



## **DIFFERENTIAL GPS (DGPS) SITE OPERATIONAL ASSESSMENT**

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**NDGPS Site:** Pahoia DGPS Site (837)  
**Inspector(s):** CWO4 William Iozzino, CWO3 Louie Baytan  
**Date:** 04 AUGUST 2014

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### **REFERENCES:**

- (1) DGPS Concept of Operations, COMDTINST 16577.2 (AUG 1995)
- (2) 2010 Federal Radio Navigation Plan
- (3) Broadcast Standard for the USCG DGPS Navigation Service, CIM 16577.1 (APR 1993).
- (4) RTCM Recommend Standards for Differential GNSS Service, Version 2.3.

### **PURPOSE:**

- Validate advertised DGPS coverage of the Pahoia DGPS site.
- Validate required RTCM message scheduling and delivery.
- Test differential correction accuracy versus a predetermined survey monument.

### **EQUIPMENT:**

Hemisphere R330 Receiver  
Hemisphere R110 Receiver  
Hemisphere A43 Antenna  
Hemisphere A42 Antenna  
MBA-2 Receive Antenna

### **PAHOIA DGPS SITE PARAMETERS:**

Frequency	290 KHz
Forward Output Power	900 W
Transmission Rate	100 baud
Field Strength/Range	75 $\mu$ V/m (37.5 dB $\mu$ V/m) at 250 km

### **SUMMARY:**

The Operational Assessment of the Pahoia DGPS site revealed that the provided coverage is not consistent with the predicted coverage plot and advertised range. The signal strength measurements, throughout the predicted coverage area within the advertised range, were not satisfactory. A review of the output/reflected power and near-field signal strength levels was conducted and found to be satisfactory. All RTCM messages were verified and evaluated and are consistent with the requirements set forth by reference (3) and (4). Finally, accuracy measurements and analysis could not be made due to lack of signal lock at the National Geodetic Survey (NGS) marker. Hence, the accuracy requirements set forth by Reference (1) and (2) could not be validated.

### **RESULTS:**

#### ***Signal Strength:***

A verification of the Pahoia DGPS coverage area was conducted on Maui and the Big Island of Hawaii. The advertised signal strength range is 250 km. Figure 1 below displays inadequate signal strength to the advertised range and most of the predicted coverage area. Green points

represent areas of satisfactory signal strength. Areas of unsatisfactory signal strength are represented with red points.

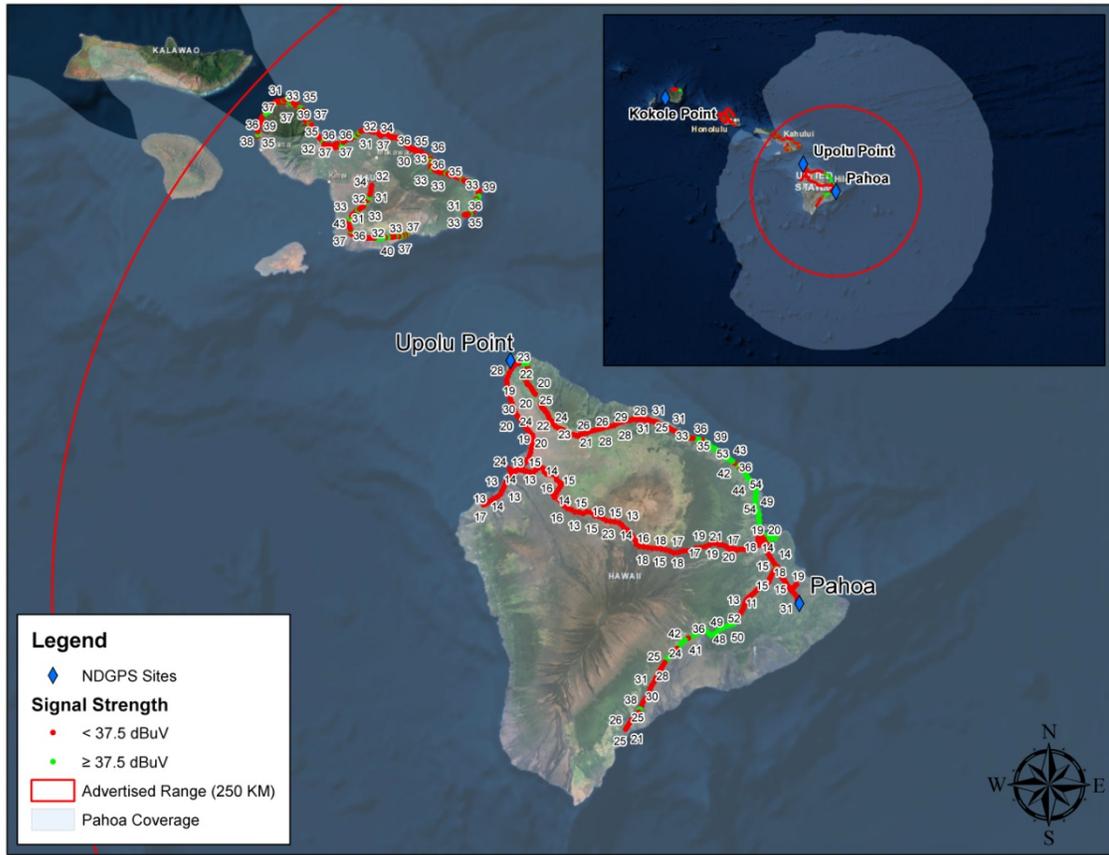


Figure 1: DNAV Signal Strength Results

**RTCM Message Verification:**

RTCM message scheduling, receipt, and content were checked during the assessment (Table 1 and 2). RTCM message scheduling on both Side A and Side B was validated with the DGPS watch and is in accordance with the Reference (3). Receipt of all RTCM messages was validated utilizing a Remote Desktop Session whereby the assessment team witnessed the on-time receipt of all messages on the active and standby Integrity Monitor computers. All message content was verified and is in accordance with Reference (4).

Message Type	Received	Scheduled	Content Verified/Accurate
Type 3	Y	Y	Y
Type 5 (ensure message is not being transmitted)	N	N	N/A
Type 7	Y	Y	Y
Type 9	Y	Y	Y
Type 16	Y	Y	Y

Table 1: Side A RTCM Message Validation

<b>Message Type</b>	<b>Received</b>	<b>Scheduled</b>	<b>Content Verified/Accurate</b>
<i>Type 3</i>	Y	Y	Y
<i>Type 5 (ensure message is not being transmitted)</i>	N	N	N/A
<i>Type 7</i>	Y	Y	Y
<i>Type 9</i>	Y	Y	Y
<i>Type 16</i>	Y	Y	Y

Table 2: Side B RTCM Message Validation

***Accuracy Validation:***

Positional data could not be collected due to the inability to get a signal lock with the Hemisphere R110 receiver at the NGS marker on Table 3. Thus, a field accuracy validation can not be made. A two dimension radial review of the same time period was completed for the integrity monitors. Side A's average deviation was 0.10469meters; Side B's average deviation was 0.10034 meters. Both findings were well within system parameters of reference (1) and (2).

<b>NGS Monument ID:</b>	<b>BBCM11</b>
Monument LAT:	19° 43' 17.25908"N
Monument LON:	155° 5' 3.87580" W
Distance from DGPS Site	25 km

Table 3: Monument ID