



DIFFERENTIAL GPS (DGPS) SITE OPERATIONAL ASSESSMENT

NDGPS Site: Aransas Pass, TX DGPS Site (816)
Inspector(s): LT Michael Brashier
Date: 06 May 2015

REFERENCES

- (1) Differential Global Positioning System (DGPS) Concept of Operations, COMDTINST 16577.2 (AUG 1995).
- (2) 2014 Federal Radio Navigation Plan.
- (3) Broadcast Standard for the USCG DGPS Navigation Service, CIM 16577.1 (APR 1993).
- (4) Radio Technical Commission for Maritime Services (RTCM) Recommended Standards for Differential Global Navigation Satellite System (GNSS) Service, Version 2.3.

PURPOSE

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

EQUIPMENT

Trimble SPS461 Receiver
Trimble GA 530 Antenna
Dell Latitude E3620 Laptop

ARANSAS PASS DGPS SITE PARAMETERS

| | |
|----------------------|--|
| Frequency | 304 KHz |
| Forward Output Power | 800 W |
| Transmission Rate | 100 baud |
| Field Strength/Range | 75 μ V/m (37.5 dB μ V/m) at 333 km |

SUMMARY

An Operational Assessment of the Aransas Pass DGPS site revealed that the provided coverage is consistent with the predicted coverage plot and advertised range. The signal strength measurements, throughout the predicted coverage area within the advertised range, were satisfactory. All RTCM messages were verified, evaluated, and are consistent with the requirements set forth by reference (3) and (4). The accuracy check results of 1.33 meters for both Side A and Side B were well within the 10 meter requirement as set forth by Reference (1) and (2).

RESULTS

Signal Strength

A verification of the Aransas Pass DGPS coverage area was conducted from Port Arthur, TX, along the coast to Port Isabel, TX near the US-Mexican border, including circumnavigation of the entire Houston VTS area. The advertised signal strength range is 333km. Figure 1 displays

adequate signal strength beyond the advertised range and throughout the predicted coverage area. Green points represent areas of satisfactory signal strength, whereas areas of unsatisfactory signal strength are represented with red points. As seen in Table 1 and Table 2, far-field signal strength readings were taken at northern and southern points of the predicted coverage area from both sides of the site. Both northern and southern far-field readings were well above the required 37.5 dB μ V/m signal strength on both sides.

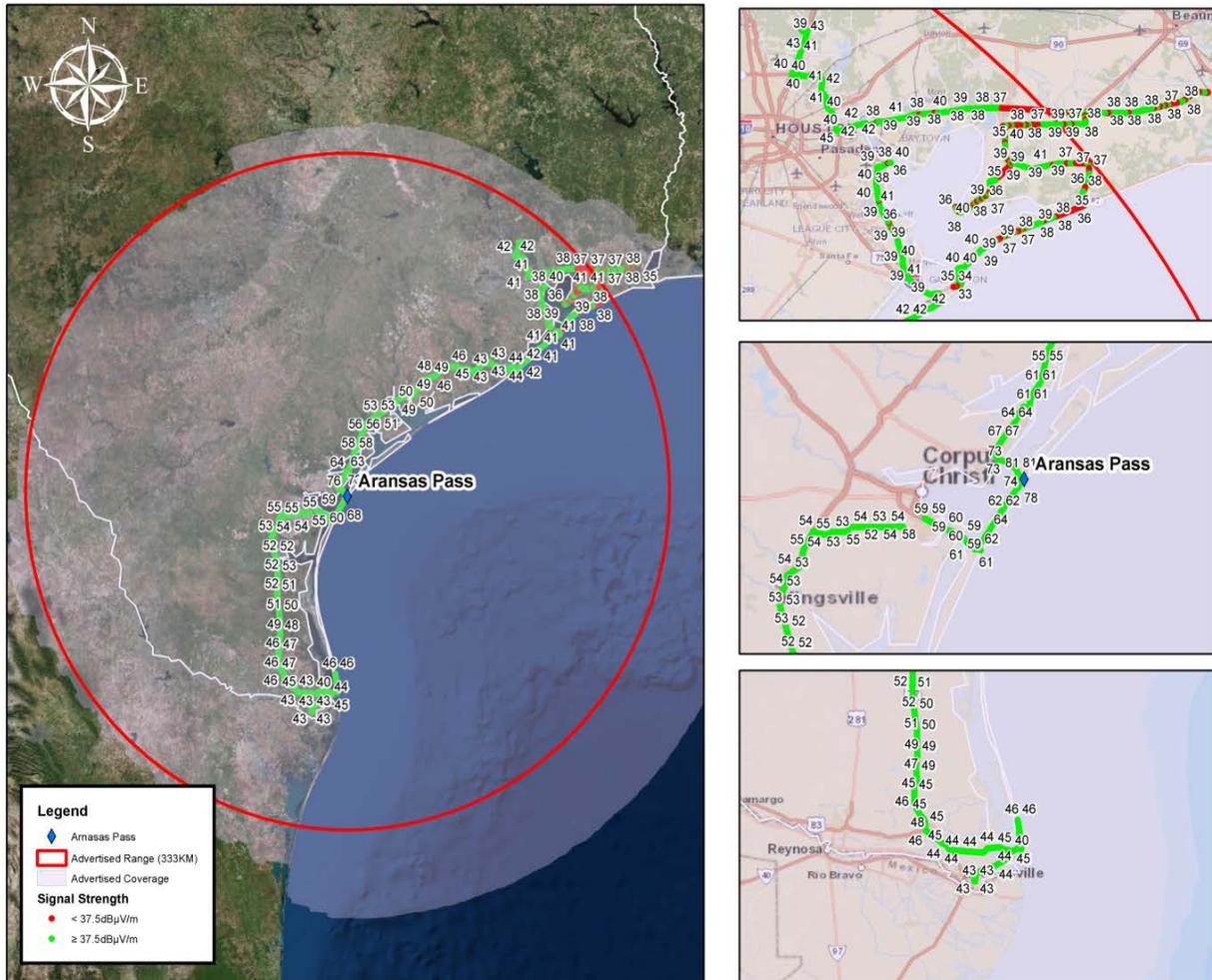


Figure 1: Signal Strength Results

| Side | Signal Strength | Signal to Noise ratio | Position |
|------|-----------------|-----------------------|-----------------------------------|
| A | 38 dB μ V/m | 20 dB μ V/m | 29° 49' 37.0" N, 094° 24' 22.0" W |
| B | N/A | N/A | |

Table 1: North Far-Field Signal Strength Reading

| Side | Signal Strength | Signal to Noise ratio | Position |
|------|-----------------|-----------------------|-----------------------------------|
| A | 43 dB μ V/m | 20 dB μ V/m | 25° 54' 22.0" N, 097° 25' 56.0" W |
| B | N/A | N/A | |

Table 2: South Far-Field Signal Strength Reading

RTCM Message Verification

Table 3 and Table 4 show RTCM message scheduling, receipt, and content collected during the assessment. RTCM message scheduling on both Side A and Side B was validated with the DGPS watch and is in accordance with 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 |
|---|----------|-----------|---------------------------|
| <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 3: Side A RTCM Message Validation

| Message Type | Received | Scheduled | Content Verified/Accurate |
|---|----------|-----------|---------------------------|
| <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 4: Side B RTCM Message Validation

Accuracy Validation

Positional data was collected for 10 minutes per side using the Trimble SPS461. The data was then post processed and compared to a National Geodetic Survey (NGS) marker to verify the horizontal accuracy of the broadcast correction (See Table 5 through Table 7). Both Side A and Side B were 1.332 meters, bearing 243° from the monument. Per Reference (1) and (2), both respective distances were well within advertised accuracy requirements.

| | |
|-------------------------|----------------------|
| NGS Monument ID: | BBDS68 |
| Monument LAT: | 29° 18' 32.11339" N |
| Monument LON: | 094° 47' 35.82107" W |
| Distance from DGPS Site | 275 km |

Table 5: NGS Monument ID

| | |
|--|---------------------|
| Averaged LAT: | 29° 18' 32.1145" N |
| Averaged LON: | 094° 47' 35.8110" W |
| Antenna Distance from Monument: | 1.332m (4.37 ft) |
| Antenna Bearing from Monument: | 243° |

Table 6: Side A Accuracy Check Results

| | |
|--------------------------------|---------------------|
| Averaged LAT: | 29° 18' 32.1134" N |
| Averaged LON: | 094° 47' 35.8211" W |
| Distance from Monument: | 1.332m (4.37 ft) |
| Bearing from Monument: | 243° |

Table 7: Side B Accuracy Check Results

#