Project Report on GPS Control

Survey in Support of LiDAR Mapping

for

Illinois Department of Transportation Region Four (4) District Seven (7)

P - 97 - 037 - 10

2011-2012

Submitted
By
American Surveying & Engineering, P.C.

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1.0 Introduction

This report discusses the GPS Control Survey performed by American Surveying & Engineering (ASE) as a sub-consultant to Aerometric, as part of their contract to provide the Illinois Department of Transportation with a high resolution digital terrain model (DTM) of District 7. This Distrct is part of IDOT's Region 4, and is comprised of sixteen (16) counties, in southeastern Illinois. Aerometric is the Prime Consultant for the Department for the mapping project. The role of ASE is to provide ground checkpoints to test the DTM and aerial mapping in accordance with the Department's project specifications and the Federal Emergency Management Agency's (FEMA's) "Guidelines and Specifications for Flood Hazard Mapping Partners". The District published certain performance criteria in the advertisement of the project, including the use of the GPS network available throughout the District, namely the Trimble "VRS Now Illinois Real Time Network".

2.0 Preliminary Testing of the VRS System

Initial survey work consisted of a test of the VRS Now System was conducted in March of 2011. Seventy-two (72) Control points provided by IDOT were surveyed with the VRS Now System and the results were compared with the record values elevations of the control points. This test demonstrated that the VRS Now system was likely capable of providing the required accuracy for the LiDAR Checkpoint Survey. A comprehensive report of this test was prepared by ASE in Aril of 2011.

3.0 Checkpoint Survey

The scope of work for the Checkpoint Survey required that QA/QC "ground truthing" points be provided in an even distribution over the 16 counties in the District. Initially, ten (10) "Hard Surface" points were established in each county. These points were PK nails or iron rods set in the centerline of paved roads. These 160 points were surveyed in August and September of 2011 and provided to Aerometric for initial QA/QC of the mapping, and along with the 72 IDOT control points, provided sufficient control checks to be used during the balance of the project.

The remainder of the checkpoint survey required the collection of checkpoint shots in six different categories based on ground surface type. Points were collected in tall grass, short grass, brush, woods/timber areas, and next to buildings. Near each checkpoint, a road cross-section was also shot, with shots at the centerline and edge of pavement of the roadway.
A group of checkpoints and associated road cross sections was collected in each township within each of the 16 counties. The FEMA specifications require that each county have a group of

checkpoints in a minimum of twenty (20) areas, so counties with less than 20 townships were split into twenty arbitrary areas.

Each checkpoint was shot as a 180 second observation and as a 5 second check observation. During the checkpoint surveys, check shots were taken to the hard point and IDOT control points.

Three counties in the district did not have good coverage from the VRS Now system. In Clay, Richland, and Lawrence counties, results obtained using the VRS Now system were either inconsistent, or coverage was not sufficient to allow survey work across the entire county. In these three counties, ASE used conventional base-rover RTK survey methods for the checkpoint surveys. Base stations were set at 10-15 mile intervals through the county and tied to the IDOT/NGS control network by static GPS survey. This allowed for RTK rover survey of the checkpoints and hard points in the county. A site calibration was performed of the RTK files to the IDOT/NGS control. This method provided much more consistent and repeatable results for these three counties.

Checkpoint surveys were performed between October 2011 and April 2012. Office review began in April of 2012, with QA/QC field visits in May of 2012.

4.0 Data Processing and Review

The survey files were reviewed and sorted in the office to compare redundant measurements and check the data against the control. Points whose repeat measurements did not agree within tolerance were placed on a list for field check. Field crews were remobilized and resurveyed any suspect points. Sufficient measurements were collected to identify outlier measurements and ensure that all points met project specifications.

The data points were then sorted by category and checked for consistency of point descriptors. After data editing, the compiled point files were provided to Aerometric, along with field notes and photographs of each checkpoint.

5.0 Conclusion

ASE was able to successfully complete LiDAR Checkpoint survey for the majority of the project with the methodology proposed by the District. The VRS Now system proved to be problematic in three of the sixteen counties of the District, but alternative methods were employed to complete the work, with no detrimental impact on scope or schedule.