



## DIFFERENTIAL GPS (DGPS) SITE OPERATIONAL ASSESSMENT

**NDGPS Site:** Myton, UT DGPS Site (873)  
**Inspector(s):** CWO3 Louie Baytan  
**Date:** 27 Sep 2015

### REFERENCES

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

### PURPOSE

- Validate advertised DGPS coverage of the Myton 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 E6320 Laptop

### MYTON DGPS SITE PARAMETERS

Frequency	303 KHz
Forward Output Power	1000 W
Transmission Rate	100 baud
Field Strength/Range	75 $\mu$ V/m (37.5 dB $\mu$ V/m) at 275 km

### SUMMARY

The Operational Assessment of the Myton DGPS site revealed that the provided coverage is consistent with the advertised range. The western far-field signal strength reading was within the required parameters. The signal strength measurements, within the advertised range, were satisfactory. Additionally, a review of the forward/reflected power and near-field signal strength levels was conducted and found to be satisfactory. All RTCM messages were verified, evaluated and are consistent with the requirements set forth by reference (1) and (2). Finally, accuracy measurements and analysis proved that at a distance of approximately 159 km from the broadcast site, the horizontal accuracy is sub-meter and within the 10 meter accuracy requirement set forth by Reference (3) and (4).

## RESULTS

### Signal Strength

A verification of the Myton DGPS coverage area was conducted from Park City, UT to the site and to Wells, NV. The advertised signal strength range is 275 km. Figure 1 displays adequate signal strength, beyond the advertised range of 275 km from the site and throughout the planned route in 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, a far-field signal strength reading was taken at western point of the advertised range from both sides of the site. The western far-field readings were above the required 37.5 dB $\mu$ V/m signal strength on both sides.

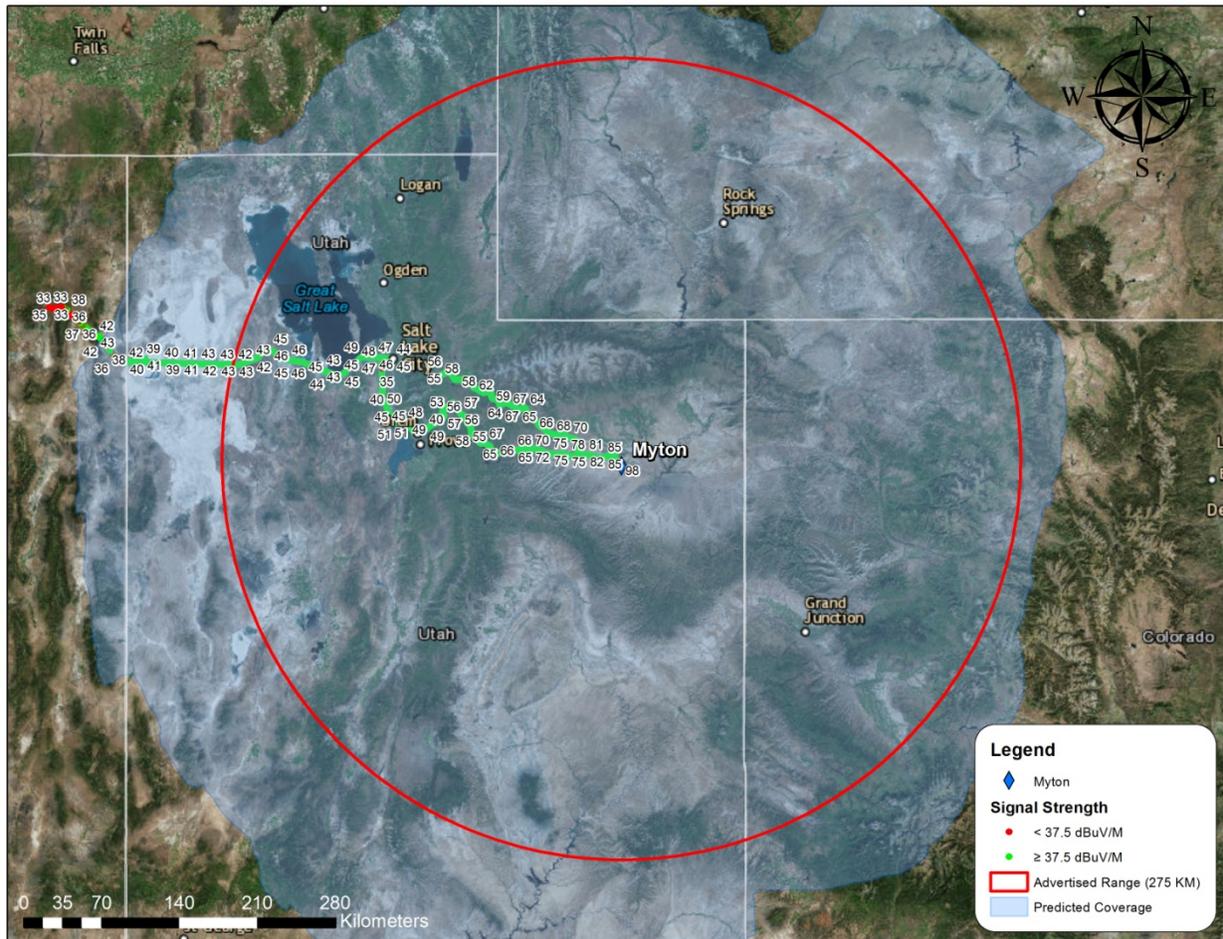


Figure 1: Signal Strength Results

Side	Signal Strength	Signal to Noise ratio	Position
A	43 dB $\mu$ V/m	29 dB $\mu$ V/m	40° 43' 34.61" N, 113° 10' 8.82" W
B	43 dB $\mu$ V/m	28 dB $\mu$ V/m	

Table 1: Western Far-Field Signal Strength Reading

***RTCM Message Verification***

Table 2 and Table 3 shows 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 the Reference (1). 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 (2).

<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 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 3: Side B RTCM Message Validation

***Accuracy Validation***

Positional data was collected for a minimum of 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 (Table 5 and 6). Side A was 0.7931 meters, bearing 331.6497° from the monument, while Side B was 0.7960 meters, bearing 300.5783° from the monument. As per Reference (3) and (4), both respective distances were within advertised accuracy requirements. A comparison between the GPS satellites in view at the Myton DGPS site and at the NGS monument location was conducted (Table 7) to identify any differences in the GPS satellite geometry used at the respective locations; any differences in geometry could lead to accuracy discrepancies. In this case, the satellites being tracked by the Reference Station and Integrity Monitor GPS receivers at the site were similar to those tracked at the NGS monument location. A two dimension radial review of the same time period was completed for the integrity monitors. Side A’s average deviation was 0.30685 meters; Side B’s average deviation was 0.30854 meters. Both findings were consistent with the findings observed in the field and are within system parameters.

<b>NGS Monument ID:</b>	<b>LO0510</b>
Monument LAT:	40° 21' 44.19886" N
Monument LON:	111° 53' 14.40712" W
Distance from DGPS Site	158.7 km

Table 4: NGS Monument ID

<b>Averaged LAT:</b>	40° 21' 44.22146" N
<b>Averaged LON:</b>	111° 53' 14.42312" W
<b>Distance from Monument:</b>	0.7931 m (2.60 ft)
<b>Bearing from Monument:</b>	331.6497°

Table 5: Side A Accuracy Check Results

<b>Averaged LAT:</b>	40° 21' 44.21197" N
<b>Averaged LON:</b>	111° 53' 14.43624" W
<b>Distance from Monument:</b>	0.7960 m (2.61 ft)
<b>Bearing from Monument:</b>	300.5783°

Table 6: Side B Accuracy Check Results

<i>Antenna Location</i>	<i>GPS Satellites Tracked (PRN)</i>										
Reference Station A	13	14	15	18	19	21	22	24	27		
Integrity Monitor A	13	15	16	18	20	21	22	26	27	29	
Reference Station B	2	6	10	12	13	17	20	24	25		
Integrity Monitor B	13	15	16	18	20	21	22	26	27	29	
NGS Monument Location, Side A	13	15	16	18	20	21	22	26	27	29	
NGS Monument Location, Side B	13	15	16	18	20	21	22	26	27	29	

Table 7: GPS Satellite Comparison

**NAVCEN INTERNAL ONLY: The following information will be placed in an OA index for internal tracking purposes and removed before posting.**

***Discrepancies***

***None***

**RECOMMENDATION**

No changes recommended

#