



DIFFERENTIAL GPS (DGPS) SITE OPERATIONAL ASSESSMENT

NDGPS Site:	Pueblo DGPS Site (872)
Inspector(s):	CWO3 Louie Baytan, LT Michael Brashier
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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 Pueblo DGPS site.
- Validate required RTCM message scheduling and delivery.
- Test differential correction accuracy versus a predetermined survey monument.

EQUIPMENT:

Raven INVICTA Receiver
MBA-2 Receive Antenna
Trimble SPS461 Receiver
Trimble GA 530 Antenna
Potomac Instruments 4100 FIM meter

PUEBLO DGPS SITE PARAMETERS:

Frequency	307 KHz
Forward Output Power	900 W
Transmission Rate	100 baud
Field Strength/Range	75 μ V/m (37.5 dB μ V/m) at 200 km

RESULTS:

Signal Strength:

A verification of the Pueblo DGPS coverage area was conducted from Colorado Springs, CO west to Grand Junction, CO. The advertised signal strength range is 200 km. Figure 1 below displays adequate signal strength, beyond the advertised range and throughout the predicted coverage area. Green points represent areas of satisfactory signal strength. Areas of unsatisfactory signal strength are represented with red points. Far-field (FF) signal strength readings were taken at a western point of the advertised range from both sides of the site (Table 1). The FF readings were well above the required 37.5 dB μ V/m signal strength on both sides.

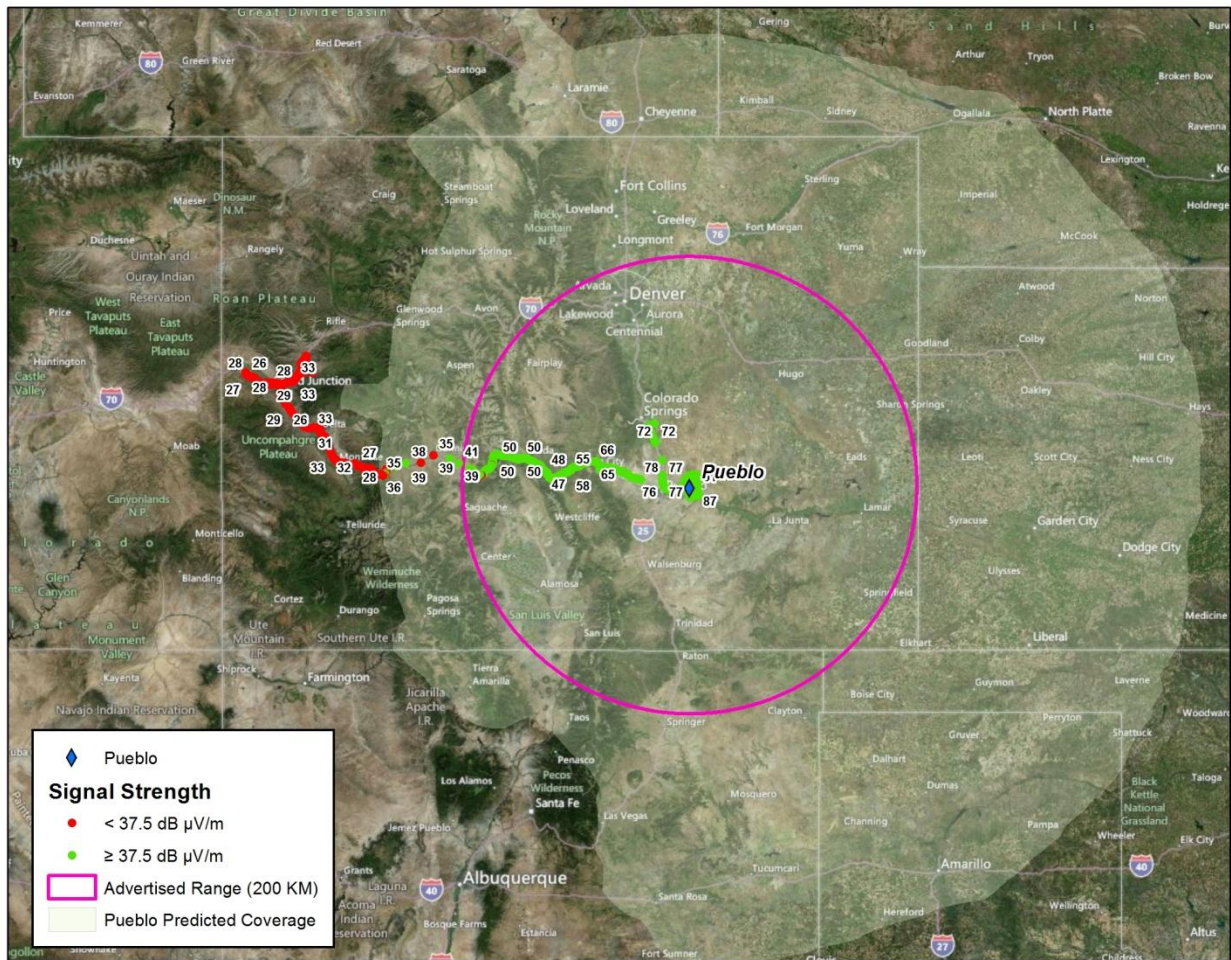


Figure 1: DNAV Signal Strength Results

	POSITION	Trimble SPS461	4100 FIM Meter
Side A SS	38° 29' 58.7"N 106° 32' 17.0"W	41 dB μ V/m, 18 SNR	41.1 dB μ V/m
Side B SS	38° 29' 58.7"N 106° 32' 17.0"W	41 dB μ V/m, 20 SNR	41.2 dB μ V/m

Table 1: Far-Field Signal Strength Reading

RTCM Message Verification:

RTCM message scheduling, receipt, and content were checked during the assessment (Table 2 and 3). 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 Raven Invicta receiver whereby the assessment team witnessed the on-time receipt of RTCM Type 3, 7 and 9 messages on the active and standby Integrity Monitor computers. Only

the initial broadcast of Type 16 message was received, follow on TYPE 16's were not received. 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>	N	Y	N

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>	N	Y	N

Table 4: Side B RTCM Message Validation

Accuracy Validation:

Accuracy Validation was not completed as a survey monument was not available along the DNAV route. A two dimension radial review of the same time period was completed for the integrity monitors. Side A's average deviation was 0.19964 meters; Side B's average deviation was 0.22928 meters.

SUMMARY:

The Operational Assessment of the Pueblo DGPS site revealed that the provided coverage is consistent with the predicted coverage plot and advertised range. The Far-Field signal strength readings were well within the required signal strength. The signal strength measurements, throughout the predicted coverage area within the advertised range, were satisfactory. Additionally, a review of the output/reflected power and near-field signal strength levels was conducted and found to be satisfactory. All but the Type 16 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 completed due to availability of an NGS survey monument along the DNAV route.