WAAS Technical Report
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Pomona, New Jersey
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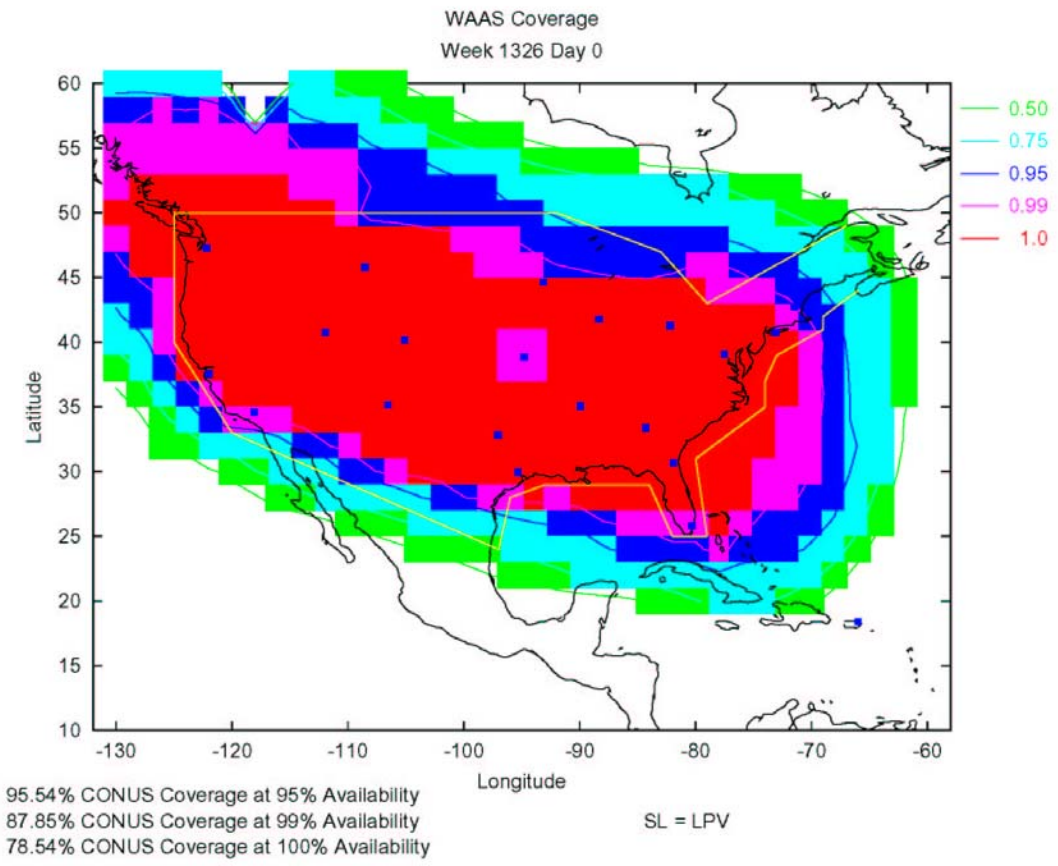
DR#7: Localized loss of availability due to single IGP (95W, 40N) being set to storm state
GPS Week/Day: Week 1326 Day 0 (6/5/2005)

Discussion:

On Day 0 of Week 1326 loss of LPV service availability was observed on daily coverage plots in the vicinity of the WRS at Kansas City. This corresponded to lower than normal availability for the Kansas City receiver on this date.

The loss of LPV service availability in the CONUS coverage volume can be observed in Figure 1.

Figure 1 – LPV Coverage, Week 1326 Day 0, 6/5/2005



The loss of availability in this area was due to the setting of a single IGP to storm state. The IGP, located at 95W 40N, had its GIVE value changed to 45 meters (storm state) by a Type 26 message issued at GPS time 60257. Table 1, taken from daily real-time processed data files from Kansas City, shows an increase in the vertical protection level. Table 2 shows that a Type 26 message (Type 26 messages contain GIVE status data) was issued at the same time. Data for Table 2 was taken from a real-time Geo message log. Table 3 shows the vertical protection level returning to normal after about 1000 seconds. Table 4 shows that this decrease corresponds to another Type 26, issued at GPS time 61121.

Table 1 – Real-time Processed Position Data File, Kansas City WRS

Time	nav valid	sats used	hdop	vdop	HPL	VPL	sats tracked	GEO
60253	1	10	0.856	1.343	11.524	20.27	10	122
60254	1	10	0.856	1.343	11.439	20.275	10	122
60255	1	10	0.856	1.343	11.419	20.287	10	122
60256	1	10	0.856	1.343	11.453	**20.381**	10	122
60257	1	10	0.856	1.343	20.567	**54.967**	10	122
60258	1	10	0.856	1.344	20.616	55.045	10	122
60259	1	10	0.856	1.344	20.646	55.113	10	122
60260	1	10	0.856	1.344	20.532	54.899	10	122
60261	1	10	0.856	1.344	20.503	54.911	10	122
60262	1	10	0.856	1.344	20.53	54.96	10	122
60263	1	10	0.856	1.344	20.567	55.022	10	122

Table 2 – Real-time Geo Message Stream, AORW

Time	Message Type	Geo	IODP/Band #	IODF/Block #
60253	3	122	2	2
60254	2	122	2	1
60255	24	122	2	2
60256	63	122		
60257	**26**	122	2	0
60258	63	122		
60259	3	122	2	0
60260	2	122	2	2
60261	24	122	2	0
60262	28	122	2	

Table 3 - Real-time Processed Position Data File, Kansas City WRS

Time	nav valid	sats used	hdop	vdop	HPL	VPL	sats tracked	GEO
61116	1	10	0.854	1.411	16.427	58.552	10	122
61117	1	10	0.854	1.411	16.439	58.538	10	122
61118	1	10	0.854	1.412	16.356	58.283	10	122
61119	1	10	0.854	1.412	16.305	58.287	10	122
61120	1	10	0.854	1.412	16.318	**58.332**	10	122
61121	1	10	0.854	1.412	11.162	**18.511**	10	122
61122	1	10	0.854	1.412	11.225	18.673	10	122
61123	1	10	0.854	1.412	11.171	18.256	10	122
61124	1	10	0.854	1.412	11.115	18.25	10	122
61125	1	10	0.854	1.412	11.091	18.269	10	122
61126	1	10	0.854	1.412	11.127	18.365	10	122

Table 4 - Real-time Geo Message Stream, AORW

Time	Message Type	Geo	IODP/Band #	IODF/Block #
61116	28	122	2	
61117	3	122	2	2
61118	2	122	2	1
61119	24	122	2	2
61120	8	122		
61121	**26**	122	2	0
61122	63	122		
61123	3	122	2	0
61124	2	122	2	2
61125	24	122	2	0
61126	28	122	2	

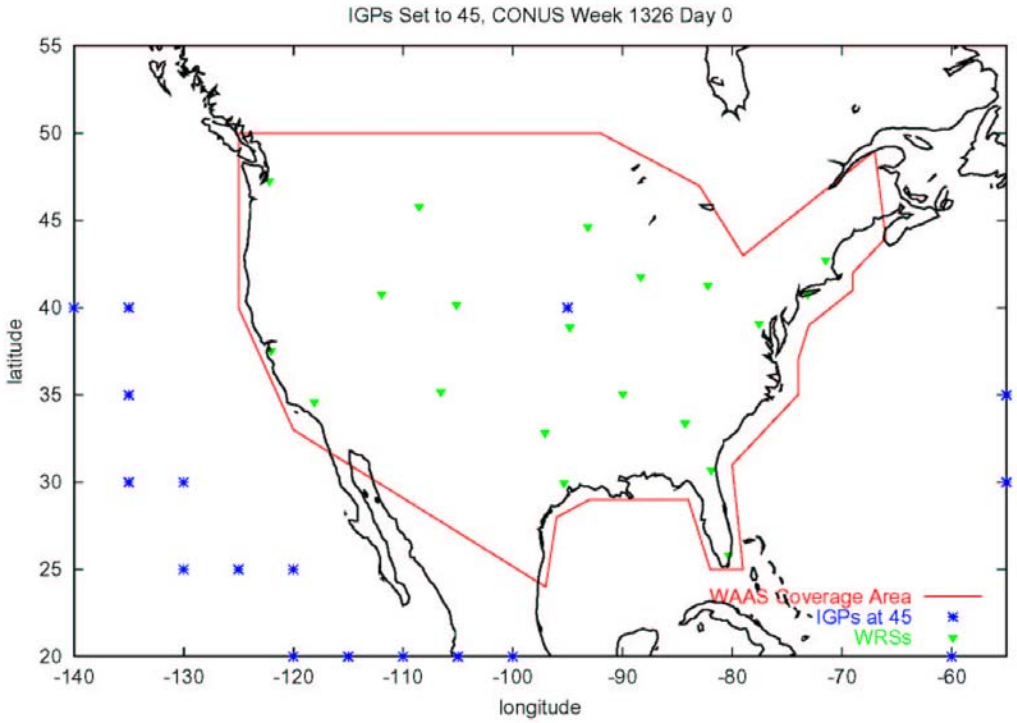
Tables 5 shows the transition of the GIVEi for the IGP at 95W 40N from 11 to 14 (storm state) at GPS time 60257, and then back down from 14 to 10 at time 61121. This data was taken from daily data integrity processing output files that track changes in GIVE indices.

Table 5 – GIVEi Transitions

Band	IGP	Lat	Long	Prev GIVEi	Current GIVEi	Prev Time	Current Time	Delta
B 2	I 419	15	-100	13	14	46128	60251	14123
B 2	I 449	**40**	**-95**	**11**	**14**	**0**	**60257**	60257
B 2	I 552	50	-75	12	13	55986	60306	4320
B 2	I 596	20	-65	13	12	54851	60323	5472
B 2	I 521	20	-80	12	13	57102	60558	3456
B 3	I 622	25	-60	13	12	41075	60659	19584
B 0	I 199	45	-145	12	13	60111	60689	578
B 1	I 274	40	-130	12	13	58422	60726	2304
B 1	I 275	45	-130	12	13	44587	60726	16139
B 1	I 322	30	-120	13	11	57275	60731	3456
B 2	I 520	15	-80	13	14	59694	60846	1152
B 2	I 546	20	-75	12	13	54834	60882	6048
B 3	I 622	25	-60	12	13	60659	60947	288
B 1	I 248	35	-135	13	12	32759	61002	28243
B 1	I 370	20	-110	14	13	60203	61067	864
B 2	I 421	25	-100	13	11	57083	61115	4032
B 2	I 449	**40**	**-95**	**14**	**10**	**60257**	**61121**	864
B 2	I 527	50	-80	13	12	60018	61170	1152

Figure 2 is a plot of the IGPs that were set at any time during the day to a GIVE of 45 (storm state), denoted by blue asterisks. Note the proximity of the IGP at 95W 40N to Kansas City (94.79W 38.88N, WRSs marked with green triangles).

Figure 2 – IGPs set to Storm State Over CONUS, Week 1326 Day 0



Moderate Geo magnetic activity was observed this day, as shown in Figure 3. However, it is anomalous that a single IGP would be set to storm state without adjacent IGP's also being affected.

Recommendation

This discrepancy report should be forwarded to Raytheon to investigate the reason why a single IGP was increased to 45 meters. This report will be re-issued when a resolution to this anomaly is determined.

Figure 3 – Kp Index, Week 1326 Day 0