

WAAS Technical Report
William J. Hughes Technical Center
Pomona, New Jersey
2/14/06

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DR# 30: Loss of Availability due to Satellite Maintenance, SV 5 (NANU 2006013)

GPS Week/Day: Week 1361 Day 4 (2/9/06)

Discussion:

On GPS Week 1361 Day 4, a loss of WAAS availability was observed over the CONUS service volume. This was a direct result of forecast satellite maintenance.

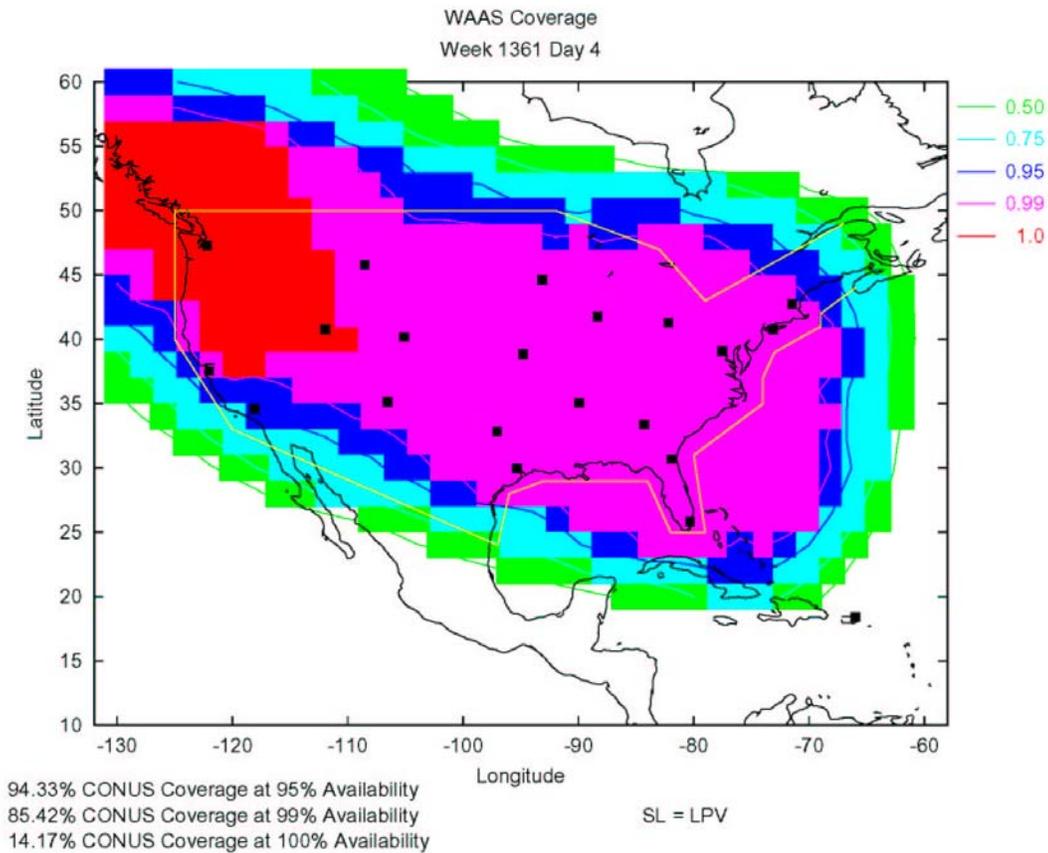
NANU 2006011 was issued on 2/1/06 forecasting satellite maintenance on SV 5 to occur on 2/9/06. The contents of this NANU are listed below.

NOTICE ADVISORY TO NAVSTAR USERS (NANU) 2006011
SUBJ: SVN35 (PRN05) FORECAST OUTAGE JDAY 040/1600 - JDAY 040/2200

1. NANU TYPE: FCSTMX
NANU NUMBER: 2006011
NANU DTG: 012151Z FEB 2006
REFERENCE NANU: N/A
REF NANU DTG: N/A
SVN: 35
PRN: 05
START JDAY: 040
START TIME ZULU: 1600
START CALENDAR DATE: 09 FEB 2006
STOP JDAY: 040
STOP TIME ZULU: 2200
STOP CALENDAR DATE: 09 FEB 2006
2. CONDITION: GPS SATELLITE SVN35 (PRN05) WILL BE UNUSABLE ON JDAY 040 (09 FEB 2006) BEGINNING 1600 ZULU UNTIL JDAY 040 (09 FEB 2006) ENDING 2200 ZULU.
3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
MILITARY - GPS OPERATIONS CENTER at
[HTTP://WWW.SCHRIEVER.AF.MIL/GPSSUPPORTCENTER](http://www.schriever.af.mil/gpssupportcenter), DSN 560-2541,
COMM 719-567-2541, gps_support@schriever.af.mil,
[HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)
MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994,
COMM 805-606-9994, SPACEAF.AOC@VANDENBERG.AF.MIL

Figure 1 shows the loss of LPV service that was observed on Week 1361 Day 4.

Figure 1 – LPV Coverage for Week 1361 Day 4



Forecast NANUs provide users with a prediction of how long satellite maintenance will last, although the resulting outage time is generally shorter. A forecast NANU will typically set aside a 12 or 24 hour block, however the actual maintenance action will rarely take that long. The actual duration of the maintenance action is reported in a summary NANU, issued after the maintenance has been completed. Specifics with respect to SV 5's outage on Week 1361 Day 4 can be found in the summary NANU listed below (NANU 2006013).

NOTICE ADVISORY TO NAVSTAR USERS (NANU) 2006013
SUBJ: SVN35 (PRN05) FORECAST OUTAGE SUMMARY JDAY 040/1611 - JDAY
040/2055

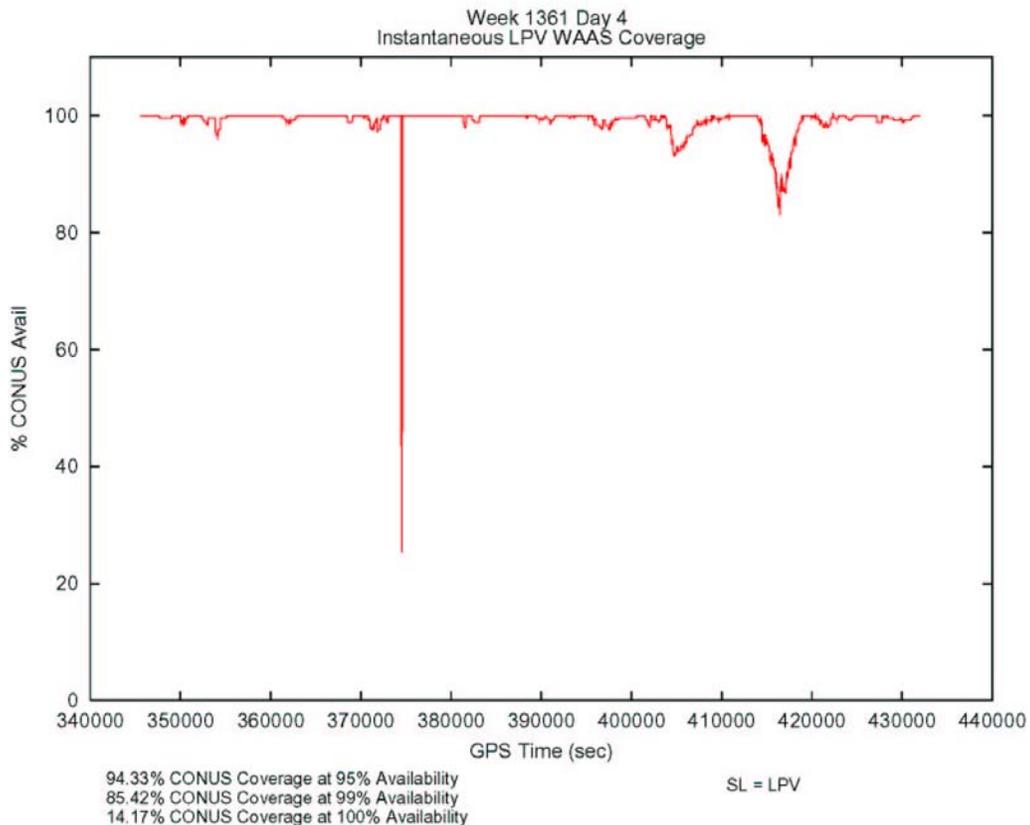
1. NANU TYPE: FCSTSUMM
NANU NUMBER: 2006013
NANU DTG: 092055Z FEB 2006
REFERENCE NANU: 2006011
REF NANU DTG: 012151Z FEB 2006
SVN: 35
PRN: 05

START JDAY: 040
START TIME ZULU: 1611
START CALENDAR DATE: 09 FEB 2006
STOP JDAY: 040
STOP TIME ZULU: 2055
STOP CALENDAR DATE: 09 FEB 2006

2. CONDITION: GPS SATELLITE SVN35 (PRN05) WAS UNUSABLE ON JDAY 040 (09 FEB 2006) BEGINNING 1611 ZULU UNTIL JDAY 040 (09 FEB 2006) ENDING 2055 ZULU.
3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
MILITARY - GPS OPERATIONS CENTER at
[HTTP://WWW.SCHRIEVER.AF.MIL/GPSSUPPORTCENTER](http://www.schriever.af.mil/gpssupportcenter), DSN 560-2541,
COMM 719-567-2541, gps_support@schriever.af.mil,
[HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)
MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994,
COMM 805-606-9994, SPACEAF.AOC@VANDENBERG.AF.MIL

Figure 2 shows a trend of instantaneous coverage (30 second sampling) for Week 1361 Day 4.

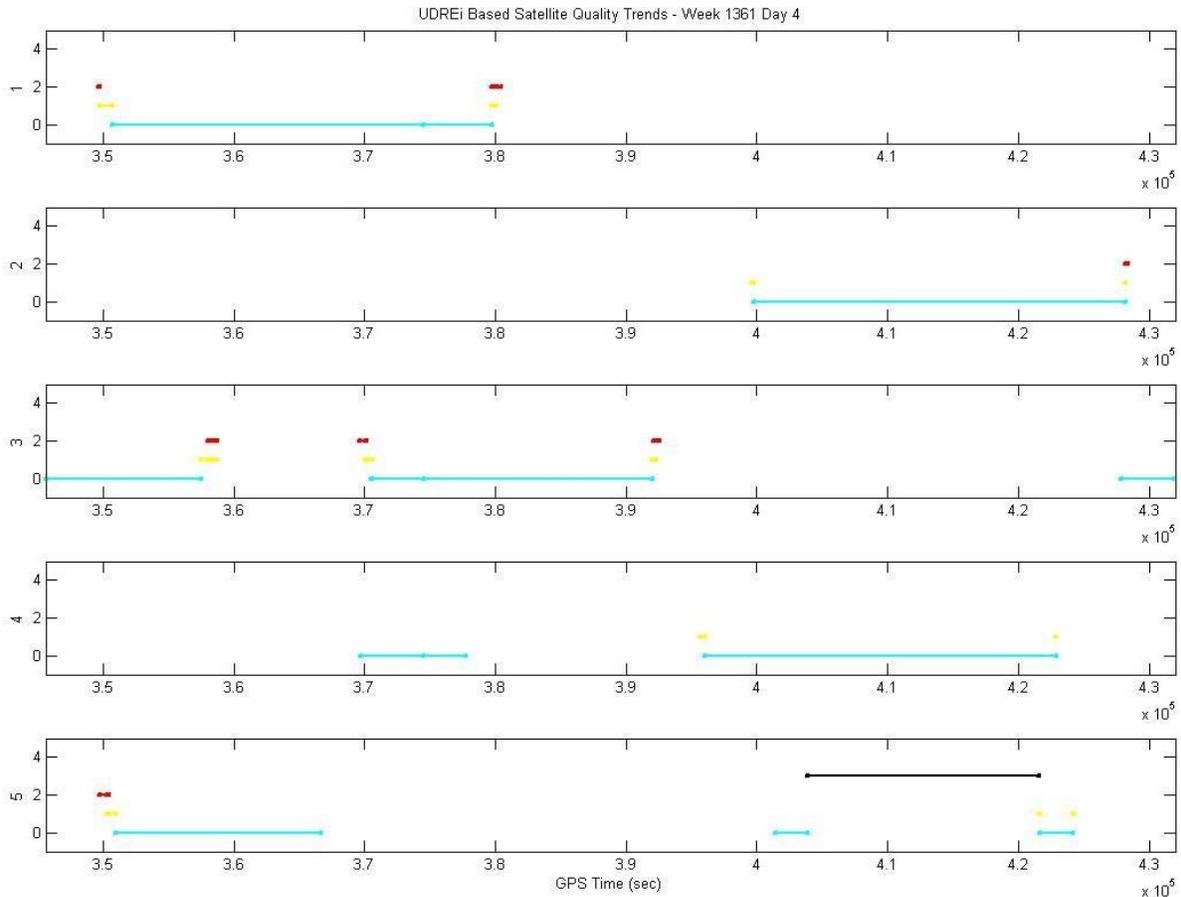
Figure 2 – Instantaneous LPV Coverage for Week 1361 Day 4



Note the correspondence between the times listed in the summary NANU indicating when the satellite outage occurred and the time during which the loss of coverage occurred. The start time listed on the summary NANU 2006013 of 16:11 Zulu (GMT) equates to GPS Time 403860 and the end time of 20:55 Zulu (GMT) to GPS Time 420900. Figure 2 shows a definite loss of coverage at this time. It should be noted that the brief drop down to ~25% that occurred earlier in the day was due to an AOR GUS switchover at GPS Time 374485.

The time that SV 5's outage was reported to have happened and the time at which coverage values were observed to have dropped can be correlated further by examining SV 5's ranging quality throughout the day. Figure 3 shows the UDREi quality of several satellites during the course of the day on Week 1361 Day 4, including SV 5. Blue indicates a UDREi of PA quality and Yellow a UDREi of NPA quality. Red indicates Not Monitored and Black Do Not Use.

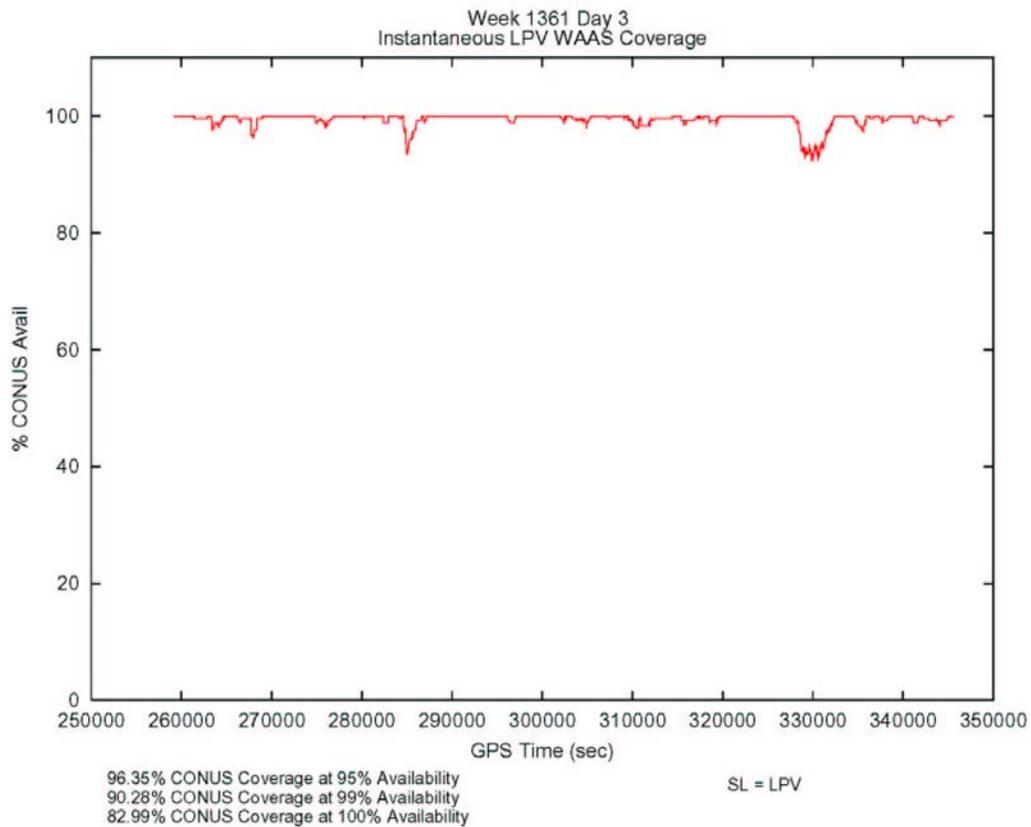
Figure 3 – PA UDREi Quality for SVs 1-5, Week 1361 Day 4



Note the change of SV 5 from PA quality to Do Not Use towards the end of the day, which corresponds very closely with both the reported times of the outage and the observed loss of coverage (GPS Time ~403000-421000).

For comparison, Figure 4 is a trend of instantaneous coverage on a day where SV 5 was healthy for the entire day, Week 1361 Day 3.

Figure 4 – Instantaneous LPV Coverage for Week 1361 Day 3



Although a drop in coverage is apparent later in the day, around the same time shown in Figure 2, it is noticeably exaggerated by the loss of SV 5.

Conclusion:

The loss of availability observed on Week 1361 Day 4 was due directly to the absence of SV 5 as a PA ranging source.