WAAS Technical Report
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DR #114: LPV Service Outage Due to Consecutive SV Alerts on PRN 138
GPS Week/Day: Week 1740 Day 3 (May 15, 2013)

Discussion:

On May 15, 2013, there was a two second LPV outage at WAAS Reference Stations located primarily in the western part of CONUS and at all Alaska reference stations. The outage occurred from 19:09:59 GMT to 19:10:01 GMT. The outage was due to a timeout of the Type 2 WAAS message. Table 1 shows which receviers had outages due to a timeout of the WAAS Type 2 message.

Table 1: Receivers which had outages due to the timeout of the WAAS Type 2 Message

Albuquerque	Anchorage	Barrow	Bethel
Billings	Cold Bay	Fairbanks	Gander
Goose Bay	Iqaluit	Juneau	Kotzebue
Los Angeles	Mexico City	Oakland	Puerto Vallarta
Salt Lake City	San Jose del Cabo	Seattle	

Description:

The selected C&V (Corrections and Verification) source for both the CRW and AMR GEO streams was ZDC. The selected C&V for the CRE GEO stream was ZLA.

Since CRE and AMR/CRW were on different selected sources, the message sequence sent by each GEO was slightly different.

Table 2 compares the WAAS message sequences that were sent by AMR/CRW and CRE

TABLE 2: WAAS Messages on GEO 133&135 and GEO 138

GEO 133&135:				GEO 138
19:09:44	28		19:09:44	28
19:09:45	4		19:09:45	4

19:09:46	3		19:09:46	3
19:09:47	2		19:09:47	2
19:09:48	26		19:09:48	28
19:09:49	63		19:09:49	26
19:09:50	26		19:09:50	26
19:09:51	4		19:09:51	4
19:09:52	4		19:09:52	4
19:09:53	4		19:09:53	4
19:09:54	4		19:09:54	4
19:09:55	4		19:09:55	4
19:09:56	3		19:09:56	3
19:09:57	4		19:09:57	4
19:09:58	4		19:09:58	4
19:09:59	4		19:09:59	4
19:10:00	4		19:10:00	4
19:10:01	2		19:10:01	2
19:10:02	3		19:10:02	3
19:10:03	25		19:10:03	25
19:10:04	25		19:10:04	25

The broadcast WAAS messages were very similar between GEO 133&135 and GEO 138. For the times shown in Table 2, the only differences were at 19:09:48 and 19:09:49.

Events Leading up to the timeout of the Type 2 message

The CRE(PRN 138) Woodbine GUS was experiencing dropped WAAS User Messages believed to be due to phase noise glitches from the phase noise enhancer (PNE).

At 19:09:51, a scheduled type 4 message was sent out. At 19:09:52, a type 4 alert was broadcast. In this alert, the UDREi of PRN 138 was changed to 13 at 19:09:52, then at 19:09:53, 19:09:54, and 19:09:55, the UDREi of PRN 138 was changed to 14.

A second SV alert was sent out from 19:09:57 to 19:10:00. No UDREi's or fast corrections were changed during this alert. PRN 138 UDREi remained at 14.

Since there were more than 12 seconds elapsed since the previous Type 2 fast correction, PRNs 1-13 timed out.

Figure 1 shows the WAAS Coverage Contours at 19:10:00 GMT on May 15, 2013. WAAS service was significantly affected by the timeout of the Type 2 fast correction.

Figure 1: WAAS Coverage Contours at 19:10:00 GMT on May 15, 2013

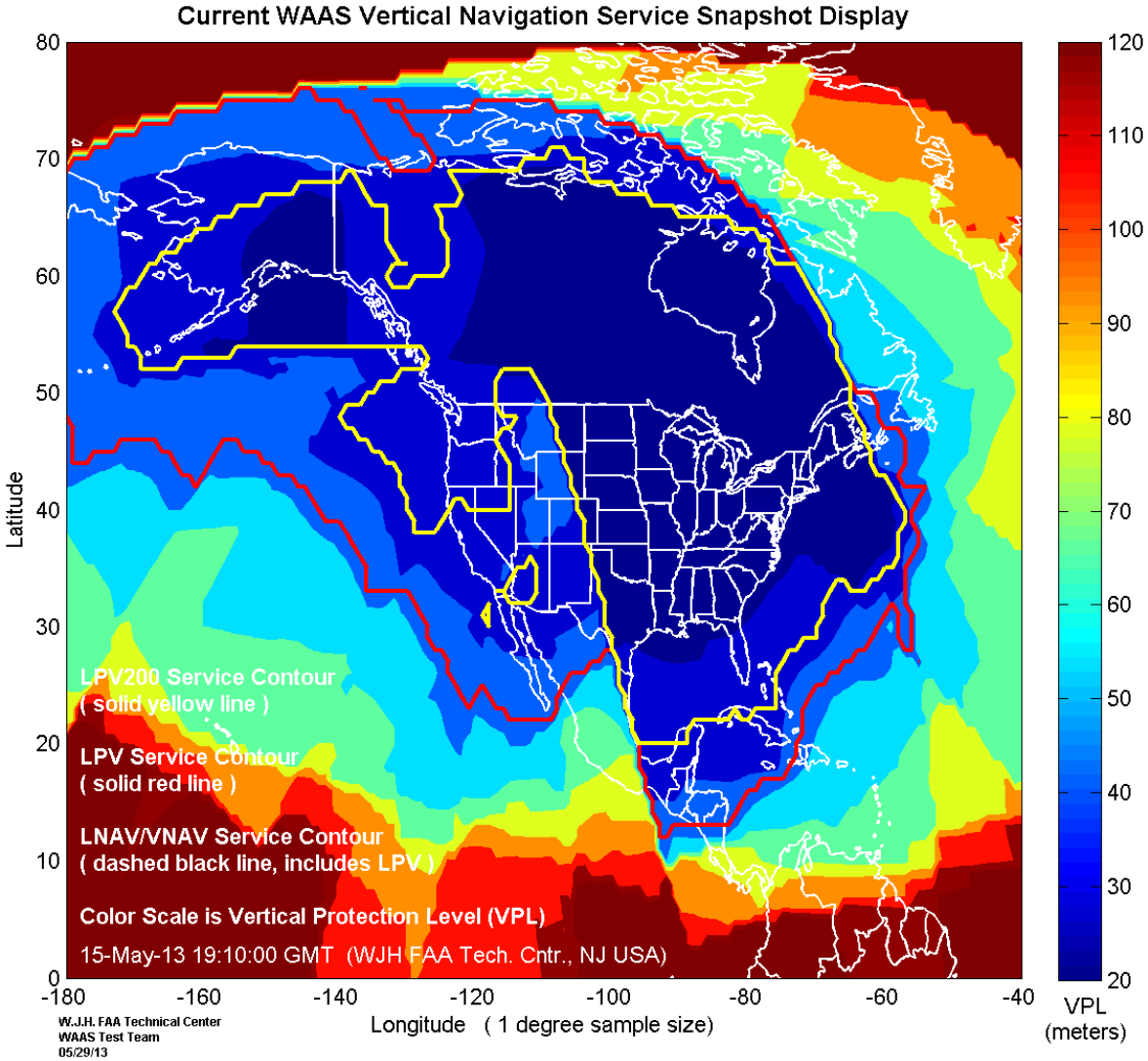
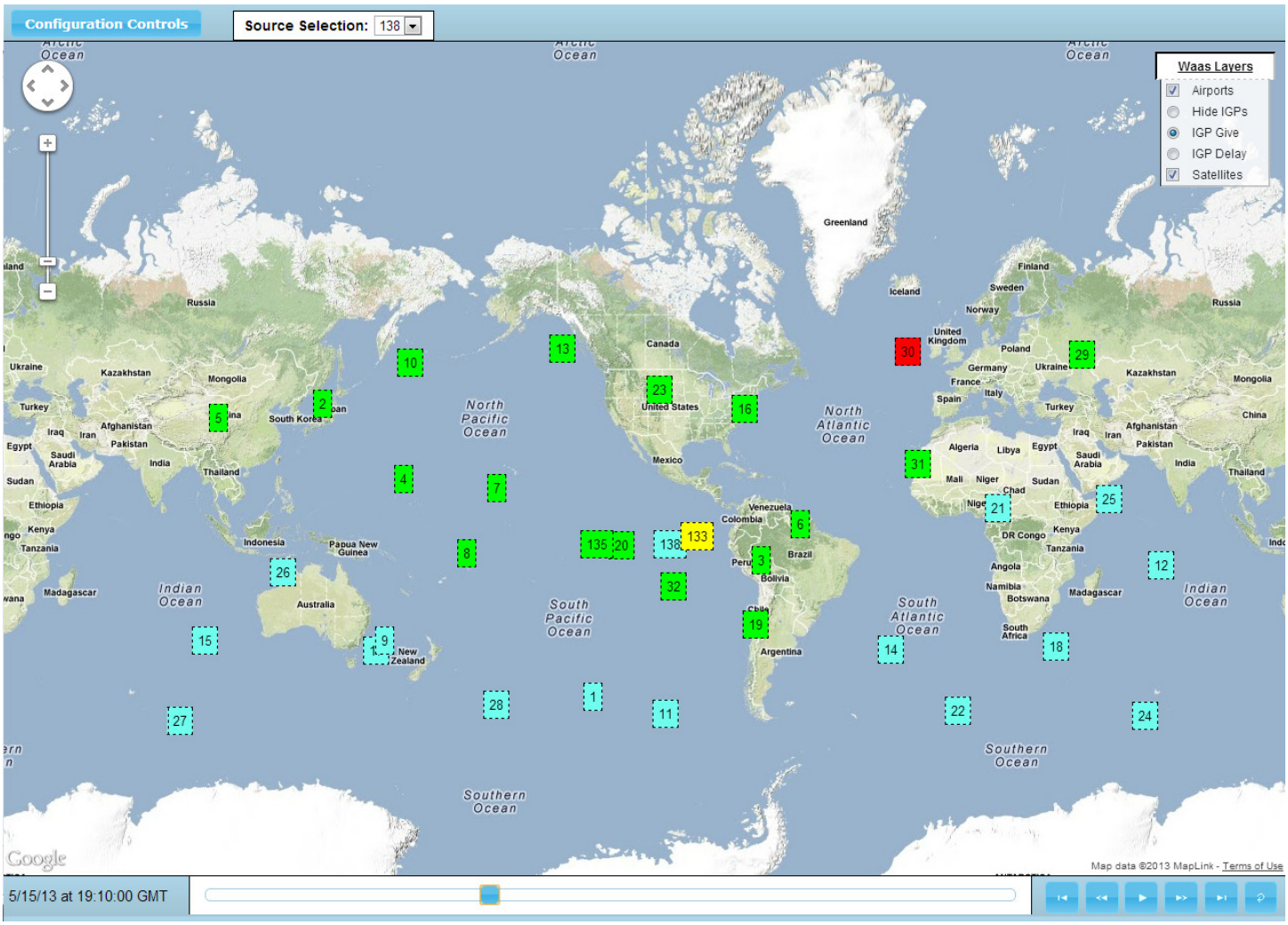


Figure 2 shows the location of the satellites that were affected by the timeout(with PRN 138 as the source of WAAS corrections). There were 17 GPS satellites in PA mode. Nine satellites were PRN 1-13. WAAS monitored satellites appear in green boxes, while satellites in blue are WAAS "Not Monitored." PRN 30 was set "Do Not Use" by WAAS, and the ranging quality on PRN 133 was "NPA." PRN 138 was set to "Not Monitored" also.

Figure 2: Location of WAAS satellites near the time of the message Type 2 timeout



Conclusion:

A timeout of the Type 2 fast correction led to the timeout of PRNs 1-13. This caused a short (two second) LPV service outage at the WAAS reference stations listed in Table 1. The service outage was from 19:09:59 GMT to 19:10:01 GMT.