

# IMS3 システム精度検証

IMS3 システムの精度検証を実施するにあたって、異なる地形の「都市部」の道路を2つ検証対象として選択した。

IMS3 システムでは GPS による位置情報に完全に頼るのではなく、方法論的に異なるアプローチ（画像を用いた位置標定）によって位置情報を取得している。そのため、GPS によって座標情報を付与する方法だけでなく、GPS 以外の情報でも座標情報を付与することができる。

下記に記す2つの方法によってそれぞれに精度検証を行った。

1. RTK-GPS（後処理キネマ）データのみを用いて座標情報を付与する。
2. 実際に計測した地上基準点（以下 GCP とする）のみを用いて座標情報を付与する。

具体的な精度検証方法は以下の通り。

方法1：検証区間の全域にわたって RTK-GPS（後処理キネマ）データを適用する方法

IMS3 システムおよび車両上部に設置した RTK-GPS を用いてデータを収集した。

後処理キネマ方式によって取得した GPS 位置情報により、CV データを補正することによって最終的に地理的な情報が与えられた画像データを作成した。

補正済み CV データと画像データを用いて、当社の MMS アプリケーション(ALV for ArcGIS)によって計測された座標値を比較用の測量済み座標と比較することで精度結果とした。

方法2：地上で測量した地点の情報（GCP）を用いる方法

IMS3 システムを用いてデータを収集した。別途 GCP は 100m ほどの間隔で道路の両サイドで取得した。

GCP の位置情報を用いて、CV データを補正することによって最終的に地理的な位置情報が与えられた画像データを作成した。

補正済み CV データと画像データを用いて、当社の MMS アプリケーション(ALV for ArcGIS)によって計測された座標値を比較用の測量済み座標と比較することで精度結果とした。

# IMS3 : Dual Cam によるデータを用いた測量の実施

## 1.1. 実施の目的

IMS3:Dual Cam による測量精度を検証することを目的とし、公共測量の作業規定に則った作業と比較検証するため本測量を実施する。

## 1.2. 本測量の範囲

本測量は、下記の区間、札幌市の市街地と郊外の 2 カ所について実施する。①は比較的高いビルのある市街地のコースで、②は郊外で低い建物が多く山林に近いコースを選定した。

表 1. 測量範囲

|   | 路線名 | 区間                    | 延長     | 車線         |
|---|-----|-----------------------|--------|------------|
| ① | 環状通 | (A)南1条～(B)南9条:道道453号線 | 1.0 Km | 4車線(片側2車線) |
| ② | 山麓通 | (A)伏見2丁目～(B)界川1丁目     | 1.0 Km | 2車線(片側1車線) |



図 1 測量範囲

### 1.3. 方法 2 で用いた GCP 一覧



図 2. GCP 設置箇所（環状通）



図 3. GCP 設置箇所（山麓通）

表 2. GCP 一覧

## 環状通

| 点名      | 緯度               | 経度                | 標高     | フレーム |
|---------|------------------|-------------------|--------|------|
| K003-1  | 43.0376388391667 | 141.3303052402780 | 30.692 | 6440 |
| K014-1  | 43.0407965747222 | 141.3273695883330 | 27.252 | 6995 |
| K017-1  | 43.0417447175000 | 141.3265499158330 | 26.322 | 7398 |
| K19-1   | 43.0424662636111 | 141.3258993066670 | 25.702 | 7567 |
| K22-2   | 43.0433490791667 | 141.3250967269440 | 25.220 | 7754 |
| K23-1   | 43.0438637041667 | 141.3247756333330 | 24.544 | 7837 |
| K031-2  | 43.0429283952778 | 141.3257652522220 | 25.627 | 7660 |
| K036    | 43.0413680922222 | 141.3270859491670 | 26.538 | 7267 |
| k40     | 43.0399760922222 | 141.3283592538890 | 27.869 | 6835 |
| SP001   | 43.0369167683333 | 141.3310362088890 | 31.861 | 6316 |
| SP002-1 | 43.0369803775000 | 141.3312223227780 | 31.666 | 6311 |
| SP003   | 43.0382745433333 | 141.3299236041670 | 30.012 | 6539 |
| SP004   | 43.0389868200000 | 141.3290279272220 | 28.906 | 6677 |
| SP006-1 | 43.0420498913889 | 141.3262271280560 | 26.104 | 7469 |
| SP009   | 43.0446550475000 | 141.3244540766670 | 24.039 | 7972 |

## 山麓通

| 点名      | 緯度               | 経度                | 標高     | フレーム  |
|---------|------------------|-------------------|--------|-------|
| 001L-1  | 43.0370554433333 | 141.3258464694440 | 59.715 | 12529 |
| 005L    | 43.0373871513889 | 141.3246651719440 | 57.376 | 12707 |
| 013L    | 43.0383065500000 | 141.3224947125000 | 57.187 | 13452 |
| 018R    | 43.0391376008333 | 141.3216428097220 | 54.546 | 13596 |
| 023L    | 43.0398107711111 | 141.3208501538890 | 52.884 | 13738 |
| 031-1L  | 43.0412030338889 | 141.3199550052780 | 49.309 | 13972 |
| 034R-1  | 43.0418069202778 | 141.3199803538890 | 46.148 | 14057 |
| 036R    | 43.0422123372222 | 141.3196946652780 | 44.873 | 14125 |
| 041L    | 43.0424346250000 | 141.3187860694440 | 43.293 | 14326 |
| 046R    | 43.0428473638889 | 141.3175839008330 | 47.770 | 14477 |
| SP001   | 43.0371346027778 | 141.3258838980560 | 59.899 | 12531 |
| SP003   | 43.0378970955556 | 141.3237155805560 | 55.310 | 13319 |
| SP006-1 | 43.0404839208333 | 141.3203456947220 | 52.343 | 13858 |
| SP009   | 43.0428671850000 | 141.3163956677780 | 54.935 | 14611 |

## 1.4. 結果～絶対位置精度

(1) 方法 1：検証区間の全域にわたって RTK-GPS（後処理キネマ）データを適用する方法

| 精度検証結果                               |             |            |        |               |            |        |              |        |        |        |          |      |
|--------------------------------------|-------------|------------|--------|---------------|------------|--------|--------------|--------|--------|--------|----------|------|
| RTK-GPS(後処理キネマ)データのみを用いて座標情報を付与したデータ |             |            |        |               |            |        |              |        |        |        |          |      |
| 環状通                                  |             |            |        |               |            |        |              |        |        |        |          |      |
| 検証点<br>NO                            | 点検測量値(実測値)  |            |        | 観測点測量値(画像計測値) |            |        | カメラから<br>の距離 | 残差     |        |        | 水平<br>距離 | コメント |
|                                      | X           | Y          | Z      | X             | Y          | Z      |              | Δ X    | Δ Y    | Δ Z    |          |      |
| K001-2                               | -106556.983 | -74903.179 | 31.434 | -106557.075   | -74903.235 | 31.536 | 8.908        | 0.092  | 0.056  | -0.102 | 0.108    |      |
| K002                                 | -106530.860 | -74919.315 | 31.136 | -106530.894   | -74919.289 | 31.142 | 5.646        | 0.034  | -0.026 | -0.006 | 0.043    |      |
| K003-1                               | -106499.880 | -74939.741 | 30.692 | -106499.898   | -74939.725 | 30.720 | 5.755        | 0.018  | -0.016 | -0.028 | 0.024    |      |
| K004                                 | -106471.068 | -74957.876 | 30.246 | -106471.150   | -74957.857 | 30.264 | 5.481        | 0.082  | -0.019 | -0.018 | 0.084    |      |
| K005-1                               | -106434.555 | -74982.554 | 30.017 | -106434.614   | -74982.513 | 30.025 | 5.884        | 0.059  | -0.041 | -0.008 | 0.072    |      |
| K006                                 | -106414.426 | -74995.744 | 29.647 | -106414.465   | -74995.715 | 29.755 | 5.845        | 0.038  | -0.028 | -0.108 | 0.048    |      |
| K007                                 | -106388.999 | -75011.684 | 29.276 | -106389.048   | -75011.687 | 29.263 | 5.379        | 0.050  | 0.003  | 0.013  | 0.050    |      |
| K008                                 | -106368.658 | -75032.120 | 29.066 | -106368.742   | -75032.216 | 29.140 | 11.002       | 0.084  | 0.097  | -0.074 | 0.128    |      |
| K009                                 | -106334.970 | -75047.111 | 28.559 | -106335.018   | -75047.110 | 28.588 | 5.435        | 0.048  | -0.001 | -0.029 | 0.048    |      |
| K010                                 | -106299.924 | -75075.278 | 28.484 | -106299.973   | -75075.305 | 28.463 | 9.402        | 0.049  | 0.027  | 0.021  | 0.056    |      |
| K011                                 | -106267.187 | -75095.852 | 28.224 | -106267.234   | -75095.896 | 28.222 | 8.776        | 0.047  | 0.045  | 0.002  | 0.065    |      |
| K012-1                               | -106233.913 | -75115.415 | 27.642 | -106233.972   | -75115.390 | 27.736 | 6.880        | 0.059  | -0.025 | -0.094 | 0.064    |      |
| K013                                 | -106189.347 | -75142.423 | 27.391 | -106189.431   | -75142.397 | 27.380 | 5.143        | 0.084  | -0.026 | 0.011  | 0.088    |      |
| K014-1                               | -106146.483 | -75175.094 | 27.252 | -106146.516   | -75175.141 | 27.264 | 8.751        | 0.034  | 0.047  | -0.012 | 0.058    |      |
| K015                                 | -106107.553 | -75196.772 | 26.898 | -106107.535   | -75196.734 | 26.917 | 5.742        | -0.017 | -0.039 | -0.019 | 0.043    |      |
| K016-1                               | -106066.675 | -75222.787 | 26.418 | -106066.695   | -75222.761 | 26.462 | 5.271        | 0.020  | -0.026 | -0.044 | 0.033    |      |
| K017-1                               | -106040.425 | -75240.722 | 26.322 | -106040.488   | -75240.767 | 26.370 | 5.704        | 0.063  | 0.045  | -0.048 | 0.077    |      |
| K018                                 | -105982.320 | -75277.999 | 25.827 | -105982.411   | -75278.093 | 25.786 | 5.552        | 0.090  | 0.095  | 0.041  | 0.131    |      |
| K019-1                               | -105959.690 | -75292.850 | 25.702 | -105959.759   | -75292.841 | 25.720 | 5.690        | 0.069  | -0.009 | -0.018 | 0.069    |      |
| K020                                 | -105920.330 | -75322.634 | 25.715 | -105920.343   | -75322.709 | 25.625 | 8.623        | 0.013  | 0.076  | 0.090  | 0.077    |      |
| K021                                 | -105900.067 | -75338.375 | 25.265 | -105900.011   | -75338.357 | 25.302 | 10.956       | -0.056 | -0.018 | -0.037 | 0.059    |      |
| k022-2                               | -105860.903 | -75357.161 | 25.220 | -105860.992   | -75357.205 | 25.214 | 8.828        | 0.089  | 0.044  | 0.006  | 0.099    |      |
| K023-1                               | -105803.449 | -75382.693 | 24.544 | -105803.485   | -75382.713 | 24.544 | 5.485        | 0.036  | 0.020  | 0.000  | 0.041    |      |
| K024                                 | -105770.953 | -75399.451 | 24.239 | -105771.006   | -75399.459 | 24.286 | 5.498        | 0.053  | 0.008  | -0.047 | 0.054    |      |
| K025                                 | -105724.481 | -75423.284 | 24.084 | -105724.526   | -75423.263 | 24.095 | 5.666        | 0.045  | -0.021 | -0.011 | 0.050    |      |
| K026                                 | -105695.050 | -75419.803 | 24.033 | -105694.963   | -75419.785 | 24.066 | 12.125       | -0.087 | -0.019 | -0.033 | 0.089    |      |
| K027-1                               | -105736.804 | -75399.067 | 24.307 | -105736.801   | -75398.977 | 24.299 | 11.568       | -0.003 | -0.089 | 0.008  | 0.089    |      |
| K028                                 | -105788.296 | -75376.017 | 24.667 | -105788.323   | -75376.068 | 24.610 | 8.709        | 0.027  | 0.052  | 0.057  | 0.058    |      |
| K029                                 | -105834.005 | -75352.460 | 25.015 | -105834.064   | -75352.582 | 25.047 | 8.648        | 0.059  | 0.122  | -0.032 | 0.136    |      |
| K030                                 | -105873.133 | -75328.761 | 25.353 | -105873.127   | -75328.696 | 25.392 | 11.608       | -0.005 | -0.065 | -0.039 | 0.065    |      |
| K031-2                               | -105908.234 | -75303.207 | 25.627 | -105908.333   | -75303.201 | 25.682 | 15.237       | 0.099  | -0.006 | -0.055 | 0.099    |      |
| K032-2                               | -105941.696 | -75289.318 | 25.643 | -105941.701   | -75289.377 | 25.693 | 8.434        | 0.005  | 0.059  | -0.050 | 0.059    |      |
| K033                                 | -105966.247 | -75273.196 | 25.902 | -105966.217   | -75273.174 | 25.912 | 9.006        | -0.030 | -0.022 | -0.010 | 0.037    |      |
| K034                                 | -105995.563 | -75250.294 | 26.238 | -105995.530   | -75250.277 | 26.279 | 12.007       | -0.033 | -0.016 | -0.041 | 0.037    |      |
| K035-2                               | -106048.789 | -75215.357 | 26.348 | -106048.791   | -75215.365 | 26.332 | 12.241       | 0.002  | 0.008  | 0.016  | 0.008    |      |
| K036                                 | -106082.742 | -75197.507 | 26.538 | -106082.725   | -75197.562 | 26.548 | 8.478        | -0.018 | 0.055  | -0.010 | 0.058    |      |
| K037-2                               | -106128.775 | -75166.593 | 27.034 | -106128.838   | -75166.656 | 27.078 | 8.905        | 0.063  | 0.063  | -0.044 | 0.089    |      |
| K038                                 | -106163.357 | -75140.351 | 27.296 | -106163.371   | -75140.317 | 27.228 | 12.058       | 0.014  | -0.034 | 0.068  | 0.037    |      |
| K039                                 | -106204.577 | -75116.932 | 27.560 | -106204.611   | -75117.023 | 27.584 | 9.157        | 0.034  | 0.092  | -0.024 | 0.098    |      |
| K040                                 | -106238.510 | -75095.457 | 27.869 | -106238.619   | -75095.423 | 27.884 | 8.349        | 0.109  | -0.035 | -0.015 | 0.114    |      |
| K041                                 | -106274.026 | -75069.897 | 28.064 | -106274.010   | -75069.851 | 28.052 | 10.275       | -0.017 | -0.046 | 0.012  | 0.049    |      |
| K042-1                               | -106310.595 | -75047.582 | 28.468 | -106310.610   | -75047.638 | 28.472 | 8.726        | 0.015  | 0.057  | -0.004 | 0.059    |      |
| K043-1                               | -106335.094 | -75027.278 | 28.564 | -106335.124   | -75027.314 | 28.571 | 12.317       | 0.029  | 0.036  | -0.007 | 0.046    |      |
| K044                                 | -106398.841 | -74989.798 | 29.496 | -106398.859   | -74989.852 | 29.550 | 8.989        | 0.018  | 0.054  | -0.054 | 0.057    |      |
| K045-2                               | -106413.487 | -74980.167 | 29.737 | -106413.555   | -74980.235 | 29.785 | 8.934        | 0.068  | 0.068  | -0.048 | 0.096    |      |
| K046-2                               | -106448.186 | -74953.454 | 30.304 | -106448.183   | -74953.412 | 30.391 | 12.380       | -0.003 | -0.042 | -0.087 | 0.042    |      |
| K047                                 | -106472.741 | -74937.370 | 30.557 | -106472.659   | -74937.331 | 30.604 | 12.354       | -0.081 | -0.039 | -0.047 | 0.090    |      |
| K048-2                               | -106512.707 | -74915.164 | 30.971 | -106512.804   | -74915.241 | 31.010 | 8.944        | 0.097  | 0.077  | -0.039 | 0.124    |      |
| K049                                 | -106539.090 | -74895.281 | 31.286 | -106539.103   | -74895.302 | 31.271 | 9.696        | 0.013  | 0.022  | 0.015  | 0.025    |      |
| K050                                 | -106558.576 | -74874.430 | 31.790 | -106558.593   | -74874.405 | 31.789 | 12.513       | 0.017  | -0.025 | 0.001  | 0.030    |      |
| 平均[m]                                |             |            |        |               |            |        |              | 0.032  | 0.012  | -0.020 | 0.067    |      |
| 標準偏差[m]                              |             |            |        |               |            |        |              | 0.045  | 0.048  | 0.039  | 0.030    |      |
| RMS誤差[m]                             |             |            |        |               |            |        |              | 0.055  | 0.049  | 0.044  | 0.074    |      |

## 精度検証結果

RTK-GPS(後処理キネマ)データのみを用いて座標情報を付与したデータ

### 山麓通り

| 検証点<br>NO | 点検測量値(実測値)  |            |        | 観測点測量値(画像計測値) |            |        | カメラから<br>の距離 | 残差     |        |        | 水平<br>距離 | コメント                   |
|-----------|-------------|------------|--------|---------------|------------|--------|--------------|--------|--------|--------|----------|------------------------|
|           | X           | Y          | Z      | X             | Y          | Z      |              | Δ X    | Δ Y    | Δ Z    |          |                        |
| 001L-1    | -106560.695 | -75303.772 | 59.715 | -106560.668   | -75303.732 | 59.870 | 4.151        | -0.027 | -0.040 | -0.155 | 0.049    |                        |
| 002R      | -106539.242 | -75326.526 | 59.043 | -106539.396   | -75326.452 | 59.174 | 7.443        | 0.154  | -0.074 | -0.131 | 0.171    | a bus hides the target |
| 003L      | -106537.057 | -75353.003 | 58.178 | -106537.055   | -75352.934 | 58.222 | 4.275        | -0.002 | -0.069 | -0.044 | 0.069    |                        |
| 004R      | -106513.986 | -75372.420 | 57.659 | -106513.938   | -75372.347 | 57.757 | 9.599        | -0.048 | -0.073 | -0.098 | 0.087    |                        |
| 005L      | -106522.787 | -75399.624 | 57.376 | -106522.736   | -75399.527 | 57.346 | 10.997       | -0.052 | -0.096 | 0.030  | 0.109    |                        |
| 006R      | -106496.700 | -75413.942 | 56.197 | -106496.773   | -75413.944 | 56.274 | 7.323        | 0.073  | 0.002  | -0.077 | 0.073    |                        |
| 007L-1    | -106493.978 | -75440.841 | 55.629 | -106493.995   | -75440.809 | 55.672 | 4.084        | 0.017  | -0.032 | -0.043 | 0.036    |                        |
| 008R      | -106472.682 | -75460.579 | 55.314 | -106472.688   | -75460.524 | 55.398 | 8.483        | 0.006  | -0.054 | -0.084 | 0.055    |                        |
| 009L-1    | -106474.739 | -75486.000 | 55.991 | -106474.737   | -75485.949 | 56.026 | 5.840        | -0.001 | -0.051 | -0.035 | 0.051    |                        |
| 010R-1    | -106448.083 | -75507.255 | 56.149 | -106448.180   | -75507.199 | 56.201 | 9.636        | 0.097  | -0.056 | -0.052 | 0.112    |                        |
| 011L      | -106445.269 | -75537.156 | 56.557 | -106445.320   | -75537.064 | 56.627 | 4.639        | 0.050  | -0.092 | -0.070 | 0.105    |                        |
| 012R      | -106425.392 | -75548.606 | 56.556 | -106425.445   | -75548.532 | 56.607 | 7.332        | 0.053  | -0.074 | -0.051 | 0.091    |                        |
| 013L      | -106418.706 | -75575.353 | 57.187 | -106418.770   | -75575.275 | 57.230 | 4.826        | 0.064  | -0.079 | -0.043 | 0.101    |                        |
| 014R      | -106390.456 | -75590.248 | 57.062 | -106390.491   | -75590.189 | 57.090 | 8.417        | 0.035  | -0.059 | -0.028 | 0.068    |                        |
| 015L      | -106388.375 | -75611.162 | 57.168 | -106388.455   | -75611.129 | 57.238 | 6.468        | 0.080  | -0.033 | -0.070 | 0.086    |                        |
| 016R      | -106362.719 | -75617.111 | 56.186 | -106362.770   | -75617.142 | 56.221 | 6.980        | 0.051  | 0.031  | -0.035 | 0.060    |                        |
| 017L      | -106356.184 | -75633.969 | 55.933 | -106356.265   | -75633.934 | 56.024 | 4.345        | 0.080  | -0.035 | -0.091 | 0.087    |                        |
| 018R      | -106325.622 | -75643.748 | 54.546 | -106325.726   | -75643.763 | 54.609 | 7.136        | 0.104  | 0.016  | -0.063 | 0.105    |                        |
| 019L      | -106318.191 | -75663.630 | 53.867 | -106318.287   | -75663.609 | 53.977 | 6.764        | 0.096  | -0.022 | -0.110 | 0.099    |                        |
| 020R      | -106296.286 | -75664.004 | 53.373 | -106296.407   | -75664.038 | 53.460 | 6.757        | 0.120  | 0.034  | -0.087 | 0.125    |                        |
| 021L      | -106289.348 | -75680.414 | 53.123 | -106289.442   | -75680.343 | 53.061 | 4.593        | 0.093  | -0.071 | 0.062  | 0.117    |                        |
| 022R-1    | -106270.822 | -75681.579 | 52.873 | -106270.840   | -75681.509 | 52.919 | 7.033        | 0.018  | -0.070 | -0.046 | 0.073    |                        |
| 023L      | -106250.130 | -75707.507 | 52.884 | -106250.172   | -75707.459 | 52.942 | 4.587        | 0.042  | -0.048 | -0.058 | 0.064    |                        |
| 024R-1    | -106232.992 | -75707.913 | 52.642 | -106233.045   | -75707.898 | 52.734 | 6.868        | 0.054  | -0.015 | -0.092 | 0.056    |                        |
| 025L      | -106219.655 | -75728.572 | 52.903 | -106219.699   | -75728.499 | 52.882 | 4.712        | 0.043  | -0.073 | 0.021  | 0.084    |                        |
| 026R      | -106197.762 | -75732.011 | 52.742 | -106197.847   | -75732.035 | 52.826 | 6.689        | 0.085  | 0.024  | -0.084 | 0.088    |                        |
| 027L      | -106184.629 | -75752.700 | 52.807 | -106184.700   | -75752.604 | 52.826 | 4.703        | 0.072  | -0.096 | -0.019 | 0.120    |                        |
| 028R      | -106163.513 | -75750.182 | 52.092 | -106163.589   | -75750.139 | 52.186 | 10.008       | 0.076  | -0.043 | -0.094 | 0.088    |                        |
| 029L      | -106148.117 | -75773.541 | 51.999 | -106148.203   | -75773.531 | 52.114 | 7.211        | 0.086  | -0.010 | -0.115 | 0.087    |                        |
| 030R      | -106116.227 | -75764.586 | 50.846 | -106116.314   | -75764.587 | 50.893 | 9.402        | 0.087  | 0.001  | -0.047 | 0.087    |                        |
| 031L-1    | -106094.665 | -75778.731 | 49.309 | -106094.759   | -75778.739 | 49.420 | 4.538        | 0.094  | 0.008  | -0.111 | 0.095    |                        |
| 032R      | -106070.913 | -75771.768 | 48.375 | -106071.023   | -75771.756 | 48.393 | 6.943        | 0.110  | -0.012 | -0.018 | 0.111    |                        |
| 033L      | -106049.926 | -75784.835 | 46.986 | -106050.036   | -75784.836 | 47.072 | 5.845        | 0.110  | 0.001  | -0.086 | 0.110    |                        |
| 034R-1    | -106027.606 | -75775.922 | 46.148 | -106027.688   | -75775.959 | 46.330 | 7.993        | 0.083  | 0.037  | -0.182 | 0.090    |                        |
| 035L      | -106016.406 | -75791.140 | 45.312 | -106016.491   | -75791.084 | 45.387 | 4.848        | 0.085  | -0.057 | -0.075 | 0.102    |                        |
| 036R      | -105982.313 | -75798.701 | 44.873 | -105982.170   | -75798.818 | 44.996 | 9.149        | -0.143 | 0.117  | -0.123 | 0.185    |                        |
| 037L      | -105980.669 | -75822.011 | 44.661 | -105980.726   | -75821.990 | 44.640 | 6.867        | 0.057  | -0.021 | 0.021  | 0.061    |                        |
| 038R      | -105962.439 | -75822.254 | 44.464 | -105962.432   | -75822.202 | 44.625 | 9.312        | -0.007 | -0.051 | -0.161 | 0.052    |                        |
| 039L      | -105970.211 | -75838.873 | 44.278 | -105970.273   | -75838.823 | 44.275 | 6.589        | 0.062  | -0.049 | 0.003  | 0.079    |                        |
| 040R      | -105951.227 | -75854.560 | 43.328 | -105951.299   | -75854.604 | 43.538 | 6.835        | 0.072  | 0.045  | -0.210 | 0.085    |                        |
| 041L      | -105956.799 | -75872.457 | 43.293 | -105956.801   | -75872.369 | 43.411 | 5.845        | 0.002  | -0.088 | -0.118 | 0.088    |                        |
| 042R-1    | -105934.137 | -75881.725 | 42.373 | -105934.145   | -75881.663 | 42.429 | 14.387       | 0.007  | -0.062 | -0.056 | 0.063    |                        |
| 043L      | -105941.604 | -75910.958 | 43.322 | -105941.678   | -75910.872 | 43.409 | 4.386        | 0.073  | -0.086 | -0.087 | 0.113    |                        |
| 044R-1    | -105923.796 | -75930.260 | 44.813 | -105923.908   | -75930.179 | 44.800 | 7.745        | 0.112  | -0.081 | 0.013  | 0.138    |                        |
| 045L      | -105926.575 | -75953.557 | 46.367 | -105926.634   | -75953.460 | 46.439 | 4.617        | 0.059  | -0.097 | -0.072 | 0.113    |                        |
| 046R      | -105909.863 | -75969.897 | 47.770 | -105909.983   | -75969.832 | 47.801 | 7.539        | 0.120  | -0.065 | -0.031 | 0.136    |                        |
| 047L      | -105908.013 | -76012.690 | 50.642 | -105908.088   | -76012.646 | 50.708 | 6.277        | 0.075  | -0.043 | -0.066 | 0.087    |                        |
| 048R      | -105892.413 | -76034.454 | 52.722 | -105892.535   | -76034.406 | 52.849 | 6.809        | 0.121  | -0.048 | -0.127 | 0.130    |                        |
| 049L      | -105903.005 | -76045.860 | 53.370 | -105903.065   | -76045.749 | 53.436 | 5.797        | 0.061  | -0.111 | -0.066 | 0.126    |                        |
| 050R-1    | -105891.999 | -76063.313 | 54.726 | -105891.991   | -76063.260 | 54.810 | 8.825        | -0.008 | -0.053 | -0.084 | 0.054    |                        |
| 平均[m]     |             |            |        |               |            |        |              | 0.055  | -0.039 | -0.069 | 0.092    |                        |
| 標準偏差[m]   |             |            |        |               |            |        |              | 0.053  | 0.045  | 0.053  | 0.030    |                        |
| RMS誤差[m]  |             |            |        |               |            |        |              | 0.077  | 0.060  | 0.087  | 0.097    |                        |

## (2) 方法2：地上で測量した地点の情報（GCP）を用いる方法

## 精度検証結果

100m間隔の地上基準点（以下GCPとする）のみを用いて座標情報を付与したデータ

## 環状通

| 検証点<br>NO | 点検測量値(実測値)  |            |        | 観測点測量値(画像計測値) |            |        | カメラから<br>の距離 | 残差     |        |        | 水平<br>距離 | コメント |
|-----------|-------------|------------|--------|---------------|------------|--------|--------------|--------|--------|--------|----------|------|
|           | X           | Y          | Z      | X             | Y          | Z      |              | Δ X    | Δ Y    | Δ Z    |          |      |
| K001-2    | -106556.983 | -74903.179 | 31.434 | -106557.008   | -74903.193 | 31.460 | 8.883        | 0.025  | 0.014  | -0.026 | 0.029    |      |
| K002      | -106530.860 | -74919.315 | 31.136 | -106530.880   | -74919.282 | 31.067 | 5.644        | 0.021  | -0.033 | 0.069  | 0.039    |      |
| K003-1    | -106499.880 | -74939.741 | 30.692 | -106499.878   | -74939.743 | 30.687 | 5.753        | -0.002 | 0.002  | 0.005  | 0.003    |      |
| K004      | -106471.068 | -74957.876 | 30.246 | -106471.122   | -74957.867 | 30.288 | 5.475        | 0.054  | -0.008 | -0.042 | 0.054    |      |
| K005-1    | -106434.555 | -74982.554 | 30.017 | -106434.597   | -74982.515 | 30.072 | 5.854        | 0.042  | -0.039 | -0.055 | 0.057    |      |
| K006      | -106414.426 | -74995.744 | 29.647 | -106414.486   | -74995.672 | 29.730 | 5.843        | 0.060  | -0.072 | -0.083 | 0.094    |      |
| K007      | -106388.999 | -75011.684 | 29.276 | -106389.033   | -75011.633 | 29.163 | 5.393        | 0.035  | -0.051 | 0.113  | 0.062    |      |
| K008      | -106368.658 | -75032.120 | 29.066 | -106368.666   | -75032.084 | 29.098 | 10.938       | 0.008  | -0.035 | -0.032 | 0.036    |      |
| K009      | -106334.970 | -75047.111 | 28.559 | -106335.001   | -75047.013 | 28.557 | 5.433        | 0.031  | -0.097 | 0.002  | 0.102    |      |
| K010      | -106299.924 | -75075.278 | 28.484 | -106299.939   | -75075.221 | 28.489 | 9.381        | 0.016  | -0.057 | -0.005 | 0.059    |      |
| K011      | -106267.187 | -75095.852 | 28.224 | -106267.251   | -75095.813 | 28.249 | 8.790        | 0.064  | -0.038 | -0.025 | 0.075    |      |
| K012-1    | -106233.913 | -75115.415 | 27.642 | -106233.948   | -75115.360 | 27.765 | 6.877        | 0.035  | -0.055 | -0.123 | 0.065    |      |
| K013      | -106189.347 | -75142.423 | 27.391 | -106189.373   | -75142.359 | 27.361 | 5.145        | 0.026  | -0.064 | 0.030  | 0.069    |      |
| K014-1    | -106146.483 | -75175.094 | 27.252 | -106146.487   | -75175.108 | 27.257 | 8.709        | 0.004  | 0.014  | -0.005 | 0.015    |      |
| K015      | -106107.553 | -75196.772 | 26.898 | -106107.640   | -75196.840 | 26.941 | 5.743        | 0.087  | 0.068  | -0.043 | 0.111    |      |
| K016-1    | -106066.675 | -75222.787 | 26.418 | -106066.800   | -75222.823 | 26.501 | 5.274        | 0.125  | 0.036  | -0.083 | 0.131    |      |
| K017-1    | -106040.425 | -75240.722 | 26.322 | -106040.435   | -75240.756 | 26.308 | 5.712        | 0.010  | 0.034  | 0.014  | 0.036    |      |
| K018      | -105982.320 | -75277.999 | 25.827 | -105982.325   | -75278.032 | 25.759 | 5.550        | 0.005  | 0.034  | 0.068  | 0.034    |      |
| K019-1    | -105959.690 | -75292.850 | 25.702 | -105959.683   | -75292.846 | 25.707 | 5.703        | -0.007 | -0.004 | -0.005 | 0.008    |      |
| K020      | -105920.330 | -75322.634 | 25.715 | -105920.319   | -75322.753 | 25.623 | 8.634        | -0.010 | 0.120  | 0.092  | 0.120    |      |
| K021      | -105900.067 | -75338.375 | 25.265 | -105899.984   | -75338.369 | 25.309 | 10.929       | -0.084 | -0.006 | -0.044 | 0.084    |      |
| K022-2    | -105860.903 | -75357.161 | 25.220 | -105860.885   | -75357.141 | 25.213 | 8.751        | -0.018 | -0.020 | 0.007  | 0.027    |      |
| K023-1    | -105803.449 | -75382.693 | 24.544 | -105803.444   | -75382.674 | 24.557 | 5.475        | -0.005 | -0.019 | -0.013 | 0.020    |      |
| K024      | -105770.953 | -75399.451 | 24.239 | -105771.006   | -75399.415 | 24.278 | 5.489        | 0.053  | -0.036 | -0.039 | 0.065    |      |
| K025      | -105724.481 | -75423.284 | 24.084 | -105724.596   | -75423.325 | 24.192 | 5.671        | 0.115  | 0.041  | -0.108 | 0.122    |      |
| K026      | -105695.050 | -75419.803 | 24.033 | -105694.939   | -75419.940 | 24.190 | 12.164       | -0.111 | 0.137  | -0.157 | 0.176    |      |
| K027-1    | -105736.804 | -75399.067 | 24.307 | -105736.811   | -75398.990 | 24.259 | 11.577       | 0.007  | -0.077 | 0.048  | 0.077    |      |
| K028      | -105788.296 | -75376.017 | 24.667 | -105788.289   | -75376.037 | 24.564 | 8.705        | -0.007 | 0.020  | 0.103  | 0.021    |      |
| K029      | -105834.005 | -75352.460 | 25.015 | -105834.033   | -75352.483 | 24.983 | 8.677        | 0.028  | 0.023  | 0.032  | 0.036    |      |
| K030      | -105873.133 | -75328.761 | 25.353 | -105873.157   | -75328.736 | 25.369 | 11.584       | 0.024  | -0.024 | -0.016 | 0.034    |      |
| K031-2    | -105908.234 | -75303.207 | 25.627 | -105908.267   | -75303.223 | 25.632 | 15.268       | 0.033  | 0.016  | -0.005 | 0.036    |      |
| K032-2    | -105941.696 | -75289.318 | 25.643 | -105941.597   | -75289.404 | 25.660 | 8.433        | -0.099 | 0.086  | -0.017 | 0.131    |      |
| K033      | -105966.247 | -75273.196 | 25.902 | -105966.108   | -75273.118 | 25.881 | 9.026        | -0.139 | -0.078 | 0.021  | 0.159    |      |
| K034      | -105995.563 | -75250.294 | 26.238 | -105995.447   | -75250.209 | 26.243 | 12.018       | -0.116 | -0.084 | -0.005 | 0.143    |      |
| K035-2    | -106048.789 | -75215.357 | 26.348 | -106048.887   | -75215.313 | 26.343 | 12.286       | 0.098  | -0.044 | 0.005  | 0.108    |      |
| K036      | -106082.742 | -75197.507 | 26.538 | -106082.799   | -75197.594 | 26.559 | 8.577        | 0.057  | 0.087  | -0.021 | 0.104    |      |
| K037-2    | -106128.775 | -75166.593 | 27.034 | -106128.820   | -75166.727 | 27.053 | 8.891        | 0.045  | 0.134  | -0.019 | 0.142    |      |
| K038      | -106163.357 | -75140.351 | 27.296 | -106163.307   | -75140.275 | 27.161 | 12.058       | -0.049 | -0.076 | 0.135  | 0.091    |      |
| K039      | -106204.577 | -75116.932 | 27.560 | -106204.566   | -75117.002 | 27.551 | 9.153        | -0.011 | 0.071  | 0.009  | 0.072    |      |
| K040      | -106238.510 | -75095.457 | 27.869 | -106238.539   | -75095.386 | 27.865 | 8.370        | 0.028  | -0.071 | 0.004  | 0.077    |      |
| K041      | -106274.026 | -75069.897 | 28.064 | -106274.018   | -75069.770 | 28.005 | 10.260       | -0.008 | -0.127 | 0.059  | 0.127    |      |
| K042-1    | -106310.595 | -75047.582 | 28.468 | -106310.568   | -75047.544 | 28.391 | 8.749        | -0.028 | -0.037 | 0.077  | 0.046    |      |
| K043-1    | -106335.094 | -75027.278 | 28.564 | -106335.103   | -75027.229 | 28.458 | 12.316       | 0.009  | -0.049 | 0.106  | 0.050    |      |
| K044      | -106398.841 | -74989.798 | 29.496 | -106398.884   | -74989.780 | 29.447 | 8.995        | 0.043  | -0.018 | 0.049  | 0.046    |      |
| K045-2    | -106413.487 | -74980.167 | 29.737 | -106413.606   | -74980.205 | 29.727 | 8.920        | 0.119  | 0.038  | 0.010  | 0.125    |      |
| K046-2    | -106448.186 | -74953.454 | 30.304 | -106448.134   | -74953.408 | 30.353 | 12.421       | -0.052 | -0.046 | -0.049 | 0.070    |      |
| K047      | -106472.741 | -74937.370 | 30.557 | -106472.637   | -74937.341 | 30.540 | 12.359       | -0.104 | -0.028 | 0.017  | 0.108    |      |
| K048-2    | -106512.707 | -74915.164 | 30.971 | -106512.789   | -74915.250 | 30.896 | 8.948        | 0.082  | 0.086  | 0.075  | 0.119    |      |
| K049      | -106539.090 | -74895.281 | 31.286 | -106539.059   | -74895.290 | 31.146 | 9.692        | -0.031 | 0.009  | 0.140  | 0.032    |      |
| K050      | -106558.576 | -74874.430 | 31.790 | -106558.504   | -74874.365 | 31.672 | 12.549       | -0.072 | -0.065 | 0.118  | 0.097    |      |
| 平均[m]     |             |            |        |               |            |        |              | 0.009  | -0.008 | 0.008  | 0.075    |      |
| 標準偏差[m]   |             |            |        |               |            |        |              | 0.060  | 0.061  | 0.064  | 0.042    |      |
| RMS誤差[m]  |             |            |        |               |            |        |              | 0.061  | 0.061  | 0.065  | 0.086    |      |

## 精度検証結果

100m間隔の地上基準点(以下GCPとする)のみを用いて座標情報を付与したデータ

### 山麓通り

| 検証点<br>NO | 点検測量値(実測値)  |            |        | 観測点測量値(画像計測値) |            |        | カメラから<br>の距離 | 残差     |        |        | 水平<br>距離 | コメント |
|-----------|-------------|------------|--------|---------------|------------|--------|--------------|--------|--------|--------|----------|------|
|           | X           | Y          | Z      | X             | Y          | Z      |              | Δ X    | Δ Y    | Δ Z    |          |      |
| 001L-1    | -106560.695 | -75303.772 | 59.715 | -106560.640   | -75303.819 | 59.724 | 4.161        | -0.055 | 0.047  | -0.009 | 0.072    |      |
| 002R      | -106539.242 | -75326.526 | 59.043 | -106539.288   | -75326.591 | 59.069 | 7.447        | 0.045  | 0.065  | -0.026 | 0.079    |      |
| 003L      | -106537.057 | -75353.003 | 58.178 | -106536.908   | -75353.112 | 58.094 | 4.266        | -0.149 | 0.109  | 0.084  | 0.184    |      |
| 004R      | -106513.986 | -75372.420 | 57.659 | -106513.879   | -75372.458 | 57.609 | 9.558        | -0.107 | 0.038  | 0.050  | 0.114    |      |
| 005L      | -106522.787 | -75399.624 | 57.376 | -106522.710   | -75399.587 | 57.365 | 11.032       | -0.078 | -0.036 | 0.011  | 0.086    |      |
| 006R      | -106496.700 | -75413.942 | 56.197 | -106496.751   | -75413.948 | 56.199 | 7.279        | 0.051  | 0.006  | -0.002 | 0.051    |      |
| 007L-1    | -106493.978 | -75440.841 | 55.629 | -106493.936   | -75440.767 | 55.614 | 4.089        | -0.042 | -0.074 | 0.015  | 0.085    |      |
| 008R      | -106472.682 | -75460.579 | 55.314 | -106472.633   | -75460.520 | 55.311 | 8.477        | -0.049 | -0.058 | 0.003  | 0.076    |      |
| 009L-1    | -106474.739 | -75486.000 | 55.991 | -106474.688   | -75485.975 | 55.933 | 5.848        | -0.051 | -0.025 | 0.058  | 0.057    |      |
| 010R-1    | -106448.083 | -75507.255 | 56.149 | -106448.085   | -75507.258 | 56.076 | 9.659        | 0.002  | 0.003  | 0.073  | 0.004    |      |
| 011L      | -106445.269 | -75537.156 | 56.557 | -106445.214   | -75537.172 | 56.499 | 4.637        | -0.056 | 0.016  | 0.058  | 0.058    |      |
| 012R      | -106425.392 | -75548.606 | 56.556 | -106425.357   | -75548.644 | 56.576 | 7.318        | -0.034 | 0.038  | -0.020 | 0.052    |      |
| 013L      | -106418.706 | -75575.353 | 57.187 | -106418.683   | -75575.354 | 57.184 | 4.816        | -0.022 | 0.001  | 0.003  | 0.022    |      |
| 014R      | -106390.456 | -75590.248 | 57.062 | -106390.393   | -75590.224 | 57.159 | 8.444        | -0.064 | -0.024 | -0.097 | 0.068    |      |
| 015L      | -106388.375 | -75611.162 | 57.168 | -106388.327   | -75611.242 | 57.227 | 6.486        | -0.048 | 0.080  | -0.059 | 0.094    |      |
| 016R      | -106362.719 | -75617.111 | 56.186 | -106362.611   | -75617.239 | 56.265 | 6.970        | -0.108 | 0.128  | -0.079 | 0.167    |      |
| 017L      | -106356.184 | -75633.969 | 55.933 | -106356.103   | -75633.987 | 56.008 | 4.335        | -0.082 | 0.019  | -0.075 | 0.084    |      |
| 018R      | -106325.622 | -75643.748 | 54.546 | -106325.622   | -75643.754 | 54.545 | 7.125        | 0.000  | 0.007  | 0.001  | 0.007    |      |
| 019L      | -106318.191 | -75663.630 | 53.867 | -106318.179   | -75663.623 | 53.834 | 6.782        | -0.012 | -0.007 | 0.033  | 0.014    |      |
| 020R      | -106296.286 | -75664.004 | 53.373 | -106296.233   | -75664.083 | 53.339 | 6.763        | -0.053 | 0.079  | 0.034  | 0.096    |      |
| 021L      | -106289.348 | -75680.414 | 53.123 | -106289.286   | -75680.388 | 52.919 | 4.584        | -0.062 | -0.026 | 0.204  | 0.067    |      |
| 022R-1    | -106270.822 | -75681.579 | 52.873 | -106270.721   | -75681.573 | 52.814 | 7.018        | -0.101 | -0.006 | 0.059  | 0.102    |      |
| 023L      | -106250.130 | -75707.507 | 52.884 | -106250.119   | -75707.509 | 52.882 | 4.583        | -0.011 | 0.002  | 0.002  | 0.011    |      |
| 024R-1    | -106232.992 | -75707.913 | 52.642 | -106232.982   | -75707.953 | 52.672 | 6.887        | -0.010 | 0.041  | -0.030 | 0.042    |      |
| 025L      | -106219.655 | -75728.572 | 52.903 | -106219.617   | -75728.579 | 52.864 | 4.706        | -0.038 | 0.007  | 0.039  | 0.039    |      |
| 026R      | -106197.762 | -75732.011 | 52.742 | -106197.812   | -75732.081 | 52.746 | 6.674        | 0.050  | 0.070  | -0.004 | 0.087    |      |
| 027L      | -106184.629 | -75752.700 | 52.807 | -106184.655   | -75752.647 | 52.781 | 4.717        | 0.026  | -0.053 | 0.026  | 0.059    |      |
| 028R      | -106163.513 | -75750.182 | 52.092 | -106163.485   | -75750.153 | 52.081 | 10.057       | -0.028 | -0.030 | 0.011  | 0.041    |      |
| 029L      | -106148.117 | -75773.541 | 51.999 | -106148.047   | -75773.577 | 52.068 | 7.198        | -0.070 | 0.036  | -0.069 | 0.079    |      |
| 030R      | -106116.227 | -75764.586 | 50.846 | -106116.222   | -75764.588 | 50.745 | 9.417        | -0.005 | 0.002  | 0.101  | 0.005    |      |
| 031L-1    | -106094.665 | -75778.731 | 49.309 | -106094.656   | -75778.729 | 49.308 | 4.534        | -0.008 | -0.001 | 0.001  | 0.008    |      |
| 032R      | -106070.913 | -75771.768 | 48.375 | -106070.948   | -75771.752 | 48.284 | 6.932        | 0.035  | -0.016 | 0.091  | 0.038    |      |
| 033L      | -106049.926 | -75784.835 | 46.986 | -106049.954   | -75784.834 | 47.002 | 5.866        | 0.027  | 0.000  | -0.016 | 0.027    |      |
| 034R-1    | -106027.606 | -75775.922 | 46.148 | -106027.611   | -75775.938 | 46.152 | 7.973        | 0.005  | 0.016  | -0.004 | 0.017    |      |
| 035L      | -106016.406 | -75791.140 | 45.312 | -106016.506   | -75790.996 | 45.298 | 4.802        | 0.100  | -0.145 | 0.014  | 0.176    |      |
| 036R      | -105982.313 | -75798.701 | 44.873 | -105982.345   | -75798.702 | 44.864 | 9.202        | 0.032  | 0.001  | 0.009  | 0.032    |      |
| 037L      | -105980.669 | -75822.011 | 44.661 | -105980.815   | -75822.074 | 44.544 | 6.867        | 0.146  | 0.063  | 0.117  | 0.159    |      |
| 038R      | -105962.439 | -75822.254 | 44.464 | -105962.502   | -75822.279 | 44.521 | 9.325        | 0.063  | 0.025  | -0.057 | 0.067    |      |
| 039L      | -105970.211 | -75838.873 | 44.278 | -105970.339   | -75838.917 | 44.165 | 6.591        | 0.128  | 0.044  | 0.113  | 0.135    |      |
| 040R      | -105951.227 | -75854.560 | 43.328 | -105951.341   | -75854.667 | 43.465 | 6.834        | 0.113  | 0.107  | -0.137 | 0.156    |      |
| 041L      | -105956.799 | -75872.457 | 43.293 | -105956.789   | -75872.462 | 43.294 | 5.835        | -0.010 | 0.005  | -0.001 | 0.012    |      |
| 042R-1    | -105934.137 | -75881.725 | 42.373 | -105934.045   | -75881.713 | 42.506 | 14.447       | -0.092 | -0.013 | -0.133 | 0.093    |      |
| 043L      | -105941.604 | -75910.958 | 43.322 | -105941.523   | -75911.040 | 43.306 | 4.386        | -0.081 | 0.082  | 0.016  | 0.116    |      |
| 044R-1    | -105923.796 | -75930.260 | 44.813 | -105923.751   | -75930.302 | 44.919 | 7.740        | -0.046 | 0.042  | -0.106 | 0.062    |      |
| 045L      | -105926.575 | -75953.557 | 46.367 | -105926.462   | -75953.571 | 46.301 | 4.599        | -0.113 | 0.014  | 0.066  | 0.114    |      |
| 046R      | -105909.863 | -75969.897 | 47.770 | -105909.873   | -75969.895 | 47.773 | 7.522        | 0.010  | -0.003 | -0.003 | 0.010    |      |
| 047L      | -105908.013 | -76012.690 | 50.642 | -105908.034   | -76012.651 | 50.598 | 6.281        | 0.021  | -0.039 | 0.044  | 0.044    |      |
| 048R      | -105892.413 | -76034.454 | 52.722 | -105892.503   | -76034.453 | 52.830 | 6.809        | 0.089  | -0.001 | -0.108 | 0.089    |      |
| 049L      | -105903.005 | -76045.860 | 53.370 | -105903.063   | -76045.790 | 53.389 | 5.809        | 0.059  | -0.070 | -0.019 | 0.091    |      |
| 050R-1    | -105891.999 | -76063.313 | 54.726 | -105891.999   | -76063.337 | 54.822 | 8.826        | -0.001 | 0.024  | -0.096 | 0.024    |      |
| 平均[m]     |             |            |        |               |            |        |              | -0.014 | 0.012  | 0.004  | 0.069    |      |
| 標準偏差[m]   |             |            |        |               |            |        |              | 0.065  | 0.050  | 0.067  | 0.047    |      |
| RMS誤差[m]  |             |            |        |               |            |        |              | 0.066  | 0.051  | 0.067  | 0.084    |      |

## 1.5. 結果～距離精度

(1) 方法 1：検証区間の全域にわたって RTK-GPS（後処理キネマ）データを適用する方法

| 環状通(単位:m)          |        |          |        |          |        |        |        |      |
|--------------------|--------|----------|--------|----------|--------|--------|--------|------|
| 道路の同一側面に隣り合う2点間の距離 |        |          |        |          |        |        |        |      |
| 検証点NO              |        | 2点間の実測距離 |        | 2点間の計測距離 |        | 残差     |        | コメント |
| Point1             | Point2 | 水平距離     | 3D距離   | 水平距離     | 3D距離   | 水平距離   | 3D距離   |      |
| K001-2             | K002   | 30.705   | 30.707 | 30.711   | 30.714 | -0.006 | -0.007 |      |
| K002               | K003-1 | 37.108   | 37.111 | 37.127   | 37.129 | -0.019 | -0.019 |      |
| K003-1             | K004   | 34.043   | 34.046 | 33.988   | 33.991 | 0.055  | 0.055  |      |
| K004               | K005-1 | 44.071   | 44.071 | 44.077   | 44.078 | -0.006 | -0.006 |      |
| K005-1             | K006   | 24.065   | 24.068 | 24.090   | 24.091 | -0.025 | -0.023 |      |
| K006               | K007   | 30.011   | 30.014 | 30.018   | 30.022 | -0.007 | -0.009 |      |
| K007               | K008   | 28.833   | 28.834 | 28.875   | 28.876 | -0.043 | -0.042 |      |
| K008               | K009   | 36.873   | 36.877 | 36.866   | 36.870 | 0.007  | 0.006  |      |
| K009               | K010   | 44.963   | 44.963 | 44.979   | 44.979 | -0.017 | -0.017 |      |
| K010               | K011   | 38.665   | 38.666 | 38.676   | 38.676 | -0.011 | -0.011 |      |
| K011               | K012-1 | 38.599   | 38.604 | 38.554   | 38.557 | 0.045  | 0.047  |      |
| K012-1             | K013   | 52.111   | 52.112 | 52.089   | 52.090 | 0.022  | 0.022  |      |
| K013               | K014-1 | 53.895   | 53.895 | 53.980   | 53.980 | -0.084 | -0.084 |      |
| K014-1             | K015   | 44.559   | 44.560 | 44.562   | 44.563 | -0.003 | -0.003 |      |
| K015               | K016-1 | 48.454   | 48.456 | 48.429   | 48.431 | 0.025  | 0.025  |      |
| K016-1             | K017-1 | 31.792   | 31.792 | 31.796   | 31.796 | -0.005 | -0.005 |      |
| K017-1             | K018   | 69.035   | 69.036 | 69.038   | 69.041 | -0.004 | -0.004 |      |
| K018               | K019-1 | 27.068   | 27.068 | 27.029   | 27.029 | 0.039  | 0.039  |      |
| K019-1             | K020   | 49.359   | 49.359 | 49.455   | 49.455 | -0.096 | -0.096 |      |
| K020               | K021   | 25.659   | 25.662 | 25.656   | 25.658 | 0.003  | 0.005  |      |
| K021               | K022-2 | 43.437   | 43.437 | 43.333   | 43.333 | 0.104  | 0.104  |      |
| K022-2             | K023-1 | 62.872   | 62.875 | 62.910   | 62.914 | -0.039 | -0.038 |      |
| K023-1             | K024   | 36.563   | 36.564 | 36.542   | 36.543 | 0.021  | 0.021  |      |
| K024               | K025   | 52.227   | 52.227 | 52.221   | 52.221 | 0.006  | 0.006  |      |
| K025               | K026   | 29.637   | 29.637 | 29.768   | 29.768 | -0.131 | -0.131 |      |
| K026               | K027-1 | 46.620   | 46.621 | 46.727   | 46.727 | -0.107 | -0.107 |      |
| K027-1             | K028   | 56.416   | 56.417 | 56.386   | 56.387 | 0.030  | 0.031  |      |
| K028               | K029   | 51.422   | 51.423 | 51.418   | 51.420 | 0.004  | 0.003  |      |
| K029               | K030   | 45.745   | 45.747 | 45.788   | 45.789 | -0.043 | -0.043 |      |
| K030               | K031-2 | 43.418   | 43.419 | 43.467   | 43.468 | -0.050 | -0.050 |      |
| K031-2             | K032-2 | 36.230   | 36.230 | 36.119   | 36.119 | 0.111  | 0.111  |      |
| K032-2             | K033   | 29.371   | 29.372 | 29.386   | 29.387 | -0.015 | -0.015 |      |
| K033               | K034   | 37.201   | 37.203 | 37.195   | 37.197 | 0.006  | 0.006  |      |
| K034               | K035-2 | 63.668   | 63.668 | 63.684   | 63.684 | -0.017 | -0.017 |      |
| K035-2             | K036   | 38.360   | 38.360 | 38.320   | 38.321 | 0.040  | 0.039  |      |
| K036               | K037-2 | 55.450   | 55.452 | 55.512   | 55.514 | -0.062 | -0.062 |      |
| K037-2             | K038   | 43.411   | 43.412 | 43.432   | 43.432 | -0.020 | -0.020 |      |
| K038               | K039   | 47.408   | 47.409 | 47.364   | 47.366 | 0.044  | 0.044  |      |
| K039               | K040   | 40.158   | 40.159 | 40.288   | 40.289 | -0.130 | -0.130 |      |
| K040               | K041   | 43.757   | 43.757 | 43.662   | 43.662 | 0.095  | 0.095  |      |
| K041               | K042-1 | 42.840   | 42.842 | 42.814   | 42.816 | 0.027  | 0.027  |      |
| K042-1             | K043-1 | 31.819   | 31.819 | 31.843   | 31.843 | -0.025 | -0.025 |      |
| K043-1             | K044   | 73.949   | 73.954 | 73.930   | 73.936 | 0.019  | 0.018  |      |
| K044               | K045-2 | 17.529   | 17.531 | 17.563   | 17.564 | -0.034 | -0.034 |      |
| K045-2             | K046-2 | 43.790   | 43.794 | 43.802   | 43.806 | -0.012 | -0.012 |      |
| K046-2             | K047   | 29.353   | 29.355 | 29.286   | 29.287 | 0.067  | 0.068  |      |
| K047               | K048-2 | 45.721   | 45.723 | 45.821   | 45.823 | -0.100 | -0.100 |      |
| K048-2             | K049   | 33.036   | 33.038 | 33.003   | 33.004 | 0.034  | 0.034  |      |
| K049               | K050   | 28.539   | 28.543 | 28.576   | 28.580 | -0.037 | -0.037 |      |
| 平均                 |        |          |        |          |        | -0.007 | -0.007 |      |
| 標準偏差               |        |          |        |          |        | 0.053  | 0.053  |      |
| RMS誤差              |        |          |        |          |        | 0.054  | 0.054  |      |

# 環状通(単位:m)

道路をはさんで向かい合う2点間の距離

| 検証点NO  |        | 2点間の実測距離 |        | 2点間の計測距離 |        | 残差     |        | コメント |
|--------|--------|----------|--------|----------|--------|--------|--------|------|
| Point1 | Point2 | 水平距離     | 3D距離   | 水平距離     | 3D距離   | 水平距離   | 3D距離   |      |
| K001-2 | K050   | 28.793   | 28.795 | 28.870   | 28.871 | -0.077 | -0.076 |      |
| K002   | K049   | 25.404   | 25.405 | 25.352   | 25.353 | 0.052  | 0.052  |      |
| K003-1 | K048-2 | 27.723   | 27.725 | 27.678   | 27.679 | 0.046  | 0.046  |      |
| K004   | K047   | 20.574   | 20.576 | 20.582   | 20.585 | -0.008 | -0.009 |      |
| K005-1 | K046-2 | 32.135   | 32.136 | 32.109   | 32.111 | 0.026  | 0.025  |      |
| K006   | K045-2 | 15.605   | 15.605 | 15.507   | 15.507 | 0.098  | 0.098  |      |
| K007   | K044   | 23.998   | 23.999 | 23.938   | 23.940 | 0.060  | 0.059  |      |
| K008   | K043-1 | 33.911   | 33.915 | 33.974   | 33.978 | -0.063 | -0.064 |      |
| K009   | K042-1 | 24.379   | 24.379 | 24.414   | 24.414 | -0.035 | -0.035 |      |
| K010   | K041   | 26.451   | 26.454 | 26.530   | 26.533 | -0.079 | -0.079 |      |
| K011   | K040   | 28.679   | 28.682 | 28.619   | 28.621 | 0.060  | 0.060  |      |
| K012-1 | K039   | 29.375   | 29.375 | 29.406   | 29.406 | -0.031 | -0.031 |      |
| K013   | K038   | 26.073   | 26.073 | 26.143   | 26.143 | -0.071 | -0.071 |      |
| K014-1 | K037-2 | 19.642   | 19.644 | 19.609   | 19.610 | 0.033  | 0.034  |      |
| K015   | K036   | 24.821   | 24.824 | 24.824   | 24.827 | -0.003 | -0.003 |      |
| K016-1 | K035-2 | 19.367   | 19.368 | 19.371   | 19.371 | -0.004 | -0.004 |      |
| K017-1 | K034   | 45.872   | 45.872 | 45.953   | 45.953 | -0.081 | -0.081 |      |
| K018   | K033   | 16.775   | 16.775 | 16.924   | 16.925 | -0.149 | -0.149 |      |
| K019-1 | K032-2 | 18.337   | 18.337 | 18.386   | 18.386 | -0.049 | -0.049 |      |
| K020   | K031-2 | 22.885   | 22.885 | 22.909   | 22.909 | -0.024 | -0.024 |      |
| K021   | K030   | 28.599   | 28.599 | 28.567   | 28.567 | 0.032  | 0.032  |      |
| K022-2 | K029   | 27.306   | 27.307 | 27.322   | 27.323 | -0.016 | -0.016 |      |
| K023-1 | K028   | 16.558   | 16.559 | 16.554   | 16.554 | 0.004  | 0.004  |      |
| K024   | K027-1 | 34.151   | 34.151 | 34.209   | 34.209 | -0.057 | -0.057 |      |
| K025   | K026   | 29.637   | 29.637 | 29.768   | 29.768 | -0.131 | -0.131 |      |
| 平均     |        |          |        |          |        | -0.019 | -0.019 |      |
| 標準偏差   |        |          |        |          |        | 0.061  | 0.061  |      |
| RMS誤差  |        |          |        |          |        | 0.063  | 0.063  |      |

# 山麓通(単位:m)

道路の同一側面に隣り合う2点間の距離

| 検証点NO  |        | 2点間の実測距離 |        | 2点間の計測距離 |        | 残差     |        | コメント |
|--------|--------|----------|--------|----------|--------|--------|--------|------|
| Point1 | Point2 | 水平距離     | 3D距離   | 水平距離     | 3D距離   | 水平距離   | 3D距離   |      |
| 001L-1 | 003L   | 54.611   | 54.633 | 54.575   | 54.600 | 0.036  | 0.033  |      |
| 002R   | 004R   | 52.385   | 52.403 | 52.484   | 52.503 | -0.099 | -0.100 |      |
| 003L   | 005L   | 48.756   | 48.762 | 48.744   | 48.752 | 0.012  | 0.011  |      |
| 004R   | 006R   | 44.976   | 45.000 | 44.999   | 45.024 | -0.023 | -0.024 |      |
| 005L   | 007L-1 | 50.288   | 50.318 | 50.301   | 50.329 | -0.014 | -0.011 |      |
| 006R   | 008R   | 52.458   | 52.465 | 52.438   | 52.446 | 0.020  | 0.020  |      |
| 007L-1 | 009L-1 | 49.086   | 49.088 | 49.076   | 49.077 | 0.010  | 0.010  |      |
| 008R   | 010R-1 | 52.762   | 52.769 | 52.718   | 52.724 | 0.044  | 0.044  |      |
| 009L-1 | 011L   | 59.038   | 59.040 | 58.976   | 58.979 | 0.062  | 0.061  |      |
| 010R-1 | 012R   | 47.167   | 47.169 | 47.173   | 47.174 | -0.005 | -0.005 |      |
| 011L   | 013L   | 46.526   | 46.530 | 46.529   | 46.533 | -0.003 | -0.003 |      |
| 012R   | 014R   | 54.356   | 54.358 | 54.379   | 54.381 | -0.023 | -0.023 |      |
| 013L   | 015L   | 46.927   | 46.928 | 46.952   | 46.952 | -0.025 | -0.025 |      |
| 014R   | 016R   | 38.613   | 38.623 | 38.664   | 38.674 | -0.051 | -0.050 |      |
| 015L   | 017L   | 39.451   | 39.471 | 39.450   | 39.469 | 0.001  | 0.002  |      |
| 016R   | 018R   | 45.669   | 45.699 | 45.617   | 45.646 | 0.052  | 0.053  |      |
| 017L   | 019L   | 48.201   | 48.245 | 48.196   | 48.240 | 0.005  | 0.005  |      |
| 018R   | 020R   | 35.650   | 35.669 | 35.647   | 35.665 | 0.003  | 0.004  |      |
| 019L   | 021L   | 33.371   | 33.379 | 33.348   | 33.361 | 0.022  | 0.018  |      |
| 020R   | 022R-1 | 30.940   | 30.944 | 30.966   | 30.971 | -0.025 | -0.026 |      |
| 021L   | 023L   | 47.667   | 47.667 | 47.722   | 47.722 | -0.055 | -0.055 |      |
| 022R-1 | 024R-1 | 46.094   | 46.094 | 46.096   | 46.096 | -0.002 | -0.002 |      |
| 023L   | 025L   | 37.046   | 37.046 | 37.031   | 37.031 | 0.015  | 0.015  |      |
| 024R-1 | 026R   | 42.683   | 42.683 | 42.680   | 42.680 | 0.003  | 0.003  |      |
| 025L   | 027L   | 42.533   | 42.533 | 42.496   | 42.496 | 0.037  | 0.037  |      |
| 026R   | 028R   | 38.771   | 38.776 | 38.747   | 38.752 | 0.024  | 0.024  |      |
| 027L   | 029L   | 42.041   | 42.049 | 42.071   | 42.077 | -0.030 | -0.028 |      |
| 028R   | 030R   | 49.431   | 49.447 | 49.434   | 49.450 | -0.002 | -0.003 |      |
| 029L   | 031L-1 | 53.704   | 53.771 | 53.698   | 53.765 | 0.006  | 0.006  |      |
| 030R   | 032R   | 45.880   | 45.946 | 45.855   | 45.923 | 0.025  | 0.023  |      |
| 031L-1 | 033L   | 45.153   | 45.212 | 45.136   | 45.197 | 0.016  | 0.015  |      |
| 032R   | 034R-1 | 43.506   | 43.563 | 43.538   | 43.587 | -0.032 | -0.024 |      |
| 033L   | 035L   | 34.108   | 34.149 | 34.122   | 34.164 | -0.014 | -0.015 |      |
| 034R-1 | 036R   | 50.698   | 50.714 | 50.936   | 50.954 | -0.238 | -0.239 |      |
| 035L   | 037L   | 47.225   | 47.229 | 47.269   | 47.275 | -0.044 | -0.046 |      |
| 036R   | 038R   | 30.817   | 30.820 | 30.601   | 30.603 | 0.217  | 0.217  |      |
| 037L   | 039L   | 19.841   | 19.845 | 19.814   | 19.818 | 0.027  | 0.027  |      |
| 038R   | 040R   | 34.196   | 34.215 | 34.261   | 34.279 | -0.065 | -0.063 |      |
| 039L   | 041L   | 36.163   | 36.177 | 36.149   | 36.160 | 0.014  | 0.017  |      |
| 040R   | 042R-1 | 32.094   | 32.108 | 32.038   | 32.057 | 0.056  | 0.051  |      |
| 041L   | 043L   | 41.391   | 41.391 | 41.367   | 41.367 | 0.024  | 0.024  |      |
| 042R-1 | 044R-1 | 49.624   | 49.684 | 49.584   | 49.640 | 0.040  | 0.044  |      |
| 043L   | 045L   | 45.172   | 45.275 | 45.167   | 45.268 | 0.006  | 0.007  |      |
| 044R-1 | 046R   | 42.015   | 42.119 | 42.027   | 42.134 | -0.013 | -0.016 |      |
| 045L   | 047L   | 61.978   | 62.125 | 62.024   | 62.171 | -0.046 | -0.046 |      |
| 046R   | 048R   | 66.874   | 67.057 | 66.890   | 67.080 | -0.016 | -0.023 |      |
| 047L   | 049L   | 33.546   | 33.657 | 33.481   | 33.592 | 0.065  | 0.064  |      |
| 048R   | 050R-1 | 28.862   | 28.931 | 28.859   | 28.925 | 0.003  | 0.006  |      |
| 平均     |        |          |        |          |        | 0.000  | 0.000  |      |
| 標準偏差   |        |          |        |          |        | 0.057  | 0.057  |      |
| RMS誤差  |        |          |        |          |        | 0.057  | 0.057  |      |

# 山麓通(単位:m)

道路をはさんで向かい合う2点間の距離

| 検証点NO  |        | 2点間の実測距離 |        | 2点間の計測距離 |        | 残差     |        | コメント |
|--------|--------|----------|--------|----------|--------|--------|--------|------|
| Point1 | Point2 | 水平距離     | 3D距離   | 水平距離     | 3D距離   | 水平距離   | 3D距離   |      |
| 001L-1 | 002R   | 31.272   | 31.279 | 31.123   | 31.131 | 0.149  | 0.148  |      |
| 002R   | 003L   | 26.567   | 26.581 | 26.586   | 26.603 | -0.019 | -0.022 |      |
| 003L   | 004R   | 30.155   | 30.159 | 30.187   | 30.191 | -0.033 | -0.032 |      |
| 004R   | 005L   | 28.592   | 28.593 | 28.569   | 28.572 | 0.023  | 0.022  |      |
| 005L   | 006R   | 29.758   | 29.782 | 29.697   | 29.716 | 0.061  | 0.065  |      |
| 006R   | 007L-1 | 27.036   | 27.042 | 27.008   | 27.015 | 0.028  | 0.028  |      |
| 007L-1 | 008R   | 29.036   | 29.038 | 29.028   | 29.030 | 0.008  | 0.008  |      |
| 008R   | 009L-1 | 25.504   | 25.513 | 25.507   | 25.515 | -0.003 | -0.001 |      |
| 009L-1 | 010R-1 | 34.093   | 34.094 | 34.013   | 34.013 | 0.080  | 0.080  |      |
| 010R-1 | 011L   | 30.034   | 30.036 | 30.002   | 30.005 | 0.032  | 0.032  |      |
| 011L   | 012R   | 22.939   | 22.939 | 22.946   | 22.946 | -0.007 | -0.007 |      |
| 012R   | 013L   | 27.571   | 27.578 | 27.563   | 27.570 | 0.007  | 0.008  |      |
| 013L   | 014R   | 31.935   | 31.936 | 31.971   | 31.971 | -0.035 | -0.035 |      |
| 014R   | 015L   | 21.017   | 21.017 | 21.038   | 21.039 | -0.021 | -0.021 |      |
| 015L   | 016R   | 26.337   | 26.355 | 26.379   | 26.399 | -0.042 | -0.044 |      |
| 016R   | 017L   | 18.080   | 18.082 | 18.008   | 18.010 | 0.072  | 0.072  |      |
| 017L   | 018R   | 32.089   | 32.118 | 32.081   | 32.112 | 0.007  | 0.006  |      |
| 018R   | 019L   | 21.226   | 21.237 | 21.194   | 21.204 | 0.032  | 0.033  |      |
| 019L   | 020R   | 21.908   | 21.913 | 21.884   | 21.891 | 0.023  | 0.023  |      |
| 020R   | 021L   | 17.817   | 17.819 | 17.731   | 17.736 | 0.086  | 0.083  |      |
| 021L   | 022R-1 | 18.562   | 18.564 | 18.638   | 18.638 | -0.075 | -0.074 |      |
| 022R-1 | 023L   | 33.173   | 33.173 | 33.175   | 33.175 | -0.002 | -0.002 |      |
| 023L   | 024R-1 | 17.143   | 17.145 | 17.132   | 17.133 | 0.011  | 0.012  |      |
| 024R-1 | 025L   | 24.590   | 24.591 | 24.547   | 24.548 | 0.043  | 0.044  |      |
| 025L   | 026R   | 22.162   | 22.162 | 22.136   | 22.136 | 0.026  | 0.026  |      |
| 026R   | 027L   | 24.506   | 24.506 | 24.412   | 24.412 | 0.094  | 0.094  |      |
| 027L   | 028R   | 21.265   | 21.277 | 21.255   | 21.264 | 0.010  | 0.012  |      |
| 028R   | 029L   | 27.976   | 27.976 | 27.998   | 27.998 | -0.022 | -0.022 |      |
| 029L   | 030R   | 33.124   | 33.144 | 33.120   | 33.142 | 0.004  | 0.001  |      |
| 030R   | 031L-1 | 25.788   | 25.834 | 25.786   | 25.828 | 0.002  | 0.006  |      |
| 031L-1 | 032R   | 24.751   | 24.769 | 24.742   | 24.763 | 0.009  | 0.006  |      |
| 032R   | 033L   | 24.722   | 24.761 | 24.729   | 24.764 | -0.007 | -0.003 |      |
| 033L   | 034R-1 | 24.034   | 24.049 | 24.046   | 24.058 | -0.012 | -0.009 |      |
| 034R-1 | 035L   | 18.895   | 18.914 | 18.819   | 18.842 | 0.076  | 0.071  |      |
| 035L   | 036R   | 34.922   | 34.924 | 35.182   | 35.184 | -0.260 | -0.260 |      |
| 036R   | 037L   | 23.369   | 23.369 | 23.218   | 23.220 | 0.151  | 0.149  |      |
| 037L   | 038R   | 18.231   | 18.232 | 18.295   | 18.295 | -0.063 | -0.062 |      |
| 038R   | 039L   | 18.346   | 18.347 | 18.378   | 18.381 | -0.031 | -0.034 |      |
| 039L   | 040R   | 24.627   | 24.645 | 24.679   | 24.690 | -0.052 | -0.045 |      |
| 040R   | 041L   | 18.744   | 18.744 | 18.597   | 18.597 | 0.148  | 0.147  |      |
| 041L   | 042R-1 | 24.484   | 24.501 | 24.489   | 24.508 | -0.005 | -0.007 |      |
| 042R-1 | 043L   | 30.171   | 30.186 | 30.165   | 30.181 | 0.006  | 0.005  |      |
| 043L   | 044R-1 | 26.262   | 26.304 | 26.239   | 26.276 | 0.023  | 0.028  |      |
| 044R-1 | 045L   | 23.462   | 23.513 | 23.441   | 23.498 | 0.021  | 0.015  |      |
| 045L   | 046R   | 23.373   | 23.415 | 23.352   | 23.391 | 0.021  | 0.024  |      |
| 046R   | 047L   | 42.833   | 42.929 | 42.856   | 42.955 | -0.024 | -0.026 |      |
| 047L   | 048R   | 26.778   | 26.858 | 26.747   | 26.832 | 0.031  | 0.026  |      |
| 048R   | 049L   | 15.565   | 15.578 | 15.478   | 15.489 | 0.087  | 0.089  |      |
| 049L   | 050R-1 | 20.633   | 20.678 | 20.719   | 20.764 | -0.086 | -0.087 |      |
| 平均     |        |          |        |          |        | 0.014  | 0.014  |      |
| 標準偏差   |        |          |        |          |        | 0.049  | 0.049  |      |
| RMS誤差  |        |          |        |          |        | 0.051  | 0.051  |      |

## (2) 方法2：地上で測量した地点の情報（GCP）を用いる方法

| 環状通(単位:m)          |        |          |        |          |        |        |        |      |
|--------------------|--------|----------|--------|----------|--------|--------|--------|------|
| 道路の同一側面に隣り合う2点間の距離 |        |          |        |          |        |        |        |      |
| 検証点NO              |        | 2点間の実測距離 |        | 2点間の計測距離 |        | 残差     |        | コメント |
| Point1             | Point2 | 水平距離     | 3D距離   | 水平距離     | 3D距離   | 水平距離   | 3D距離   |      |
| K001-2             | K002   | 30.705   | 30.707 | 30.685   | 30.687 | 0.021  | 0.020  |      |
| K002               | K003-1 | 37.108   | 37.111 | 37.146   | 37.148 | -0.038 | -0.037 |      |
| K003-1             | K004   | 34.043   | 34.046 | 33.991   | 33.994 | 0.052  | 0.053  |      |
| K004               | K005-1 | 44.071   | 44.071 | 44.063   | 44.064 | 0.008  | 0.008  |      |
| K005-1             | K006   | 24.065   | 24.068 | 24.032   | 24.034 | 0.033  | 0.033  |      |
| K006               | K007   | 30.011   | 30.014 | 30.044   | 30.049 | -0.032 | -0.035 |      |
| K007               | K008   | 28.833   | 28.834 | 28.863   | 28.863 | -0.030 | -0.029 |      |
| K008               | K009   | 36.873   | 36.877 | 36.828   | 36.832 | 0.046  | 0.045  |      |
| K009               | K010   | 44.963   | 44.963 | 45.000   | 45.000 | -0.037 | -0.037 |      |
| K010               | K011   | 38.665   | 38.666 | 38.633   | 38.634 | 0.031  | 0.031  |      |
| K011               | K012-1 | 38.599   | 38.604 | 38.616   | 38.619 | -0.017 | -0.016 |      |
| K012-1             | K013   | 52.111   | 52.112 | 52.114   | 52.116 | -0.003 | -0.004 |      |
| K013               | K014-1 | 53.895   | 53.895 | 53.960   | 53.960 | -0.065 | -0.065 |      |
| K014-1             | K015   | 44.559   | 44.560 | 44.513   | 44.514 | 0.046  | 0.046  |      |
| K015               | K016-1 | 48.454   | 48.456 | 48.404   | 48.406 | 0.050  | 0.050  |      |
| K016-1             | K017-1 | 31.792   | 31.792 | 31.886   | 31.887 | -0.095 | -0.095 |      |
| K017-1             | K018   | 69.035   | 69.036 | 69.038   | 69.040 | -0.004 | -0.004 |      |
| K018               | K019-1 | 27.068   | 27.068 | 27.057   | 27.058 | 0.011  | 0.011  |      |
| K019-1             | K020   | 49.359   | 49.359 | 49.436   | 49.436 | -0.078 | -0.078 |      |
| K020               | K021   | 25.659   | 25.662 | 25.640   | 25.641 | 0.019  | 0.021  |      |
| K021               | K022-2 | 43.437   | 43.437 | 43.372   | 43.372 | 0.065  | 0.065  |      |
| K022-2             | K023-1 | 62.872   | 62.875 | 62.860   | 62.863 | 0.012  | 0.012  |      |
| K023-1             | K024   | 36.563   | 36.564 | 36.503   | 36.504 | 0.060  | 0.060  |      |
| K024               | K025   | 52.227   | 52.227 | 52.208   | 52.208 | 0.019  | 0.019  |      |
| K025               | K026   | 29.637   | 29.637 | 29.849   | 29.849 | -0.213 | -0.213 |      |
| K026               | K027-1 | 46.620   | 46.621 | 46.821   | 46.821 | -0.201 | -0.201 |      |
| K027-1             | K028   | 56.416   | 56.417 | 56.363   | 56.364 | 0.053  | 0.053  |      |
| K028               | K029   | 51.422   | 51.423 | 51.452   | 51.453 | -0.030 | -0.031 |      |
| K029               | K030   | 45.745   | 45.747 | 45.766   | 45.768 | -0.021 | -0.021 |      |
| K030               | K031-2 | 43.418   | 43.419 | 43.401   | 43.402 | 0.017  | 0.017  |      |
| K031-2             | K032-2 | 36.230   | 36.230 | 36.081   | 36.081 | 0.148  | 0.148  |      |
| K032-2             | K033   | 29.371   | 29.372 | 29.429   | 29.430 | -0.058 | -0.057 |      |
| K033               | K034   | 37.201   | 37.203 | 37.223   | 37.225 | -0.022 | -0.022 |      |
| K034               | K035-2 | 63.668   | 63.668 | 63.825   | 63.825 | -0.157 | -0.157 |      |
| K035-2             | K036   | 38.360   | 38.360 | 38.262   | 38.263 | 0.097  | 0.097  |      |
| K036               | K037-2 | 55.450   | 55.452 | 55.413   | 55.415 | 0.037  | 0.037  |      |
| K037-2             | K038   | 43.411   | 43.412 | 43.464   | 43.464 | -0.053 | -0.052 |      |
| K038               | K039   | 47.408   | 47.409 | 47.370   | 47.371 | 0.039  | 0.038  |      |
| K039               | K040   | 40.158   | 40.159 | 40.267   | 40.268 | -0.109 | -0.109 |      |
| K040               | K041   | 43.757   | 43.757 | 43.760   | 43.760 | -0.003 | -0.002 |      |
| K041               | K042-1 | 42.840   | 42.842 | 42.777   | 42.779 | 0.063  | 0.063  |      |
| K042-1             | K043-1 | 31.819   | 31.819 | 31.855   | 31.855 | -0.036 | -0.036 |      |
| K043-1             | K044   | 73.949   | 73.954 | 73.962   | 73.968 | -0.013 | -0.014 |      |
| K044               | K045-2 | 17.529   | 17.531 | 17.562   | 17.564 | -0.033 | -0.034 |      |
| K045-2             | K046-2 | 43.790   | 43.794 | 43.706   | 43.711 | 0.084  | 0.084  |      |
| K046-2             | K047   | 29.353   | 29.355 | 29.301   | 29.301 | 0.053  | 0.053  |      |
| K047               | K048-2 | 45.721   | 45.723 | 45.828   | 45.829 | -0.107 | -0.106 |      |
| K048-2             | K049   | 33.036   | 33.038 | 32.993   | 32.994 | 0.043  | 0.043  |      |
| K049               | K050   | 28.539   | 28.543 | 28.565   | 28.570 | -0.026 | -0.027 |      |
| 平均                 |        |          |        |          |        | -0.007 | -0.007 |      |
| 標準偏差               |        |          |        |          |        | 0.053  | 0.053  |      |
| RMS誤差              |        |          |        |          |        | 0.054  | 0.054  |      |

# 環状通(単位:m)

道路をはさんで向かい合う2点間の距離

| 検証点NO  |        | 2点間の実測距離 |        | 2点間の計測距離 |        | 残差     |        | コメント |
|--------|--------|----------|--------|----------|--------|--------|--------|------|
| Point1 | Point2 | 水平距離     | 3D距離   | 水平距離     | 3D距離   | 水平距離   | 3D距離   |      |
| K001-2 | K050   | 28.793   | 28.795 | 28.870   | 28.871 | -0.077 | -0.076 |      |
| K002   | K049   | 25.404   | 25.405 | 25.352   | 25.353 | 0.052  | 0.052  |      |
| K003-1 | K048-2 | 27.723   | 27.725 | 27.678   | 27.679 | 0.046  | 0.046  |      |
| K004   | K047   | 20.574   | 20.576 | 20.582   | 20.585 | -0.008 | -0.009 |      |
| K005-1 | K046-2 | 32.135   | 32.136 | 32.109   | 32.111 | 0.026  | 0.025  |      |
| K006   | K045-2 | 15.605   | 15.605 | 15.507   | 15.507 | 0.098  | 0.098  |      |
| K007   | K044   | 23.998   | 23.999 | 23.938   | 23.940 | 0.060  | 0.059  |      |
| K008   | K043-1 | 33.911   | 33.915 | 33.974   | 33.978 | -0.063 | -0.064 |      |
| K009   | K042-1 | 24.379   | 24.379 | 24.414   | 24.414 | -0.035 | -0.035 |      |
| K010   | K041   | 26.451   | 26.454 | 26.530   | 26.533 | -0.079 | -0.079 |      |
| K011   | K040   | 28.679   | 28.682 | 28.619   | 28.621 | 0.060  | 0.060  |      |
| K012-1 | K039   | 29.375   | 29.375 | 29.406   | 29.406 | -0.031 | -0.031 |      |
| K013   | K038   | 26.073   | 26.073 | 26.143   | 26.143 | -0.071 | -0.071 |      |
| K014-1 | K037-2 | 19.642   | 19.644 | 19.609   | 19.610 | 0.033  | 0.034  |      |
| K015   | K036   | 24.821   | 24.824 | 24.824   | 24.827 | -0.003 | -0.003 |      |
| K016-1 | K035-2 | 19.367   | 19.368 | 19.371   | 19.371 | -0.004 | -0.004 |      |
| K017-1 | K034   | 45.872   | 45.872 | 45.953   | 45.953 | -0.081 | -0.081 |      |
| K018   | K033   | 16.775   | 16.775 | 16.924   | 16.925 | -0.149 | -0.149 |      |
| K019-1 | K032-2 | 18.337   | 18.337 | 18.386   | 18.386 | -0.049 | -0.049 |      |
| K020   | K031-2 | 22.885   | 22.885 | 22.909   | 22.909 | -0.024 | -0.024 |      |
| K021   | K030   | 28.599   | 28.599 | 28.567   | 28.567 | 0.032  | 0.032  |      |
| K022-2 | K029   | 27.306   | 27.307 | 27.322   | 27.323 | -0.016 | -0.016 |      |
| K023-1 | K028   | 16.558   | 16.559 | 16.554   | 16.554 | 0.004  | 0.004  |      |
| K024   | K027-1 | 34.151   | 34.151 | 34.209   | 34.209 | -0.057 | -0.057 |      |
| K025   | K026   | 29.637   | 29.637 | 29.768   | 29.768 | -0.131 | -0.131 |      |
| 平均     |        |          |        |          |        | -0.019 | -0.019 |      |
| 標準偏差   |        |          |        |          |        | 0.061  | 0.061  |      |
| RMS誤差  |        |          |        |          |        | 0.063  | 0.063  |      |

# 山麓通(単位:m)

道路の同一側面に隣り合う2点間の距離

| 検証点NO  |        | 2点間の実測距離 |        | 2点間の計測距離 |        | 残差     |        | コメント |
|--------|--------|----------|--------|----------|--------|--------|--------|------|
| Point1 | Point2 | 水平距離     | 3D距離   | 水平距離     | 3D距離   | 水平距離   | 3D距離   |      |
| 001L-1 | 003L   | 54.611   | 54.633 | 54.575   | 54.600 | 0.036  | 0.033  |      |
| 002R   | 004R   | 52.385   | 52.403 | 52.484   | 52.503 | -0.099 | -0.100 |      |
| 003L   | 005L   | 48.756   | 48.762 | 48.744   | 48.752 | 0.012  | 0.011  |      |
| 004R   | 006R   | 44.976   | 45.000 | 44.999   | 45.024 | -0.023 | -0.024 |      |
| 005L   | 007L-1 | 50.288   | 50.318 | 50.301   | 50.329 | -0.014 | -0.011 |      |
| 006R   | 008R   | 52.458   | 52.465 | 52.438   | 52.446 | 0.020  | 0.020  |      |
| 007L-1 | 009L-1 | 49.086   | 49.088 | 49.076   | 49.077 | 0.010  | 0.010  |      |
| 008R   | 010R-1 | 52.762   | 52.769 | 52.718   | 52.724 | 0.044  | 0.044  |      |
| 009L-1 | 011L   | 59.038   | 59.040 | 58.976   | 58.979 | 0.062  | 0.061  |      |
| 010R-1 | 012R   | 47.167   | 47.169 | 47.173   | 47.174 | -0.005 | -0.005 |      |
| 011L   | 013L   | 46.526   | 46.530 | 46.529   | 46.533 | -0.003 | -0.003 |      |
| 012R   | 014R   | 54.356   | 54.358 | 54.379   | 54.381 | -0.023 | -0.023 |      |
| 013L   | 015L   | 46.927   | 46.928 | 46.952   | 46.952 | -0.025 | -0.025 |      |
| 014R   | 016R   | 38.613   | 38.623 | 38.664   | 38.674 | -0.051 | -0.050 |      |
| 015L   | 017L   | 39.451   | 39.471 | 39.450   | 39.469 | 0.001  | 0.002  |      |
| 016R   | 018R   | 45.669   | 45.699 | 45.617   | 45.646 | 0.052  | 0.053  |      |
| 017L   | 019L   | 48.201   | 48.245 | 48.196   | 48.240 | 0.005  | 0.005  |      |
| 018R   | 020R   | 35.650   | 35.669 | 35.647   | 35.665 | 0.003  | 0.004  |      |
| 019L   | 021L   | 33.371   | 33.379 | 33.348   | 33.361 | 0.022  | 0.018  |      |
| 020R   | 022R-1 | 30.940   | 30.944 | 30.966   | 30.971 | -0.025 | -0.026 |      |
| 021L   | 023L   | 47.667   | 47.667 | 47.722   | 47.722 | -0.055 | -0.055 |      |
| 022R-1 | 024R-1 | 46.094   | 46.094 | 46.096   | 46.096 | -0.002 | -0.002 |      |
| 023L   | 025L   | 37.046   | 37.046 | 37.031   | 37.031 | 0.015  | 0.015  |      |
| 024R-1 | 026R   | 42.683   | 42.683 | 42.680   | 42.680 | 0.003  | 0.003  |      |
| 025L   | 027L   | 42.533   | 42.533 | 42.496   | 42.496 | 0.037  | 0.037  |      |
| 026R   | 028R   | 38.771   | 38.776 | 38.747   | 38.752 | 0.024  | 0.024  |      |
| 027L   | 029L   | 42.041   | 42.049 | 42.071   | 42.077 | -0.030 | -0.028 |      |
| 028R   | 030R   | 49.431   | 49.447 | 49.434   | 49.450 | -0.002 | -0.003 |      |
| 029L   | 031L-1 | 53.704   | 53.771 | 53.698   | 53.765 | 0.006  | 0.006  |      |
| 030R   | 032R   | 45.880   | 45.946 | 45.855   | 45.923 | 0.025  | 0.023  |      |
| 031L-1 | 033L   | 45.153   | 45.212 | 45.136   | 45.197 | 0.016  | 0.015  |      |
| 032R   | 034R-1 | 43.506   | 43.563 | 43.538   | 43.587 | -0.032 | -0.024 |      |
| 033L   | 035L   | 34.108   | 34.149 | 34.122   | 34.164 | -0.014 | -0.015 |      |
| 035L   | 037L   | 47.225   | 47.229 | 47.269   | 47.275 | -0.044 | -0.046 |      |
| 037L   | 039L   | 19.841   | 19.845 | 19.814   | 19.818 | 0.027  | 0.027  |      |
| 038R   | 040R   | 34.196   | 34.215 | 34.261   | 34.279 | -0.065 | -0.063 |      |
| 039L   | 041L   | 36.163   | 36.177 | 36.149   | 36.160 | 0.014  | 0.017  |      |
| 040R   | 042R-1 | 32.094   | 32.108 | 32.038   | 32.057 | 0.056  | 0.051  |      |
| 041L   | 043L   | 41.391   | 41.391 | 41.367   | 41.367 | 0.024  | 0.024  |      |
| 042R-1 | 044R-1 | 49.624   | 49.684 | 49.584   | 49.640 | 0.040  | 0.044  |      |
| 043L   | 045L   | 45.172   | 45.275 | 45.167   | 45.268 | 0.006  | 0.007  |      |
| 044R-1 | 046R   | 42.015   | 42.119 | 42.027   | 42.134 | -0.013 | -0.016 |      |
| 045L   | 047L   | 61.978   | 62.125 | 62.024   | 62.171 | -0.046 | -0.046 |      |
| 046R   | 048R   | 66.874   | 67.057 | 66.890   | 67.080 | -0.016 | -0.023 |      |
| 047L   | 049L   | 33.546   | 33.657 | 33.481   | 33.592 | 0.065  | 0.064  |      |
| 048R   | 050R-1 | 28.862   | 28.931 | 28.859   | 28.925 | 0.003  | 0.006  |      |
| 平均     |        |          |        |          |        | 0.001  | 0.001  |      |
| 標準偏差   |        |          |        |          |        | 0.034  | 0.034  |      |
| RMS誤差  |        |          |        |          |        | 0.034  | 0.034  |      |

# 山麓通(単位:m)

道路をはさんで向かい合う2点間の距離

| 検証点NO  |        | 2点間の実測距離 |        | 2点間の計測距離 |        | 残差     |        | コメント |
|--------|--------|----------|--------|----------|--------|--------|--------|------|
| Point1 | Point2 | 水平距離     | 3D距離   | 水平距離     | 3D距離   | 水平距離   | 3D距離   |      |
| 001L-1 | 002R   | 31.272   | 31.279 | 31.123   | 31.131 | 0.149  | 0.148  |      |
| 002R   | 003L   | 26.567   | 26.581 | 26.586   | 26.603 | -0.019 | -0.022 |      |
| 003L   | 004R   | 30.155   | 30.159 | 30.187   | 30.191 | -0.033 | -0.032 |      |
| 004R   | 005L   | 28.592   | 28.593 | 28.569   | 28.572 | 0.023  | 0.022  |      |
| 005L   | 006R   | 29.758   | 29.782 | 29.697   | 29.716 | 0.061  | 0.065  |      |
| 006R   | 007L-1 | 27.036   | 27.042 | 27.008   | 27.015 | 0.028  | 0.028  |      |
| 007L-1 | 008R   | 29.036   | 29.038 | 29.028   | 29.030 | 0.008  | 0.008  |      |
| 008R   | 009L-1 | 25.504   | 25.513 | 25.507   | 25.515 | -0.003 | -0.001 |      |
| 009L-1 | 010R-1 | 34.093   | 34.094 | 34.013   | 34.013 | 0.080  | 0.080  |      |
| 010R-1 | 011L   | 30.034   | 30.036 | 30.002   | 30.005 | 0.032  | 0.032  |      |
| 011L   | 012R   | 22.939   | 22.939 | 22.946   | 22.946 | -0.007 | -0.007 |      |
| 012R   | 013L   | 27.571   | 27.578 | 27.563   | 27.570 | 0.007  | 0.008  |      |
| 013L   | 014R   | 31.935   | 31.936 | 31.971   | 31.971 | -0.035 | -0.035 |      |
| 014R   | 015L   | 21.017   | 21.017 | 21.038   | 21.039 | -0.021 | -0.021 |      |
| 015L   | 016R   | 26.337   | 26.355 | 26.379   | 26.399 | -0.042 | -0.044 |      |
| 016R   | 017L   | 18.080   | 18.082 | 18.008   | 18.010 | 0.072  | 0.072  |      |
| 017L   | 018R   | 32.089   | 32.118 | 32.081   | 32.112 | 0.007  | 0.006  |      |
| 018R   | 019L   | 21.226   | 21.237 | 21.194   | 21.204 | 0.032  | 0.033  |      |
| 019L   | 020R   | 21.908   | 21.913 | 21.884   | 21.891 | 0.023  | 0.023  |      |
| 020R   | 021L   | 17.817   | 17.819 | 17.731   | 17.736 | 0.086  | 0.083  |      |
| 021L   | 022R-1 | 18.562   | 18.564 | 18.638   | 18.638 | -0.075 | -0.074 |      |
| 022R-1 | 023L   | 33.173   | 33.173 | 33.175   | 33.175 | -0.002 | -0.002 |      |
| 023L   | 024R-1 | 17.143   | 17.145 | 17.132   | 17.133 | 0.011  | 0.012  |      |
| 024R-1 | 025L   | 24.590   | 24.591 | 24.547   | 24.548 | 0.043  | 0.044  |      |
| 025L   | 026R   | 22.162   | 22.162 | 22.136   | 22.136 | 0.026  | 0.026  |      |
| 026R   | 027L   | 24.506   | 24.506 | 24.412   | 24.412 | 0.094  | 0.094  |      |
| 027L   | 028R   | 21.265   | 21.277 | 21.255   | 21.264 | 0.010  | 0.012  |      |
| 028R   | 029L   | 27.976   | 27.976 | 27.998   | 27.998 | -0.022 | -0.022 |      |
| 029L   | 030R   | 33.124   | 33.144 | 33.120   | 33.142 | 0.004  | 0.001  |      |
| 030R   | 031L-1 | 25.788   | 25.834 | 25.786   | 25.828 | 0.002  | 0.006  |      |
| 031L-1 | 032R   | 24.751   | 24.769 | 24.742   | 24.763 | 0.009  | 0.006  |      |
| 032R   | 033L   | 24.722   | 24.761 | 24.729   | 24.764 | -0.007 | -0.003 |      |
| 033L   | 034R-1 | 24.034   | 24.049 | 24.046   | 24.058 | -0.012 | -0.009 |      |
| 034R-1 | 035L   | 18.895   | 18.914 | 18.819   | 18.842 | 0.076  | 0.071  |      |
| 037L   | 038R   | 18.231   | 18.232 | 18.295   | 18.295 | -0.063 | -0.062 |      |
| 038R   | 039L   | 18.346   | 18.347 | 18.378   | 18.381 | -0.031 | -0.034 |      |
| 039L   | 040R   | 24.627   | 24.645 | 24.679   | 24.690 | -0.052 | -0.045 |      |
| 040R   | 041L   | 18.744   | 18.744 | 18.597   | 18.597 | 0.148  | 0.147  |      |
| 041L   | 042R-1 | 24.484   | 24.501 | 24.489   | 24.508 | -0.005 | -0.007 |      |
| 042R-1 | 043L   | 30.171   | 30.186 | 30.165   | 30.181 | 0.006  | 0.005  |      |
| 043L   | 044R-1 | 26.262   | 26.304 | 26.239   | 26.276 | 0.023  | 0.028  |      |
| 044R-1 | 045L   | 23.462   | 23.513 | 23.441   | 23.498 | 0.021  | 0.015  |      |
| 045L   | 046R   | 23.373   | 23.415 | 23.352   | 23.391 | 0.021  | 0.024  |      |
| 046R   | 047L   | 42.833   | 42.929 | 42.856   | 42.955 | -0.024 | -0.026 |      |
| 047L   | 048R   | 26.778   | 26.858 | 26.747   | 26.832 | 0.031  | 0.026  |      |
| 048R   | 049L   | 15.565   | 15.578 | 15.478   | 15.489 | 0.087  | 0.089  |      |
| 049L   | 050R-1 | 20.633   | 20.678 | 20.719   | 20.764 | -0.086 | -0.087 |      |
| 平均     |        |          |        |          |        | 0.014  | 0.014  |      |
| 標準偏差   |        |          |        |          |        | 0.049  | 0.049  |      |
| RMS誤差  |        |          |        |          |        | 0.051  | 0.051  |      |