



### Fugro EarthData's Accuracy Assessment Form (QC Master)

Project Name/Number: FEMA Region 6 Arkansas OL2 LIDAR

Date: 10/07/2015

Tian Wang

|                          |                                 |   |                                  |   |  |              |
|--------------------------|---------------------------------|---|----------------------------------|---|--|--------------|
| Coordinate System<br>UTM | Horizontal Datum<br>NAD83(2011) | UTM Zone or SPC State name<br>UTM zone 15 N | GC Points Source<br>Field GPS    | For Elevation purposes<br>JMS ONLY:     | Enter Value in GSD<br>0.09                       | (Meter)      |
| Units<br>(None)          | Product type<br>LIDAR           | GSD/Point Spacing<br>0.7 m                  | Vertical Datum<br>NAVD83(Geoid2) | Vertical Accuracy Value<br>User Defined | Supported Height RMSE<br>According to Map Scale= | 1.80 (Meter) |

| Block ID: Lower Black Watershed | Point ID | Block/Model/Sheet ID | Ortho/stereo/DEM measured by Fugro EarthData |  |  | QA/QC Points as surveyed in the Field   |  |  | Residual error = Measured coordinates - surveyed coordinates |                          |                           | Normalized error = Residuals - bias |                          |                           | Comments |
|---------------------------------|----------|----------------------|--|--|--|---|--|--|--|--------------------------|---------------------------|-------------------------------------|--------------------------|---------------------------|----------|
|                                 |          |                      | UTM zone 15 N<br>Easting (E)<br>(Meter)      | NAD83(2011)<br>Northing (N)<br>(Meter) | NAVD83(Geoid2)<br>Elevation (H)<br>(Meter) | UTM zone 15 N<br>Easting (E)<br>(Meter) | NAD83(2011)<br>Northing (N)<br>(Meter) | NAVD83(Geoid2)<br>Elevation (H)<br>(Meter) | ΔE (Easting)<br>(Meter)                                      | ΔN (Northing)<br>(Meter) | ΔH (Elevation)<br>(Meter) | ΔE (Easting)<br>(Meter)             | ΔN (Northing)<br>(Meter) | ΔH (Elevation)<br>(Meter) |          |
| GCP51                           |          |                      | 240.162                                      | 669783.803                             | 4060166.620                                | 240.148                                 | No Data                                | No Data                                    | 0.014  | No Data                  | No Data                   | 0.013                               |                          |                           |          |
| GCP52                           |          |                      | 180.697                                      | 665817.831                             | 4056829.540                                | 180.692                                 | No Data                                | No Data                                    | 0.005  | No Data                  | No Data                   | 0.004                               |                          |                           |          |
| GCP53                           |          |                      | 167.197                                      | 670888.805                             | 4049660.750                                | 167.210                                 | No Data                                | No Data                                    | -0.013   | No Data                  | No Data                   | -0.014                              |                          |                           |          |
| GCP54                           |          |                      | 236.524                                      | 647131.549                             | 40439760.201                               | 236.550                                 | No Data                                | No Data                                    | -0.026   | No Data                  | No Data                   | -0.027                              |                          |                           |          |
| GCP55                           |          |                      | 152.340                                      | 658120.059                             | 4040990.766                                | 152.344                                 | No Data                                | No Data                                    | -0.004   | No Data                  | No Data                   | -0.005                              |                          |                           |          |
| GCP56                           |          |                      | 153.102                                      | 674665.990                             | 4039263.396                                | 153.078                                 | No Data                                | No Data                                    | 0.024  | No Data                  | No Data                   | 0.023                               |                          |                           |          |
| GCP57                           |          |                      | 140.413                                      | 686182.089                             | 4041842.986                                | 140.432                                 | No Data                                | No Data                                    | -0.019   | No Data                  | No Data                   | -0.020                              |                          |                           |          |
| GCP58                           |          |                      | 91.694                                       | 669351.523                             | 4040810.868                                | 91.677                                  | No Data                                | No Data                                    | 0.017  | No Data                  | No Data                   | 0.016                               |                          |                           |          |
| GCP59                           |          |                      | 88.994                                       | 671638.466                             | 4040707.543                                | 89.955                                  | No Data                                | No Data                                    | 0.039  | No Data                  | No Data                   | 0.038                               |                          |                           |          |
| GCP60                           |          |                      | 160.372                                      | 660814.695                             | 4034083.273                                | 160.382                                 | No Data                                | No Data                                    | -0.010   | No Data                  | No Data                   | -0.011                              |                          |                           |          |
| GCP61                           |          |                      | 123.547                                      | 657830.418                             | 4025837.843                                | 123.523                                 | No Data                                | No Data                                    | 0.024  | No Data                  | No Data                   | 0.023                               |                          |                           |          |
| GCP62                           |          |                      | 102.266                                      | 670992.899                             | 4024891.343                                | 102.286                                 | No Data                                | No Data                                    | -0.020   | No Data                  | No Data                   | -0.021                              |                          |                           |          |
| GCP63                           |          |                      | 104.823                                      | 686252.071                             | 4025399.392                                | 104.828                                 | No Data                                | No Data                                    | -0.005   | No Data                  | No Data                   | -0.006                              |                          |                           |          |
| GCP64                           |          |                      | 88.132                                       | 703513.898                             | 4029913.512                                | 88.132                                  | No Data                                | No Data                                    | 0.000  | No Data                  | No Data                   | -0.001                              |                          |                           |          |
| GCP65                           |          |                      | 171.574                                      | 657468.054                             | 4014861.999                                | 171.579                                 | No Data                                | No Data                                    | -0.005   | No Data                  | No Data                   | -0.006                              |                          |                           |          |
| GCP66                           |          |                      | 99.181                                       | 673047.989                             | 4012746.716                                | 99.150                                  | No Data                                | No Data                                    | 0.031  | No Data                  | No Data                   | 0.030                               |                          |                           |          |
| GCP67                           |          |                      | 84.268                                       | 693221.884                             | 4021748.833                                | 84.273                                  | No Data                                | No Data                                    | -0.005   | No Data                  | No Data                   | -0.006                              |                          |                           |          |
| GCP68                           |          |                      | 81.142                                       | 685944.550                             | 4010675.376                                | 81.127                                  | No Data                                | No Data                                    | 0.015  | No Data                  | No Data                   | 0.014                               |                          |                           |          |
| GCP69                           |          |                      | 84.058                                       | 693715.264                             | 4009585.848                                | 84.029                                  | No Data                                | No Data                                    | 0.039  | No Data                  | No Data                   | 0.038                               |                          |                           |          |
| GCP70                           |          |                      | 102.680                                      | 670419.518                             | 4000430.063                                | 102.627                                 | No Data                                | No Data                                    | 0.053  | No Data                  | No Data                   | 0.052                               |                          |                           |          |
| GCP71                           |          |                      | 112.665                                      | 657223.063                             | 3983223.397                                | 112.650                                 | No Data                                | No Data                                    | 0.015  | No Data                  | No Data                   | 0.014                               |                          |                           |          |
| GCP72                           |          |                      | 78.441                                       | 672673.387                             | 3989478.296                                | 78.440                                  | No Data                                | No Data                                    | 0.001  | No Data                  | No Data                   | 0.000                               |                          |                           |          |
| GCP73                           |          |                      | 81.362                                       | 686464.909                             | 3995671.470                                | 81.374                                  | No Data                                | No Data                                    | -0.012   | No Data                  | No Data                   | -0.013                              |                          |                           |          |
| GCP74                           |          |                      | 195.624                                      | 629381.360                             | 3980293.772                                | 195.620                                 | No Data                                | No Data                                    | 0.004  | No Data                  | No Data                   | 0.003                               |                          |                           |          |
| GCP75                           |          |                      | 80.857                                       | 654276.846                             | 3975630.711                                | 80.864                                  | No Data                                | No Data                                    | -0.007   | No Data                  | No Data                   | -0.008                              |                          |                           |          |
| GCP76                           |          |                      | 77.976                                       | 671990.413                             | 3976838.031                                | 77.967                                  | No Data                                | No Data                                    | 0.011  | No Data                  | No Data                   | 0.010                               |                          |                           |          |
| GCP77                           |          |                      | 78.768                                       | 678199.336                             | 3983676.997                                | 78.800                                  | No Data                                | No Data                                    | -0.032   | No Data                  | No Data                   | -0.033                              |                          |                           |          |
| GCP78                           |          |                      | 79.651                                       | 685095.173                             | 3980095.269                                | 79.653                                  | No Data                                | No Data                                    | -0.002   | No Data                  | No Data                   | -0.003                              |                          |                           |          |
| GCP79                           |          |                      | 157.802                                      | 638679.438                             | 3978424.363                                | 157.794                                 | No Data                                | No Data                                    | 0.008  | No Data                  | No Data                   | 0.007                               |                          |                           |          |
| GCP80                           |          |                      | 157.472                                      | 632988.578                             | 3969912.710                                | 157.696                                 | No Data                                | No Data                                    | -0.224   | No Data                  | No Data                   | -0.225                              |                          |                           |          |
| GCP81                           |          |                      | 126.923                                      | 644143.155                             | 39698815.205                               | 126.937                                 | No Data                                | No Data                                    | -0.014   | No Data                  | No Data                   | -0.015                              |                          |                           |          |
| GCP82                           |          |                      | 70.109                                       | 657711.848                             | 3968828.572                                | 70.072                                  | No Data                                | No Data                                    | 0.037  | No Data                  | No Data                   | 0.036                               |                          |                           |          |
| GCP83                           |          |                      | 76.424                                       | 666645.514                             | 3972909.842                                | 76.430                                  | No Data                                | No Data                                    | -0.006   | No Data                  | No Data                   | -0.007                              |                          |                           |          |
| GCP84                           |          |                      | 86.058                                       | 652973.264                             | 3955423.460                                | 86.077                                  | No Data                                | No Data                                    | -0.009   | No Data                  | No Data                   | -0.010                              |                          |                           |          |
| GCP85                           |          |                      | 90.132                                       | 645615.789                             | 3959438.973                                | 90.125                                  | No Data                                | No Data                                    | 0.007  | No Data                  | No Data                   | 0.006                               |                          |                           |          |
| GCP86                           |          |                      | 72.550                                       | 666737.677                             | 3957564.329                                | 72.571                                  | No Data                                | No Data                                    | -0.021   | No Data                  | No Data                   | -0.022                              |                          |                           |          |
| GCP87                           |          |                      | 76.658                                       | 629870.690                             | 3950621.599                                | 76.649                                  | No Data                                | No Data                                    | 0.009  | No Data                  | No Data                   | 0.008                               |                          |                           |          |
| GCP87A                          |          |                      | 73.769                                       | 635650.336                             | 3944651.237                                | 73.744                                  | No Data                                | No Data                                    | 0.025  | No Data                  | No Data                   | 0.024                               |                          |                           |          |
| GCP88                           |          |                      | 67.866                                       | 646405.045                             | 3944967.783                                | 67.936                                  | No Data                                | No Data                                    | -0.010   | No Data                  | No Data                   | -0.011                              |                          |                           |          |
| GCP89                           |          |                      | 70.940                                       | 658861.520                             | 3944089.010                                | 70.940                                  | No Data                                | No Data                                    | 0.000  | No Data                  | No Data                   | -0.001                              |                          |                           |          |
| GCP90                           |          |                      | 70.865                                       | 666811.050                             | 3944829.130                                | 70.881                                  | No Data                                | No Data                                    | -0.016   | No Data                  | No Data                   | -0.017                              |                          |                           |          |
| OPEN1                           |          |                      | 117.379                                      | 661379                                 | 681432.442                                 | 4016714.919                             | 117.281                                | No Data                                    | No Data  | 0.098                    | No Data                   | 0.097                               |                          |                           |          |
| OPEN2                           |          |                      | 151.016                                      | 654965.529                             | 4039981.880                                | 151.009                                 | No Data                                | No Data                                    | 0.007  | No Data                  | No Data                   | 0.006                               |                          |                           |          |
| OPEN3                           |          |                      | 119.082                                      | 668280.743                             | 3995444.761                                | 119.144                                 | No Data                                | No Data                                    | -0.062   | No Data                  | No Data                   | -0.063                              |                          |                           |          |
| OPEN4                           |          |                      | 192.340                                      | 631439.484                             | 3977712.050                                | 192.406                                 | No Data                                | No Data                                    | -0.066   | No Data                  | No Data                   | -0.067                              |                          |                           |          |
| OPEN5                           |          |                      | 109.031                                      | 641102.736                             | 3965272.323                                | 109.048                                 | No Data                                | No Data                                    | -0.017   | No Data                  | No Data                   | -0.018                              |                          |                           |          |
| OPEN6                           |          |                      | 115.517                                      | 635582.949                             | 3958196.098                                | 115.533                                 | No Data                                | No Data                                    | -0.016   | No Data                  | No Data                   | -0.017                              |                          |                           |          |
| OPEN7                           |          |                      | 72.995                                       | 639900.954                             | 3950738.638                                | 72.986                                  | No Data                                | No Data                                    | 0.009  | No Data                  | No Data                   | 0.008                               |                          |                           |          |

**LEGENDS:** Orange Point ID → Δ > 2\*RMSE. RED ΔE,ΔN,ΔH → Δ > 95% of NSSDA

Accuracy Computations (before bias removal): GSD = 0.7 m (Meter) Supported Mapping Scale: 0 Supported Height RMSE according to map scale = 6.00

|                         |         |         |      |         |         |      |
|-------------------------|---------|---------|------|---------|---------|------|
| Number of check points: | 0       | 0       | 48   | 0       | 0       | 48   |
| Mean (Bias)             | No Data | No Data | 0.00 | No Data | No Data | 0.00 |
| StDEV                   | No Data | No Data | 0.03 | No Data | No Data | 0.03 |
| RMSE (Meter)            | No Data | No Data | 0.03 | No Data | No Data | 0.03 |

Units: (Meter)

|  |         |  |               |
|--|---------|--|---------------|
| <b>ASPRS</b>                           |         |  |               |
| Horizontal RMSE (E) =                  | No Data | Max. Allowable RMSE in E =               | 5.68 (Meter)  |
| Horizontal RMSE (N) =                  | No Data | Max. Allowable RMSE in N =               | 5.68 (Meter)  |
| Circular RMSE <sub>c</sub> =           | No Data | Max. Allowable circular RMSE =           | 8.03 (Meter)  |
| Vertical RMSE <sub>v</sub> =           | 0.03    | Max. Allowable RMSE in Height =          | 0.09 (Meter)  |
| <b>NSSDA</b>                           |         |  |               |
| Horizontal tested at 95% = (1.73*RMSE) | No Data | Max. Allowable Horizontal Error at 95% = | 13.90 (Meter) |
| Vertical tested at 95% = (1.96*RMSE)   | 0.05    | Max. Allowable Vertical Error at 95% =   | 0.18 (Meter)  |
| <b>National Maps Accuracy (NMAS)</b>   |         |  |               |
| Horizontal Accuracy at 90% =           | No Data | Max. Allowable Horizontal Error at 90% = | 12.19 (Meter) |
| Vertical Accuracy at 90% =             | 0.04    | Max. Allowable Vertical Error at 90% =   | 0.15 (Meter)  |

**Bias Treatment Summary**

To remove the vertical bias's effect from the elevation, Lower the vector/DEM data by 0.01 (Meter)

To remove the horizontal bias's effect from planimetric E, No Data the vector EASTING the value No Data (Meter)

To remove the horizontal bias's effect from planimetric N, No Data the vector NORTHING the value No Data (Meter)

Normalized Accuracy Computations (after bias removal):

|  |         |  |               |
|--|---------|--|---------------|
| <b>ASPRS</b>                           |         |  |               |
| Horizontal RMSE (E) =                  | No Data | Max. Allowable RMSE in E =               | 5.68 (Meter)  |
| Horizontal RMSE (N) =                  | No Data | Max. Allowable RMSE in N =               | 5.68 (Meter)  |
| Circular RMSE <sub>c</sub> =           | No Data | Max. Allowable circular RMSE =           | 8.03 (Meter)  |
| Vertical RMSE <sub>v</sub> =           | 0.03    | Max. Allowable RMSE in Height =          | 0.09 (Meter)  |
| <b>NSSDA</b>                           |         |  |               |
| Horizontal tested at 95% = (1.73*RMSE) | No Data | Max. Allowable Horizontal Error at 95% = | 13.90 (Meter) |
| Vertical tested at 95% = (1.96*RMSE)   | 0.05    | Max. Allowable Vertical Error at 95% =   | 0.18 (Meter)  |
| <b>National Maps Accuracy (NMAS)</b>   |         |  |               |
| Horizontal Accuracy at 90% =           | No Data | Max. Allowable Horizontal Error at 90% = | 12.19 (Meter) |
| Vertical Accuracy at 90% =             | 0.04    | Max. Allowable Vertical Error at 90% =   | 0.15 (Meter)  |