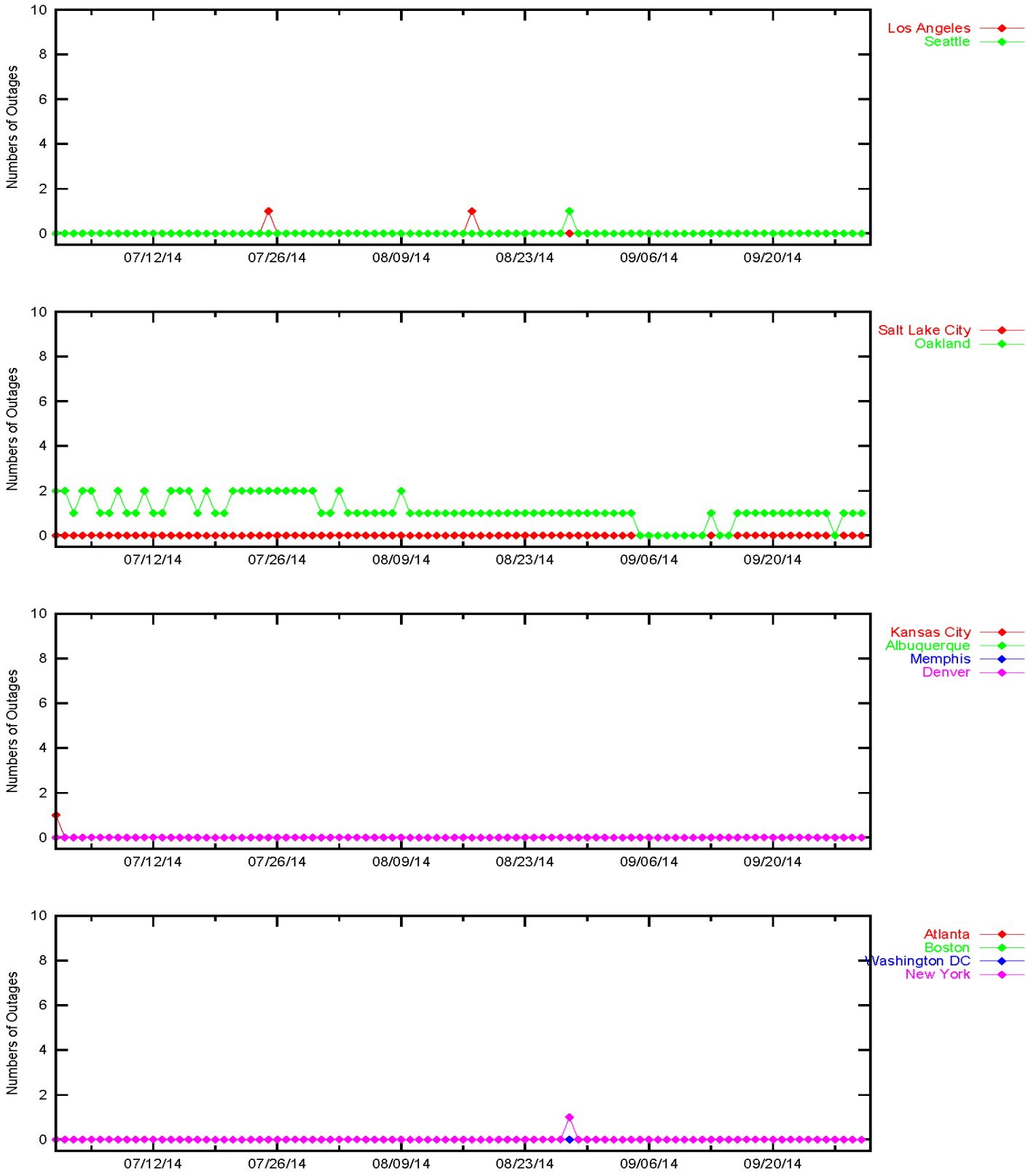


**Figure 3-11 LPV 200 Outages**

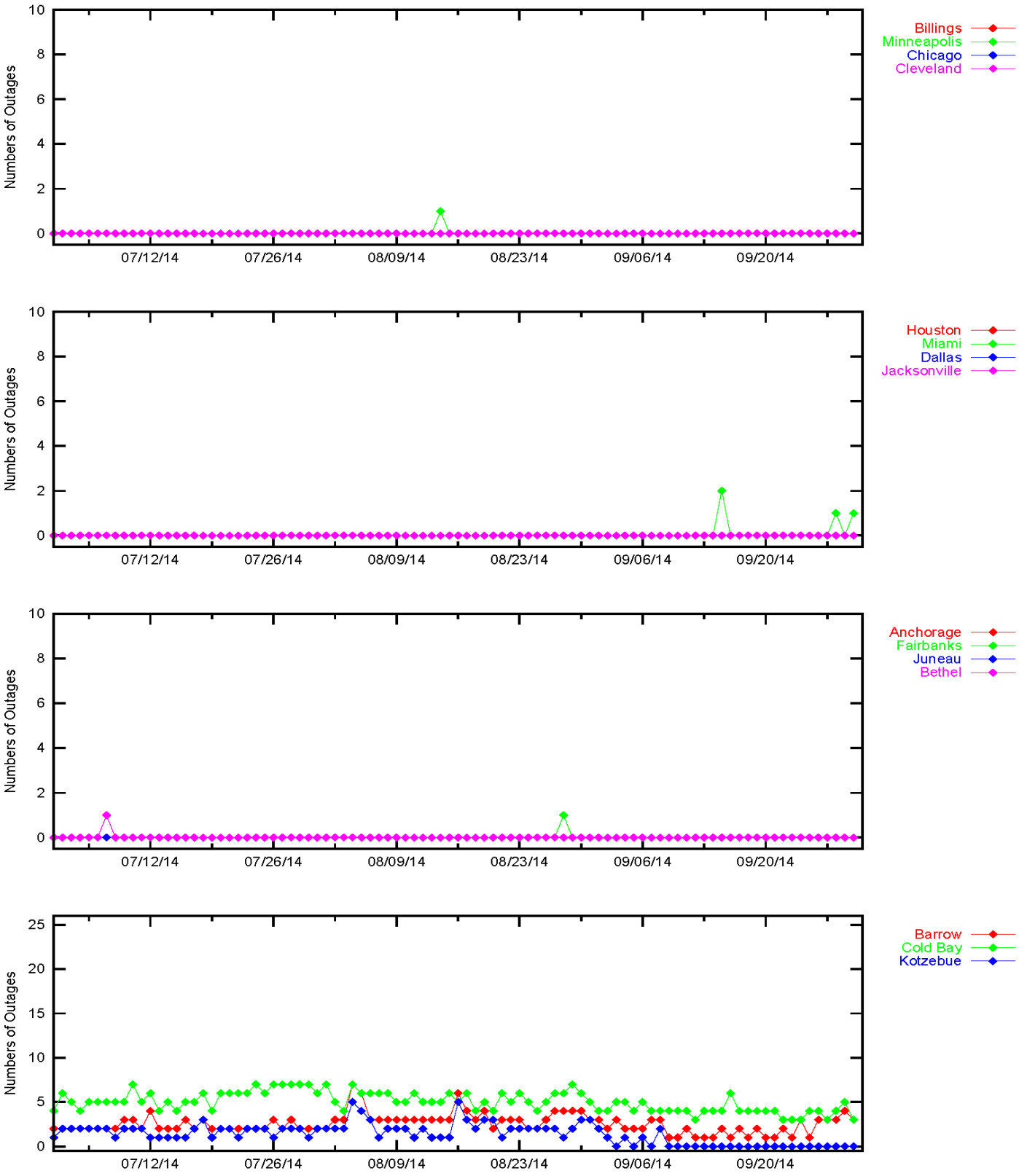
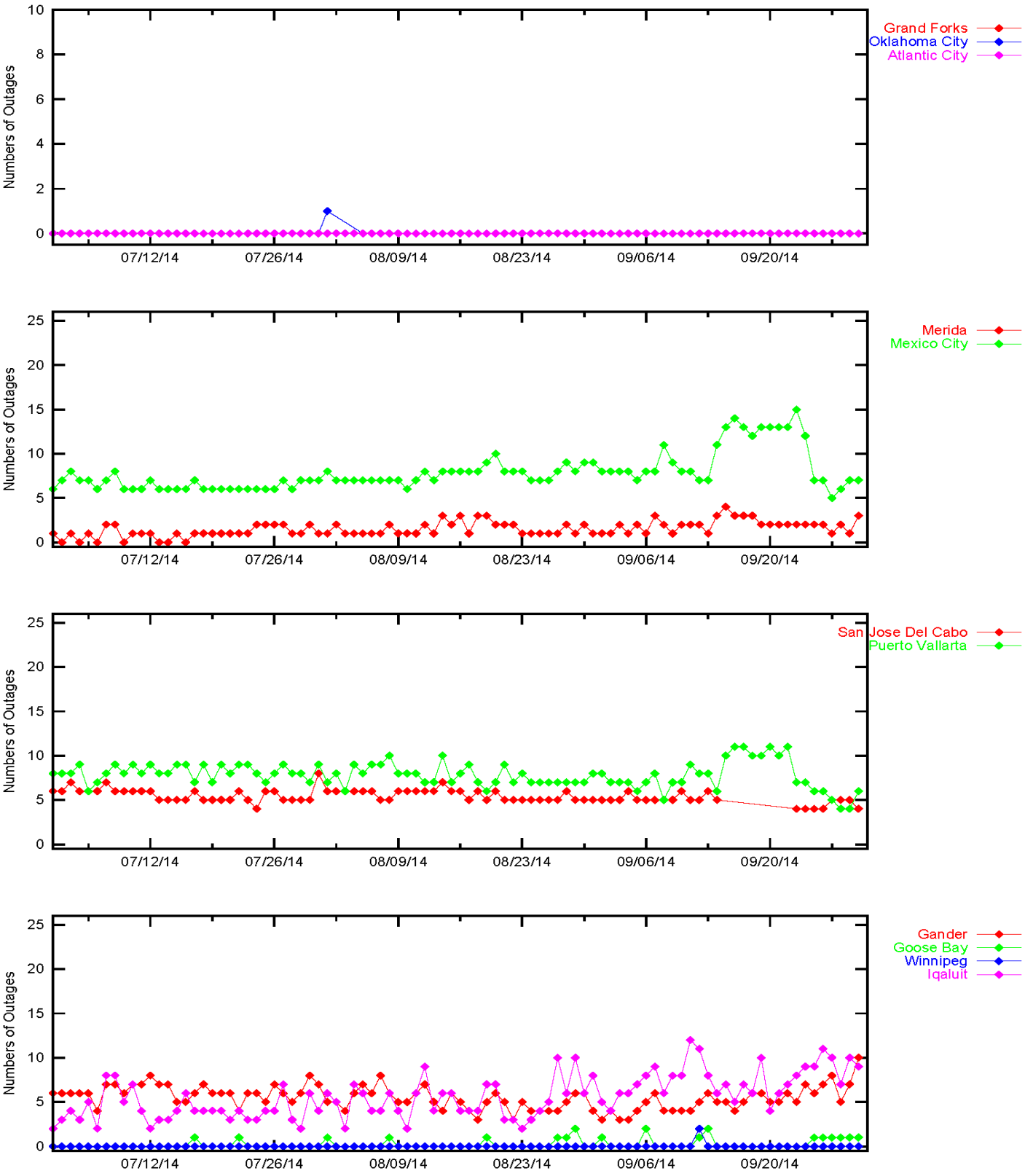


**Figure 3-12 LPV 200 Outages**



## 4.0 COVERAGE

The WAAS coverage area evaluation estimates the percent of service volume where WAAS provided service for the operational service levels defined in Table 1-1. The WAAS message and the GPS/GEO satellite status are used to determine WAAS availability across North America. For PA coverage, protection levels were calculated at 30-sec intervals at one degree spacing over the PA service volume, while NPA coverage were calculated at 30-sec intervals at five degree spacing over the NPA service volume.

Daily analysis for PA was conducted for LP, LPV and LPV 200 service levels. The coverage plots provide 100, 99.9, 99, 98 and 95% availability contours. Figure 4-1 shows the rollup LP North America coverage. Figure 4-2 shows the rollup LPV North America coverage. Figure 4-3 shows the rollup LPV 200 North America coverage. Figure 4-6 shows the daily LPV and LPV 200 CONUS coverage, and Figure 4-7 shows the daily LPV Alaska coverage at 99% availability and ionosphere Kp index values for this quarter. Figure 4-8 shows the daily LPV and LPV 200 Canada coverage at 99% availability and ionosphere Kp index values for this quarter. Please see Appendix B for coverage plots of 98% LP and LPV availability contour, and 99% LPV 200 availability contour. Kp quantifies the disturbance in the earth's magnetic field and is an indicator of solar storms causing geomagnetic disturbances that can cause the ionosphere to become unpredictable. WAAS increases GIVE values making PA service unavailable when WAAS detects that the ionosphere is disturbed.

Daily analysis for NPA was conducted for RNP 0.1 and RNP 0.3 service levels based on a 100% availability requirement. RNP 0.1 service is asserted to be available when HPL is less than 185 meters and RNP 0.3 service is asserted to be available when HPL is less than 556 meters. The NPA coverage plots provide 100, 99.9 and 99% availability contours. Figure 4-4 shows the rollup RNP 0.1 coverage and Figure 4-5 shows the rollup RNP 0.3 coverage for the quarter. Figure 4-9 shows the daily RNP coverage at 100% availability and ionosphere Kp index values for this quarter.

The coverage decreases for this quarter were mostly due to GUS switchovers, satellite outages, carrier phase anomalies, geomagnetic activity, communication outages, and elevated UDRE and GIVE values. The major events are discussed below. To see all the events that affected coverage, please refer to Table 1-5.

Geomagnetic activity on September 12-13 elevated GIVE values and reduced LPV200 coverage in CONUS and LPV/LPV200 coverage in Canada; see DR #125 Effects on WAAS from Iono Activity on September 12-13, 2014.

Significant events that reduced CONUS coverage in Figure 4-6 were observed on the following days: On August 2, geomagnetic activity elevated GIVE values resulting in a slight reduction in LPV200 coverage. On August 14, planned maintenance on PRN-13 caused minor LPV200 coverage loss. On August 28, elevated GIVE values due to geomagnetic activity affected LPV200 coverage; in addition, carrier phase spike on PRN-21 caused minor degradation in LPV200 coverage. On September 15, geomagnetic activity increased GIVE values resulting in LPV/LPV200 CONUS and Mexico coverage reduction. On September 28 through September 30, high GIVE values caused slight loss of LPV200 coverage.

Significant events that reduced Alaska coverage in Figure 4-7 were observed on the following days: On July 7, faulted GUS switchover on CRE GEO (PRN-138) elevated UDRE values and caused minor degradation in LPV200 Alaska coverage. On August 2, geomagnetic activity elevated GIVE values resulting in a slight reduction in LPV200 coverage. On August 4, manual switchover on CRW GEO (PRN-135) affected LPV200 Alaska coverage. On August 5, high GIVE values due to geomagnetic activity along with elevated UDRE after the GUS switchover reduced LPV200 Alaska coverage. On August 16, manual switchover on CRW GEO (PRN-135) affected LPV200 coverage. On August 19, high GIVE values caused minor LPV200 coverage reduction.

Significant events that reduced Canada coverage in Figure 4-9 were observed on the following days: On July 22, communication outages at Iqaluit reduced LPV/LPV200 Canada coverage. On August 12, geomagnetic activity in combination with planned maintenance on PRN-4 affected LPV/LPV200 coverage. Iqaluit communication outages also contributed in LPV/LPV200 Canada coverage reduction. On August 19, geomagnetic activity increased GIVE values and affected LPV/LPV200 Canada coverage. On September 19, geomagnetic activity affected LPV/LPV200 Canada coverage.

Radio frequency interference (RFI) caused localized loss of LPV/LPV200 coverage at Kansas City on July 1, LPV200 coverage at Oklahoma City on July 18, LPV200 coverage at Salt Lake City on August 3, LPV/LPV200 coverage at Los Angeles on August 17, and LPV200 coverage at Miami on September 15, but had no effect on WAAS service.

**Figure 4-1 LP North America Coverage for the Quarter**

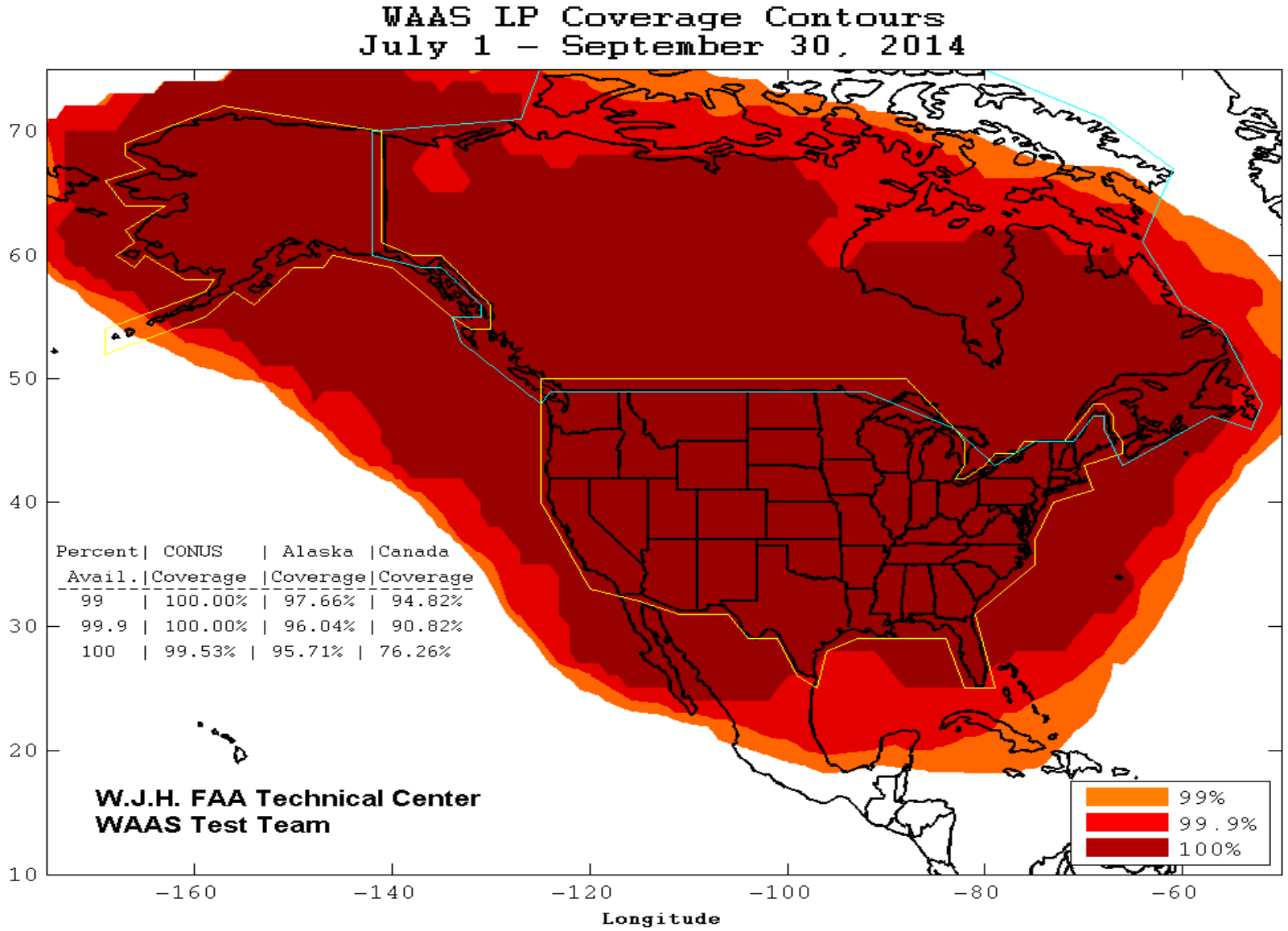


**Figure 4-2 LPV North America Coverage for the Quarter**

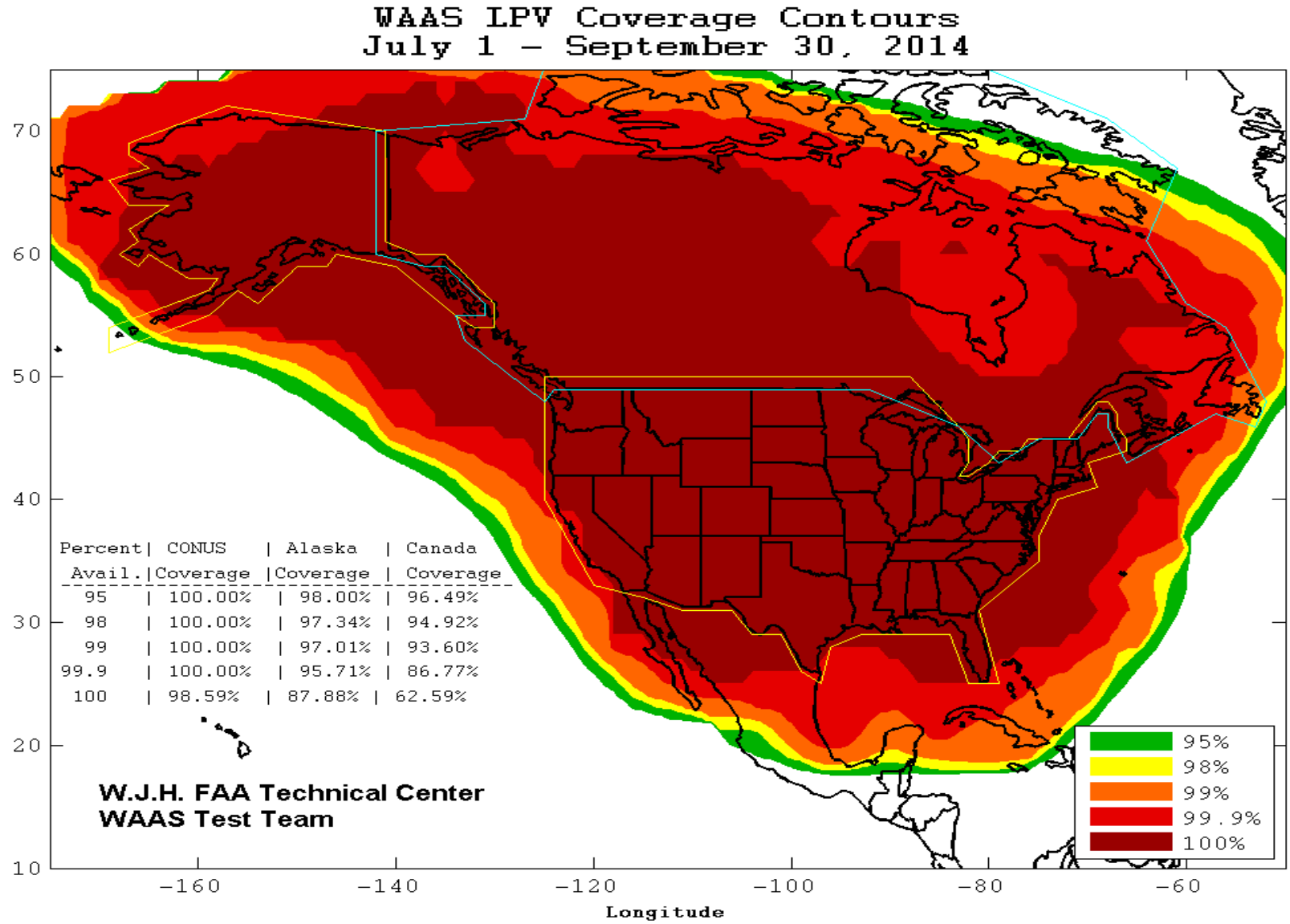


**Figure 4-3 LPV 200 North America Coverage for the Quarter**

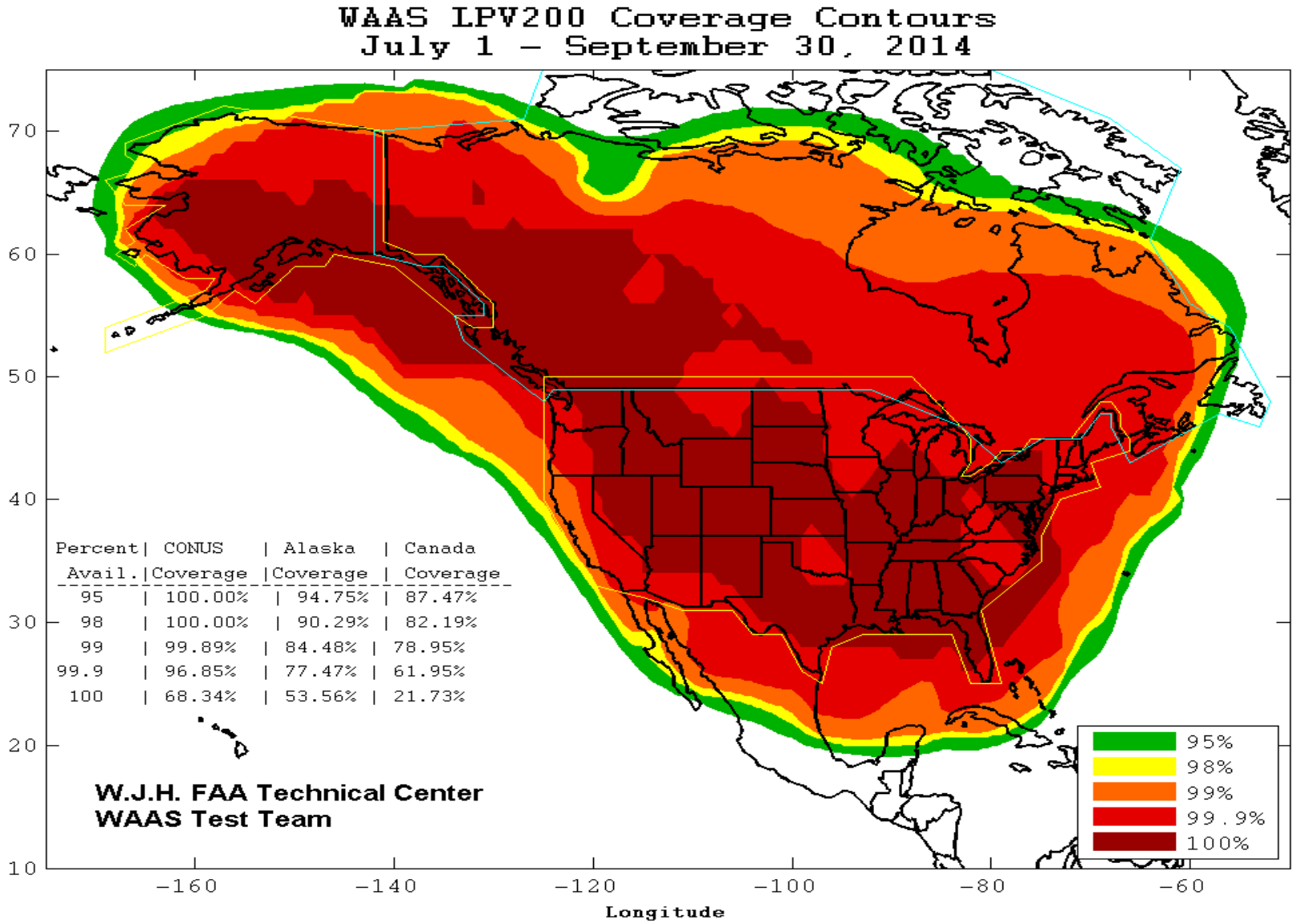


**Figure 4-4 RNP 0.1 Coverage for the Quarter**

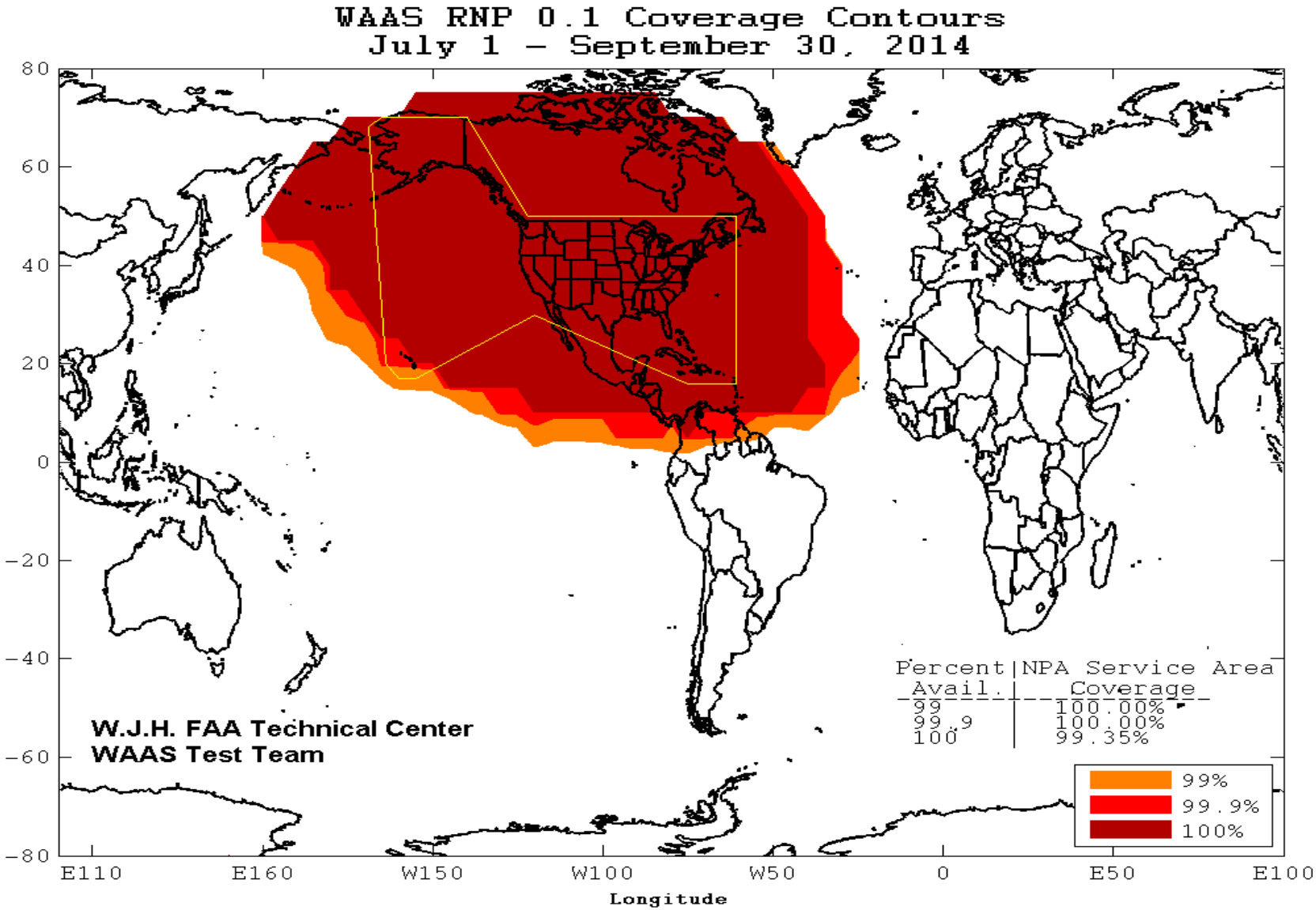


**Figure 4-5 RNP 0.3 Coverage for the Quarter**

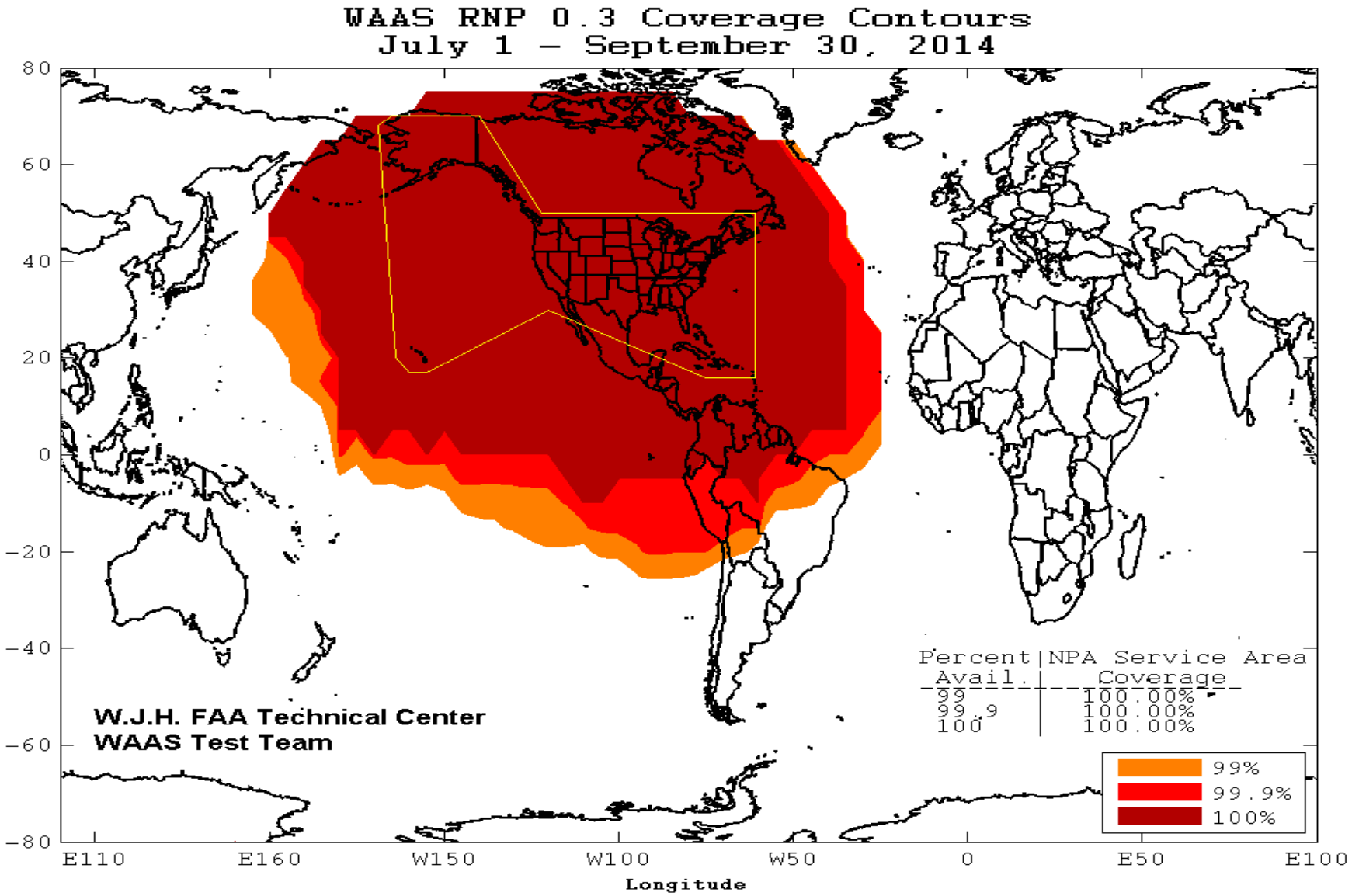


**Figure 4-6 Daily LPV and LPV 200 CONUS Coverage**

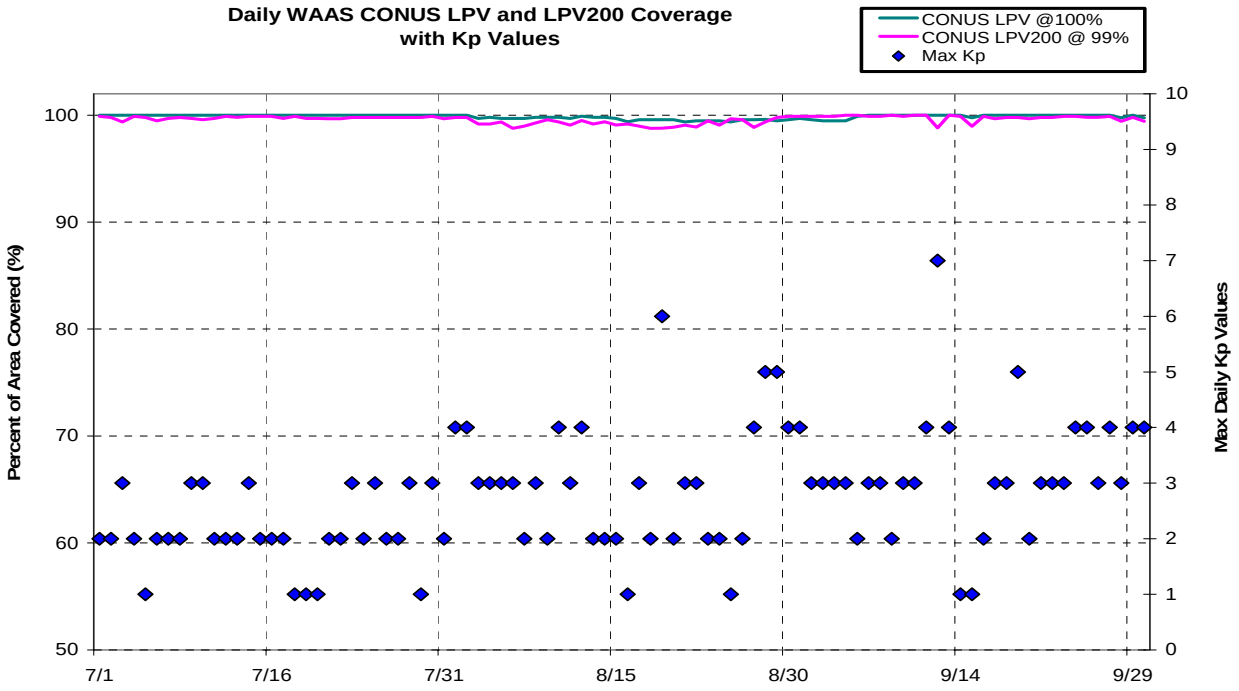



**Figure 4-7 Daily LPV and LPV 200 Alaska Coverage**

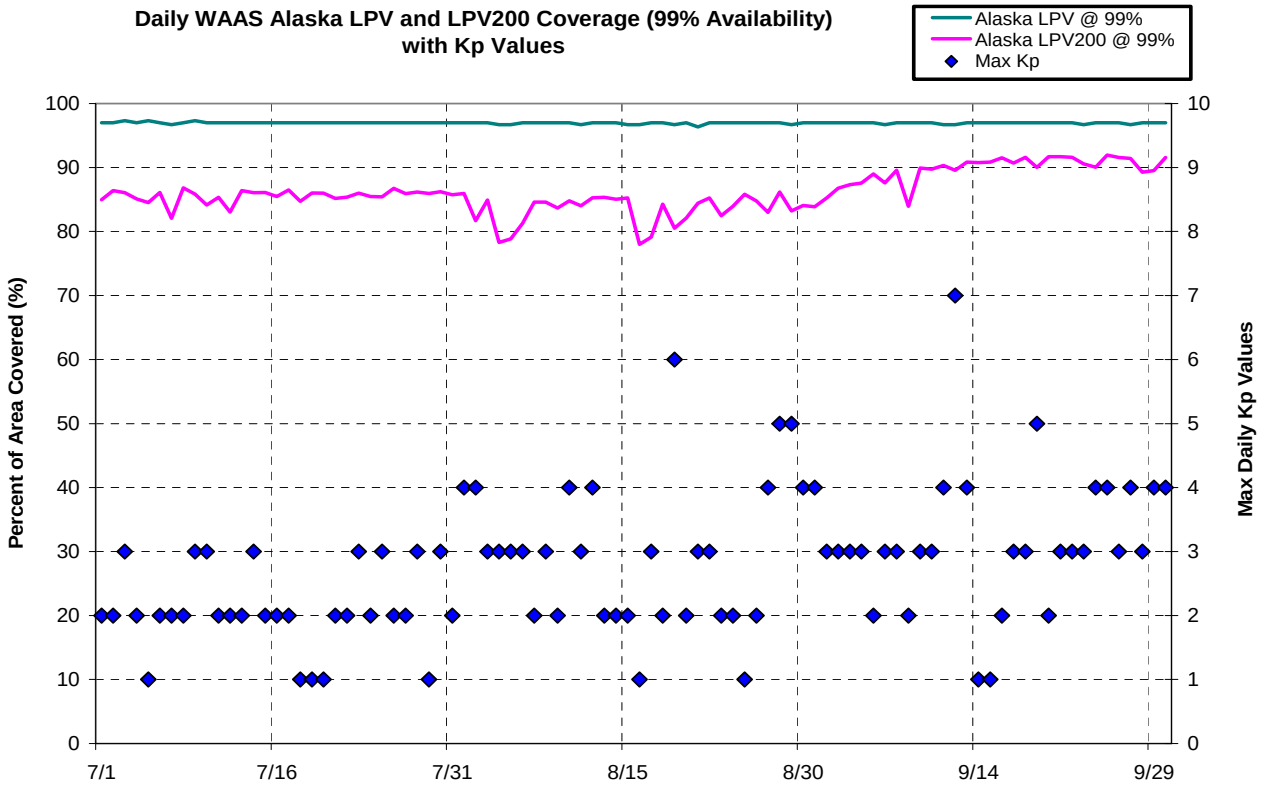


**Figure 4-8 Daily LPV and LPV 200 Canada Coverage**

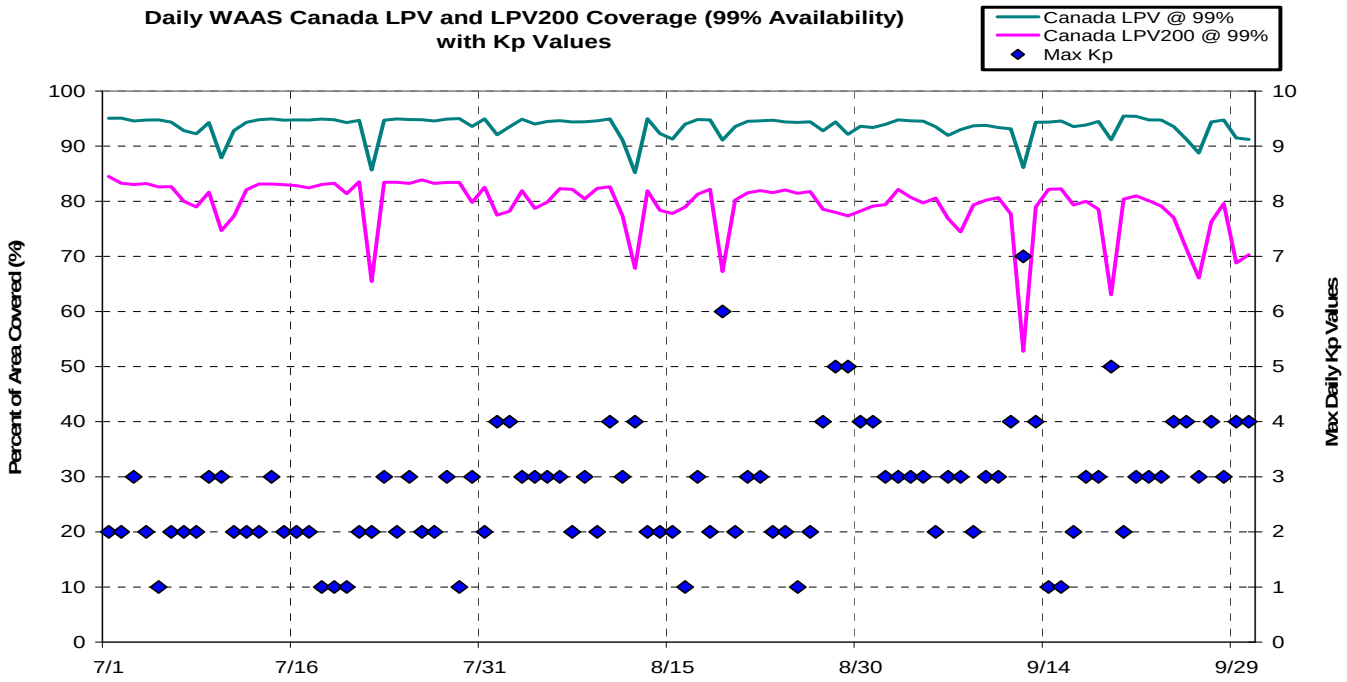
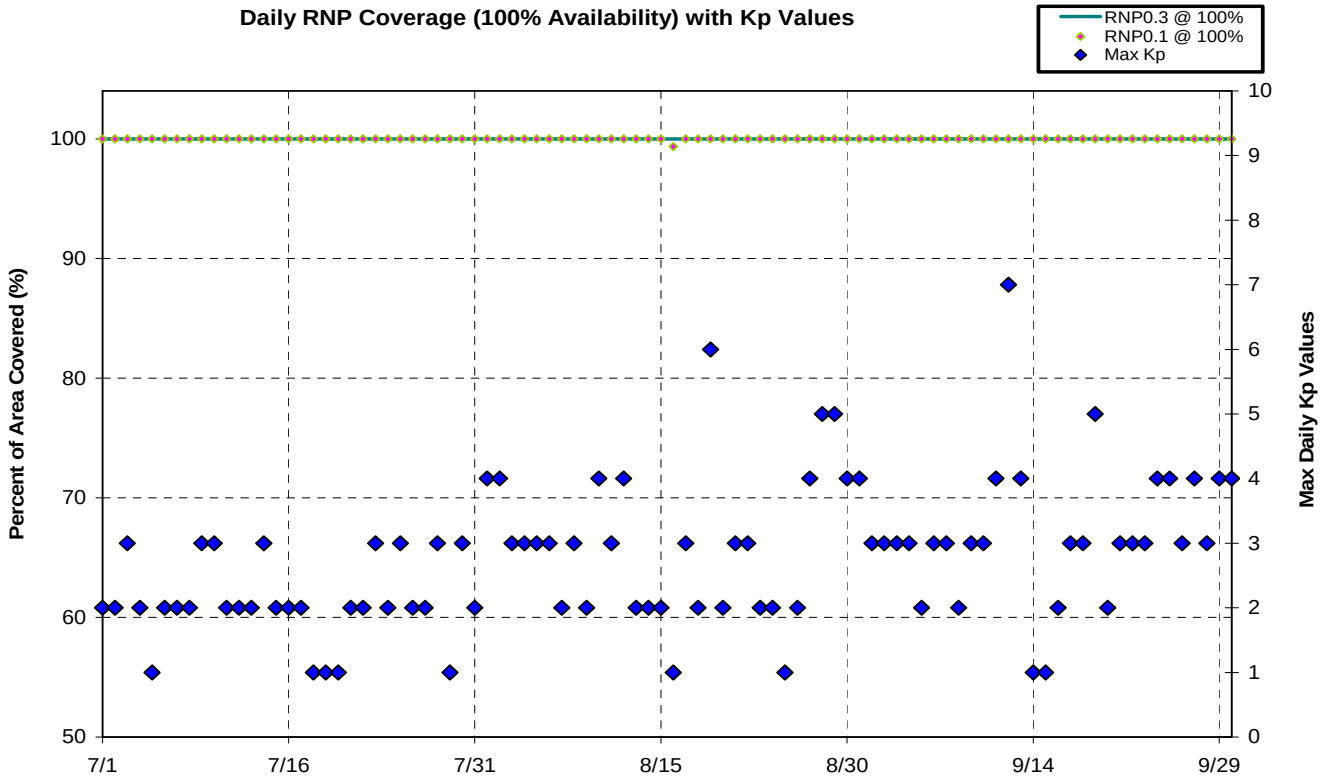



**Figure 4-9 Daily RNP Coverage**



# 5.0 INTEGRITY

## 5.1 HMI Analysis

Analysis of integrity includes the identification and evaluation of HMI (hazardously misleading information), as well as the generation of a safety index to illustrate the margin of safety that WAAS protection levels are providing. The safety index is a metric that shows how well the protection levels are bounding the maximum observed error when LPV service is available. The process for determining this index involves dividing the protection limit observed by the maximum observed error. An observed safety index of greater than one indicates safe bounding of the greatest observed error, less than one indicates that the maximum error was not bounded, and a result equal to one means that the error was equal to the protection level. An HMI occurs if the position error exceeds the protection level in the vertical or horizontal dimensions at any time and 6.2 seconds or more passes before this event is corrected by WAAS.

Table 5-1 lists the safety index and the number of HMI events. For this evaluation period, the lowest safety margin index is 4.06 at Iqaluit. There was no HMI event. Since WAAS was made available to the public in August 2000 there has not been an HMI event. WAAS was commissioned by the FAA for safety of life services in July 2003.

**Table 5-1 Minimum Safety Margin Index and HMI Statistics**

| Location | Safety Index | | |
|---|---|---|---|
| | Horizontal | Vertical | Number of HMIs |
| Atlantic City | 4.68 | 4.89 | 0 |
| Grand Forks | 5.37 | 7.83 | 0 |
| Oklahoma City | 11.24 | 6.27 | 0 |
| Albuquerque | 6.41 | 8.31 | 0 |
| Anchorage | 6.14 | 6.99 | 0 |
| Atlanta | 7.45 | 5.38 | 0 |
| Barrow | 8.43 | 7.48 | 0 |
| Bethel | 11.03 | 8.37 | 0 |
| Billings | 6.29 | 6.94 | 0 |
| Boston | 5.83 | 4.18 | 0 |
| Chicago | 6.49 | 5.06 | 0 |
| Cleveland | 6.15 | 6.15 | 0 |
| Cold Bay | 11.90 | 9.66 | 0 |
| Dallas | 5.70 | 7.88 | 0 |
| Denver | 6.63 | 6.77 | 0 |
| Fairbanks | 6.27 | 4.86 | 0 |
| Gander | 5.56 | 6.23 | 0 |
| Goose Bay | 9.11 | 7.59 | 0 |
| Houston | 6.01 | 4.26 | 0 |
| Iqaluit | 5.49 | 4.06 | 0 |
| Jacksonville | 6.58 | 7.30 | 0 |
| Juneau | 6.99 | 6.21 | 0 |
| Kansas City | 6.49 | 7.72 | 0 |
| Kotzebue | 10.23 | 7.08 | 0 |
| Los Angeles | 6.10 | 8.01 | 0 |
| Memphis | 7.17 | 7.41 | 0 |
| Merida | 10.34 | 7.59 | 0 |
| Mexico City | 12.21 | 4.77 | 0 |
| Miami | 5.49 | 8.54 | 0 |
| Minneapolis | 4.95 | 4.29 | 0 |
| New York | 6.84 | 4.37 | 0 |
| Oakland | 6.43 | 9.09 | 0 |
| Puerto Vallarta | 8.26 | 5.98 | 0 |
| Salt Lake City | 6.81 | 6.43 | 0 |
| San Jose Del Cabo | 9.51 | 7.96 | 0 |
| Seattle | 6.64 | 6.13 | 0 |
| Washington DC | 6.22 | 7.11 | 0 |
| Winnipeg | 5.72 | 4.24 | 0 |

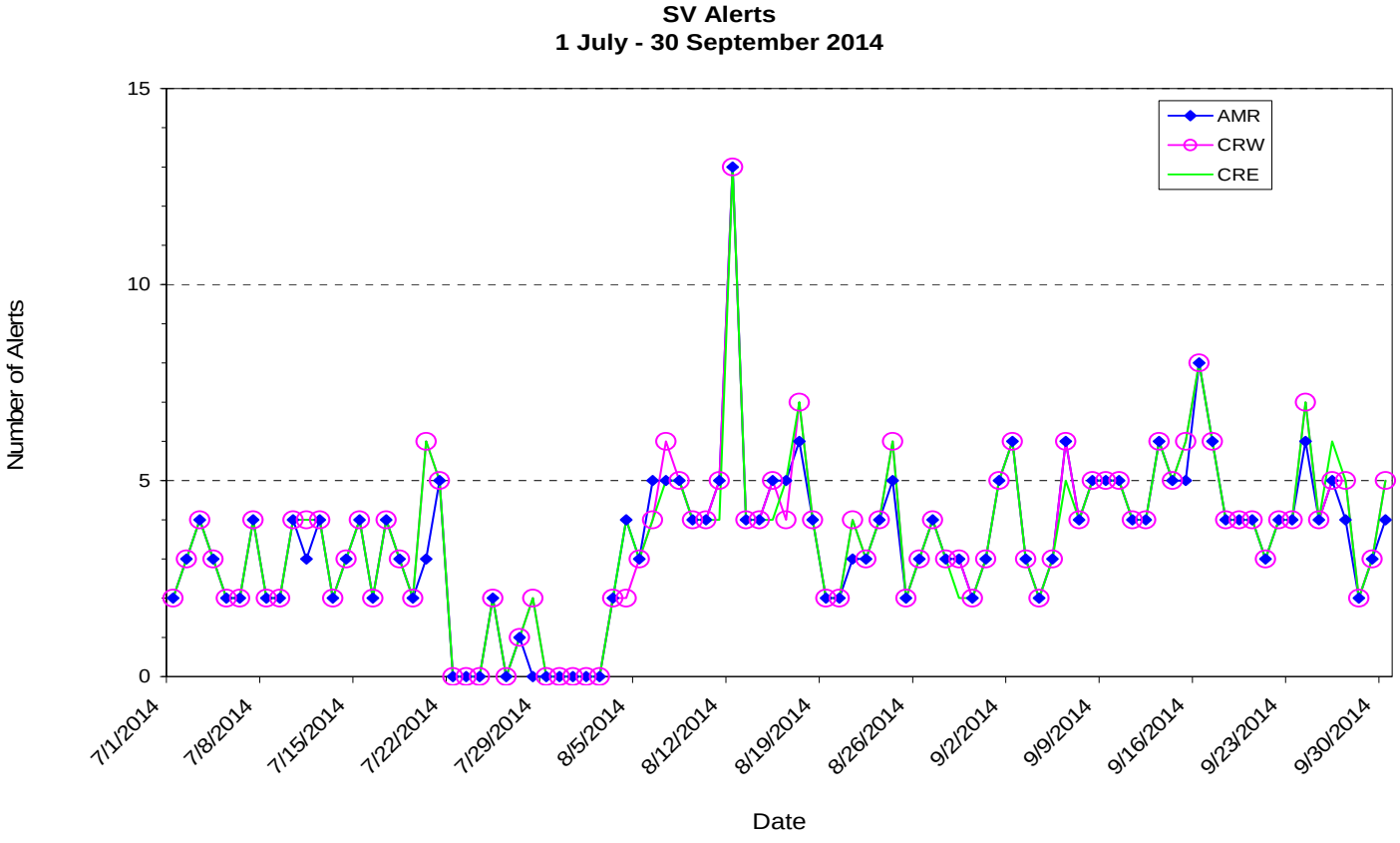
## 5.2 Broadcast Alerts

The WAAS transmits alert messages to protect the users if the active WAAS corrections are no longer bound by the UDREs. Alerts increase the User Differential Range Error (UDRE) for one or more PRNs, which can reduce the weighting of the satellite in the navigation solution, or completely exclude the satellite from the navigation solution. An increase in UDRE's after an alert effectively increases the user protection levels (HPL and VPL), which affects the availability. Additionally, if an alert message sequence lasts for more than 12 seconds, WAAS fast corrections can time out, causing a loss of continuity. Table 5-2 shows the total number of alerts and the average number of alerts per day. Figure 5-1 shows the number of SV alerts that occurred daily during the reporting period. Often the number of alerts on one GEO is the same as the number of alerts on the other GEO. Therefore, lines tend to overlap in most points on this plot.

**Table 5-2 WAAS SV Alert**

| | Number of Alerts | | | Average Alerts Per Day | | |
|---|---|---|---|---|---|---|
| **Message Type** | **AMR** | **CRW** | **CRE** | **AMR** | **CRW** | **CRE** |
| 2 | 277 | 276 | 277 | 3.0109 | 3.0000 | 3.0109 |
| 3 | 21 | 21 | 21 | 0.2283 | 0.2283 | 0.2283 |
| 4 | 18 | 29 | 26 | 0.1957 | 0.3152 | 0.2826 |
| 5 | 0 | 0 | 0 | 0.0000 | 0.0000 | 0.0000 |
| 6 | 0 | 0 | 0 | 0.0000 | 0.0000 | 0.0000 |
| 24 | 0 | 0 | 0 | 0.0000 | 0.0000 | 0.0000 |
| 26 | 0 | 0 | 0 | 0.0000 | 0.0000 | 0.0000 |
| Total Alerts | 316 | 326 | 324 | 3.4348 | 3.5435 | 3.5217 |
| **Days in Service** | 92 | 92 | 92 | | | |

**Figure 5-1 SV Daily Alert Trend**



### 5.3 Availability of WAAS Messages (CRE, CRW, and AMR)

For an accurate and current user position to be calculated, the content of the WAAS message must be broadcast and received within precise time specifications. This aspect of the WAAS is critical to maintaining continuity requirements. Each message type in the WAAS SIS has a specific timeout interval and an expected worst case broadcast interval. Table 5-3 lists the maximum intervals at which each message must broadcast to meet system requirements.

GUS switchovers or broadcast WAAS alerts can interrupt the normal broadcast message stream. If these events occur at a time when the maximum interval of a specific message is approaching, that message may be delayed, resulting in its late transmittal.

Late messages statistics reported during the quarter were mainly caused by GEO SIS outages, GUS switchovers and SV alerts except message type 7 and 10. Occasionally, message type 7 and 10 were late and they were not caused by GEO SIS outages, GUS switchovers or SV alerts. The lateness of type 7 and type 10 messages has little or no impact on user performance and safety.

Tables 5-4 to 5-8 show fast correction, long correction, ephemeris covariance, ionosphere correction, and ionospheric mask message rates statistics broadcasted on AMR GEO. Table 5-9 to 5-13 show message rates statistics broadcasted on CRW GEO. Table 5-14 to 5-18 show message rates statistics on CRE GEO.

**Table 5-3 Update Rates for WAAS Messages**

| **Data** | **Associated Message Types** | **Maximum Update Interval** (seconds) | **En Route, Terminal, NPA Timeout** (seconds) | **Precision Approach Timeout** (seconds) |
|---|---|---|---|---|
| WAAS in Test Mode | 0 | 6 | N/A | N/A |
| PRN Mask | 1 | 60 | None | None |
| UDREI | 2-6, 24 | 6 | 18 | 12 |
| Fast Corrections | 2-5, 24 | See Table A-8 in RTCA DO-229C | See Table A-8 in RTCA DO-229C | See Table A-8 in RTCA DO-229C |
| Long Term Corrections | 24, 25 | 120 | 360 | 240 |
| GEO Nav. Data | 9 | 120 | 360 | 240 |
| Fast Correction Degradation | 7 | 120 | 360 | 240 |
| Weighting Factors | 8 | 120 | 240 | 240 |
| Degradation Parameters | 10 | 120 | 360 | 240 |
| Ionospheric Grid Mask | 18 | 300 | None | None |
| Ionospheric Corrections | 26 | 300 | 600 | 600 |
| UTC Timing Data | 12 | 300 | None | None |
| Almanac Data | 17 | 300 | None | None |

**Table 5-4 WAAS Fast Correction and Degradation Message Rates – AMR**

| Message Type | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 103345 | 2 | 2232 |
| 2 | 1325107 | 54 | 2166 |
| 3 | 1324317 | 71 | 2172 |
| 4 | 1324309 | 79 | 2166 |
| 7 | 96581 | 10 | 2213 |
| 9 | 93070 | 3 | 2215 |
| 10 | 96633 | 14 | 2192 |
| 17 | 31292 | 3 | 2489 |

**Table 5-5 WAAS Long Correction Message Rates (Type 24 and 25) – AMR**

| SV | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 49539 | 0 | 0 |
| 2 | 47591 | 0 | 0 |
| 3 | 17146 | 2 | 169 |
| 4 | 48199 | 0 | 0 |
| 5 | 48145 | 0 | 0 |
| 6 | 47751 | 0 | 0 |
| 7 | 47512 | 1 | 178 |
| 8 | 47778 | 1 | 166 |
| 9 | 6764 | 0 | 0 |
| 10 | 48549 | 1 | 168 |
| 11 | 49640 | 2 | 178 |
| 12 | 47582 | 0 | 0 |
| 13 | 46825 | 1 | 168 |
| 14 | 47397 | 2 | 182 |
| 15 | 48463 | 0 | 0 |
| 16 | 47960 | 1 | 150 |
| 17 | 47369 | 1 | 187 |
| 18 | 46878 | 2 | 169 |
| 19 | 48768 | 1 | 180 |
| 20 | 49048 | 0 | 0 |
| 21 | 47675 | 3 | 180 |
| 22 | 47369 | 3 | 180 |
| 23 | 47496 | 1 | 166 |
| 24 | 49135 | 2 | 172 |
| 25 | 48979 | 2 | 172 |
| 26 | 48524 | 2 | 168 |
| 27 | 49354 | 2 | 180 |
| 28 | 48010 | 2 | 180 |
| 29 | 47559 | 2 | 168 |
| 30 | 46919 | 1 | 180 |
| 31 | 48267 | 0 | 0 |
| 32 | 47254 | 1 | 187 |

**Table 5-6 WAAS Ephemeris Covariance Message Rates (Type 28) – AMR**

| SV | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 40698 | 0 | 0 |
| 2 | 39032 | 0 | 0 |
| 3 | 14073 | 2 | 2287 |
| 4 | 39599 | 2 | 215 |
| 5 | 39478 | 3 | 2284 |
| 6 | 39179 | 1 | 206 |
| 7 | 38969 | 1 | 206 |
| 8 | 39239 | 3 | 174 |
| 9 | 5555 | 0 | 0 |
| 10 | 39870 | 0 | 0 |
| 11 | 40808 | 7 | 210 |
| 12 | 39065 | 0 | 0 |
| 13 | 38474 | 0 | 0 |
| 14 | 38940 | 0 | 0 |
| 15 | 39739 | 5 | 208 |
| 16 | 39380 | 2 | 211 |
| 17 | 38898 | 1 | 211 |
| 18 | 38465 | 6 | 209 |
| 19 | 39997 | 2 | 208 |
| 20 | 40241 | 2 | 211 |
| 21 | 39179 | 2 | 206 |
| 22 | 38887 | 3 | 206 |
| 23 | 39020 | 1 | 150 |
| 24 | 40368 | 1 | 206 |
| 25 | 40215 | 1 | 209 |
| 26 | 39845 | 0 | 0 |
| 27 | 40569 | 0 | 0 |
| 28 | 39414 | 5 | 258 |
| 29 | 39062 | 2 | 211 |
| 30 | 38537 | 3 | 211 |
| 31 | 39573 | 1 | 209 |
| 32 | 38794 | 1 | 207 |
| 133 | 75863 | 6 | 8640 |
| 135 | 76348 | 4 | 2293 |
| 138 | 76217 | 4 | 4230 |

**Table 5-7 WAAS Ionospheric Correction Message Rates (Type 26) – AMR**

| Band | Block | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|---|
| 0 | 0 | 27525 | 11 | 2605 |
| 0 | 1 | 27542 | 6 | 2592 |
| 0 | 2 | 27524 | 8 | 2593 |
| 1 | 0 | 27552 | 4 | 2592 |
| 1 | 1 | 27528 | 8 | 2592 |
| 1 | 2 | 27524 | 7 | 2592 |
| 1 | 3 | 27543 | 12 | 2598 |
| 1 | 4 | 27535 | 11 | 2592 |
| 2 | 0 | 27526 | 9 | 2598 |
| 2 | 1 | 27536 | 8 | 2315 |
| 2 | 2 | 27541 | 8 | 2304 |
| 2 | 3 | 27527 | 7 | 2304 |
| 2 | 4 | 27533 | 9 | 2304 |
| 3 | 0 | 27529 | 13 | 2304 |
| 3 | 1 | 27526 | 10 | 2304 |
| 3 | 2 | 27555 | 12 | 2304 |
| 9 | 0 | 27522 | 11 | 2304 |
| 9 | 1 | 27547 | 6 | 2308 |
| 9 | 2 | 27528 | 11 | 2306 |
| 9 | 3 | 27543 | 6 | 2304 |
| 9 | 4 | 27544 | 11 | 2599 |
| 9 | 5 | 27525 | 10 | 2592 |
| 9 | 6 | 27531 | 9 | 2592 |

**Table 5-8 WAAS Ionospheric Mask Message Rates (Type 18) – AMR**

| Band | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 0 | 35526 | 2 | 2279 |
| 1 | 35497 | 1 | 2509 |
| 2 | 35510 | 2 | 2418 |
| 3 | 35542 | 3 | 2352 |
| 9 | 35503 | 2 | 2438 |

**Table 5-9 WAAS Fast Correction and Degradation Message Rates – CRW**

| Message Type | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 108004 | 2 | 175 |
| 2 | 1325489 | 46 | 48 |
| 3 | 1324701 | 65 | 48 |
| 4 | 1324737 | 64 | 48 |
| 7 | 100982 | 9 | 193 |
| 9 | 93099 | 1 | 186 |
| 10 | 100870 | 4 | 186 |
| 17 | 31747 | 0 | 0 |

**Table 5-10 WAAS Long Correction Message Rates (Type 24 and 25) - CRW**

| SV | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 49538 | 0 | 0 |
| 2 | 47634 | 0 | 0 |
| 3 | 17173 | 1 | 158 |
| 4 | 48219 | 0 | 0 |
| 5 | 48155 | 0 | 0 |
| 6 | 47775 | 0 | 0 |
| 7 | 47538 | 1 | 173 |
| 8 | 47795 | 0 | 0 |
| 9 | 6763 | 0 | 0 |
| 10 | 48580 | 0 | 0 |
| 11 | 49644 | 1 | 186 |
| 12 | 47581 | 0 | 0 |
| 13 | 46852 | 0 | 0 |
| 14 | 47403 | 2 | 174 |
| 15 | 48461 | 0 | 0 |
| 16 | 47982 | 2 | 174 |
| 17 | 47381 | 0 | 0 |
| 18 | 46882 | 1 | 158 |
| 19 | 48793 | 1 | 180 |
| 20 | 49072 | 0 | 0 |
| 21 | 47676 | 3 | 180 |
| 22 | 47365 | 3 | 180 |
| 23 | 47515 | 0 | 0 |
| 24 | 49135 | 1 | 150 |
| 25 | 48984 | 0 | 0 |
| 26 | 48517 | 2 | 186 |
| 27 | 49391 | 1 | 180 |
| 28 | 48019 | 2 | 181 |
| 29 | 47593 | 1 | 163 |
| 30 | 46942 | 0 | 0 |
| 31 | 48294 | 0 | 0 |
| 32 | 47281 | 0 | 0 |

**Table 5-11 WAAS Ephemeris Covariance Message Rates (Type 28) – CRW**

| SV | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 40693 | 1 | 130 |
| 2 | 39064 | 0 | 0 |
| 3 | 14096 | 0 | 0 |
| 4 | 39630 | 0 | 0 |
| 5 | 39501 | 0 | 0 |
| 6 | 39218 | 0 | 0 |
| 7 | 39002 | 1 | 206 |
| 8 | 39291 | 0 | 0 |
| 9 | 5546 | 0 | 0 |
| 10 | 39896 | 0 | 0 |
| 11 | 40821 | 1 | 204 |
| 12 | 39067 | 0 | 0 |
| 13 | 38504 | 0 | 0 |
| 14 | 38939 | 0 | 0 |
| 15 | 39749 | 3 | 208 |
| 16 | 39410 | 0 | 0 |
| 17 | 38894 | 1 | 211 |
| 18 | 38473 | 3 | 206 |
| 19 | 40027 | 3 | 208 |
| 20 | 40266 | 0 | 0 |
| 21 | 39193 | 1 | 201 |
| 22 | 38888 | 1 | 206 |
| 23 | 39052 | 0 | 0 |
| 24 | 40349 | 1 | 206 |
| 25 | 40208 | 0 | 0 |
| 26 | 39842 | 0 | 0 |
| 27 | 40595 | 1 | 148 |
| 28 | 39430 | 0 | 0 |
| 29 | 39080 | 2 | 211 |
| 30 | 38564 | 2 | 211 |
| 31 | 39596 | 0 | 0 |
| 32 | 38821 | 0 | 0 |
| 133 | 75859 | 3 | 208 |
| 135 | 76349 | 2 | 208 |
| 138 | 76214 | 1 | 200 |

**Table 5-12 WAAS Ionospheric Correction Message Rates (Type 26) – CRW**

| Band | Block | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|---|
| 0 | 0 | 27543 | 5 | 311 |
| 0 | 1 | 27535 | 7 | 305 |
| 0 | 2 | 27532 | 14 | 306 |
| 1 | 0 | 27546 | 11 | 576 |
| 1 | 1 | 27540 | 10 | 576 |
| 1 | 2 | 27550 | 8 | 306 |
| 1 | 3 | 27539 | 12 | 312 |
| 1 | 4 | 27539 | 12 | 310 |
| 2 | 0 | 27544 | 11 | 306 |
| 2 | 1 | 27536 | 7 | 301 |
| 2 | 2 | 27532 | 11 | 306 |
| 2 | 3 | 27551 | 9 | 307 |
| 2 | 4 | 27540 | 11 | 305 |
| 3 | 0 | 27538 | 13 | 306 |
| 3 | 1 | 27526 | 13 | 310 |
| 3 | 2 | 27552 | 6 | 576 |
| 9 | 0 | 27546 | 9 | 307 |
| 9 | 1 | 27542 | 8 | 576 |
| 9 | 2 | 27526 | 16 | 576 |
| 9 | 3 | 27541 | 6 | 306 |
| 9 | 4 | 27540 | 7 | 306 |
| 9 | 5 | 27555 | 7 | 306 |
| 9 | 6 | 27547 | 6 | 576 |

**Table 5-13 WAAS Ionospheric Mask Message Rates (Type 18) – CRW**

| Band | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 0 | 36098 | 1 | 455 |
| 1 | 36130 | 1 | 305 |
| 2 | 36147 | 2 | 467 |
| 3 | 36121 | 1 | 426 |
| 9 | 36133 | 2 | 473 |

**Table 5-14 WAAS Fast Correction and Degradation Message Rates – CRE**

| Message Type | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 107888 | 3 | 174 |
| 2 | 1325487 | 47 | 48 |
| 3 | 1324694 | 67 | 48 |
| 4 | 1324723 | 64 | 48 |
| 7 | 100856 | 9 | 193 |
| 9 | 93099 | 1 | 168 |
| 10 | 100771 | 11 | 179 |
| 17 | 31731 | 0 | 0 |

**Table 5-15 WAAS Long Correction Message Rates (Type 24 and 25) – CRE**

| SV | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 49539 | 0 | 0 |
| 2 | 47608 | 0 | 0 |
| 3 | 17172 | 1 | 158 |
| 4 | 48231 | 1 | 161 |
| 5 | 48164 | 0 | 0 |
| 6 | 47772 | 0 | 0 |
| 7 | 47533 | 1 | 163 |
| 8 | 47805 | 0 | 0 |
| 9 | 6765 | 0 | 0 |
| 10 | 48581 | 1 | 165 |
| 11 | 49650 | 2 | 186 |
| 12 | 47586 | 0 | 0 |
| 13 | 46857 | 0 | 0 |
| 14 | 47396 | 2 | 172 |
| 15 | 48462 | 0 | 0 |
| 16 | 47989 | 1 | 158 |
| 17 | 47381 | 0 | 0 |
| 18 | 46879 | 1 | 158 |
| 19 | 48793 | 1 | 180 |
| 20 | 49070 | 0 | 0 |
| 21 | 47678 | 5 | 180 |
| 22 | 47369 | 4 | 180 |
| 23 | 47515 | 0 | 0 |
| 24 | 49131 | 1 | 158 |
| 25 | 48994 | 0 | 0 |
| 26 | 48520 | 3 | 186 |
| 27 | 49389 | 1 | 180 |
| 28 | 48018 | 1 | 180 |
| 29 | 47591 | 1 | 162 |
| 30 | 46945 | 0 | 0 |
| 31 | 48302 | 0 | 0 |
| 32 | 47287 | 0 | 0 |

**Table 5-16 WAAS Ephemeris Covariance Message Rates (Type 28) – CRE**

| SV | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 1 | 40687 | 3 | 211 |
| 2 | 39075 | 0 | 0 |
| 3 | 14084 | 0 | 0 |
| 4 | 39626 | 0 | 0 |
| 5 | 39496 | 0 | 0 |
| 6 | 39216 | 0 | 0 |
| 7 | 39003 | 0 | 0 |
| 8 | 39268 | 0 | 0 |
| 9 | 5548 | 0 | 0 |
| 10 | 39882 | 0 | 0 |
| 11 | 40825 | 0 | 0 |
| 12 | 39073 | 0 | 0 |
| 13 | 38503 | 1 | 187 |
| 14 | 38948 | 1 | 135 |
| 15 | 39741 | 2 | 210 |
| 16 | 39406 | 2 | 208 |
| 17 | 38908 | 0 | 0 |
| 18 | 38475 | 0 | 0 |
| 19 | 40022 | 0 | 0 |
| 20 | 40266 | 0 | 0 |
| 21 | 39183 | 1 | 124 |
| 22 | 38894 | 0 | 0 |
| 23 | 39010 | 0 | 0 |
| 24 | 40366 | 0 | 0 |
| 25 | 40179 | 1 | 206 |
| 26 | 39857 | 1 | 206 |
| 27 | 40579 | 1 | 121 |
| 28 | 39425 | 1 | 206 |
| 29 | 39095 | 2 | 211 |
| 30 | 38542 | 2 | 211 |
| 31 | 39595 | 1 | 206 |
| 32 | 38819 | 1 | 145 |
| 133 | 75894 | 3 | 206 |
| 135 | 76362 | 7 | 211 |
| 138 | 76249 | 2 | 208 |

**Table 5-17 WAAS Ionospheric Correction Message Rates (Type 26) – CRE**

| Band | Block | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|---|
| 0 | 0 | 27532 | 12 | 576 |
| 0 | 1 | 27541 | 13 | 395 |
| 0 | 2 | 27534 | 12 | 447 |
| 1 | 0 | 27541 | 9 | 422 |
| 1 | 1 | 27537 | 10 | 305 |
| 1 | 2 | 27530 | 13 | 306 |
| 1 | 3 | 27540 | 11 | 314 |
| 1 | 4 | 27536 | 14 | 585 |
| 2 | 0 | 27532 | 11 | 307 |
| 2 | 1 | 27542 | 8 | 576 |
| 2 | 2 | 27540 | 11 | 305 |
| 2 | 3 | 27552 | 6 | 305 |
| 2 | 4 | 27547 | 3 | 305 |
| 3 | 0 | 27541 | 12 | 576 |
| 3 | 1 | 27531 | 6 | 576 |
| 3 | 2 | 27548 | 6 | 306 |
| 9 | 0 | 27550 | 8 | 306 |
| 9 | 1 | 27554 | 8 | 306 |
| 9 | 2 | 27543 | 5 | 576 |
| 9 | 3 | 27536 | 9 | 424 |
| 9 | 4 | 27534 | 10 | 576 |
| 9 | 5 | 27541 | 11 | 576 |
| 9 | 6 | 27545 | 5 | 384 |

**Table 5-18 WAAS Ionospheric Mask Message Rates (Type 18) – CRE**

| Band | On Time | Late | Max Late Length (seconds) |
|---|---|---|---|
| 0 | 36160 | 0 | 0 |
| 1 | 36106 | 1 | 444 |
| 2 | 36128 | 3 | 414 |
| 3 | 36133 | 1 | 414 |
| 9 | 36150 | 1 | 414 |

### 5.4 Satellite Glitches

The GPS satellites occasionally have periods of signal carrier stability 'glitches' of varying magnitude. These are short degradations in the signal that in severe cases cause WAAS to lose track or cycle slip for some or all of the WAAS receivers. The more severe glitches will cause the WAAS reported UDRE spike to 'Not Monitor' and result in an alert.

Figure 5-2 shows the satellite glitches visible to WAAS for the quarter. Glitches are categorized into three severity levels. Severity one glitches cause a significant number of the receivers to simultaneously have bad subframe parity, but not all receivers. Severity two glitches cause all of the receivers to report bad subframe parity data and some receivers to also have cycle slips and or lose tracking of L2 and or L1. Severity three glitches cause all of the receivers to lose track of both L1 and L2 data. Note, the tool that performs this Satellite Glitch Analysis reports times when more than 14 GPS satellites are in view for some of the WAAS reference stations. The NovAtel WAAS G2 receiver is only capable of tracking 14 GPS satellites at a given time. GPS users may also experience this condition.

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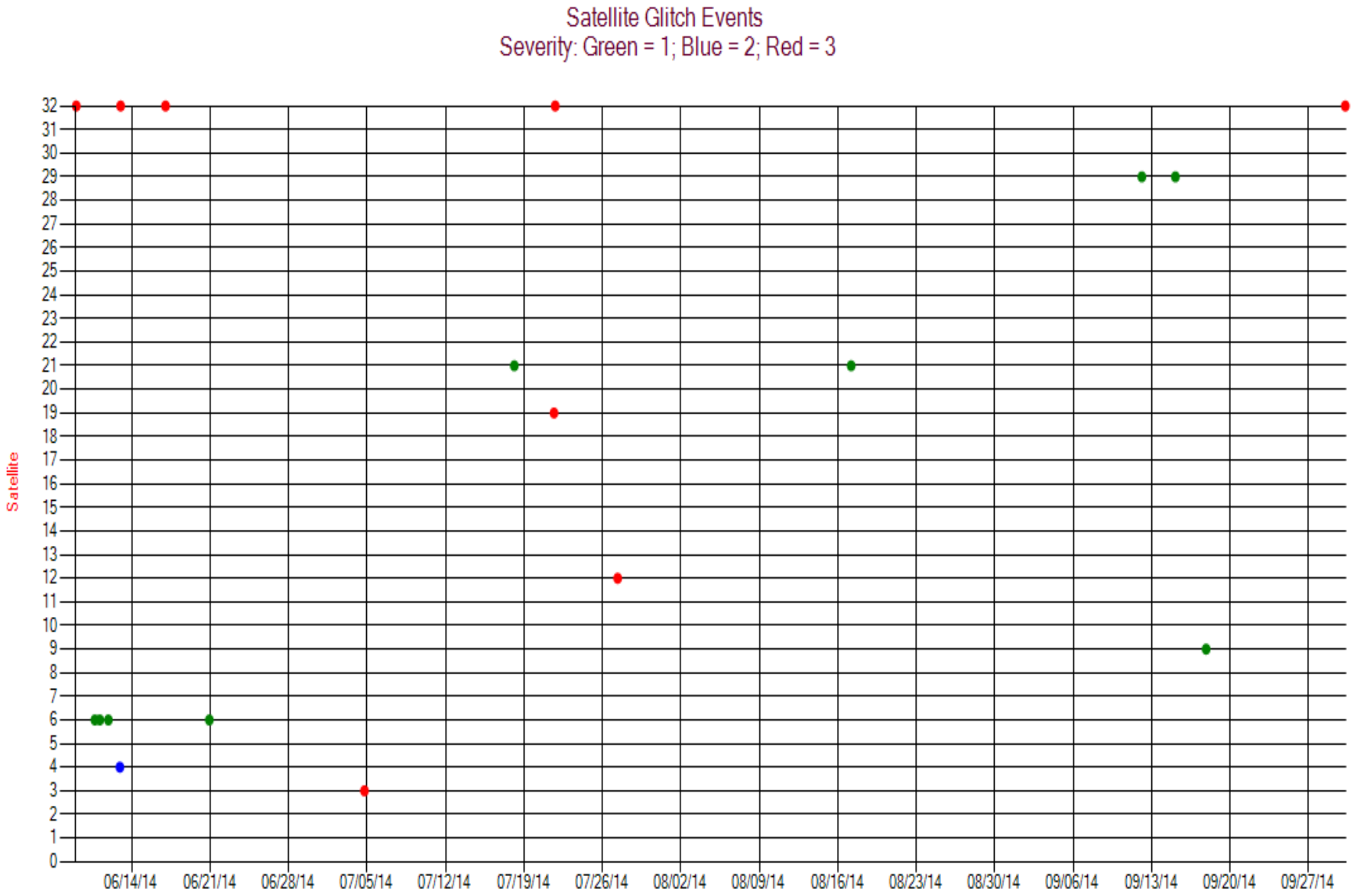
**Figure 5-2 SV Glitch Trend**



## 6.0 SV RANGE ACCURACY

Range accuracy evaluation computes the probability that the WAAS User Differential Range Error (UDRE) and Grid Ionospheric Vertical Error (GIVE) statistically bound 99.9% of the range residuals for each satellite tracked by the receiver. A UDRE is broadcast by the WAAS for each satellite that is monitored by the system and the 99.9% bound (3.29 sigma) of the residual error on a pseudorange after application of fast and long-term corrections is checked. The pseudorange residual error is determined by taking the difference between the raw pseudorange and a calculated reference range. The reference range is equal to the true range between the corrected satellite position and surveyed user antenna plus all corrections (WAAS Fast Clock, WAAS Long-Term Clock, WAAS Ionospheric delay, Tropospheric delay, Receiver Clock Bias, and Multipath). Since the true ionospheric delay and multipath error are not precisely known, the estimated variance in these error sources are added to the UDRE before the comparing it to the residual error.

GPS satellite range residual errors were calculated for twelve WAAS receivers during the quarter. Table 6-1 and 6-2 show the range error 95% index and 99.9% (3.29 sigma) bounding statistics for each SV at the selected locations. Figures 6-1 to 6-2 show the range error for each SV as measured by the WAAS receivers at the Washington DC reference station.

A GIVE is broadcast by the WAAS for each IGP that is monitored by the system and the 99.9% (3.29 sigma) bound of the ionospheric error is checked. The WAAS broadcasts the ionospheric model using IGP's at predefined geographic locations. Each IGP contains the vertical ionospheric delay and the error in that delay in the form of the GIVE. The ionospheric error is determined by taking the difference between the WAAS vertical ionospheric delay interpolated from the IGP's and GPS dual frequency measurement at that GPS satellite.

GPS satellite ionospheric errors were calculated for twelve WAAS receivers during the quarter. Table 6-3 and 6-4 show the ionospheric error 95% index and 99.9% (3.29 sigma) bounding statistics for each SV at the selected locations. Figures 6-3 to 6-4 show the ionospheric error for each SV as measured by the WAAS receiver at the Washington DC reference station.

For this reporting period, most satellites range errors were bounded 99.9% of the time by UDRE. The unbounded errors were due to geomagnetic activity and noise and multipath.

**Table 6-1 Range Error 95% index and 3.29 Sigma Bounding**

| Site → | Billings | | Albuquerque | | Boston | | Washington DC | | Houston | | Kansas City | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV ↓ | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) |
| 1 | 2.998 | 100 | 3.987 | 99.9991 | 3.370 | 100 | 2.743 | 100 | 3.229 | 100 | 3.036 | 100 |
| 2 | 2.120 | 100 | 2.566 | 100 | 2.343 | 100 | 2.525 | 100 | 2.443 | 100 | 3.208 | 100 |
| 3 | 1.494 | 100 | 1.170 | 100 | 1.355 | 100 | 1.357 | 100 | 1.334 | 100 | 1.441 | 100 |
| 4 | 1.645 | 100 | 1.753 | 100 | 1.639 | 100 | 1.370 | 100 | 1.471 | 100 | 1.556 | 100 |
| 5 | 1.553 | 100 | 1.678 | 100 | 1.817 | 100 | 1.113 | 100 | 1.328 | 100 | 1.673 | 100 |
| 6 | 3.546 | 99.9555* | 3.433 | 99.9789* | 3.178 | 99.9985* | 2.846 | 100 | 3.483 | 99.9996* | 4.249 | 96.8087* |
| 7 | 1.330 | 100 | 1.229 | 100 | 1.220 | 100 | 1.477 | 100 | 0.867 | 100 | 1.448 | 100 |
| 8 | 1.256 | 100 | 0.993 | 100 | 1.102 | 100 | 0.954 | 100 | 1.072 | 100 | 1.117 | 100 |
| 9 | 2.331 | 100 | 1.930 | 100 | 2.076 | 100 | 1.733 | 100 | 1.278 | 100 | 1.913 | 100 |
| 10 | 1.378 | 100 | 1.166 | 100 | 1.068 | 100 | 1.285 | 100 | 1.899 | 100 | 1.182 | 100 |
| 11 | 0.788 | 100 | 0.840 | 100 | 0.997 | 100 | 1.248 | 100 | 1.815 | 100 | 1.956 | 100 |
| 12 | 1.463 | 100 | 1.213 | 100 | 1.598 | 100 | 0.963 | 100 | 1.023 | 100 | 1.485 | 100 |
| 13 | 1.240 | 100 | 1.237 | 100 | 1.241 | 100 | 1.327 | 100 | 1.184 | 100 | 1.417 | 100 |
| 14 | 2.285 | 100 | 0.755 | 100 | 1.007 | 100 | 1.224 | 100 | 1.571 | 100 | 0.954 | 100 |
| 15 | 1.382 | 100 | 1.687 | 100 | 1.679 | 100 | 1.158 | 100 | 1.283 | 100 | 1.430 | 100 |
| 16 | 1.635 | 100 | 0.883 | 100 | 1.167 | 100 | 0.918 | 100 | 1.714 | 100 | 1.465 | 100 |
| 17 | 1.260 | 100 | 1.303 | 100 | 1.353 | 100 | 0.772 | 100 | 1.281 | 100 | 1.621 | 100 |
| 18 | 0.968 | 100 | 1.255 | 100 | 1.230 | 100 | 1.593 | 100 | 1.740 | 100 | 1.384 | 100 |
| 19 | 2.459 | 100 | 1.956 | 100 | 2.338 | 100 | 2.299 | 100 | 2.925 | 100 | 2.560 | 100 |
| 20 | 0.993 | 100 | 1.207 | 100 | 1.159 | 100 | 1.193 | 100 | 2.032 | 100 | 1.318 | 100 |
| 21 | 1.201 | 100 | 1.399 | 100 | 1.853 | 100 | 1.912 | 100 | 1.734 | 100 | 2.083 | 100 |
| 22 | 2.033 | 100 | 2.053 | 100 | 2.048 | 100 | 2.639 | 100 | 2.664 | 100 | 2.102 | 100 |
| 23 | 1.526 | 100 | 1.583 | 100 | 2.063 | 100 | 1.691 | 100 | 2.767 | 100 | 1.467 | 100 |
| 24 | 2.973 | 100 | 2.902 | 100 | 3.078 | 100 | 2.450 | 100 | 3.011 | 99.9999 | 2.889 | 100 |
| 25 | 2.469 | 99.9981 | 2.334 | 99.9996 | 2.707 | 100 | 2.104 | 100 | 2.544 | 100 | 2.420 | 100 |
| 26 | 1.600 | 100 | 1.114 | 100 | 1.481 | 100 | 1.065 | 100 | 1.239 | 100 | 1.482 | 100 |
| 27 | 2.560 | 100 | 2.156 | 100 | 2.271 | 100 | 2.160 | 100 | 2.193 | 100 | 2.434 | 100 |
| 28 | 1.705 | 100 | 0.926 | 100 | 1.344 | 100 | 1.324 | 100 | 1.150 | 100 | 1.070 | 100 |
| 29 | 1.802 | 100 | 1.843 | 100 | 1.247 | 100 | 1.473 | 100 | 1.051 | 100 | 1.294 | 100 |
| 30 | 2.149 | 100 | 2.517 | 100 | 2.659 | 100 | 2.231 | 100 | 2.081 | 100 | 2.754 | 100 |
| 31 | 1.100 | 100 | 0.956 | 100 | 0.925 | 100 | 0.759 | 100 | 1.168 | 100 | 2.275 | 100 |
| 32 | 1.009 | 100 | 0.942 | 100 | 0.964 | 100 | 0.999 | 100 | 1.134 | 100 | 1.286 | 100 |
| 135 | 1.735 | 100 | 2.066 | 100 | 3.038 | 100 | 1.844 | 100 | 2.080 | 100 | 1.283 | 100 |
| 138 | 1.558 | 100 | 1.330 | 100 | 1.212 | 100 | 1.772 | 100 | 1.603 | 100 | 1.815 | 100 |

*Note: Reduced range bounding due to the difference between L1 C/A and L1P satellite signal delays on Block IIF space vehicles.

**Table 6-2 Range Error 95% index and 3.29 Sigma Bounding**

| Site → | Los Angeles | | Salt Lake City | | Miami | | Minneapolis | | Atlanta | | Juneau | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV ↓ | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) |
| 1 | 2.620 | 100 | 3.335 | 100 | 2.984 | 100 | 2.947 | 100 | 2.951 | 99.9912 | 3.295 | 100 |
| 2 | 2.563 | 100 | 2.088 | 100 | 2.570 | 100 | 2.150 | 100 | 2.227 | 100 | 1.698 | 100 |
| 3 | 1.406 | 100 | 1.362 | 100 | 1.358 | 100 | 1.630 | 100 | 1.231 | 100 | 2.035 | 100 |
| 4 | 1.613 | 100 | 1.698 | 100 | 1.584 | 100 | 1.785 | 100 | 1.413 | 100 | 2.085 | 100 |
| 5 | 1.214 | 100 | 1.744 | 100 | 1.355 | 100 | 1.867 | 100 | 1.128 | 100 | 2.024 | 100 |
| 6 | 3.076 | 100 | 3.609 | 99.9457* | 3.285 | 100 | 3.299 | 98.6121* | 3.074 | 100 | 4.076 | 99.9733* |
| 7 | 1.029 | 100 | 1.566 | 100 | 1.232 | 100 | 1.740 | 100 | 1.205 | 100 | 1.935 | 100 |
| 8 | 0.977 | 100 | 1.315 | 100 | 1.191 | 100 | 1.187 | 100 | 0.890 | 100 | 1.541 | 100 |
| 9 | 1.305 | 100 | 2.789 | 100 | 2.053 | 100 | 1.900 | 100 | 1.616 | 100 | 2.480 | 100 |
| 10 | 0.963 | 100 | 0.963 | 100 | 1.027 | 100 | 0.801 | 100 | 1.053 | 100 | 1.109 | 100 |
| 11 | 1.966 | 100 | 1.250 | 100 | 1.911 | 100 | 0.901 | 100 | 0.984 | 100 | 1.181 | 100 |
| 12 | 1.003 | 100 | 1.313 | 100 | 1.167 | 100 | 1.734 | 100 | 0.871 | 100 | 1.544 | 100 |
| 13 | 1.161 | 100 | 2.315 | 100 | 1.531 | 100 | 1.561 | 100 | 1.189 | 100 | 1.683 | 100 |
| 14 | 1.189 | 100 | 0.959 | 100 | 0.981 | 100 | 0.695 | 100 | 0.811 | 100 | 0.954 | 100 |
| 15 | 1.255 | 100 | 1.618 | 100 | 1.117 | 100 | 1.703 | 100 | 1.121 | 100 | 1.699 | 100 |
| 16 | 1.491 | 100 | 1.197 | 100 | 1.129 | 100 | 1.125 | 100 | 1.053 | 100 | 0.987 | 100 |
| 17 | 0.895 | 100 | 1.649 | 100 | 1.231 | 100 | 1.170 | 100 | 0.969 | 100 | 1.615 | 100 |
| 18 | 1.422 | 100 | 1.392 | 100 | 1.392 | 100 | 1.144 | 100 | 1.500 | 100 | 0.980 | 100 |
| 19 | 2.360 | 100 | 2.011 | 100 | 1.941 | 100 | 1.811 | 100 | 2.505 | 100 | 2.643 | 100 |
| 20 | 1.647 | 100 | 1.133 | 100 | 1.201 | 100 | 0.901 | 100 | 1.128 | 100 | 0.883 | 100 |
| 21 | 1.479 | 100 | 0.951 | 100 | 1.869 | 100 | 1.259 | 100 | 1.481 | 100 | 0.883 | 100 |
| 22 | 2.477 | 100 | 1.987 | 100 | 2.531 | 100 | 1.808 | 100 | 2.388 | 100 | 2.022 | 100 |
| 23 | 2.473 | 100 | 1.711 | 100 | 1.545 | 100 | 1.224 | 100 | 1.868 | 100 | 1.184 | 100 |
| 24 | 2.539 | 100 | 3.783 | 98.5554* | 2.693 | 100 | 3.011 | 100 | 2.645 | 99.9477* | 3.411 | 100 |
| 25 | 2.053 | 100 | 2.472 | 100 | 2.394 | 100 | 2.521 | 100 | 2.139 | 100 | 2.752 | 100 |
| 26 | 1.634 | 100 | 1.467 | 100 | 1.004 | 100 | 1.546 | 100 | 1.165 | 100 | 1.654 | 100 |
| 27 | 2.135 | 100 | 2.583 | 100 | 2.419 | 100 | 2.676 | 100 | 2.438 | 100 | 2.602 | 100 |
| 28 | 1.388 | 100 | 0.889 | 100 | 1.880 | 100 | 0.855 | 100 | 1.101 | 100 | 1.088 | 100 |
| 29 | 1.189 | 100 | 2.242 | 100 | 1.656 | 100 | 1.580 | 100 | 0.999 | 100 | 1.745 | 100 |
| 30 | 1.895 | 100 | 2.358 | 100 | 2.448 | 100 | 2.608 | 100 | 2.100 | 100 | 2.881 | 100 |
| 31 | 1.163 | 100 | 1.052 | 100 | 1.711 | 100 | 1.021 | 100 | 0.931 | 100 | 1.314 | 100 |
| 32 | 1.044 | 100 | 0.976 | 100 | 1.242 | 100 | 1.103 | 100 | 0.862 | 100 | 1.369 | 100 |
| 135 | 1.803 | 100 | 1.604 | 100 | 1.599 | 100 | 2.094 | 100 | 2.043 | 100 | 1.355 | 100 |
| 138 | 2.908 | 100 | 1.527 | 100 | 1.787 | 100 | 1.595 | 100 | 1.472 | 100 | 1.323 | 100 |

*Note: Reduced range bounding due to the difference between L1 C/A and L1P satellite signal delays on Block IIF space vehicles.

**Table 6-3 Ionospheric Error 95% index and 3.29 Sigma Bounding**

| Site → | Billings | | Albuquerque | | Boston | | Washington DC | | Houston | | Kansas City | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV ↓ | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) |
| 1 | 1.838 | 100 | 2.047 | 100 | 2.283 | 100 | 1.867 | 100 | 2.003 | 100 | 1.988 | 100 |
| 2 | 1.675 | 100 | 1.563 | 100 | 1.433 | 100 | 1.519 | 100 | 1.713 | 100 | 1.840 | 100 |
| 3 | 0.612 | 100 | 0.523 | 100 | 0.530 | 100 | 0.473 | 100 | 0.816 | 100 | 0.640 | 100 |
| 4 | 0.954 | 100 | 1.075 | 100 | 1.045 | 100 | 0.940 | 100 | 1.172 | 100 | 1.113 | 100 |
| 5 | 1.002 | 100 | 1.169 | 100 | 0.910 | 100 | 0.588 | 100 | 1.438 | 100 | 1.395 | 100 |
| 6 | 2.766 | 100 | 2.838 | 99.9896 | 2.626 | 100 | 2.662 | 100 | 3.164 | 100 | 3.419 | 99.9367 |
| 7 | 0.787 | 100 | 0.762 | 100 | 0.536 | 100 | 0.594 | 100 | 0.609 | 100 | 0.606 | 100 |
| 8 | 0.650 | 100 | 0.578 | 100 | 0.481 | 100 | 0.395 | 100 | 0.567 | 100 | 0.451 | 100 |
| 9 | 1.825 | 100 | 1.479 | 100 | 1.254 | 100 | 1.017 | 100 | 1.055 | 100 | 1.183 | 100 |
| 10 | 0.489 | 100 | 0.468 | 100 | 0.403 | 100 | 0.474 | 100 | 0.896 | 100 | 0.443 | 100 |
| 11 | 0.339 | 100 | 0.341 | 100 | 0.430 | 100 | 0.454 | 100 | 0.896 | 100 | 0.603 | 100 |
| 12 | 0.692 | 100 | 0.783 | 100 | 0.595 | 100 | 0.460 | 100 | 0.535 | 100 | 0.674 | 100 |
| 13 | 0.690 | 100 | 0.830 | 100 | 0.633 | 100 | 0.532 | 100 | 0.660 | 100 | 0.664 | 100 |
| 14 | 1.459 | 100 | 0.618 | 100 | 0.408 | 100 | 0.426 | 100 | 0.634 | 100 | 0.479 | 100 |
| 15 | 0.627 | 100 | 0.858 | 100 | 0.830 | 100 | 0.716 | 100 | 0.974 | 100 | 0.818 | 100 |
| 16 | 0.802 | 100 | 0.475 | 100 | 0.507 | 100 | 0.551 | 100 | 0.836 | 100 | 0.628 | 100 |
| 17 | 0.736 | 100 | 0.776 | 100 | 0.910 | 100 | 0.494 | 100 | 0.791 | 100 | 0.630 | 100 |
| 18 | 0.668 | 100 | 0.564 | 100 | 0.647 | 100 | 0.783 | 100 | 0.914 | 100 | 0.623 | 100 |
| 19 | 1.250 | 100 | 1.084 | 100 | 1.688 | 100 | 1.558 | 100 | 1.942 | 100 | 1.552 | 100 |
| 20 | 0.755 | 100 | 0.661 | 100 | 0.572 | 100 | 0.601 | 100 | 0.900 | 100 | 0.669 | 100 |
| 21 | 0.690 | 100 | 0.936 | 100 | 0.924 | 100 | 1.115 | 100 | 1.110 | 100 | 1.196 | 100 |
| 22 | 1.730 | 100 | 1.397 | 100 | 1.537 | 100 | 1.820 | 100 | 1.948 | 100 | 1.513 | 100 |
| 23 | 1.195 | 100 | 1.218 | 100 | 1.483 | 100 | 1.380 | 100 | 1.849 | 100 | 1.085 | 100 |
| 24 | 1.697 | 100 | 1.745 | 100 | 1.907 | 100 | 1.633 | 100 | 1.807 | 100 | 1.730 | 100 |
| 25 | 1.502 | 100 | 1.575 | 100 | 1.502 | 100 | 1.256 | 100 | 1.327 | 100 | 1.369 | 100 |
| 26 | 0.739 | 100 | 0.635 | 100 | 0.694 | 100 | 0.550 | 100 | 0.684 | 100 | 0.733 | 100 |
| 27 | 1.272 | 100 | 1.257 | 100 | 1.384 | 100 | 1.216 | 100 | 1.352 | 100 | 1.381 | 100 |
| 28 | 1.182 | 100 | 0.553 | 100 | 0.811 | 100 | 0.655 | 100 | 0.625 | 100 | 0.596 | 100 |
| 29 | 0.946 | 100 | 1.093 | 100 | 0.724 | 100 | 0.759 | 100 | 0.801 | 100 | 0.760 | 100 |
| 30 | 1.517 | 100 | 1.862 | 100 | 1.629 | 100 | 1.503 | 100 | 1.682 | 100 | 1.770 | 100 |
| 31 | 0.541 | 100 | 0.657 | 100 | 0.459 | 100 | 0.449 | 100 | 0.889 | 100 | 1.306 | 100 |
| 32 | 0.389 | 100 | 0.636 | 100 | 0.464 | 100 | 0.386 | 100 | 0.577 | 100 | 0.509 | 100 |

**Table 6-4 Ionospheric Error 95% index and 3.29 Sigma Bounding**

| Site → | Los Angeles | | Salt Lake City | | Miami | | Minneapolis | | Atlanta | | Juneau | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV ↓ | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) |
| 1 | 2.105 | 100 | 1.919 | 100 | 2.188 | 100 | 2.013 | 100 | 1.923 | 100 | 2.197 | 100 |
| 2 | 1.654 | 100 | 1.408 | 100 | 1.604 | 100 | 1.487 | 100 | 1.612 | 100 | 1.271 | 100 |
| 3 | 0.632 | 100 | 0.552 | 100 | 0.643 | 100 | 0.687 | 100 | 0.392 | 100 | 1.031 | 100 |
| 4 | 1.175 | 100 | 1.054 | 100 | 1.134 | 100 | 1.043 | 100 | 0.839 | 100 | 1.294 | 100 |
| 5 | 1.024 | 100 | 1.229 | 100 | 1.313 | 100 | 1.091 | 100 | 0.800 | 100 | 1.256 | 100 |
| 6 | 2.675 | 100 | 2.923 | 100 | 2.833 | 100 | 2.752 | 100 | 2.394 | 100 | 2.968 | 100 |
| 7 | 0.708 | 100 | 0.865 | 100 | 0.706 | 100 | 0.697 | 100 | 0.418 | 100 | 0.949 | 100 |
| 8 | 0.572 | 100 | 0.704 | 100 | 0.572 | 100 | 0.492 | 100 | 0.331 | 100 | 0.739 | 100 |
| 9 | 1.100 | 100 | 1.607 | 100 | 1.218 | 100 | 1.300 | 100 | 1.020 | 100 | 1.381 | 100 |
| 10 | 0.456 | 100 | 0.401 | 100 | 0.546 | 100 | 0.347 | 100 | 0.513 | 100 | 0.449 | 100 |
| 11 | 0.741 | 100 | 0.423 | 100 | 0.711 | 100 | 0.346 | 100 | 0.622 | 100 | 0.536 | 100 |
| 12 | 0.560 | 100 | 0.682 | 100 | 0.646 | 100 | 0.754 | 100 | 0.451 | 100 | 0.902 | 100 |
| 13 | 0.607 | 100 | 1.196 | 100 | 0.855 | 100 | 0.756 | 100 | 0.479 | 100 | 0.877 | 100 |
| 14 | 0.515 | 100 | 0.526 | 100 | 0.529 | 100 | 0.353 | 100 | 0.435 | 100 | 0.446 | 100 |
| 15 | 0.853 | 100 | 0.897 | 100 | 0.911 | 100 | 0.967 | 100 | 0.654 | 100 | 1.133 | 100 |
| 16 | 0.629 | 100 | 0.486 | 100 | 0.525 | 100 | 0.556 | 100 | 0.599 | 100 | 0.479 | 100 |
| 17 | 0.659 | 100 | 1.064 | 100 | 0.807 | 100 | 0.766 | 100 | 0.466 | 100 | 0.917 | 100 |
| 18 | 0.648 | 100 | 0.866 | 100 | 0.754 | 100 | 0.677 | 100 | 1.024 | 100 | 0.735 | 100 |
| 19 | 1.477 | 100 | 1.125 | 100 | 1.487 | 100 | 1.367 | 100 | 1.627 | 100 | 1.550 | 100 |
| 20 | 0.480 | 100 | 0.506 | 100 | 0.655 | 100 | 0.635 | 100 | 0.672 | 100 | 0.455 | 100 |
| 21 | 0.680 | 100 | 0.583 | 100 | 1.044 | 100 | 0.881 | 100 | 1.100 | 100 | 0.564 | 100 |
| 22 | 1.535 | 100 | 1.410 | 100 | 1.875 | 100 | 1.501 | 100 | 1.916 | 100 | 1.594 | 100 |
| 23 | 1.186 | 100 | 1.160 | 100 | 1.117 | 100 | 1.100 | 100 | 1.549 | 100 | 1.086 | 100 |
| 24 | 1.929 | 100 | 2.038 | 100 | 1.954 | 100 | 1.958 | 100 | 1.687 | 100 | 2.273 | 100 |
| 25 | 1.474 | 100 | 1.646 | 100 | 1.542 | 100 | 1.581 | 100 | 1.212 | 100 | 1.786 | 100 |
| 26 | 0.881 | 100 | 0.681 | 100 | 0.704 | 100 | 0.825 | 100 | 0.697 | 100 | 0.922 | 100 |
| 27 | 1.551 | 100 | 1.335 | 100 | 1.452 | 100 | 1.641 | 100 | 1.354 | 100 | 1.606 | 100 |
| 28 | 0.584 | 100 | 0.457 | 100 | 1.125 | 100 | 0.414 | 100 | 0.796 | 100 | 0.589 | 100 |
| 29 | 0.799 | 100 | 1.023 | 100 | 0.955 | 100 | 0.812 | 100 | 0.624 | 100 | 0.994 | 100 |
| 30 | 1.584 | 100 | 1.806 | 100 | 1.817 | 100 | 1.704 | 100 | 1.340 | 100 | 1.933 | 100 |
| 31 | 0.630 | 100 | 0.686 | 100 | 0.735 | 100 | 0.526 | 100 | 0.437 | 100 | 0.665 | 100 |
| 32 | 0.419 | 100 | 0.550 | 100 | 0.668 | 100 | 0.510 | 100 | 0.400 | 100 | 0.700 | 100 |

**Figure 6-1 95% Range Error (PRN 1 – PRN 16) – Washington DC**

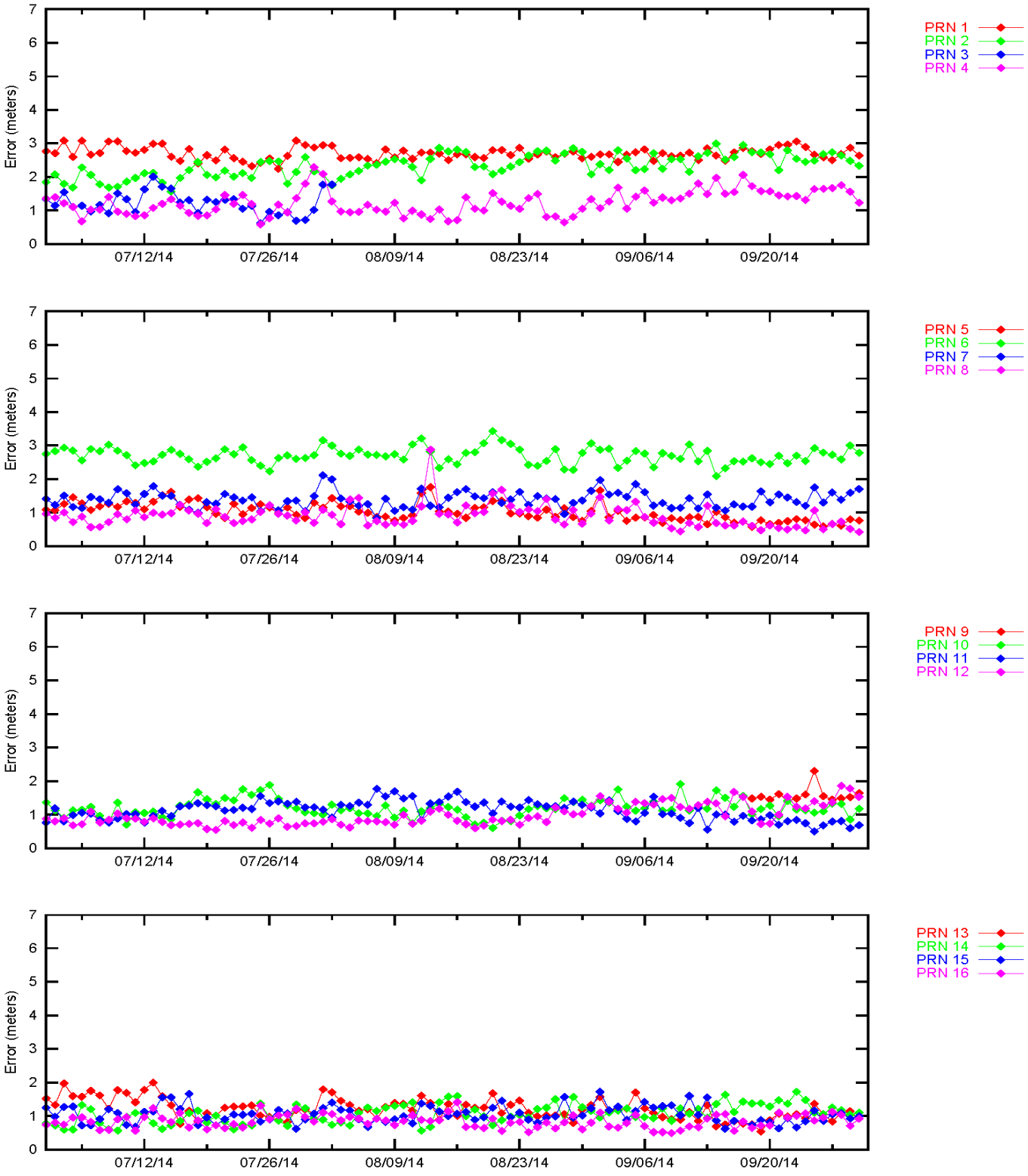


**Figure 6-2 95% Range Error (PRN 17 – PRN 32) – Washington DC**

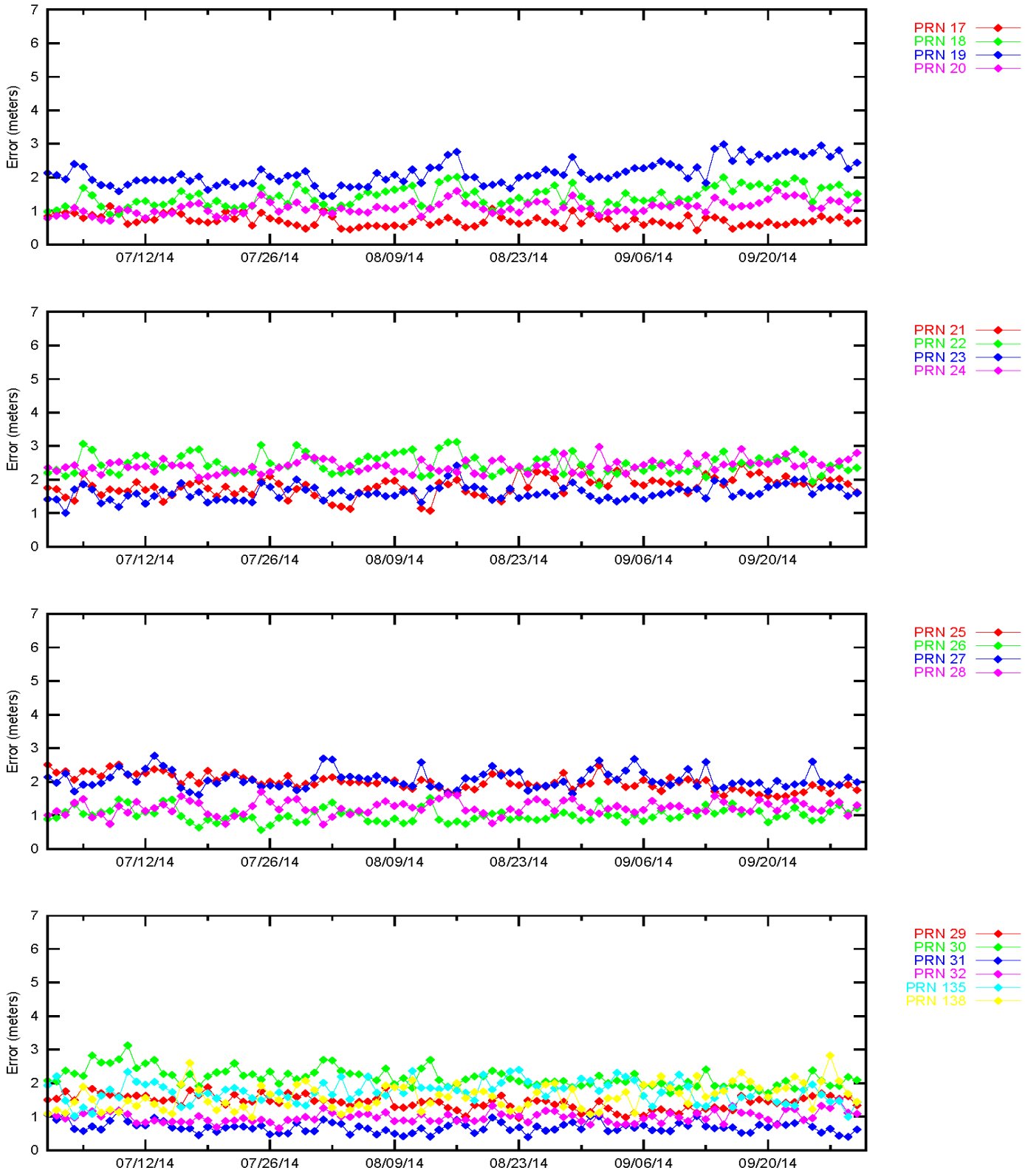


**Figure 6-3 95% Ionospheric Error (PRN 1 – PRN 16) – Washington DC**

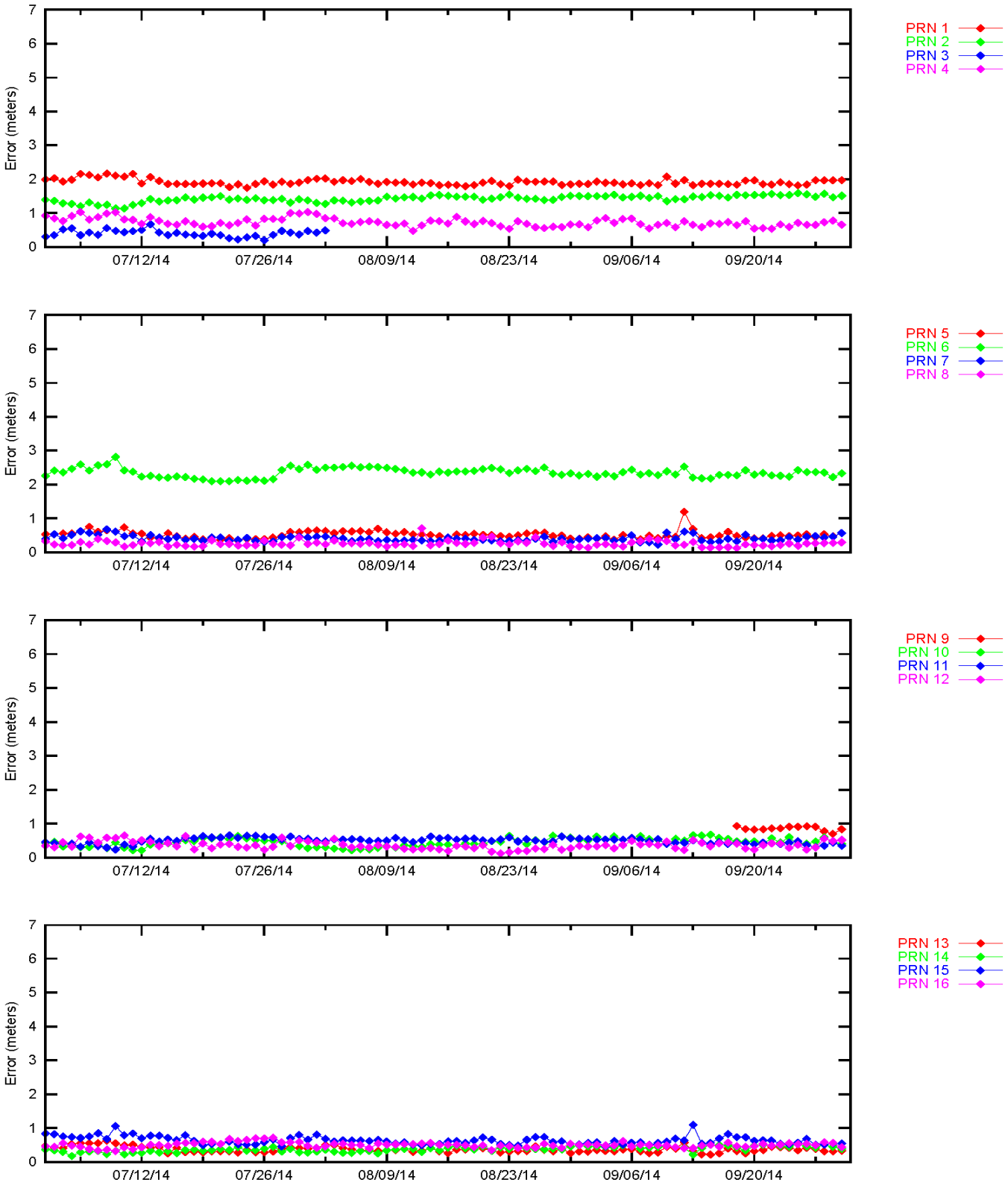
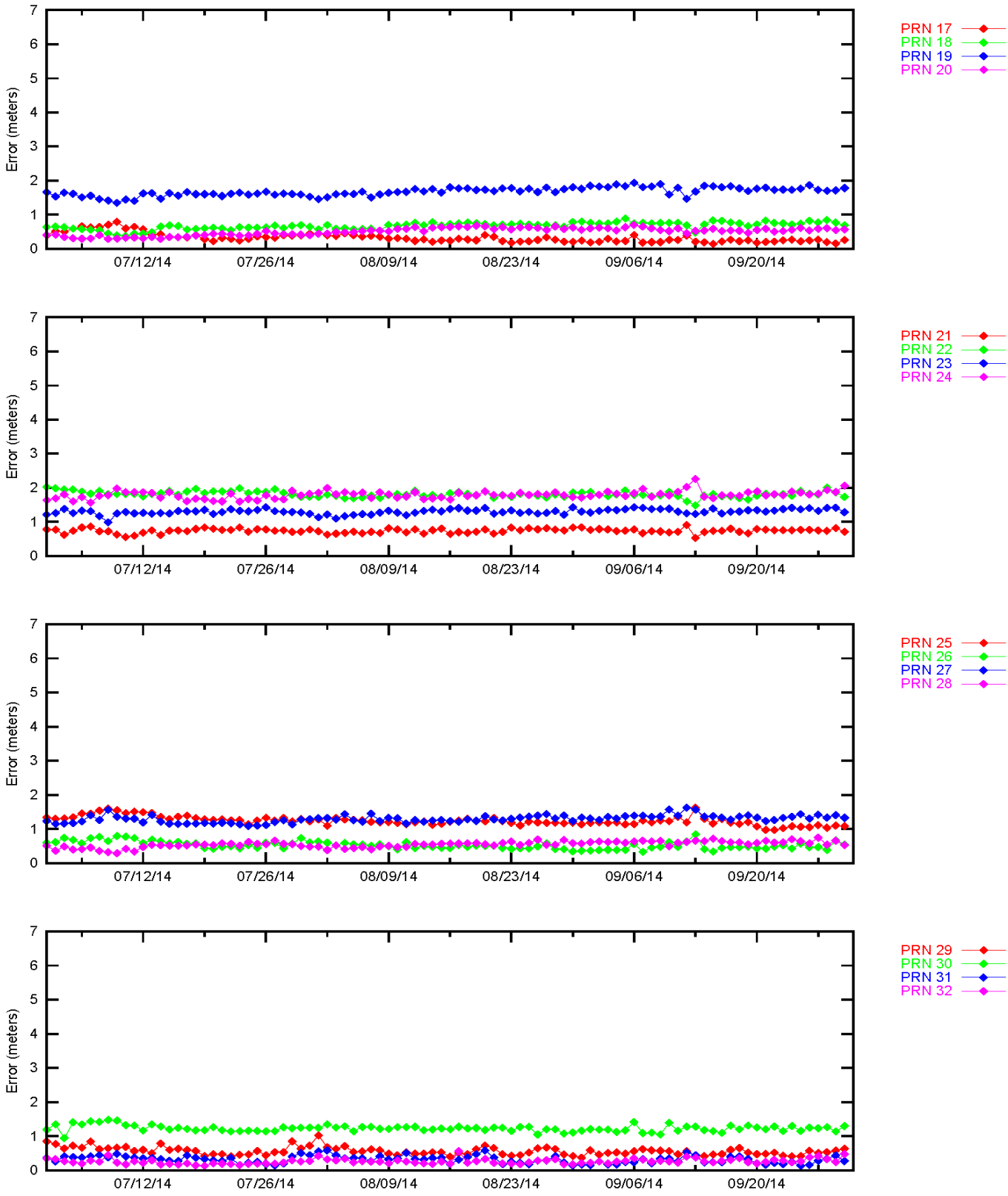


**Figure 6-4 95% Ionospheric Error (PRN 17 - PRN 32) – Washington DC**



## 7.0 GEO RANGING PERFORMANCE

The WAAS GEO navigation messages provide corrections and UDRE values for each satellite. The GEO ranging availability from each GEO navigation message source was evaluated separately to determine the quality of service provided.

Table 7-1 shows the GEO-Ranging performance. Figure 7-1 shows the trend of CRW GEO PA Ranging Availability. Figure 7-2 shows the trend of CRE GEO PA Ranging Availability. Figure 7-3 shows the trend of AMR GEO NPA Ranging Availability.

The decreases in AMR NPA ranging availability in Figure 7-3 for the quarter were due to GUS switchovers and SV alerts on the AMR GEO. On July 20, 2014 CRW and CRE PA availability decreases reported by AMR were due to a SIS outage.

**Table 7-1 GEO Ranging Availability**

| GEO Source | GEO | PA (%) | NPA (%) | Not Monitored (%) | Do Not Use (%) |
|---|---|---|---|---|---|
| AMR 133 | CRW | 99.37 | 0.46 | 0.11 | 0.00 |
| AMR 133 | CRE | 98.71 | 0.96 | 0.27 | 0.00 |
| AMR 133 | AMR | 0.00 | 99.23 | 0.67 | 0.04 |
| CRW 135 | CRW | 99.40 | 0.46 | 0.11 | 0.00 |
| CRW 135 | CRE | 98.74 | 0.96 | 0.27 | 0.00 |
| CRW 135 | AMR | 0.00 | 99.21 | 0.70 | 0.07 |
| CRE 138 | CRW | 99.40 | 0.46 | 0.11 | 0.00 |
| CRE 138 | CRE | 98.74 | 0.96 | 0.27 | 0.00 |
| CRE 138 | AMR | 0.00 | 99.22 | 0.69 | 0.07 |

**Figure 7-1 Daily PA CRW GEO Ranging Availability Trend**

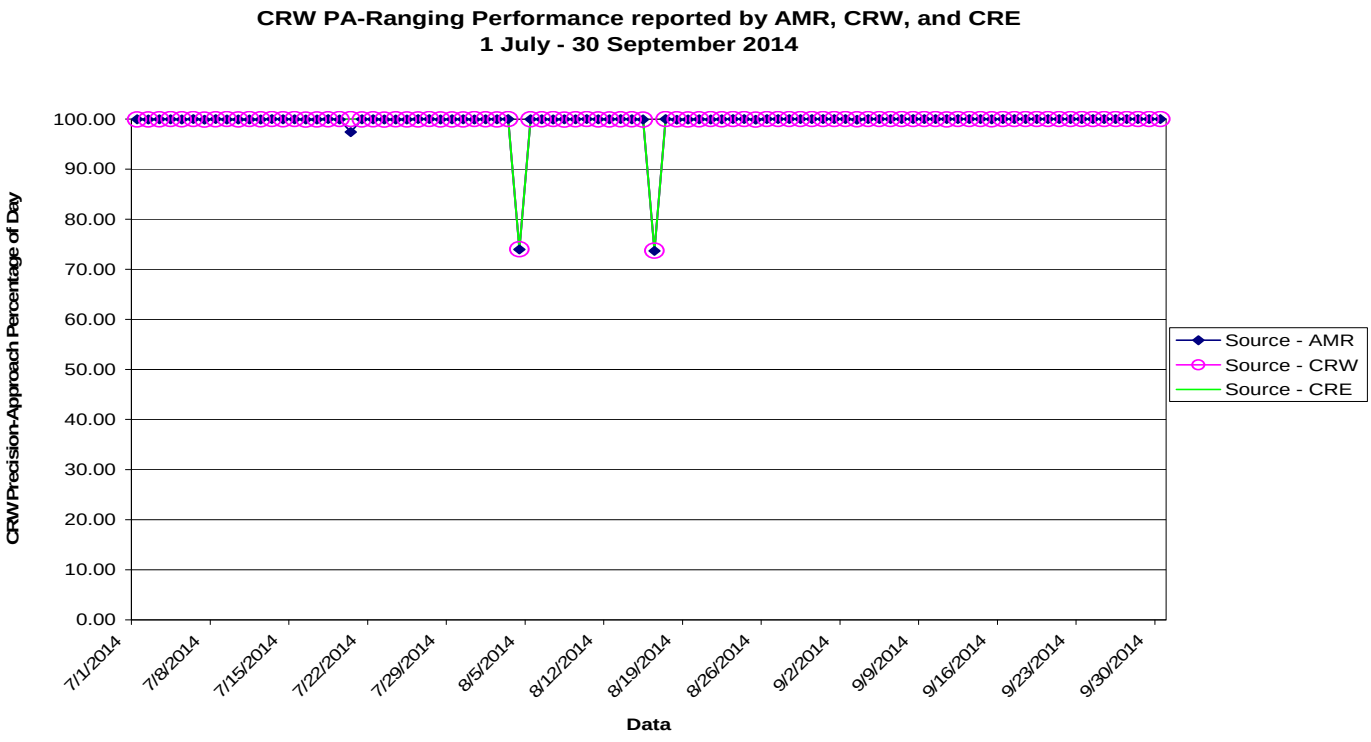


**Figure 7-2 Daily PA CRE GEO Ranging Availability Trend**

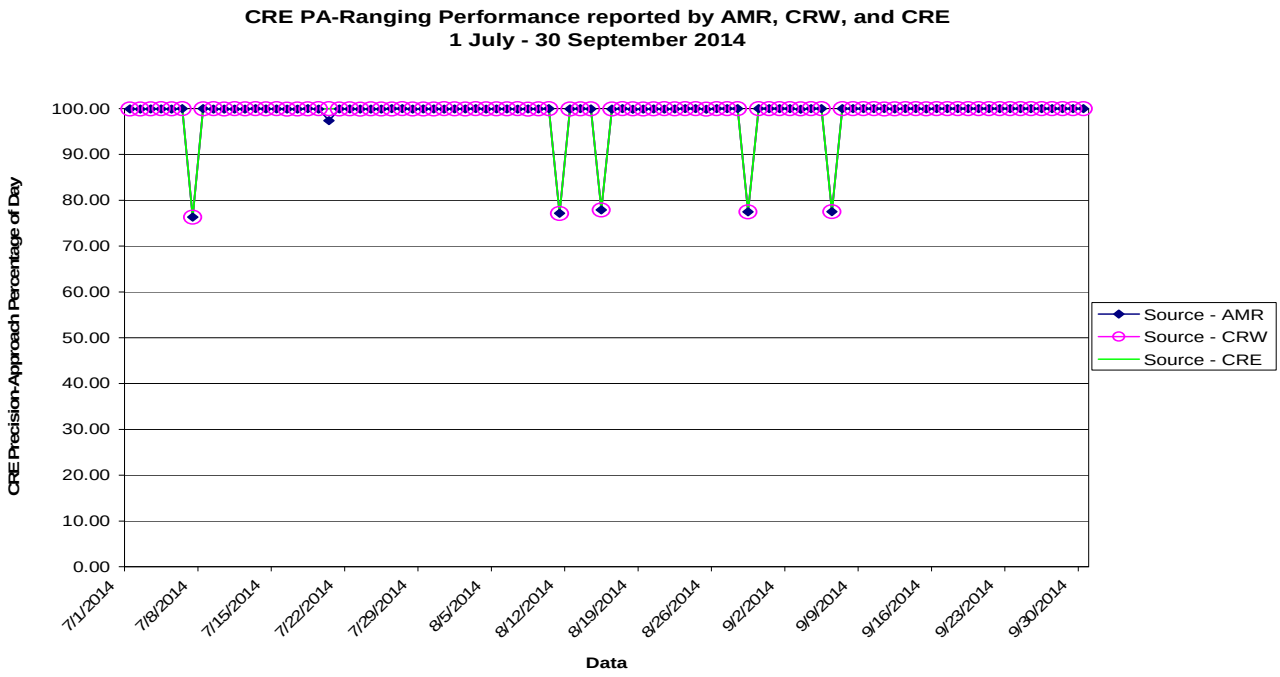
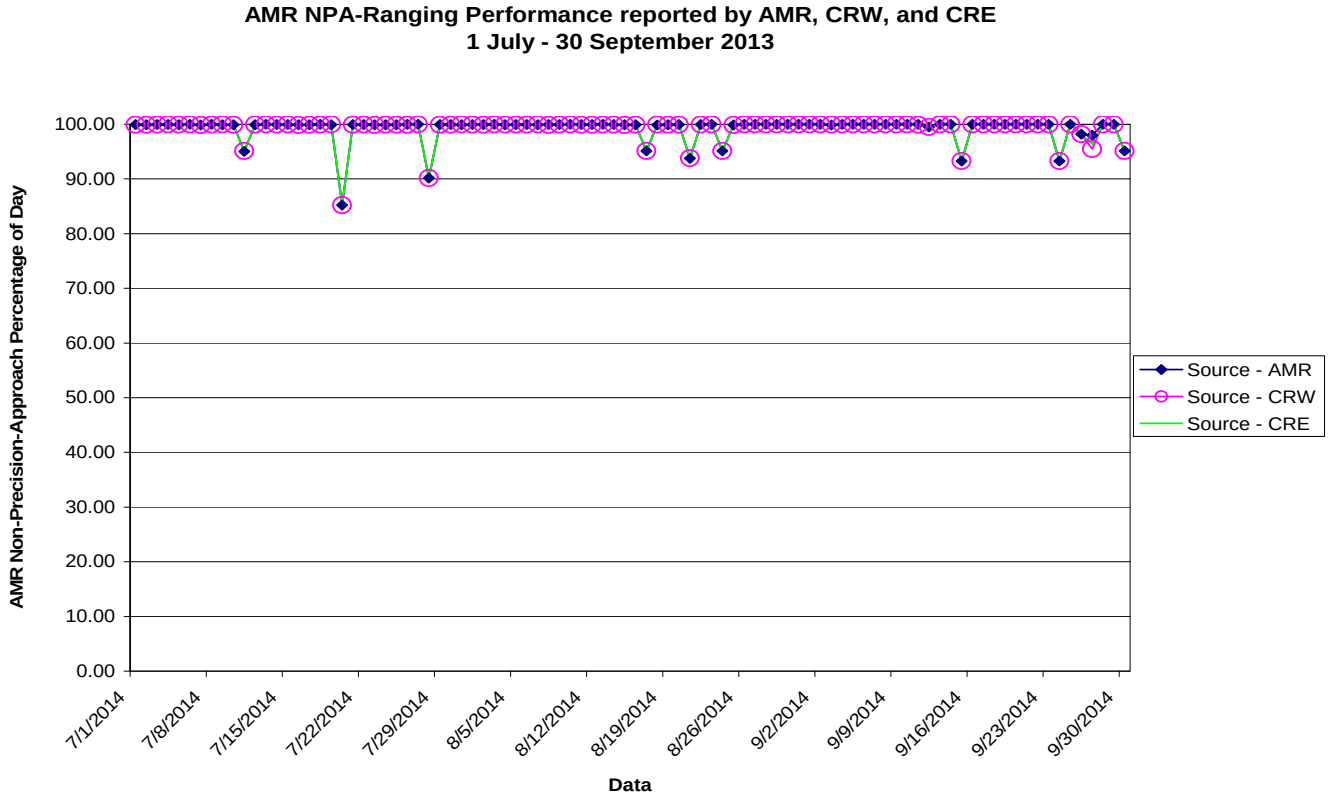



**Figure 7-3 Daily NPA AMR GEO Ranging Availability Trend**



## 8.0 WAAS AIRPORT AVAILABILITY

The WAAS airport availability evaluation determines the number and length LPV service outages at selected airports from the transmitted WAAS navigation message. The navigation messages transmitted from all GEO satellites are processed simultaneously, and WAAS protection levels (VPL and HPL) are computed at each airport once every 30 second in accordance with the RTCA DO-229D. Once the protection levels have been produced at each airport an LPV service evaluation is conducted to identify outages in service (i.e. when protection levels exceed alert limits). WAAS LPV service is available for a user when the vertical protection level (VPL) is less than or equal to vertical alert limit (VAL) of 50 meters and the horizontal protection level (HPL) is less than or equal to horizontal alert limit (HAL) of 40 meters. If both conditions are met at a specified airport location then WAAS LPV service is available at that airport. If either one of the conditions are not met at a specified airport location then WAAS LPV service at that airport is unavailable and an outage in LPV service is recorded with its duration. When the LPV service becomes unavailable it is not considered available again until protection levels are below or equal to alert limits for at least 15 minutes. Although this will reduce LPV service availability minimally, it substantially reduces the number of service outages and prevents excessive switching in and out of service availability. Similar service analysis is completed for LP and LPV 200 services in accordance with HAL and VAL shown in Table 1-1. The number of WAAS LPV service outages and the availability at selected airports in the US and Canada for this evaluation period of WAAS operation is presented in Table 8-1. Figures 8-1 to 8-6 provide the graphical representation of the LP, LPV and LPV 200 availability and outage counts at all airports, including many that do not have published approaches. These results are depicted geographically on an interactive web page at http://www.nstb.tc.faa.gov/AirportOutages/ .

The interactive web page can be accessed by entering the web address into an Internet browser and selecting the current quarter from the drop-down menu on the upper left corner and clicking “Submit Request”. The WAAS LPV airport layer will appear providing color coded availability results as shown in Figures 8-1 to 8-2. Rolling over any airport with the cursor displays the LPV availability and number of LPV outages for the reporting period. The “WAAS Layer” menu in the upper right of the display allows the user to select WAAS LP or LPV 200 availability and the number of outage results as shown in Figures 8-3 to 8-6. The user can review WAAS availability performance for US airports with GPS RNAV instrument approach procedures by selecting “Show all Airports”, or limit airports displayed to those with approved LPV approaches as provided in Table 8-1.

**Table 8-1 WAAS LP, LPV, and LPV200 Outages and Availability**

| Airport Id | Airport Name | State/ Provence | Service | LP Outages | LP Avail | LPV Outages | LPV Avail | LPV 200 Outages | LPV 200 Avail |
|---|---|---|---|---|---|---|---|---|---|
| CAL4 | FORT MACKAY / ALBIAN AERODROME | AB | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CEV3 | VEGREVILLE | AB | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYEG | EDMONTON / JOSEPHBURG | AB | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYXD | EDMONTON CITY CTR | AB | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 2C7 | SHAKTOOLIK | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 6A8 | ALLAKAKET | AK | LP | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| 7KA | TATITLEK | AK | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 9A3 | CHUATHBALUK | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AKN | KING SALMON | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ANC | TED STEVENS ANCHORAGE INTL | AK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AQH | QUINHAGAK | AK | LPV | 0 | 1 | 0 | 1 | 4 | 0.999913 |
| AQT | NUIQSUT | AK | LPV | 0 | 1 | 0 | 1 | 18 | 0.999415 |
| BET | BETHEL | AK | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BRW | WILEY POST-WILL ROGERS MEM | AK | LPV | 0 | 1 | 2 | 0.999891 | 218 | 0.979552 |
| CDB | COLD BAY | AK | LPV200 | 0 | 1 | 0 | 1 | 436 | 0.912587 |
| CDV | MERLE K (MUDHOLE) SMITH | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CLP | CLARKS POINT | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CXF | COLDFOOT | AK | LP | 0 | 1 | 0 | 1 | 2 | 0.999962 |
| D76 | ROBERT/BOB/CURTIS MEMORIAL | AK | LPV | 0 | 1 | 0 | 1 | 82 | 0.998030 |
| DLG | DILLINGHAM | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ELI | ELIM | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ENA | KENAI MUNICIPAL | AK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ENM | EMMONAK | AK | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| FAI | FAIRBANKS INTL | AK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GAL | EDWARD G. PITKA | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GKN | GULKANA | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HLA | HUSLIA | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HOM | HOMER | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HPB | HOOPER BAY | AK | LP | 0 | 1 | 0 | 1 | 23 | 0.999204 |
| ILI | ILIAMNA | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| KAL | KALTAG | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| KSM | ST MARY'S | AK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| KTN | KETCHIKAN INTL | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| KWT | KWETHLUK | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| KYU | KOYUKUK | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MCG | MCGRATH | AK | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| MDM | MARSHALL DON HUNTER SR | AK | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| MDO | MIDDLETON ISLAND | AK | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| OOK | TOKSOOK BAY | AK | LP | 0 | 1 | 0 | 1 | 89 | 0.997611 |
| ORT | NORTHWAY | AK | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| OTZ | RALPH WIEN MEMORIAL | AK | LPV200 | 0 | 1 | 0 | 1 | 138 | 0.996079 |
| PAQ | PALMER MUNICIPAL | AK | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| RBY | RUBY | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SCC | DEADHORSE | AK | LPV | 0 | 1 | 0 | 1 | 18 | 0.999298 |
| SCM | SCAMMON BAY | AK | LP | 0 | 1 | 0 | 1 | 9 | 0.999770 |
| SHG | SHUNGNAK | AK | LP | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| SHX | SHAGELUK | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SMK | ST MICHAEL | AK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UNK | UNALAKLEET | AK | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| WLK | SELAWIK | AK | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| WNA | NAPAKIAK | AK | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| YAK | YAKUTAT | AK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 06A | MOTON FIELD MUNICIPAL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 0J6 | HEADLAND MUNICIPAL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 0R1 | ATMORE MUNICIPAL | AL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 12J | BREWTON MUNICIPAL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 1M4 | POSEY FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 1R8 | BAY MINETTE MUNICIPAL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2R5 | ST ELMO | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3A1 | FOLSOM FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3M8 | NORTH PICKENS | AL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 4A9 | ISBELL FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 5R4 | FOLEY MUNICIPAL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 79J | SOUTH ALABAMA RGNL AT BILL BENTON FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 8A0 | ALBERTVILLE MUNICIPAL-T. J. BRUMLIK FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 9A4 | LAWRENCE COUNTY | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ANB | ANNISTON METROPOLITAN | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ASN | TALLADEGA MUNICIPAL | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AUO | AUBURN UNIVERSITY RGNL | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BFM | MOBILE DOWNTOWN | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BHM | BIRMINGHAM INTL | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CQF | H L SONNY CALLAHAN | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DCU | PRYOR FIELD RGNL | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DHN | DOTHAN RGNL | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| EDN | ENTERPRISE MUNICIPAL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EET | SHELBY COUNTY | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EKY | BESSEMER | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EUF | WEEDON FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GAD | NORTHEAST ALABAMA RGNL | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HAB | MARION COUNTY-RANKIN FITE | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HSV | HUNTSVILLE INTL-CARL T JONES FLD | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| JFX | WALKER COUNTY-BEVILL FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JKA | JACK EDWARDS | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| M95 | RICHARD ARTHUR FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MDQ | MADISON COUNTY EXECUTIVE/TOM SHARP JR FLD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MGM | MONTGOMERY RGNL (DANNELLY FIELD) | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MOB | MOBILE RGNL | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MSL | NORTHWEST ALABAMA RGNL | AL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PLR | ST CLAIR COUNTY | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PYP | CENTRE-PIEDMONT CHEROKEE COUNTY RGNL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SCD | MERKEL FIELD SYLACAUGA MUNICIPAL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SEM | CRAIG FIELD | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TCL | TUSCALOOSA RGNL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TOI | TROY MUNICIPAL | AL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 4M3 | CARLISLE MUNICIPAL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 7M1 | MC GEHEE MUNICIPAL | AR | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ARG | WALNUT RIDGE RGNL | AR | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ASG | SPRINGDALE MUNICIPAL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| AWM | WEST MEMPHIS MUNICIPAL | AR | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BPK | OZARK RGNL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BVX | BATESVILLE RGNL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BYH | ARKANSAS INTL | AR | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CDH | HARRELL FIELD | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ELD | SOUTH ARKANSAS RGNL AT GOODWIN FIELD | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FSM | FORT SMITH RGNL | AR | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FYV | DRAKE FIELD | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HRO | BOONE COUNTY | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JBR | JONESBORO MUNICIPAL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LIT | ADAMS FIELD | AR | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| M19 | NEWPORT MUNICIPAL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M77 | HOWARD COUNTY | AR | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ORK | NORTH LITTLE ROCK MUNICIPAL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PBF | GRIDER FIELD | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ROG | ROGERS MUNICIPAL-CARTER FIELD | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RUE | RUSSELLVILLE RGNL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SGT | STUTTGART MUNICIPAL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SLG | SMITH FIELD | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SRC | SEARCY MUNICIPAL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SUZ | SALINE COUNTY RGNL | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TXK | TEXARKANA RGNL-WEBB FIELD | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VBT | BENTONVILLE MUNICIPAL/LOUISE M THADEN FIELD | AR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| XNA | NORTHWEST ARKANSAS RGNL | AR | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AVQ | MARANA RGNL | AZ | LP | 0 | 1 | 0 | 1 | 10 | 0.999747 |
| D68 | SPRINGERVILLE MUNICIPAL | AZ | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| DVT | PHOENIX DEER VALLEY | AZ | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| FFZ | FALCON FLD | AZ | LP | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| FHU | SIERRA VISTA MUNICIPAL-LIBBY AAF | AZ | LPV200 | 0 | 1 | 0 | 1 | 11 | 0.999766 |
| FLG | FLAGSTAFF PULLIAM | AZ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GEU | GLENDALE MUNICIPAL | AZ | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| HII | LAKE HAVASU CITY | AZ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IFP | LAUGHLIN/BULLHEAD INTL | AZ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IGM | KINGMAN | AZ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IWA | PHOENIX-MESA GATEWAY | AZ | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| P33 | COCHISE COUNTY | AZ | LPV | 0 | 1 | 0 | 1 | 4 | 0.999981 |
| PGA | PAGE MUNICIPAL | AZ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PHX | PHOENIX SKY HARBOR INTL | AZ | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| PRC | ERNEST A. LOVE FIELD | AZ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RQE | WINDOW ROCK | AZ | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| SAD | SAFFORD RGNL | AZ | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SJN | ST JOHNS INDUSTRIAL AIR PARK | AZ | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| SOW | SHOW LOW RGNL | AZ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TUS | TUCSON INTL | AZ | LPV | 0 | 1 | 0 | 1 | 10 | 0.999755 |
| CYBL | CAMPBELL RIVER | BC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYCD | NANAIMO | BC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYVR | VANCOUVER INTL | BC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYXS | PRINCE GEORGE | BC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYYJ | VICTORIA INTL | BC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CZBB | VANCOUVER / BOUNDARY BAY | BC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AAT | ALTURAS MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ACV | ARCATA | CA | LPV200 | 0 | 1 | 0 | 1 | 67 | 0.996271 |
| APC | NAPA COUNTY | CA | LPV | 0 | 1 | 15 | 0.999857 | 111 | 0.993459 |
| APV | APPLE VALLEY | CA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| AUN | AUBURN MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 40 | 0.998660 |
| BFL | MEADOWS FIELD | CA | LPV200 | 0 | 1 | 0 | 1 | 17 | 0.999819 |
| BLH | BLYTHE | CA | LP | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| C83 | BYRON | CA | LPV | 0 | 1 | 9 | 0.999966 | 106 | 0.994482 |
| CCR | BUCHANAN FIELD | CA | LPV | 0 | 1 | 18 | 0.999891 | 110 | 0.993403 |
| CEC | JACK MC NAMARA FIELD | CA | LPV200 | 0 | 1 | 0 | 1 | 64 | 0.996426 |
| CIC | CHICO MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 64 | 0.998211 |
| CMA | CAMARILLO | CA | LPV | 0 | 1 | 0 | 1 | 48 | 0.998936 |
| CNO | CHINO | CA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| CRQ | MC CLELLAN-PALOMAR | CA | LPV200 | 0 | 1 | 0 | 1 | 3 | 0.999962 |
| CVH | HOLLISTER MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 80 | 0.991414 |
| DAG | BARSTOW-DAGGETT | CA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| DWA | YOLO COUNTY-DAVIS/WOODLAND/WINTERS | CA | LPV | 0 | 1 | 1 | 0.999996 | 105 | 0.995426 |
| FAT | FRESNO YOSEMITE INTL | CA | LPV | 0 | 1 | 0 | 1 | 20 | 0.999732 |
| HAF | HALF MOON BAY | CA | LPV | 0 | 1 | 33 | 0.999532 | 102 | 0.989523 |
| HHR | HAWTHORNE JACK NORTHROP FIELD | CA | LPV | 0 | 1 | 0 | 1 | 2 | 0.999981 |
| HWD | HAYWARD EXECUTIVE | CA | LPV | 0 | 1 | 32 | 0.999774 | 103 | 0.991670 |
| LAX | LOS ANGELES INTL | CA | LPV | 0 | 1 | 0 | 1 | 2 | 0.999981 |
| LGB | LONG BEACH/DAUGHERTY FIELD | CA | LPV | 0 | 1 | 0 | 1 | 2 | 0.999981 |
| LHM | LINCOLN RGNL/KARL HARDER FIELD | CA | LPV200 | 0 | 1 | 0 | 1 | 68 | 0.998071 |
| LLR | LITTLE RIVER | CA | LP | 0 | 1 | 0 | 1 | 139 | 0.992686 |
| LSN | LOS BANOS MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 72 | 0.995384 |
| LVK | LIVERMORE MUNICIPAL | CA | LPV | 0 | 1 | 21 | 0.999921 | 107 | 0.993342 |
| MAE | MADERA MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 34 | 0.998981 |
| MCE | MERCED RGNL/MACREADY FIELD | CA | LPV | 0 | 1 | 0 | 1 | 46 | 0.998007 |
| MER | CASTLE | CA | LPV200 | 0 | 1 | 0 | 1 | 44 | 0.997871 |
| MHR | SACRAMENTO MATHER | CA | LPV200 | 0 | 1 | 0 | 1 | 70 | 0.997807 |
| MIT | SHAFTER-MINTER FIELD | CA | LPV | 0 | 1 | 0 | 1 | 16 | 0.999758 |

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|---|---|---|---|---|---|---|---|---|---|
| MOD | MODESTO CITY-CO-HARRY SHAM FLD | CA | LPV | 0 | 1 | 0 | 1 | 66 | 0.997083 |
| MRY | MONTEREY PENINSULA | CA | LPV | 0 | 1 | 9 | 0.999966 | 83 | 0.988855 |
| MYF | MONTGOMERY FIELD | CA | LPV200 | 0 | 1 | 0 | 1 | 3 | 0.999913 |
| MYV | YUBA COUNTY | CA | LPV200 | 0 | 1 | 0 | 1 | 80 | 0.997939 |
| O02 | NERVINO | CA | LPV | 0 | 1 | 0 | 1 | 15 | 0.999709 |
| O27 | OAKDALE | CA | LPV | 0 | 1 | 0 | 1 | 50 | 0.997702 |
| O69 | PETALUMA MUNICIPAL | CA | LPV | 0 | 1 | 19 | 0.999747 | 114 | 0.992852 |
| O88 | RIO VISTA MUNICIPAL | CA | LP | 0 | 1 | 1 | 0.999996 | 106 | 0.995033 |
| OAK | METROPOLITAN OAKLAND INTL | CA | LPV | 0 | 1 | 33 | 0.999698 | 106 | 0.991852 |
| ONT | ONTARIO INTL | CA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| OVE | OROVILLE MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 67 | 0.998132 |
| OXR | OXNARD | CA | LPV | 0 | 1 | 0 | 1 | 59 | 0.998570 |
| PMD | PALMDALE USAF PLANT 42 | CA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| POC | BRACKETT FIELD | CA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| PRB | PASO ROBLES MUNICIPALCIPAL | CA | LPV200 | 0 | 1 | 0 | 1 | 74 | 0.992727 |
| PVF | PLACERVILLE | CA | LPV | 0 | 1 | 0 | 1 | 24 | 0.998856 |
| RAL | RIVERSIDE MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| RBL | RED BLUFF MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 64 | 0.998339 |
| RDD | REDDING MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 61 | 0.998358 |
| RHV | REID-HILLVIEW OF SANTA CLARA | CA | LPV | 0 | 1 | 25 | 0.999906 | 93 | 0.991221 |
| SAC | SACRAMENTO EXECUTIVE | CA | LPV200 | 0 | 1 | 0 | 1 | 99 | 0.996350 |
| SAN | SAN DIEGO INTL | CA | LP | 0 | 1 | 0 | 1 | 3 | 0.999913 |
| SBA | SANTA BARBARA MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 81 | 0.995969 |
| SBP | SAN LUIS COUNTY RGNL | CA | LPV200 | 0 | 1 | 0 | 1 | 79 | 0.992104 |
| SCK | STOCKTON METROPOLITAN | CA | LPV | 0 | 1 | 0 | 1 | 97 | 0.996090 |
| SEE | GILLESPIE FIELD | CA | LP | 0 | 1 | 0 | 1 | 3 | 0.999921 |
| SFO | SAN FRANCISCO INTL | CA | LPV | 0 | 1 | 33 | 0.999619 | 104 | 0.990878 |
| SJC | NORMAN Y. MINETA SAN JOSE INTL | CA | LPV | 0 | 1 | 31 | 0.999879 | 93 | 0.990851 |
| SMF | SACRAMENTO INTL | CA | LPV200 | 0 | 1 | 0 | 1 | 98 | 0.996513 |
| SMX | SANTA MARIA PUBLIC/CAPT G ALLAN HANCOCK FIELD | CA | LPV200 | 0 | 1 | 0 | 1 | 81 | 0.992535 |
| SNA | JOHN WAYNE-ORANGE COUNTY | CA | LPV | 0 | 1 | 0 | 1 | 2 | 0.999981 |
| SNS | SALINAS MUNICIPAL | CA | LPV200 | 0 | 1 | 0 | 1 | 84 | 0.990100 |
| STS | CHARLES M. SCHULZ-SONOMA COUNTY | CA | LPV | 0 | 1 | 4 | 0.999955 | 114 | 0.993018 |
| TCY | TRACY MUNICIPAL | CA | LPV | 0 | 1 | 0 | 1 | 102 | 0.994837 |
| TOA | ZAMPERINI FIELD | CA | LPV200 | 0 | 1 | 0 | 1 | 3 | 0.999977 |
| VCB | NUT TREE | CA | LPV | 0 | 1 | 1 | 0.999992 | 109 | 0.994829 |
| VCV | SOUTHERN CALIFORNIA LOGISTICS | CA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| VIS | VISALIA MUNICIPAL | CA | LPV200 | 0 | 1 | 0 | 1 | 16 | 0.999785 |
| WJF | GENERAL WM J FOX AIRFIELD | CA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |

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|---|---|---|---|---|---|---|---|---|---|
| WLW | WILLOWS-GLENN COUNTY | CA | LPV | 0 | 1 | 0 | 1 | 81 | 0.997339 |
| ALS | SAN LUIS VALLEY RGNL/BERGMAN FIELD | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| APA | CENTENNIAL | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BJC | ROCKY MOUNTAIN METROPOLITAN | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CEZ | CORTEZ MUNICIPAL | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| COS | CITY OF COLORADO SPRINGS MUNICIPAL | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DEN | DENVER INTL | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DRO | DURANGO-LA PLATA COUNTY | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FMM | FORT MORGAN MUNICIPAL | CO | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| FNL | FORT COLLINS-LOVELAND MUNICIPAL | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FTG | FRONT RANGE | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GJT | GRAND JUNCTION RGNL | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GXY | GREELEY-WELD COUNTY | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HDN | YAMPA VALLEY | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ITR | KIT CARSON COUNTY | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LAA | LAMAR MUNICIPAL | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LHX | LA JUNTA MUNICIPAL | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MTJ | MONTROSE RGNL | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PUB | PUEBLO MEMORIAL | CO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RIL | GARFIELD COUNTY RGNL | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| STK | STERLING MUNICIPAL | CO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TEX | TELLURIDE RGNL | CO | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| BDL | BRADLEY INTL | CT | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| GON | GROTON-NEW LONDON | CT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| HVN | TWEED-NEW HAVEN | CT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| IJD | WINDHAM | CT | LP | 0 | 1 | 0 | 1 | 1 | 0.999966 |
| OXC | WATERBURY-OXFORD | CT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| DCA | RONALD REAGAN WASHINGTON NATL | DC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HEF | MANASSAS RGNL/HARRY P. DAVIS FIELD | DC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IAD | WASHINGTON DULLES INTL | DC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 33N | DELAWARE AIRPARK | DE | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| EVY | SUMMIT | DE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GED | SUSSEX COUNTY | DE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ILG | NEW CASTLE | DE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 1J0 | TRI-COUNTY | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 28J | PALATKA MUNICIPALCIPAL ARPT | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 40J | PERRY-FOLEY | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 54J | DEFUNIAK SPRINGS | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| AAF | APALACHICOLA MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| APF | NAPLES MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AVO | AVON PARK EXECUTIVE | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| BCT | BOCA RATON | FL | LPV | 0 | 1 | 0 | 1 | 2 | 0.999974 |
| BKV | HERNANDO COUNTY | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BOW | BARTOW MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CEW | BOB SIKES | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CHN | WAUCHULA MUNICIPAL | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| COI | MERRITT ISLAND | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CRG | CRAIG MUNICIPAL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CTY | CROSS CITY | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DAB | DAYTONA BEACH INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DED | DELAND MUNICIPAL-SIDNEY H TAYLOR FLD | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DTS | DESTIN-FORT WALTON BEACH | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ECP | NORTHWEST FLORIDA BEACHES INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| EVB | NEW SMYRNA BEACH MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EYW | KEY WEST INTL | FL | LPV | 0 | 1 | 0 | 1 | 5 | 0.999615 |
| F45 | NORTH PALM BEACH COUNTY GENERAL AVIATION | FL | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| FHB | FERNANDINA BEACH MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FLL | FORT LAUDERDALE/HOLLYWOOD INTL | FL | LPV | 0 | 1 | 0 | 1 | 3 | 0.999740 |
| FMY | PAGE FIELD | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FPR | ST LUCIE COUNTY INTL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FXE | FT LAUDERDALE EXECUTIVE | FL | LPV200 | 0 | 1 | 0 | 1 | 3 | 0.999819 |
| GIF | WINTER HAVEN'S GILBERT | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GNV | GAINESVILLE RGNL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HEG | HERLONG RECREATIONAL | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| IMM | IMMOKALEE RGNL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ISM | KISSIMMEE GATEWAY | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| JAX | JACKSONVILLE INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LAL | LAKELAND LINDER RGNL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LCQ | LAKE CITY MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LEE | LEESBURG INTL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MCO | ORLANDO INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MIA | MIAMI INTL | FL | LPV | 0 | 1 | 0 | 1 | 4 | 0.999683 |
| MKY | MARCO ISLAND | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MLB | MELBOURNE INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MTH | THE FLORIDA KEYS MARATHON | FL | LPV | 1 | 0.999977 | 1 | 0.999977 | 5 | 0.999426 |
| OBE | OKEECHOBEE COUNTY | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OCF | OCALA INTL-JIM TAYLOR FLD | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| OPF | OPA LOCKA EXECUTIVE | FL | LPV200 | 0 | 1 | 0 | 1 | 4 | 0.999709 |
| ORL | EXECUTIVE | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PBI | PALM BEACH INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| PCM | PLANT CITY MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| PGD | PUNTA GORDA | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PHK | PALM BEACH COUNTY GLADES | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PIE | ST PETERSBURG-CLEARWATER INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PMP | POMPANO BEACH AIRPARK | FL | LPV | 0 | 1 | 0 | 1 | 3 | 0.999834 |
| PNS | PENSACOLA RGNL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RSW | SOUTHWEST FLORIDA INTL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SEF | SEBRING RGNL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SFB | ORLANDO SANFORD INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SGJ | ST AUGUSTINE | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SRQ | SARASOTA/BRADENTON INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SUA | WITHAM FIELD | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TIX | SPACE COAST RGNL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TLH | TALLAHASSEE RGNL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TMB | KENDALL-TAMIAMI EXECUTIVE | FL | LPV200 | 0 | 1 | 0 | 1 | 4 | 0.999570 |
| TPA | TAMPA INTL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TPF | PETER O KNIGHT | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| VDF | TAMPA EXECUTIVE | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VNC | VENICE MUNICIPAL | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| VQQ | CECIL FIELD | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VRB | VERO BEACH MUNICIPAL | FL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| X07 | LAKE WALES MUNICIPAL | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| X14 | LA BELLE MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| X26 | SEBASTIAN MUNICIPAL | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| X35 | MARION CO & PARK OF COMMERCE | FL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| X51 | HOMESTEAD GENERAL AVIATION | FL | LPV | 0 | 1 | 0 | 1 | 4 | 0.999524 |
| XFL | FLAGLER COUNTY | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ZPH | ZEPHYRHILLS MUNICIPAL | FL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 09J | JEKYLL ISLAND | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 15J | COOK COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 17J | DONALSONVILLE MUNICIPAL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 18A | FRANKLIN COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 19A | JACKSON COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 2J5 | MILLEN | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3J7 | GREENE COUNTY RGNL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 48A | COCHRAN | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 4A4 | POLK COUNTY AIRPORT CORNELIUS MOORE FIELD | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 4J1 | BRANTLEY COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 4J6 | ST MARYS | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 52A | MADISON MUNICIPAL | GA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 6A2 | GRIFFIN-SPALDING COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 70J | CAIRO-GRADY COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ABY | SOUTHWEST GEORGIA RGNL | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| ACJ | JIMMY CARTER RGNL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AGS | AUGUSTA RGNL AT BUSH FIELD | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AHN | ATHENS/BEN EPPS | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AJR | HABERSHAM COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ATL | HARTSFIELD - JACKSON ATLANTA INTL | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AYS | WAYCROSS-WARE COUNTY | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BGE | DECATUR COUNTY INDUSTRIAL AIR PARK | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BHC | BAXLEY MUNICIPAL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BIJ | EARLY COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BQK | BRUNSWICK GOLDEN ISLES | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CCO | NEWNAN COWETA COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CKF | CRISP COUNTY-CORDELE | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CNI | CHEROKEE COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CSG | COLUMBUS METROPOLITAN | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CTJ | WEST GEORGIA RGNL-O V GRAY FIELD | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CVC | COVINGTON MUNICIPAL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CWV | CLAXTON-EVANS COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| D73 | MONROE-WALTON COUNTY | GA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| DNN | DALTON MUNICIPAL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DQH | DOUGLAS MUNICIPAL | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| EZM | HEART OF GEORGIA RGNL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FFC | ATLANTA RGNL FALCON FIELD | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FTY | FULTON COUNTY AIRPORT-BROWN FIELD | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FZG | FITZGERALD MUNICIPAL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GVL | LEE GILMER MEMORIAL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HOE | HOMERVILLE | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HQU | THOMSON-MCDUFFIE COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IIY | WASHINGTON-WILKES COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JES | JESUP-WAYNE COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JYL | PLANTATION ARPK | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JZP | PICKENS COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LGC | LAGRANGE-CALLAWAY | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LZU | GWINNETT COUNTY-BRISCOE FIELD | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MAC | MACON DOWNTOWN | GA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| MCN | MIDDLE GEORGIA RGNL | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MGR | MOULTRIE MUNICIPAL | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MLJ | BALDWIN COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MQW | TELFAIR-WHEELER | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OKZ | KAOLIN FIELD | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OPN | THOMASTON-UPSON COUNTY | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PIM | HARRIS COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| PUJ | PAULDING NORTHWEST ATLANTA | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PXE | PERRY-HOUSTON COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RMG | RICHARD B RUSSELL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RVJ | SWINTON SMITH FLD AT REIDSVILLE MUNICIPAL | GA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| RYY | COBB COUNTY-MC COLLUM FIELD | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SAV | SAVANNAH/HILTON HEAD INTL | GA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SBO | EAST GEORGIA REGIONAL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TBR | STATESBORO-BULLOCH COUNTY | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TMA | HENRY TIFTON MYERS | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TOC | TOCCOA RG LETOURNEAU FIELD | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TVI | THOMASVILLE RGNL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VDI | VIDALIA RGNL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VLD | VALDOSTA RGNL | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VPC | CARTERSVILLE | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| WDR | WINDER-BARROW | GA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AIO | ATLANTIC MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ALO | WATERLOO RGNL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| AMW | AMES MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| AWG | WASHINGTON MUNICIPAL | IA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BRL | SOUTHEAST IOWA RGNL | IA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CBF | COUNCIL BLUFFS MUNICIPAL | IA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CID | THE EASTERN IOWA | IA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CIN | ARTHUR N NEU | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| CKP | CHEROKEE COUNTY RGNL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| CSQ | CRESTON MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| CWI | CLINTON MUNICIPAL | IA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DBQ | DUBUQUE RGNL | IA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DEH | DECORAH MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| DNS | DENISON MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DSM | DES MOINES INTL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| DVN | DAVENPORT MUNICIPAL | IA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| EBS | WEBSTER CITY MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| EFW | JEFFERSON MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| EOK | KEOKUK MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EST | ESTHERVILLE MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| FFL | FAIRFIELD MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FOD | FORT DODGE RGNL | IA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| FXY | FOREST CITY MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| GGI | GRINNELL RGNL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| I75 | OSCEOLA MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| ICL | SCHENCK FIELD | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IIB | INDEPENDENCE MUNICIPAL | IA | LP | 0 | 1 | 0 | 1 | 1 | 0.999989 |

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|---|---|---|---|---|---|---|---|---|---|
| IKV | ANKENY RGNL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| IOW | IOWA CITY MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LRJ | LE MARS MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MCW | MASON CITY MUNICIPAL | IA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| MPZ | MOUNT PLEASANT MUNICIPALCIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MUT | MUSCATINE MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MXO | MONTICELLO RGNL | IA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| OOA | OSKALOOSA MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OTM | OTTUMWA RGNL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OXV | KNOXVILLE MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| PEA | PELLA MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| POH | POCAHONTAS MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| PRO | PERRY MUNICIPAL | IA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| RDK | RED OAK MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SDA | SHENANDOAH MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SHL | SHELDON MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| SKI | SAC CITY MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| SLB | STORM LAKE MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| SPW | SPENCER MUNICIPAL | IA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| SUX | SIOUX GATEWAY/COL BUD DAY FIELD | IA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TNU | NEWTON MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| TVK | CENTERVILLE MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TZT | BELLE PLAINE MUNICIPAL | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| VTI | VINTON VETERANS MEML ARPK | IA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| BOI | BOISE AIR TERMINAL/GOWEN FLD | ID | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| COE | PAPPY BOYINGTON FIELD | ID | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DIJ | DRIGGS-REED MEMORIAL | ID | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| EUL | CALDWELL INDUSTRIAL | ID | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GNG | GOODING MUNICIPAL | ID | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IDA | IDAHO FALLS RGNL | ID | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| JER | JEROME COUNTY | ID | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LWS | LEWISTON-NEZ PERCE COUNTY | ID | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MAN | NAMPA MUNICIPAL | ID | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MYL | MC CALL MUNICIPALCIPAL | ID | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PIH | POCATELLO RGNL | ID | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TWF | JOSLIN FIELD-MAGIC VALLEY RGNL | ID | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| U76 | MOUNTAIN HOME MUNICIPAL | ID | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3LF | LITCHFIELD MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3MY | MOUNT HAWLEY AUXILIARY | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AJG | MOUNT CARMEL MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ALN | ST LOUIS RGNL | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ARR | AURORA MUNICIPAL | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| BLV | SCOTT AFB/MIDAMERICA | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BMI | CENTRAL IL REGL ARPT AT BLOOMINGTON-NORMAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| C15 | PEKIN MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| C73 | DIXON MUNICIPAL-CHARLES R. WALGREEN FLD | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CMI | UNIVERSITY OF ILLINOIS-WILLARD | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CPS | ST LOUIS DOWNTOWN | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CUL | CARMI MUNICIPAL | IL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| DEC | DECATUR | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DKB | DE KALB TAYLOR MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DNV | VERMILION COUNTY | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DPA | DUPAGE | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ENL | CENTRALIA MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FEP | ALBERTUS | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FOA | FLORA MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GBG | GALESBURG MUNICIPAL | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HSB | HARRISBURG-RALEIGH | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| I63 | MOUNT STERLING MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IGQ | LANSING MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IKK | GREATER KANKAKEE | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LOT | LEWIS UNIVERSITY | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LWV | LAWRENCEVILLE-VINCENNES INTL | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MDW | CHICAGO MIDWAY INTL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MLI | QUAD CITY INTL | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MTO | COLES COUNTY MEMORIAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MVN | MOUNT VERNON | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MWA | WILLIAMSON COUNTY RGNL | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ORD | CHICAGO-O'HARE INTL | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PIA | GREATER PEORIA RGNL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PNT | PONTIAC MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PWK | CHICAGO EXECUTIVE | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RFD | CHICAGO/ROCKFORD INTL | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RPJ | ROCHELLE MUNICIPAL-KORITZ FIELD | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RSV | ROBINSON MUNICIPAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SAR | SPARTA COMMUNICIPALTY-HUNTER FIELD | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SFY | TRI-TOWNSHIP | IL | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| SPI | ABRAHAM LINCOLN CAPITAL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SQI | WHITESIDE COUNTY-JOS J BITTORF FLD | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UGN | WAUKEGAN RGNL | IL | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UIN | QUINCY RGNL-BALDWIN FIELD | IL | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 4I7 | PUTNAM COUNTY | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AID | ANDERSON MUNICIPAL- | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| | DARLINGTON FIELD | | | | | | | | |
| ASW | WARSAW MUNICIPALCIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BAK | COLUMBUS MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BFR | VIRGIL I GRISSOM MUNICIPAL | IN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| BMG | MONROE COUNTY | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CEV | METTEL FIELD | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EKM | ELKHART MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EVV | EVANSVILLE RGNL | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| EYE | EAGLE CREEK AIRPARK | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FRH | FRENCH LICK MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FWA | FORT WAYNE INTL | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GEZ | SHELBYVILLE MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GGP | LOGANSPORT/CASS COUNTY | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GSH | GOSHEN MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GWB | DE KALB COUNTY | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GYY | GARY/CHICAGO INTL | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HFY | GREENWOOD MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HNB | HUNTINGBURG | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HUF | TERRE HAUTE INTL-HULMAN FIELD | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| I22 | RANDOLPH COUNTY | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IMS | MADISON MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IND | INDIANAPOLIS INTL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JVY | CLARK RGNL | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LAF | PURDUE UNIVERSITY | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MCX | WHITE COUNTY | IN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| MIE | DELAWARE COUNTY-JOHNSON FIELD | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MQJ | MOUNT COMFORT | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MZZ | MARION MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OKK | KOKOMO MUNICIPAL | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| OVO | NORTH VERNON | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OXI | STARKE COUNTY | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PLD | PORTLAND MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RCR | FULTON COUNTY | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RID | RICHMOND MUNICIPAL | IN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RZL | JASPER COUNTY | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SBN | SOUTH BEND RGNL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SER | FREEMAN MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SMD | SMITH FIELD | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TEL | PERRY COUNTY MUNICIPAL | IN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| TYQ | INDIANAPOLIS EXECUTIVE | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VPZ | PORTER COUNTY MUNICIPAL | IN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3AU | AUGUSTA MUNICIPAL | KS | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 3K3 | SYRACUSE-HAMILTON COUNTY MUNICIPALCIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AAO | COLONEL JAMES JABARA | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| ADT | ATWOOD-RAWLINS COUNTY CITY-COUNTY | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ANY | ANTHONY MUNICIPAL | KS | LP | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| CBK | SHALZ FIELD | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CNK | BLOSSER MUNICIPAL | KS | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| DDC | DODGE CITY RGNL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EGT | WELLINGTON MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EHA | ELKHART-MORTON COUNTY | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EMP | EMPORIA MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EWK | NEWTON-CITY-COUNTY | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FOE | FORBES FIELD | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FSK | FORT SCOTT MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GBD | GREAT BEND MUNICIPAL | KS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GCK | GARDEN CITY RGNL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GLD | RENNER FLD/GOODLAND MUNICIPAL/ | KS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HQG | HUGOTON MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HUT | HUTCHINSON MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HYS | HAYS RGNL | KS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ICT | WICHITA MID-CONTINENT | KS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| IDP | INDEPENDENCE MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IXD | NEW CENTURY AIRCENTER | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| K88 | ALLEN COUNTY | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LBL | LIBERAL MID-AMERICA RGNL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LQR | LARNED PAWNEE CO | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LWC | LAWRENCE MUNICIPAL | KS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MHK | MANHATTAN RGNL | KS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MPR | MCPHERSON | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MYZ | MARYSVILLE MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| NRN | NORTON MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OEL | OAKLEY MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OJC | JOHNSON COUNTY EXECUTIVE | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OWI | OTTAWA MUNICIPAL | KS | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| PPF | TRI-CITY | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PTS | ATKINSON MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PTT | PRATT INDUSTRIAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RPB | BELLEVILLE MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RSL | RUSSELL MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SLN | SALINA MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TOP | PHILIP BILLARD MUNICIPAL | KS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TQK | SCOTT CITY MUNICIPAL | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UKL | COFFEY COUNTY | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ULS | ULYSSES | KS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 27K | GEORGETOWN SCOTT CO-MARSHALL FLD | KY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 2I0 | MADISONVILLE MUNICIPAL | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 6I2 | LEBANON-SPRINGFIELD | KY | LP | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| 7K4 | OHIO COUNTY | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AAS | TAYLOR COUNTY | KY | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| BRY | SAMUELS FIELD | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BWG | BOWLING GREEN-WARREN CTY RGNL | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BYL | WILLIAMSBURG-WHITLEY COUNTY | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CEY | KYLE-OAKLEY FIELD | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CPF | WENDELL H FORD | KY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CVG | CINCINNATI/NORTHERN KENTUCKY INTL | KY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DVK | STUART POWELL FIELD | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DWU | ASHLAND RGNL | KY | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| EHR | HENDERSON CITY-COUNTY | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EKX | ADDINGTON FIELD | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FGX | FLEMING-MASON | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GLW | GLASGOW MUNICIPAL | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HVC | HOPKINSVILLE-CHRISTIAN COUNTY | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| I39 | MADISON | KY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| K22 | BIG SANDY RGNL | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| KY8 | HANCOCK CO-RON LEWIS FIELD | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LEX | BLUE GRASS | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LOU | BOWMAN FIELD | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LOZ | LONDON-CORBIN ARPT-MAGEE FLD | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M21 | MUHLENBERG COUNTY | KY | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| M97 | MOREHEAD-ROWAN COUNTY CLYDE A THOMAS RGNL | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OWB | OWENSBORO-DAVIESS COUNTY | KY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PAH | BARKLEY RGNL | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SDF | LOUISVILLE INTL-STANDIFORD FLD | KY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SME | LAKE CUMBERLAND RGNL | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TWT | STURGIS MUNICIPAL | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TZV | TOMPKINSVILLE-MONROE COUNTY | KY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 1L0 | ST JOHN THE BAPTIST PARISH | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3R4 | HART | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ACP | ALLEN PARISH | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AEX | ALEXANDRIA INTL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ARA | ACADIANA RGNL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BQP | MOREHOUSE MEMORIAL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BTR | BATON ROUGE METRO | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BXA | GEORGE R CARR MEMORIAL AIR FIELD | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| CWF | CHENNAULT INTL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DTN | SHREVEPORT DOWNTOWN | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ESF | ESLER RGNL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| F88 | JONESBORO | LA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| GAO | SOUTH LAFOURCHE LEONARD MILLER JR | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HDC | HAMMOND NORTHSHORE RGNL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HUM | HOUMA-TERREBONNE | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HZR | FALSE RIVER RGNL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IER | NATCHITOCHES RGNL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IYA | ABBEVILLE CHRIS CRUSTA MEML | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| L38 | LOUISIANA RGNL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| L39 | LEESVILLE | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LCH | LAKE CHARLES RGNL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LFT | LAFAYETTE RGNL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M79 | JOHN H HOOKS JR MEMORIAL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MLU | MONROE RGNL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MSY | LOUIS ARMSTRONG NEW ORLEANS INTL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| NEW | LAKEFRONT | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OPL | ST LANDRY PARISH-AHART FIELD | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PTN | HARRY P WILLIAMS MEMORIAL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RSN | RUSTON RGNL AIRPORT | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SHV | SHREVEPORT RGNL | LA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SPH | SPRINGHILL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TVR | VICKSBURG TALLULAH RGNL | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UXL | SOUTHLAND FIELD | LA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3B0 | SOUTHBRIDGE MUNICIPAL | MA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| ACK | NANTUCKET MEMORIAL | MA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| BAF | BARNES MUNICIPAL | MA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| BED | LAURENCE G HANSCOM FLD | MA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| BOS | GEN EDWARD LAWRENCE LOGAN INTL | MA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| BVY | BEVERLY MUNICIPAL | MA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| EWB | NEW BEDFORD RGNL | MA | LP | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| GBR | WALTER J KOLADZA | MA | LP | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| HYA | BARNSTABLE MUNICIPAL-BOARDMAN/POLANDO FIELD | MA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| LWM | LAWRENCE MUNICIPAL | MA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| MVY | MARTHAS VINEYARD | MA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| ORE | ORANGE MUNICIPAL | MA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| ORH | WORCESTER RGNL | MA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| OWD | NORWOOD MEMORIAL | MA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| PYM | PLYMOUTH MUNICIPAL | MA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |

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|---|---|---|---|---|---|---|---|---|---|
| 2G4 | GARRETT COUNTY | MD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 2W6 | ST. MARY'S COUNTY RGNL | MD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BWI | BALTIMORE/WASHINGTON INTL THURGOOD MARSHALL | MD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CBE | GREATER CUMBERLAND RGNL | MD | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| DMW | CARROLL COUNTY REGNL/JACK B POAGE FIELD | MD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ESN | EASTON/NEWNAM FIELD | MD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FDK | FREDERICK MUNICIPAL | MD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GAI | MONTGOMERY COUNTY AIRPARK | MD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HGR | HAGERSTOWN RGNL-RICHARD A HENSON FIELD | MD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MTN | MARTIN STATE | MD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OXB | OCEAN CITY MUNICIPAL | MD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SBY | SALISBURY-OCEAN CITY WICOMICO RGNL | MD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 1B0 | DEXTER RGNL | ME | LP | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| 81B | OXFORD COUNTY RGNL | ME | LP | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| AUG | AUGUSTA STATE | ME | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| BGR | BANGOR INTL | ME | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| BHB | HANCOCK COUNTY-BAR HARBOR | ME | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| BXM | BRUNSWICK EXECUTIVE | ME | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| FVE | NORTHERN AROOSTOOK RGNL | ME | LPV | 0 | 1 | 0 | 1 | 2 | 0.999955 |
| HUL | HOULTON INTL | ME | LP | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| LEW | AUBURN/LEWISTON MUNICIPAL | ME | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| MLT | MILLINOCKET MUNICIPAL | ME | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| PQI | NORTHERN MAINE RGNL ARPT AT PRESQUE IS | ME | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| PWM | PORTLAND INTL JETPORT | ME | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| RKD | KNOX COUNTY RGNL | ME | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| SFM | SANFORD RGNL | ME | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| WVL | WATERVILLE ROBERT LAFLEUR | ME | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| 77G | MARLETTE | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| 9D9 | HASTINGS | MI | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ACB | ANTRIM COUNTY | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| ADG | LENAWEE COUNTY | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AMN | GRATIOT COMMUNICIPALTY | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| ANJ | SAULT STE MARIE MUNICIPAL - SANDERSON FIELD | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999902 |
| APN | ALPENA COUNTY RGNL | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| ARB | ANN ARBOR MUNICIPAL | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AZO | KALAMAZOO/BATTLE CREEK INTL | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BAX | HURON COUNTY MEMORIAL | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |

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|---|---|---|---|---|---|---|---|---|---|
| BEH | SOUTHWEST MICHIGAN RGNL | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BIV | TULIP CITY | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BTL | W K KELLOGG | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CAD | WEXFORD COUNTY | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| CIU | CHIPPEWA COUNTY INTL | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| CMX | HOUGHTON COUNTY MEMORIAL | MI | LPV | 0 | 1 | 0 | 1 | 2 | 0.999785 |
| CVX | CHARLEVOIX MUNICIPAL | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| DET | COLEMAN A YOUNG MUNICIPAL | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DTW | DETROIT METROPOLITAN WAYNE COUNTY | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ERY | LUCE COUNTY | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999921 |
| ESC | DELTA COUNTY | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| FFX | FREMONT MUNICIPAL | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FNT | BISHOP INTL | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| GDW | GLADWIN ZETTEL MEMORIAL | MI | LP | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| GLR | GAYLORD RGNL | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| GRR | GERALD R. FORD INTL | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HYX | SAGINAW COUNTY H.W. BROWNE | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| IKW | JACK BARSTOW | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| IMT | FORD | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| IRS | KIRSCH MUNICIPAL | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ISQ | SCHOOLCRAFT COUNTY | MI | LP | 0 | 1 | 0 | 1 | 1 | 0.999849 |
| IWD | GOGEBIC-IRON COUNTY | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999943 |
| JXN | JACKSON COUNTY-REYNOLDS FIELD | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LAN | CAPITAL REGION INTL | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LDM | MASON COUNTY | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| LWA | SOUTH HAVEN AREA RGNL | MI | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| MBS | MBS INTL | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| MCD | MACKINAC ISLAND | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999928 |
| MKG | MUSKEGON COUNTY | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MNM | MENOMINEE-MARINETTE TWIN COUNTY | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MOP | MOUNT PLEASANT MUNICIPAL | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| N98 | BOYNE CITY MUNICIPAL | MI | LP | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| OEB | BRANCH COUNTY MEMORIAL | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OSC | OSCODA-WURTSMITH | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| OZW | LIVINGSTON COUNTY SPENCER J. HARDY | MI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PHN | SAINT CLAIR COUNTY INTL | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| PLN | PELLSTON RGNL AIRPORT OF EMMET COUNTY | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999917 |
| PTK | OAKLAND COUNTY INTL | MI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| RNP | OWOSSO COMMUNICIPALTY | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| SAW | SAWYER INTL | MI | LPV200 | 0 | 1 | 0 | 1 | 2 | 0.999947 |

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|---|---|---|---|---|---|---|---|---|---|
| SLH | CHEBOYGAN COUNTY | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999917 |
| TTF | CUSTER | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TVC | CHERRY CAPITAL | MI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| YIP | WILLOW RUN | MI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AEL | ALBERT LEA MUNICIPAL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999943 |
| ANE | ANOKA COUNTY-BLAINE ARPT (JANES FIELD) | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999932 |
| AUM | AUSTIN MUNICIPAL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999947 |
| AXN | CHANDLER FIELD | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| BBB | BENSON MUNICIPAL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| BDE | BAUDETTE INTL | MN | LPV | 0 | 1 | 0 | 1 | 2 | 0.999777 |
| BDH | WILLMAR MUNICIPAL-JOHN L RICE FIELD | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| BJI | BEMIDJI RGNL | MN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BRD | BRAINERD LAKES RGNL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999943 |
| CBG | CAMBRIDGE MUNICIPAL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999925 |
| CKC | GRAND MARAIS/COOK COUNTY | MN | LPV | 0 | 1 | 0 | 1 | 2 | 0.999641 |
| CKN | CROOKSTON MUNICIPAL/KIRKWOOD FLD | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| CNB | MYERS FIELD | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| COQ | CLOQUET CARLTON COUNTY | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999909 |
| CQM | COOK MUNICIPAL | MN | LP | 0 | 1 | 0 | 1 | 2 | 0.999796 |
| D39 | SAUK CENTRE MUNICIPAL | MN | LP | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| DLH | DULUTH INTL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999906 |
| DTL | DETROIT LAKES-WETHING FIELD | MN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DXX | LAC QUI PARLE COUNTY | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| ELO | ELY MUNICIPAL | MN | LPV200 | 0 | 1 | 0 | 1 | 2 | 0.999755 |
| ETH | WHEATON MUNICIPAL | MN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| FCM | FLYING CLOUD | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999936 |
| FFM | FERGUS FALLS MUNICIPAL-EINAR MICKELSON FLD | MN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FKA | FILLMORE COUNTY | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| FOZ | BIGFORK MUNICIPALCIPAL | MN | LP | 0 | 1 | 0 | 1 | 1 | 0.999887 |
| FRM | FAIRMONT MUNICIPAL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| FSE | FOSSTON MUNICIPAL | MN | LP | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| GPZ | GRAND RAPIDS/ITASCA CO-GORDON NEWSTROM | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| HCD | HUTCHINSON MUNICIPAL-BUTLER FIELD | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| HIB | RANGE RGNL | MN | LPV200 | 0 | 1 | 0 | 1 | 2 | 0.999943 |
| INL | FALLS INTL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999789 |
| JKJ | MOORHEAD MUNICIPAL | MN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LJF | LITCHFIELD MUNICIPAL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999955 |
| LVN | AIRLAKE | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999932 |
| LXL | LITTLE FALLS/MORRISON CO-LINDBERGH FLD | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999947 |

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|---|---|---|---|---|---|---|---|---|---|
| LYV | QUENTIN AANENSON FIELD | MN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MGG | MAPLE LAKE MUNICIPAL | MN | LP | 0 | 1 | 0 | 1 | 1 | 0.999943 |
| MKT | MANKATO RGNL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| MML | SOUTHWEST MINNESOTA RGNL MARSHALL/RYAN FIELD | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| MSP | MINNEAPOLIS-ST PAUL INTL/WOLD-CHAMBERLAIN | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999932 |
| MZH | MOOSE LAKE CARLTON COUNTY | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999913 |
| ONA | WINONA MUNICIPAL-MAX CONRAD FLD | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| ORB | ORR RGNL | MN | LP | 0 | 1 | 0 | 1 | 1 | 0.999789 |
| OTG | WORTHINGTON MUNICIPAL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| OWA | OWATONNA DEGNER RNGL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999932 |
| PKD | PARK RAPIDS MUNICIPAL-KONSHOK FIELD | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| RGK | RED WING RGNL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999936 |
| ROS | RUSH CITY RGNL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999921 |
| ROX | ROSEAU MUNICIPAL/RUDY BILLBERG FIELD | MN | LPV | 0 | 1 | 0 | 1 | 2 | 0.999872 |
| RRT | WARROAD INTL MEMORIAL | MN | LPV | 0 | 1 | 0 | 1 | 2 | 0.999770 |
| RST | ROCHESTER INTL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| RWF | REDWOOD FALLS MUNICIPAL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| SAZ | STAPLES MUNICIPAL | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999955 |
| STC | ST CLOUD RGNL | MN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999943 |
| STP | ST PAUL DOWNTOWN HOLMAN FLD | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999928 |
| TVF | THIEF RIVER FALLS | MN | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| TWM | RICHARD B HELGESON | MN | LPV | 0 | 1 | 0 | 1 | 2 | 0.999906 |
| VVV | ORTONVILLE MUNICIPAL-MARTINSON FIELD | MN | LP | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| 1H0 | CREVE COEUR | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 2H2 | JERRY SUMNERS SR AURORA MUNICIPALCIPAL | MO | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 6M6 | LEWIS COUNTY RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 8WC | WASHINGTON COUNTY AIRPORT | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AIZ | LEE C FINE MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BBG | BRANSON | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BUM | BUTLER MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CGI | CAPE GIRARDEAU RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CHT | CHILLICOTHE MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| COU | COLUMBIA RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DMO | SEDALIA MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DXE | DEXTER MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EIW | COUNTY MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EOS | NEOSHO HUGH ROBINSON | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EVU | NORTHWEST MISSOURI RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| EZZ | CAMERON MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FAM | FARMINGTON RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FTT | ELTON HENSLEY MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FWB | BRANSON WEST MUNICIPAL-EMERSON FIELD | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FYG | WASHINGTON RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GPH | MIDWEST NATIONAL AIR CENTER | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| H21 | CAMDENTON MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| H79 | ELDON MODEL AIRPARK | MO | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| HAE | HANNIBAL RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HFJ | MONETT MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HIG | HIGGINSVILLE INDUSTRIAL MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IRK | KIRKSVILLE RGNL | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| JEF | JEFFERSON CITY MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JLN | JOPLIN RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| K02 | PERRYVILLE MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| K57 | GOULD PETERSON MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LRY | LAWRENCE SMITH MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LXT | LEE'S SUMMIT MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M05 | CARUTHERSVILLE MEM | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M17 | BOLIVAR MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M48 | HOUSTON MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MAW | MALDEN MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MBY | OMAR N BRADLEY | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MCI | KANSAS CITY INTL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MHL | MARSHALL MEML MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MKC | CHARLES B. WHEELER DOWNTOWN | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MO8 | NORTH CENTRAL MISSOURI RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MYJ | MEXICO MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| NVD | NEVADA MUNICIPAL | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PLK | M. GRAHAM CLARK DOWNTOWN | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| POF | POPLAR BLUFF MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RCM | SKYHAVEN | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SGF | SPRINGFIELD-BRANSON NATIONAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SIK | SIKESTON MEML MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| STJ | ROSECRANS MEMORIAL | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| STL | LAMBERT-ST LOUIS INTL | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SUS | SPIRIT OF ST LOUIS | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TBN | WAYNESVILLE-ST ROBERT RGNL/FORNEY AAF | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TRX | TRENTON MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UBX | CUBA MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| UNO | WEST PLAINS MUNICIPAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UUV | SULLIVAN RGNL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VER | JESSE VIERTEL MEMORIAL | MO | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VIH | ROLLA NATIONAL | MO | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 87I | YAZOO COUNTY | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CKM | FLETCHER FIELD | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CRX | ROSCOE TURNER | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GLH | MID DELTA RGNL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GNF | GRENADA MUNICIPAL | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GPT | GULFPORT-BILOXI INTL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GTR | GOLDEN TRIANGLE RGNL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GWO | GREENWOOD-LEFLORE | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HBG | HATTIESBURG BOBBY L. CHAIN MUNICIPAL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HEZ | HARDY-ANDERS FLD NATCHEZ-ADAMS COUNTY | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HKS | HAWKINS FIELD | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HSA | STENNIS INTL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| IDL | INDIANOLA MUNICIPAL | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JAN | JACKSON-EVERS INTL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| JVW | JOHN BELL WILLIAMS | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LUL | HESLER-NOBLE FIELD | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M40 | MONROE COUNTY | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M43 | PRENTISS-JEFFERSON DAVIS COUNTY | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MCB | MC COMB-PIKE COUNTY-JOHN E LEWIS FIELD | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MEI | KEY FIELD | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MJD | PICAYUNE MUNICIPAL | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MPE | PHILADELPHIA MUNICIPAL | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OLV | OLIVE BRANCH | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PIB | HATTIESBURG-LAUREL RGNL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PQL | TRENT LOTT INTL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RNV | CLEVELAND MUNICIPAL | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| STF | GEORGE M BRYAN | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TUP | TUPELO RGNL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| UOX | UNIVERSITY-OXFORD | MS | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UTA | TUNICA MUNICIPAL | MS | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 1S3 | TILLITT FIELD | MT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| 4U6 | CIRCLE TOWN COUNTY | MT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| 6S8 | LAUREL MUNICIPALCIPAL | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 7S0 | RONAN | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BIL | BILLINGS LOGAN INTL | MT | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BTM | BERT MOONEY | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BZN | GALLATIN FIELD | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GDV | DAWSON COMMUNICIPALTY | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GGW | WOKAL FIELD/GLASGOW INTL | MT | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |

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|---|---|---|---|---|---|---|---|---|---|
| GPI | GLACIER PARK INTL | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GTF | GREAT FALLS INTL | MT | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HLN | HELENA RGNL | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HVR | HAVRE CITY-COUNTY | MT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| LVM | MISSION FIELD | MT | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| LWT | LEWISTOWN MUNICIPAL | MT | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| M75 | MALTA | MT | LP | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| MLS | FRANK WILEY FIELD | MT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| MSO | MISSOULA INTL | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OLF | L M CLAYTON | MT | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| PWD | SHER-WOOD | MT | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| RPX | ROUNDUP | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SBX | SHELBY | MT | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| SDY | SIDNEY-RICHLAND MUNICIPAL | MT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| WYS | YELLOWSTONE | MT | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CYCL | CHARLO | NB | LPV | 0 | 1 | 0 | 1 | 3 | 0.999936 |
| CYQM | MONCTON INTL | NB | LPV | 0 | 1 | 0 | 1 | 2 | 0.999947 |
| AFP | ANSON COUNTY-JEFF CLOUD FLD | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| AKH | GASTONIA MUNICIPAL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| AVL | ASHEVILLE RGNL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| BUY | BURLINGTON-ALAMANCE RGNL | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| CLT | CHARLOTTE/DOUGLAS INTL | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| CTZ | CLINTON-SAMPSON COUNTY | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| DPL | DUPLIN COUNTY | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999966 |
| ECG | ELIZABETH CITY CG AIR STATION/RGNL | NC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EDE | NORTHEASTERN RGNL | NC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| EHO | SHELBY-CLEVELAND COUNTY RGNL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| EQY | MONROE RGNL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| EWN | COASTAL CAROLINA RGNL | NC | LPV | 0 | 1 | 0 | 1 | 2 | 0.999977 |
| EXX | DAVIDSON COUNTY | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| EYF | CURTIS L BROWN JR FIELD | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999966 |
| FAY | FAYETTEVILLE RGNL/GRANNIS FIELD | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| FQD | RUTHERFORD CO/MARCHMAN FIELD | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| GSO | PIEDMONT TRIAD INTL | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999966 |
| GWW | WAYNE EXECUTIVE JETPORT | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| HKY | HICKORY RGNL | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| HNZ | HENDERSON-OXFORD | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999947 |
| HRJ | HARNETT COUNTY | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| ILM | WILMINGTON INTL | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| INT | SMITH REYNOLDS | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999966 |
| IPJ | LINCOLNTON-LINCOLN COUNTY RGNL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999985 |

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|---|---|---|---|---|---|---|---|---|---|
| ISO | KINSTON REGL JETPORT AT STALLINGS FLD | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| IXA | HALIFAX-NORTHAMPTON RGNL | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999928 |
| JNX | JOHNSTON COUNTY | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| JQF | CONCORD RGNL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| LBT | LUMBERTON MUNICIPAL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| LHZ | TRIANGLE NORTH EXECUTIVE | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| MEB | LAURINBURG-MAXTON | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| MQI | DARE COUNTY RGNL | NC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MRH | MICHAEL J. SMITH FIELD | NC | LPV | 0 | 1 | 0 | 1 | 2 | 0.999992 |
| MRN | FOOTHILLS RGNL | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| MWK | MOUNT AIRY/SURRY COUNTY | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| OAJ | ALBERT J ELLIS | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| OCW | WARREN FIELD | NC | LPV | 0 | 1 | 0 | 1 | 2 | 0.999958 |
| ONX | CURRITUCK COUNTY RGNL | NC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PGV | PITT-GREENVILLE | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999955 |
| PMZ | PLYMOUTH MUNICIPAL | NC | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| RCZ | RICHMOND COUNTY | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| RDU | RALEIGH-DURHAM INTL | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| RUQ | ROWAN COUNTY | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| RWI | ROCKY MOUNT-WILSON RGNL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999940 |
| SOP | MOORE COUNTY | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| SUT | CAPE FEAR RGNL JETPORT/HOWIE FRANKLIN FLD | NC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SVH | STATESVILLE RGNL | NC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| TDF | PERSON COUNTY | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999955 |
| TTA | RALEIGH EXEC AT SANFORD-LEE COUNTY | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| VUJ | STANLY COUNTY | NC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| 2C8 | CAVALIER MUNICIPAL | ND | LPV | 0 | 1 | 0 | 1 | 1 | 0.999947 |
| 5N8 | CASSELTON ROBERT MILLER RGNL | ND | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BAC | BARNES COUNTY MUNICIPAL | ND | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BIS | BISMARCK MUNICIPAL | ND | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BWP | HARRY STERN | ND | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| D09 | BOTTINEAU MUNICIPAL | ND | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| D55 | ROBERTSON FIELD | ND | LPV | 0 | 1 | 0 | 1 | 1 | 0.999936 |
| D60 | TIOGA MUNICIPAL | ND | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DIK | DICKINSON-THEODORE ROOSEVELT RGNL | ND | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DVL | DEVILS LAKE RGNL | ND | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| FAR | HECTOR INTL | ND | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GAF | HUTSON FIELD | ND | LPV | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| GFK | GRAND FORKS INTL | ND | LPV | 0 | 1 | 0 | 1 | 1 | 0.999955 |
| GWR | GWINNER-ROGER MELROE FIELD | ND | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| HZE | MERCER COUNTY RGNL | ND | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ISN | SLOULIN FLD INTL | ND | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| JMS | JAMESTOWN RGNL | ND | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MOT | MINOT INTL | ND | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RUG | RUGBY MUNICIPAL | ND | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| S25 | WATFORD CITY MUNICIPAL | ND | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 07K | CENTRAL CITY MUNICIPAL-LARRY REINEKE FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 0B4 | HARTINGTON MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 0C4 | PENDER MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 0V3 | PIONEER VILLAGE FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 12K | SUPERIOR MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 4V9 | ANTELOPE COUNTY | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 6K3 | CREIGHTON MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 7V7 | RED CLOUD MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 8V2 | STUART-ATKINSON MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 93Y | DAVID CITY MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 9V5 | MODISETT | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AFK | NEBRASKA CITY MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AHQ | WAHOO MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AIA | ALLIANCE MUNICIPAL | NE | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ANW | AINSWORTH MUNICIPAL | NE | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AUH | AURORA MUNICIPALCIPAL - AL POTTER FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BBW | BROKEN BOW MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BFF | WESTERN NEB. RGNL/WILLIAM B. HEILIG FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BIE | BEATRICE MUNICIPAL | NE | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BVN | ALBION MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CDR | CHADRON MUNICIPAL | NE | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CEK | CRETE MUNICIPALCIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CZD | COZAD MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EAR | KEARNEY RGNL | NE | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FBY | FAIRBURY MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FET | FREMONT MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FMZ | FAIRMONT STATE AIRFIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FNB | BRENNER FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GGF | GRANT MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GRI | CENTRAL NEBRASKA RGNL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GRN | GORDON MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HDE | BREWSTER FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HSI | HASTINGS MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IBM | KIMBALL MUNICIPAL/ROBERT E ARRAJ FI | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IML | IMPERIAL MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JYR | YORK MUNICIPALCIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| LBF | NORTH PLATTE RGNL AIRPORT LEE BIRD FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LCG | WAYNE MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LNK | LINCOLN | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LXN | JIM KELLY FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MCK | MCCOOK RGNL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MLE | MILLARD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ODX | EVELYN SHARP FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OFK | KARL STEFAN MEMORIAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OGA | SEARLE FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OKS | GARDEN COUNTY | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OLU | COLUMBUS MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OMA | EPPLEY AIRFIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ONL | THE O'NEILL MUNICIPAL-JOHN L BAKER FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PMV | PLATTSMOUTH MUNICIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RBE | ROCK COUNTY | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SNY | SIDNEY MUNICIPAL/LLOYD W. CARR FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SWT | SEWARD MUNICIPALCIPAL | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TIF | THOMAS COUNTY | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VTN | MILLER FIELD | NE | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ASH | BOIRE FLD | NH | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| CNH | CLAREMONT MUNICIPAL | NH | LP | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| CON | CONCORD MUNICIPAL | NH | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| DAW | SKYHAVEN | NH | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| EEN | DILLANT-HOPKINS | NH | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| HIE | MOUNT WASHINGTON RGNL | NH | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| LCI | LACONIA MUNICIPAL | NH | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| LEB | LEBANON MUNICIPAL | NH | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| MHT | MANCHESTER | NH | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| PSM | PORTSMOUTH INTL AT PEASE | NH | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| 39N | PRINCETON | NJ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 47N | CENTRAL JERSEY RGNL | NJ | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 4N1 | GREENWOOD LAKE | NJ | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ACY | ATLANTIC CITY INTL | NJ | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CDW | ESSEX COUNTY | NJ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EWR | NEWARK LIBERTY INTL | NJ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MIV | MILLVILLE MUNICIPAL | NJ | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MMU | MORRISTOWN MUNICIPAL | NJ | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| N14 | FLYING W | NJ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| N40 | SKY MANOR | NJ | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| TEB | TETERBORO | NJ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TTN | TRENTON MERCER | NJ | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| VAY | SOUTH JERSEY RGNL | NJ | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| WWD | CAPE MAY COUNTY | NJ | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYDF | DEER LAKE | NL | LPV | 0 | 1 | 8 | 0.999785 | 303 | 0.971479 |

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|---|---|---|---|---|---|---|---|---|---|
| ABQ | ALBUQUERQUE INTL SUNPORT | NM | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CNM | CAVERN CITY AIR TRML | NM | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| CVN | CLOVIS MUNICIPAL | NM | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DMN | DEMING MUNICIPAL | NM | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| FMN | FOUR CORNERS RGNL | NM | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HOB | LEA COUNTY RGNL | NM | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LAM | LOS ALAMOS | NM | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ONM | SOCORRO MUNICIPAL | NM | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ROW | ROSWELL INTL AIR CENTER | NM | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SRR | SIERRA BLANCA RGNL | NM | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SVC | GRANT COUNTY | NM | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| CYHZ | HALIFAX / STANFIELD INTL | NS | LPV | 0 | 1 | 0 | 1 | 2 | 0.999940 |
| CYEV | INUVIK | NT | LPV | 0 | 1 | 0 | 1 | 24 | 0.999838 |
| ELY | ELY ARPT-YELLAND FLD | NV | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LAS | MC CARRAN INTL | NV | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RNO | RENO/TAHOE INTL | NV | LPV | 0 | 1 | 0 | 1 | 14 | 0.999906 |
| RTS | RENO/STEAD | NV | LPV | 0 | 1 | 0 | 1 | 14 | 0.999868 |
| TPH | TONOPAH | NV | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| WMC | WINNEMUCCA MUNICIPAL | NV | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 06N | RANDALL | NY | LP | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| 1B1 | COLUMBIA COUNTY | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| 44N | SKY ACRES | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| 4B6 | TICONDEROGA MUNICIPAL | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999966 |
| 5B2 | SARATOGA COUNTY | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| 5G0 | LE ROY | NY | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 7G0 | LEDGEDALE AIRPARK | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 9G0 | BUFFALO AIRFIELD | NY | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ALB | ALBANY INTL | NY | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| ART | WATERTOWN INTL | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BGM | GREATER BINGHAMTON/EDWIN A LINK FIELD | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BUF | BUFFALO NIAGARA INTL | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| D38 | CANANDAIGUA | NY | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ELM | ELMIRA/CORNING RGNL | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ELZ | WELLSVILLE MUNICIPAL ARPT | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FOK | FRANCIS S. GABRESKI | NY | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| FRG | REPUBLIC | NY | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| FZY | OSWEGO COUNTY | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GFL | FLOYD BENNETT MEMORIAL | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| GVQ | BATAVIA | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HPN | WESTCHESTER COUNTY | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| HTF | HORNELL MUNICIPAL | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HTO | EAST HAMPTON | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| HWV | BROOKHAVEN | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| IAG | NIAGARA FALLS INTL | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ISP | LONG ISLAND MAC ARTHUR | NY | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999989 |

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|---|---|---|---|---|---|---|---|---|---|
| ITH | ITHACA TOMPKINS RGNL | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JFK | JOHN F KENNEDY INTL | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| JHW | CHAUTAUQUA COUNTY/JAMESTOWN | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| K09 | PISECO | NY | LP | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| LGA | LA GUARDIA | NY | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| MAL | MALONE-DUFORT | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MGJ | ORANGE COUNTY | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| MSS | MASSENA INTL-RICHARDS FIELD | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| MSV | SULLIVAN COUNTY INTL | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| N66 | ONEONTA MUNICIPAL | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| NY0 | FULTON COUNTY | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| OGS | OGDENSBURG INTL | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| OLE | CATTARAUGUS COUNTY-OLEAN | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PBG | PLATTSBURGH INTL | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| PEO | PENN YAN | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| POU | DUTCHESS COUNTY | NY | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| RME | GRIFFISS INTL | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ROC | GREATER ROCHESTER INTL | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SCH | SCHENECTADY COUNTY | NY | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| SDC | WILLIAMSON-SODUS | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SLK | ADIRONDACK RGNL | NY | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| SWF | STEWART INTL | NY | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| SYR | SYRACUSE HANCOCK INTL | NY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| VGC | HAMILTON MUNICIPAL | NY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 0G6 | WILLIAMS COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 16G | SENECA COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 1G0 | WOOD COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 1G3 | KENT STATE UNIV | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 4I3 | KNOX COUNTY | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 6G5 | BARNESVILLE-BRADFIELD | OH | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| AOH | LIMA ALLEN COUNTY | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AXV | NEIL ARMSTRONG | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BJJ | WAYNE COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BKL | BROOKHAVEN | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CAK | AKRON-CANTON RGNL | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CGF | CUYAHOGA COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CLE | CLEVELAND-HOPKINS INTL | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CMH | PORT COLUMBUS INTL | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CQA | LAKEFIELD | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CXY | CAPITAL CITY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DAY | JAMES M COX DAYTON INTL | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DLZ | DELAWARE MUNICIPAL | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EDJ | BELLEFONTAINE RGNL | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FDY | FINDLAY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| FZI | FOSTORIA METROPOLITAN | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GQQ | GALION MUNICIPAL | OH | LP | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| HAO | BUTLER CO RGNL | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HZY | ASHTABULA COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| I19 | GREENE COUNTY-LEWIS A JACKSON RGNL | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| I66 | CLINTON FIELD | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| I68 | LEBANON-WARREN COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| I69 | CLERMONT COUNTY | OH | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| I74 | GRIMES FIELD | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ILN | AIRBORNE AIRPARK | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LCK | RICKENBACKER INTL | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LHQ | FAIRFIELD COUNTY | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LNN | WILLOUGHBY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LPR | LORAIN COUNTY RGNL | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LUK | CINCINNATI MUNICIPAL AIRPORT-LUNKEN FIELD | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MFD | MANSFIELD LAHM RGNL | OH | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| MGY | DAYTON-WRIGHT BROTHERS | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MNN | MARION MUNICIPAL | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MRT | UNION COUNTY | OH | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| MWO | MIDDLETOWN REGIONAL/HOOK FIELD | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OSU | OHIO STATE UNIVERSITY | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| OWX | PUTNAM COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OXD | MIAMI UNIVERSITY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PCW | CARL R KELLER FIELD | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PHD | HARRY CLEVER FIELD | OH | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| PMH | GREATER PORTSMOUTH RGNL | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RZT | ROSS COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| S24 | SANDUSKY COUNTY RGNL | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SGH | SPRINGFIELD-BECKLEY MUNICIPAL | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TDZ | TOLEDO EXECUTIVE | OH | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| TOL | TOLEDO EXPRESS | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TSO | CARROLL COUNTY-TOLSON | OH | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| TZR | BOLTON FIELD | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| UNI | OHIO UNIVERSITY SNYDER FIELD | OH | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| USE | FULTON COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UYF | MADISON COUNTY | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| YNG | YOUNGSTOWN/WARREN RGNL | OH | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 1F0 | ARDMORE DOWNTOWN EXECUTIVE | OK | LP | 0 | 1 | 0 | 1 | 12 | 0.999868 |
| 80F | ANTLERS MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 47 | 0.999264 |
| ADH | ADA MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 20 | 0.999619 |
| ADM | ARDMORE MUNICIPAL | OK | LPV200 | 0 | 1 | 0 | 1 | 15 | 0.999823 |
| AXS | ALTUS/QUARTZ MOUNTAIN | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| | RGNL | | | | | | | | |
| BKN | BLACKWELL-TONKAWA MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| BVO | BARTLESVILLE MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CHK | CHICKASHA MUNICIPAL | OK | LPV200 | 0 | 1 | 0 | 1 | 2 | 0.999974 |
| CLK | CLINTON RGNL | OK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CSM | CLINTON-SHERMAN | OK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DUA | EAKER FIELD | OK | LPV | 0 | 1 | 0 | 1 | 37 | 0.999336 |
| DUC | HALLIBURTON FIELD | OK | LPV | 0 | 1 | 0 | 1 | 2 | 0.999977 |
| ELK | ELK CITY RGNL BUSINESS | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| F22 | PERRY MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 5 | 0.999917 |
| FDR | FREDERICK RGNL | OK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GCM | CLAREMORE RGNL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GMJ | GROVE MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GOK | GUTHRIE-EDMOND RGNL | OK | LPV | 0 | 1 | 0 | 1 | 5 | 0.999928 |
| GUY | GUYMON MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GZL | STIGLER RGNL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HBR | HOBART MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HSD | SUNDANCE AIRPARK | OK | LPV | 0 | 1 | 0 | 1 | 2 | 0.999966 |
| MKO | DAVIS FIELD | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MLC | MC ALESTER RGNL | OK | LPV | 0 | 1 | 0 | 1 | 44 | 0.999185 |
| OKC | WILL ROGERS WORLD | OK | LPV200 | 0 | 1 | 0 | 1 | 2 | 0.999951 |
| OKM | OKMULGEE RGNL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OUN | UNIVERSITY OF OKLAHOMA WESTHEIMER | OK | LPV200 | 0 | 1 | 0 | 1 | 4 | 0.999932 |
| OWP | WILLIAM R. POGUE MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PNC | PONCA CITY RGNL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PVJ | PAULS VALLEY MUNICIPAL | OK | LPV200 | 0 | 1 | 0 | 1 | 8 | 0.999875 |
| PWA | WILEY POST | OK | LPV200 | 0 | 1 | 0 | 1 | 3 | 0.999955 |
| RCE | CLARENCE E. PAGE MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 2 | 0.999974 |
| RVS | RICHARD LLOYD JONES JR | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SNL | SHAWNEE RGNL | OK | LPV200 | 0 | 1 | 0 | 1 | 11 | 0.999804 |
| SWO | STILLWATER RGNL | OK | LPV | 0 | 1 | 0 | 1 | 7 | 0.999860 |
| TQH | TAHLEQUAH MUNICIPAL | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TUL | TULSA INTL | OK | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| WDG | ENID WOODRING RGNL | OK | LPV200 | 0 | 1 | 0 | 1 | 2 | 0.999974 |
| WWR | WEST WOODWARD | OK | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CNS7 | KINCARDINE | ON | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| CYHD | DRYDEN REGIONAL | ON | LPV | 0 | 1 | 0 | 1 | 1 | 0.999785 |
| CYKF | KITCHENER / WATERLOO | ON | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| CYOW | OTTAWA / MACDONALDCARTIER INTL | ON | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| CYQT | THUNDER BAY | ON | LPV | 0 | 1 | 0 | 1 | 2 | 0.999638 |
| CYTS | TIMMINS / VICTOR M POWER | ON | LPV | 0 | 1 | 0 | 1 | 1 | 0.999887 |
| CYXL | SIOUX LOOKOUT | ON | LPV | 0 | 1 | 0 | 1 | 1 | 0.999672 |
| AST | ASTORIA RGNL | OR | LPV | 0 | 1 | 0 | 1 | 3 | 0.999902 |

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|---|---|---|---|---|---|---|---|---|---|
| BDN | BEND MUNICIPAL | OR | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| CVO | CORVALLIS MUNICIPAL | OR | LPV200 | 0 | 1 | 0 | 1 | 7 | 0.999872 |
| EUG | MAHLON SWEET FIELD | OR | LPV200 | 0 | 1 | 0 | 1 | 14 | 0.999860 |
| GCD | GRANT CO RGNL/OGILVIE FIELD | OR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HIO | PORTLAND-HILLSBORO | OR | LPV200 | 0 | 1 | 0 | 1 | 3 | 0.999940 |
| LGD | LA GRANDE/UNION COUNTY | OR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LMT | KLAMATH FALLS | OR | LPV | 0 | 1 | 0 | 1 | 2 | 0.999977 |
| MMV | MCMINNVILLE MUNICIPAL | OR | LPV | 0 | 1 | 0 | 1 | 5 | 0.999921 |
| ONO | ONTARIO MUNICIPAL | OR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PDT | EASTERN OREGON RGNL AT PENDLETON | OR | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PDX | PORTLAND INTL | OR | LPV200 | 0 | 1 | 0 | 1 | 3 | 0.999958 |
| RDM | ROBERTS FIELD | OR | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| S33 | MADRAS MUNICIPALCIPAL | OR | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SLE | MCNARY FLD | OR | LPV200 | 0 | 1 | 0 | 1 | 5 | 0.999917 |
| SPB | SCAPPOOSE INDUSTRIAL AIRPARK | OR | LPV | 0 | 1 | 0 | 1 | 3 | 0.999943 |
| UAO | AURORA STATE | OR | LPV | 0 | 1 | 0 | 1 | 3 | 0.999951 |
| 22N | JAKE ARNER MEMORIAL | PA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 2G9 | SOMERSET COUNTY | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 8G2 | CORRY-LAWRENCE | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 8N8 | DANVILLE | PA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 9D4 | DECK | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ABE | LEHIGH VALLEY INTL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AFJ | WASHINGTON COUNTY | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AGC | ALLEGHENY COUNTY | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AOO | ALTOONA-BLAIR COUNTY | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AVP | WILKES-BARRE/SCRANTON INTL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AXQ | CLARION COUNTY | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BFD | BRADFORD RGNL | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BTP | BUTLER COUNTY/K W SCHOLTER FLD | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BVI | BEAVER FALLS MUNICIPAL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DUJ | DUBOIS RGNL | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ERI | ERIE INTL/TOM RIDGE FIELD | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FIG | CLEARFIELD-LAWRENCE | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FKL | VENANGO RGNL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FWQ | ROSTRAVER | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GKJ | PORT MEADVILLE | PA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| HMZ | BEDFORD COUNTY | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HZL | HAZLETON MUNICIPAL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IPT | WILLIAMSPORT RGNL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JST | JOHN MURTHA JOHNSTOWN-CAMBRIA COUNTY | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LBE | ARNOLD PALMER RGNL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LNS | LANCASTER | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| LOM | WINGS FIELD | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MDT | HARRISBURG INTL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MPO | POCONO MOUNTAINS MUNICIPAL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MQS | CHESTER COUNTY G O CARLSON | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| N38 | WELLSBORO JOHNSTON | PA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| N79 | NORTHUMBERLAND COUNTY | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OYM | ST MARYS MUNICIPAL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PHL | PHILADELPHIA INTL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PIT | PITTSBURGH INTL | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PNE | NORTHEAST PHILADELPHIA | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PSB | MID STATE | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RDG | READING RGNL/CARL A SPAATZ FLD | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RVL | MIFFLIN COUNTY | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| THV | YORK | PA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| UCP | NEW CASTLE MUNICIPAL | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UKT | QUAKERTOWN | PA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| UNV | UNIVERSITY PARK | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| VVS | JOSEPH A. HARDY CONNELLSVILLE | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| WAY | GREENE COUNTY | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| WBW | WILKES-BARRE WYOMING VALLEY | PA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| XLL | ALLENTOWN-QUEEN CITY MUNICIPAL | PA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ZER | SCHUYLKILL COUNTY/JOE ZERBEY | PA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CPN8 | OPINACA | QC | LPV | 0 | 1 | 1 | 0.999789 | 1 | 0.999713 |
| CSR3 | VICTORIAVILLE | QC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| CTP9 | KATTINIQ / DONALDSON | QC | LPV | 0 | 1 | 3 | 0.999909 | 37 | 0.996358 |
| CYEY | AMOS | QC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999898 |
| CYHU | MONTREAL / STHUBERT | QC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| CYIF | STAUGUSTIN | QC | LPV | 0 | 1 | 1 | 0.999977 | 75 | 0.996698 |
| CYMX | MONTREAL (MIRABEL INTL) | QC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| CYQB | QUEBEC / JEAN LESAGE INTL | QC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| CYRI | RIVIEREDULOUP | QC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| CYRQ | TROISRIVIERES | QC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| CYVB | BONAVENTURE | QC | LPV | 0 | 1 | 0 | 1 | 3 | 0.999932 |
| CYVP | KUUJJUAQ | QC | LPV | 0 | 1 | 0 | 1 | 28 | 0.998053 |
| CYYY | MONTJOLI | QC | LPV | 0 | 1 | 0 | 1 | 3 | 0.999928 |
| BID | BLOCK ISLAND STATE | RI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| OQU | QUONSET STATE | RI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| PVD | THEODORE FRANCIS GREEN STATE | RI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| 6J0 | LEXINGTON COUNTY AT PELION | SC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| AIK | AIKEN MUNICIPAL | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AND | ANDERSON RGNL | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ARW | BEAUFORT COUNTY | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BBP | MARLBORO COUNTY JETPORT-H E AVENT FIELD | SC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| BNL | BARNWELL RGNL | SC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CAE | COLUMBIA METROPOLITAN | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CDN | WOODWARD FIELD | SC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CEU | OCONEE COUNTY RGNL | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CHS | CHARLESTON AFB/INTL | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CRE | GRAND STRAND | SC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| DCM | CHESTER CATAWBA RGNL | SC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DYB | SUMMERVILLE | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FDW | FAIRFIELD COUNTY | SC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FLO | FLORENCE RGNL | SC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| GGE | GEORGETOWN COUNTY | SC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| GMU | GREENVILLE DOWNTOWN | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GSP | GREENVILLE-SPARTANBURG INTL - ROGER MILLIKEN | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GYH | DONALDSON CENTER | SC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HYW | CONWAY-HORRY COUNTY | SC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999981 |
| JZI | CHARLESTON EXECUTIVE | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LKR | LANCASTER COUNTY-MC WHIRTER FIELD | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LQK | PICKENS COUNTY | SC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LRO | MT PLEASANT RGNL-FAISON FIELD | SC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| MKS | BERKELEY COUNTY | SC | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MYR | MYRTLE BEACH INTL | SC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| OGB | ORANGEBURG MUNICIPAL | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RBW | LOWCOUNTRY RGNL | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SMS | SUMTER | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SPA | SPARTANBURG DOWNTOWN MEMORIAL | SC | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| UDG | DARLINGTON COUNTY JETPORT | SC | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| UZA | ROCK HILL/YORK CO/BRYANT FIELD | SC | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| 0D8 | GETTYSBURG MUNICIPAL | SD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 49B | STURGIS MUNICIPAL | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 9D1 | GREGORY MUNICIPAL - FLYNN FIELD | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ABR | ABERDEEN RGNL | SD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ATY | WATERTOWN RGNL | SD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BKX | BROOKINGS RGNL | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EFC | BELLE FOURCHE MUNICIPAL | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FSD | JOE FOSS FIELD | SD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HON | HURON RGNL | SD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| HSR | HOT SPRINGS MUNICIPAL | SD | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ICR | WINNER RGNL | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MBG | MOBRIDGE MUNICIPAL | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MDS | MADISON MUNICIPAL | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MHE | MITCHELL MUNICIPAL | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MKA | MILLER MUNICIPAL | SD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PIR | PIERRE RGNL | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RAP | RAPID CITY RGNL | SD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SPF | BLACK HILLS-CLYDE ICE FIELD | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VMR | HAROLD DAVIDSON FIELD | SD | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| YKN | CHAN GURNEY MUNICIPAL | SD | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CKQ8 | MCARTHUR RIVER | SK | LPV | 0 | 1 | 0 | 1 | 1 | 0.999872 |
| CYKJ | KEY LAKE | SK | LPV | 0 | 1 | 0 | 1 | 1 | 0.999913 |
| 0A3 | SMITHVILLE MUNICIPAL | TN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 0M3 | JOHN A BAKER | TN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 0M4 | BENTON COUNTY | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 0M5 | HUMPHREYS COUNTY | TN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 1A3 | MARTIN CAMPBELL FIELD | TN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 1M5 | PORTLAND MUNICIPAL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 2A0 | MARK ANTON | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 2M8 | CHARLES W. BAKER | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 3M7 | LAFAYETTE MUNICIPAL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BGF | WINCHESTER MUNICIPAL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BNA | NASHVILLE INTL | TN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CHA | LOVELL FIELD | TN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CKV | OUTLAW FIELD | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CSV | CROSSVILLE MEMORIAL-WHITSON FIELD | TN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DKX | KNOXVILLE DOWNTOWN ISLAND | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DYR | DYERSBURG RGNL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FYE | FAYETTE CO | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FYM | FAYETTEVILLE MUNICIPAL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GKT | GATLINBURG-PIGEON FORGE | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GZS | ABERNATHY FIELD | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HZD | CARROLL COUNTY | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JWN | JOHN C. TUNE | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LUG | ELLINGTON | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M01 | GENERAL DEWITT SPAIN | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M33 | SUMNER COUNTY RGNL | TN | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| M54 | LEBANON MUNICIPAL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| M91 | SPRINGFIELD ROBERTSON COUNTY | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MBT | MURFREESBORO MUNICIPAL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MEM | MEMPHIS INTL | TN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MKL | MC KELLAR-SIPES RGNL | TN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| MMI | MCMINN COUNTY | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MOR | MOORE-MURRELL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MQY | SMYRNA | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MRC | MAURY COUNTY | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| NQA | MILLINGTON RGNL JETPORT | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PHT | HENRY COUNTY | TN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PVE | BEECH RIVER RGNL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RKW | ROCKWOOD MUNICIPAL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SNH | SAVANNAH-HARDIN COUNTY | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SRB | UPPER CUMBERLAND RGNL | TN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SYI | BOMAR FIELD-SHELBYVILLE MUNICIPAL | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SZY | ROBERT SIBLEY | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| THA | TULLAHOMA RGNL/WM NORTHERN FLD | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TRI | TRI-CITIES RGNL TN/VA | TN | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| TYS | MCGHEE-TYSON | TN | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| UCY | EVERETT-STEWART RGNL | TN | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 11R | BRENHAM MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 2F5 | LAMESA MUNICIPAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 2R9 | KARNES COUNTY | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 3T5 | FAYETTE RGNL AIR CENTER | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 45R | HAWTHORNE FIELD | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 50R | LOCKHART MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 5C1 | BOERNE STAGE FIELD | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 5T9 | MAVERICK COUNTY MEMORIAL INTL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 6R3 | CLEVELAND MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 77F | WINTERS MUNICIPAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 8F3 | CROSBYTON MUNICIPALCIPAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ABI | ABILENE RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ACT | WACO RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ADS | ADDISON | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AFW | FORT WORTH ALLIANCE | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ALI | ALICE INTL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AMA | RICK HUSBAND AMARILLO INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ARM | WHARTON RGNL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ASL | HARRISON COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AUS | AUSTIN-BERGSTROM INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AXH | HOUSTON-SOUTHWEST | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BAZ | NEW BRAUNFELS MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BBD | CURTIS FIELD | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BKD | STEPHENS COUNTY | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| BPG | BIG SPRING MC MAHON-WRINKLE | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BPT | SOUTHEAST TEXAS RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| BRO | BROWNSVILLE/SOUTH PADRE ISLAND INTL | TX | LP | 1 | 0.999872 | 1 | 0.999872 | 2 | 0.999713 |
| BWD | BROWNWOOD RGNL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BYY | BAY CITY MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CFD | COULTER FIELD | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CLL | EASTERWOOD FIELD | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CNW | TSTC WACO | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| COM | COLEMAN MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CRP | CORPUS CHRISTI INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| CXO | LONE STAR EXECUTIVE | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DAL | DALLAS LOVE FIELD | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DFW | DALLAS-FT WORTH INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DKR | HOUSTON COUNTY | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| DRT | DEL RIO INTL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DTO | DENTON MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DUX | MOORE COUNTY | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DWH | DAVID WAYNE HOOKS MEMORIAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| E01 | ROY HURD MEMORIAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| E11 | ANDREWS COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| E19 | GRUVER MUNICIPAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| E30 | BRUCE FIELD | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| E38 | ALPINE-CASPARIS MUNICIPALCIPAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| EBG | EDINBURG INTL | TX | LPV | 0 | 1 | 0 | 1 | 2 | 0.999921 |
| EDC | AUSTIN EXECUTIVE | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| EFD | ELLINGTON FIELD | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ELA | EAGLE LAKE | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ELP | EL PASO INTL | TX | LP | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| ERV | KERRVILLE MUNICIPAL/LOUIS SCHREINER FLD | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ETN | EASTLAND MUNICIPAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| F00 | JONES FIELD | TX | LPV | 0 | 1 | 0 | 1 | 37 | 0.999460 |
| F05 | WILBARGER COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FST | FT. STOCKTON-PECOS COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FTW | FORT WORTH MEACHAM INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FWS | FORT WORTH SPINKS | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GDJ | GRANBURY RGNL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GGG | EAST TEXAS RGNL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GKY | ARLINGTON MUNICIPAL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GLE | GAINESVILLE MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 14 | 0.999932 |
| GLS | SCHOLES INTL AT GALVESTON | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GNC | GAINES COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GRK | ROBERT GRAY AAF | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| GVT | MAJORS | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GYI | NORTH TEXAS RGNL/PERRIN FIELD | TX | LPV200 | 0 | 1 | 0 | 1 | 32 | 0.999683 |

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|---|---|---|---|---|---|---|---|---|---|
| HBV | JIM HOGG COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| HDO | HONDO MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HOU | WILLIAM P HOBBY | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HQZ | MESQUITE METRO | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HRL | VALLEY INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 2 | 0.999713 |
| HRX | HEREFORD MUNICIPAL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| IAH | GEORGE BUSH INTERCONTINENTAL/HOUSTON | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| IKG | KLEBERG COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| INJ | HILLSBORO MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| IWS | WEST HOUSTON | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| JAS | JASPER COUNTY-BELL FIELD | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JSO | CHEROKEE COUNTY | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| JWY | MID-WAY RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LBB | LUBBOCK PRESTON SMITH INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LBX | BRAZORIA COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LFK | ANGELINA COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LHB | HEARNE MUNICIPAL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LLN | LEVELLAND MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LNC | LANCASTER | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LRD | LAREDO INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| LUD | DECATUR MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LVJ | PEARLAND RGNL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LXY | MEXIA-LIMESTONE CO | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| MAF | MIDLAND INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MDD | MIDLAND AIRPARK | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MFE | MC ALLEN MILLER INTL | TX | LPV | 0 | 1 | 0 | 1 | 2 | 0.999906 |
| MNZ | HAMILTON MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OCH | A L MANGHAM JR RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ODO | ODESSA-SCHLEMEYER FIELD | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ONY | OLNEY MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ORG | ORANGE COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PEQ | PECOS MUNICIPAL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PIL | PORT ISABEL-CAMERON COUNTY | TX | LPV | 1 | 0.999906 | 1 | 0.999906 | 2 | 0.999713 |
| PPA | PERRY LEFORS FIELD | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PRX | COX FIELD | TX | LPV | 0 | 1 | 0 | 1 | 22 | 0.999917 |
| PSX | PALACIOS MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PVW | HALE COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RAS | MUSTANG BEACH | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RBD | DALLAS EXECUTIVE | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RBO | NUECES COUNTY | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| RKP | ARANSAS COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RYW | LAGO VISTA TX - RUSTY ALLEN | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| SAT | SAN ANTONIO INTL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |

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|---|---|---|---|---|---|---|---|---|---|
| SGR | SUGAR LAND RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SJT | SAN ANGELO RGNL/MATHIS FLD | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SLR | SULPHUR SPRINGS MUNICIPAL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SNK | WINSTON FIELD | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SWW | AVENGER FIELD | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| T41 | LA PORTE MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| T59 | WHEELER MUNICIPAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| T78 | LIBERTY MUNICIPAL | TX | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| T82 | GILLESPIE COUNTY | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TFP | T P MC CAMPBELL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TKI | COLLIN COUNTY RGNL AT MC KINNEY | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TME | HOUSTON EXECUTIVE | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TPL | DRAUGHON-MILLER CENTRAL TEXAS RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| TRL | TERRELL MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| TYR | TYLER POUNDS RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| UTS | HUNTSVILLE MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VCT | VICTORIA RGNL | TX | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| XBP | BRIDGEPORT MUNICIPAL | TX | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BCE | BRYCE CANYON | UT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BDG | BLANDING MUNICIPAL | UT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BMC | BRIGHAM CITY | UT | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| DTA | DELTA MUNICIPAL | UT | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| ENV | WENDOVER | UT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FOM | FILLMORE MUNICIPAL | UT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LGU | LOGAN-CACHE | UT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OGD | OGDEN-HINCKLEY | UT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PUC | CARBON COUNTY RGNL/BUCK DAVIS FIELD | UT | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| PVU | PROVO MUNICIPAL | UT | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SGU | ST GEORGE MUNICIPAL | UT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SLC | SALT LAKE CITY INTL | UT | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| U14 | NEPHI MUNICIPAL | UT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| U55 | PANGUITCH MUNICIPAL | UT | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| VEL | VERNAL | UT | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 0VG | LEE COUNTY | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 8W2 | NEW MARKET | VA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| AVC | MECKLENBURG-BRUNSWICK RGNL | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999932 |
| BCB | VIRGINIA TECH/MONTGOMERY EXECUTIVE | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999936 |
| CHO | CHARLOTTESVILLE-ALBEMARLE | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CJR | CULPEPER RGNL | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CPK | CHESAPEAKE RGNL | VA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DAN | DANVILLE RGNL | VA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999947 |

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|---|---|---|---|---|---|---|---|---|---|
| EMV | EMPORIA-GREENSVILLE RGNL | VA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| FCI | CHESTERFIELD COUNTY | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FKN | FRANKLIN MUN-JOHN BEVERLY ROSE | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FVX | FARMVILLE RGNL | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FYJ | MIDDLE PENINSULA RGNL | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HLX | TWIN COUNTY | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| HSP | INGALLS FIELD | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999913 |
| HWY | WARRENTON-FAUQUIER | VA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| JFZ | TAZEWELL COUNTY | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999989 |
| JYO | LEESBURG EXECUTIVE | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LKU | LOUISA COUNTY/FREEMAN FIELD | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LNP | LONESOME PINE | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LUA | LURAY CAVERNS | VA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| LYH | LYNCHBURG RGNL/PRESTON GLENN FLD | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999928 |
| MFV | ACCOMACK COUNTY | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| MKJ | MOUNTAIN EMPIRE | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| MTV | BLUE RIDGE | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| OFP | HANOVER COUNTY MUNICIPAL | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OKV | WINCHESTER RGNL | VA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ORF | NORFOLK INTL | VA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PHF | NEWPORT NEWS/WILLIAMSBURG INTL | VA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PSK | NEW RIVER VALLEY | VA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999962 |
| PTB | DINWIDDIE COUNTY | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RIC | RICHMOND INTL | VA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RMN | STAFFORD RGNL | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ROA | ROANOKE RGNL/WOODRUM FIELD | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999932 |
| SFQ | SUFFOLK EXECUTIVE | VA | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| SHD | SHENANDOAH VALLEY RGNL | VA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| VJI | VIRGINIA HIGHLANDS | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| W63 | MARKS MUNICIPAL | VA | LP | 0 | 1 | 0 | 1 | 1 | 0.999940 |
| W78 | WILLIAM M TUCK | VA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999940 |
| XSA | TAPPAHANNOCK-ESSEX COUNTY | VA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BTV | BURLINGTON INTL | VT | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999966 |
| FSO | FRANKLIN COUNTY STATE | VT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| MPV | EDWARD F KNAPP STATE | VT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| RUT | RUTLAND-SOUTHERN VERMONT RGNL | VT | LPV | 0 | 1 | 0 | 1 | 1 | 0.999958 |
| ALW | WALLA WALLA RGNL | WA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| AWO | ARLINGTON MUNICIPAL | WA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BLI | BELLINGHAM INTL | WA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BVS | SKAGIT RGNL | WA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CLM | WILLIAM R FAIRCHILD INTL | WA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| CLS | CHEHALIS-CENTRALIA | WA | LPV | 0 | 1 | 0 | 1 | 3 | 0.999958 |
| DEW | DEER PARK | WA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EPH | EPHRATA MUNICIPAL | WA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FHR | FRIDAY HARBOR | WA | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GEG | SPOKANE INTL | WA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HQM | BOWERMAN | WA | LPV200 | 0 | 1 | 0 | 1 | 2 | 0.999947 |
| MWH | GRANT CO INTL | WA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| OLM | OLYMPIA RGNL | WA | LPV | 0 | 1 | 0 | 1 | 2 | 0.999966 |
| OTH | SOUTHWEST OREGON RGNL | WA | LPV | 0 | 1 | 0 | 1 | 37 | 0.999049 |
| PAE | SNOHOMISH COUNTY (PAINE FLD) | WA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| PSC | TRI-CITIES | WA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| PWT | BREMERTON NATIONAL | WA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| RLD | RICHLAND | WA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| RNT | RENTON MUNICIPAL | WA | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| SEA | SEATTLE-TACOMA INTL | WA | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| TDO | ED CARLSON MEMORIAL - SOUTH LEWIS CO | WA | LPV | 0 | 1 | 0 | 1 | 3 | 0.999962 |
| TIW | TACOMA NARROWS | WA | LPV | 0 | 1 | 0 | 1 | 2 | 0.999992 |
| YKM | YAKIMA AIR TERMINAL/MCALLISTER FIELD | WA | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| 57C | EAST TROY MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| 82C | MAUSTON-NEW LISBON UNION | WI | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 8D1 | NEW HOLSTEIN MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| ARV | LAKELAND/NOBLE F. LEE MEMORIAL FIELD | WI | LPV | 0 | 1 | 0 | 1 | 2 | 0.999947 |
| ASX | JOHN F. KENNEDY MEMORIAL | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999925 |
| ATW | OUTAGAMIE COUNTY RGNL | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| AUW | WAUSAU DOWNTOWN | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| BCK | BLACK RIVER FALLS AREA | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| C29 | MIDDLETON MUNICIPAL-MOREY FIELD | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| C35 | REEDSBURG MUNICIPAL | WI | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| CLI | CLINTONVILLE MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CMY | SPARTA/FORT MC COY | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| CWA | CENTRAL WISCONSIN | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| DLL | BARABOO WISCONSIN DELLS | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EAU | CHIPPEWA VALLEY RGNL | WI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999947 |
| EGV | EAGLE RIVER UNION | WI | LPV | 0 | 1 | 0 | 1 | 2 | 0.999966 |
| ENW | KENOSHA RGNL | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ETB | WEST BEND MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EZS | SHAWANO MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| FLD | FOND DU LAC COUNTY | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GRB | AUSTIN STRAUBEL INTL | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HXF | HARTFORD MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| HYR | SAWYER COUNTY | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999932 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| JVL | SOUTHERN WISCONSIN RGNL | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| LNR | TRI-COUNTY RGNL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LSE | LA CROSSE MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| LUM | MENOMONIE MUNICIPALCIPAL-SCORE FIELD | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999940 |
| MDZ | TAYLOR COUNTY | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999970 |
| MFI | MARSHFIELD MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| MKE | GENERAL MITCHELL INTL | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MRJ | IOWA COUNTY | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MSN | DANE COUNTY RGNL-TRUAX FIELD | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MTW | MANITOWOC COUNTY | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MWC | LAWRENCE J TIMMERMAN | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OCQ | J DOUGLAS BAKE MEML | WI | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| OSH | WITTMAN RGNL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| OVS | BOSCOBEL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PBH | PRICE COUNTY | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999951 |
| PCZ | WAUPACA MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PVB | PLATTEVILLE MUNICIPALCIPAL | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RAC | JOHN H. BATTEN | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RCX | RUSK COUNTY | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999947 |
| RHI | RHINELANDER-ONEIDA COUNTY | WI | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999985 |
| RNH | NEW RICHMOND RGNL | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999925 |
| RPD | RICE LAKE RGNL - CARL'S FIELD | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999932 |
| RRL | MERRILL MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| SBM | SHEBOYGAN COUNTY MEMORIAL | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| STE | STEVENS POINT MUNICIPAL | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| SUE | DOOR COUNTY CHERRYLAND | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SUW | RICHARD I BONG | WI | LP | 0 | 1 | 0 | 1 | 1 | 0.999913 |
| TKV | TOMAHAWK RGNL | WI | LP | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| UES | WAUKESHA COUNTY | WI | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| UNU | DODGE COUNTY | WI | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| VIQ | NEILLSVILLE MUNICIPAL | WI | LPV | 0 | 1 | 0 | 1 | 1 | 0.999977 |
| Y50 | WAUTOMA MUNICIPAL | WI | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| 3I2 | MASON COUNTY | WV | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| BKW | RALEIGH COUNTY MEMORIAL | WV | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999925 |
| BLF | MERCER COUNTY | WV | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| CKB | NORTH CENTRAL WEST VIRGINIA | WV | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CRW | YEAGER | WV | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999992 |
| HLG | WHEELING OHIO CO | WV | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| HTS | TRI-STATE/MILTON J. FERGUSON FIELD | WV | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| I18 | JACKSON COUNTY | WV | LPV200 | 0 | 1 | 0 | 1 | 1 | 0.999996 |
| LWB | GREENBRIER VALLEY | WV | LPV | 0 | 1 | 0 | 1 | 1 | 0.999921 |
| MGW | MORGANTOWN MUNICIPAL-WALTER L. BILL HART FIELD | WV | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| MRB | EASTERN WV RGNL/SHEPHERD | WV | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PKB | MID-OHIO VALLEY RGNL | WV | LPV | 0 | 1 | 0 | 1 | 1 | 0.999891 |
| SXL | SUMMERSVILLE | WV | LP | 0 | 1 | 0 | 1 | 1 | 0.999909 |
| USW | BOGGS FIELD | WV | LP | 0 | 1 | 0 | 1 | 1 | 0.999894 |
| W22 | UPSHUR COUNTY RGNL | WV | LPV | 0 | 1 | 0 | 1 | 1 | 0.999974 |
| 7V6 | CAMP GUERNSEY | WY | LP | 0 | 1 | 0 | 1 | 0 | 1 |
| COD | YELLOWSTONE RGNL | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CPR | NATRONA COUNTY INTL | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYS | CHEYENNE RGNL/JERRY OLSON FIELD | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| DGW | CONVERSE COUNTY | WY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| ECS | MONDELL FIELD | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| EVW | EVANSTON-UINTA COUNTY BURNS FIELD | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| GCC | GILLETTE-CAMPBELL COUNTY | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| JAC | JACKSON HOLE | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| LAR | LARAMIE RGNL | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| PNA | RALPH WENZ FIELD | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| RIW | RIVERTON RGNL | WY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RKS | ROCK SPRINGS-SWEETWATER COUNTY | WY | LPV200 | 0 | 1 | 0 | 1 | 0 | 1 |
| RWL | RAWLINS MUNICIPAL/HARVEY FIELD | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SAA | SHIVELY FIELD | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| SHR | SHERIDAN COUNTY | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| WRL | WORLAND MUNICIPAL | WY | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYQH | WATSON LAKE | YT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |
| CYXY | WHITEHORSE / ERIK NIELSEN INTL | YT | LPV | 0 | 1 | 0 | 1 | 0 | 1 |

**Figure 8-1 WAAS LP Availability at Airports in the US and Canada with GPS RNAV Instrument Approach Procedures**

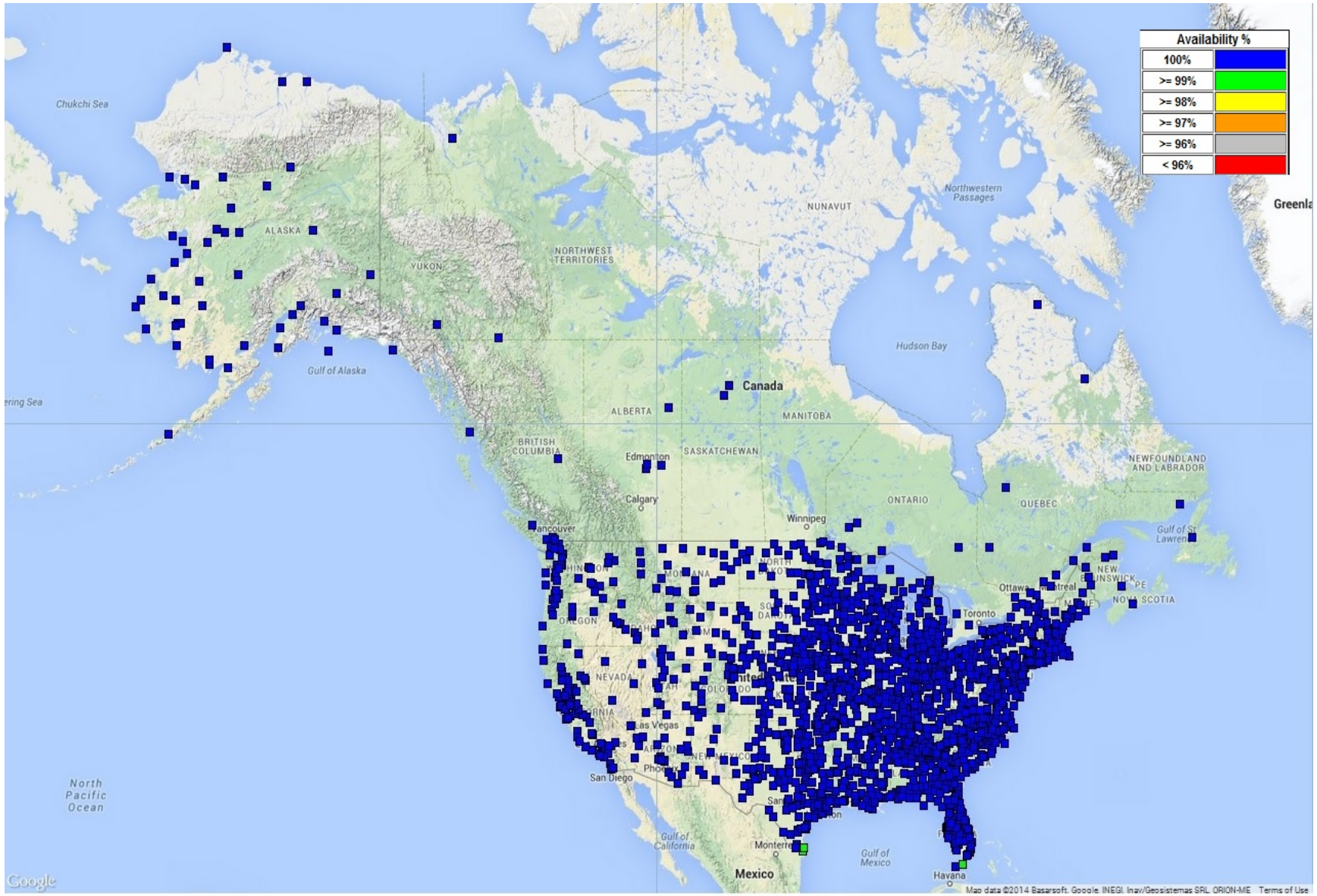


**Figure 8-2 WAAS LP Outages at Airports in the US and Canada with GPS RNAV Instrument Approach Procedures**

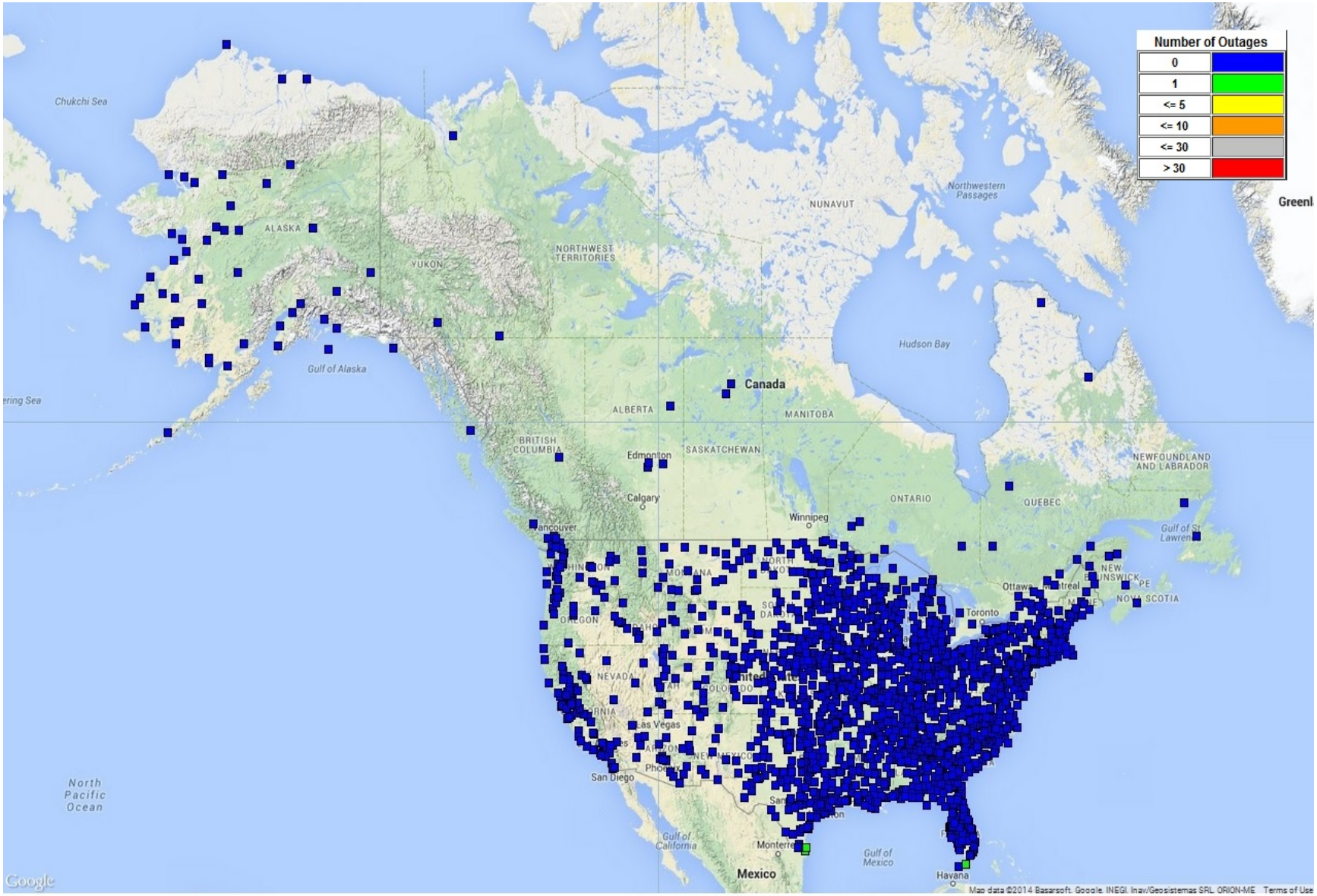


**Figure 8-3 WAAS LPV Availability Airports in the US and Canada with GPS RNAV Instrument Approach Procedures**

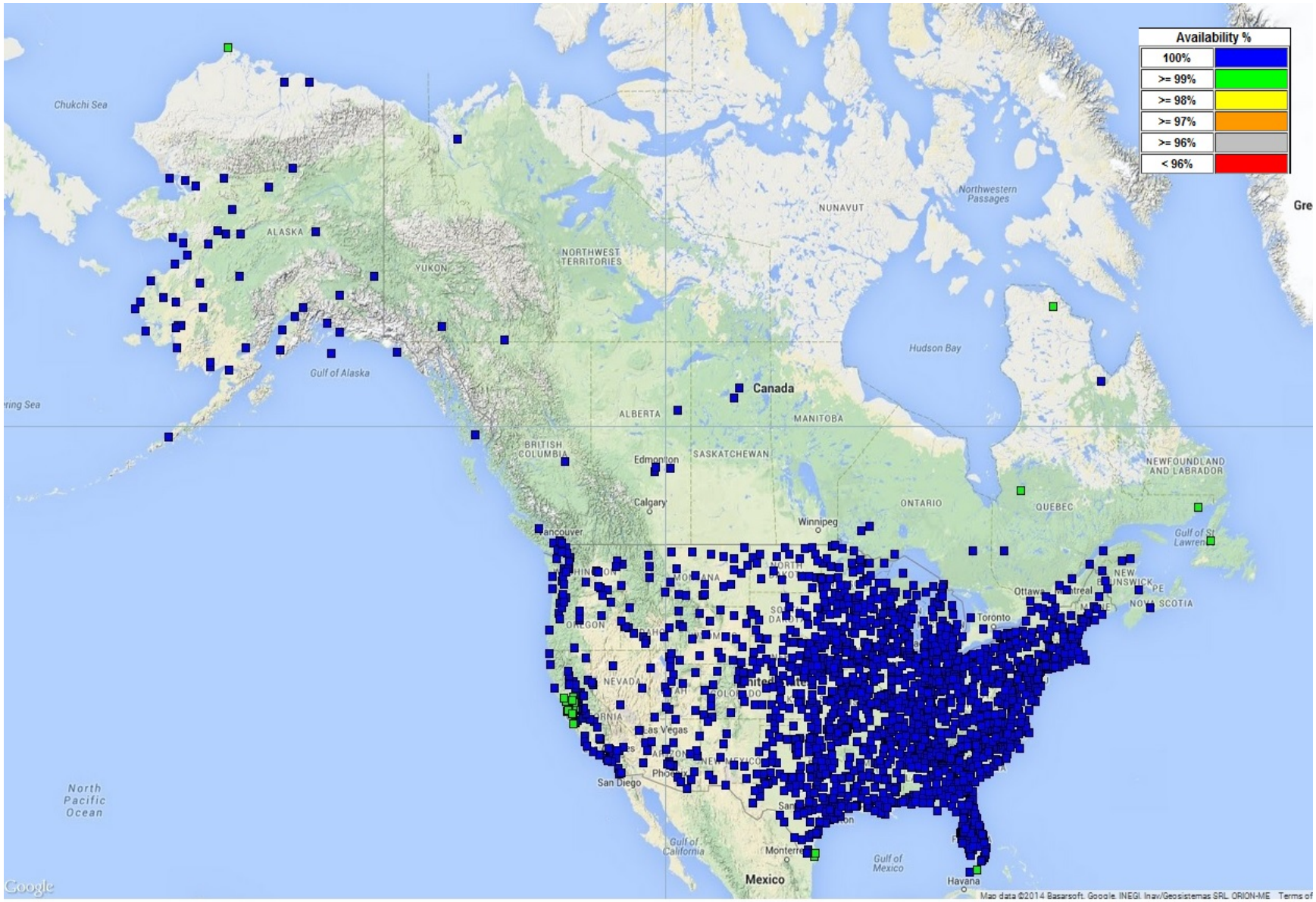


**Figure 8-4 WAAS LPV Outages at Airports in the US and Canada with GPS RNAV Instrument Approach Procedures**

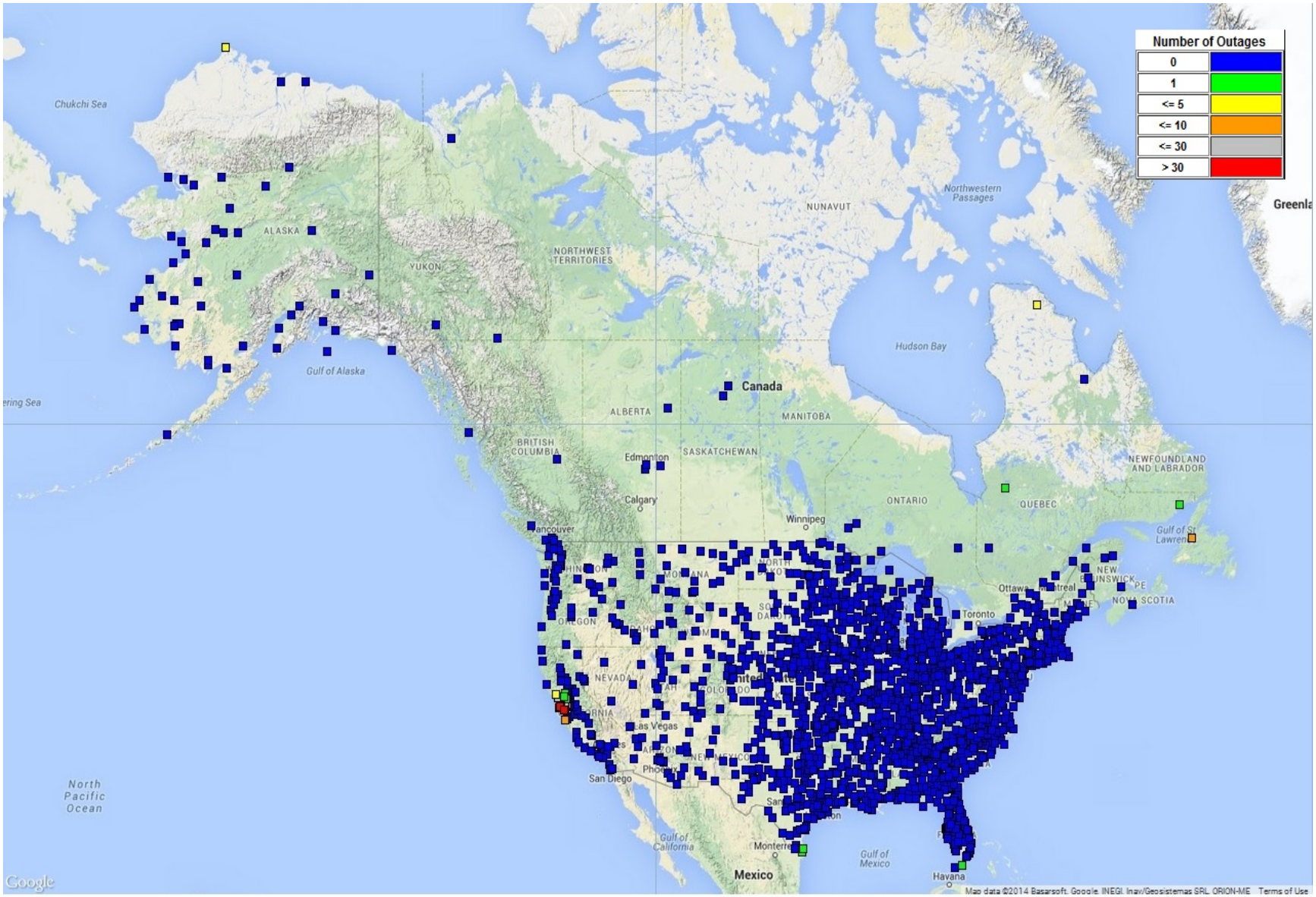


**Figure 8-5 WAAS LPV 200 Availability at Airports in the US and Canada with GPS RNAV Instrument Approach Procedures**

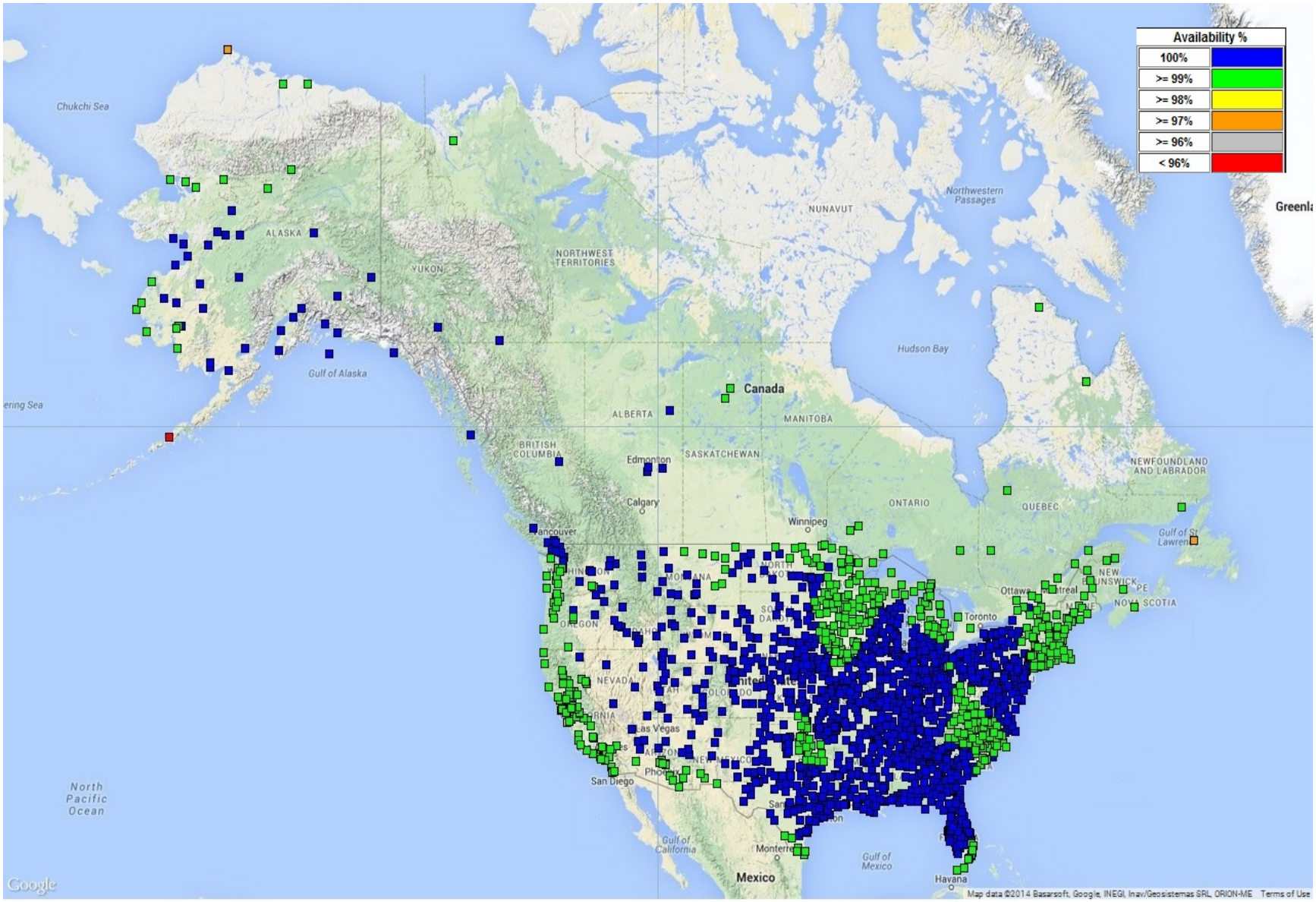
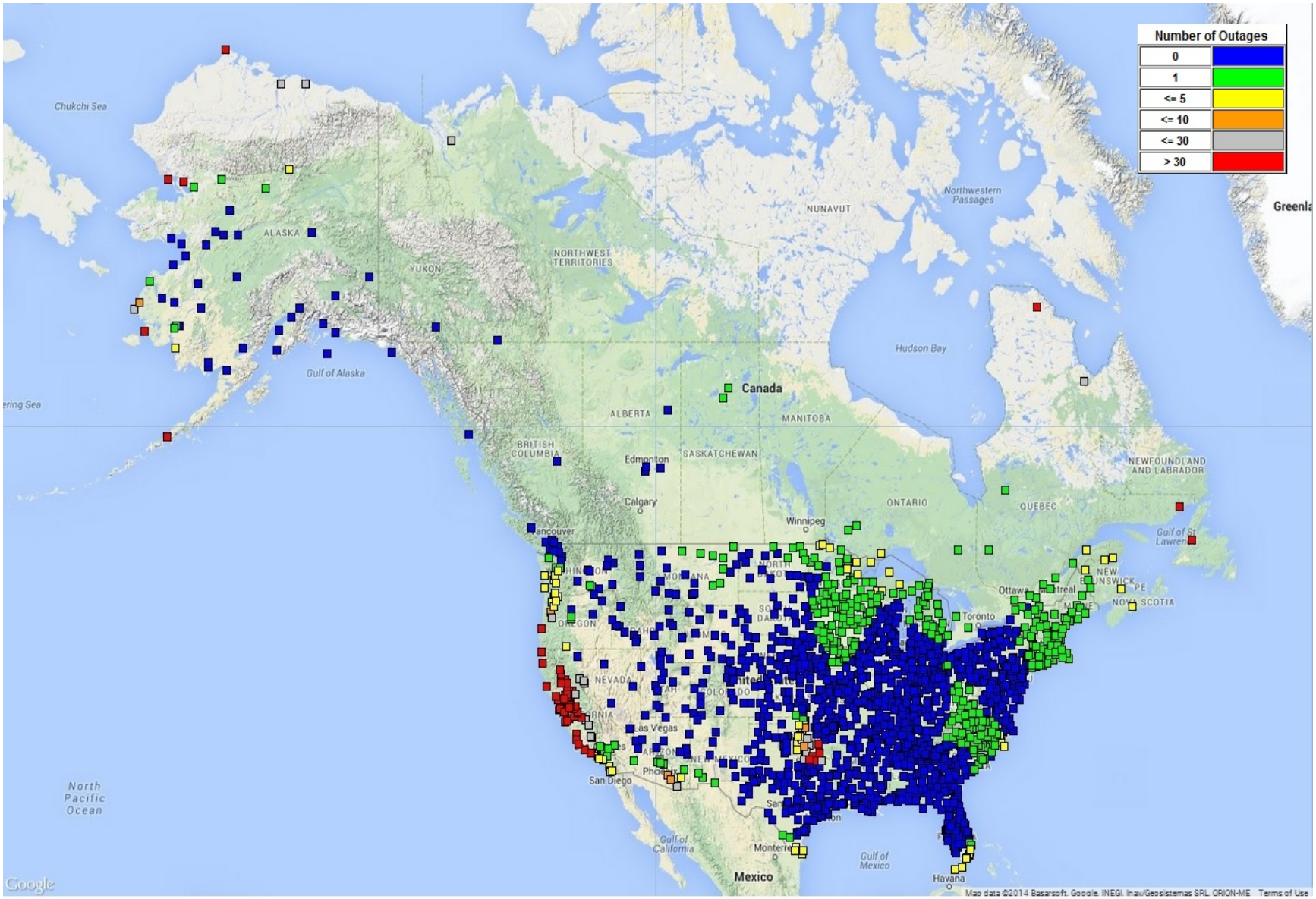


**Figure 8-6 WAAS LPV 200 Outages at Airports in the US and Canada with GPS RNAV Instrument Approach Procedures**



## 9.0 WAAS DETERMINISTIC CODE NOISE AND MULTIPATH (CNMP) BOUNDING ANALYSIS

WAAS utilizes a deterministic model to estimate the residual CNMP noise after the application of standard dual frequency carrier smoothing techniques to minimize the effects of multipath and code noise. This analysis performs an assessment of how well that deterministic model bounds the actual errors. This analysis is periodically performed as part of the WAAS Test Team's off-line monitoring to ensure that there are no drastic detrimental changes to the multipath environment at the WAAS Reference Stations (WRSs). This analysis also ensures that WAAS system is not indefinitely exposed to conspiring receiver failure symptoms that would invalidate the CNMP bounding estimate in a manner that would exceed the assumption that no more than one reference station is conspiring to deceive the WAAS monitors at any time by underestimating the residual measurement noise the safety monitors. Although some failures mechanisms that cause CNMP bounding issues are occasionally seen, no "conspiring" errors have ever been detected. That is, data has caused the safety monitors to trip unnecessarily versus missing a necessary trip.

The analysis post processes measurement data to estimate the pseudorange code to carrier ambiguity for each entire arc of measurements for each satellite pass. The ambiguity estimate is then used to level the carrier measurement. The leveled carrier is then used as a multipath free truth estimate. The WAAS real time deterministic CNMP smoothing algorithm is then applied to the original measurements. The difference between the smoothed measurements and the leveled truth measurements is compared to the deterministic noise estimates. Only arcs with continuous carrier phase greater in length than 7200 seconds are utilized for this analysis to minimize the impacts of non-zero mean multipath biasing the truth estimates. The WAAS dual frequency cycle slip detector algorithm is used to detect any discontinuities in the carrier phase.

Statistics are calculated on how well the 0.1 multiples of the deterministically estimated standard deviation bounds the difference between the leveled truth and the real time smoothed measurements. Those statistics are then compared to a theoretical Gaussian distribution and an extensive set of plots are generated and manually reviewed. Table 9-1 recaps the results of that manual analysis.

**Table 9-1 CNMP Bounding Statistics**

| WAAS Site | WRE | Oct 13 | Nov 13 | Dec 13 | Jan 14 | Feb 14 | Mar 14 | Apr 14 | May 14 | Jun 14 | Jul 14 | Aug 14 | Sep 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albuquerque | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Anchorage | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Atlanta | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Barrow | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Bethel | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | – | ● | ● | ● | ● | ● | ● | ● |
| Billings | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Boston | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Chicago | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Cleveland | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Cold Bay | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Dallas | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Denver | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Fairbanks | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Gander | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Goose Bay | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Honolulu | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Houston | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Iqaluit | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Jacksonville | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

- ● **Excellent** - 3.29σ bounded 100%
- ● **Good** - 4σ bounded 100%
- ● **Fair** - 4σ bounded 100% with one worst satellite excluded (Requires manual review if symptoms repeat from month to month)
- ● **Poor** – Requires manual review
- – No data available

| WAAS Site | WRE | Oct 13 | Nov 13 | Dec 13 | Jan 14 | Feb 14 | Mar 14 | Apr 14 | May 14 | Jun 14 | Jul 14 | Aug 14 | Sep 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Juneau | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Kansas City | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Kotzebue | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Los Angeles | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Memphis | A | ● | ● | ● | – | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Merida | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Mexico City | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Miami | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Minneapolis | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| New York | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Oakland | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Puerto Vallarta | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Salt Lake City | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| San Jose Del Cabo | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| San Juan | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Seattle | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Tapachula | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | – |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Washington, DC | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Winnipeg | A | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | B | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | C | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

- ● **Excellent** - 3.29σ bounded 100%
- ● **Good** - 4σ bounded 100%
- ● **Fair** - 4σ bounded 100% with one worst satellite excluded (Requires manual review if symptoms repeat from month to month)
- ● **Poor** – Requires manual review
- – No data available

## 10.0 WAAS REFERENCE STATION SURVEY VALIDATION

Antenna L1 phase center position surveys were performed for all the WAAS Reference Station antennas using 25 hour sets of data from 23:00 on 9/24/14 to 23:59:30 on 9/25/14.

Duplicate surveys were performed using both the National Geodetic Survey (NGS) Online Positioning User Service (OPUS) and the Canadian Spatial Reference System (CSRS) Precise Point Positioning (PPP) service. The IGS08 reference frame is used for the OPUS solutions. A value of -0.4445 meters was used for the antenna reference point (ARP) to antenna phase center (APC) offset for the MicroPulse MPL-WAAS-2225W WAAS antennas in the processing.

The overall RMS quality metrics reported by OPUS were all <= 2.7cm. The CSRS surveys' RSSs of the reported ECEF sigmas for the 9/25/19 data set were all <= 10 mm. The OPUS and CSRS surveys for the 9/25/19 data set agreed to an average of 1.2 cm. with a standard deviation of 6 mm. The maximum of difference was 3.0 cm. for Oakland thread C ( ZOA3).

The OPUS positions were compared to the positions in the currently fielded WAAS software Build W7.012 which was fielded in August. Build W7.012 contains updated antenna positions that have been extrapolated forward in time to maximize the time interval before the next update is required. The OPUS surveys agree with the Build W7.012 positions to better or equal than 5.4 cm. for all sites except Mexico City (MMX) which were 10.0 cm, 9.5 cm and 10.0 cm respectively for MMX1, MMX2, and MMX3. The non-MMX maximum was 5.4 cm at Jacksonville C, ZJX3. Note almost all of the Mexico City differences are in height.

Table 10-1 lists the WAAS antenna L1 phase center positions as of 9/25/19 using the OPUS data.

Figures 10-1 to 10-3 show the RSS of the ECEF differences between the 9/25/19 OPUS survey antenna phase center locations and the locations in the Build W7.012 software. Each reference station has three independent strings of WAAS receiving equipment (WRE). A surveyed antenna phase center location is required for each WRE. All three strings of a reference station are shown in the three figures. For example, BET1 identifies the RSS of the ECEF deltas for the Bethel WRE string 1(A). The next two bars in the chart are Bethel string 2(B) and Bethel string 3(C). Figure 10-4 to 10-6 shows the OPUS surveys overall RMS quality indications.

The "take action" threshold established by the WAAS Integrity Performance Panel (WIPP) is 25 cm. for Mexico City and 10 cm. for the remaining sites. The large MMX allowance is required because of the rapid subsidence in Mexico City (approximately 28 to 30 cm / year).

Figures 10-7 to 10-9 show the RSS of the ECEF difference between the positions obtained from OPUS and the positions obtained from CSRS. Note that that OPUS positions are in IGS08 and the CSRS positions are in ITRF-2008. Figures 10-10 to 10-12 show the RSS of the ECEF sigma's survey qualities reported by CSRS.

**Table 10-1 WAAS Antenna Positions (OPUS IGS08) as of 9/25/14**

| WRE | X(m) | Y(m) | Z(m) | Latitude | Longitude | H(m) |
|---|---|---|---|---|---|---|
| BET1 | -2965385.072 | -972576.622 | 5543892.882 | 60.7879152055556 | -161.8417251194440 | 52.181 |
| BET2 | -2965385.845 | -972580.347 | 5543891.829 | 60.7878957472222 | -161.8416645611110 | 52.187 |
| BET3 | -2965388.411 | -972577.477 | 5543890.959 | 60.7878798444444 | -161.8417293083330 | 52.181 |
| | | | | | | |
| BIL1 | -1416445.895 | -4223577.027 | 4550862.155 | 45.8037067750000 | -108.5397232111110 | 1112.255 |
| BIL2 | -1416449.971 | -4223574.879 | 4550862.871 | 45.8037160388889 | -108.5397816972220 | 1112.253 |
| BIL3 | -1416441.588 | -4223574.281 | 4550866.010 | 45.8037565722222 | -108.5396819194440 | 1112.250 |
| | | | | | | |
| BRW1 | -1886758.943 | -809058.665 | 6018494.449 | 71.2827646805556 | -156.7899249416670 | 15.552 |
| BRW2 | -1886756.355 | -809055.919 | 6018495.636 | 71.2827974722222 | -156.7899669111110 | 15.566 |
| BRW3 | -1886755.265 | -809059.710 | 6018495.453 | 71.2827927666667 | -156.7898576805560 | 15.550 |
| | | | | | | |
| CDB1 | -3484099.070 | -1084748.784 | 5213678.615 | 55.1923739416667 | -162.7064047444440 | 49.695 |
| CDB2 | -3484105.706 | -1084741.583 | 5213675.666 | 55.1923278777778 | -162.7065436750000 | 49.669 |
| CDB3 | -3484111.984 | -1084734.815 | 5213672.920 | 55.1922844277778 | -162.7066744416670 | 49.687 |
| | | | | | | |
| FAI1 | -2304741.838 | -1448715.280 | 5748843.666 | 64.8096297472222 | -147.8473411583330 | 149.928 |
| FAI2 | -2304741.357 | -1448706.467 | 5748846.057 | 64.8096802444444 | -147.8474928111110 | 149.922 |
| FAI3 | -2304732.827 | -1448707.402 | 5748849.201 | 64.8097468222222 | -147.8473806083330 | 149.905 |
| | | | | | | |
| HNL1 | -5508637.138 | -2234493.184 | 2303722.276 | 21.3129910166667 | -157.9208287750000 | 24.688 |
| HNL2 | -5508656.295 | -2234483.495 | 2303687.025 | 21.3126480944444 | -157.9209847166670 | 25.021 |
| HNL3 | -5508647.704 | -2234497.433 | 2303694.120 | 21.3127167277778 | -157.9208291055560 | 25.064 |
| | | | | | | |
| JNU1 | -2354254.921 | -2388549.650 | 5407043.108 | 58.3625744305556 | -134.5857073694440 | 16.106 |
| JNU2 | -2354252.835 | -2388565.766 | 5407036.943 | 58.3624688583333 | -134.5854887166670 | 16.109 |
| JNU3 | -2354239.619 | -2388568.613 | 5407041.398 | 58.3625452527778 | -134.5852937694440 | 16.100 |
| | | | | | | |
| MMD1 | 35070.404 | -5959686.654 | 2264365.777 | 20.9319093916667 | -89.6628408416667 | 29.111 |
| MMD2 | 35065.483 | -5959687.037 | 2264364.990 | 20.9319016083333 | -89.6628881694444 | 29.160 |
| MMD3 | 35065.143 | -5959685.250 | 2264369.646 | 20.9319466611111 | -89.6628913388889 | 29.153 |
| | | | | | | |
| MMX1 | -948701.014 | -5943934.985 | 2109212.506 | 19.4316537111111 | -99.0683897861111 | 2234.938 |
| MMX2 | -948696.580 | -5943934.804 | 2109214.932 | 19.4316770083333 | -99.0683483777778 | 2234.917 |
| MMX3 | -948705.445 | -5943935.177 | 2109210.075 | 19.4316303416667 | -99.0684311472222 | 2234.966 |
| | | | | | | |
| MPR1 | -1570142.232 | -5759530.602 | 2238184.763 | 20.6790033805556 | -105.2492033222220 | 10.981 |
| MPR2 | -1570139.404 | -5759530.117 | 2238188.809 | 20.6790414361111 | -105.2491783583330 | 11.277 |
| MPR3 | -1570143.510 | -5759527.986 | 2238190.575 | 20.6790594722222 | -105.2492217583330 | 10.987 |
| | | | | | | |
| MSD1 | -1979519.834 | -5523222.972 | 2493106.843 | 23.1604474722222 | -109.7176493666670 | 104.271 |
| MSD2 | -1979521.400 | -5523225.306 | 2493100.439 | 23.1603846277778 | -109.7176560722220 | 104.258 |
| MSD3 | -1979525.849 | -5523222.039 | 2493104.114 | 23.1604207305556 | -109.7177077333330 | 104.256 |
| | | | | | | |
| MTP1 | -254854.372 | -6162909.146 | 1617805.055 | 14.7913659472222 | -92.3679993638889 | 54.921 |
| MTP2 | -254850.753 | -6162910.174 | 1617801.633 | 14.7913340222222 | -92.3679653805555 | 54.895 |
| MTP3 | -254855.526 | -6162910.281 | 1617800.105 | 14.7913199666667 | -92.3680096388889 | 54.799 |
| | | | | | | |
| OTZ1 | -2396056.040 | -750356.163 | 5843502.495 | 66.8873319361111 | -162.6113730083330 | 10.874 |
| OTZ2 | -2396052.871 | -750354.335 | 5843504.023 | 66.8873667611111 | -162.6113912055560 | 10.878 |
| OTZ3 | -2396052.854 | -750358.278 | 5843503.535 | 66.8873554583333 | -162.6113052250000 | 10.885 |

| WRE | X(m) | Y(m) | Z(m) | Latitude | Longitude | H(m) |
|---|---|---|---|---|---|---|
| | | | | | | |
| YFB1 | 1035381.417 | -2634289.649 | 5696539.540 | 63.7314905472222 | -68.5431840611111 | 10.026 |
| YFB2 | 1035372.206 | -2634296.048 | 5696538.165 | 63.7314642861111 | -68.5434049750000 | 9.937 |
| YFB3 | 1035366.133 | -2634306.811 | 5696534.395 | 63.7313866055556 | -68.5435990833333 | 10.007 |
| | | | | | | |
| YQX1 | 2430424.604 | -3419640.393 | 4788223.840 | 48.9664901666667 | -54.5976325000000 | 146.873 |
| YQX2 | 2430432.567 | -3419639.045 | 4788220.784 | 48.9664482888889 | -54.5975331944444 | 146.875 |
| YQX3 | 2430440.472 | -3419637.677 | 4788217.777 | 48.9664070416667 | -54.5974343722222 | 146.881 |
| | | | | | | |
| YWG1 | -520164.393 | -4083475.939 | 4855843.045 | 49.9005743638889 | -97.2593978583333 | 222.105 |
| YWG2 | -520150.522 | -4083468.882 | 4855850.441 | 49.9006773861111 | -97.2592187500000 | 222.124 |
| YWG3 | -520152.396 | -4083478.002 | 4855842.612 | 49.9005682083333 | -97.2592285861111 | 222.116 |
| | | | | | | |
| YYR1 | 1885341.403 | -3321428.361 | 5091171.665 | 53.3086472250000 | -60.4194685805556 | 37.848 |
| YYR2 | 1885344.358 | -3321419.885 | 5091176.084 | 53.3087135500000 | -60.4193672583333 | 37.859 |
| YYR3 | 1885340.076 | -3321413.070 | 5091182.085 | 53.3088037000000 | -60.4193726527778 | 37.867 |
| | | | | | | |
| ZAB1 | -1488636.859 | -5003946.534 | 3654557.702 | 35.1735753527778 | -106.5673499638890 | 1620.121 |
| ZAB2 | -1488631.525 | -5003948.221 | 3654557.679 | 35.1735746833333 | -106.5672885750000 | 1620.187 |
| ZAB3 | -1488632.303 | -5003950.802 | 3654553.825 | 35.1735323027778 | -106.5672886833330 | 1620.170 |
| | | | | | | |
| ZAN1 | -2659536.671 | -1549114.773 | 5567750.759 | 61.2292016277778 | -149.7802510861110 | 80.707 |
| ZAN2 | -2659548.424 | -1549110.816 | 5567746.269 | 61.2291180138889 | -149.7804248583330 | 80.701 |
| ZAN3 | -2659541.372 | -1549106.689 | 5567750.740 | 61.2292015972222 | -149.7804251694440 | 80.687 |
| | | | | | | |
| ZAU1 | 138704.095 | -4761244.132 | 4227763.926 | 41.7826580750000 | -88.3313369361111 | 195.877 |
| ZAU2 | 138704.358 | -4761248.759 | 4227758.772 | 41.7825956833333 | -88.3313353944444 | 195.897 |
| ZAU3 | 138711.061 | -4761248.491 | 4227758.849 | 41.7825966361111 | -88.3312547055556 | 195.894 |
| | | | | | | |
| ZBW1 | 1490299.200 | -4448983.170 | 4306010.498 | 42.7357205555556 | -71.4804260916667 | 39.110 |
| ZBW2 | 1490304.313 | -4448981.160 | 4306010.846 | 42.7357245777778 | -71.4803590916667 | 39.140 |
| ZBW3 | 1490306.020 | -4448984.784 | 4306006.530 | 42.7356717388889 | -71.4803533833333 | 39.133 |
| | | | | | | |
| ZDC1 | 1069125.745 | -4839598.995 | 4001126.518 | 39.1015959500000 | -77.5427467527778 | 80.073 |
| ZDC2 | 1069128.138 | -4839603.626 | 4001120.313 | 39.1015239555556 | -77.5427312888889 | 80.070 |
| ZDC3 | 1069124.036 | -4839602.709 | 4001122.501 | 39.1015493638889 | -77.5427753055556 | 80.068 |
| | | | | | | |
| ZDV1 | -1273628.631 | -4711375.572 | 4094890.109 | 40.1873032416667 | -105.1272245777780 | 1541.356 |
| ZDV2 | -1273622.931 | -4711377.093 | 4094890.127 | 40.1873034777778 | -105.1271553194440 | 1541.353 |
| ZDV3 | -1273624.935 | -4711380.286 | 4094885.832 | 40.1872529888889 | -105.1271682500000 | 1541.336 |
| | | | | | | |
| ZFW1 | -659983.212 | -5324060.789 | 3438276.482 | 32.8306497388889 | -97.0664719138889 | 155.636 |
| ZFW2 | -659988.475 | -5324063.328 | 3438271.476 | 32.8305963277778 | -97.0665243583333 | 155.583 |
| ZFW3 | -659983.504 | -5324063.850 | 3438271.683 | 32.8305983527778 | -97.0664709861111 | 155.617 |
| | | | | | | |
| ZHU1 | -513864.490 | -5506451.700 | 3166720.475 | 29.9618963861111 | -95.3314264694444 | 10.847 |
| ZHU2 | -513867.129 | -5506455.104 | 3166714.314 | 29.9618318583333 | -95.3314504166667 | 10.919 |
| ZHU3 | -513873.418 | -5506457.750 | 3166708.717 | 29.9617736138889 | -95.3315127416667 | 10.913 |
| | | | | | | |
| ZJX1 | 772646.432 | -5434462.188 | 3237231.746 | 30.6988596916667 | -81.9081852305556 | 2.136 |
| ZJX2 | 772649.754 | -5434463.734 | 3237228.343 | 30.6988240972222 | -81.9081531722222 | 2.116 |
| ZJX3 | 772645.699 | -5434466.155 | 3237225.233 | 30.6987915666667 | -81.9081986333333 | 2.099 |
| | | | | | | |

| WRE | X(m) | Y(m) | Z(m) | Latitude | Longitude | H(m) |
|---|---|---|---|---|---|---|
| ZKC1 | -415247.532 | -4954556.385 | 3982161.113 | 38.8801594055556 | -94.7908340111111 | 305.894 |
| ZKC2 | -415231.139 | -4954557.706 | 3982161.168 | 38.8801600888889 | -94.7906444888889 | 305.887 |
| ZKC3 | -415237.260 | -4954561.059 | 3982155.979 | 38.8801019222222 | -94.7907115527778 | 305.629 |
| | | | | | | |
| ZLA1 | -2474409.971 | -4637294.637 | 3602183.553 | 34.6035184166667 | -118.0838957750000 | 763.527 |
| ZLA2 | -2474404.692 | -4637297.428 | 3602183.552 | 34.6035185250000 | -118.0838306833330 | 763.508 |
| ZLA3 | -2474411.300 | -4637297.123 | 3602179.576 | 34.6034744805556 | -118.0838958000000 | 763.589 |
| | | | | | | |
| ZLC1 | -1808273.234 | -4486410.810 | 4145303.013 | 40.7860432750000 | -111.9521778305560 | 1287.425 |
| ZLC2 | -1808274.632 | -4486414.426 | 4145298.517 | 40.7859898277778 | -111.9521771777780 | 1287.423 |
| ZLC3 | -1808270.427 | -4486416.141 | 4145298.520 | 40.7859897388889 | -111.9521233861110 | 1287.439 |
| | | | | | | |
| ZMA1 | 966042.288 | -5662999.811 | 2761581.502 | 25.8246122750000 | -80.3191898944444 | -7.599 |
| ZMA2 | 966029.313 | -5662999.109 | 2761585.983 | 25.8246599833333 | -80.3193162805556 | -8.234 |
| ZMA3 | 966037.389 | -5662997.941 | 2761586.332 | 25.8246620055556 | -80.3192349250000 | -7.896 |
| | | | | | | |
| ZME1 | 4070.879 | -5226189.295 | 3644028.427 | 35.0673941527778 | -89.9553701333333 | 68.604 |
| ZME2 | 4070.909 | -5226186.742 | 3644032.531 | 35.0674376500000 | -89.9553697805556 | 68.872 |
| ZME3 | 4064.714 | -5226186.618 | 3644032.688 | 35.0674394750000 | -89.9554376972222 | 68.857 |
| | | | | | | |
| ZMP1 | -249978.401 | -4539297.502 | 4458955.054 | 44.6374632583333 | -93.1520857277778 | 262.658 |
| ZMP2 | -249972.599 | -4539297.839 | 4458955.055 | 44.6374631527778 | -93.1520124805556 | 262.671 |
| ZMP3 | -249973.696 | -4539302.123 | 4458950.578 | 44.6374070611111 | -93.1520233166667 | 262.612 |
| | | | | | | |
| ZNY1 | 1406144.611 | -4627343.982 | 4144322.052 | 40.7843286000000 | -73.0971659527778 | 6.440 |
| ZNY2 | 1406146.409 | -4627347.006 | 4144317.270 | 40.7842759000000 | -73.0971559888889 | 5.903 |
| ZNY3 | 1406140.852 | -4627348.672 | 4144317.310 | 40.7842763000000 | -73.0972247166667 | 5.912 |
| | | | | | | |
| ZOA1 | -2684436.893 | -4293337.366 | 3865351.862 | 37.5430539916667 | -122.0159482277780 | -3.520 |
| ZOA2 | -2684433.883 | -4293341.440 | 3865349.440 | 37.5430264861111 | -122.0158949083330 | -3.522 |
| ZOA3 | -2684438.253 | -4293342.322 | 3865345.579 | 37.5429820777778 | -122.0159315444440 | -3.445 |
| | | | | | | |
| ZOB1 | 650770.169 | -4754715.668 | 4187420.755 | 41.2971545194444 | -82.2064449000000 | 223.680 |
| ZOB2 | 650777.848 | -4754714.842 | 4187422.773 | 41.2971668444444 | -82.2063527277778 | 225.179 |
| ZOB3 | 650776.177 | -4754719.667 | 4187414.982 | 41.2970870833333 | -82.2063803055556 | 223.459 |
| | | | | | | |
| ZSE1 | -2308930.284 | -3668169.684 | 4663526.483 | 47.2869932027778 | -122.1883729250000 | 82.113 |
| ZSE2 | -2308934.672 | -3668175.224 | 4663520.071 | 47.2869076472222 | -122.1883830027780 | 82.168 |
| ZSE3 | -2308935.723 | -3668179.487 | 4663516.114 | 47.2868559611111 | -122.1883647416670 | 82.087 |
| | | | | | | |
| ZSU1 | 2462589.446 | -5529372.115 | 2003724.487 | 18.4313358833333 | -65.9934766777778 | -28.096 |
| ZSU2 | 2462587.510 | -5529377.478 | 2003712.192 | 18.4312187555556 | -65.9935140722222 | -28.083 |
| ZSU3 | 2462594.139 | -5529375.222 | 2003710.113 | 18.4311991194444 | -65.9934480638889 | -28.137 |
| | | | | | | |
| ZTL1 | 529840.390 | -5305248.814 | 3489342.851 | 33.3796885861111 | -84.2967261527778 | 261.138 |
| ZTL2 | 529846.765 | -5305247.966 | 3489343.133 | 33.3796917527778 | -84.2966570805555 | 261.117 |
| ZTL3 | 529847.444 | -5305251.414 | 3489337.908 | 33.3796350611111 | -84.2966535000000 | 261.164 |

**Figure 10-1 Build W7.012 Antenna Positions Deltas from 9/25/19 OPUS Survey**

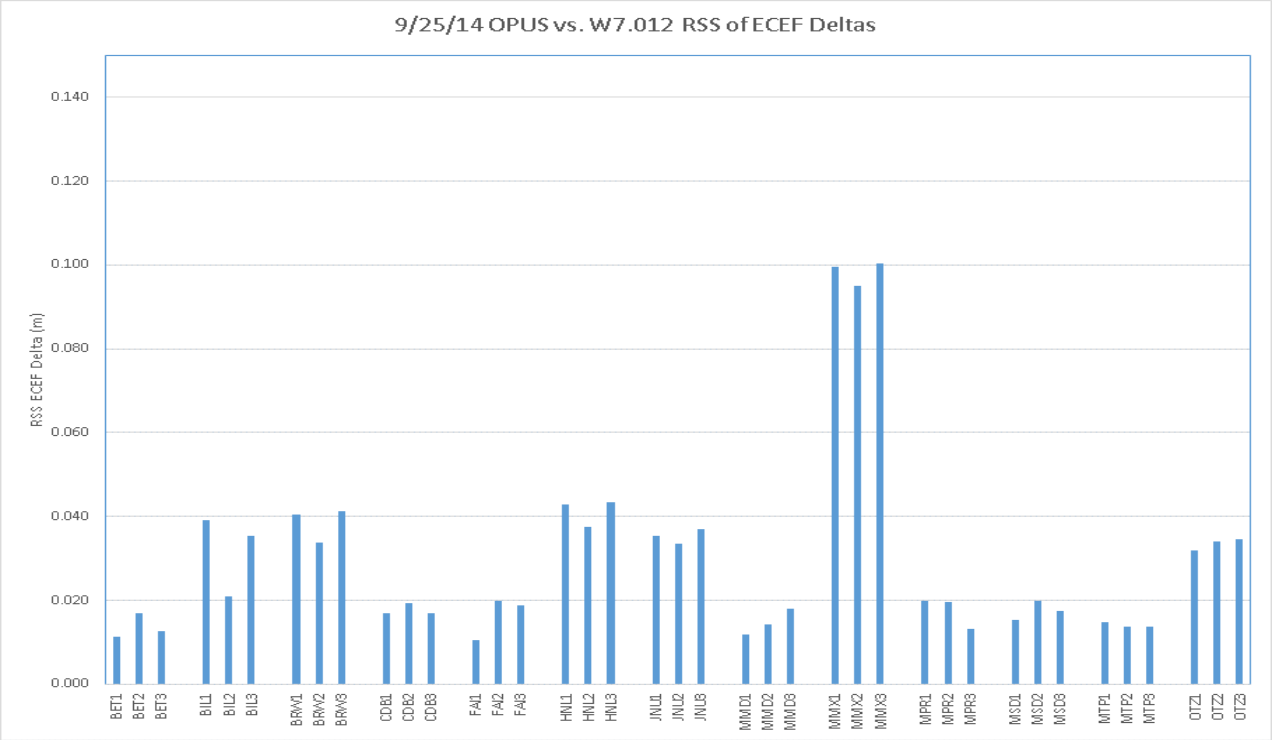



**Figure 10-2 Build W7.012 Antenna Positions Deltas from 9/25/19 OPUS Survey**

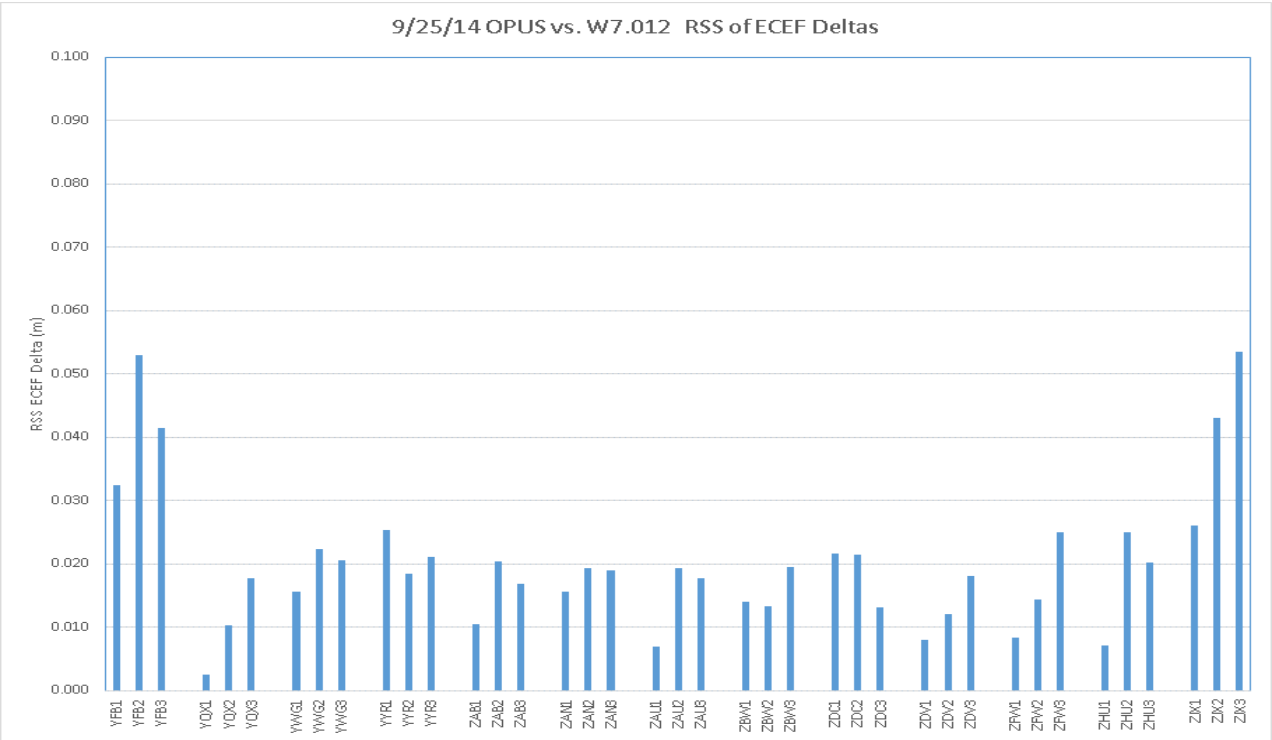


**Figure 10-3 Build W7.012 Antenna Positions Deltas from 9/25/19 OPUS Survey**

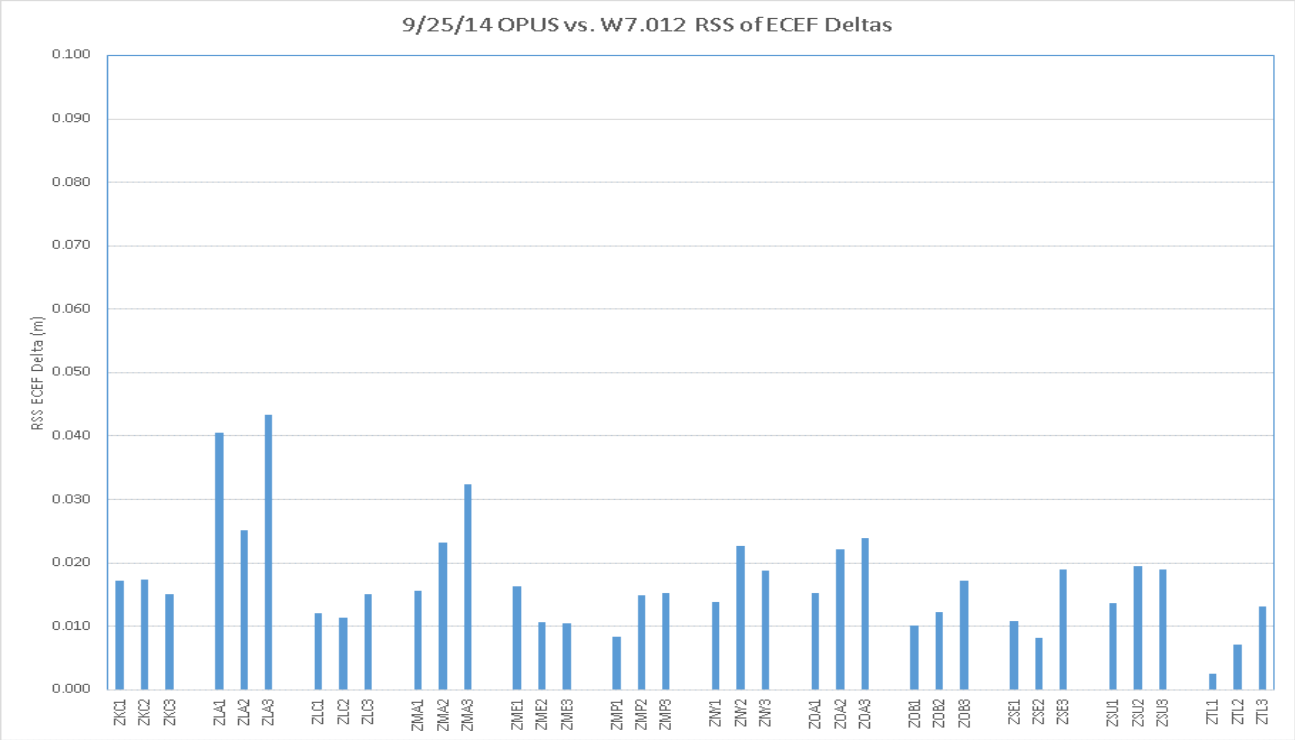



**Figure 10-4 69/25/19 OPUS Survey Overall RMS Qualities**

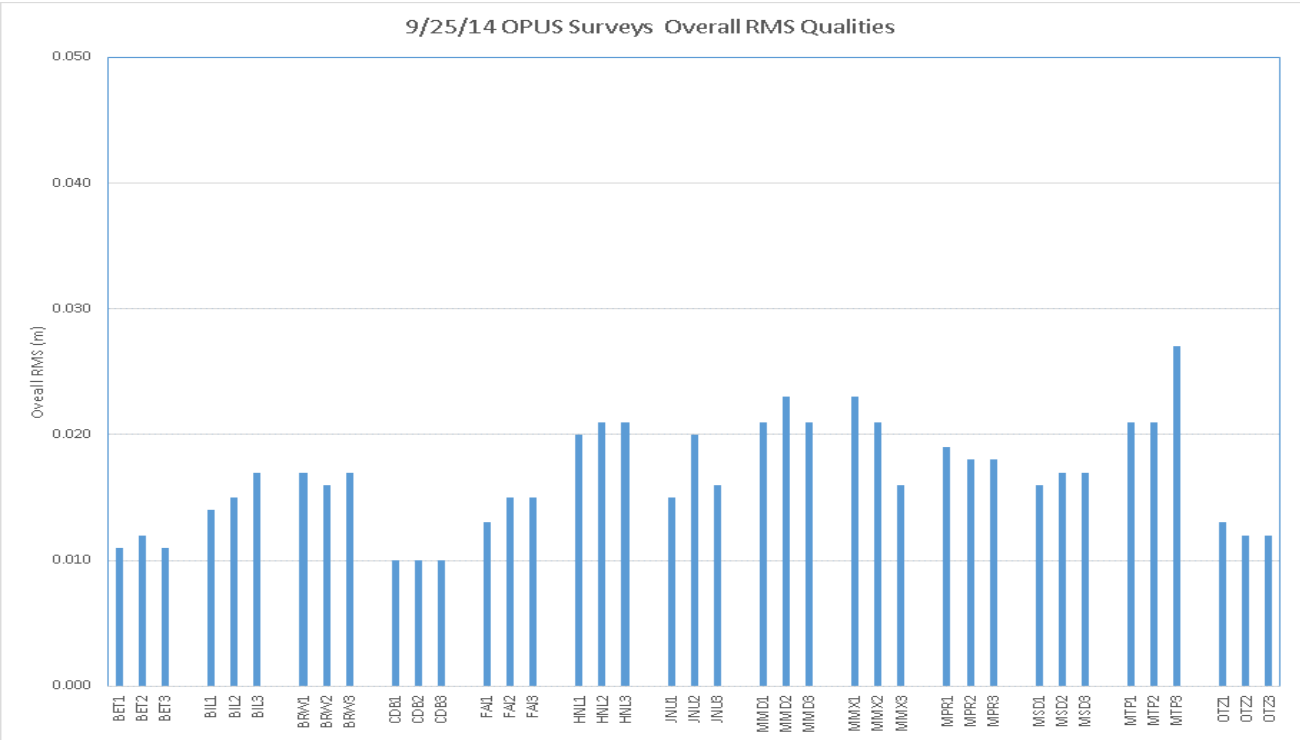


**Figure 10-5 9/25/19 OPUS Survey Overall RMS Qualities**

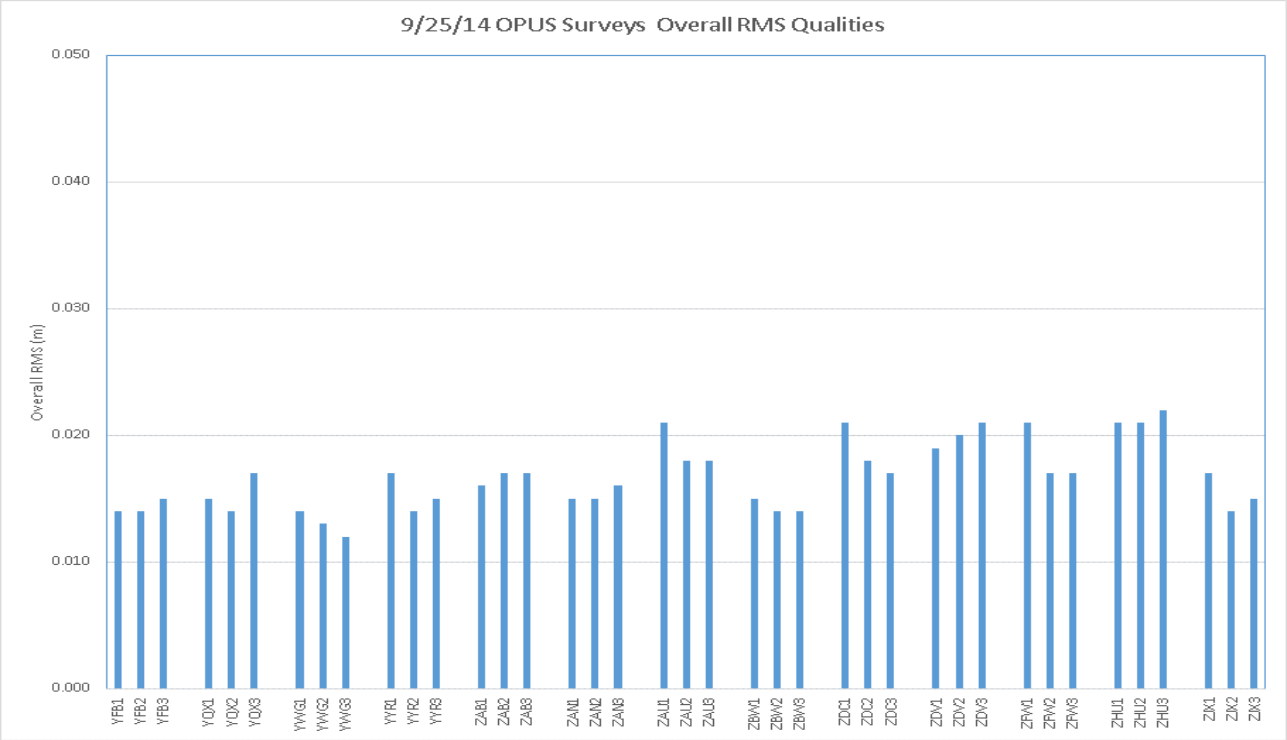



**Figure 10-6 9/25/19 OPUS Survey Overall RMS Qualities**

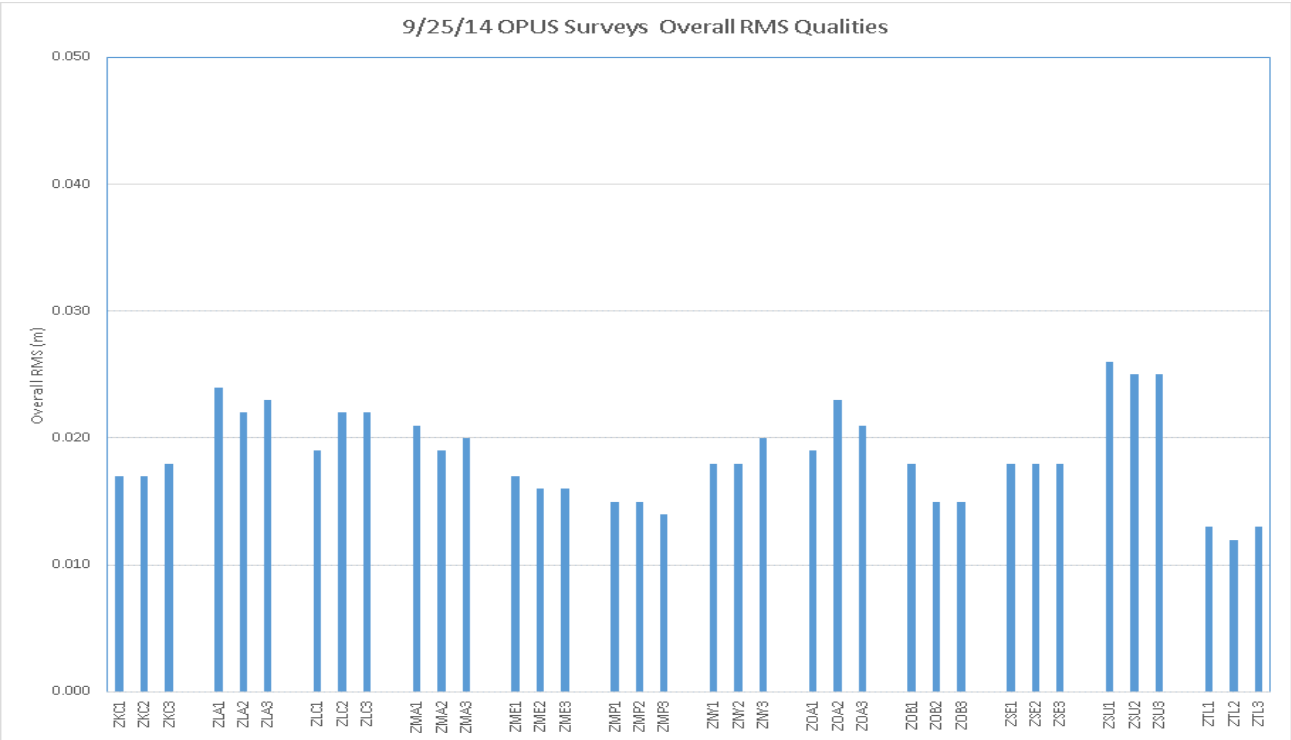


**Figure 10-7 9/25/19 OPUS vs. CSRS RSS ECEF Deltas**

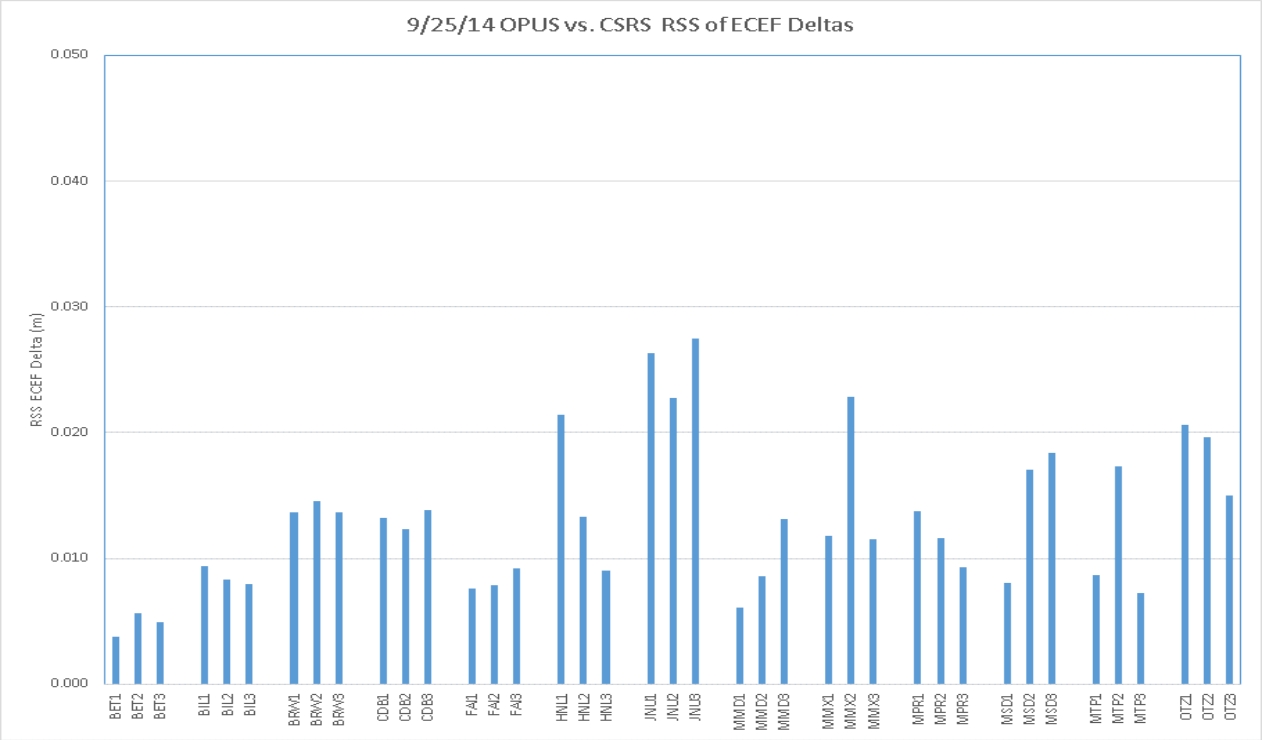



**Figure 10-8 9/25/19 OPUS vs. CSRS RSS ECEF Deltas**

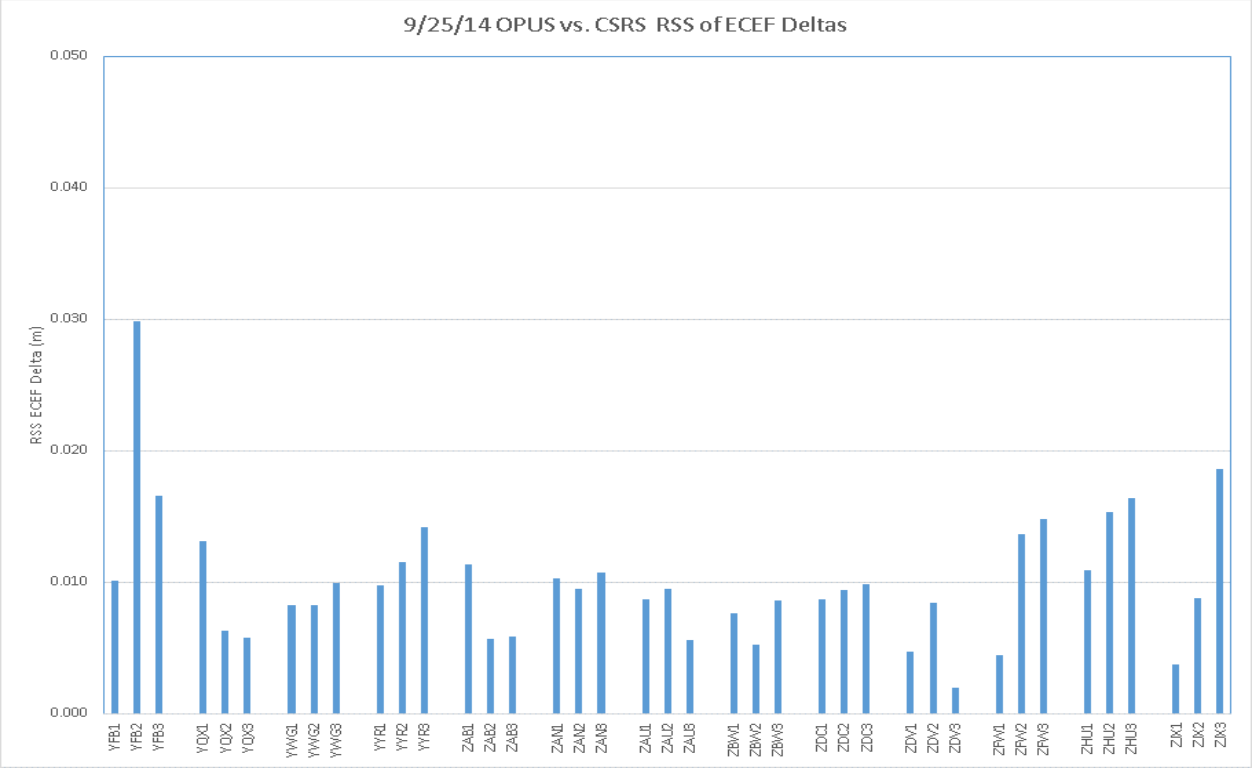


**Figure 10-9 9/25/19 OPUS vs. CSRS RSS ECEF Deltas**

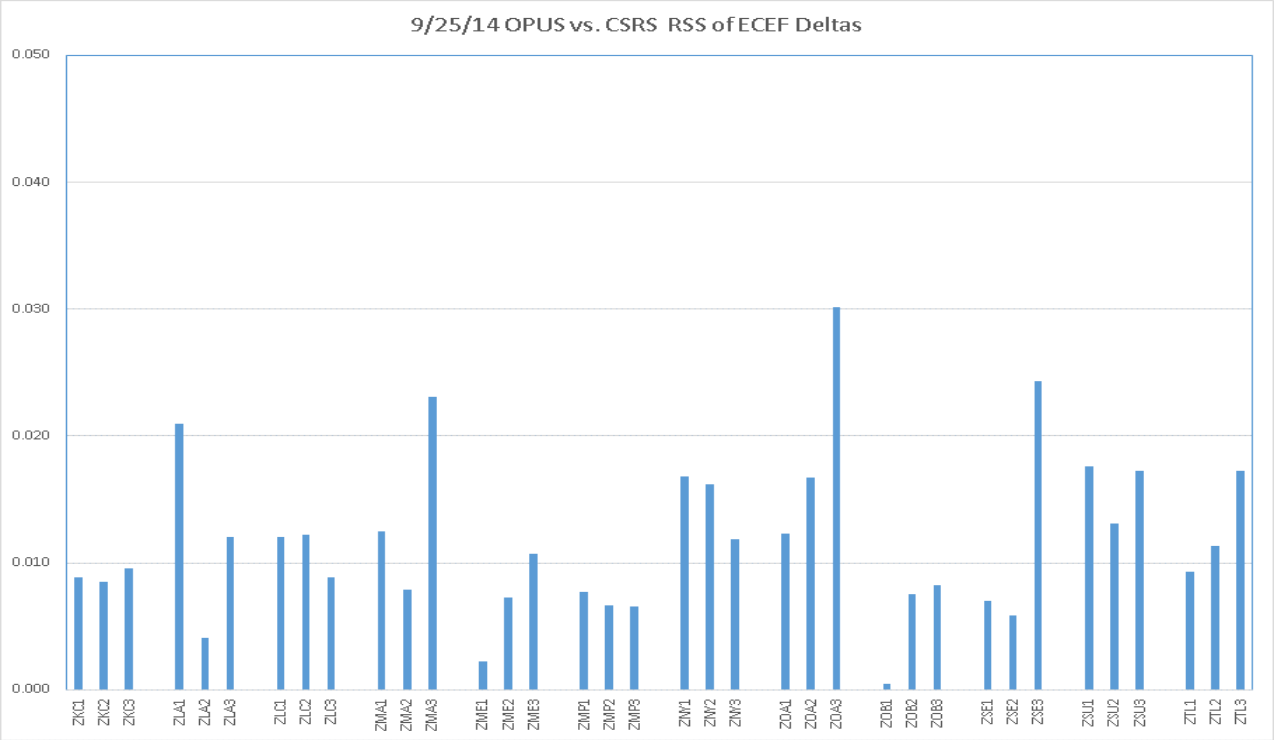



**Figure 10-10 9/25/19 CSRS Survey Qualities**

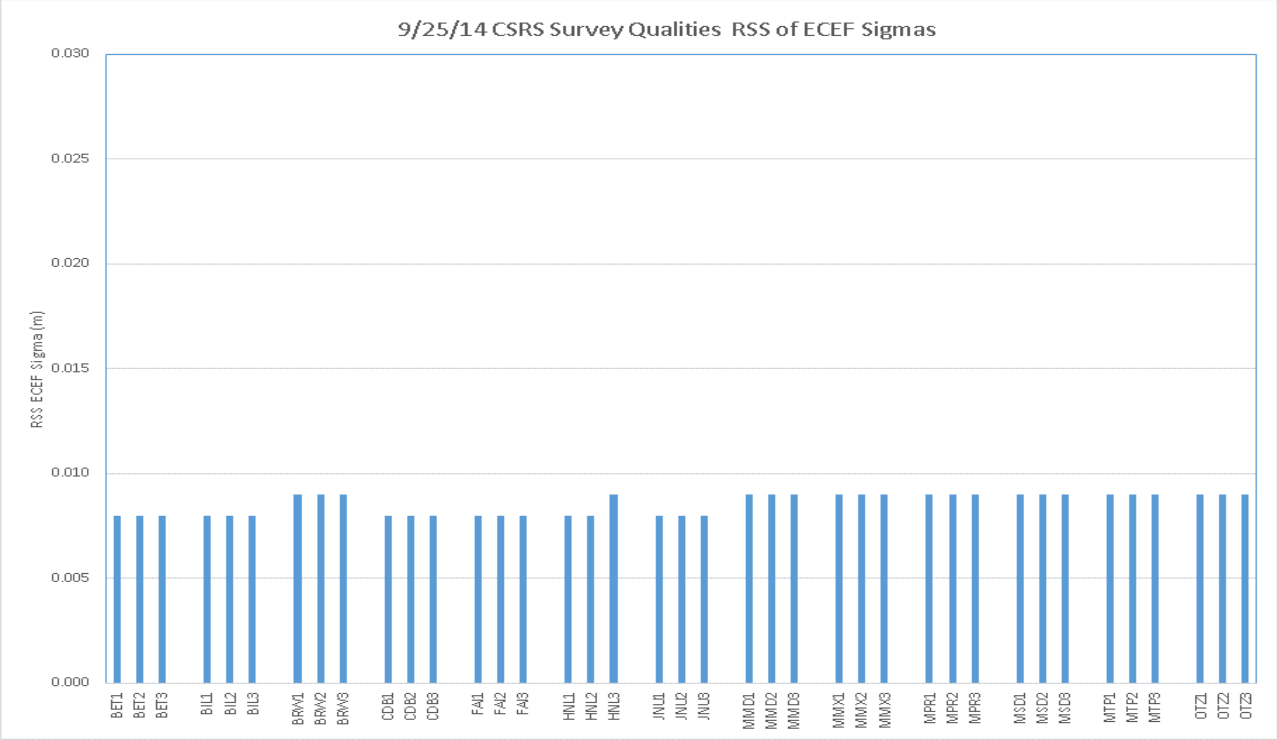


**Figure 10-11 9/25/19 CSRS Survey Qualities**

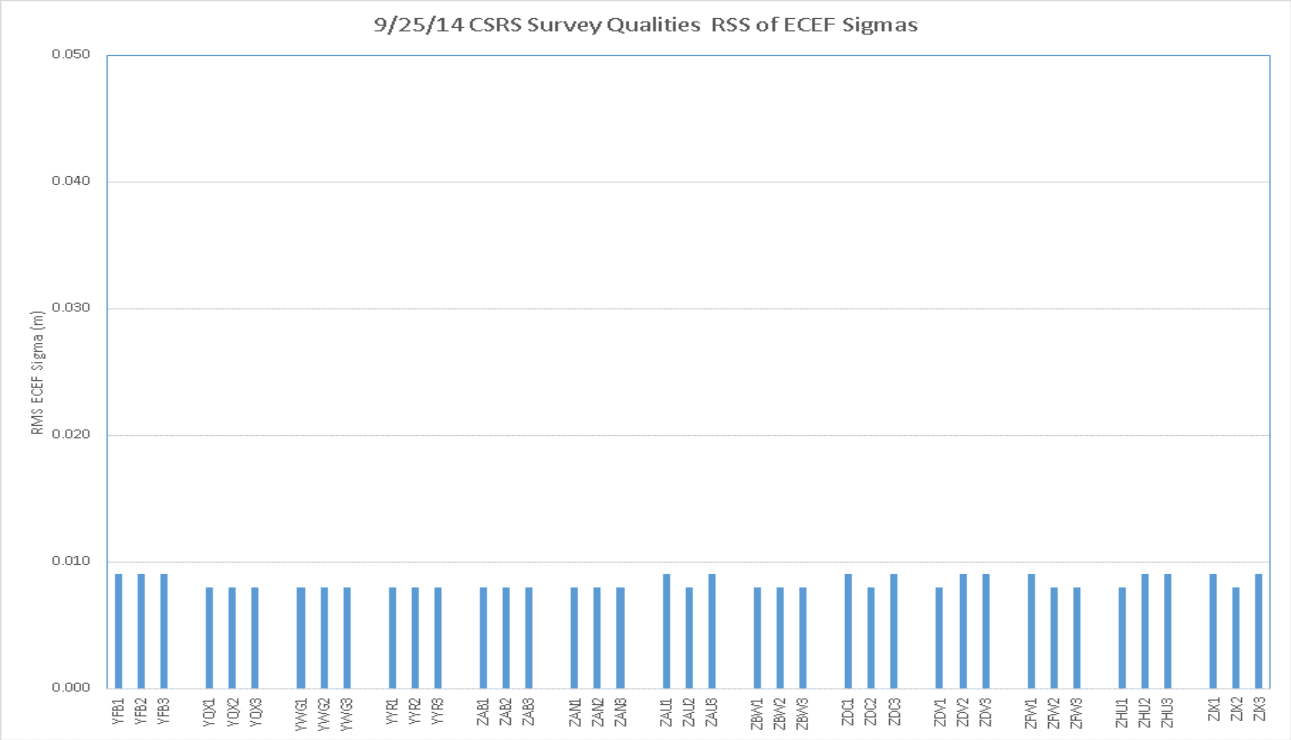
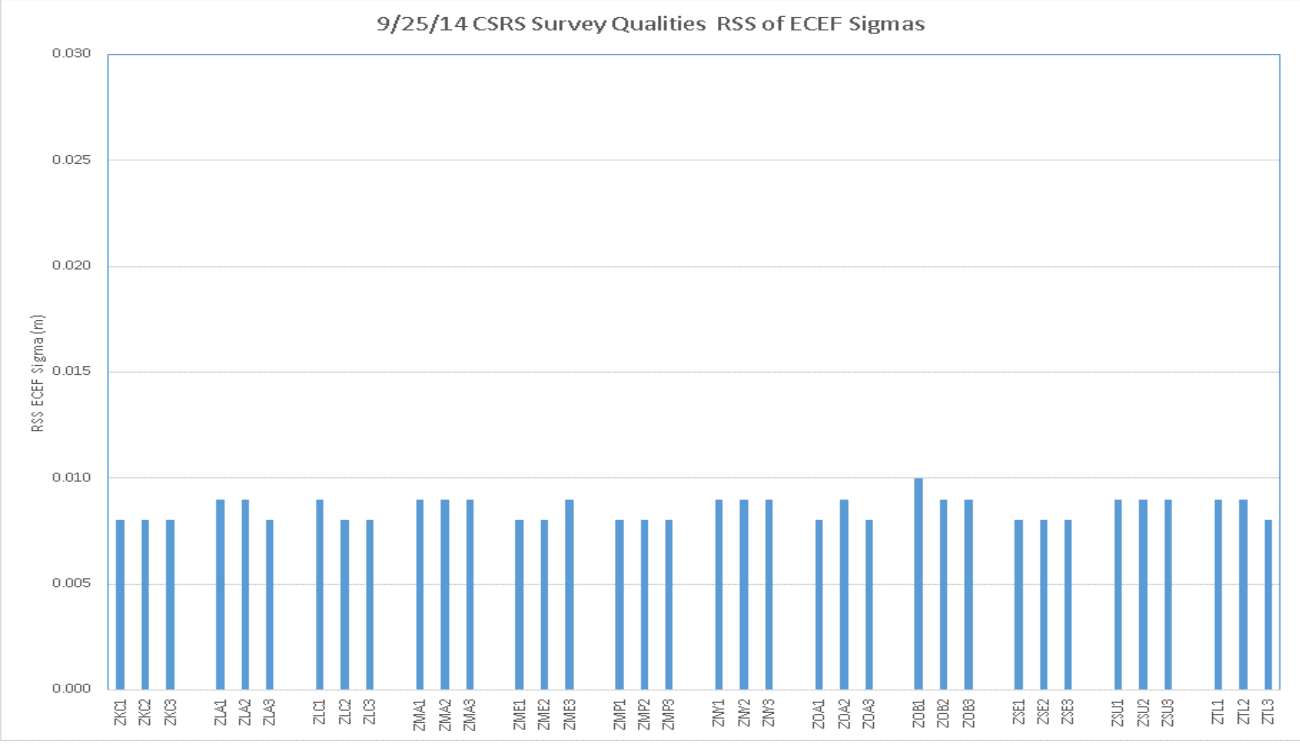



**Figure 10-12 9/25/19 CSRS Survey Qualities**



## 11.0 SIGNAL QUALITY MONITOR (SQM)

The Signal Quality Monitor (SQM) is designed to detect signal deformations that originate in the GPS or GEO satellites and ensures that the UDRE values are sufficiently inflated to protect given the monitor's current observations. SQM processes various correlator spacing measurements produced by the reference station receivers to form four detection metrics for each receiver and calculates statistics based on the observed performance against "ideal" signal correlation peaks. This results in an estimate of the overall deformation per satellite. The deformation level calculated is then compared against threshold values, which includes the acceptable error levels per UDRE value. If the estimated deformation exceeds threshold, the monitor trips for the given satellite and the UDRE value is set to 'Don't Use'. The monitor depends on the entire ground network in order to ensure that the satellite is the source of any problem detected rather than a localized affect. Currently all 114 receivers are being used in the SQM computations.

WAAS SQM offline monitoring effort includes the monitoring of the PRN type biases, trips, and the estimated deformation for each satellite that will be referred to as PRN bias in this report.

### 11.1 Alpha Metrics

The alpha metrics values are pre-determined by offline integrity analysis and are defined as constants in the SQM algorithm. These values remained unchanged for this reporting period and are listed in Table 11-1. Currently there are 4 sets of alpha metrics in the WAAS SQM algorithm that form four detection metrics for each receiver channel. For this report, the four detection metrics will be referred to as: DM1, DM2, DM3, and DM4.

**Table 11-1 Alpha Metrics**

| Correlator Spacing | DM1 | DM2 | DM3 | DM4 |
|---|---|---|---|---|
| -0.1 | 0 | 0.43407318 | 0 | -0.36110353 |
| -0.075 | 0 | 0.48570652 | -0.0058771682 | -0.74860302 |
| -0.05 | -0.4071265 | -0.69931105 | -0.011382325 | 0.23726003 |
| -0.025 | 1 | -0.010099034 | 0.00037033029 | -0.0076011735 |
| 0 | 0 | 0 | 0 | 0 |
| 0.025 | -0.25 | 0.13317879 | 0.99991788 | -0.062414070 |
| 0.05 | 1.008525 | -0.22851782 | 0 | 0.25177272 |
| 0.075 | 0 | 0.10209042 | 0 | 0.42875623 |
| 0.1 | 0 | 0.078436452 | 0 | 0.41602138 |

### 11.2 Type Bias

PRN Type biases are evaluated as part of the WAAS SQM offline monitoring effort. Depending on the PRN number of any given satellite, it can be classified into three categories of correlation function shapes: skinny (Type 0), nominal (Type 1), and broad (Type 2). Wideband geostationary satellites are considered a different type (Type 3). PRN-type estimates are computed at each epoch and daily averages are computed for each type, for four detection metrics.

For this reporting period, geostationary satellites type biases are not evaluated. Table11-3 shows the rollup average for the quarter. Table 11-4 shows the rollup average since January 1, 2008. Figure 11-1 shows the daily average for the four detection metrics for the quarter.

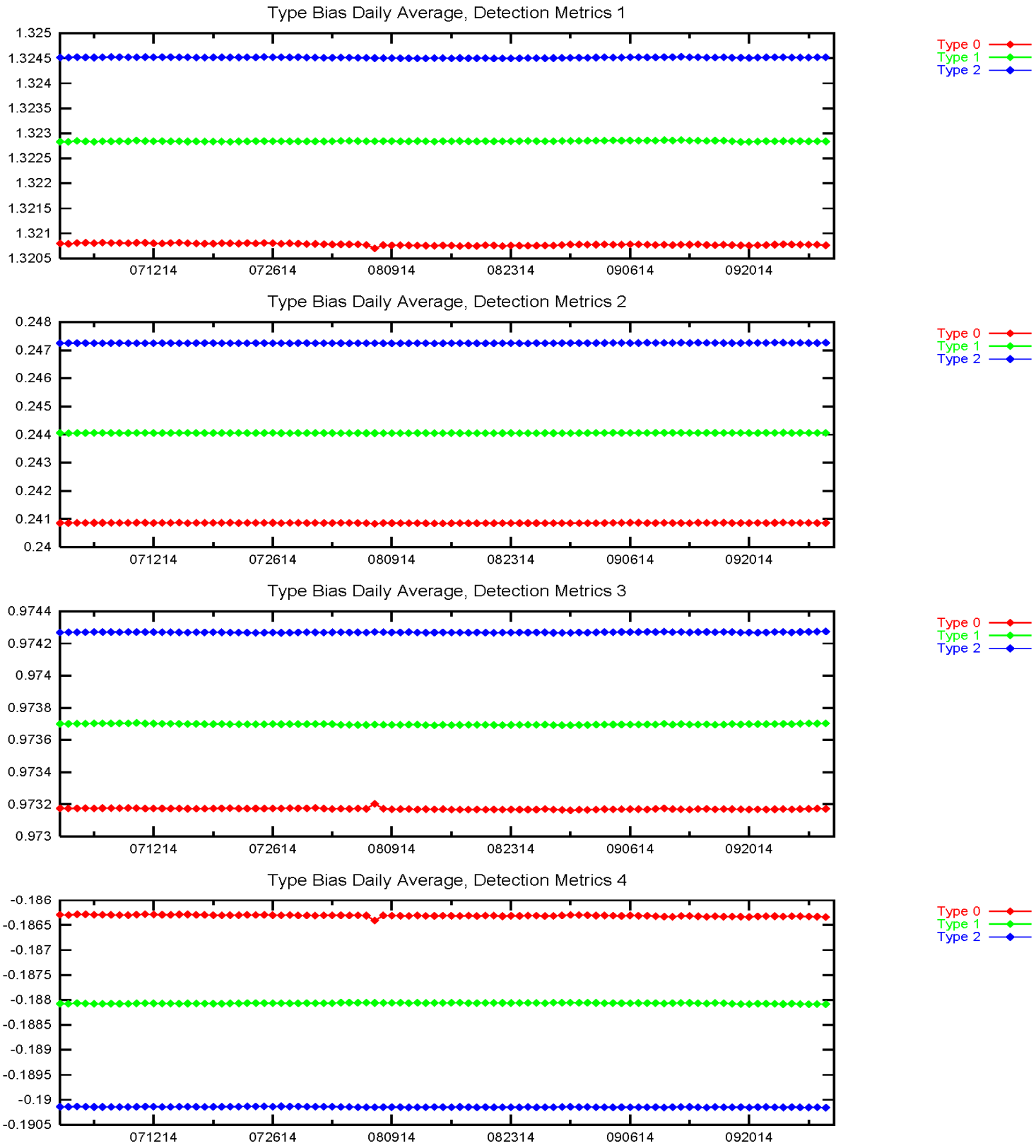
**Table 11-2 Type Bias Average for the Quarter**

| Detection Metric | Type 0 | Type 1 | Type 2 |
|---|---|---|---|
| DM 1 | 1.3207800 | 1.3228400 | 1.3245100 |
| DM 2 | 0.2408570 | 0.2440560 | 0.2472520 |
| DM 3 | 0.9731710 | 0.9736980 | 0.9742700 |
| DM 4 | -0.1863130 | -0.1880670 | -0.1901440 |

**Table 11-3 Type Bias Average Since January 1, 2008**

| Detection Metric | Type 0 | Type 1 | Type 2 |
|---|---|---|---|
| DM 1 | 1.3209000 | 1.3228700 | 1.3245800 |
| DM 2 | 0.2408500 | 0.2440890 | 0.2472720 |
| DM 3 | 0.9731740 | 0.9737080 | 0.9742750 |
| DM 4 | -0.1862230 | -0.1880650 | -0.1901050 |

**Figure 11-1 Type Bias Average Trend**



### 11.3 PRN Bias

PRN biases are evaluated as part of the WAAS SQM offline monitoring effort. PRN bias is the overall estimated deformation per satellite across receivers. Detection metrics are adjusted for inter-receiver bias, corrected for PRN type bias, and combined across receivers for each satellite. Relying on the assertion that the majority of the SV signals are healthy and normal, detection metrics are normalized over all the satellites on orbit resulting in an overall PRN bias for each satellite. PRN biases are collected at each epoch and daily averages are computed for each satellite, for four detection metrics.

Table 11-4 and Figure 11-2 show the rollup PRN bias average for the quarter. Figures 11-3 to 11-10 show the PRN bias average trend for each SV. The maximum average for DM1 for this quarter is PRN 23 at 0.001049. The maximum average for DM2 is PRN 11 at 0.0002146. The maximum average for DM3 is PRN 10 at 0.0002606 and the maximum average for DM4 is PRN 23 at 0.0004253.

For this reporting period, geostationary satellite biases are not evaluated. Please refer to Table 1-5 for events that may have an impact on PRN bias statistics. The small spikes in PRN bias daily averages are due to satellite outages. On the days of satellite maintenance, partial data resulted in a slightly varied PRN bias daily average compared to full day data average. PRN-3 (SVN-33) was decommissioned on 8/2/14. PRN-9 (SVN-68) became operational on 9/17/14.

**Table 11-4 PRN Bias Average for the Quarter**

| PRN | SVN | DM1 | DM2 | DM3 | DM4 |
|---|---|---|---|---|---|
| 1 | 63 | 0.0001459 | 0.0000900 | 0.0000774 | 0.0000876 |
| 2 | 61 | 0.0005710 | 0.0001302 | 0.0000972 | 0.0001034 |
| 3 | 33 | 0.0001756 | 0.0000771 | 0.0001085 | 0.0003412 |
| 4 | 34 | 0.0001663 | 0.0000451 | 0.0000585 | 0.0001485 |
| 5 | 50 | 0.0001225 | 0.0001108 | 0.0000546 | 0.0000987 |
| 6 | 67 | 0.0002115 | 0.0002049 | 0.0001483 | 0.0001342 |
| 7 | 34 | 0.0001313 | 0.0000676 | 0.0000345 | 0.0001228 |
| 8 | 38 | 0.0001449 | 0.0001582 | 0.0000378 | 0.0001002 |
| 9 | 39 | 0.0001902 | 0.0000754 | 0.0000899 | 0.0003910 |
| 10 | 40 | 0.0006866 | 0.0000457 | 0.0002606 | 0.0001203 |
| 11 | 46 | 0.0009683 | 0.0002146 | 0.0000619 | 0.0002476 |
| 12 | 58 | 0.0001439 | 0.0000707 | 0.0000910 | 0.0000803 |
| 13 | 43 | 0.0005943 | 0.0000534 | 0.0000856 | 0.0001506 |
| 14 | 41 | 0.0007041 | 0.0001346 | 0.0001200 | 0.0001191 |
| 15 | 55 | 0.0001355 | 0.0000574 | 0.0000262 | 0.0001364 |
| 16 | 56 | 0.0001325 | 0.0000613 | 0.0001332 | 0.0003375 |
| 17 | 53 | 0.0001630 | 0.0000656 | 0.0000444 | 0.0001182 |
| 18 | 54 | 0.0007066 | 0.0001365 | 0.0000466 | 0.0002319 |
| 19 | 59 | 0.0004752 | 0.0001759 | 0.0000547 | 0.0000868 |
| 20 | 51 | 0.0001373 | 0.0000565 | 0.0000341 | 0.0001813 |
| 21 | 45 | 0.0003766 | 0.0001267 | 0.0001706 | 0.0001290 |
| 22 | 47 | 0.0003509 | 0.0000577 | 0.0000944 | 0.0003416 |
| 23 | 60 | 0.0010490 | 0.0001747 | 0.0000390 | 0.0004253 |
| 24 | 65 | 0.0002141 | 0.0000491 | 0.0000380 | 0.0001135 |
| 25 | 62 | 0.0002965 | 0.0001864 | 0.0000800 | 0.0001193 |
| 26 | 26 | 0.0002152 | 0.0000569 | 0.0001330 | 0.0000988 |
| 27 | 66 | 0.0005978 | 0.0001781 | 0.0000658 | 0.0003095 |
| 28 | 44 | 0.0002946 | 0.0000456 | 0.0000322 | 0.0000874 |
| 29 | 57 | 0.0002948 | 0.0000558 | 0.0000904 | 0.0002842 |
| 30 | 64 | 0.0002116 | 0.0000550 | 0.0000475 | 0.0001675 |
| 31 | 52 | 0.0003868 | 0.0001430 | 0.0000346 | 0.0002604 |
| 32 | 23 | 0.0001964 | 0.0000649 | 0.0000979 | 0.0000953 |

**Figure 11-2 PRN Bias Average for the Quarter**

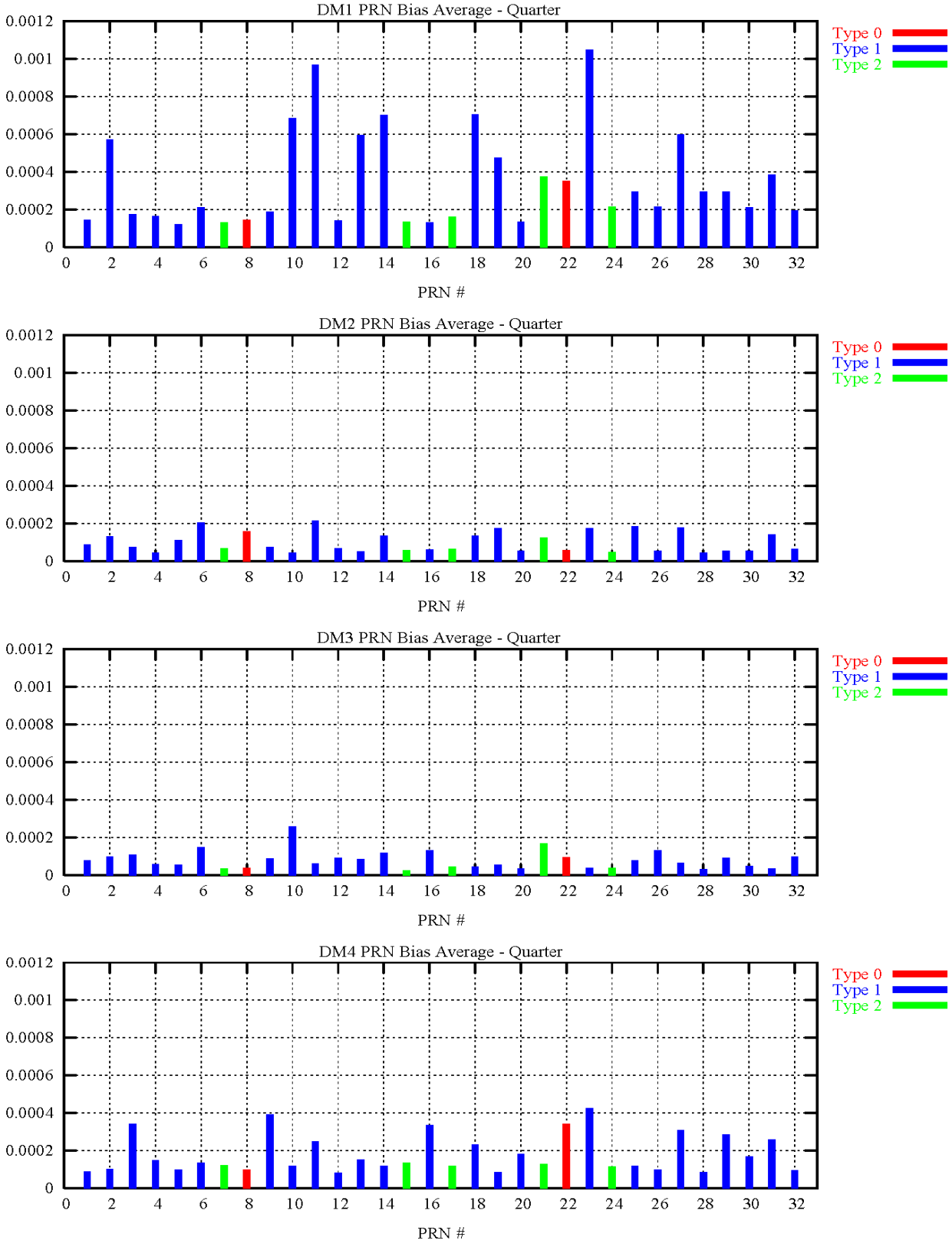


**Figure 11-3 PRN Bias Average Trend (PRN 1 – PRN 4)**

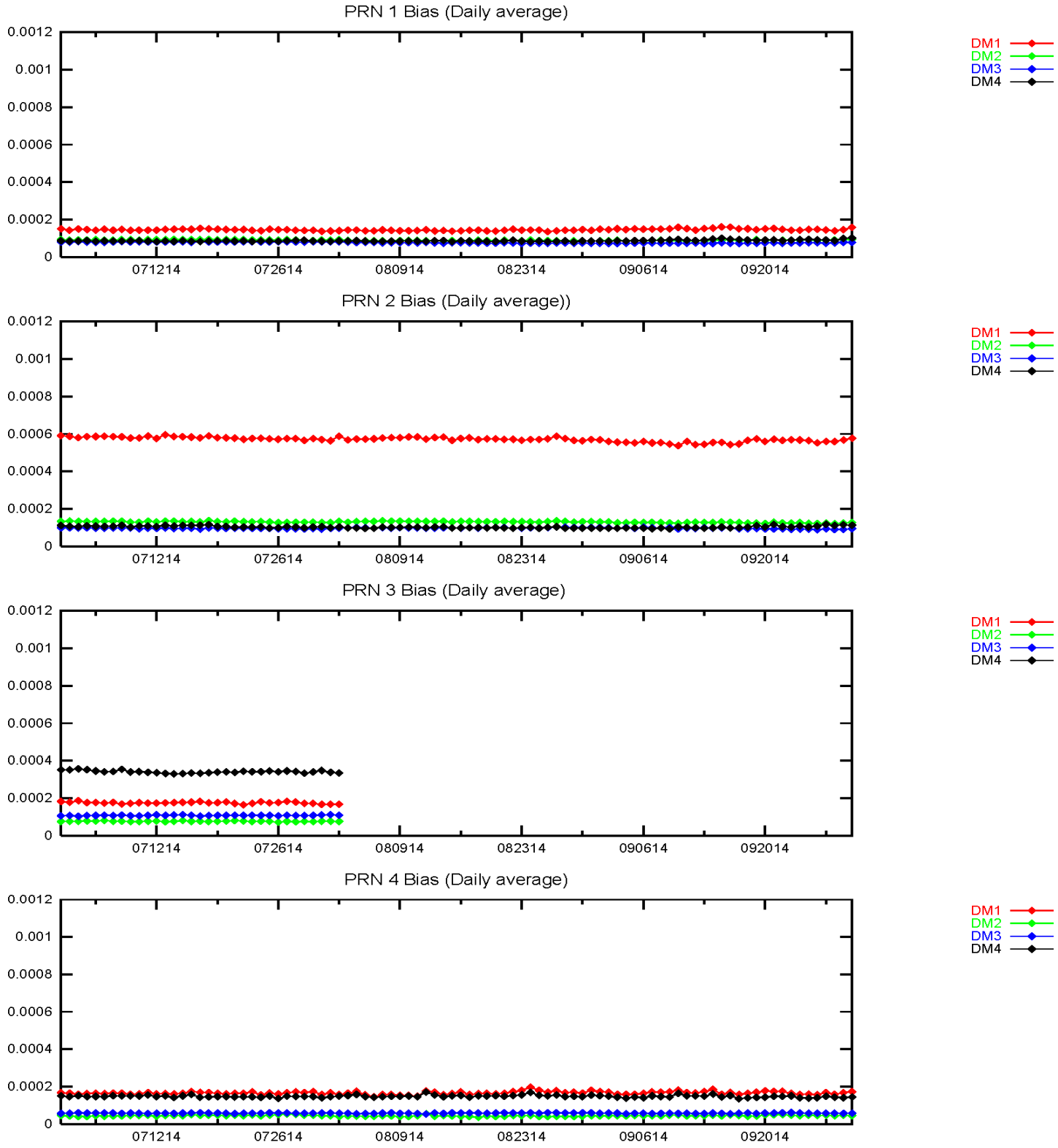


**Figure 11-4 PRN Bias Average Trend (PRN 5 – PRN 8)**

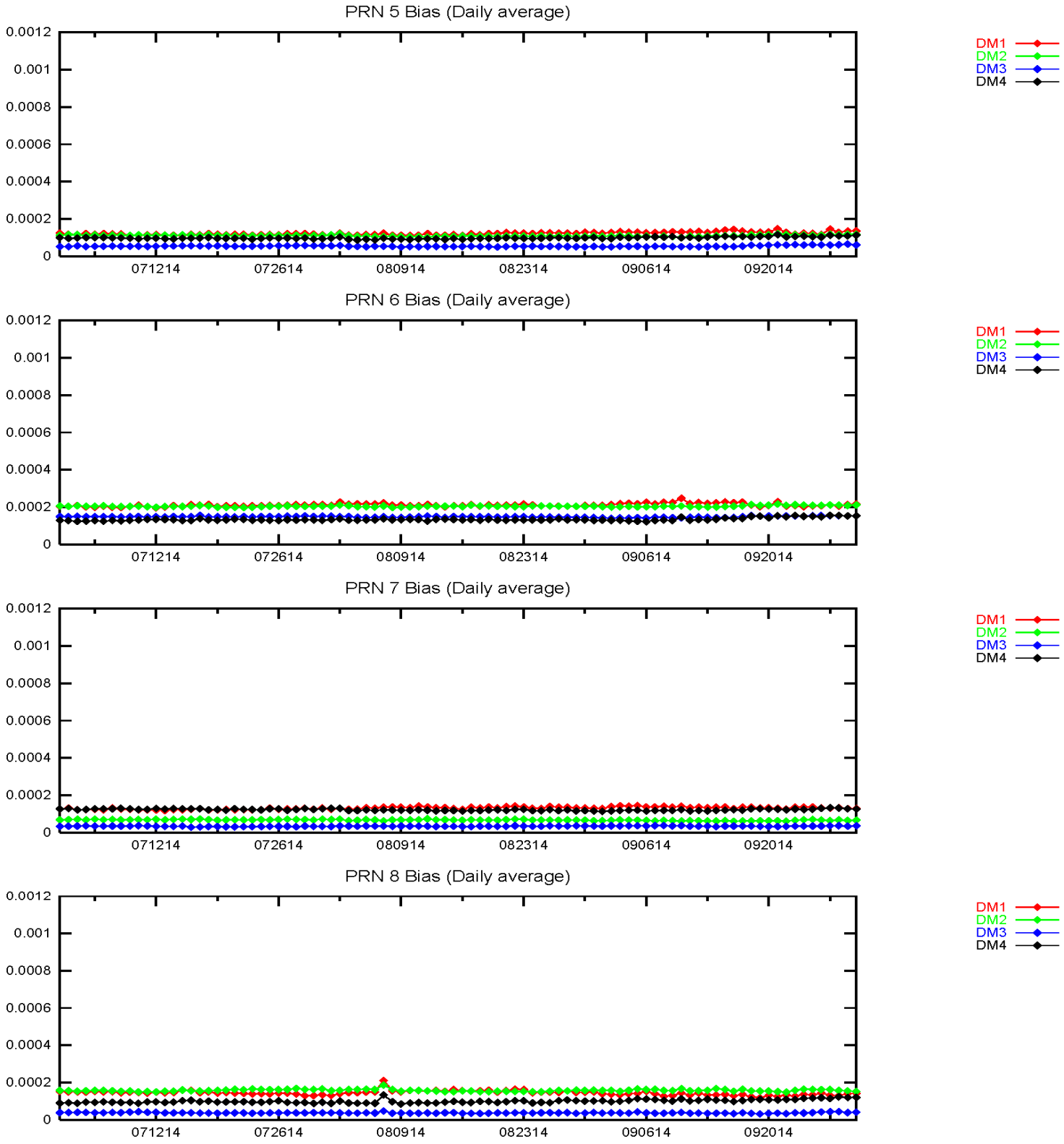


**Figure 11-5 PRN Bias Average Trend (PRN 9 – PRN 12)**

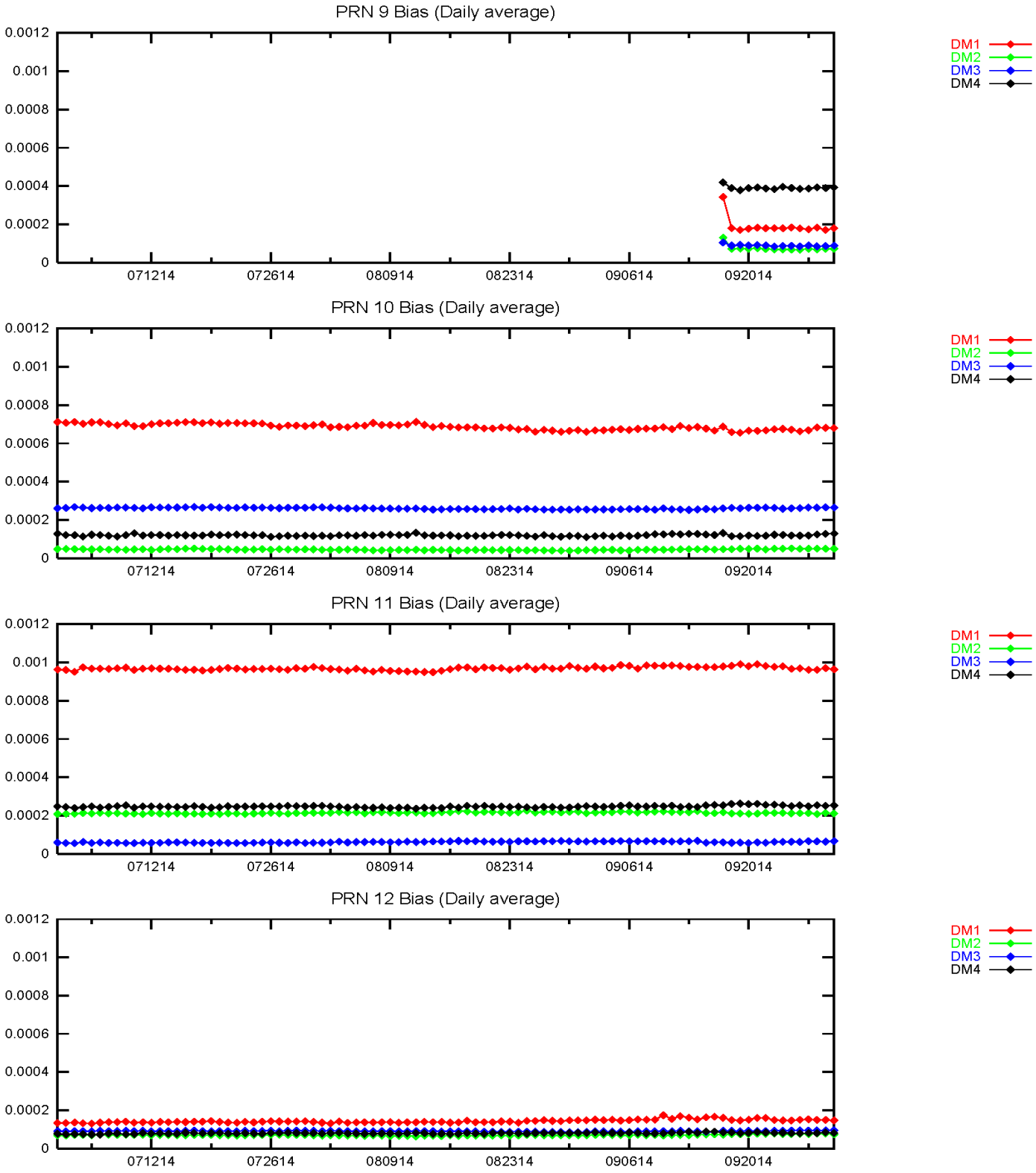


**Figure 11-6 PRN Bias Average Trend (PRN 13 – PRN 16)**

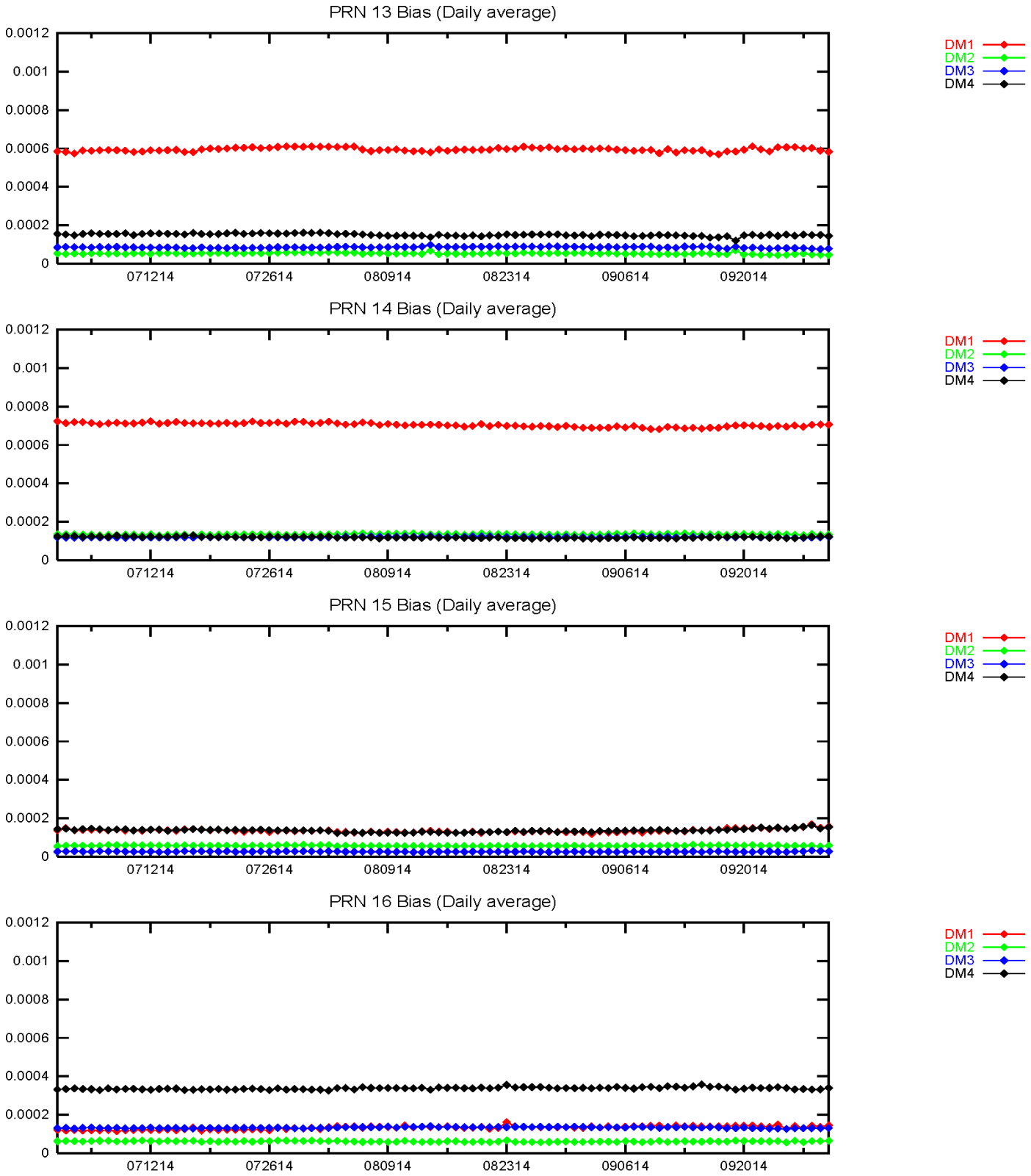


**Figure 11-7 PRN Bias Average Trend (PRN 17 – PRN 20)**

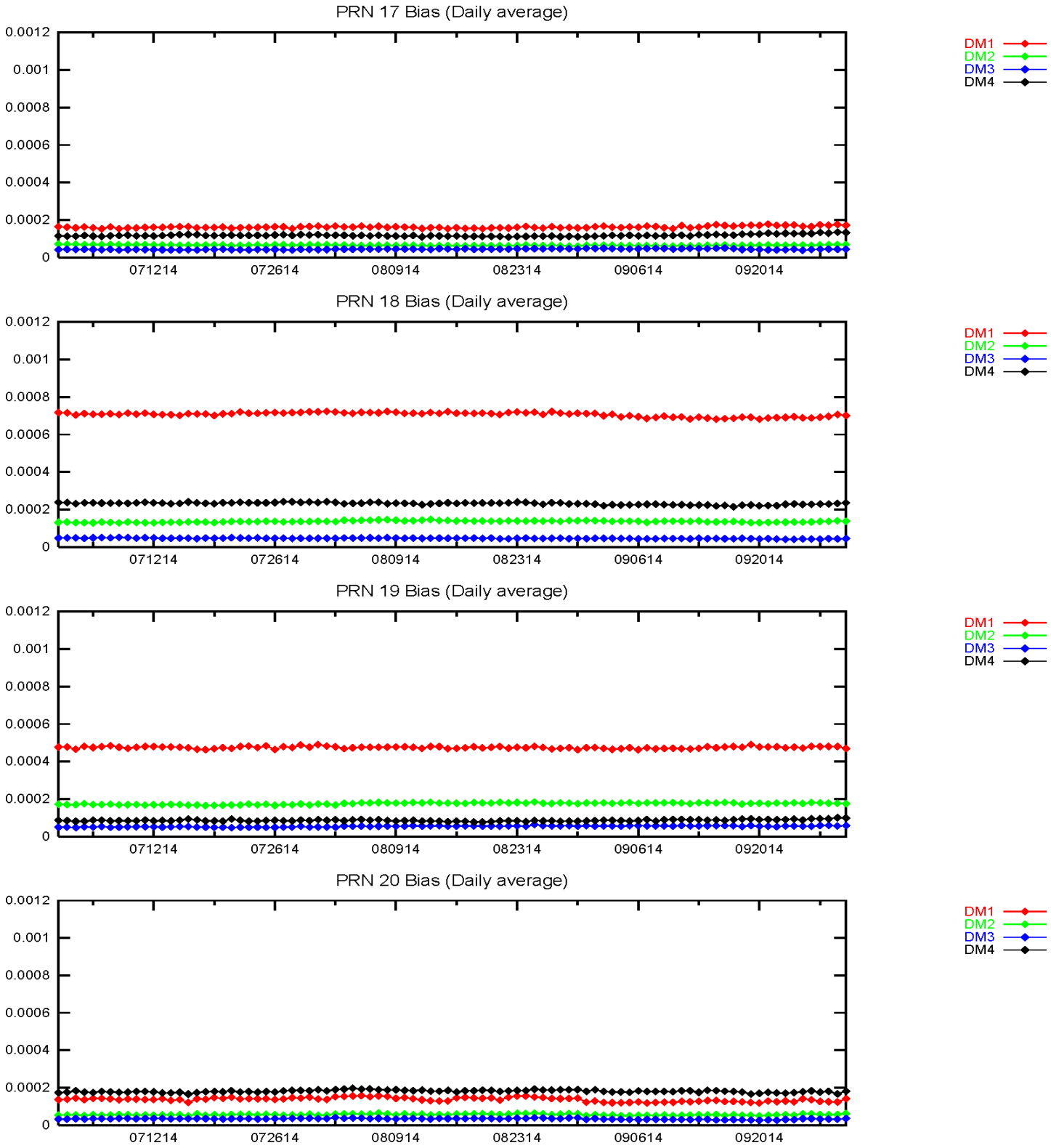


**Figure 11-8 PRN Bias Average Trend (PRN 21 – PRN 24)**

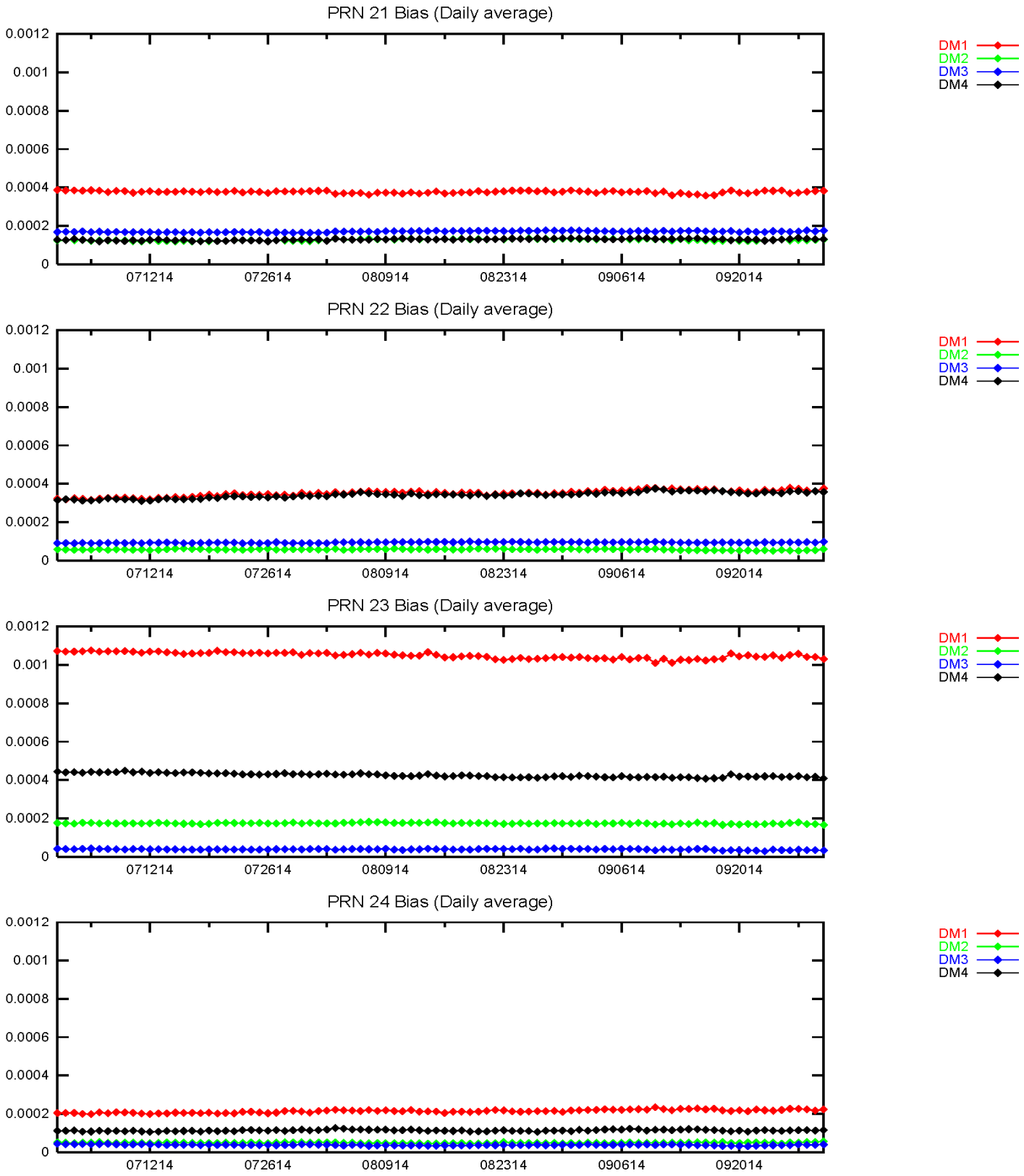


**Figure 11-9 PRN Bias Average Trend (PRN 25 – PRN 28)**

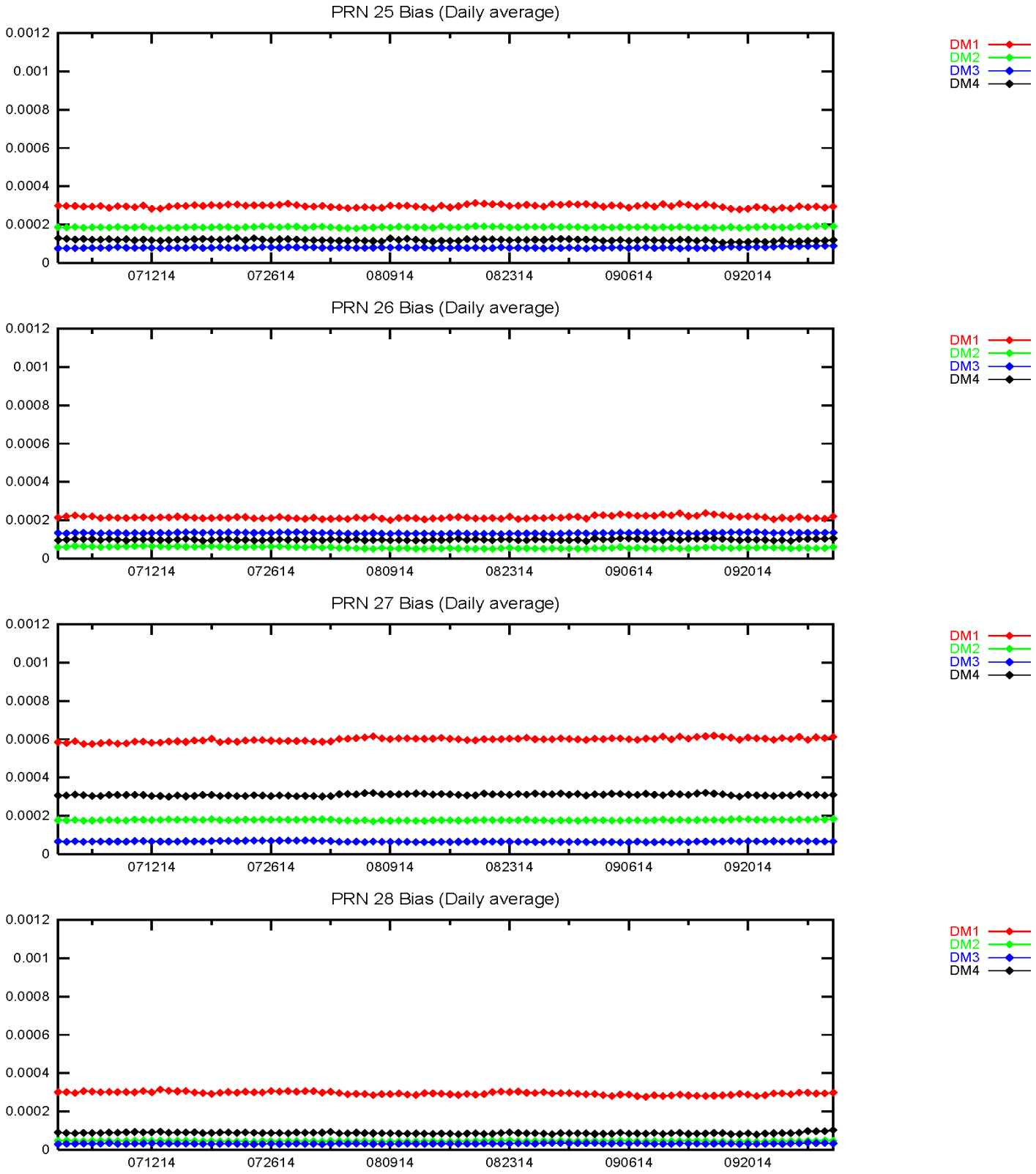
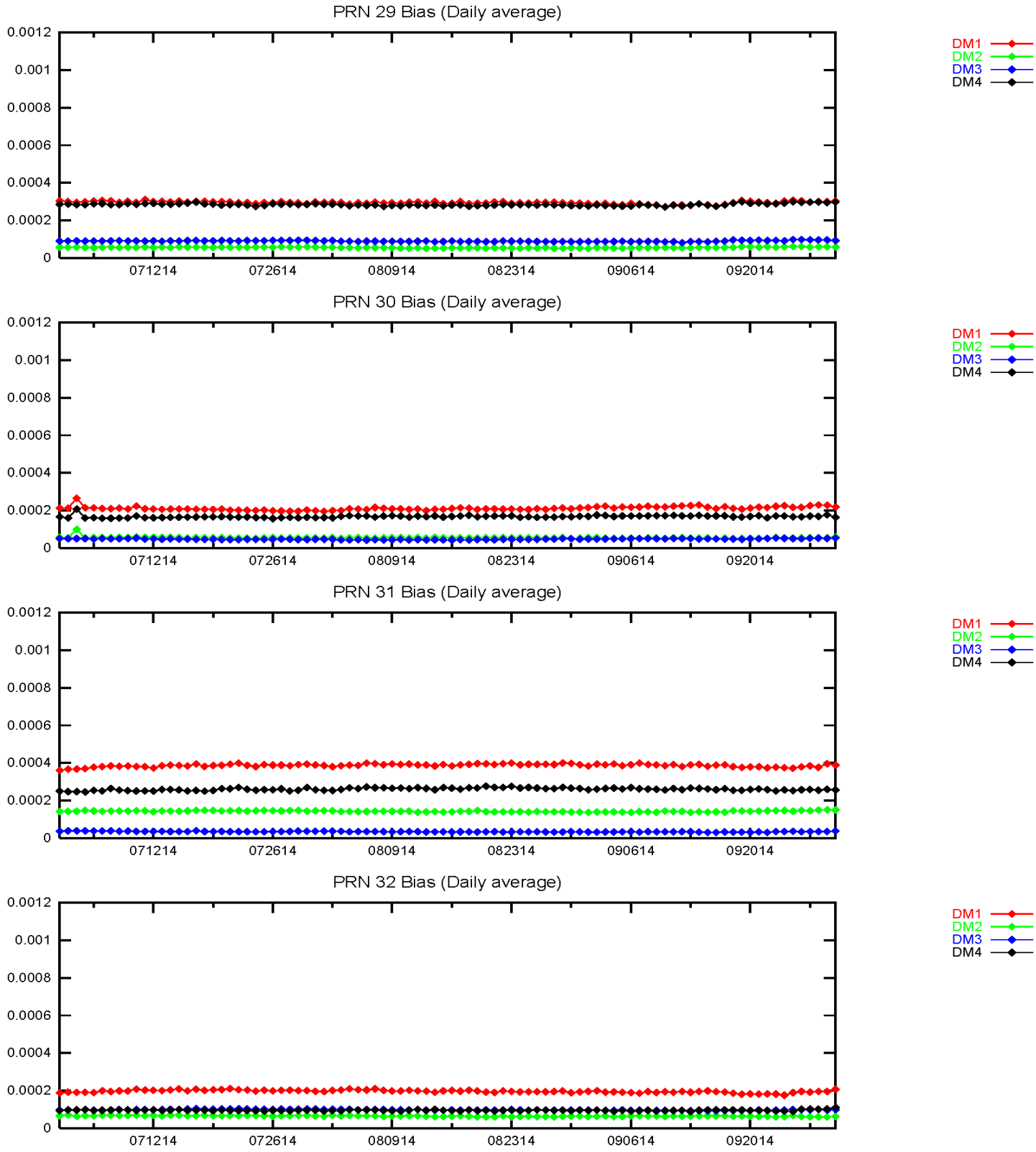


**Figure 11-10 PRN Bias Average Trend (PRN 29 – PRN 32)**



### 11.4 SQM Trips

SQM trip occurs when the estimated deformation exceeds threshold. There were no SQM trips for this quarter.

## 12.0 G3 RECEIVER ANALYSIS

The WAAS G3 receiver analysis determines the position and range domain performance of the new Novatel G3 receiver as compared to the currently fielded Novatel G2 receiver. In preparation for a full constellation of dual civil frequency GPS satellites (L1/L5), the WAAS system will be upgraded with new receivers in order to fully recognize the benefit of GPS modernization. The receivers have already undergone extensive factory testing by the manufacturer and the first test receivers were delivered to the Federal Aviation Administration in October 2013. The new receivers were setup at six existing WAAS reference sites (WRS) using the existing antenna subsystems and reference clocks for input. The six sites are:

| | |
|---|---|
| Nashua, New Hampshire (Boston) | Honolulu, Hawaii |
| Aurora, Illinois | Miami, Florida |
| Fairbanks, Alaska | Seattle, Washington |

Two Novatel G3 receivers were installed at each site for a total of twelve test receivers. The test receiver navigation error data was collected and processed to determine position accuracy at each location. This was accomplished by utilizing the GPS/WAAS position solution tool to compute a RTCA DO-229D weighted least squares user navigation solution once every second for the month of March 2014. The G3 test receivers are marked as 4 and 5, while the fielded G2 receivers are marked 1 and 2 for each site. Receivers 1 and 4 are tied to the same antenna and clock hardware, as are receivers 2 and 5.

### 12.1 G3 Position Accuracy

Table 12-1 lists the receivers used in the PA analysis. Table 12-2 shows PA horizontal and vertical position accuracy maintained for 95% of the time at LP, LPV and LNAV/VNAV operational service levels for the quarter. Figures 12-1 to 12-4 show the daily horizontal and vertical 95% accuracy for LPV operational service level for the reporting period. Note that WAAS accuracy statistics presented are compiled only when all WAAS corrections (fast, long term, and ionospheric) for at least 4 satellites are available. This is referred to as PA navigation mode. The percentage of time that PA navigation mode was supported by WAAS at each receiver is also shown in Table 12-2. The Honolulu site is an exception to the rule because it so far outside CONUS. Honolulu was evaluated solely in NPA mode for all position results.

Table 12-3 shows the maximum LPV error statistics. The column marked ‘Horizontal Error’ shows the maximum position errors while the calculated HPL meets the LPV service level defined in Table 1-1. The column marked ‘Vertical Error’ shows the maximum position errors while the calculated VPL meets the LPV service level. The columns marked ‘Horizontal Error/HPL’ and ‘Vertical Error/VPL’ show the ratio of position error to protection level at the time the maximum error occurred. The columns marked ‘Horizontal Maximum Ratio’ and ‘Vertical Maximum Ratio’ show the maximum position error to protection level ratio for the quarter.

During this reporting period, the maximum 95% CONUS horizontal and vertical LPV errors are 1.0008 meters and 1.774 meters at Miami-A and Fairbanks-A, respectively. The minimum 95% CONUS horizontal and vertical LPV errors are 0.625 meters and 0.970 meters at Chicago-B and Seattle-B, respectively.

**Table 12-1 PA Evaluation Sites for G3 Receivers**

| Location | Days Evaluated | Samples |
|---|---|---|
| Boston-A | 87 | 7537195 |
| Boston-B | 85 | 7314344 |
| Chicago-A | 84 | 7245849 |
| Chicago-B | 85 | 7312136 |
| Fairbanks-A | 47 | 4068101 |
| Fairbanks-B | 64 | 5524923 |
| Honolulu-A | 86 | 7455054 |
| Honolulu-B | 86 | 7392686 |
| Miami-A | 91 | 7835387 |
| Miami-B | 91 | 7835845 |
| Seattle-A | 89 | 7658279 |
| Seattle-B | 89 | 7663016 |

**Table 12-2 PA 95% Horizontal and Vertical Accuracy for G3 Receivers**

| Location | Horizontal (HAL = 40m) (Meters) | Horizontal (HAL=556m) (Meters) | Vertical (VAL=50m) (Meters) | Percentage in PA mode (%) |
|---|---|---|---|---|
| Boston-A | 0.767 | 0.767 | 1.17 | 100 |
| Boston-B | 0.803 | 0.803 | 0.999 | 100 |
| Chicago-A | 0.889 | 0.889 | 1.09 | 100 |
| Chicago-B | 0.625 | 0.625 | 1.019 | 100 |
| Fairbanks-A | 0.917 | 0.917 | 1.774 | 100 |
| Fairbanks-B | 0.75 | 0.75 | 1.246 | 100 |
| Miami-A | 1.008 | 1.008 | 1.236 | 100 |
| Miami-B | 0.97 | 0.97 | 1.171 | 100 |
| Seattle-A | 0.658 | 0.658 | 1.007 | 100 |
| Seattle-B | 0.963 | 0.963 | 0.97 | 100 |
| | | | | |
| Honolulu-A * | 4.78 | 11.577 | - | 93.78842 |
| Honolulu-B * | 4.783 | 11.734 | - | 93.0038 |

* Note: Because Honolulu sites are so far outside CONUS, they were evaluated for position in Non-Precision Approach (NPA) mode only. Because NPA mode was used, no vertical accuracy is given. The percentage value for Honolulu is the percent of total time evaluated of March 2014.

**Table 12-3 Maximum LPV Error Statistics for G3 Receivers**

| Location | Horizontal Error (m) | Horizontal Error/HPL | Horizontal Maximum Ratio | Vertical Error (m) | Vertical Error/VPL | Vertical Maximum Ratio |
|---|---|---|---|---|---|---|
| Boston-A | 2.609 | 0.173 | 0.177 | 5.162 | 0.241 | 0.268 |
| Boston-B | 2.820 | 0.186 | 0.193 | 4.714 | 0.257 | 0.257 |
| Chicago-A | 1.841 | 0.146 | 0.182 | 3.778 | 0.206 | 0.206 |
| Chicago-B | 2.980 | 0.169 | 0.169 | 3.536 | 0.192 | 0.192 |
| Fairbanks-A | 2.093 | 0.143 | 0.163 | 4.579 | 0.166 | 0.224 |
| Fairbanks-B | 1.992 | 0.155 | 0.155 | 3.778 | 0.223 | 0.223 |
| Miami-A | 2.341 | 0.181 | 0.216 | 3.120 | 0.204 | 0.204 |
| Miami-B | 2.598 | 0.201 | 0.207 | 5.876 | 0.126 | 0.190 |
| Seattle-A | 3.022 | 0.270 | 0.280 | 4.912 | 0.294 | 0.294 |
| Seattle-B | 2.642 | 0.213 | 0.213 | 3.884 | 0.252 | 0.252 |
| | | | | | | |
| Honolulu-A * | 14.779 | 0.320 | - | 22.132 | 0.332 | - |
| Honolulu-B * | 14.728 | 0.319 | - | 22.342 | 0.335 | - |

* Note: Because Honolulu sites are so far outside CONUS, they were evaluated for position in Non-Precision Approach (NPA) mode only. Because NPA mode was used, no vertical accuracy is given. The percentage value for Honolulu is the percent of total time evaluated of March 2014.

**Figure 12-1 LPV 95% Horizontal Accuracy**

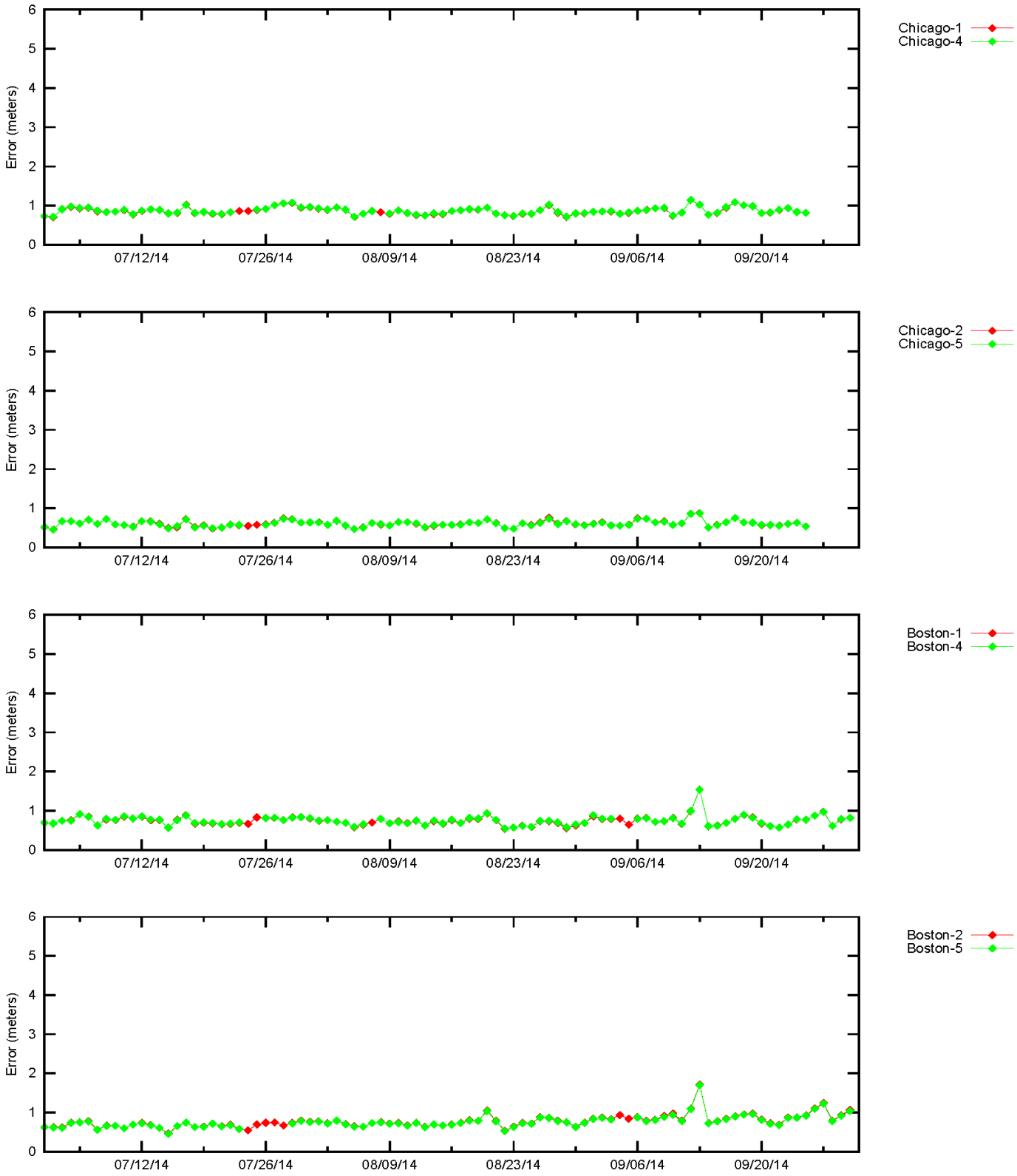


**Figure 12-2 LPV 95% Horizontal Accuracy**

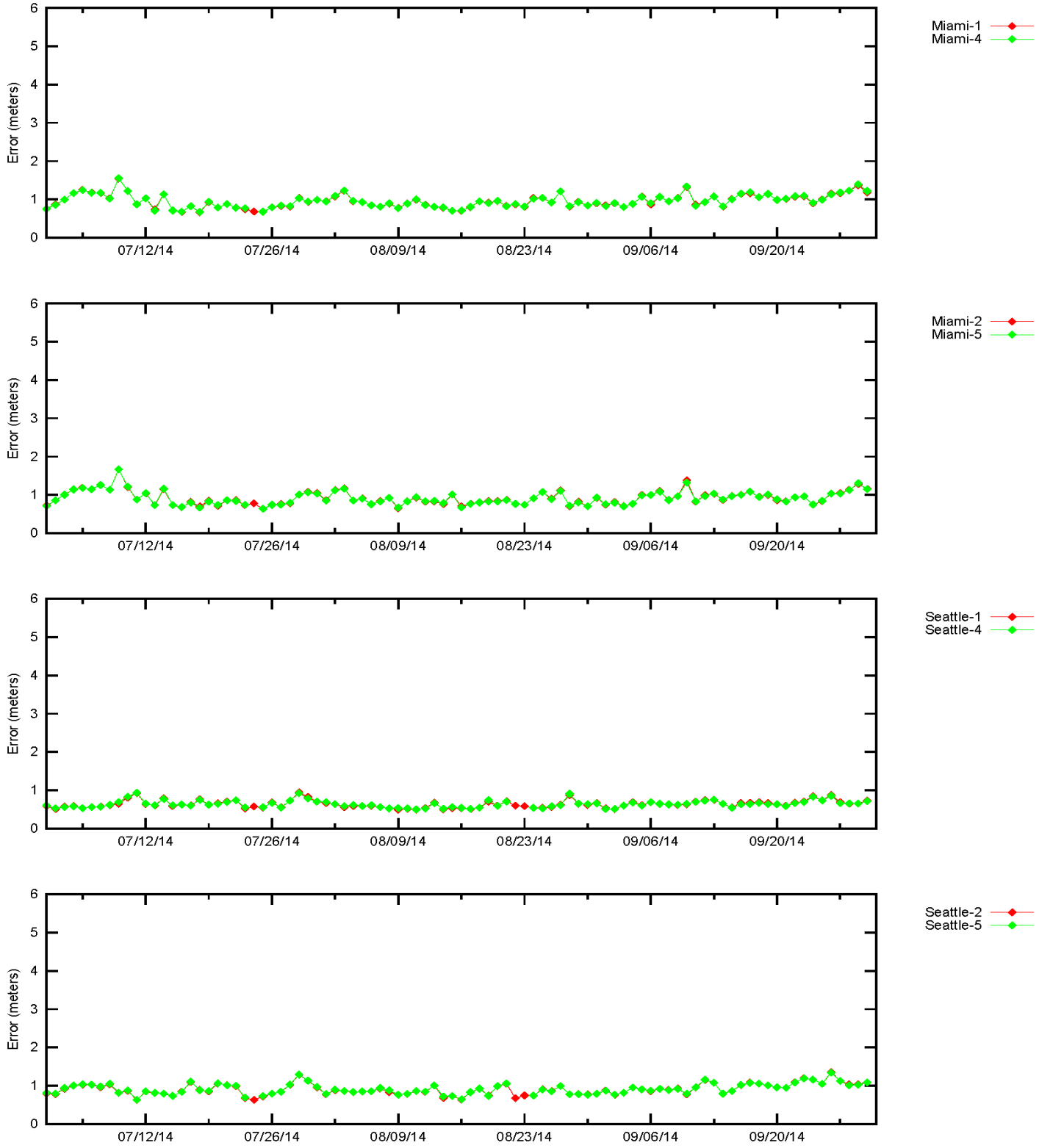


**Figure 12-3 LPV 95% Vertical Accuracy**

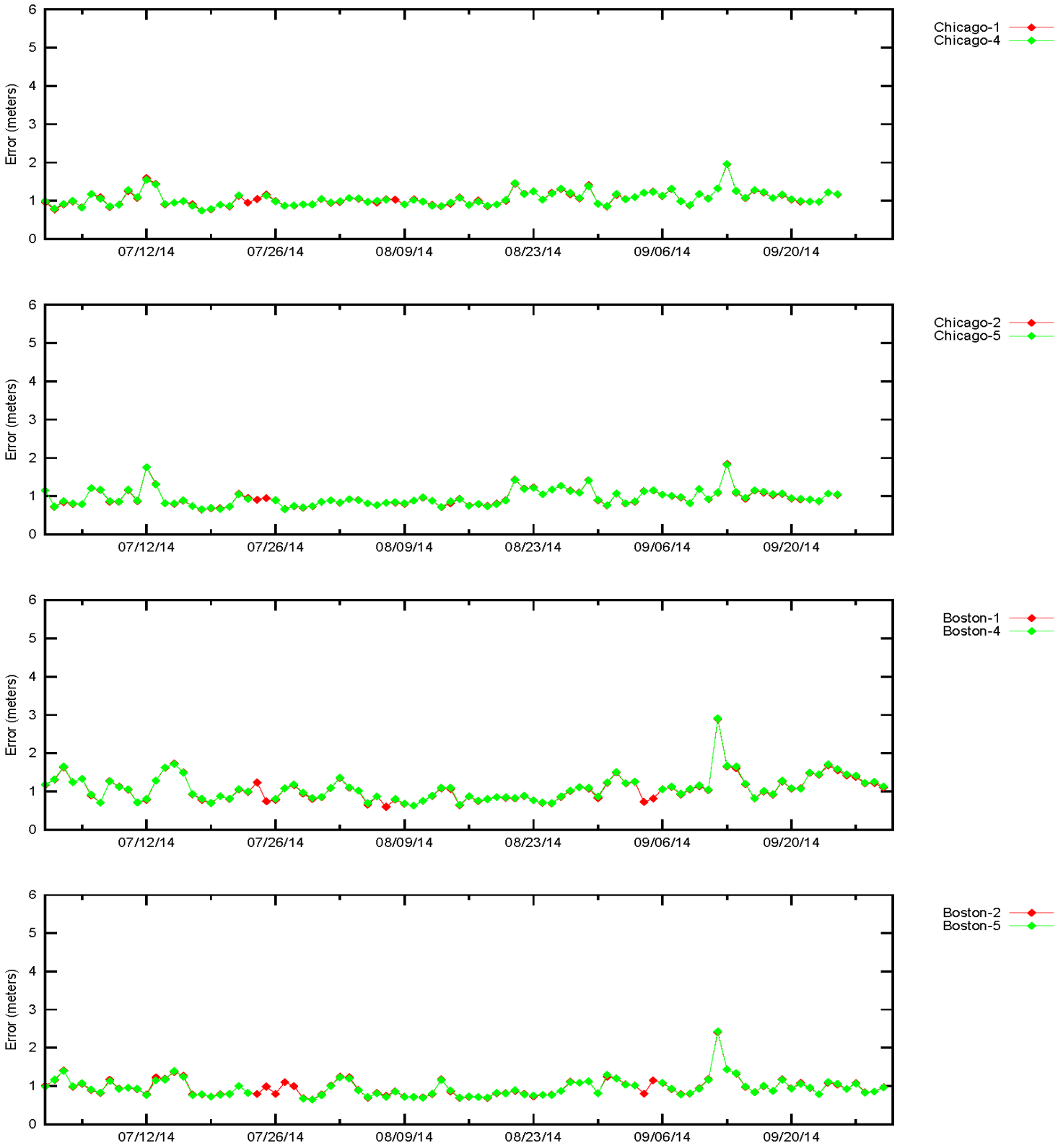


**Figure 12-4 LPV 95% Vertical Accuracy**

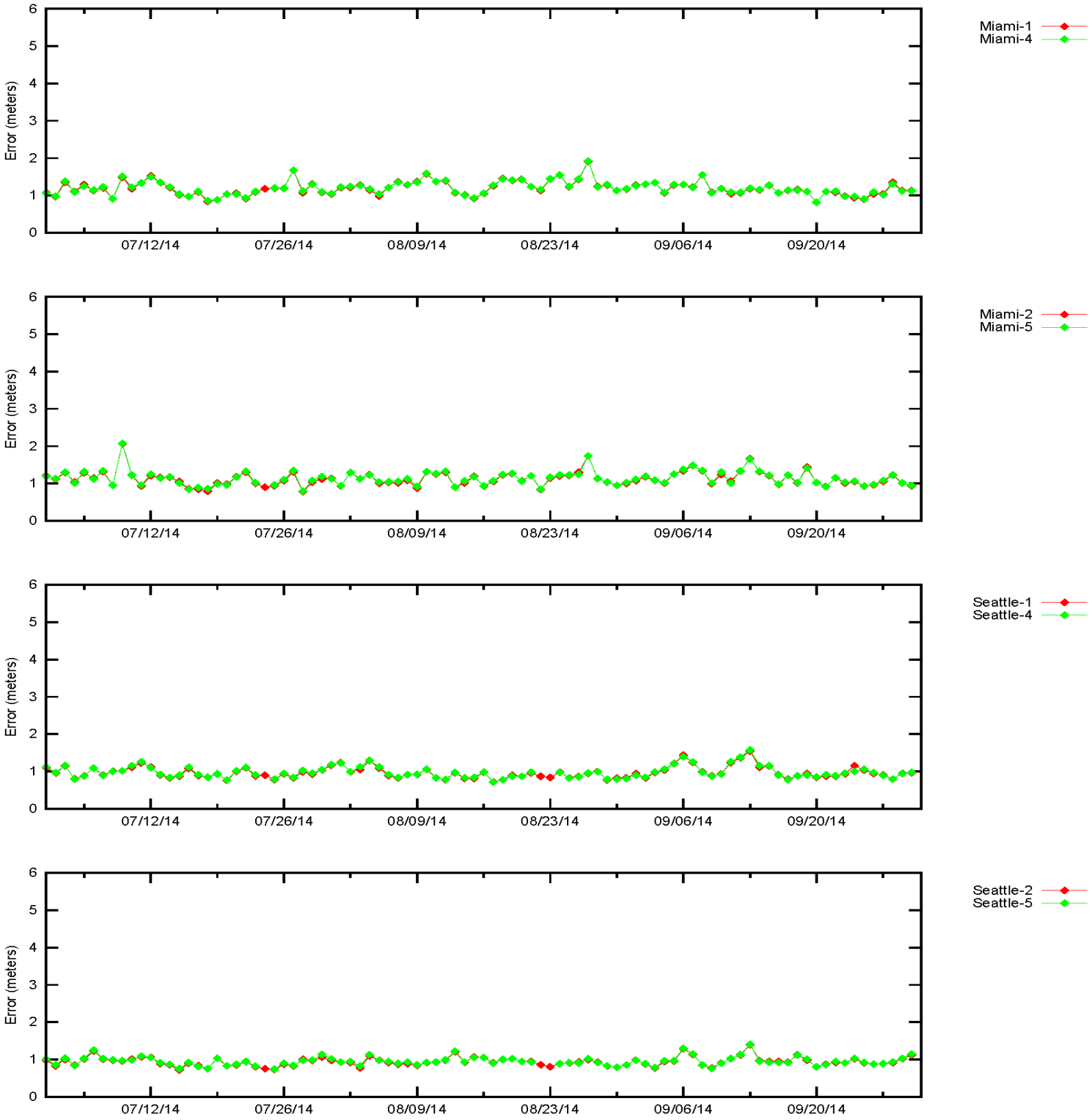


**Figure 12-5 LPV Horizontal Error Distribution Histogram**

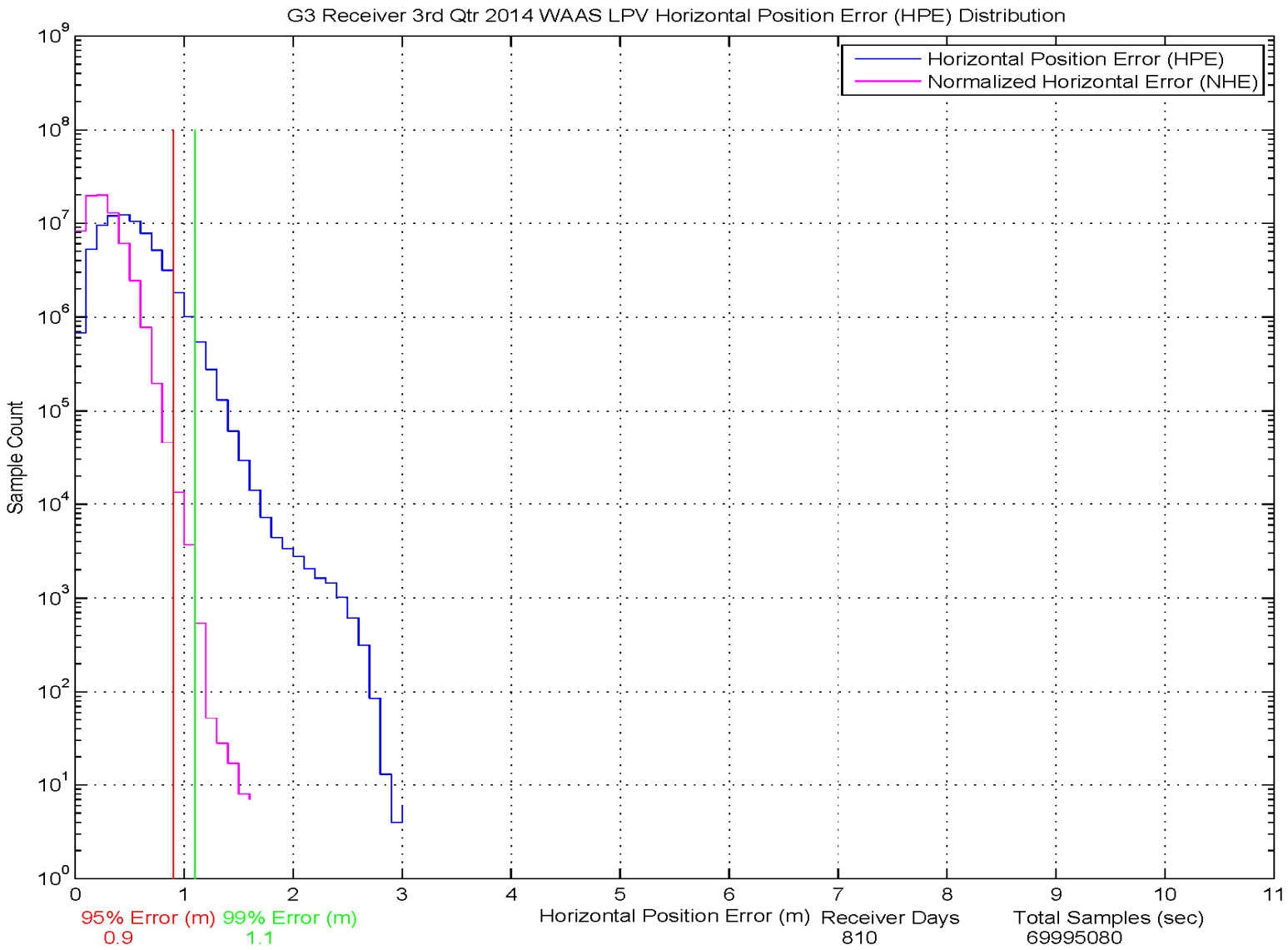


**Figure 12-6 LPV Vertical Error Distribution Histogram**

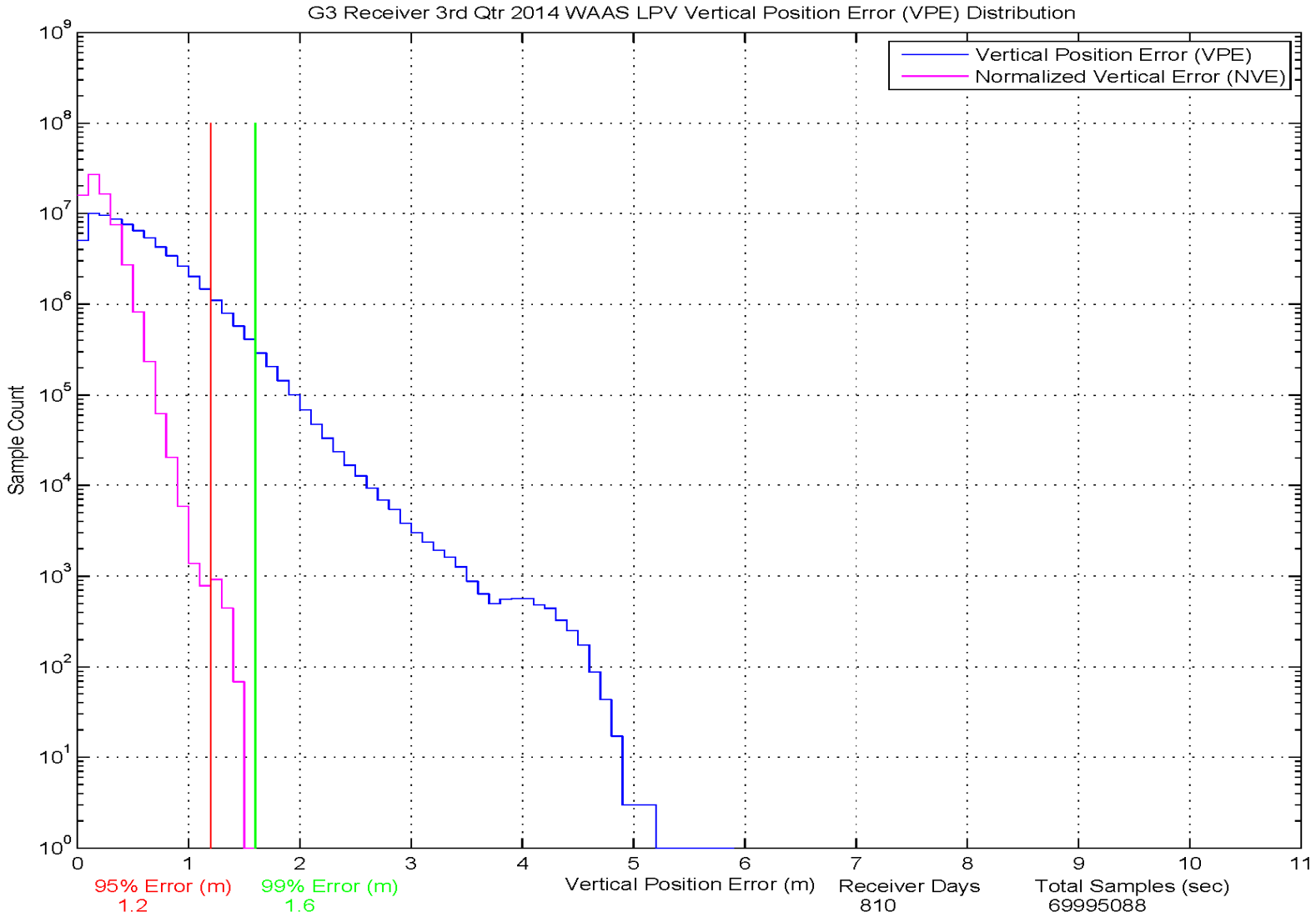


**Figure 12-7 LPV 95% Horizontal Error Bounding Triangle Chart**

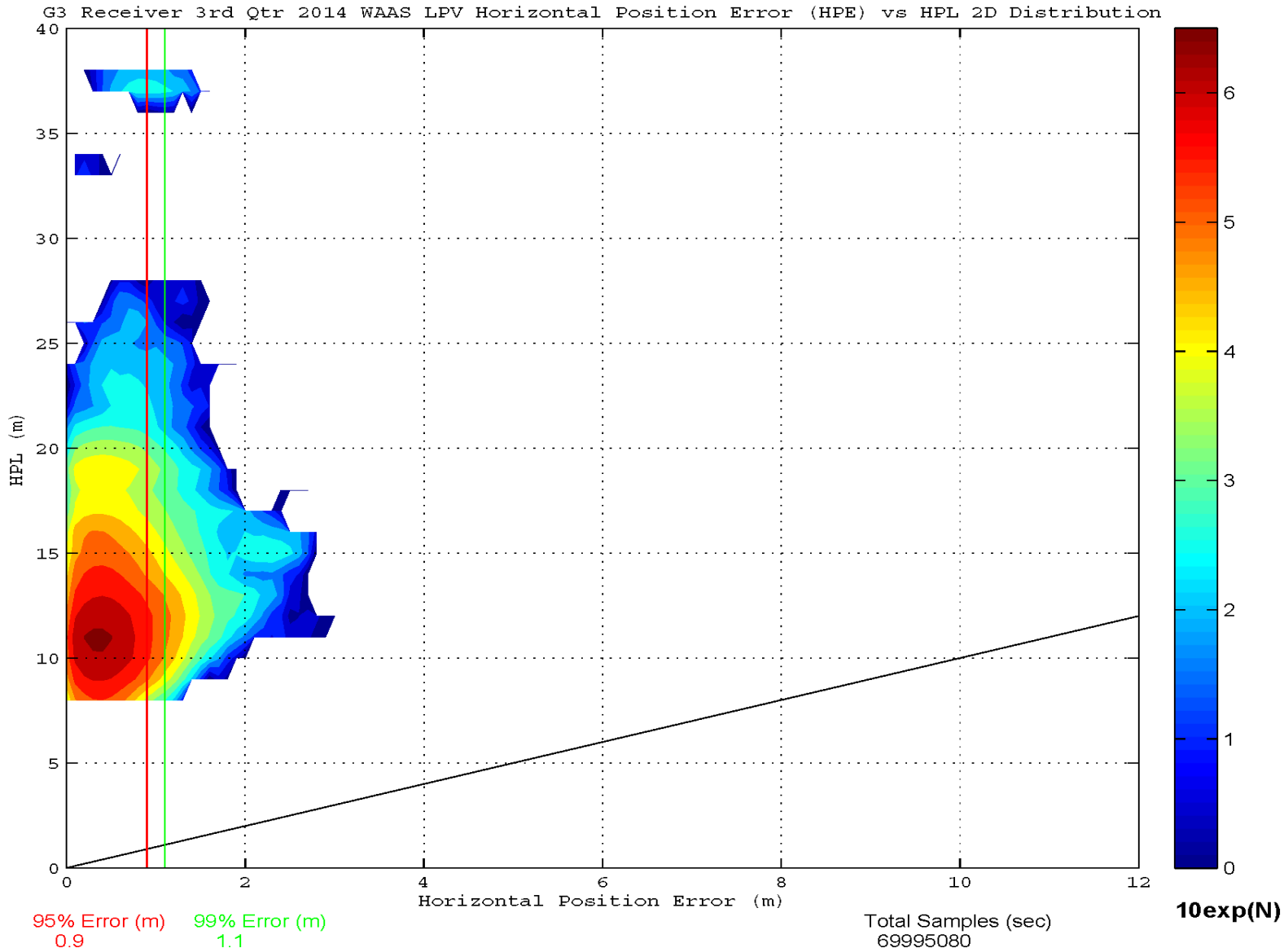
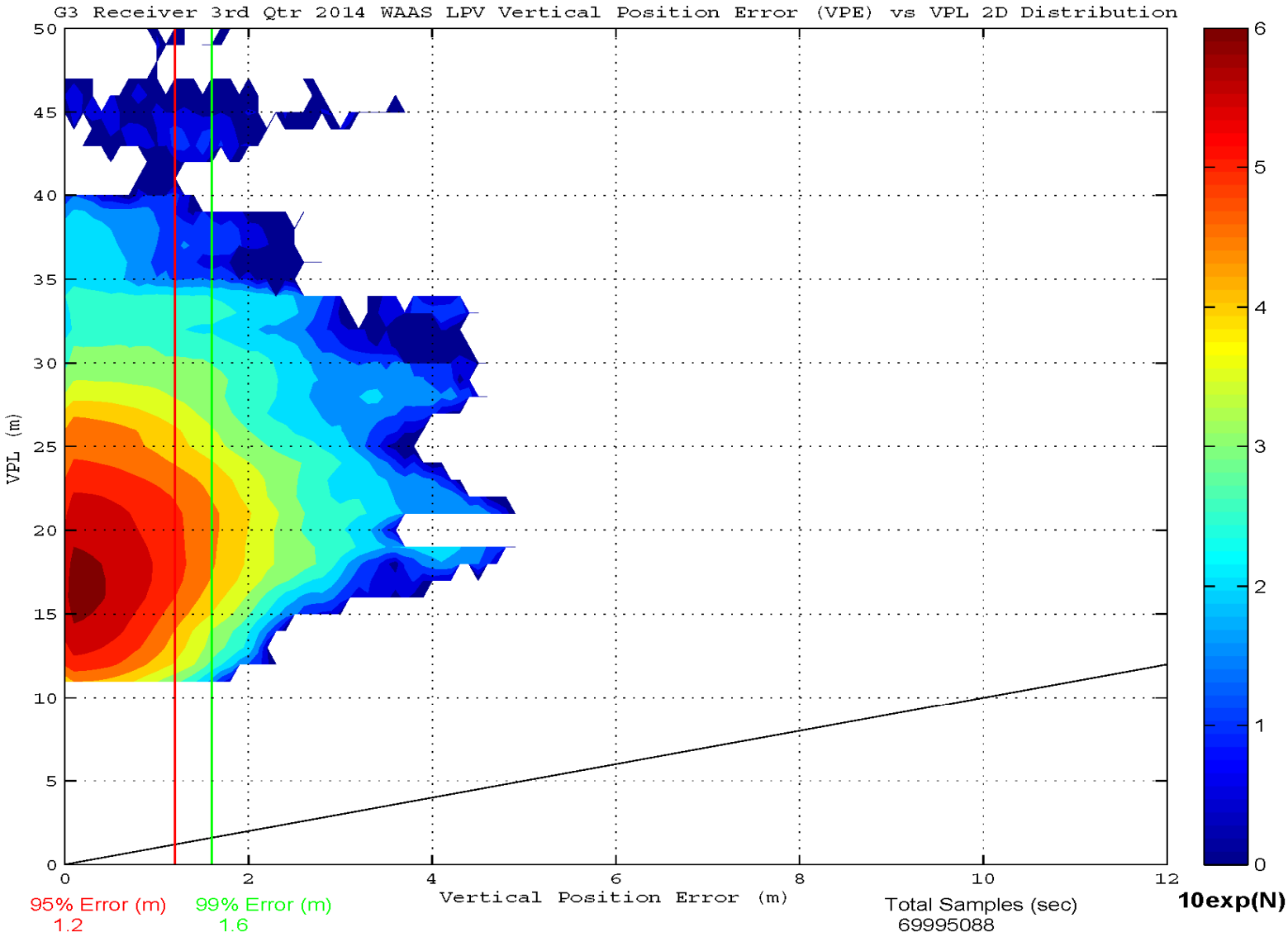


**Figure 12-8 LPV 95% Vertical Error Bounding Triangle Chart**



### 12.2 G3 SV Range Accuracy

Range accuracy evaluation computes the probability that the WAAS User Differential Range Error (UDRE) and Grid Ionospheric Vertical Error (GIVE) statistically bound 99.9% of the range residuals for each satellite tracked by the receiver. A UDRE is broadcast by the WAAS for each satellite that is monitored by the system and the 99.9% bound (3.29 sigma) of the residual error on a pseudorange after application of fast and long-term corrections is checked. The pseudorange residual error is determined by taking the difference between the raw pseudorange and a calculated reference range. The reference range is equal to the true range between the corrected satellite position and surveyed user antenna plus all corrections (WAAS Fast Clock, WAAS Long-Term Clock, WAAS Ionospheric delay, Tropospheric delay, Receiver Clock Bias, and Multipath). Since the true ionospheric delay and multipath error are not precisely known, the estimated variance in these error sources are added to the UDRE before the comparing it to the residual error. GPS satellite range residual errors were calculated for the twelve test receivers during the period. Table 12-4 and 12-5 show the range error 95% index and 99.9% (3.29 sigma) bounding statistics for each SV at the selected locations. A GIVE is broadcast by the WAAS for each IGP that is monitored by the system and the 99.9% (3.29 sigma) bound of the ionospheric error is checked. The WAAS broadcasts the ionospheric model using IGP's at predefined geographic locations. Each IGP contains the vertical ionospheric delay and the error in that delay in the form of the GIVE. The ionospheric error is determined by taking the difference between the WAAS vertical ionospheric delay interpolated from the IGP's and GPS dual frequency measurement at that GPS satellite. GPS satellite ionospheric errors were calculated for the twelve test receivers during the period. Table 12-6 and 12-7 show the ionospheric error 95% index and 99.9% (3.29 sigma) bounding statistics for each SV at the test locations.

**Table 12-4 Range Error 95% Index and 3.29 Sigma Bounding**

| Site → | Chicago 4 | | Chicago 5 | | Boston 4 | | Boston 5 | | Seattle 4 | | Seattle 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV ↓ | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) | 95% Range Error | 3.29 Sigma Bounding(%) |
| 1 | 3.327 | 99.954396 | 3.076 | 99.9024 | 3.245 | 100 | 3.228 | 100 | 2.771 | 100 | 2.904 | 100 |
| 2 | 2.687 | 100 | 2.436 | 100 | 2.581 | 99.9981 | 2.419 | 100 | 2.543 | 100 | 2.656 | 100 |
| 3 | 1.736 | 100 | 1.495 | 100 | 1.237 | 100 | 1.721 | 100 | 1.041 | 100 | 1.038 | 100 |
| 4 | 1.770 | 100 | 1.672 | 100 | 1.486 | 100 | 1.764 | 100 | 1.279 | 100 | 1.390 | 100 |
| 5 | 1.416 | 100 | 1.462 | 100 | 1.686 | 100 | 1.580 | 100 | 1.110 | 100 | 1.448 | 100 |
| 6 | 3.030 | 99.8394 | 3.336 | 99.2903 | 2.975 | 100 | 3.320 | 99.9967 | 3.536 | 100 | 3.400 | 100 |
| 7 | 1.531 | 100 | 1.601 | 100 | 1.064 | 100 | 1.161 | 100 | 1.022 | 100 | 1.062 | 100 |
| 8 | 1.167 | 100 | 1.215 | 100 | 1.044 | 100 | 1.221 | 100 | 0.815 | 100 | 0.904 | 100 |
| 9 | 1.468 | 100 | 1.536 | 100 | 1.966 | 100 | 1.672 | 100 | 1.254 | 100 | 1.535 | 100 |
| 10 | 1.417 | 100 | 1.064 | 100 | 1.167 | 100 | 0.825 | 100 | 1.211 | 100 | 1.295 | 100 |
| 11 | 1.416 | 100 | 1.140 | 100 | 1.151 | 100 | 0.821 | 100 | 2.199 | 100 | 1.305 | 100 |
| 12 | 1.785 | 100 | 1.120 | 100 | 1.501 | 100 | 1.459 | 100 | 1.004 | 100 | 0.879 | 100 |
| 13 | 1.207 | 100 | 1.132 | 100 | 1.111 | 100 | 1.545 | 100 | 0.880 | 100 | 1.052 | 100 |
| 14 | 1.484 | 100 | 1.141 | 100 | 1.026 | 100 | 0.759 | 100 | 1.195 | 100 | 1.236 | 100 |
| 15 | 1.200 | 100 | 2.149 | 100 | 1.518 | 100 | 1.584 | 100 | 1.003 | 100 | 0.946 | 100 |
| 16 | 3.101 | 100 | 1.294 | 100 | 1.377 | 100 | 0.862 | 100 | 1.259 | 100 | 1.401 | 100 |
| 17 | 1.150 | 100 | 1.075 | 100 | 1.195 | 100 | 1.128 | 100 | 1.498 | 100 | 1.220 | 100 |
| 18 | 1.591 | 100 | 1.274 | 100 | 1.375 | 100 | 1.158 | 100 | 1.791 | 100 | 1.695 | 100 |
| 19 | 2.449 | 100 | 2.016 | 100 | 2.629 | 100 | 1.716 | 100 | 3.007 | 100 | 2.569 | 100 |
| 20 | 1.251 | 100 | 1.187 | 100 | 1.356 | 100 | 1.061 | 100 | 1.596 | 100 | 1.526 | 100 |
| 21 | 1.554 | 100 | 1.391 | 100 | 2.036 | 100 | 1.111 | 100 | 1.702 | 100 | 1.613 | 100 |
| 22 | 2.600 | 100 | 2.071 | 100 | 2.314 | 100 | 2.347 | 100 | 2.529 | 100 | 2.756 | 100 |
| 23 | 1.747 | 100 | 1.693 | 100 | 2.405 | 100 | 1.686 | 100 | 2.368 | 100 | 2.197 | 100 |
| 24 | 2.644 | 100 | 3.262 | 99.9938 | 2.849 | 100 | 3.150 | 100 | 2.657 | 100 | 2.395 | 100 |
| 25 | 2.423 | 100 | 2.414 | 100 | 2.510 | 100 | 2.639 | 100 | 2.326 | 100 | 2.147 | 100 |
| 26 | 1.547 | 100 | 1.455 | 100 | 1.368 | 100 | 1.585 | 100 | 1.135 | 100 | 0.845 | 100 |
| 27 | 2.568 | 100 | 2.435 | 99.9964 | 2.139 | 100 | 2.568 | 100 | 2.184 | 100 | 1.760 | 100 |
| 28 | 0.932 | 100 | 1.087 | 100 | 1.559 | 100 | 1.168 | 100 | 1.269 | 100 | 1.652 | 100 |
| 29 | 1.422 | 100 | 1.546 | 100 | 1.195 | 100 | 1.596 | 100 | 0.971 | 100 | 1.379 | 100 |
| 30 | 2.315 | 100 | 2.508 | 100 | 2.515 | 100 | 2.435 | 100 | 2.013 | 100 | 2.220 | 100 |
| 31 | 1.179 | 100 | 1.217 | 100 | 0.846 | 100 | 1.224 | 100 | 1.299 | 100 | 0.942 | 100 |
| 32 | 0.903 | 100 | 0.868 | 100 | 0.908 | 100 | 1.276 | 100 | 0.897 | 100 | 0.864 | 100 |
| 135 | 1.882 | 100 | 1.331 | 100 | 3.063 | 100 | 1.551 | 100 | 1.515 | 100 | 2.260 | 100 |
| 138 | 2.274 | 100 | 1.503 | 100 | 1.238 | 100 | 1.956 | 100 | 1.414 | 100 | 1.379 | 100 |

**Table 12-5 Range Error 95% Index and 3.29 Sigma Bounding**

| Site → | Miami 4 | | Miami 5 | | Fairbanks 4 | | Fairbanks 5 | |
|---|---|---|---|---|---|---|---|---|
| SV ↓ | 95% Range Error | 3.29 Sigma Bounding (%) | 95% Range Error | 3.29 Sigma Bounding (%) | 95% Range Error | 3.29 Sigma Bounding (%) | 95% Range Error | 3.29 Sigma Bounding (%) |
| 1 | 2.965 | 100 | 3.638 | 99.9897 | 3.144 | 100 | 3.116 | 100 |
| 2 | 2.694 | 100 | 2.460 | 100 | 2.765 | 100 | 2.553 | 100 |
| 3 | 1.421 | 100 | 1.710 | 100 | 1.305 | 100 | 1.318 | 100 |
| 4 | 1.544 | 100 | 1.937 | 100 | 1.467 | 100 | 1.713 | 100 |
| 5 | 1.330 | 100 | 1.371 | 100 | 1.594 | 100 | 1.603 | 100 |
| 6 | 3.302 | 100 | 4.132 | 100 | 3.247 | 100 | 3.392 | 99.9966 |
| 7 | 1.254 | 100 | 1.200 | 100 | 1.364 | 100 | 1.323 | 100 |
| 8 | 1.230 | 100 | 1.154 | 100 | 1.340 | 100 | 1.213 | 100 |
| 9 | 2.072 | 100 | 1.783 | 100 | 1.676 | 100 | 1.623 | 100 |
| 10 | 1.107 | 100 | 1.044 | 100 | 1.533 | 100 | 1.376 | 100 |
| 11 | 2.160 | 100 | 1.287 | 100 | 2.352 | 100 | 1.402 | 100 |
| 12 | 1.149 | 100 | 1.548 | 100 | 1.267 | 100 | 1.192 | 100 |
| 13 | 1.508 | 100 | 1.469 | 100 | 1.394 | 100 | 1.136 | 100 |
| 14 | 0.998 | 100 | 1.030 | 100 | 1.323 | 100 | 1.390 | 100 |
| 15 | 1.164 | 100 | 1.117 | 100 | 1.169 | 100 | 1.191 | 100 |
| 16 | 1.182 | 100 | 2.123 | 100 | 1.479 | 100 | 1.380 | 100 |
| 17 | 1.223 | 100 | 1.302 | 100 | 1.089 | 100 | 1.102 | 100 |
| 18 | 1.536 | 100 | 1.585 | 100 | 1.942 | 100 | 1.714 | 100 |
| 19 | 2.161 | 100 | 2.842 | 100 | 2.757 | 100 | 2.670 | 100 |
| 20 | 1.228 | 100 | 1.267 | 100 | 1.788 | 100 | 1.432 | 100 |
| 21 | 1.950 | 100 | 1.615 | 100 | 1.581 | 100 | 1.739 | 100 |
| 22 | 2.695 | 100 | 2.584 | 100 | 2.976 | 100 | 2.628 | 100 |
| 23 | 1.801 | 100 | 2.054 | 100 | 2.356 | 100 | 2.073 | 100 |
| 24 | 2.572 | 100 | 2.655 | 100 | 2.563 | 100 | 2.847 | 100 |
| 25 | 2.254 | 100 | 2.292 | 100 | 1.932 | 100 | 2.350 | 100 |
| 26 | 0.990 | 100 | 1.522 | 100 | 1.166 | 100 | 1.177 | 100 |
| 27 | 2.367 | 100 | 2.378 | 100 | 2.128 | 100 | 2.250 | 100 |
| 28 | 2.030 | 100 | 1.095 | 100 | 1.708 | 100 | 1.586 | 100 |
| 29 | 1.652 | 100 | 1.450 | 100 | 1.212 | 100 | 1.674 | 100 |
| 30 | 2.391 | 100 | 2.709 | 100 | 2.929 | 100 | 2.281 | 100 |
| 31 | 1.835 | 100 | 1.633 | 100 | 1.144 | 100 | 1.034 | 100 |
| 32 | 1.214 | 100 | 1.068 | 100 | 1.310 | 100 | 1.299 | 100 |
| 135 | 1.650 | 100 | 2.410 | 100 | 5.412 | 100 | 4.085 | 100 |
| 138 | 1.787 | 100 | 1.730 | 100 | 3.119 | 100 | 4.340 | 100 |

**Table 12-6 Ionospheric Error 95% Index and 3.29 Sigma Bounding**

| Site → | Chicago 4 | | Chicago 5 | | Boston 4 | | Boston 5 | | Seattle 4 | | Seattle 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV ↓ | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) |
| 1 | 2.199 | 100 | 2.086 | 100 | 2.165 | 100 | 2.219 | 100 | 1.996 | 100 | 2.011 | 100 |
| 2 | 1.760 | 100 | 1.600 | 100 | 1.640 | 100 | 1.596 | 100 | 1.964 | 100 | 2.281 | 100 |
| 3 | 0.658 | 100 | 0.746 | 100 | 0.426 | 100 | 0.678 | 100 | 0.534 | 100 | 0.415 | 100 |
| 4 | 0.996 | 100 | 1.134 | 100 | 0.901 | 100 | 1.098 | 100 | 0.857 | 100 | 0.836 | 100 |
| 5 | 0.732 | 100 | 0.863 | 100 | 0.751 | 100 | 0.881 | 100 | 0.704 | 100 | 0.641 | 100 |
| 6 | 2.461 | 100 | 2.748 | 100 | 2.461 | 100 | 2.708 | 100 | 2.661 | 100 | 2.382 | 100 |
| 7 | 0.480 | 100 | 0.649 | 100 | 0.435 | 100 | 0.607 | 100 | 0.539 | 100 | 0.578 | 100 |
| 8 | 0.402 | 100 | 0.482 | 100 | 0.483 | 100 | 0.522 | 100 | 0.390 | 100 | 0.430 | 100 |
| 9 | 1.079 | 100 | 1.128 | 100 | 1.260 | 100 | 0.952 | 100 | 0.923 | 100 | 1.078 | 100 |
| 10 | 0.523 | 100 | 0.475 | 100 | 0.465 | 100 | 0.364 | 100 | 0.546 | 100 | 0.710 | 100 |
| 11 | 0.464 | 100 | 0.428 | 100 | 0.551 | 100 | 0.408 | 100 | 0.877 | 100 | 0.704 | 100 |
| 12 | 0.636 | 100 | 0.513 | 100 | 0.532 | 100 | 0.704 | 100 | 0.465 | 100 | 0.438 | 100 |
| 13 | 0.470 | 100 | 0.526 | 100 | 0.543 | 100 | 0.786 | 100 | 0.357 | 100 | 0.438 | 100 |
| 14 | 0.688 | 100 | 0.520 | 100 | 0.443 | 100 | 0.317 | 100 | 0.753 | 100 | 0.824 | 100 |
| 15 | 0.767 | 100 | 1.297 | 100 | 0.690 | 100 | 0.938 | 100 | 0.602 | 100 | 0.574 | 100 |
| 16 | 1.310 | 100 | 0.524 | 100 | 0.653 | 100 | 0.392 | 100 | 0.736 | 100 | 0.976 | 100 |
| 17 | 0.784 | 100 | 0.471 | 100 | 0.762 | 100 | 0.686 | 100 | 0.854 | 100 | 0.673 | 100 |
| 18 | 0.842 | 100 | 0.577 | 100 | 0.775 | 100 | 0.626 | 100 | 1.022 | 100 | 1.171 | 100 |
| 19 | 1.607 | 100 | 1.518 | 100 | 1.863 | 100 | 1.443 | 100 | 1.883 | 100 | 1.815 | 100 |
| 20 | 0.641 | 100 | 0.487 | 100 | 0.741 | 100 | 0.743 | 100 | 0.866 | 100 | 0.863 | 100 |
| 21 | 0.844 | 100 | 0.826 | 100 | 1.056 | 100 | 0.609 | 100 | 0.927 | 100 | 1.035 | 100 |
| 22 | 2.065 | 100 | 1.539 | 100 | 1.829 | 100 | 1.800 | 100 | 1.852 | 100 | 2.110 | 100 |
| 23 | 1.290 | 100 | 1.278 | 100 | 1.809 | 100 | 1.297 | 100 | 1.600 | 100 | 1.540 | 100 |
| 24 | 1.720 | 100 | 2.020 | 100 | 1.825 | 100 | 2.218 | 100 | 1.705 | 100 | 1.620 | 100 |
| 25 | 1.210 | 100 | 1.307 | 100 | 1.389 | 100 | 1.642 | 100 | 1.496 | 100 | 1.284 | 100 |
| 26 | 0.767 | 100 | 0.802 | 100 | 0.581 | 100 | 0.873 | 100 | 0.798 | 100 | 0.356 | 100 |
| 27 | 1.473 | 100 | 1.494 | 100 | 1.252 | 100 | 1.590 | 100 | 1.455 | 100 | 1.093 | 100 |
| 28 | 0.483 | 100 | 0.581 | 100 | 0.982 | 100 | 0.645 | 100 | 0.798 | 100 | 1.092 | 100 |
| 29 | 0.758 | 100 | 0.830 | 100 | 0.688 | 100 | 0.943 | 100 | 0.605 | 100 | 0.553 | 100 |
| 30 | 1.442 | 100 | 1.658 | 100 | 1.496 | 100 | 1.664 | 100 | 1.431 | 100 | 1.405 | 100 |
| 31 | 0.508 | 100 | 0.715 | 100 | 0.321 | 100 | 0.683 | 100 | 0.763 | 100 | 0.666 | 100 |
| 32 | 0.359 | 100 | 0.384 | 100 | 0.458 | 100 | 0.653 | 100 | 0.353 | 100 | 0.314 | 100 |

**Table 12-7 Ionospheric Error 95% Index and 3.29 Sigma Bounding**

| Site → | Miami 4 | | Miami 5 | | Fairbanks 4 | | Fairbanks 5 | |
|---|---|---|---|---|---|---|---|---|
| SV ↓ | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) | 95% Iono Error | 3.29 Sigma Bounding(%) |
| 1 | 2.014 | 100 | 2.375 | 100 | 2.271 | 100 | 2.104 | 100 |
| 2 | 1.701 | 100 | 1.722 | 100 | 1.408 | 100 | 1.384 | 100 |
| 3 | 0.669 | 100 | 0.825 | 100 | 0.790 | 100 | 0.688 | 100 |
| 4 | 1.156 | 100 | 1.284 | 100 | 0.830 | 100 | 0.823 | 100 |
| 5 | 1.272 | 100 | 0.986 | 100 | 0.921 | 100 | 0.839 | 100 |
| 6 | 2.802 | 100 | 3.342 | 100 | 2.073 | 100 | 1.839 | 100 |
| 7 | 0.720 | 100 | 0.690 | 100 | 0.656 | 100 | 0.569 | 100 |
| 8 | 0.555 | 100 | 0.518 | 100 | 0.581 | 100 | 0.509 | 100 |
| 9 | 1.327 | 100 | 1.133 | 100 | 1.369 | 100 | 0.958 | 100 |
| 10 | 0.537 | 100 | 0.716 | 100 | 0.570 | 100 | 0.535 | 100 |
| 11 | 0.767 | 100 | 0.737 | 100 | 0.774 | 100 | 0.576 | 100 |
| 12 | 0.582 | 100 | 0.651 | 100 | 0.693 | 100 | 0.633 | 100 |
| 13 | 0.762 | 100 | 0.756 | 100 | 0.784 | 100 | 0.623 | 100 |
| 14 | 0.500 | 100 | 0.501 | 100 | 0.472 | 100 | 0.556 | 100 |
| 15 | 0.925 | 100 | 0.998 | 100 | 0.788 | 100 | 0.668 | 100 |
| 16 | 0.558 | 100 | 0.890 | 100 | 0.573 | 100 | 0.693 | 100 |
| 17 | 0.743 | 100 | 0.640 | 100 | 0.603 | 100 | 0.481 | 100 |
| 18 | 0.866 | 100 | 0.925 | 100 | 0.922 | 100 | 0.901 | 100 |
| 19 | 1.670 | 100 | 1.835 | 100 | 1.499 | 100 | 1.484 | 100 |
| 20 | 0.634 | 100 | 0.644 | 100 | 0.853 | 100 | 0.802 | 100 |
| 21 | 1.167 | 100 | 1.073 | 100 | 0.750 | 100 | 0.956 | 100 |
| 22 | 2.076 | 100 | 2.003 | 100 | 1.772 | 100 | 1.781 | 100 |
| 23 | 1.345 | 100 | 1.469 | 100 | 1.519 | 100 | 1.458 | 100 |
| 24 | 1.759 | 100 | 1.780 | 100 | 2.040 | 99.9991 | 2.265 | 99.9994 |
| 25 | 1.210 | 100 | 1.153 | 100 | 1.536 | 100 | 1.732 | 100 |
| 26 | 0.677 | 100 | 0.964 | 100 | 0.769 | 100 | 0.773 | 100 |
| 27 | 1.358 | 100 | 1.451 | 100 | 1.518 | 100 | 1.412 | 100 |
| 28 | 1.235 | 100 | 0.846 | 100 | 0.670 | 100 | 0.686 | 100 |
| 29 | 0.976 | 100 | 0.803 | 100 | 0.829 | 100 | 0.882 | 100 |
| 30 | 1.781 | 100 | 1.805 | 100 | 1.806 | 100 | 1.521 | 100 |
| 31 | 0.761 | 100 | 1.296 | 100 | 0.423 | 100 | 0.402 | 100 |
| 32 | 0.619 | 100 | 0.474 | 100 | 0.438 | 100 | 0.635 | 100 |

### 12.3 G3 SQM

G3 SQM analysis includes the processing of data from 114 G2 receivers and 12 G3 receivers. The same analysis in Section 11 (SQM G2 only) is used in this section for the combined G2 and G3 data. G3 SQM monitoring effort includes the monitoring of PRN type biases, PRN biases, and SQM trips.

For this reporting period, there were no SQM anomalies observed.

## Appendix A: Glossary

### General Terms and Definitions

**Alert.** An alert is an indication provided by the GPS/WAAS equipment to inform the user when the positioning performance achieved by the equipment does not meet the integrity requirements.

**Availability.** The availability of a navigation system is the ability of the system to provide the required function and performance at the initiation of the intended operation. Availability is an indication of the ability of the system to provide usable service within the specified coverage area.

**C&V.** The Correction and Verification Subsystem.

**CONUS.** Continental United States.

**Continuity.** The continuity of a system is the ability of the total system (comprising all elements necessary to maintain aircraft position within the defined airspace) to perform its function without interruption during the intended operation. More specifically, continuity is the probability that the specified system performance will be maintained for the duration of a phase of operation, presuming that the system was available at the beginning of that phase of operation.

**Coverage.** The coverage provided by a radio navigation system is that surface area or space volume in which the signals are adequate to permit the user to determine position to a specified level of accuracy. Coverage is influenced by system geometry, signal power levels, receiver sensitivity, atmospheric noise conditions, and other factors that affect signal availability.

**Dilution of Precision (DOP).** The magnifying effect on GPS position error induced by mapping GPS ranging errors into position through the position solution. The DOP may be represented in any user local coordinate desired. Examples are HDOP for local horizontal, VDOP for local vertical, PDOP for all three coordinates, and TDOP for time.

**DR.** Discrepancy Report

**Fault Detection and Exclusion (FDE).** Fault detection and exclusion is a receiver processing scheme that autonomously provides integrity monitoring for the position solution, using redundant range measurements. The FDE consists of two distinct parts: fault detection and fault exclusion. The fault detection part detects the presence of an unacceptably large position error for a given mode of flight. Upon the detection, fault exclusion follows and excludes the source of the unacceptably large position error, thereby allowing navigation to return to normal performance without an interruption in service.

**GEO.** Geostationary Satellite.

**Global Positioning System (GPS).** A space-based positioning, velocity, and time system composed of space, control, and user segments. The space segment, when fully operational, will be composed of 24 satellites in six orbital planes. The control segment consists of five monitor stations, three ground antennas, and a master control station. The user segment consists of antennas and receiver-processors that provide positioning, velocity, and precise timing to the user.

**Grid Ionospheric Vertical Error (GIVE).** GIVEs indicate the accuracy of ionospheric vertical delay correction at a geographically defined ionospheric grid point (IGP). WAAS transmits one GIVE for each IGP in the mask.

**Hazardous Misleading Information (HMI).** Hazardous misleading information is any position data, that is output, that has an error larger than the current protection level (HPL/VPL), without any indication of the error (e.g., alert message sequence).

**Horizontal Alert Limit (HAL).** The Horizontal Alert Limit (HAL) is the radius of a circle in the horizontal plane (the local plane tangent to the WGS-84 ellipsoid), with its center being at the true position, which describes the region that is

required to contain the indicated horizontal position with a probability of $1\text{-}10^{-7}$ per flight hour, for a particular navigation mode, assuming the probability of a GPS satellite integrity failure being included in the position solution is less than or equal to $10^{-4}$ per hour.

**Horizontal Protection Level (HPL).** The Horizontal Protection Level is the radius of a circle in the horizontal plane (the plane tangent to the WGS-84 ellipsoid), with its center being at the true position, which describes the region that is assured to contain the indicated horizontal position. It is based upon the error estimates provided by WAAS.

**IGS**. International GPS Service.

**Ionospheric Grid Point (IGP).** IGP is a geographically defined point for which the WAAS provides the vertical ionospheric delay.

**LNAV.** Lateral Navigation.

**LP**. Localizer Performance. LP is a WAAS operational service level with a HAL equal to 40 meters.

**LPV**. Localizer Performance with Vertical Guidance. LPV is a WAAS operational service level with a HAL equal to 40 meters and a VAL equal to 50 meters.

**LPV 200**. Localizer Performance with Vertical Guidance to 200 ft decision height. LPV 200 is a WAAS operational service level with a HAL equal to 40 meters and a VAL equal to 35 meters.

**MOPS.** Minimum Operational Performance Standards.

**NANU**. Notice Advisory to Navstar Users. NANU is an advisory message to inform users of a change in the GPS constellation. These messages inform users in advance of planned maintenance and also notify users of unscheduled outages.

**Navigation Message.** Message structure designed to carry navigation data.

**Non-Precision Approach (NPA) Navigation Mode.** The Non-Precision Approach navigation mode refers to the navigation solution operating with a minimum of four satellites with fast and long term WAAS corrections (no WAAS ionospheric corrections) available.

**Position Solution.** The use of ranging signal measurements and navigation data from at least four satellites to solve for three position coordinates and a time offset.

**Precision Approach (PA) Navigation Mode.** The Precision Approach navigation mode refers to the navigation solution operating with a minimum of four satellites with all WAAS corrections (fast, long term, and ionospheric) available.

**RFI**. Radio Frequency Interference.

**Selective Availability.** Protection technique employed by the DOD to deny full system accuracy to unauthorized users.

**Signal Quality Monitor (SQM)**. SQM monitors correlator measurements to detect signal deformations that originate in the GPS or GEO satellites and ensures that the UDREs are sufficiently inflated to protect given the monitor's current observations.

**Standard Positioning Service (SPS).** Three-dimensional position and time determination capability provided to a user equipped with a minimum capability GPS SPS receiver in accordance with GPS national policy and the performance specifications.

**SV.** Space Vehicle.

**User Differential Range Error (UDRE).** UDRE's indicate the accuracy of combined fast and slow error corrections. WAAS transmits one UDRE for each satellite in the mask.

**Vertical Alert Limit (VAL).** The Vertical Alert Limit is half the length of a segment on the vertical axis (perpendicular to the horizontal plane of WGS-84 ellipsoid), with its center being at the true position, which describes the region that is required to contain the indicated vertical position with a probability of $1\text{-}10^{-7}$ per flight hour, for a particular navigation mode, assuming the probability of a GPS satellite integrity failure being included in the position solution is less than or equal to $10^{-4}$ per hour.

**Vertical Protection Level (VPL).** The Vertical Protection Level is half the length of a segment on the vertical axis (perpendicular to the horizontal plane of WGS-84 ellipsoid), with its center being at the true position, which describes the region that is assured to contain the indicated vertical position. It is based upon the error estimates provided by WAAS.

**VNAV.** Vertical Navigation.

**Wide Area Augmentation System (WAAS).** The WAAS is made up of an integrity reference monitoring network, processing facilities, geostationary satellites, and control facilities. Wide area reference stations and integrity monitors are widely dispersed data collection sites that contain GPS/WAAS ranging receivers that monitor all signals from the GPS, as well as the WAAS geostationary satellites. The reference stations collect measurements from the GPS and WAAS satellites so that differential corrections, ionospheric delay information, GPS/WAAS accuracy, WAAS network time, GPS time, and UTC can be determined. The wide area reference station and integrity monitor data are forwarded to the central data processing sites. These sites process the data in order to determine differential corrections, ionospheric delay information, and GPS/WAAS accuracy, as well as verify residual error bounds for each monitored satellite. The central data processing sites also generate navigation messages for the geostationary satellites and WAAS messages. This information is modulated on the GPS-like signal and broadcast to the users from geostationary satellites.

## Appendix B: Additional Coverage Plots

This section includes coverage plots with 99% LPV 200 availability contour, 98% LPV availability contours, and 98% LP availability contours for the quarter. Figure B.1 shows CONUS coverage with 98% LP availability contour. Figure B.2 shows Alaska coverage with 98% LP availability contour. .Figure B.3 shows CONUS coverage with 98% LPV availability contour. Figure B.4 shows Alaska coverage with 98% LPV availability contour. Figure B.5 shows CONUS coverage with 99% LPV 200 availability contour. Figure B.6 shows Alaska coverage with 99% LPV 200 availability contour.

**Figure B-1 98% CONUS LP Availability Contour**

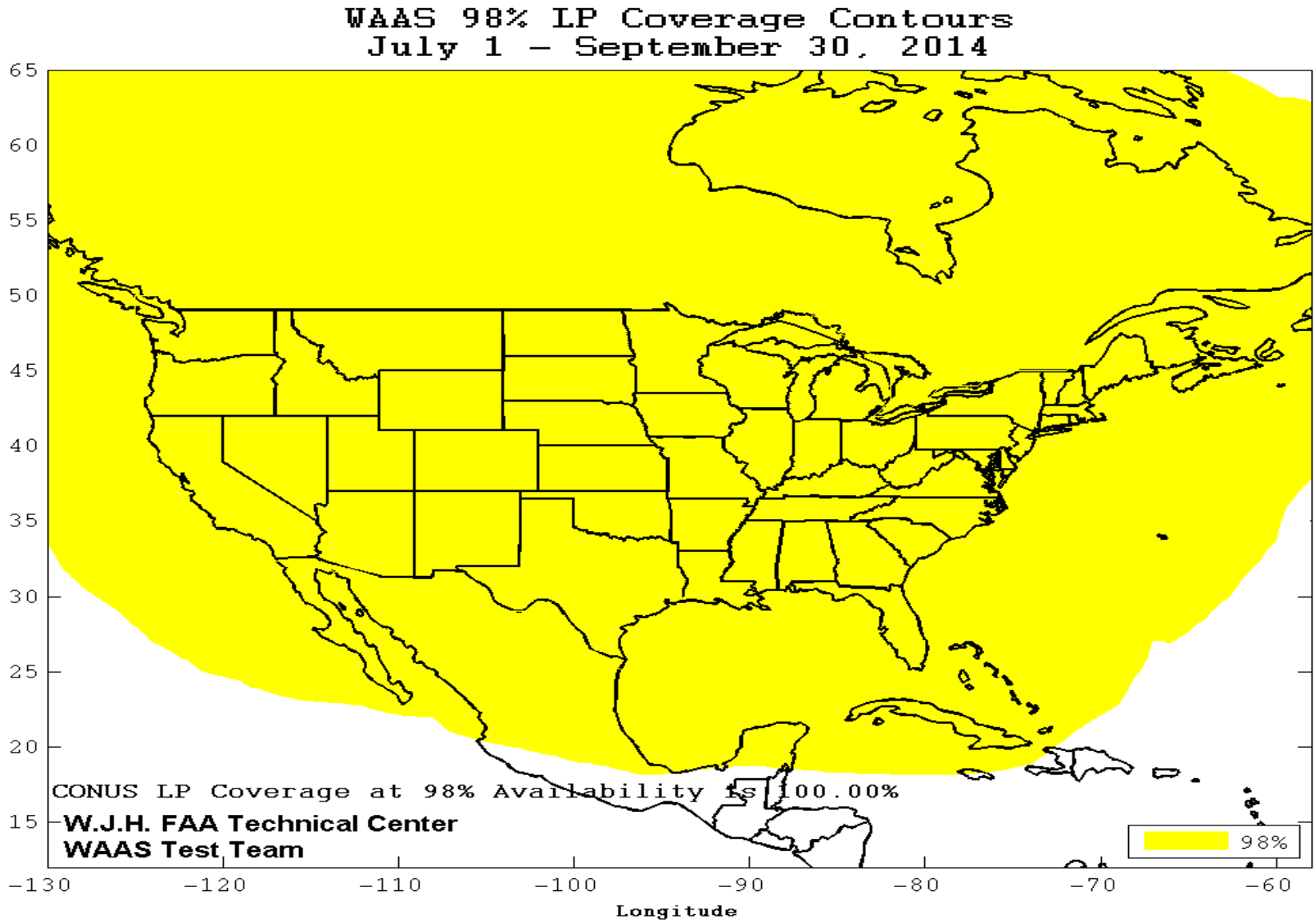


**Figure B-2 98% Alaska LP Availability Contour**

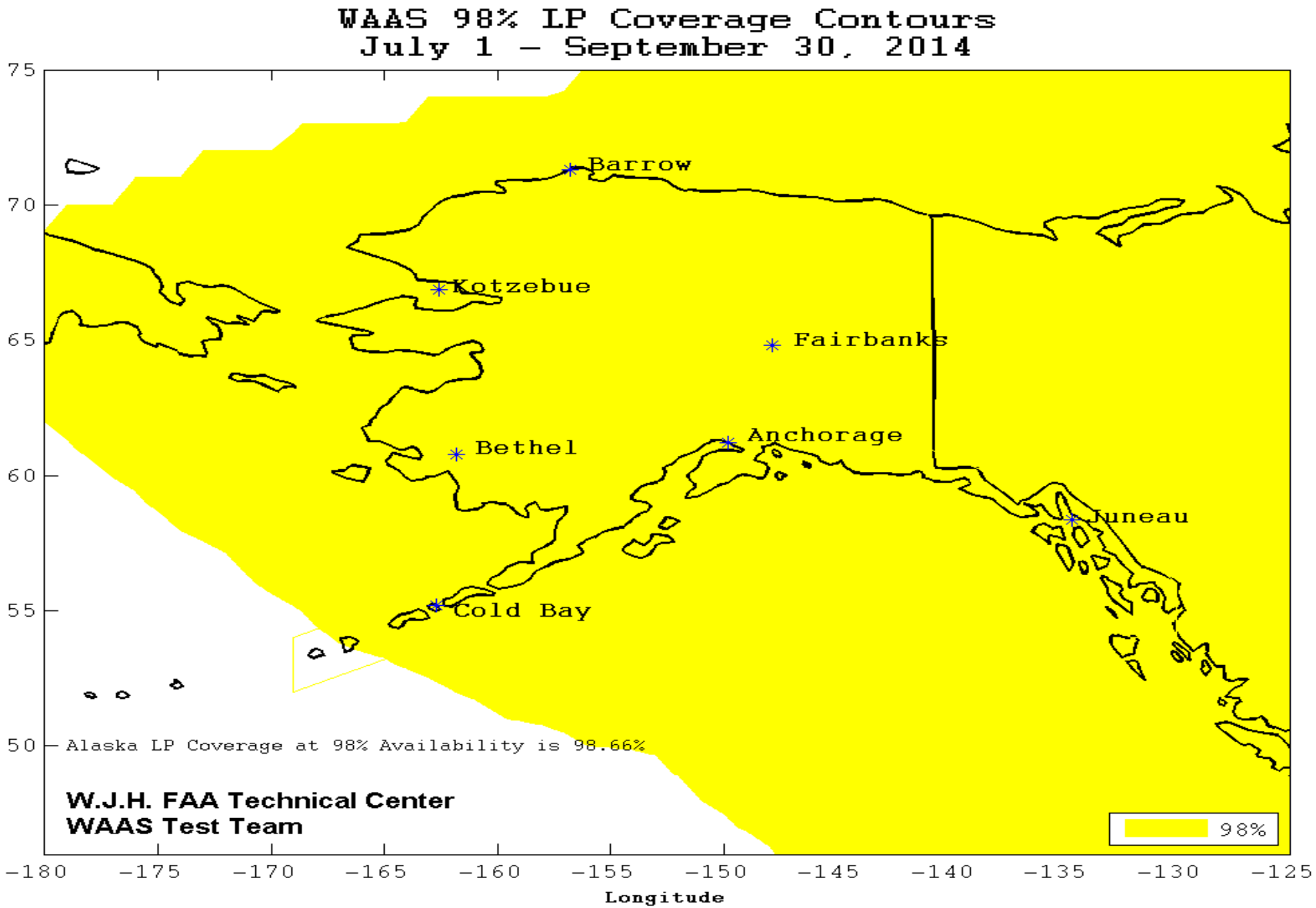


**Figure B-3 98% CONUS LPV Availability Contour**

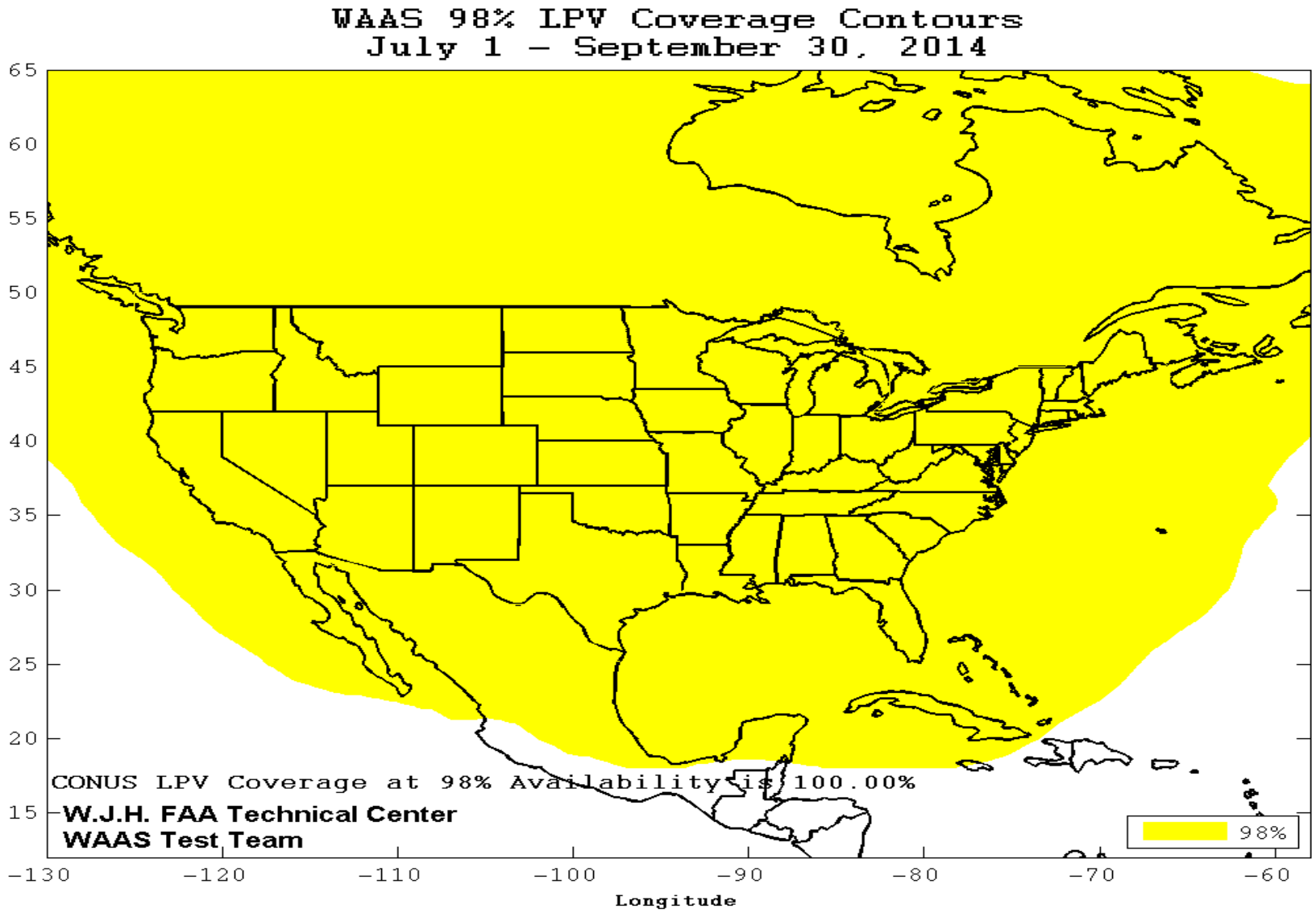


**Figure B-4 98% Alaska LPV Availability Contour**

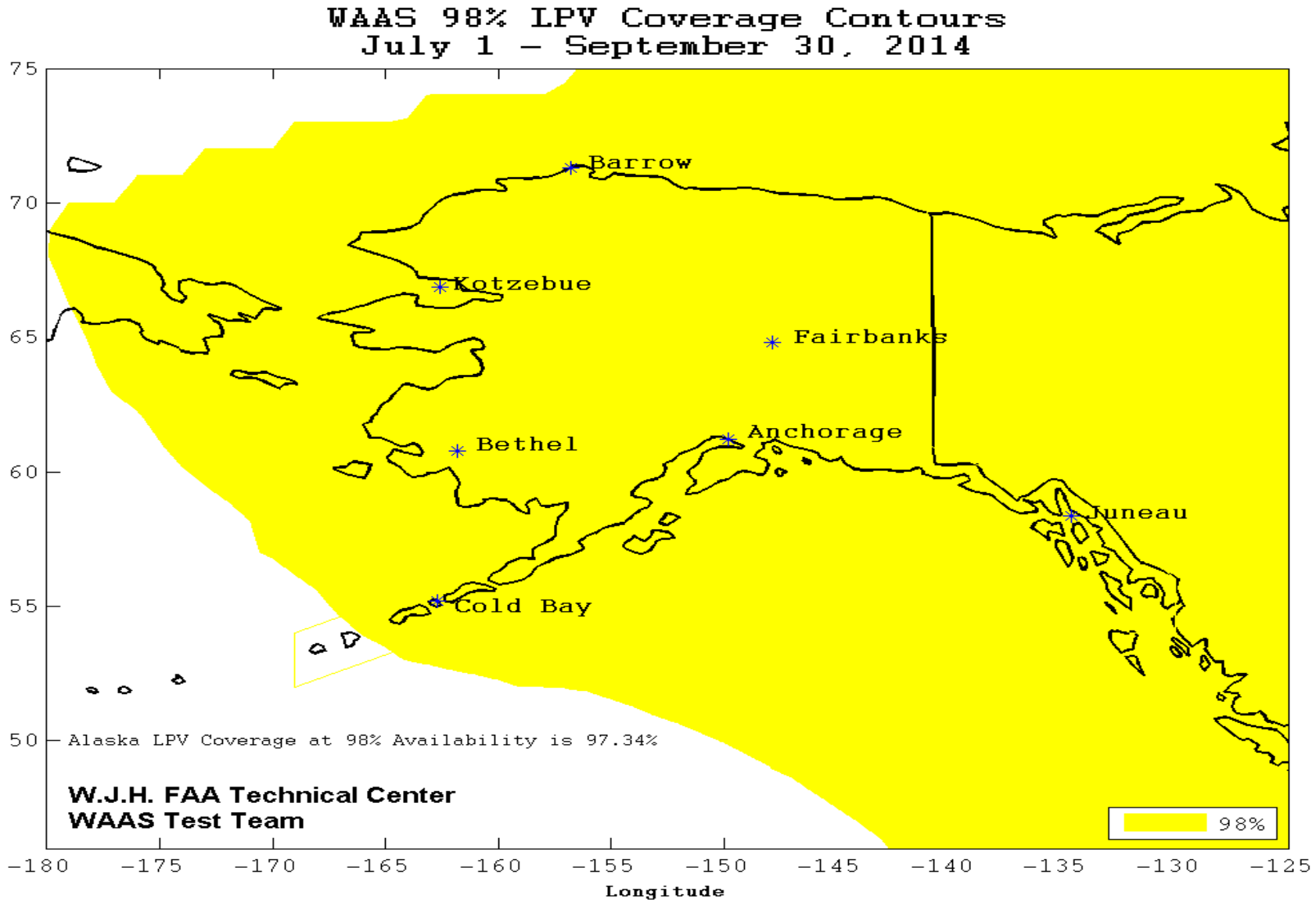


**Figure B-5 99% CONUS LPV 200 Availability Contour**

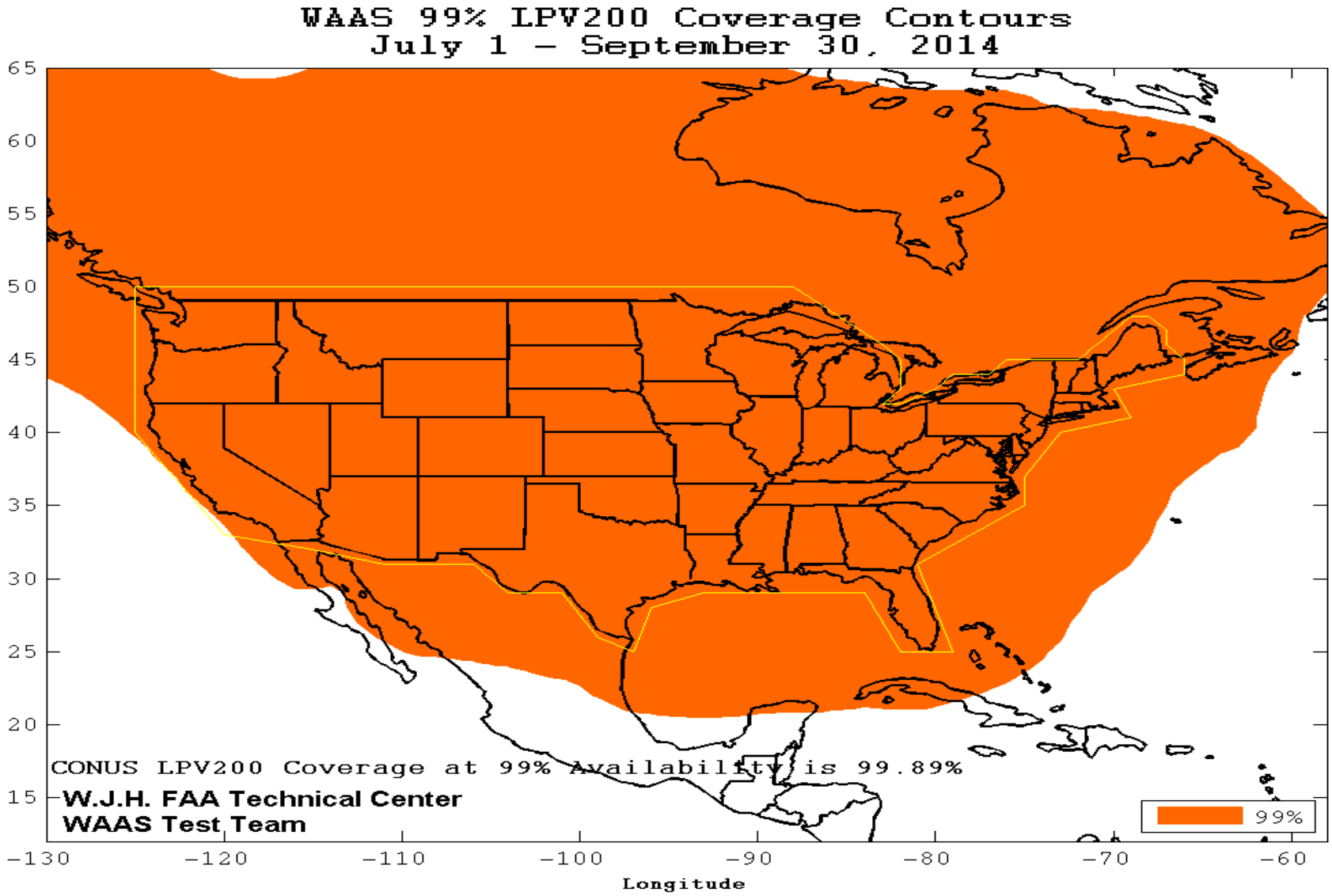


**Figure B-6 99% Alaska LPV 200 Availability Contour**