



**Presented at the FIG Working Week 2023,
28 May - 1 June 2023 in Orlando, Florida, USA**

NGS Field Operations Branch

Real-Time Surveying

FIG Working Week 2023

May 31, 2023

Kevin Jordan, Lead Cartographer

Previous Surveys

- NGS FOB RTK Over the Years
 - Aeronautical Survey Program (ASP)
 - Topo/Bathy LiDAR Support
 - NOAA Restoration Days
 - National Estuarine Research Reserve System (NERRS) Training
 - Internal testing and support



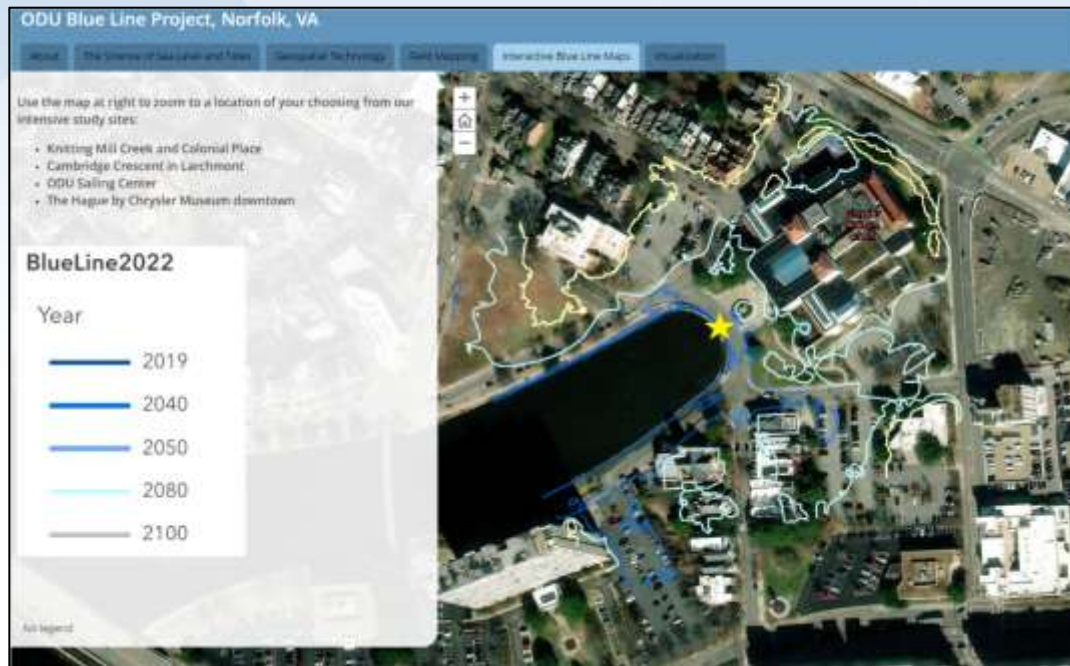
Previous Surveys

- 2019 Old Dominion University (ODU)
 - Coastal Resiliency Projects
 - Temporary Control for NSRS alignment



Previous Surveys

- 2019 Old Dominion University (ODU)
 - Coastal Resiliency Projects
 - Temporary Control for NSRS alignment
 - 2019 Blue Line Project



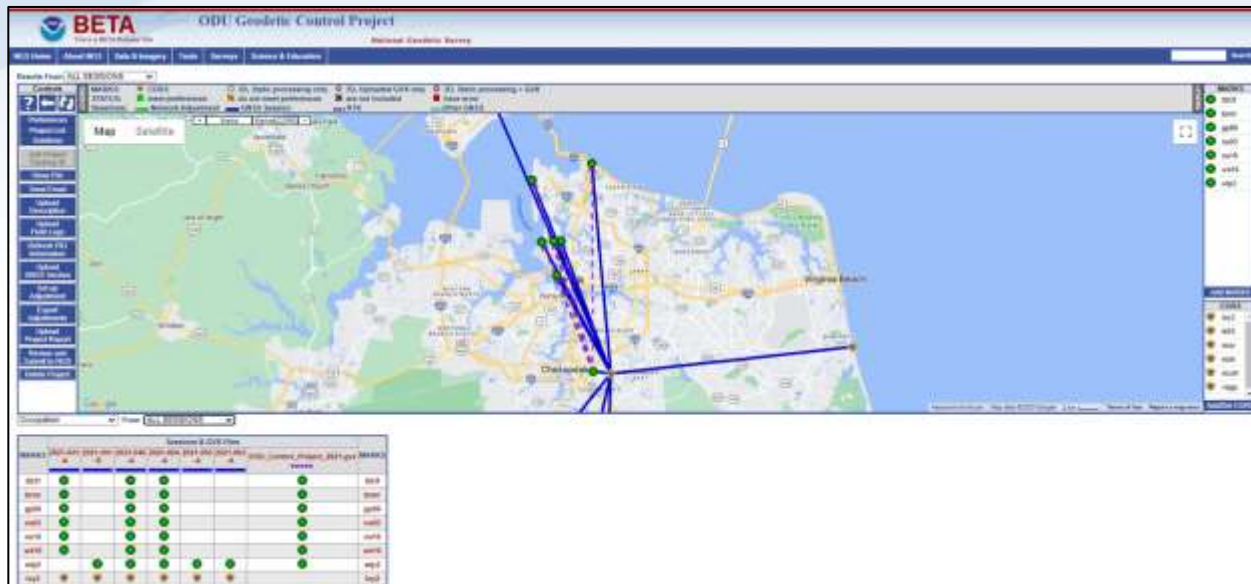
Previous Surveys

- 2021 ODU/Elizabeth River Project
 - Static GNSS
 - RTN (Vendor Based)
 - Aerial Photo Control
 - Topo



Previous Surveys

- 2021
ODU/Elizabeth
River Project
 - Static & RTN Occupations
 - Use of OPUS Projects 5.1 for Static & RTN alignment to the NSRS



Modern Surveys


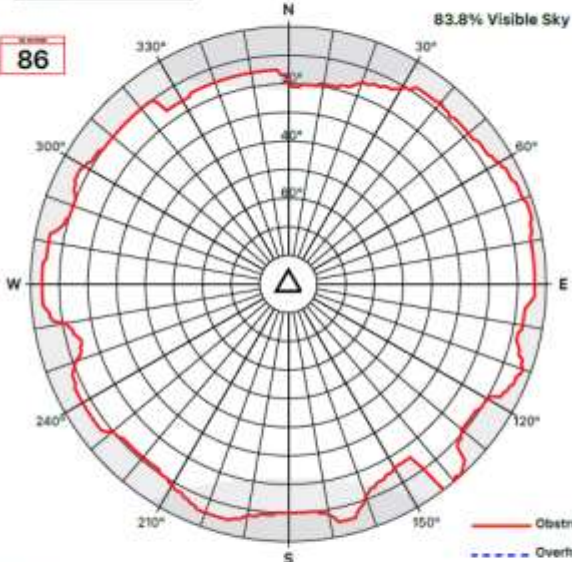
- U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA)
- First Responder Network Authority (FirstNet) Test Facility – Boulder, CO
 - Static & RTK Occupations
 - Terrestrial Surveying (indoors)
 - Use of OPUS Projects 5.1 for Static and RTK alignment to the NSRS
 - Traverse Adjustment and Alignment to NSRS



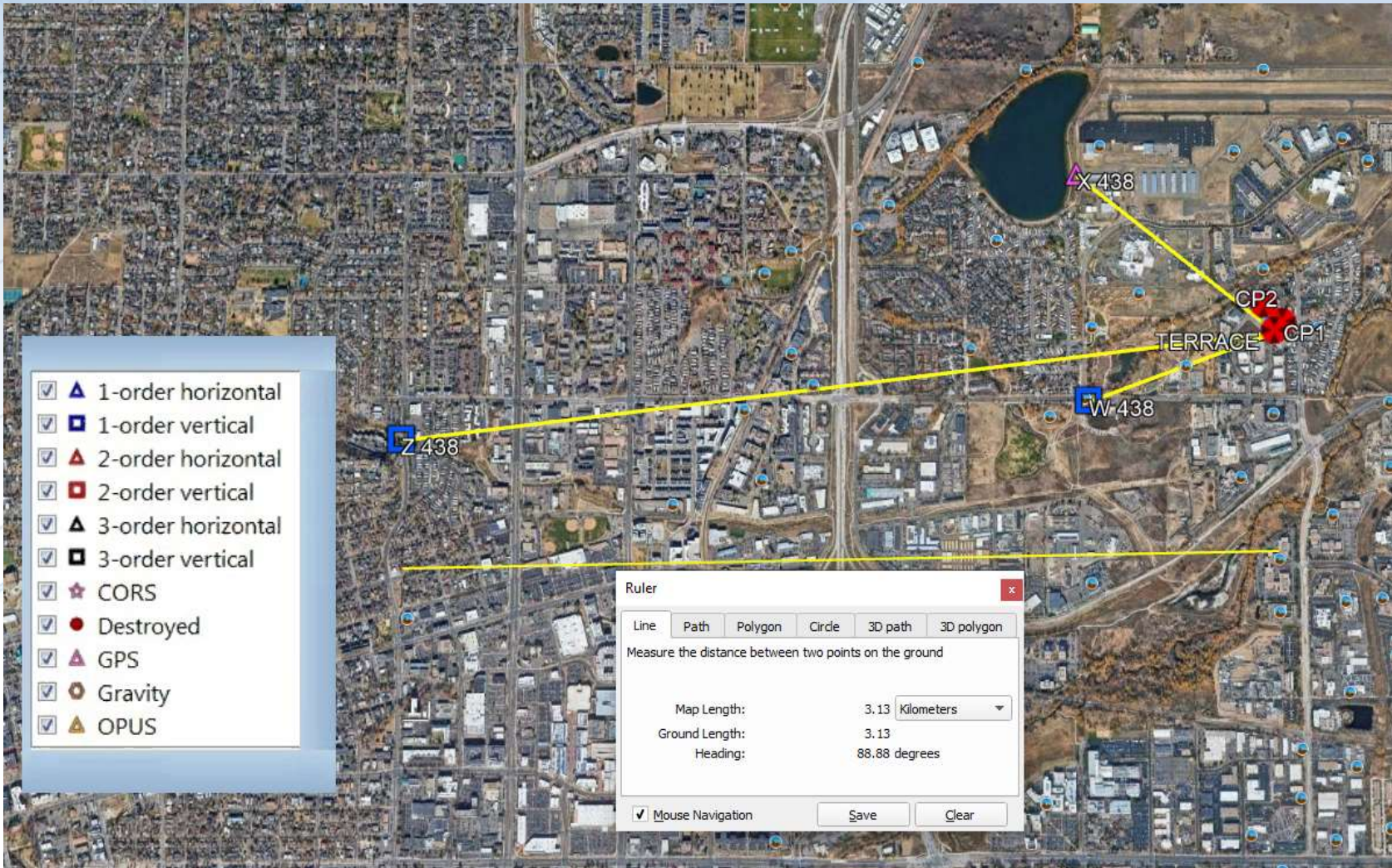


- U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA)



GNSS OBSERVATION LOG SHEET			
	PROJECT NAME: <u>First Net</u>	<input type="checkbox"/> REVISION	
	Site Name: _____	Date: <u>6/23/22</u>	DOY: <u>174</u>
	Site Number: _____	4 Character ID: _____	
PID: _____		VISIBILITY DIAGRAM	
Designation: <u>Terrace</u>		<div style="border: 1px solid red; padding: 2px; display: inline-block; margin-right: 10px;">86</div> 83.8% Visible Sky	
			
Lat: <u>0.00°</u>		— Obstruction Line - - - Overhead Lines	
Visibility Notes: 			
Contact Information			
Organization: <u>National Geodetic Survey</u>		Height Above Mark: <u>2.0</u>	
Name: <u>Kevin Jordan</u>			
Telephone: <u>2023846471</u>		email: <u>kevin.jordan@noaa.gov</u>	
Created with NOAA OBS 1.00 W. C.A.R. for iPhone and iPad OBSLogbook.com Page 4 of 8			





- ▲ 1-order horizontal
- 1-order vertical
- ▲ 2-order horizontal
- 2-order vertical
- ▲ 3-order horizontal
- 3-order vertical
- ☆ CORS
- Destroyed
- ▲ GPS
- Gravity
- ▲ OPUS

Ruler

Line Path Polygon Circle 3D path 3D polygon

Measure the distance between two points on the ground

Map Length: 3.13 Kilometers

Ground Length: 3.13

Heading: 88.88 degrees

Mouse Navigation Save Clear



- X 438 (LL1137)

```

PROGRAM = datasheet95, VERSION = 8.12.5.14
Starting Datasheet Retrieval...
1 National Geodetic Survey, Retrieval Date = MARCH 21, 2023
LL1137 *****
LL1137 DESIGNATION - X 438
LL1137 PID - LL1137
LL1137 STATE/COUNTY- CO/BOULDER
LL1137 COUNTRY - US
LL1137 USGS QUAD - NIWOT (2019)
LL1137
LL1137 *CURRENT SURVEY CONTROL
LL1137
LL1137* NAD 83(2011) POSITION- 40 02 11.39082(N) 105 14 05.37354(W) ADJUSTED
LL1137* NAD 83(2011) ELLIP HT- 1596.277 (meters) (06/27/12) ADJUSTED
LL1137* NAD 83(2011) EPOCH - 2010.00
LL1137* NAVD 88 ORTHO HEIGHT - 1612.286 (meters) 5289.64 (feet) ADJUSTED
LL1137
LL1137 GEOID HEIGHT - -16.020 (meters) GEOID18
LL1137 NAD 83(2011) X - -1,285,321.030 (meters) COMP
LL1137 NAD 83(2011) Y - -4,719,427.846 (meters) COMP
LL1137 NAD 83(2011) Z - 4,082,115.978 (meters) COMP
LL1137 LAPLACE CORR - -17.60 (seconds) DEFLEC18
LL1137 DYNAMIC HEIGHT - 1610.760 (meters) 5284.64 (feet) COMP
LL1137 MODELED GRAVITY - 979,623.5 (mgal) NAVD 88
LL1137
LL1137 VERT ORDER - FIRST CLASS II
LL1137
LL1137 Network accuracy estimates per FGDC Geospatial Positioning Accuracy
LL1137 Standards:
LL1137 FGDC (95% conf, cm) Standard deviation (cm) CorrNE
LL1137 Horiz Ellip SD_N SD_E SD_h (unitless)
LL1137 -----
LL1137 NETWORK 0.43 1.25 0.19 0.16 0.64 0.05175353
LL1137 -----
LL1137 Click here for local accuracies and other accuracy information.
LL1137
    
```



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PROGRAM = datasheet95, VERSION = 8.12.5.14
Starting Datasheet Retrieval...
1      National Geodetic Survey,  Retrieval Date = MARCH 21, 2023
LL1136 *****
LL1136 DESIGNATION - W 438
LL1136 PID - LL1136
LL1136 STATE/COUNTY- CO/BOULDER
LL1136 COUNTRY - US
LL1136 USGS QUAD - NIWOT (2019)
LL1136
LL1136 *CURRENT SURVEY CONTROL
LL1136
LL1136* NAD 83(1986) POSITION- 40 01 44.9 (N) 105 14 03.9 (W) HD_HELD2
LL1136* NAVD 88 ORTHO HEIGHT - 1597.984 (meters) 5242.72 (feet) ADJUSTED
LL1136
LL1136 GEOID HEIGHT - -16.026 (meters) GEOID18
LL1136 DYNAMIC HEIGHT - 1596.467 (meters) 5237.74 (feet) COMP
LL1136 MODELED GRAVITY - 979,621.7 (mgal) NAVD 88
LL1136
LL1136 VERT ORDER - FIRST CLASS II
LL1136
LL1136.The horizontal coordinates were established by autonomous hand held GPS
LL1136.observations and have an estimated accuracy of +/- 10 meters.
LL1136.
LL1136.The orthometric height was determined by differential leveling and
LL1136.adjusted by the NATIONAL GEODETTIC SURVEY
LL1136.in June 1991.
LL1136
LL1136.Significant digits in the geoid height do not necessarily reflect accuracy.
LL1136.GEOID18 height accuracy estimate available here.
LL1136

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- W 438 (LL1136)



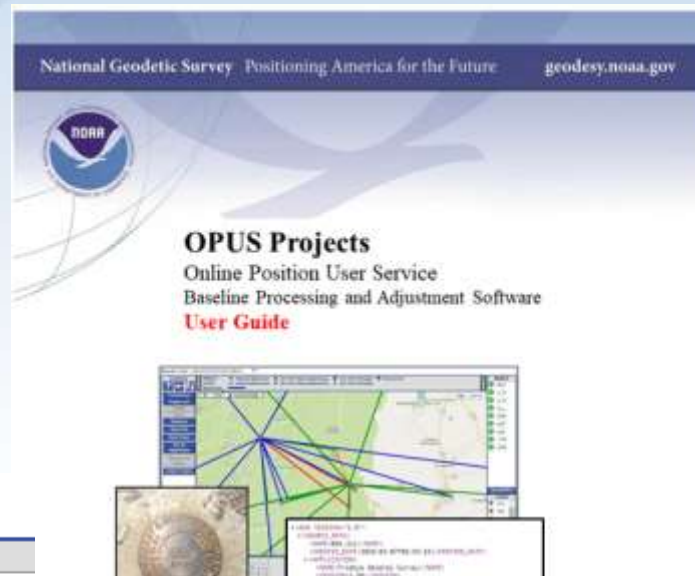
```

PROGRAM = datasheet95, VERSION = 8.12.5.14
Starting Datasheet Retrieval...
1      National Geodetic Survey,  Retrieval Date = MARCH 21, 2023
LL1126 *****
LL1126 DESIGNATION - Z 438
LL1126 PID - LL1126
LL1126 STATE/COUNTY- CO/BOULDER
LL1126 COUNTRY - US
LL1126 USGS QUAD - BOULDER (2019)
LL1126
LL1126 *CURRENT SURVEY CONTROL
LL1126
LL1126* NAD 83(1986) POSITION- 40 01 40.3 (N) 105 15 47.6 (W) HD_HELD2
LL1126* NAVD 88 ORTHO HEIGHT - 1619.011 (meters) 5311.71 (feet) ADJUSTED
LL1126
LL1126 GEOID HEIGHT - -15.763 (meters) GEOID18
LL1126 DYNAMIC HEIGHT - 1617.463 (meters) 5306.63 (feet) COMP
LL1126 MODELED GRAVITY - 979,613.8 (mgal) NAVD 88
LL1126
LL1126 VERT ORDER - FIRST CLASS II
LL1126
LL1126.The horizontal coordinates were established by autonomous hand held GPS
LL1126.observations and have an estimated accuracy of +/- 10 meters.
LL1126.
LL1126.The orthometric height was determined by differential leveling and
LL1126.adjusted by the NATIONAL GEODETIC SURVEY
LL1126.in June 1991.
LL1126
LL1126.Significant digits in the geoid height do not necessarily reflect accuracy.
LL1126.GEOID18 height accuracy estimate available here.
LL1126

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- Z 438 (LL1126)

- Observation Requirements
 - Static – Minimum two 2-hour
 - RTK – Minimum three 5-min observations

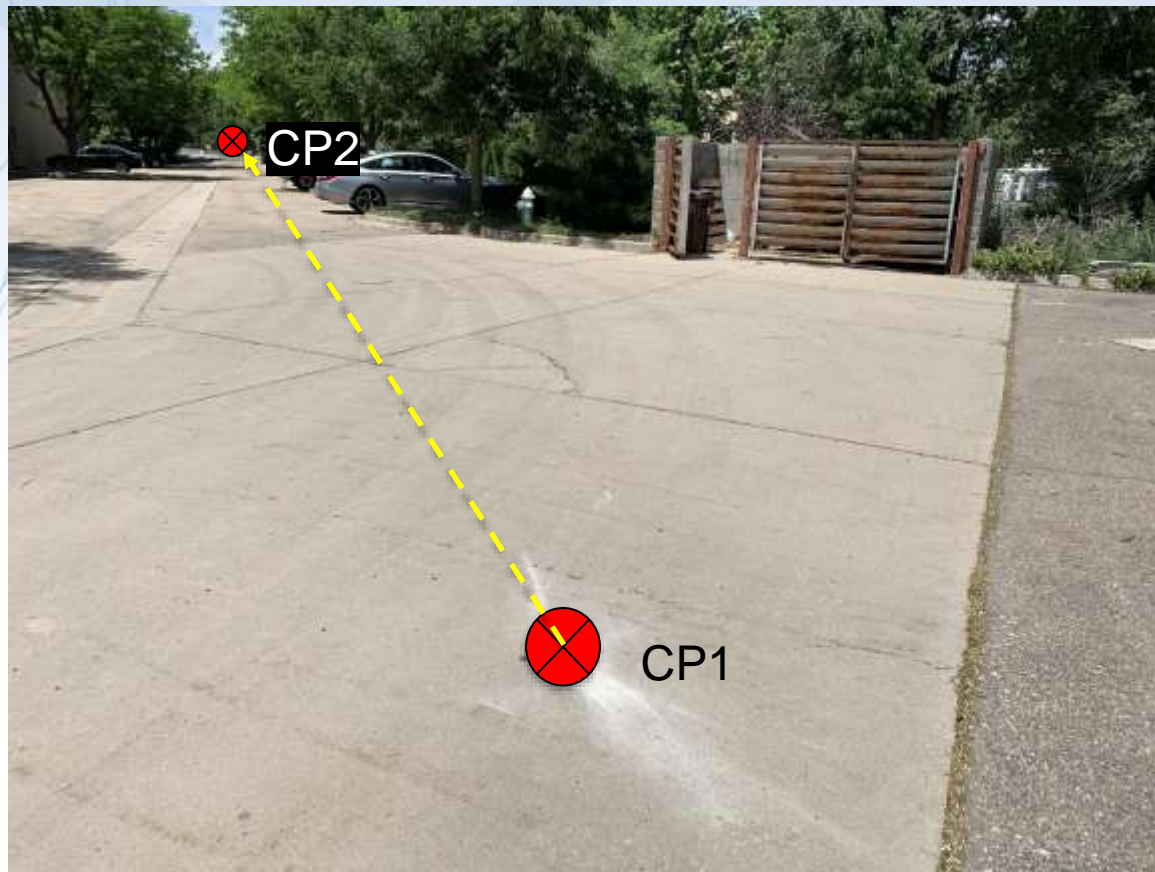


MARK Occupations

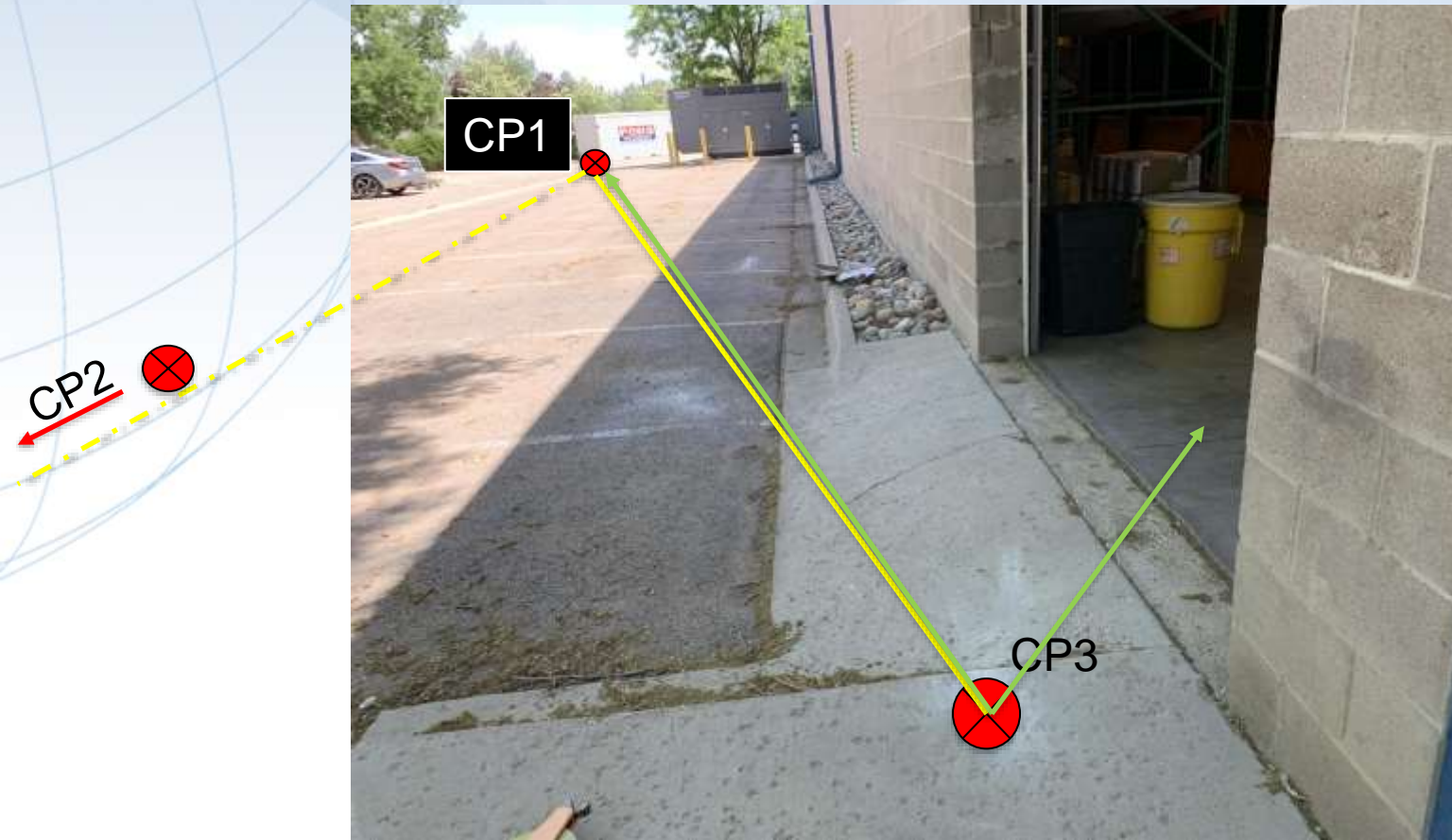
USE	DATA FILE	SPAN
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Baselines To-From	GVX Baseline Statistics											Baselines To-From
	Vector Count	Vector Used	Span Min (s)	Span Max (s)	Epoch Used Min	Epoch Used Max	PDOP Min	PDOP Max	North P2P(cm)	East P2P(cm)	Up P2P(cm)	
cp1_terr	5	5	183	313	183	313	1.7	3.54	1.22	1.46	0.77	cp1_terr
cp2_terr	4	4	189	307	182	307	2.64	3.28	1.07	0.78	1.32	cp2_terr
w_43-terr	5	5	182	1743	182	303	1.37	3.73	1.89	0.79	0.48	w_43-terr
x_43-terr	5	5	181	758	181	546	1.59	4.04	0.84	0.48	1.21	x_43-terr
z_43-terr	4	4	183	440	183	301	1.73	2.32	0.75	0.6	0.84	z_43-terr

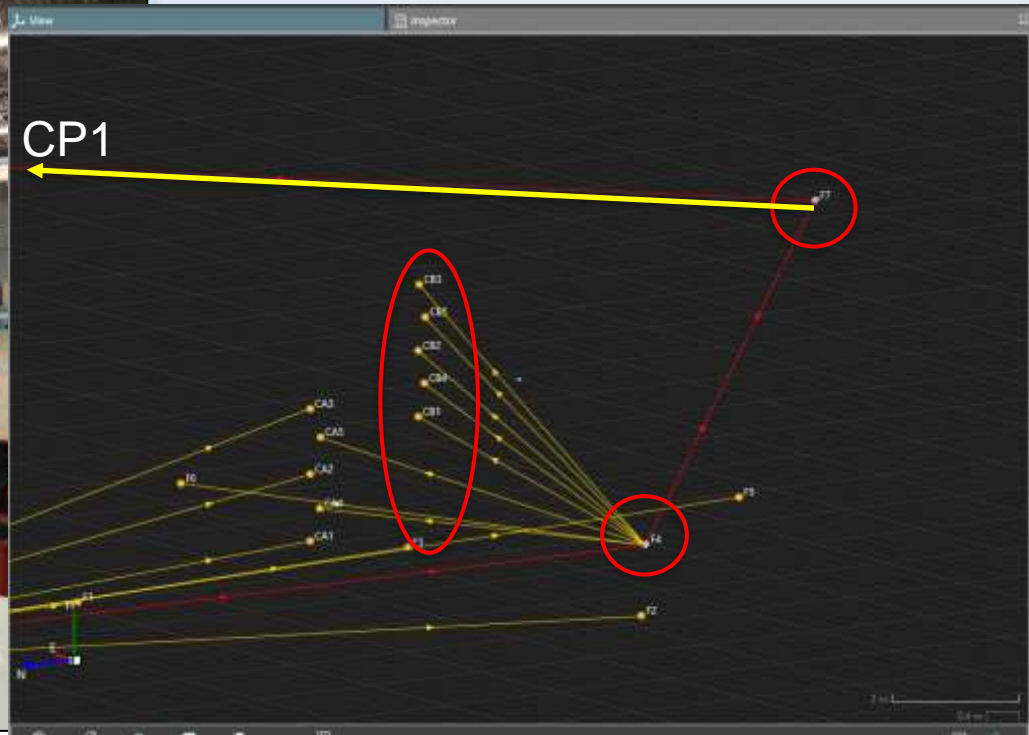
Exterior



Exterior - Interior



Interior



Office Processing

Traverse Accuracy before Adjustment			
Start Station	CP1	Misclosure Point	CP1
End Station	F7	Easting	-0.001 m
Total Length (CP1 to CP1)	115.315 m	Northing	-0.001 m
1D Accuracy	1/38219 ✓	Height	0.003 m
2D Accuracy	1/59299 ✓	Length of Error	0.002 m
Computed Scale	1.000000000000	Direction of Error	43° 36' 27.80"
Start Azimuth	0° 00' 04.28"	End Azimuth	106° 47' 11.72"
<input type="checkbox"/> Use start azimuth	0° 00' 02.89"	<input type="checkbox"/> Use end azimuth	106° 47' 11.72"

Select method for misclosure distribution			
Angular Misclosure			
Max. Error	0° 00' 30.00" Calculated	-	No Angle Distribution ▾
Length Misclosure			
Max. Error	0.107 m Calculated	0.002 m ✓	←
Height Misclosure			
Max. Error	0.010 m Calculated	0.003 m ✓	←

Office Processing

Results From: ALL SESSIONS

Controls

- Profession Project List Solutions
- Add Project Tracking ID
- Show File
- Send Email
- Upload Description
- Upload Field Logs
- Refresh PID Information
- Upload GNSS Vectors
- Set up Adjustment
- Export Adjustments
- Upload Project Report
- Refresh and Submit to NGS
- Update Project

MARKS: ■ CORS ■ 3D, Static processing only ■ 3D, Uploads GVX only ■ 3D, Static processing + GNSS

STATUS: ■ meet preferences ■ do not meet preferences ■ are not included ■ have error

Baseline: ■ Network Adjustment ■ GNSS Session ■ are not included ■ Other GNSS

Map Satellite

Statistics From: ALL SESSIONS

MARKS	Session Statistics										MARKS
	Occupations Count	Occupations Used	Solutions Count	Obs Used	Obs Used(%)	AMB Flood(%)	North P2P(%)	East P2P(%)	Up P2P(%)		
cpr1											cpr1
ter	3	3	3	54857	98.8	98.7	0.29	0.14	0.79		ter
w_43											w_43
s_43											s_43
t_43											t_43
amc4	4	3	3	58661	99.8	99.4	0.12	0.36	0.7		amc4
coBk	4	3	3	58631	98.3	92.1	0.12	0.35	0.56		coBk
ec01	4	3	3	55717	88.8	99.8	0.09	0.63	0.12		ec01
pd41	4	3	3	445549	98.9	98.4	0.02	0.64	0.01		pd41
pie1	4	3	3	54625	99.8	99.6	0.23	0.35	0.85		pie1
wBt	4	3	3	55896	98.3	96.3	0.08	0.36	0.83		wBt
img2	4	3	3	57346	88.5	98.6	0.21	0.27	0.56		img2
zdv1	4	3	3	56111	97.4	96.6	0.13	0.18	0.48		zdv1

Office Processing

 Statistics From ALL GVX VECTORS

Baselines To-From	GVX Baseline Statistics											Baselines To-From
	Vector Count	Vector Used	Span Min (s)	Span Max (s)	Epoch Used Min	Epoch Used Max	PDOP Min	PDOP Max	North P2P(cm)	East P2P(cm)	Up P2P(cm)	
cp1_-terr	5	5	183	313	183	313	1.7	3.54	1.22	1.46	0.77	cp1_-terr
cp2_-terr	4	4	189	307	182	307	2.64	3.28	1.07	0.78	1.32	cp2_-terr
w_43-terr	5	5	182	1743	182	303	1.37	3.73	1.89	0.79	0.48	w_43-terr
x_43-terr	5	5	181	758	181	546	1.59	4.04	0.84	0.48	1.21	x_43-terr
z_43-terr	4	4	183	440	183	301	1.73	2.32	0.75	0.6	0.84	z_43-terr

Thresholds are used to highlight solution results that do not meet the quality preferences for your project.

Precise Ephemeris:	Best Available
Minimum ARP Height (m):	0.000
Maximum ARP Height (m):	3.000
Minimum Observations Used (%):	80.0
Minimum Ambiguities Fixed (%):	80.0
Maximum Solution RMS (m):	0.025
Maximum Height Uncertainty (m):	0.040
Maximum Latitude Uncertainty (m):	0.020
Maximum Longitude Uncertainty (m):	0.020
Maximum Pdop:	7.0
Minimum Duration (s):	2
Minimum Epoch Used (epochs):	60.0
Coordinate Type:	Fixed

Office Processing

"NIST FirstNet" Network Adjustment

?
Perform Adjustment
X

NGS survey project tracking ID : 0000

Preliminary
 Horizontal free
 Horizontal constrained
 Vertical free
 Vertical constrained

Adjustment Name (30 char max): Prelim

Included Solutions

network: Prelim
 FirstNet.gvx

Available Solutions

(none)

MARK	CONSTRAINT	HEIGHT (m)	LATITUDE (° ' ")	LONGITUDE (° ' ")	REF. FRAME
cp1_	NONE	EL HGT	3274.13653 9940:02:54.50896	9105:13:55.81069	NAD_83(2011)(2010 0000)
cp2_	NONE	EL HGT	3276.23320 9940:02:54.61094	9105:13:24.73129	NAD_83(2011)(2010 0000)
ler	NONE	EL HGT	3273.609 9940:02:53.36993	9105:13:58.13120	NAD_83(2011)(2010 0000)
w_43	NONE	EL HGT	3381.95331 9940:02:44.85036	9104:14:05.71983	NAD_83(2011)(2010 0000)
x_43	NONE	EL HGT	3386.27403 9940:02:41.39026	9104:14:00.27240	NAD_83(2011)(2010 0000)
z_43	NONE	EL HGT	3303.24170 9940:02:40.33633	9105:13:47.83188	NAD_83(2011)(2010 0000)
CORS	CONSTRAINT	HEIGHT (m)	LATITUDE (° ' ")	LONGITUDE (° ' ")	REF. FRAME
amc4	NONE	EL HGT	3712.276 9938:48:11.22602	9104:11:28.43672	NAD_83(2011)(2010 0000)
cobk	NONE	EL HGT	3815.690 9939:31:06.24300	9104:02:51.44442	NAD_83(2011)(2010 0000)
ec01	NONE	EL HGT	3267.676 9939:28:04.33170	9104:50:51.73281	NAD_83(2011)(2010 0000)
p041	3-D	EL HGT	1729.716 9939:56:58.16001	9105:11:25.31667	NAD_83(2011)(2010 0000)
pie1	NONE	EL HGT	3345.686 9934:13:25.40331	9108:27:28.23024	NAD_83(2011)(2010 0000)
stft	NONE	EL HGT	3008.148 9940:00:45.77512	9104:51:33.73814	NAD_83(2011)(2010 0000)
tnsg2	NONE	EL HGT	3449.493 9940:07:47.83494	9108:13:54.89926	NAD_83(2011)(2010 0000)
zdy1	NONE	EL HGT	3341.785 9940:11:14.27223	9104:07:37.81993	NAD_83(2011)(2010 0000)

Processing Preferences

Output Ref Frame: LET OPUS CHOOSE

Output Geoid Model: LET OPUS CHOOSE

Constraint Weights: LOOSE NORMAL TIGHT

Office Processing

"NIST FirstNet" Network Adjustment

NGS survey project tracking ID : 0000

Preliminary
 Horizontal free
 Horizontal constrained
 Vertical free
 Vertical constrained

Adjustment Name (30 char max): Prelim

Included Solutions

network-Prelim-horizontal-free

Available Solutions

[none]

MARK	CONSTRAINT		HEIGHT (m)	LATITUDE (° '')	LONGITUDE (° '')	REF. FRAME
cp1_	NONE	EL HGHT	1574.15431	040 01:54.00338	W108 13:39.91048	NAD_83(2011) (2010 0000)
cp2_	NONE	EL HGHT	1574.88420	040 01:56.07088	W108 13:39.78128	NAD_83(2011) (2010 0000)
levr	NONE	EL HGHT	1679.909	040 03:58.89991	W108 13:39.13130	NAD_83(2011) (2010 0000)
w_43	NONE	EL HGHT	1581.95337	040 01:54.95034	W108 14:38.77952	NAD_83(2011) (2010 0000)
x_43	3-D	EL HGHT	1886.277	040 02:11.39082	W108 14:08.17384	NAD_83(2011) (2010 0000)
z_43	NONE	EL HGHT	1702.24170	040 01:40.35430	W108 15:47.85244	NAD_83(2011) (2010 0000)
CORS						
mmc4	3-D	EL HGHT	1312.274	039 48:11.22882	W104 31:28.49873	NAD_83(2011) (2010 0000)
cobk	3-D	EL HGHT	2018.640	039 31:46.86200	W108 02:31.64642	NAD_83(2011) (2010 0000)
ec01	3-D	EL HGHT	1367.478	039 39:06.88170	W106 00:51.73281	NAD_83(2011) (2010 0000)
p041	3-D	EL HGHT	1723.718	039 04:58.18001	W108 11:39.31487	NAD_83(2011) (2010 0000)
pie1	NONE	EL HGHT	1240.840	034 19:09.40301	W108 07:39.03034	NAD_83(2011) (2010 0000)
stfl	3-D	EL HGHT	2089.140	040 30:48.77812	W106 51:53.78816	NAD_83(2011) (2010 0000)
lmp2	3-D	EL HGHT	1669.992	040 07:49.88494	W105 18:58.59928	NAD_83(2011) (2010 0000)
zdr1	3-D	EL HGHT	1641.788	040 11:14.27301	W108 07:37.86882	NAD_83(2011) (2010 0000)

Processing Preferences

Output Ref Frame: LET OPUS CHOOSE

Output Geoid Model: LET OPUS CHOOSE

Constraint Weights: LOOSE NORMAL TIGHT

Office Processing

MARK ESTIMATED - PUBLISHED HORIZONTAL COORDINATE SHIFTS

amc4	N:	0.003 m (0.001 m)	E:	0.003 m (0.001 m)	U:	-0.004 m (0.004 m)	CORS
cobk	N:	0.000 m (0.001 m)	E:	0.003 m (0.001 m)	U:	0.017 m (0.004 m)	CORS
ec01	N:	-0.002 m (0.001 m)	E:	-0.005 m (0.001 m)	U:	0.009 m (0.004 m)	CORS
p041	N:	-0.001 m (0.001 m)	E:	-0.004 m (0.001 m)	U:	-0.005 m (0.004 m)	CORS
pie1	N:	-0.004 m (0.002 m)	E:	0.002 m (0.001 m)	U:	0.015 m (0.004 m)	CORS
stbt	N:	-0.002 m (0.001 m)	E:	0.003 m (0.001 m)	U:	0.005 m (0.004 m)	CORS
tmg2	N:	0.003 m (0.001 m)	E:	0.001 m (0.001 m)	U:	0.011 m (0.004 m)	CORS
x_43	N:	-0.004 m (0.002 m)	E:	-0.005 m (0.001 m)	U:	-0.003 m (0.004 m)	LL1137
zdv1	N:	0.002 m (0.001 m)	E:	-0.004 m (0.001 m)	U:	-0.006 m (0.004 m)	CORS

Office Processing

?
Perform Adjustment
X

NGS survey project tracking ID : 0000

Preliminary
 Horizontal free
 Horizontal constrained
 Vertical free
 Vertical constrained

Adjustment Name (30 char max): Prelm

Included Solutions	Available Solutions
network-Prelm-horizontal-constrained	[none]

MARK	CONSTRAINT	HEIGHT (m)	LATITUDE (°'")	LONGITUDE (°'")	REF. FRAME
cp1_	NONE	EL HGT - GEOID18	3550.23	W105-13-03-31000	NAD_83(2011) (2010 0000)
cp2_	NONE	EL HGT - GEOID18	3552.40	W105-13-00-73100	NAD_83(2011) (2010 0000)
tenr	NONE	EL HGT - GEOID18	3595.60	W105-13-00-38100	NAD_83(2011) (2010 0000)
w_43	VER-ONLY	NAVD 88 (FGCS LEVELING IN NGSIDB)	3597.984	W105-13-00-71900	NAD_83(2011) (2010 0000)
x_43	NONE	NAVD 88 (FGCS LEVELING IN NGSIDB)	3613.294	W105-14-00-37354	NAD_83(2011) (2010 0000)
z_43	NONE	NAVD 88 (FGCS LEVELING IN NGSIDB)	3613.011	W105-13-07-60944	NAD_83(2011) (2010 0000)
CORS	CONSTRAINT	HEIGHT (m)	LATITUDE (°'")	LONGITUDE (°'")	REF. FRAME
amc4	NONE	EL HGT - GEOID18	1830.79	W104-01-20-45470	NAD_83(2011) (2010 0000)
cobk	NONE	EL HGT - GEOID18	2929.82	W104-02-00-66600	NAD_83(2011) (2010 0000)
ec01	NONE	EL HGT - GEOID18	2001.39	W104-00-00-73201	NAD_83(2011) (2010 0000)
p041	HOR-ONLY	EL HGT - GEOID18	3740.87	W108-11-00-31457	NAD_83(2011) (2010 0000)
pie1	NONE	EL HGT - GEOID18	2369.99	W104-07-00-40391	NAD_83(2011) (2010 0000)
stbt	NONE	EL HGT - GEOID18	3100.72	W104-01-00-78910	NAD_83(2011) (2010 0000)
tmg2	NONE	EL HGT - GEOID18	3488.91	W101-13-00-09320	NAD_83(2011) (2010 0000)
zdv1	NONE	EL HGT - GEOID18	3580.43	W105-07-07-36302	NAD_83(2011) (2010 0000)

Processing Preferences

Output Ref Frame: LET OPUS CHOOSE

Output Geoid Model: LET OPUS CHOOSE

Constraint Weights: LOOSE NORMAL TIGHT

Office Processing

"NIST FirstNet" Network Adjustment

?
Postform Adjustment
X

NGS survey project tracking ID : 0000

Preliminary
 Horizontal free
 Horizontal constrained
 Vertical free
 Vertical constrained

Adjustment Name (30 char max): Preim

Included Solutions

Available Solutions

MARK	CONSTRAINT	HEIGHT (m)	LATITUDE (***)	LONGITUDE (***)	REF. FRAME
cp1	NONE	EL HGT - GEOID18	1290.23	840 01 04 50536	NAD_83(2011) (2010 0000)
cp2	NONE	EL HGT - GEOID18	1292.40	840 01 04 87104	NAD_83(2011) (2010 0000)
lnt	NONE	EL HGT - GEOID18	1426.40	840 01 03 99997	NAD_83(2011) (2010 0000)
w_43	VER-ONLY	NAVD 88 (FGCS LEVELING IN NSSIDB)	1497.354	840 01 04 85154	NAD_83(2011) (2010 0000)
x_43	VER-ONLY	NAVD 88 (FGCS LEVELING IN NSSIDB)	1412.286	840 02 11 20002	NAD_83(2011) (2010 0000)
z_43	VER-ONLY	NAVD 88 (FGCS LEVELING IN NSSIDB)	1419.013	840 02 00 33622	NAD_83(2011) (2010 0000)
CORS					
MARK	CONSTRAINT	HEIGHT (m)	LATITUDE (***)	LONGITUDE (***)	REF. FRAME
anc4	NONE	EL HGT - GEOID18	1290.79	808 48 11 22993	NAD_83(2011) (2010 0000)
cofk	NONE	EL HGT - GEOID18	1428.32	809 01 08 89208	NAD_83(2011) (2010 0000)
ec01	NONE	EL HGT - GEOID18	1291.68	809 08 08 88170	NAD_83(2011) (2010 0000)
p041	HOR-ONLY	EL HGT - GEOID18	1746.87	839 48 58 18001	NAD_83(2011) (2010 0000)
pa1	NONE	EL HGT - GEOID18	1492.55	839 18 09 80191	NAD_83(2011) (2010 0000)
stf	NONE	EL HGT - GEOID18	1210.72	840 00 03 77612	NAD_83(2011) (2010 0000)
trng2	NONE	EL HGT - GEOID18	1288.31	840 07 47 83894	NAD_83(2011) (2010 0000)
zdv1	NONE	EL HGT - GEOID18	1268.43	840 11 14 27201	NAD_83(2011) (2010 0000)

Processing Preferences

Output Ref Frame: LET OPUS CHOOSE

Output Geoid Model: LET OPUS CHOOSE

Constraint Weights: LOOSE NORMAL TIGHT

Office Processing

MARK ESTIMATED - VERTICAL-FREE ADJUSTMENT COORDINATE SHIFTS

amc4	N:	0.000 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.005 m (0.004 m)
cobk	N:	0.000 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.005 m (0.004 m)
cp1_	N:	0.000 m (0.003 m)	E:	0.000 m (0.004 m)	H:	-0.004 m (0.004 m)
cp2_	N:	0.000 m (0.004 m)	E:	0.000 m (0.004 m)	H:	-0.004 m (0.004 m)
ec01	N:	0.000 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.005 m (0.004 m)
p041	N:	0.000 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.004 m (0.004 m)
pie1	N:	-0.001 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.005 m (0.004 m)
stbt	N:	0.000 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.004 m (0.004 m)
terr	N:	0.000 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.004 m (0.003 m)
tmg2	N:	0.000 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.005 m (0.004 m)
w_43	N:	0.000 m (0.003 m)	E:	0.000 m (0.004 m)	H:	-0.004 m (0.003 m)
x_43	N:	0.000 m (0.003 m)	E:	0.000 m (0.004 m)	H:	-0.005 m (0.003 m)
z_43	N:	0.000 m (0.006 m)	E:	0.000 m (0.006 m)	H:	-0.002 m (0.004 m)
zdv1	N:	0.000 m (0.002 m)	E:	0.000 m (0.003 m)	H:	-0.005 m (0.004 m)

MARK ESTIMATED - PUBLISHED VERTICAL COORDINATE SHIFTS

w_43:	ORTHO HGT:	-0.004 m	←	FGCS LEVELING IN NGSIDB
x_43:	ORTHO HGT:	0.007 m	←	FGCS LEVELING IN NGSIDB
z_43:	ORTHO HGT:	-0.003 m	←	FGCS LEVELING IN NGSIDB

Office Processing

	A	DX	DY	DZ	EA	EB	EC	
1	esid	ortho_hgt	utm_zone	spc_zone	northing_utm	northing_spc	easting_utm	eas
2	terr	(= EL HGT	UTM (Zon	SPC (0501	4431265.3350	382341.3260	480681.2390	93
3	amc4	(= EL HGT	UTM (Zon	SPC (0502	4295036.1380	1354683.6320	541281.1950	327
4	cobk	(= EL HGT	UTM (Zon	SPC (0502	4376082.8480	1618281.5670	409958.9160	284
5	ec01	(= EL HGT	UTM (Zon	SPC (0502	4390745.1840	1665118.7400	341477.2860	262
6	p041							
7	pie1	(= EL HGT	UTM (Zon	SPC (3003	3799345.5280	1201236.3340	765159.3140	263
8	stbt	(= EL HGT	UTM (Zon	SPC (0501	4486336.8550	1432543.5950	342001.7800	262
9	tmg2	(= EL HGT	UTM (Zon	SPC (0501	4442207.0520	1290298.4360	480144.2240	307
10	zdv1	(= EL HGT	UTM (Zon	SPC (0501	4448553.5380	1311294.1950	489171.0260	310
11	cp1_	(= EL HGT	UTM (Zon	SPC (0501	4431296.5000	382372.6660	480710.2510	93
12	cp2_	(= EL HGT	UTM (Zon	SPC (0501	4431360.4200	382436.2320	480643.5590	93
13	w_43							
14	x_43							
15	z_43							
16								
17								

Export Adjustments from Project [nist22]

Export Selected Adjustments

NGS survey project tracking ID:

Export Format: CSV GeoJSON DXF (geometry only) KML GPKG

Adjustment Name: final

Available Network Solutions

- network-final
- network-final-horizontal-free
- network-final-horizontal-constrained
- network-final-vertical-free
- network-final-vertical-constrained

Selected Network Solutions

- network-final (for submission)

Website Owner: National Geodetic Survey / Last modified by OPUS team Mar 22 2023

Thank You!

