Detail Adjustment Report

Prepared by: GeoNet Labs Co.

Date: 2025-10-03 | **Time:** 09:05:24

Executive Summary

Total No. of Observations	21
Total No. of Parameters	18
Degrees of Freedom	3
Adjustment Method	Batch Adjustment
A Priori Variance	1
A Posteriori Variance	[[2.04242424e-05]]
Outlier Detected	No (Test: N/A)
Weight Type Used	Unity
Constraint Used	None

1. Observation Equations

```
-X_Crucesair + X_USPA
-Y_Crucesair + Y_USPA
-Z_Crucesair + Z_USPA
-X_USPA + X_USPB
-Y_USPA + Y_USPB
-Z_USPA + Z_USPB
X_Pseudo - X_USPA
Y_Pseudo - Y_USPA
Z_Pseudo - Z_USPA
X_Reilly - X_USPB
```

```
Y_Reilly - Y_USPB
Z_Reilly - Z_USPB
-X_Bromilow + X_Reilly
-Y_Bromilow + Y_Reilly
-Z_Bromilow + Z_Reilly
-X_Pseudo + X_Reilly
-Y_Pseudo + Y_Reilly
-Z_Pseudo + Z_Reilly
-X_Bromilow + X_Pseudo
-Y_Bromilow + Y_Pseudo
-Z_Bromilow + Z_Pseudo
```

2. Constraints

```
None
```

3. Observation Results

S.No.	Observed	Std Dev (Obs)	Residual	Adjusted	Std Dev (Adj)
1	15752.080000	0.000000	0.000000	15752.080000	0.004519
2	-5179.102000	0.000000	0.000000	-5179.102000	0.004519
3	-903.089000	0.000000	-0.000000	-903.089000	0.004519
4	14.964000	0.000000	0.000636	14.964636	0.003854
5	-15.365000	0.000000	0.001182	-15.363818	0.003854
6	-16.664000	0.000000	-0.003000	-16.667000	0.003854
7	-528.036000	0.000000	-0.000636	-528.036636	0.003854
8	560.657000	0.000000	-0.001182	560.655818	0.003854
9	585.897000	0.000000	0.003000	585.900000	0.003854
10	-514.003000	0.000000	0.000636	-514.002364	0.003854

S.No.	Observed	Std Dev (Obs)	Residual	Adjusted	Std Dev (Adj)
11	741.438000	0.000000	0.001182	741.439182	0.003854
12	868.293000	0.000000	-0.003000	868.290000	0.003854
13	32.134000	0.000000	0.000455	32.134455	0.003605
14	51.175000	0.000000	0.001273	51.176273	0.003605
15	94.198000	0.000000	-0.001000	94.197000	0.003605
16	29.000000	0.000000	-0.001091	28.998909	0.003338
17	165.422000	0.000000	-0.002455	165.419545	0.003338
18	265.719000	0.000000	0.004000	265.723000	0.003338
19	3.136000	0.000000	-0.000455	3.135545	0.003605
20	-114.242000	0.000000	-0.001273	-114.243273	0.003605
21	-171.527000	0.000000	0.001000	-171.526000	0.003605

Covariance Matrix of Observations (ΣL)

```
     0    1    2    3    4    5    6    7    8    9    10   11   12
13   14   15   16   17   18   19   20
0   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
1   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
2   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
3   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
4   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
5   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
6   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```

```
7   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
8   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
9   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
10  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
11  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
12  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
13  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
14  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
15  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
16  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
17  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
18  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
19  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
20  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```

4. Residuals

S.No.	Residual	Std Dev	Normalized Residual
1	0.000000	0.001000	0.0000
2	0.000000	0.001000	0.0000
3	-0.000000	0.001000	0.0000
4	0.000636	0.002360	0.2696

S.No.	Residual	Std Dev	Normalized Residual
5	0.001182	0.002360	0.5007
6	-0.003000	0.002360	1.2711
7	-0.000636	0.002360	0.2696
8	-0.001182	0.002360	0.5007
9	0.003000	0.002360	1.2711
10	0.000636	0.002360	0.2696
11	0.001182	0.002360	0.5007
12	-0.003000	0.002360	1.2711
13	0.000455	0.002725	0.1668
14	0.001273	0.002725	0.4670
15	-0.001000	0.002725	0.3669
16	-0.001091	0.003047	0.3580
17	-0.002455	0.003047	0.8056
18	0.004000	0.003047	1.3128
19	-0.000455	0.002725	0.1668
20	-0.001273	0.002725	0.4670
21	0.001000	0.002725	0.3669

5. Parameters

Station: Bromilow

Cartesian Coordinates

Parameter	Initial	Final	Std. Dev
X		15220.907970	0.003212
Y		-4504.202568	0.003212
Z		-145.663556	0.003212

Geodetic Coordinates

Parameter	Initial	Final	Std. Dev
Lambda			
Phi			
Height			

Station: Crucesair

Cartesian Coordinates

Parameter	Initial	Final	Std. Dev
X		0.000152	0.004427
Y		0.000341	0.004427
Z		-0.000556	0.004427

Geodetic Coordinates

Parameter	Initial	Final	Std. Dev
Lambda			
Phi			
Height			

Station: Pseudo

Cartesian Coordinates

Parameter	Initial	Final	Std. Dev
X		15224.043515	0.002446
Y		-4618.445841	0.002446
Z		-317.189556	0.002446

Geodetic Coordinates

Parameter	Initial	Final	Std. Dev
Lambda			
Phi			
Height			

Station: Reilly

Cartesian Coordinates

Parameter	Initial	Final	Std. Dev
X		15253.042424	0.002569

Parameter	Initial	Final	Std. Dev
Y		-4453.026295	0.002569
Z		-51.466556	0.002569

Geodetic Coordinates

Parameter	Initial	Final	Std. Dev
Lambda			
Phi			
Height			

Station: USPA

Cartesian Coordinates

Parameter	Initial	Final	Std. Dev
X		15752.080152	0.002446
Y		-5179.101659	0.002446
Z		-903.089556	0.002446

Geodetic Coordinates

Parameter	Initial	Final	Std. Dev
Lambda			
Phi			
Height			

Station: USPB

Cartesian Coordinates

Parameter	Initial	Final	Std. Dev
X		15767.044788	0.002908
Y		-5194.465477	0.002908
Z		-919.756556	0.002908

Geodetic Coordinates

Parameter	Initial	Final	Std. Dev
Lambda			
Phi			
Height			

Covariance Matrix of Parameters ($\Sigma\hat{X}$)

```
              0             1             2             3
4             5             6             7             8
9             10            11            12            13
14            15            16            17
0   1.031527e-05 -6.949645e-23 -6.286430e-22 -7.323845e-06
-8.635985e-22 -7.920551e-22  1.650444e-06 -1.527577e-21
6.647811e-21  1.959902e-06  4.886257e-23 -4.391966e-21 -3.919804e-06
2.966251e-22 -6.817855e-21 -2.681971e-06 -5.135830e-22  4.249029e-21
1  -1.236309e-22  1.031527e-05  6.315540e-21  1.966386e-21
-7.323845e-06 -1.914335e-20  1.027983e-21  1.650444e-06
3.242080e-21  2.387579e-22  1.959902e-06  5.328485e-21  3.096809e-21
-3.919804e-06 -6.041621e-21  1.582123e-21 -2.681971e-06  2.215740e-21
2   2.840344e-21  3.864593e-21  1.031527e-05 -5.914628e-24
-4.608138e-21 -7.323845e-06  1.148860e-21  1.192889e-21
1.650444e-06  2.327545e-21  1.429659e-21  1.959902e-06 -4.898725e-22
-2.208109e-21 -3.919804e-06  6.361625e-22 -4.602089e-22 -2.681971e-06
```

```
3  -7.323845e-06  4.370699e-21  4.333442e-21  1.959902e-05
-6.768891e-21 -2.906848e-21 -4.848179e-06  2.878336e-21 -7.637281e-22
-6.395470e-06  3.183263e-21  1.531963e-21  2.578818e-06
-2.244344e-21  5.676884e-22 -3.610346e-06  7.999829e-22 -1.553992e-21
4  -1.551938e-21 -7.323845e-06 -4.349587e-21 -1.229373e-21
1.959902e-05  1.204511e-20 -1.336855e-21 -4.848179e-06 -1.082395e-21
-3.362744e-22 -6.395470e-06 -1.289364e-21 -1.374300e-21
2.578818e-06  5.279904e-21 -3.772486e-23 -3.610346e-06  1.573776e-21
5  -2.709428e-21 -6.074639e-21 -7.323845e-06 -1.231590e-22
5.493755e-21  1.959902e-05 -1.531672e-21 -2.505926e-21 -4.848179e-06
-2.759553e-21  1.625748e-21 -6.395470e-06  5.005395e-22
5.310472e-21  2.578818e-06 -1.353403e-21  2.124935e-21 -3.610346e-06
6   1.650444e-06  1.303560e-21  1.971165e-21 -4.848179e-06
-2.221415e-21 -4.078224e-21  5.982859e-06  8.192858e-22
-2.636541e-21  7.220692e-07  1.518977e-23  4.534237e-21 -1.444138e-06
-1.128061e-21  2.394696e-21 -2.063055e-06  2.235781e-23 -2.433754e-21
7   5.121290e-22  1.650444e-06  4.142599e-21  7.178168e-22
-4.848179e-06 -8.915161e-21  4.822261e-22  5.982859e-06
7.693729e-22  5.671024e-22  7.220692e-07  2.264909e-21  1.046315e-21
-1.444138e-06 -4.572820e-21  1.066728e-21 -2.063055e-06 -9.525300e-23
8   1.197144e-21 -6.256349e-22  1.650444e-06 -6.255695e-22
3.357667e-22 -4.848179e-06  8.643966e-22 -1.872551e-21  5.982859e-06
8.979775e-22  2.972644e-22  7.220692e-07 -2.413346e-22 -1.427075e-21
-1.444138e-06  9.328907e-23  1.551564e-21 -2.063055e-06
9   1.959902e-06 -5.413895e-22  2.163048e-22 -6.395470e-06
1.176611e-21 -3.057821e-21  7.220692e-07  4.510065e-22 -6.674437e-21
6.601775e-06 -1.311587e-21  6.861068e-21 -2.991429e-06 -8.799581e-22
6.950686e-21  1.031527e-07  9.638847e-23 -5.357918e-21
10  2.694441e-23  1.959902e-06  5.611576e-21  2.713936e-22
-6.395470e-06 -1.227203e-20 -2.001598e-23  7.220692e-07
2.235685e-21  1.045860e-22  6.601775e-06  2.020677e-21  3.990584e-22
-2.991429e-06 -4.088251e-21  6.812727e-23  1.031527e-07  7.161646e-22
11  1.450105e-21  7.362355e-22  1.959902e-06 -4.529574e-22
-3.901221e-21 -6.395470e-06  9.837833e-22  8.329133e-22
7.220692e-07  1.170607e-21 -1.754451e-21  6.601775e-06  1.960874e-23
-6.341340e-22 -2.991429e-06  4.719962e-22  9.834400e-22  1.031527e-07
12 -3.919804e-06  1.324367e-21  2.779130e-21  2.578818e-06
-1.625134e-21 -5.381489e-22 -1.444138e-06  5.426220e-22  4.212572e-21
-2.991429e-06  1.042959e-21 -2.545710e-21  5.982859e-06  2.533209e-22
-4.466753e-21 -2.063055e-07 -3.424093e-22  1.356503e-21
13 -6.071621e-22 -3.919804e-06  1.927008e-21 -1.602172e-22
2.578818e-06  1.187220e-21 -6.177408e-22 -1.444138e-06  9.426041e-22
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-1.634462e-22 -2.991429e-06  1.947472e-21 -7.070757e-22
5.982859e-06  1.681317e-22  8.436842e-23 -2.063055e-07 -6.872035e-22
14 -6.730384e-22 -3.419677e-21 -3.919804e-06 -1.755494e-21
6.108019e-21  2.578818e-06 -5.310216e-22 -2.928227e-21 -1.444138e-06
-5.531733e-22 -1.974042e-21 -2.991429e-06 -4.640598e-22
2.684812e-21  5.982859e-06 -3.393698e-22  2.420993e-21 -2.063055e-07
15 -2.681971e-06  1.163657e-21  5.950289e-22 -3.610346e-06
-8.806601e-23 -1.093871e-22 -2.063055e-06  3.540499e-22
3.660878e-21  1.031527e-07  9.505628e-22 -1.570055e-21 -2.063055e-07
8.283092e-23 -2.938831e-21  8.458525e-06 -9.641125e-22  1.399912e-21
16 -5.741128e-22 -2.681971e-06  6.953254e-21 -6.818774e-22
-3.610346e-06 -3.712612e-21 -8.588093e-22 -2.063055e-06  1.849699e-21
-4.543714e-22  1.031527e-07  2.684158e-21 -1.336891e-21 -2.063055e-07
-2.422582e-21 -1.052715e-21  8.458525e-06 -2.491518e-21
17  5.304896e-22 -2.580450e-21 -2.681971e-06 -1.122269e-21
7.313585e-21 -3.610346e-06  1.313343e-22 -6.989952e-22 -2.063055e-06
6.112238e-22 -3.685802e-21  1.031527e-07 -3.529168e-22  7.492625e-23
-2.063055e-07  2.126765e-22 -2.394254e-21  8.458525e-06
```

6. Graphs

VTPV Graph

VTPV Graph

Chi-Square Test Graph

Chi-Square Graph